

MĀORI GENETIC DATA -INALIENABLE RIGHTS AND TIKANGA SOVEREIGNTY

KARAITIANA NATHAN TAIURU 2021

A thesis presented to Te Whare Wānanga o Awanuiārangi in fulfilment of the requirements for the degree of Doctor of Philosophy in Indigenous Studies, Te Whare Wānanga o Awanuiārangi



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DECLARATION

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This thesis contains no material that I have submitted towards the award of any other degree or diploma in any other university or other institution.

This thesis represents research I have undertaken. The findings and opinions in my thesis are mine and they are not necessarily those of Te Whare Wānanga o Awanuiārangi.

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Karaitiana Nathan Taiuru

Signature:

Date: April 26, 2021

ABSTRACT

"He whatinga pūngāwerewere".

At the Waitangi Tribunal, in the Ngāti Hikairo Closing Submissions 22 October 2014, "Meto Hopa applied the above metaphor of the spider's web to the claims. Although this *kōrero* (talk) mentions the spider, it actually refers to a spider's web, a *māwhaiwhai* or *whare tukutuku*. When the strands of a web are pulled at or shifted, it strains and weakens the web. It may break part of the web or destroy it completely". (Wackrow, 2014, p. 75).

While Meto Hopa used the above metaphor for boundaries that are crossed or adjusted, therefore creating changes to the 'web' which may strain or weaken it, I have likened the same metaphor to Māori genetic data testing and storage. Genomics is a result of *whakapapa* (genealogy) and is *tapu* (sacredness) like our tribal boundaries. The more scientists extract, pull and shift the genomic code around, the more the *whakapapa* is weakened, compromised, or destroyed.

Māori social, cultural, economic, educational, health and political spectrum of voices is now moving into areas of customary intellectual property connection to *whakapapa*. The purpose of this doctorate thesis is to ascertain the connection between *whakapapa* obligation-responsibility and the formation of Māori DNA and Genomic ownership.

The thesis asks how Māori can define for themselves their own intellectual customary intellectual property rights in regard to human, environmental endemic native species, and traditional *Taonga* Species (Sacred Species) genetic data and what moral, ethical, socio-economic, physical, and political implications of genomic research to Māori are and how can these be discussed more thoroughly and understood and approved by Māori. If Māori can define for themselves their own intellectual customary intellectual property rights in regard to human, environmental endemic native species, and traditional *Taonga* Species genetic data, then what moral, ethical, socio-economic, physical, and political implications of genomic research to Māori are? These implications are then discussed more thoroughly.

This research argues that DNA is *whakapapa*, therefore a *taonga* (treasure), regardless of if the DNA is from a living or dead human, endemic native species, or other *Taonga* Species. This results in a number of protection mechanisms under the Te Tiriti/Treaty of Waitangi, Declaration of Independence, various New Zealand legislation and UN Declaration on the Rights of Indigenous Peoples (UNDRIP) in addition to medical and scientific research ethics of *te ao Māori* (the Māori world).

Because of the wide spread genomic research being conducted without Māori ethics, it is likely that genomics and DNA will be the new repatriation challenge for Māori within the next decade as Māori fight to regain ownership and access to their *whakapapa*, in some instances due to Māori unwittingly giving permission to international conglomerates to use and take ownership of their genetic data.

There has been limited consideration of the ownership of endemic species genomic data or from genetic data gained from archaeological sites and museums. Existing legislation and instruments that are applicable to the protecting of rights of Māori with their DNA and genomic data have been ignored by Eurocentric scientists and governments. Māori researchers have obfuscated tikanga and traditional knowledge which has resulted in further confusion. Therefore, this thesis recommends a code of ethics to be observed when extracting and researching Māori genetic data.

This study does not intend to state that there is one Māori world view, indeed, it is expected to be the opposite as Mead asserted in 1979 "it was obvious that few people really understood *tikanga* (protocols), and this included our own people" (Sidney M. Mead, 2016b). This is likely due to the facts that Māori culture has been integrated into European culture for over 300 years by colonisation, intermarriage, introduced and forced religion, urbanisation, politicians, and educationalists encouraging the move away from Māori culture and government-imposed assimilation.

The research described in this proposal focuses on the dilemma facing Māori with genetic and genomic research. The only ethical guidelines for Māori currently available consider only human research from a western perspective. The ethical guidelines do not consider genetic and genomic data as a *taonga* (treasure), traditional knowledge, nor the fact that endemic native species and other Taonga Species appear in the same level of *whakapapa* as the first Māori human beings.

This thesis will introduce unique discussions outlining *whakapapa* of the *ira tangata* (human body) and other endemic native species. Taonga species is introduced here as any species that were brought to Aotearoa/New Zealand by the early Māori settlers or that were already here as traditional stories of these introduced species tell of their *whakapapa* and therefore place as being a *taonga*.

Definitions of *taonga* and *whakapapa* will be discussed and compared to DNA. This will then form the key argument that any genetic data from any living or dead species defined in this research is *tapu* (sacred).

Māori individuals, *whānau* (family), *hapū* (sub tribe) and *Iwi* (tribe) are yet to grasp the power and influence of the emerging science of genetic and genomic research. Māori researchers have obfuscated *tikanga* and traditional knowledge which has resulted in confusion (Hutchings & Reynolds, 2005). Therefore, this thesis recommends a code of ethics which external users should observe when extracting and researching DNA and Genomic data.

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Firstly, I want to acknowledge my *whānau whānui* (all family) who have departed to Hine nui i te po (deceased). The many *kaumātua* who installed seeds of knowledge and life values into me as a baby and early childhood through to this day. Especially to my *Tāua* (grandmother) and *Koro* (grandfather) who empowered me with traditional knowledge, that while at the time did not appear relevant and caused a lot of frustration, it did give me the solid basis to write this thesis and to be and advocate for Māori rights throughout my life.

All of my children and grandchildren, you were my motivation to begin this journey. The future holds so many unknowns with science and technology. The idea that I could maybe provide a little new and revived knowledge on the topic of Māori inalienable rights with genetic data, I hope will be my gift to you.

The thought of being a role model to my *whānau* as the first person in our *whānau* to obtain a PhD, a symbol that while the education systems work against Māori, we can beat it and come out the other end more qualified than those who supress us in the system.

Out of thirteen years of schooling in New Zealand, I only had three teachers who had any positive impact on my desire to stay at school and to engage. Mr Ken Bye my History teacher; Miss Grogan my English teacher and Koka Alamein Connell (Ngati Porou) my Māori language teacher, all of Linwood High School. Although it has been more than more than 27 years, the impact they had on me remains with me to this day.

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1972). Buck introduced Māori names to Freemason's temples or masonic lodges in New Zealand and compiled a list of suggested names including all lodge names that being with "Ara" as a connection with the lodge Buck was initiated into Ara Lodge No. 1, in 1908.

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CHAPTER OUTLINE

Chapter One: Introduces the author beginning with a cultural narrative placing himself within visual portraits of interconnected *marae* (tribal house), identifying of *whakapapa*, essence, spiritual connection & *whānau* (family) in a representative manner similar to that of a DNA sequence and symbolic of a genome. The chapter then continues to introduce the background and sets the scene for the rest of the thesis.

Chapter Two: Introduces the notion of *kaupapa Māori* methodologies and research practices that this thesis uses for research and analysis. A new *kaupapa Māori* framework is created and introduced in this chapter to fill the knowledge gap of other well-established frameworks and methodologies. Ngāi Tahu whānau and corporate values are adapted in this chapter as the underlying methodology to guide the other principles.

Chapter Three: A critical review of a series of literature that claim to be a Māori perspective of genetic and genome research. Key *tikanga* (cultural practices) and cultural concepts are identified, and an analysis using authoritative *kaupapa Māori* literature to explain and compare the differences in the definitions provided and shows how different cultural perspectives can be concluded from widely understood and intergenerational knowledge of those key cultural concepts.

Chapter Four: Introduces customary *tikanga Māori* knowledge and explores customary Māori rights to DNA and breaks with current scientific thinking by applying customary and traditional Māori knowledge with *Atua* (Deities). A new definition is introduced that all species from deities are *Taonga* Species and the many *pūrākau* (traditional knowledge) that contain DNA knowledge, including the many *atua* of various body fluids are discussed and warnings are explored.

Chapter Five: Analyses the scientific outputs and extraction of DNA from *taonga* species and uses customary *tikanga* and cultural practices to show that DNA is a property right and a *taonga* that must be recognised by legislation and Waitangi Tribunal.

Chapter Six: Proposes a new 'Customary Rights Frameworks' for Māori ownership to DNA from *Taonga* Species and proposes a set of ethical recommendations for researchers and scientists that recognises customary *tikanga* and property rights of Māori. A number of recommendations are made for the New Zealand government to recognise these property rights in legislation amendments and to recognise various international treaties that New Zealand should be a signatory and participant to further protect and enhance Māori rights to DNA and genomic research. The chapter concludes with the recommendations to create a

CHAPTER OUTLINE

Māori genetic academy to ensure new knowledge and leading research is conducted and a government appointed Māori genetic commission that is commissioned to ensure the government recognises Māori inalienable rights.

Chapter Seven Is a compilation of scientific and technological research of emerging biological and possible biological technologies that will impact on the human race and the environment. It then analyses specifically how these changes might directly impact Māori people, non-human *Taonga* species and the environment. The intention of this chapter is to assist Māori to protect their *taonga* now.

Chapter Eight: Provides a high-level summary of all of the previous chapters and makes a number of suggestions of how Māori, Academia and The Crown can work in mana enhancing relationships to progress and protect Māori inalienable rights to improve social, economic, education, research benefits which will then flow on to all of New Zealand society. The need to support and work in collaboration with other Indigenous Peoples to protect their own genetic Data, some of which is also shared with Māori is summarised and recommendations made.

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amo short boards at the front of the wharenui representing legs.

Aotearoa New Zealand

atua Māori deity

Aute Paper Mulberry (Broussonetia papyrifera)

Haka posture dance

hapū sub Tribe

Harakeke New Zealand flax (Phormium tenax)

hau vitality - of a person, place, or object

Haumia See Haumia-tiketike

Haumiatiketike Atua of fernroot and uncultivated food. Also known as Haumia, Haumiatikitiki and Haumia-roa

Hawaiki Ancient homeland

heke rafters

hine term of address to a girl or younger woman

Hineahuone Name of the first woman

Authored by Karaitiana N Taiuru

GLOSSARY

Hine-nui-i-te-pō deity of death

hohonu depth

Hue Gourd (Lagenaria siceraria)

Huia An extinct bird (Heteralocha acutirostrisa)

Īnaka Whitebait, fish (Galaxias maculatus)

Io Supreme God, creator of all.

iwi tribe

Kahawai Fish name (Arripis trutta)

kai moana sea food

Kāi Tahu A Māori tribe of the South Island. Also see Ngāi Tahu

Kaiapoi Place Name in North Canterbury

kaitiaki guardian. See kaitiakitanga.

kaitiakitaka see Kaitiakitanga

kaitiakitanga Guardianship, stewardship, trusteeship, trustee

kākahu clothes **Kakariki** Parakeet (Cyanoramphus novaezelandiae)

kanohi ki kanohi face to face

Karaka tree name (Corynocarpus laevigatus)

karakia prayer

kaumātua elder

kaupapa subject, agenda

kaupapa Māori Māori approach

kawa protocol

kawanatanga rule, authority, governorship, province

Kēkēwai freshwater crayfish; Paranephrops zealandicus

Kete-aronui Basket of knowledge of aroha, peace and the arts and crafts

Kiore Rat (Rattus exulans)

Kiwi A bird name (*Apteryx sp.*)

Kōhanga Reo Māori Language pre-school

GLOSSARY

Kōkako bird name (Callaeas cinereus)

Kōpī tree name (Corynocarpus laevigata)

koro grand father

kotahitanga unity, togetherness, solidarity, collective action.

Koura Freshwater crayfish (Paranephrops zealandicus)

Kōwaro Canterbury mudfish (Neochanna burrowsius)

kōwhaiwhai patterns commonly used on meeting house rafters

Kūmara Sweet Potato (*Ipomoea batatas*)

Kura Kaupapa Māori Māori-language immersion school

Kuri Dog (Canis lupus familiaris)

Kuru Breadfruit tree (Artocarpus incisa)

mahinga kai food-gathering place

mahua front barge boards

Mahuika deity of fire maihi front barge boards

mākutu curse

mana respect

mana tangata human rights

manaaki give hospitality to

manaakitaka Ngāi Tahu dialect for Manaakitanga

manaakitanga hospitality, kindness, generosity, support - the process of showing respect, generosity, and care for others

manawhenua Māori People with inherited authority over a part of land

maoritanga explanation, meaning.

marae courtyard - the open area in front of the wharenui.

marae ātea courtyard, public forum open area in front of the wharenui where formal welcomes to visitors takes place and issues are debated.

maramataka calendar māramatanga enlightenment, insight, understanding, light, meaning, significance

Māreikura order of female supernatural beings. See whatukura

Mataatua People descended from the

crew of this canoe from Hawaiki whose territories are in Northland and the Bay of Plenty.

mātauraka Ngāi Tahu word for mātauranga

mātauranga knowledge

Māui A well-known Polynesian character of narratives

Māui Tikitiki A well-known Polynesian character of narratives

Māui tinihanga A well-known Polynesian character of narratives

Māui-mua A well-known Polynesian character of narratives

Māui-Pōtiki A well-known Polynesian character of narratives

Maukatere Mt Grey in Canterbury

mauri life force, vital essence **miro** spin or roll together

Moa

extinct bird, Megalapteryx didinus; Anomalopteryx didiformis; Pachyornis elephantopus; Pachyornis geranoides; Pachyornis australis; Emeus crassus; Emeidae, Euryapteryx; Dinornis novaezealandiae and Dinornis robustus

Moeraki

A place name in the lower South Island

mokomokai preserved human head.

mokopuna grandchild

mōteatea

tradition of chanted songpoetry

Ngā Kaihautū Tikanga Taiao Statutory Māori advisory committee of the Environmental Protection Agency

Ngā Puhi A Māori Tribe in the far north of the North Island.

Ngāi Tūāhuriri A North Canterbury sub tribe of Ngāi Tahu

Ngāti Porou A tribe from the East Coast of the North Island

noa normal, not sacred

pā fortified village

Paikea

Tīpuna name. Humpback whale, *Megaptera novaeangliae*

Pākehā Non-Māori person.

pakitara side walls

Pakura Porphyrio melanotus

Papa See Papatūānuku.

papaka a narrow panel usually decorated with kōwhaiwhai.

papatipu rūnanga tribal council in Ngāi Tahu iwi

Papatūānuku Earth, Earth mother and wife of Rangi-nui - all living things originate from them

Paratawhiti King Fern, *Maritta fraxinea*

patere chant

Pāua Abalone, *Haliotis spp*

pēpeha A tribal saying used for identification

PereiOrchid,GastrodiaCunninghammiandOrthoceras strictuum

Pīwakawaka Fantail*, Rhipidura fuliginosa* **Pōhā** Kelp, Macrocystis pyrifera

pou pole

pōua Ngāi Tahu term for grandfather

poupou post

pōwhiri welcoming ceremony

puapua Labia

Pūkeko Porphyrio melanotus

pūrākau traditional form of Māori narrative

rakatirataka Ngāi Tahu word for Rangatiratanga

rangahau research

rangatira chief

rangatiratanga knowledge of and practice of the Treaty of Waitangi/Te Tiriti

Rangi See Ranginui.

Ranginui Father of the Sky.

Rangiora A shrub Brachyglottis repanda

raranga

GLOSSARY

woven patterns

Rohe a wife of Māui

Rongo deity of peace

Rongo-mā-Tāne deity of the Kūmara and cultivated food

Rūamoko Atua of minerals and earthquakes

ruatau helix shape

rūnaka Ngāi Tahu word for rūnanga

rūnanga tribal council

tā moko tattoo

tāhuhu ridge pole

Takitimu Name of an ancient canoe

takiwā tribal area

Tāne Māhuta deity of forests and all the species in a forest

Tane-te-waiora indicating "life, prosperity, welfare, sunlight

Tangaroa deity of the ocean and all of its children

tangata whenua

people of the land, Māori.

taonga treasure, something of significant value.

tapu Sacred

Taro *Colocasia esulenta*

tāua Ngāi Tahu word for grandmother or a respectful address to an elderly lady

tautoko support, agree

Tāwhirimatea Tutelary deity of the weather

te ao Māori The Māori world

te ao Pākehā Eurocentric perspective

Te Aupōuri Name of a Māori tribe in the north island, north of Kaitaia

Te Puke ki Hikurangi Māori newspaper

te reo Māori the Māori Language

Te Rūnanga o Ngāi Tahu Corporate body of Ngāi Tahu iwi.

Te Tiriti The Māori Language version of the Treaty of Waitangi

Te Whānau-ā-Apanui

An east coast Māori Tribe of the North Island

tekoteko Carved figure

Tī pore Cordyline fruticose

tika correct, appropriate

tikaka Ngāi Tahu word for Tikanga.

tikanga Customs

Tiki Auaha Name of the first human

tino rangatiratanga self-governance

tipuna ancestor

tohuka Southern word for Tohunga

tohungatanga expertise, competence, proficiency

Treaty of Waitangi founding document of New Zealand

Tū See Tūmatauenga

Tuahiwi place name

Tuatara Sphenodon punctatus - an endemic reptile

Tūhoe

GLOSSARY

A Māori tribe of the North Island

Tūmatauenga deity of War

Tuna Anguilla dieffenbachii

upoko senior person

utu revenge

wāhi tapu sacred place

WAI 262 Waitangi Tribunal claim for Intellectual Property Rights for Māori

waiata song

Waihora Māori name of Lake Ellesmere in Canterbury

wairua spirit

wairuatanga spirituality **waka** canoe

wakahuia A treasure box for taonga

Wētā Name of an insect

whakairo carvings

Whakamoeariki The name of the house where dwelt the gods Ruatau, Aitu-pawa, Rehua, and the Pono-aua

whakapapa genealogy

whakatau formal welcoming

whakataukī proverb

whakawhānui creating a friendly environment

whānau family

whanaukataka creating a friendly environment whanaunga relation

whanaungatanga relationship, kinship, sense of family connection

whāngai adopted

Whare Kura A place where esoteric lore was taught.

Whare Tipuna Ancestral House

Wharenui meeting house

Whatukura an order of male supernatural beings. See Māreikura

whenu a single-pair twining' weaving technique

Whikaho Yam, *Dioscorea Dioscorea sp*

Whiro Atua of things associated with evil, darkness and death.

NEW MĀORI WORDS FOR GENE RESEARCH

English	Māori	Whakapapa
bio~, biological	koiora	takenga mai: koiora – life
bioethics	matatika koiora	takenga mai: matatika – right, straight; koiora – biology
biological control	whakatina koiora	takenga mai: whakatina – overcome, confine, put under restraint; koiora biology
biological warfare	pakanga ā-koiora	
biology	mātai koiora	takenga mai: mātai – inspect, examine; koiora – life
chromosome	pūira	(takenga mai: pū – source, origin; ira – gene
DNA (deoxyribonucleic acid)	pītau ira	takenga mai: pītau — perforated spiral carving, young succulent shoot of afern; ira – gene
dominant gene	ira tāpua	takenga mai: ira – gene; tāpua – prominent, significant, stand out
female gamete	pūtau hema-uwha	takenga mai: pūtau – cell; hema – pudenda [external genetial organs]; uwha – female
gene	ira	takenga mai: ira – life principle
gene pool	mātāira	takenga mai: mātā – heap, layer; ira – gene) (kupu kē atu: puna ira
gene pool	puna ira	kupu kē atu: mātāira
genetic engineering, genetic modification	raweke ira	
genetic inheritance	iranga tuku iho	
genetic mutation	irakē	takenga mai: ira – gene; kē – different, of another kind
genetics (field of study)	mātai iranga	
genome	huinga ira	
meiosis	whāiti pūira	takenga mai: whā – causative prefix; iti – small; pūira – chromosome) (kupu kē atu: maiohi [kupu mino]

NEW MĀORI WORDS FOR GENE RESEARCH

mitosis	whāū pūira	takenga mai: whā – causitive
		prefix; ū – be firm, fixed;
		pūira - chromosome) (kupu
		kē atu: maitohi [kupu mino]
recessive gene	ira huna	
trait (genetic) -	huaira	takenga mai: hua – product;
		ira – gene

CHAPTER ONE: KO AU KO KARAITIANA NATHAN TAIURU



Figure 1 Chapter One

Authored by Karaitiana N Taiuru

1.1 Building Research Around Identity

I was born and raised in the shadow of my $hap\bar{u}'$ (clan) sacred and lofty mountain Maukatere (Mount Grey) in the small township now named Rangiora, usually pronounced as 'Rang-yourare' by the locals. The original name for Rangiora is Rakiora. Traditional *Kāi Tahu* dialect often added vowels for euphony and sounded 'l' for 'r'. This was the case with Rangiora which was often traditionally referred to as Rakioura, Rakioula and Lakioula (Herries. Beattie, 1995).

The name Rangiora has often been translated to mean the place of the "Rangiora shrub *Brachyglottis repanda* - a small tree that grows up to 6 meters tall with very large, dull green, soft leaves which are white and felted underneath and have wavy edges, which during spring and early summer tiny fragrant flowers cover the tree" (Moorfield, 2005). The only part of the Rangiora township in the area now known as Bush Street Reserve was covered in the Rangiora bush ¹. But, Taare Tikao, a well-known *Tohuka* (learned expert) of the Ngāi Tahu tribe stated Rangiora has several meanings, but it was not the name of a South Island shrub, but of one in the North Island only (Tikao & Beattie, 1939, p. 107).

The proper translation of Rangiora is "calm after a storm; The place name recalls a peace agreement between Te Hautapunuiotū a senior chief of Ngāi Tahu and Rakiihia a senior chief of the Ngāti Mamoe tribe. The peace agreement was for the Ngāi Tahu of Kaipoi and Kaikōura and Ngāti Mamoe. The place name Rangiora confirms the union of the two tribes" (Tau, 2003, p. 179). I use the name Kaipoi as did the citation as I do not recollect the official name Kaiapoi ever being used by my kaumātua (elders) and whānau (family) when I was a child.

My family and I lived in a cul-de-sac adjoining the Bush Street Reserve (Rangiora). Along the northern part of the reserve is Middle Stream Brook, simply referred to as 'the creek'. No name signage exists, and the Māori names are not widely known or ever used apart from history books. Middle Stream Brook (O Tu Whataiti) is one of three brooks that run through Rangiora; the other two are North Brook (O Tu Whatanui) and South Brook (Te Whakapuni a Uruia) (Beattie, 1995). The three brooks are fed by natural water springs called Mātāwai. The brooks are tributaries to the culturally significant river Ruataniwha (Cam River) which flows into the primary river of many of my *hapū* (clan) in that area including the Waimakariri river which then flows out to Kairaki river the mouth of the Waimakariri.

Though from birth, my legal first name was registered on my birth certificate as Karaitiana, a name gifted upon me by my *Tāua* (Grandmother) and *Koro* (Grandfather), I was never to be referred to by my first name unless I was with my *Tāua* and *Koro* and other *kaumātua*. Society did not tolerate Māori names. Rangiora township was predominately *Pākehā* (non-Māori) and very racist during my childhood. It was not till I was 17 after being inspired by a History class in Form 6 at Linwood High School about discrimination, Rua Kenana, Te Puea, Māori Land Wars and the Māori Battalion that I made the life changing decision that I would no longer tolerate being referred to by my second name. This change was empowering and taught me the value of Māori rights.

 $^{^{1}}http://www.rangiorahockey.co.nz/uploads/5/2/8/5/5285294/history_of_the_parks_and_reserves_of_rangiora.sflb.pdf$

My early childhood was divided up between my family home and my two sets of grandparents. Our family home was a *marae* (communal home) environment despite our family being the only Māori household for many years, until when our *whanaunga* (relations) moved over the back fence.

As children, we would leave the house in the morning and return home when hungry or when someone's parents would yell out to their child. Or, if we ventured out after the evening meal, our curfew was when the streetlights would turn on. We knew all the parents and the children and would visit each other's homes or play in the street. In the Summer months, I would often venture off by myself to O Tu Whataiti (the creek) to observe the myriad of *taonga* (treasured) species including the many varieties of fish, insects, flora, and the many birds that frequented the area.

My parents ensured that my sister and I were a part of the Tuahiwi cultural group lead by Uncle Johno Crofts and Aunty Rua. This involved many afternoons and weekends at the Tuahiwi *marae* (Mahaanui I) performing *waiata* (songs), *haka* and spending time with the cousins and *whānau*. There were many visits to *kaumātua* in Tuahiwi and the neighbouring areas.

Time with my *Tāua* (Grandmother) and *Koro* (Grandfather) was spent being immersed in *Te Ao Māori* (Māori culture and epistemologies), stories of unjust land theft by the government, the Ngāi Tahu Claims and learning to speak *te reo Kāi Tahu* (Māori Language using the Kāi Tahu dialect). Having a *Tāua* and a *Koro* was unique at the time with my cousins as many children's grandparents were usually both Ngāi Tahu or Ngāi Tahu and Pākehā, hence, a *Tāua* and a *Põua* (Grandfather in Kāi Tahu dialect) were common.

My *Tāua* and *Koro* lived in Kaiapoi, near Kairaki beach, just down the road from the old Ngāi Tahu *Pā* (fortress) "Kaipoi" where Te Rauparaha almost decimated Ngāi Tahu, in particular one of my *hapū* Ngāi Tūāhuriri. I was a frequently taken by my *Tāua* and *Koro* to many of the *marae* meetings in the South Island and often to Rātana Pā for meetings as they were both devoted Rātana followers.

My first recollection of using *te reo Māori* in pubic was terrifying. At kindergarten in Bush Street, I asked and pleaded for the teacher to take me to the toilet. The teacher had no idea what I was asking for as I did not know how to say it in English. The result was mum had to pick me up and take me home to be washed and for clean clothes. This was to be one of many instances where I knew only the Māori word for something and not the English word which resulted in negative memories and a passion to be Māori despite my Pākehā appearance.

At primary school I was often confused with the *pūrākau* (incorrectly referred to as myths and legends) being taught by the teachers and from books, as it contradicted what I was taught as a child. "While Māori embraced literacy, print, and coloniser technologies, *whakapapa* (genealogy) and Māori oral history, during this time were displaced and often rejected by Pākehā as 'a mixture of unsifted fact and fable', 'superstition' and the 'puerile imaginings' of a 'primitive race'" (Sinclair, 1980); (Grey & Bird, 1956); (Taylor, 1870, p. vi). This process has been referred to as 'cultural colonisation' in which "Maori themselves and their cultures were textualized by Pākehā from the nineteenth century onward, so that the colonists could know the people they were displacing" (Gibbons 2002, p. 13).

Similarly, Māori words that were taught to me at school had no resemblance to what I had been taught by my *Tāua* and *Koro*. I engaged with further learning and using the language after my *Tāua* and *Koro* had passed, via private tuition and then correspondence school and at high school. As an adult, I learnt that the words and sayings I was taught were in the *Kāi Tahu* dialect and not the modern standard language we have all come to accept. Kāi Tahu dialect is being revitalised and debates about its authenticity are still part of some marae discussions today.

I remember that most of my *kaumātua* claimed not to have any knowledge of *Te Reo Māori*. Yet, in the privacy of their own homes many would speak Māori to each other and discuss *pūrākau* and other topics. The last *kaumātua* I witnessed this with was in the late 1980's at Arahura Pā with Aunty Nixie Tainui and Dame Whina Cooper who visited her one day.

Whare Kura (Ancient school of learning), while not officially being in existence since the introduction of the sealers, but private meetings would often occur in people's homes where such knowledge was shared. This added to my childhood memories that being Māori was frowned upon and was an excuse for teachers, principals, and law enforcement to pay extra attention to Māori.

Time with my *Pākehā* grandparents was also a valuable lesson in life. My grandfather was a World War Two returned serviceman and a keen gardener and fisherman. It was from him that I learnt about western styles of gardening and developed a keen interest in hunting in later life. With him, I spent what felt like every day at the Waimakariri river and Kairaki river fishing for Salmon, Kahawai (*Arripis trutta*) and *Īnaka* (*Galaxias maculatus*). The Waimakariri river has for generations been known colloquially in Canterbury as "The Waimak" (Logan, 1987). Our usual fishing spot was at a place called Te Rau a te kaka near the south bank of the railway bridge (Herries. Beattie, 1995, p. 54). For *Tuna* (*Anguilla dieffenbachii*) and shortfin eel (*Anguilla australis*) and Trout (*Salmo trutta Linnaeus*), we would fish at the Ashley River. The river's official name was changed from Ashley River to the dual name Ashley River/Rakahuri by the Ngai Tahu Claims Settlement Act 1998. This is another significant river for my *hapū* and is below Maukatere.

CHAPTER ONE: KO AU KO KARAITIANA NATHAN TAIURU

In my pre-teen's, theology was of significant interest. I would visit various religious denominations and learn what I could. I would then ask where Māori theology fitted in and was always told it did not and that it was evil. This gave me an open mind to all religious beliefs and taught me to guard the little amount mātauranga I did have.

In my living memory, I have seen the impacts of cultural assimilation and how it discreetly became the new normal while learned people passed away. I have also seen the revitalisation and normalisation of *te reo Māori*. These events are my motivation to see that customary and traditional knowledge is revived and normalised with DNA and genomic research, so that Māori may once again have their inalienable rights with *Taonga Species* recognised and become again, the decision makers of their own biological materials.

Ngāi Tahu kawa (practices) has for many generations been keen to share and document *whakapapa* in written and oral form so that it could be used to assist with land claims for future generations (Tau, 2003). That same Ngāi Tahu kawa has been the guiding principle for this thesis. To begin to document that sacred *whakapapa* connected to the opening section of this thesis, my connection to the analogy of *pepeha* (tribal saying) in the first part of this chapter. Each of us contain, a *pepeha* and *whakapapa* that technology can extract, read and re colonise and confiscate from this generation and every future generation. This is a concern that I hope this thesis will expose.

1.2 Locating the Researcher and Papa Kāinga Whakapapa Through Pepeha

My *whakapapa* links are widely spread throughout the South Island and North Island. I predominately identify as Ngāi Tahu as I was raised and still reside in that tribal area. I acknowledge all of my *iwi* and *hapū* and continue to be integrated connecting social, cultural, meaningful engagement with all of my *iwi*.

From my father Karaitiana Taiuru, my tāua is Mihara Huiarei Tainui, known as Bessy. Bessy and my *Koro* James Karaitiana Taiuru *whāngai* (adopted) and raised my father. Bessy is the great-granddaughter of Teone Taare Tikao and Maata Hanna Toko Tikao (born Horomona). Daughter of Mairehe Rahera Tikao and Hoani Te Ruahuanui Tainui (John Tainui). She was one of seven children.

James Karaitiana Taiuru, my Koro was from Marton. He has whakapapa links to Ngāti Tūwharetoa, Ngāti Hauiti, Ngāti Taiuru, Ngāti Haukaha, Ngāti Hikairo and Ngāti Whitikaupeka.

My biological *Pōua* is Edward Nukuroa Tirikatene. My biological great-grandfather is Edward James Te Aika Tregerthen, later known as Eruera Tihema Tirikatene who was born in January 1895 at *pā* near Kaiapoi called Te Rakiwhakaputa. Eruera married Ruti Matekino Solomon (Horomona) who is the daughter of Ngāi Tahu *rangatira (chief)* Aperahama Tupahu Tahuna Horomona (Abraham Solomon) and his wife, a woman of rank from Ngāti Pāhauwera *hapū* of Ngāti Kahungunu Miria [Amelia] Henrici. "The couple were to have 12 children, though two did not survive to adulthood" (Ballara, 1998).

My children via my first partner Janine Hohaia, moe mai ra e ngākau (sign of affection to a dead person), *whakapapa* to Ngāti Tama, Ngāti Ruanui, Te Ati Awa, Taranaki, Ngāti Hauiti and Whanganui. Janine is the daughter of Graeme Hohaia a descendant of Te Rangiurei, Te Karae – Puri Hohaia from Te Rangi Tuwhakararo Hohaia from Te Rangimoeke. From my second partner my children descend from Tūmatakōkiri, Ngāti Kuia, Ngāti Koata, Ngāti Apa ki te Rātō, Ngāti Ruanui, Ngāti Ranginui, Ngāti Porou, Waikato (Ngāti Tipa, Ngāti Tahinga, Ngāti Māhanga, Ngāti Apakura, Ngāti Maniapoto).

1.2.2 Pepeha

Pepeha is a medium by which sacred and profane knowledge is passed from one person to another regarding the speaker's identity. It embraces charms, witticisms, figures of speech, boasts and other sayings (Williams, 1971, p. 274).

"Pepeha are used especially (but by no means exclusively) for sayings that encapsulate the boundaries or characteristics of a tribal group or region. It is etiquette to introduce yourself and it is an important part of building a sense of identity and belonging. Pepeha are essential ingredients in formal oratory, and indeed continue to be a primary means of conveying important social, cultural, legal and political principles and information" (Benton, Frame, Meredith, & Te Mātāhauariki, 2013).

Each of my *iwi* identified in this thesis begins with a photo of my *marae*, then proceeds with a *pepeha* unique to that marae. The *pepeha* identify my landmarks and my *whakapapa* to the land, *atua*, *kaitiaki* (guardian), *Taonga Species*, people and to the *marae*. As a researcher dealing with Māori DNA and Genomics, it is important to be able to clearly identify who you are and where you come from. Without a *pepeha*, a researcher should not have access to any Taonga Species genetic data.

1.3 South Island Iwi

My primary *iwi* is Ngāi Tahu/Kāi Tahu. Ngāi Tahu descend from a common ancestor called Tahu Pōtiki, who lived more than twenty generations ago. "However, Ngāi Tahu is a generic term for older tribes of the South Island who have been incorporated within their authority. Those tribes are Waitaha, Ngāti Māmoe, Rapuwai, Ngāti Ira, Ngāti Wairaki and Ngāti Tūmatakōkiri" (Tau, 2003, p. 17).

Ngāi Tahu/Kāi Tahu, is the principal Māori tribe of the southern region of New Zealand. Its *takiwā* (tribal area) is the largest in New Zealand and extends from White Bluffs, Te Parinui o Whiti (southeast of Blenheim), Mount Mahanga and Kahurangi Point in the north to Stewart Island in the south.

Traditionally Ngāi Tahu were made up of more than 160 *hapū* (clans). Ngāi Tahu now recognise only 5 primary *hapū*: Kāti Kurī, Ngāti Irakehu, Kāti Huirapa, Ngāi Tūāhuriri and Ngāi Te Ruakihikihi of which I share *whakapapa* with all. The five primary *hapū* have no governance or legal structure. However, under Te Rūnanga o Ngāi Tahu Act 1996, 18 Papatipu Rūnanga (tribal councils) were formed to be the colonial authority of their geographic tribal boundaries. See *Figure 2 Ngā Rūnanga o Ngāi Tahu*.

Migrating from the North Island's East Coast over 800 years ago, Ngāi Tahu thrived in the South Island. They intermarried with local tribes and adopted their beliefs. "Their lands cover much of Te Wai Pounamu – the South Island – and are New Zealand's largest single tribal territory, covering 80% of New Zealand's South Island" (Tau, 2005). Ngāi Tahu is the fourth largest *iwi* Māori.

In 20 years from 1844, Ngāi Tahu signed formal land sale contracts with the Crown for 34.5 million acres, approximately 80% of the South Island, Te Wai Pounamu. The Crown failed to honour its part of those contracts when it did not allocate one-tenth of the land to the iwi, as agreed. It also refused to pay a fair price for the land. Judiciously robbed of the opportunity to participate in the land-based economy alongside the settlers, Ngāi Tahu became an impoverished and virtually landless tribe. Its full claim involved some 3.4 million acres of lost land, one-tenth of the Ngāi Tahu land total sold to the Crown. This was the basis of the Ngāi Tahu Claim.

Today, as an organisation, Ngāi Tahu is worth more than \$1.8 billion and has numerous corporate and social organisations, many of whom maintain their own management and governance structures and own integrity, autonomy, and operations in isolation from each other.

There are discrepancies in the dialect used in the following Ngāi Tahu *pepeha*, as some *Rūnanga* (Tribal Council) use the southern dialect while others do not. The most obvious feature of Southern dialect is the substitution of 'k' for 'ng' or to interchange between both. Herries Beattie noted that Teone Taare Tikao a native speaker and Tohuka early in the 19th century, interchanged between the 'k' and 'ng' (Tikao & Beattie, 1939). This thesis respects the preference of the corporate *Rūnanga* orthographic policies and practices and that of each *marae*.

The following map pinpoints the 18 Ngāi Tahu *Rūnanga*, 10 of which I discuss in the following *pepeha*. The remaining 8 Rūnanga are in this image to show the boundaries.



Figure 2 Ngā Rūnanga o Ngāi Tahu. Source http://www.ngaitahu.iwi.nz



Figure 3 Tūtehuarewa. Source http://www.ngaitahu.maori.nz

A. Te Rūnanga o Koukourarata

Ko Makawhiu, Uruao, Tākitimu kā waka. Ko Te Ahu Pātiki, Te Pōhue kā mauka. Ko Kahukunu rāua ko Koukourarata kā aua. Ko Te Arawhānui a Makawhiu, rāua ko Koukourarata kā moana. Ko Ngāi Tūhaitara, Ngāi Tūtehuarewa, Ngāti Huikai kā hapū. Ko Tūtehuarewa te whare. Ko Te Pātaka o Huikai te wharekai. Ko Te Whare Karakia Mihinare ki Puari te whare karakia.

Rakaitekura, the mother of Tūāhuriri was the wife of Tumaro, a great sailor, who spent the greater part of his time away from home on various expeditions. During one of his absences, Rakaitekura fell in love with another notable chief, Te Aohikuraki, and on Tumaro's return he found that she was about to give birth to a child. When the time arrived for the birth, Tumaro's suspicions were aroused by the prolonged labour of his wife (a traditional sign of Infidelity), and he thereupon resorted to incantations in which he mentioned the names of various prominent chiefs. As soon as the name of Te Aohikuraki was pronounced the child was born, and Tumaro thus became aware of the identity of its father. The child was given the name of Hikutawatawa.

With this event, Tumaro resolved to return to his own people; but he decided not to take his wife. In view of her high rank, he would not kill her for her infidelity, but he asked her to dress her hair and prepare herself, and when she was ready, he led her to Te Aohikuraki to become his wife.

CHAPTER ONE: KO AU KO KARAITIANA NATHAN TAIURU

The stream in Wellington where Rakaitekura dressed her hair was named Koukourarata from this incident. Koukou means to bind up the hair and rarata means to tame, or to hand over quietly. The chief Moki named the bay Koukourarata to recall the birth of Tūāhuriri (Tainui, 1946).

Koukourarata was traditionally occupied in three main areas: Koukourarata, Puari and Kāi Tara. After the fall of Kaiapoi $p\bar{a}$, Koukourarata and Puari became the main centres of Ngāi Tahu activity in Canterbury. The $p\bar{a}$ was primarily occupied by Ngāi Tūāhuriri and the marae which stands today is called Tūtehuarewa, after a local ancestress.

"The geographical location of Te Rūnanga o Koukourarata centres on Koukourarata and extends from Pohatu Pā to the shores of Te Waihora including Te Kaituna" (New Zealand Parliamentary Counsel Office, 2001). See *Figure 2 Ngā Rūnanga o Ngāi Tahu*.


Figure 4 Huirapa. Source http://www.ngaitahu.maori.nz

B. Kāti Huirapa Rūnaka ki Puketeraki

Ko Takitimu, Uruao, Araiteuru kā waka Ko Hikaroroa te mauka Ko Waikouaiti te aua Ko Kāti Huirapa rāua ko Kāi Te Ruahikihiki kā hapū Ko Huirapa te marae Ko Maririhau te wharekai

In 2001 the Huirapa Hall, the original *whare rūnaka* was restored and re-opened as Puketeraki Marae.

"From the 1920s to the present day, the whare rūnaka was a place for music, singing and dancing, food, and fun of the days when the Puke Hall was used for everything from Māori Land Court sittings and public meetings, silent films, women's group parties and school concerts, to Girl Guides, Boy Scouts, table tennis and roller skating. The Hall was the glue that bound a close community together. Now, Puketeraki Marae is a place where both whānau and whānui gather to experience the unique atmosphere this site offers" (Kāti Huirapa Rūnanga ki Puketeraki, 2007).

"The geographical location of Kāti Huirapa ki Puketeraki centres on Karitane and extends from Waihemo to Purehurehu and includes an interest in Otepoti and the greater harbour of Otakou and extends inland to the Main Divide sharing an interest in the lakes and mountains

to Whakatipu-Waitai with Rūnanga to the south" (New Zealand Parliamentary Counsel Office, 2001). See *Figure 2 Ngā Rūnanga o Ngāi Tahu*.



Figure 5 Te Rāpaki o Te Rakiwhakaputa. Source http://www.ngaitahu.maori.nz

C. Te Rūnanga o Rāpaki

Ko Tākitimu, Uruao, Makawhiu kā waka Ko Te Poho o Tamatea Pōkai Whenua te mauka Ko Ōmaru te aua Ko Whakaraupō te moana Ko Ngāti Wheke te hapū Ko Te Rakiwhakaputa te Takata Ko Te Rāpaki o Te Rakiwhakaputa te marae Ko Wheke te whare tipuna

The chief Te Rakiwhakaputa laid down his *rāpaki* (waist mat) and claimed the land for his people. Having secured Rāpaki as Ngāi Tahu territory he moved on to claim other lands and left his son Wheke to establish the settlement. Today Rāpaki is home to Te Hapū o Ngāti Wheke, one of four Ngāi Tahu *Papatipu Rūnanga* situated on the Banks Peninsula. The families that live there are mostly Ngāi Tahu and they continue the tradition of upholding the mana of their hapū and keeping the home fires burning.

The *rūnanga* has recently built a new *wharenui* (meeting house) named Wheke which records the hapū and iwi history and traditions through ornate carvings and woven *tukutuku* (design) panels. The marae is the heart of the Rāpaki community, and the people and their stories remain the heart of the *marae*.

"The geographical location of Rāpaki Rūnanga centres on Rāpaki and includes the catchment of Whakaraupō and Te Kaituna" (New Zealand Parliamentary Counsel Office, 2001). See *Figure* 2.



Figure 6 Ngāti Moki. Source http://www.ngaitahu.maori.nz

D. Te Rūnanga o Taumutu

Ko Tākitimu te waka Ko Nuku Mania te mauka Ko Ōrakaia, Waikekewai, Waitatari, Waiwhio kā aua Ko Waihora te Roto Ko Te Kete Ika a Rakaihautū te moana Ko Ngāti Moki rāua ko Ngāti Ruahikihiki kā hapū Ko Ngāti Moki te whare Ko Riki Te Mairaki Ellison te Wharekai Ko Hone Wetere te Whare Karakia

Descendants of Te Taumutu Rūnanga descend from their *tīpuna* (ancestor), Te Ruahikihiki and his son Moki who established themselves at Taumutu in the seventeenth century. Te Ruahikihiki moved from Akaroa Harbour to Taumutu on the southern shores of Te Waihora (Lake Ellesmere). Te Ruahikihiki settled at the *pā* Orariki, which is where the present-day Hone Wetere church and *hapū urupā* (sub-tribe cemetery) are located.

Moki II established his *pā* site nearby Taumutu, on the place where the present Ngāti Moki marae (pictured above) is located, near the south-western edge of Te Waihora. In 1891 a *wharenui* (meeting hall), named Moki was opened on the site of the original historic *Pā o Moki* (Fort of Moki). The meeting hall has undergone many alterations and additions and is now

known as Ngāti Moki. Grass covered mounds of earth can still be seen at the Ngāti Moki $p\bar{a}$ site.

These ramparts run parallel to Pohau Road and are the remains of the traditional battle defences of the original pā.

"The geographical location of Taumutu Rūnanga centres on Taumutu and the waters of Te Waihora and adjoining lands and shares a common interest with Te Ngāi Tūāhuriri Rūnanga and Te Rūnanga o Arowhenua in the area south to Hakatere" (New Zealand Parliamentary Counsel Office, 2001). See *Figure 2*.



Figure 7 Tuahiwi. Source http://www.ngaitahu.maori.nz

F. Te Ngāi Tūāhuriri Rūnanga

Ko Makawhiua rāua ko Tākitimu ngā waka Ko Maungatere te maunga Ko Ngā Kohatu Whakarekareka o Tamatea-pokai-whenua te puke Ko Rakahuri te Awa Ko Ngāi Tūāhuriri te hapū Ko Tuahiwi te marae Ko Maahunui II te Wharenui Ko St Stephen te Whare Karakia

This is the story of the child of Rakaitekura referred to in the previous narrative of Koukourarata.

When Hikutawatawa was a child, he was wont to join with the other children in throwing darts or stones fastened to a cord. He was very proficient in these sports, and the other children, becoming jealous of his prowess, began to insult him, even to the extent of calling him *poriro* (bastard). He was filled with shame at this taunt and with-drew from the company of the other children. When he grew up, Hikutawatawa questioned his mother as to the identity of his father and his whereabouts. His mother had anticipated that someday he would ask this question, so she answered him by saying, "Your father is at the rising of the sun." Hikutawatawa then came to the south with a war-party to seek his father. He arrived at Whakatu in his canoe, Te Haumia, and the chief of the pa invited him to enter. The old chief

took the party into his principal house, and as they entered, he gave his people instructions to heat up the ovens, proposing to slay his visitors and cook them for food. However, while Hikutawatawa was lying in the house taking stock of the carved walls and pillars of the building, he began to murmur to himself, "Ai ko te kaha tukou o taku tīpuna a Kahukuratepaku i mahue atu ra i au i rawahi i Ngawhakaarawaru." (This sentence is obscure, but could mean, "I have left beyond Ngawhakaarawaru the adzed pillars of my ancestor Kahukuratepaku").

The children playing nearby heard these words and reported them to the old chief, who thereupon came and asked him if he was Hikutawatawa. On hearing that this was so, the chief ordered the fires to be extinguished as the visitor was his own grandchild. In the meantime, however, Hikutawatawa had learned that the ovens had been prepared for him and his party, and he became very angry. His grandfather, on the other hand, was so pleased to see Hikutawatawa that he invited him to go to his sacred place and receive his blessing. They accordingly proceeded to the tuahu (sacred place), but the heart of Hikutawatawa was full of anger even as he received the blessing. He soon left the pā and began to plan his revenge. Twelve months later he returned with a war-party and slaughtered his grandparents and his people.

From the anger he felt whilst at the *tuahu* of his grandfather, Hikutawatawa was thenceforward known as Tūāhuriri. Ngāi Tūāhuriri are descendants from him.

"The geographical location of Te Ngāi Tūāhuriri Rūnanga centres on Tuahiwi and extends from the Hurunui to Hakatere, sharing an interest with Arowhenua Rūnanga northwards to Rakaia, and thence inland to the Main Divide" (New Zealand Parliamentary Counsel Office, 2001). See *Figure 2*.



Figure 8 Tūhuru. Source http://www.ngaitahu.maori.nz

G. Te Rūnanga o Ngāti Waewae

Ko Uruao te waka Ko Tuhua te maunga Ko Arahura te awa Ko Poutini te Moana Ko Poutini te taniwha Ko Ngāti Waewae rāua ko Ngāti Wairangi kā hapū Ko Pounamu te taonga Ko Tūhuru te whare Ko Papakura te Wharekai

My direct link to Ngāti Waewae also provides my direct link to Ngāti Rārua, via my great-greatgreat-great-grandfather Tūhuru Kokare and my great-great-great-great-grandmother Papakura. Tūhuru was the son of Te Ruahuanui and Titohi. Tūhuru lived at the *pā* Kaikainui which was the pā of my great-great-great-great-great-great-great-grandfather Waewae.

Tūhuru and his wife, Papakura, had six children: Hinekino, Tarapuhi Te Kaukihi, Wereta Tainui, Nihorere, Tawhao and Te Hiakai. I descend from Nihorere, who is my great-

Tūhuru was a powerful warrior chief, of huge stature. He and his hapū were involved in the defeat of Ngāti Wairangi at Kotuku-whakaoho (Lake Brunner) about the turn of the nineteenth century. From here they commenced the conquest of the West Coast (known as Tai Poutini). The campaign started in the Karamea district. Tūhuru systematically worked his way down the coast, defeating all before him, as far as Makawhio (Jacobs River). "Battles were fought at Karamea, Whanganui Inlet, Kawatiri, Mawhera, Taramakau, Arahura, Hokitika, Okarito and Makawhio" (Mason, 1990).

In the eighteenth century Ngāi Tahu from Canterbury went to the source of greenstone in the Arahura river and Mawhera (Grey) river of the West Coast, and fought with the local people, Ngāti Wairangi. The final defeat of Ngāti Wairangi took place in the Paparoa Range, after which a meeting of Tūhuru and his party was held at Rūnanga.

Tūhuru and his people established a new $p\bar{a}$ at Mawhera and settled there. They were known as Poutini Ngāi Tahu, the Ngāi Tahu people of the West Coast.

"The geographical location of Te Rūnanga o Ngāti Waewae is centred on Arahura and Hokitika and extends from the north bank of the Hokitika River to Kahuraki and inland to the Main Divide together with a shared interest with Te Rūnanga o Makaawhio in the area situated between the north bank of the Pouerua River and the south bank of the Hokitika River" (New Zealand Parliamentary Counsel Office, 2001). *Figure 2*.



Figure 9 Waihao. Source http://www.ngaitahu.maori.nz

H. Te Rūnanga o Waihao

Ko Araiteuru, Tākitimu, Uruao kā waka Ko Te Taari Te Kaumira, Kā Tapuwae o Urihia, Uretāne kā mauka Ko Waihao te awa Ko Wainono te roto Ko Wainono to moana Ko Ngāti Hateatea, Ngāi Taoka, Te Aitaka a Tapuiti, Kāti Huirapa kā hapū

The name Waihao refers to our river, named by Rokohouia the son of Rākaihautu who were both *ariki* (leaders and guardians) of the *waka* (sailing canoe) Uruao, one of the earlier *waka* arrivals to Aotearoa. The river, which has its source in the inland foothills – Te Tari a Te Kaumira – is home to the *hao* or shortfin eel, hence the name Waihao. The hao eel was, and still is, one of the delicacies still gathered as *mahinga kai* by *whānau* (family) from the Waihao River and its Wainono lagoon – the *kete kai* (food basket) of local Māori.

"The geographical location of Te Rūnanga o Waihao centres on Wainono, sharing interests with Te Rūnanga o Arowhenua to Waitaki, and extends inland to Omarama and the Main Divide" (New Zealand Parliamentary Counsel Office, 2001). See *Figure 2*.



Figure 10 Rakitauneke. Source http://www.ngaitahu.maori.nz

I. Te Rūnanga o Waihōpai

Ko Tākitimu, Uruaokapuarangi, Horouta ngā waka Ko Tākitimu te maunga Ko Oreti rāua ko Waihopai ngā awa Ko Te Ara a Kewa te moana Ko Kāti Huirapa, Ngai Te Ruahikihiki, Ngai Tūāhuriri, Ngai Te Rakiamoa, Ngai Te Atawhuia ngā hapū Ko Te Rakitauneke te whare

Ko Hine o Te Iwi te wharekai

"The geographical location of Waihopai Rūnaka centres on Waihopai and extends northwards to Te Matau sharing an interest in the lakes and mountains to the western coast with other Murihiku Rūnanga and those located from Waihemo southwards" (New Zealand Parliamentary Counsel Office, 2001). See *Figure 2*.



Figure 11 Wairewa. Source http://www.ngaitahu.maori.nz

J. Te Rūnanga o Wairewa

Ko Uruao te waka Ko Te Upoko o Tahumatā te mauka Ko Ōkana te aua Ko Wairewa te roto Ko Ngāti Irakehu rāua ko Ngāti Makō kā hapū Ko Wairewa te marae Ko Makō te whare tipuna Ko Te Rōpūake te whare kai

Ngāti Mako traces back in time to a famous ancestor named Paikea who lived in the North Island. As the population increased, families migrated to find new home lands for themselves. Descendants of Paikea's son Tahu Pōtiki migrated southward together from Gisborne to Hawkes Bay, then through the Wairarapa and on to Hātaitai (Wellington Harbour).

Approximately ten generations after Paikea, Pūraho, the son of Tahumataroa, and grandson of ariki Rokotipuetiata. His mother was Rākaitekura, the eldest child of Kurī and Tānemoehu. Puraho's wife Hinepāka was the daughter of Pahirua and granddaughter of Tūhaitara. Pūraho was honoured with leading the large-scale migration of his mother's people from Hātaitai to Te Wai Pounamu sometime in the latter part of the 17th century.

Pūraho's heir Maru Kaitātea led Ngāti Kurī through most of the difficult battles and first phase of the Southern migration, ultimately taking Kaikōura for himself. When the coast was cleared, our relations who hesitated, mocked our boldness, and stayed in the north migrated and the descendants of Tahu formally consolidated at Kaikōura. Meanwhile, younger brother Makō Hakirikiri stepped out from Maru's shadow earning the esteem of his colleagues-atarms by his deeds and his courage. At a hui south of Kaikōura, descriptions of the land southward and the resources it held were reported; in his turn, Makō claimed Southern Horomaka as his new home.

Makō and his people went to Horomaka from Kaikoura after they settled there from Haitaitai and settled in Waikākahi the enormous Ngāti Mamoe pā between Te Roto o Wairewa and Te Waihora. Later, Makō built his pā named Otawiri at the head of the lake and settled peacefully.

"The geographical location of Wairewa Rūnanga centres on Wairewa and the catchment of the lake Te Wairewa and the hills and coast to the adjoining takiwā of Koukourarata, Ōnuku Rūnanga, and Taumutu Rūnanga" (New Zealand Parliamentary Counsel Office, 2001). See *Figure 2*.



Figure 12 Ō Te Ika Rama. Source http://www.ngaitahu.maori.nz

K. Hokonui Rūnanga

Ko Tākitimu rāua ko Uruao ngā waka Ko Ōparure te maunga Ko Hoka-nui, Kowhaka-ruru rāua ko Tarahau-kapiti ngā puke Ko Mataura te awa Ko Te Au-nui Pihapiha Kanakana te rere Ko Ara a Kiwa te moana Ko Maruawai te whenua Ko Ō Te Ika Rama te marae

Established in 1987, Hokonui Rūnanga was to provide well-being for members through the guidance and management of members spiritual, cultural, educational, moral, social, and economic needs.

"The geographical location of Hokonui Rūnanga centres on the Hokonui region and includes a shared interest in the lakes and mountains between Whakatipu-Waitai and Tawhitarere with other Murihiku Rūnanga and those located from Waihemo southwards" (New Zealand Parliamentary Counsel Office, 2001). See *Figure 2 Ngā Rūnanga o Ngāi Tahu*.



Figure 13 Waitaha Design (Te Korako, 2006)

L. Waitaha

Ko Uruao, Te Waka a Raki, Te Wakahuruhurumanu, Te Waka o Aoraki kā waka Ko Rākaihautū te tipuna Ko Te Anau te Roto Ko Waitaha te Iwi.

My great-great-great-grandmother, Emma Driver, derived her high rank in Ngāi Tahu, Ngāti Mamoe and Waitaha from her mother, Motoitoi, of Puketeraki in Otago (Ballara, 1998).

The Waitaha *iwi* occupied the South Island between 1477 to 1577 (Stack, 1996). Most of their knowledge has been lost due to intermarriages and warfare with Ngāti Mamoe and then Ngāi Tahu (Te Korako & Te Korako, 2006)



Figure 14 Kāti Mamoe Patterns. Source Te Rūnanga o Arowhenua

M. Kāti Mamoe

Kāti Mamoe were the last iwi to occupy the South Island between 1577 to 1677 (Stack, 1996).

I whakapapa to Kāti Mamoe via my *tīpuna* (ancestor) Tuhaitara who is the *tīpuna* whom my Ngāi Tahu *hapū* in Koukourarata is named from Tuhaitara who married Marukore of the Ngāti Mamoe.

"One day, being angered by her husband, she insulted him with a "mōkai" (slave), or particularly offensive remark imputing slavery to the person addressed. The mōkai was as follows: "Ehara koe i te tangata; he taurekareka no roto i te kaka kai amio; i puta mai koe i roto i te pohatu paremoremo, i te aruhe taratara." This may be translated, "You are no man; you are a low person from amongst the parakeets, constantly on the move in search of food; you are a survivor from the slippery stones (oven stones slippery with grease), from the oven covered only with rough ferns (i.e., not of sufficient importance to be covered with plaited mats)". Naturally, this terrible insult was resented by Marukore, and the incident led to the outbreak of war between Ngāi Tahu and Ngāti Mamoe" (Mc Ewen, 1946).

1.4 North Island Iwi

I *whakapapa* to six *iwi* (tribes) in the North Island. Most of the *Iwi* have merged into another *Iwi*. Throughout my personal narrative in this chapter, I have identified the modern-day *Iwi*.



Figure 15 Ngāti Pāhauwera. Source http://www.maorimaps.com

A. Ngāti Pāhauwera

Ko Takitimu te waka Ko Tangitū ki te moana Ko Maungaharuru ki uta Ko Mōhaka te awa Ko Raupunga rāua ko Waipapa a iwi ngā marae I te taha o Ngāti Kura, ko Waihua te Marae I te taha o Ngāti Paroa, ko Putere te Marae Ko Ngāti Kape Kape, Ngāti Puraro, Ngāti Kura, Ngāti Paroa ngā hapū. Ko Ngāti Pāhauwera te iwi



Figure 16 Ngāti Pāhauwera tribal boundary. Source Ngāti Pāhauwera Education Strategy 2015-2020: Page 10.

Amelia Henrici is my great-great-great-grandmother. She is the daughter of Ropine Hine Mare. "Ropine was married to Adolphus Henrici of Hamburg Germany who had the nickname "Chips" by Pākehā of Akaroa where he and Amelia resided" (Jacobson, 1884). Adolphus was a boatbuilder and offered medical assistance to the local Māori as a doctor, though he was not a qualified medical doctor. They were married by Te Hapuku and other Ahuriri rangatira who needed someone to fix a ship they had bought.

Ropine Hinemare who was the daughter of Matenga Te Aohia and Imaimai Mekura (Ngāti Kapekape, Ngāti Kura, Ngāti Puraro). Matenga was a casualty of an attack on Te Huki Pā at Mohaka by the Hauhau.

Ngāti Pāhauwera are a confederation of hapū centred on Mohaka in Hawke's Bay. Ngāti Pāhauwera have a large number of traditional hapū and ancestors who had customary use rights and long occupation (*take-whenua, noho tuturu, ahikāroa*) of the area within the traditional iwi boundaries (*rohe tawhito*) set by Te Kahu o te Rangi prior to Te Tiriti o Waitangi, the Treaty of Waitangi.

The traditional boundary of Ngāti Pāhauwera, confirmed by Te Kahu o Te Rangi, extended inland from the coast north of the Waihua River across to the Waiau River and followed its course to the headwaters in the Huiarau. From there the boundary extended across to Tatarakina (Te Haroto) and on to Puketiri and from there across to Te Wai o Hinganga.

Waipapa-a-iwi Mōhaka marae is located in Mōhaka. Raupunga Te Huki marae is located just off State Highway 2 in Raupunga, 35 km west of Wairoa. Huramua marae is located in Wairoa. Its principal hapū is Ngāti Tānemitirangi. Te Putere marae is located in Te Putere, 56 km northwest of Wairoa at the southern end of Lake Roto-nui-a-ha.

B. Ngāti Rārua/Ngāti Toa Rangatira

Ko Tainui te waka Ko Pukeone rāua Ko Tuao Wharepapa ngā maunga Ko Motueka te awa Ko Ngāti Rārua te Iwi Ko Niho te tipuna.

My *whakapapa* to Ngāti Rārua/Ngāti Toa is via my great-great-great-great-grandfather Tūhuru who is referenced in Chapter 1, 1.2, of this thesis.

After Tūhuru was captured and forced to make some sort of formal submission to Te Rauparaha at Rangitoto, he was later 'released "as a vassal chief after giving over a mere pounamu and accepting a marriage alliance between his daughter a Niho" (Phillipson, 1995). That daughter is my great-great-great-great-great-grandmother Nihorere. Niho was a Ngāti Rārua *tohunga* and "also a high-ranking chief" (Gilling, 2003, p. 68).



Figure 17 Hikairo ki Te Rena, Ko Papakai ki Tongariro, Ko Otukou ki Huimako. Source http://www.maorimaps.com

C. Ngāti Hikairo

Ko Te Arawa te waka Ko Waipa te awa Ko Tongariro te maunga Ko Rotoaira te moana Ko Hikairo ki Te Rena, Ko Papakai ki Tongariro, Ko Otukou ki Huimako ngā marae Ko Ngāti Taiuru te hapū Ko Ngāti Hikairo te Iwi

Ko Pāpākai te marae Ko Rākeipoho te whare Ko Papakai, Wairehu ngā awa Ko Rotoaira te Roto

Pāpākai marae is located in Rotoaira, 25 km southwest of Turangi and about 27 km southeast of Taumarunui on Hohotaka Road, Te Rena.

Ko Otūkou te marae Ko Okahukura te Whare Ko Mangatipua, Wairehu ngā Awa Ko Rotoaira te Roto

Otūkou marae is located on Otukou Road in Rotoaira, 22 km southwest of Turangi.

Ko Te Rena te marae Ko Hikairo te Whare Ko Whanganui te awa Ko Taupo te roto

Te Rena marae is located about 27 km southeast of Taumarunui on Hohotaka Road, Te Rena.

Ngāti Hikairo is a confederation of hapū which include the following: Te Whānau Pani; Ngāti Te Uru; Ngā Uri-o-Te Makaho; Ngāti Horotakere; Ngāti Puhiawe; Ngāti Wai; Te Matewai; Ngāti Parehinga; Ngāti Purapura; Ngāti Pare; Ngāti Hineue; Ngāti Whatitiri; Ngāti Rāhui; Ngāti Te Mihinga; Ngāti Pōkaia; Ngāti Te Rahopupuwai; Te Whānau-o-Te Ake; Ngāti Paretaikō; Ngāti Waikaha; Ngāti Huritake; and Ngāti Taiuru.



Figure 18 Tumakaurangi. Source http://www.maorimaps.com

D. Ngāti Tūwharetoa

Ko Hauāuru te waka Ko Tongariro te maunga Ko Taupo Nui a Tia te Roto Ko Tumakaurangi te whare Ko Te Puawaitanga o Ngā Tumunako te wharekai Ngāti Tamakopiri te hapū Ko Tūwharetoa te iwi

Ngāti Tamakopiri has two gazetted *marae*, Opaea and Kaiewe. Opaea is situated approx. 9 kilometres from Taihape on the Spooners Hill Road. Kaiewe is currently in a dilapidated condition and is unusable.



Figure 19 Kaiwe marae. Source http://www.maorimaps.com

Ko Te Tahi o Pipiri te Wharetupuna; Physical location is Otuarei Road, RD2 Taihape



Figure 20 Taahuhu. Source http://www.maorimaps.com

E. Ngāti Hauiti

Ko Takitimu te waka Ko Ruahine te Pae Maunga Ko Rangitīkei te awa Ko Taahuhu te marae Te Ruku a Te Kawau te whare nui Ko Ngāti Hauiti te iwi Ko Ngāti Haukaha te hapū

"The people of Ngāti Hauiti take their name from the eponymous tupuna Hauiti, whose origins within the Mōkai Pātea District came from Te Hika ā Kahukare, descendants of Tamatea Pokai Whenua and his second wife Kahukare. Hauiti was the son of Whakaruruhau of Te Hika ā Kahukare, and Paratuae, who was herself a descendent of Ngāti Whatumamoa the iwi that held mana whenua of much of the central/southern part of the Mōkai Pātea District"².

Taahuhu marae is located 11 km south of Hunterville on State Highway 1.

Chapter Two

²http://www.ngatihauiti.iwi.nz/ng257ti-hauiti-history.html



Figure 21 Whitikaupeka. Source http://www.maorimaps.com

F. Ngāti Whitikaupeka

Ko Takitimu te waka Ko Aorangi te maunga Ko Moawhango (Rahi) te awa Ko Moawhango te marae Ko Whitikaupeka te whare karakia Ko Whitikaupeka te whare tupuna Ko Terina te Whare Kai Ko Ngāti Whitikaupeka te iwi

Ngāti Whitikaupeka are descended from Whitikaupeka who in turn was descended from Ruaehu, one of the sons of Tamatea Pōkai Whenua by his wife Kahukare. Tamatea Pōkai Whenua named many places and brought a number of mōkai to the Mōkai Pātea district and beyond.

Another *tupuna* (great-grandfather) of Whitikaupeka was Punua who is usually attributed with settling in Mōkai Pātea and it was he who brought the *Atua* (deity)– Kahukura to Mōkai Pātea. Whitikaupeka consolidated his rights in Mōkai Pātea by take tupuna and ringa kaha and these were re-enforced by his marriage to Haumoetahanga of Ngāi Te Ohuake and Ngāti Whatumāmoa.



Figure 22 Te Riu o Puanga marae. Source http://www.maorimaps.com

Ko Te Riu o Puanga te mare

Ko Oruamatua te Wharetupuna

Both *marae* are situated in the Moawhango Valley on the Taihape Napier Road approx. 20 kilometres east on the Taihape Napier Road in the same vicinity as the Moawhango School.

1.5 Significance and Connection of Research

This thesis opens with a detailed integrated analysis of the authors own significant and connecting *pepeha* and *marae*. This interconnecting process is about identifying who he is, in order to sustain a Māori genetic and genomic research framework for researchers and others. The key perspective is, those who work with Māori genetic data need to understand and share their own identity, their own *tikanga* (customs) in order to have access, privilege, to work with Māori genetic data.

Genetics refers to the study of genes and the way that certain traits or conditions are passed down from one generation to another. Genomics is a term that describes the study of all parts of an organism's genes.

Māori Genetic Data for the purposes of this thesis is genetic data that is held by Māori (collectively or individually), extracted from a Taonga Species, contains, or represents any Māori (collectively or individually) biological material that has *whakapapa* to a Māori deity, whether it is still in its biological state or has been altered in any way including anonymised or digitised.

DNA stands for deoxyribonucleic acid. Nuclear DNA is inherited from both parents and recombines with every generation. Your DNA originates from your parent's DNA, who got it from their parents and so on back to the first human beings including Hineahuone and Tiki.

Mitochondrial DNA is inherited solely from your mother, who derived it from her mother and so on back to the first mother of all Māori human beings (Hineahuone). As such, mitochondrial DNA - mtDNA (also known as the "mitogenome") is a key tool for tracking genetic history. A mother who gives birth only to sons will see her mtDNA lineage lost. Mitochondria are also valuable to evolutionists because copies of the exact same mtDNA you have can be found in cells throughout your body. "Geneticists have concluded by analysing Mitochondria DNA, that every person on earth right now can trace his or her lineage back to a single common female ancestor who lived around 200,000 years ago" (Cann, Stoneking, & Wilson, 1987). From a Māori perspective, this verifies that all Māori descendants of Hineahuone³.

Deoxyribonucleic acid is a large molecule in the shape of a double helix (*Ruatau* in weaving). The information in DNA is stored as a code made up of four chemical bases: adenine (A), guanine (G), cytosine (C), and thymine (T). Human DNA consists of about 3 billion bases, and more than 99 percent of those bases are the same in all people.

DNA can be extracted from body fluids, skin, nails, hair, and body parts such as bones, marrow, and organs amongst other fluids. DNA can be collected from virtually anywhere that is all encompassing and part of the human anatomy. When the human anatomy of a Māori individual, then that individual is connected to Māori *whakapapa* which will include a connection to ancestors and deity such as Hineahuone. Therefore, the aspect of intergenerational transmission of DNA through Māori ancestry is intrinsically connected to that part of the Māori world view which has a *whakapapa* connection. Adding to *whakapapa*

³ The first woman who was created by Tāne.

is *tikanga*. *Tikanga* is a powerful combined analogy of identity and cultural history engendering reflection, connection, learning and personal growth

The purpose of this research focuses on sustaining in the first instances core Māori research resolve and excellence enabling an investigation, analysis and interpretation into, and with 'Māori Genetic and Genomic distinctive samples. In so doing the combined ownership for this Māori Genetic and Genomic sample will reside with Māori'.

There are key fundamental *tikanga* (customary), cultural, and intellectual expectations and property rights to support the inalienable rights of Māori and Indigenous people across the globe. Many of these interdisciplinary customary rights will be explored and presented in this thesis. By building upon these customary evidence-based platforms; will prove Māori have the right to protect and control the dissemination of Māori DNA, instilled with genomic ownership rights. This is based on cultural and intellectual property rights of the Indigenous Peoples of Aotearoa/New Zealand and Indigenous people across the globe. Specifically, areas of clarity will focus on cultural-tikanga (values) and identity. The core belief of *tikanga* directly speaks to grow and maintain the *mauri* (essence) to sustain the unification of the interconnectedness of historical and contemporary Māori scholarship-knowledge. This also includes new knowledge sources thereby strengthening intergenerational sharing and dissemination of this form of inter-cultural, intellectual understanding. This thesis structure will also provide a series of recommendations to implement new policies and practices that recognise that Māori and indigenous people are the guardians of DNA customary and intellectual knowledge.

1.6 Responsive Research Methodology Connected to Identity

Traditional attitudes to knowledge have a bearing on contemporary research practices. According to Mead (2003), "research in a Māori sense seeks to expand knowledge *whakawhanui* and to look into te *hohonu* (depth) promulgating a clear pathway towards *maramatanga* (enlightenment)".

Similarly, many contemporary approaches to research strive to describe, explain, and interpret things in contrasting and complementary ways. Therefore, this thesis is positioned within the theoretical discourse and methodologies of *rangahau*. Rangahau is a verb meaning to search and seek out. Rangahau is the traditional name for authentic Māori inquiry underpinned by traditional Māori values, principles, including embedded Māori epistemologies. Te Waka Mātauranga Framework developed by Professor Taiarahia Black is also be used (Black, Murphy, Buchanan, Nuku, & Ngaia, 2014).

This sequential system of knowledge management provides a knowledge progressive development process whereby each interdisciplinary theme and perspective comes together to enrich the other. Each of these themes in Te Waka Mātauranga Framework is interconnected to demonstrate the unifying connection of Māori epistemology and cultural ontologies.

1.7 Summary

In *te Ao Māori* it is customary to introduce yourself and who you are before you speak on any given topic. Genetic data contains all biological data about the living specimen it was extracted from, hence it is a whakapapa. In *te Ao Māori*, when a person has a responsibility for *whakapapa*, it is essential that the person with the responsibility is well versed in their own whakapapa. The more whakapapa connections a person can recite, the more relationships and networks that person can claim.

Genetic and genomic research will impact on every person and living species in the world with so much potential and developments that it is impossible to understand today what the full impacts are. Māori are on the edge of significant social, cultural, political, and technological changes that can empower Māori if understood now. If Māori do not understand this new mātauranga now, we face a new wave of colonisation and repatriation of our biological *whakapapa*.

By combining the remaining Ngāi Tahu knowledge of the ancient schools and to use other *iwi* knowledge and to adapt it to the new sciences to create new *mātauranga* (knowledge). This will create new knowledge to satisfy the scientific and technological world we all live in.

CHAPTER TWO: RESEARCH METHODOLOGIES



Figure 23: Chapter Two

2.1 Research Questions

The purpose of this doctorate thesis is to ascertain the connection between intergenerational genealogy obligations and responsibilities and the formation of Māori Genetic, DNA and Genomic ownership.

Māori social, cultural, economic, educational, health, political spectrum of voices is now moving into areas of customary intellectual property connection to (genealogical connections).

- 1. How can Māori define rights to genetic data?
- 2. What are the moral, ethical, cultural, socio-economic, physical, and political implications of genetic and genomic research to Māori and how can these be discussed more thoroughly and understood and approved by Māori?
- 3. What would a code of ethics which external users must observe when extracting and researching DNA and Genomic data?
- 4. How can the current scientific community environment research be strengthened to increase the involvement of Indigenous knowledge communities and Indigenous customary environmental knowledge into Genomic research?
2.2 Introduction

Since the first colonial settlers arrived on the shores of New Zealand, Māori were taught to ignore their epistemologies, cosmologies, and other knowledge systems in favour of a western religion and Euro centric belief systems that eradicated morals and ownership values. This resulted in the loss of significant amounts of traditional knowledge, communal living and being protectors of knowledge and nature in favour of individual property ownership. From the years 1904 to 1967 as one of the many successful government assimilation legislations, the Tohunga Suppression Act made it illegal to practice and use traditional knowledge. The results have seen significant amounts of experience, knowledge and scholarship values erased.

Numerous generations of families and individuals either lost knowledge or were institutionalised into not sharing that knowledge to the detriment of Māori. Tohuka (expert in natural lore and genealogy) of Ngāi Tahu Tiramōrehu stated that: "our ritual, that of the Māori of this land was abandoned since the coming of the faith resulting in Ngāi Tahu ignoring all these beliefs of their ancestors, however, there are many beliefs of our ancestors which can never be collected, there are so many" (Tiramōrehu, Van Ballekom, & Harlow, 1987, p. 33). This was not just confined to the South Island of New Zealand. Elsdon Best early in the 19th century expressed his concerns "the old men of Tūhoe will assert that the greatest aitua (disaster) of modern times was their forsaking the ancient beliefs, religion, customs, tapu, etc., of their race and the adaption of those of the white man. Hence the degeneration, lack of vitality and lessoned numbers of the Māori people." (Best, 1972, p. 1014).

2.3 Methodology

The literature reviewed at the start of undertaking this research showed four clear overlapping themes that cover all aspects of Māori ethics with gene research. The key themes identified are: Intellectual Property Rights, Tikanga Māori, Data Sovereignty and sciences. Therefore, it was identified that the primary interviewees would need to have experience, knowledge, and expertise with at least one of the key themes. The Māori interviewees in addition have expertise and be well versed in tikanga and be respected leaders in their area, discipline.

Interviews occurred with a primary group of people with whom ethics was sought and approved. All the primary interviewees were identified from the literature review process. The international interviewees were identified from meeting key speakers at an Indigenous genomics workshop held in Wellington in 2018 and via a previous international trip to Alaska, Hawai'i, and Albuquerque where I met a number of Indigenous leaders. Direct email introductions and explanation of the research was provided to the potential interviewees with an invitation to contact the researcher if they wanted to be interviewed.

The ethics committee identified the sensitive nature of this PhD research and stated "There is a risk that participants are identifiable within the thesis and given the sensitive nature of the topic may be open to negative feedback either personally or publicly. Please ensure that the participant information sheet notes this and advises participants that every effort will be made to maintain confidentiality" and "Given participants identities are not intended to be disclosed in the thesis, please remove the names from the application form and instead insert a general description of participants". Therefore, the consent form stated, "that your name will not be mentioned unless you give permission to the researcher". Considering all of this, permission was not sought to identify participants with the researcher anonymising any identifiable personal information.

As this is an emerging and new area of science and has new impacts on Māori society and culture, let alone the impacts on other Indigenous communities, it was important to take the opportunity to further engage with other Māori and experts in the area. As a result of this knowledge gap, the opportunity to engage with several unplanned secondary interviews occurred with 93 individuals who were interviewed and engaged about various aspects of knowledge that was compiled by this thesis during *wānanga or pūrākau* style engagements. These individuals all are specialists in science, mātauranga Māori and Kāi Tahutaka in addition have presented at Waitangi Tribunal hearings. Some of the research was shared in five New Zealand government public consultations and further refinement of research from the public submissions that were received.

Consent from the secondary sources was gained by explaining this research and expertise of these key people key experts in various aspects of the research integrated as part of the Tohukataka methodology. It was agreed that the knowledge being shared unless it was western knowledge and owned by an entity or individual that traditional Māori narratives will remain unsourced. This was favoured by especially by those in the research industry as their mātauranga Māori is not owned by their employers and is communally owned by all.

Key themes were recoded from all interviews and then relayed back to the interviewees to ensure that the researcher has interpreted the discussions correctly.

In conclusion, engagement with kaumātua of Ngāi Tahu occurred as it a customary practice of seeking approval before publishing.

2.3.1 Group A: Primary

It was agreed that a maximum of 12 individuals should make up the primary interview group. Three-quarters of the participants (8/12) were men.

To ensure an Indigenous viewpoint could be reflected across primary interviews and that Ngāi Tahu kaupapa methodologies are reflected, it was decided that of the primary interviewees; four should be Ngāi Tahu, four international Indigenous Peoples, three Māori and one Pākehā would be identified.

The primary interviewees experience, expertise and knowledge included Māori and Indigenous leaders from areas of biological Intellectual Property Rights, WAI 262, law with property rights, academic research and Māori gene ethics and tribal whakapapa experts. A non Pākehā scientist with academic research interests with genetics and molecular biology was also interviewed for a balance of views.

Four international Indigenous leaders were also identified for their expertise in genealogy, data sovereignty, genomics and Intellectual Property rights were identified to cross reference an international perspective with a Māori standpoint. An ethics approval process was approved that recognised the sensitivity of the proposed research which is a research project about individuals and groups genealogy (whakapapa) in an age of direct-to-consumer DNA testing and sharing. It was also noted that Māori communities are small and often interrelated requiring a high degree of sensitivity and respect of people's contributions.

The Kaupapa Māori "Koru of Māori Ethics" was used as a high-level framework when considering the interview process. The 'Koru of Maori Ethics' is a framework used for deciphering Māori ethical issues which was designed by the late Manuka Henare. This allowed for the discussion of both the physical, mental and spiritual aspects of Māori and their attitudes to and about gene technologies.



Koru of Maori Ethics

Figure 24 Māori Ethics (Henare, 1998)

CHAPTER TWO: RESEARCH METHODOLOGIES

Interviews with the primary interviewees used a structured interview schedule as agreed with by the Ethics committee. Interviews ranged from 60 minutes to 93 minutes in duration and were voice recorded and securely stored and transcribed with the offer for the interviewee to consult the transcript if they so desired.

A Kaupapa Māori methodology called Tohungatanga was deployed to ensure that full and honest opinion sharing could occur. All interviewees were assured strict confidentiality and that nothing that was said would be directly attributed to the individual without explicit consent being sought about any specific statement. As is a common practice with Māori and whakapapa, there are many sources of truth and sensitivities that can cause emotional harm to some people.

Participation was voluntary for the 12 individuals and no incentives were offered except for a small refreshment as a sign of manaakitanga.

The interviews were conducted in physical face to face meetings around New Zealand at a place and time that was convenient to the interviewee. Thus, reflecting the *tikanga* and importance of the *mana* of the people being interviewed. The Moriori expert interview was conducted with a phone call due to technology and geographical issues.

For the remaining international Indigenous Peoples experts, interviews with online video conferencing technologies Skype and Zoom were used at times of the day and evening that were suitable for the interviewee.

2.3.2 Group B: Māori focus groups consultation.

Three groups that were informally interviewed using wānanga and pūrākau engagements arose by chance with several Māori engagement meetings regarding the review of two pieces of legislation that directly impacted Māori intellectual property rights and in particular DNA. These three meetings occurred between December 2018 and March 2019.

2.3.3 Group C: Professional Seminars.

Three professional conferences and seminars during 2018 and 2019 provided an ad hoc opportunity to engage with Māori and international Indigenous experts in the genomics field of research. A brief of the thesis and the research to date was introduced and then permission gaging the individuals' thoughts about the research questions in an unstructured format manner.

2.3.4 Group D: Mātauranga Māori Experts

In November of 2018, an expert Māori Advisory group of mātauranga Māori advisers were asked several informal questions about the Taonga Species definition and the role of atua today. Tribal membership included: Te Arawa, Tūhoe, Ngāti Awa, Tūwharetoa, and Ngā Puhi.

2.3.5 Group E: Waitangi Tribunal

In exceptionally circumstances, two aspects of the PhD research were used in two Waitangi Tribunal hearings in December 2019 and November 2020 to provide expert evidence regarding Intellectual property rights and data sovereignty. The Taonga Species Definition and the Data Sovereignty definition was scrutinised, and cross examined by the panels and lawyers including members of Ngāti Awa, Tūhoe, Ngāi Tahu, Tainui and Ngā Puhi, Te Arawa, Te Aitanga ā Mate, Ngāti Porou and Pākehā.

2.3.6 Group F: Māori and non-Māori Scientists and Researchers

Using the baseline of knowledge from the Te Ao Māori experts, in 2018 a further set of related questions and considerations were sought from 29 Māori scientists and emerging Māori researchers from local government, regional council, Crown Research at three national wānanga were approached and asked:

1. What/if there was the gap in Genomics/DNA research from a Māori ethical/cultural perspective?

2. What is your knowledge of the three Māori ethical frameworks (that now form the literature review of this thesis).

2.3.7 Group G: Kāi Tahu Kaumātua

Utilising all of the tikaka of Kāti Huikai, Kāi Tūtehuarewa and Kāi Tūhaitara hapū that was used as a primary Kaupapa Māori research methodology, the research findings were then taken back to kaumātua in the Kāi Tahu rohe as would be expected of any research before it is published. It is customary to seek advice from your own elders before sharing it with outside networks.

Eleven *Kaumatua* at various Canterbury Ngāi Tahu and *taurahere marae* were spoken to about the role gene research plays in modern day society. The interviews were casual conversations using traditional Ngāi Tahu and Ngāti Kahungunu *pūrākau* and *whakapapa* to describe a gene and genomics.

2.4 Utilised Kaupapa Māori methodologies

Increasingly in academia, research providers and local authorities are seeking traditional Māori knowledge to be shared with the government, forcing Māori to take individual ownership of the traditional communally protected knowledge and giving government and academia licence to use and own that communal knowledge. This thesis has chosen to ignore those Eurocentric values and by using Kaupapa Māori research methodologies and principles, recognising that traditional knowledge is communally protected for the next generation can be used to ensure holistic health of Māori Peoples.

This research heavily utilises a Kaupapa Māori research approach utilising the five Kaupapa Māori principles by (Pihama, Cram, & Walker, 2002):

- 1. Kaupapa Māori research gives full recognition to Māori cultural values and systems
- 2. Kaupapa Māori research is a strategic position that challenges dominant Pākehā constructions of research
- 3. Kaupapa Māori research determines the assumptions, values, key ideas, and priorities of research
- 4. Kaupapa Māori research ensures that Māori maintain conceptual, methodological, and interpretive control over the research
- 5. Kaupapa Māori research is a philosophy that guides Māori research and ensures that Tikanga Māori will be followed during the research process.

Furthermore, the core research, thesis direction utilised the following Kāti Huikai, Kāi Tūtehuarewa and Kāi Tūhaitara hapū principles ensuring that the research was completed in an Indigenous manner and not a western construct giving both the researcher and interview participants mana.

- 1. **Rakatirataka** Our leaders must be strong and act to develop self-determination for the Rūnaka. This has been exercised in the research by respecting both academia and traditional Māori values.
- 2. **Manaakitaka** We must care about our people and have empathy and respect for others' mana. At all times, the mana of participants, colleagues and the Wānanga have been treated with respect and compassion.
- 3. **Mātauraka** We must bring confident knowledge and application of expertise towards the outcomes of the Rūnaka. Expert individuals were identified and engaged with using my own mātauraka and to seek out their mātauraka.
- 4. **Kaitiakitaka** We must work actively to protect environment, knowledge, culture, language, and resources important to the Rūnaka for future generations. A Māori world view code of ethics that will guide researchers, Māori, whānau, hapū and lwi to be kaitiaki of their genetic data.
- 5. Whakapapa We must understand and acknowledge the interconnectedness of people, place, and environment. We also acknowledge whakapapa as the reason to ensure unity of purpose and outcomes for the Rūnaka. This research has identified that genetic data is whakapapa and within the research is the value of

interconnectedness of Te Ao Māori whakapapa from the individual to the group, to non-human beings and then to atua.

- 6. **Tikaka** We must maintain a high degree of personal integrity aligned to the Rūnaka's cultural protocols, understand the ever-evolving nature of tikaka and do what is right. Evolving tikaka was identified and with manaakitaka was revived and discussed.
- 7. Whanaukataka We must have two-way connectivity and investment in all relationships important to the Rūnaka. Whanaukataka exercised by exploring both primary and secondary sources and respecting the many knowledge holders and their interconnectedness to Te Ao Māori and mātauraka.

2.5 Results

Overwhelmingly, the consensus was that there are considerable gaps in the *tikanga* and traditional Māori knowledge of Māori genetic data and that some previous academic research was never completed and is rarely, if ever quoted by modern day Māori biological researchers. All Māori and Pākehā researchers agreed that Māori should have Intellectual Property Rights to genetic data from Taonga Species and that some form of ethics and guidance for both researchers and for Māori providing samples was required.

There was confusion of what a taonga species was. Academics referred to legislation which did not define what a taonga species was. Three Ngāi Tahu sources mentioned the Ngāi Tahu Settlement Act list of taonga species. Mātauranga Māori practitioners provided a holistic approach to whakapapa to define what a taonga species is.

The findings from the verbal interviews were compiled and used as a framework and guidelines to conduct further research and write this thesis.

Significant findings from the interviews were almost unanimous by all the participants that Māori genetic data, whether from a human being or other species, is a *taonga* that Māori should be able to define for themselves, their own intellectual customary intellectual property rights.

There was an overwhelming response that there has been a lot of research about Māori and gene and genomic research in New Zealand, but that none of it was based on traditional *tikanga* values and that much of the research was more Eurocentric.

2.5.1 Group A: Primary Interviewees

The national and one international interviewee all concurred that there is a gap in knowledge and understanding of traditional knowledge and DNA and that DNA is a property right that should be held in Māori/whānau/hapū/lwi interests. A Hawai'I interviewee disagreed with this and felt that DNA was a personal property right. He did not have any fixed opinions of traditional knowledge. He was very science based.

The key themes that emerged from the interviews were:

- 1. DNA is whakapapa, therefore a Taonga that is not widely recognised, due to the low numbers of Māori participation in the sciences.
- 2. There are significant Intellectual Property Rights that are ignored and commercial exploitation of non-human Taonga Species, noting other Indigenous Peoples suffer bio piracy at the same rates.
- 3. There is a huge void of traditional knowledge missing that is wanted. Yet, no one else has yet provided the skills.
- 4. There is an urgent need to revitalise traditional tikanga associated with DNA and other body fluids and incorporate that into mainstream academia.
- 5. There is a large literature gap of traditional Māori knowledge
- 6. Intellectual Property Rights are being ignored

2.5.2 Group B: Māori focus group consultations.

Overwhelmingly, the consensus was that there are considerable gaps in the *tikanga* and traditional Māori knowledge of Māori genetic data and that some previous work was never completed and is rarely, if ever quoted by modern day Māori biological researchers. All Māori and Pākehā researchers agreed that Māori should have Intellectual Property Rights to genetic data from Taonga Species.

85% of the participants were familiar with at least one of the frameworks from Chapter 3. 85% agreed that the frameworks obfuscated tikanga Māori. One participant questioned if there were kaumātua involved in approving the final drafts before publication.

Many of the interviewees were from Te Tai Tokerau and expressed the fact that Ngā Puhi did not sign Te Tiriti and that the research must consider He Whakaputanga and the rights of hapū in relation to research, rights and data of Taonga Species.

2.5.3 Group C: Professional Seminars

International Indigenous Researchers did not consider their tribal non-human species as important as their human DNA which is being exploited by research companies and other researchers including archaeologists. One of the issues faced by the tribes of Canada, America, Mexico and the Arctic is that their history is so long, and their remains are still available, that there is a scientific interest in extracting the DNA from the dead.

Internationally there is also an emphasis on the DNA extraction from archaeological sites and the many Indigenous Peoples bodies and body parts that are in museums and academia institutions. There was a strong desire for treaties and legislation to not only repatriate the physical bodies but also any genetic materials that have been extracted from the bodies.

Māori are not working with other Indigenous Peoples to create instruments and guides for governments.

All international students and researchers agreed that an international Indigenous approach was required, and that Māori seem to be working in isolation from other Indigenous Peoples. There was also a consensus that the UN Declaration of the Rights of Indigenous Peoples that New Zealand signed does not appear to be considered by Māori or the New Zealand government with Māori rights to genetic data.

2.5.4 Group D: Mātauranga Māori Experts

All experts agreed that tikanga Māori can and does evolve, but that "there are too many young people who for whatever reason do not understand the tikanga and then create new tikanga. Tikanga cannot be taught at schools and universities, it needs to be taught on the marae and in wānanga. Several individuals discussed traditional wānanga and why a University can be called a wānanga but a wānanga cannot be called a University. That "these double standards contribute to the misunderstandings of traditional tikanga".

Discussions occurred comparing genealogy tests and the dangers to the common practice of recent years of haircuts, nail clipping and for some even of shaving during the day and then burial of hair and nails in the ground to prevent makutu. There were concerns that this is in fact a spiritual attack on our whole race and could be a reason why Māori are suffering from colonisation at such alarming rates.

There was confusion that there was no set definition of Taonga Species. One individual stated, "there are several definitions including in the "The Ngāti Awa Deed of Settlement" and the Ngāi Tahu Claims Act. Neither definition is broad, and both appear to be general examples that are specific to only the claims of the day. Another participant stated that it is too difficult to create a definition and the guide is to use the Wai262 claim as a reference. Another participant stated that the honeybee could be a taonga species as it produces income for some iwi and other iwi could consider the wild boar as a taonga species as it is a food source for many. These perspectives were considered with other feedback to define a Taonga Species which uses the Wai262 examples as a starting point and then further explores the open-ended discussions in the report.

2.5.5 Group E: Waitangi Tribunal

The Taonga Species definition attracted questions from the residing panel of Mātauranga Māori experts with no negative feedback or questioning. The Crown then included the proposed definition into the proposed Plant Variety Rights Bill 2021.

Then the second claim involved using the Māori Data and Māori Data Sovereignty definitions and explored how they can be applied in real life situations with digital and genetic spaces. There were robust discussions which lead to the definitions being further refined.

2.5.6 Group F: Māori and non-Māori Scientists and Researchers

Like the Te Ao Māori experts, all the students and researchers were aware of the three frameworks, but no one understand the Māori frameworks, how to implement them, or believed that the frameworks were of little or no value.

The three frameworks were identified as the only literature to support ethics/Māori cultural aspirations with DNA research and analysis. All informants stated that there was no internal Māori ethics regarding Māori DNA analysis and research at that stage.

In September 2018 and then again in October 2020, using public databases of policies from all the New Zealand Universities verified that there were no Māori DNA policies. It was decided not to issue Official Information Act Requests to the research institutes and councils as it was not necessary.

Like the Te Ao Māori experts, most of the students and researchers did not understand the Māori frameworks or believed that the frameworks were of little or no value. The majority wanted a clear set of guidelines, documentation that directly stated what a Māori cultural perspective is of DNA and what cultural practices should be implemented.

2.5.7 Group G: Kāi Tahu Kaumātua

The knowledge gained from the research and interviews was brought back to the *takiwā* of Ngāi Tahu to evaluate if there was a difference of opinion with national Māori beliefs and to seek approval from *kaumātua*. Eleven *Kaumatua* at various Canterbury Ngāi Tahu and *taurahere marae* were spoken to about the role gene research plays in modern day society. The interviews were casual conversations using traditional Ngāi Tahu and Ngāti Kahungunu *pūrākau* and *whakapapa* to describe DNA and genomics.

Overwhelmingly all the *kaumatua* identified the key *tikanga* from the previous government consultation on Genetic Modification and stated that genetic data is simply biological whakapapa that has been cloaked in a way that only now when the world is ready, can we see and understand it. When discussing multiple other *tikanga* terms in the current Māori gene frameworks there was confusion and disagreement that the *tikanga* were in fact

relevant with one kaumātua stating "it sounds like somebody was just creating new tikanga for the sake of it".

One kaumātua stated that "Our DNA is tapu and should be treated as we do our whakapapa manuscripts". Another participant shared traditional knowledge of the sacredness of any body fluid and how it was always protected from enemies in fear of makutu (spells). This led to further conversations about the disposal of human body fluids from embalming and hospitals, that "the practice is attacking the mauri of our people and because most of this generation do not understand the old tikanga from our old people".

The discussions progressed to a more in-depth discussion about rūnaka ownership rights, Te Tiriti obligations between the Crown and rūnaka regarding taonga species.

The feedback from the international Indigenous genome researchers resonated with the kaumātua who expressed comparisons to their early childhoods when non-Māori would go to sacred sites and dig up human remains and other artefacts of cultural significance. A clear mandate was made archaeologists today must have a code of ethics to prevent DNA exploitation and that government agencies such as the New Zealand Police and the Department of Conservation must have guidelines for human and non-human taonga species to protect our ancestors from scientific exploitation.

2.6 Closing Statement

This thesis and research will aim to address the key findings of Māori cultural rights and obligations with gene and genomic research in "Intellectual Property Rights, Data Sovereignty, reviving and reviewing traditional Māori knowledge and exploring how Māori can work with other Indigenous Peoples and share resources".

The knowledge gained from the literature review and then the multiple interviews identified significant and concerning gaps in the current knowledge and literature that is attributed to colonisation, government interventions, property ownership and western academic institutes inability to recognise and implement kaupapa Māori research methodologies. This has resulted in culturally unsafe genetic and genomic research practices that has the potential to damage the mauri and wairua of individual Māori donors, whānau, hapū and Iwi, both now and into the future while biological samples are being stored, tested, and sequenced.

The research findings from the science and researchers were so concerning that a thorough review of the three ethical frameworks that are purported to be Māori cultural ethical codes is required. Therefore, the next chapter directly addresses the indigeneity and kaupapa Māori of the Māori gene and genomic research frameworks.

The intention of Chapter 3 is to provide Māori and non-Māori researchers in the gene and genomic fields a 'code of ethics' that is based upon Māori cultural values and not constrained in any way by western initialised beliefs and colonisation.

CHAPTER THREE: REVIEW OF THREE CURRENT MĀORI GENE ETHICAL FRAMEWORKS



Figure 25: Chapter Three

3.1 Background

This chapter discusses and critiques three ethical guidelines and frameworks that have been developed in New Zealand in relation to genetic and genomic research of Māori human beings biological samples: Te Ara Tika (Hudson, Health Research Council of New, & Pūtaiora Writing, 2010); He Tangata Kei Tua (Hudson, Beaton, et al., 2016a) and Te Mata Ira (Hudson, Russell, et al., 2016).

The three guidelines are widely referenced by non-Māori academics, but they create a deficit of *tikanga Māori* with genetic and genomic research and confusion among *tikanga Māori* practitioners. The frameworks contain some important high-level principals, but no information about how to implement the suggestions or why there is a need for some of the *tikanga*. This review therefore is essential, as it will create the justification for this thesis as a new body of knowledge and will allow readers and researchers to better understand quality of the three publications.

To assess how useful the three frameworks are to researchers who work with Māori genetic data, a number of interviews were conducted with both Māori and non-Māori scientists who have read one, two or all of the frameworks. In addition to the interviews, a survey of New Zealand Universities: Intellectual Property Policies, Research Ethics with Human Beings and Māori, Genetic Research policies were analysed for any input or guidance of any of the three frameworks including from: Victoria University ⁴, Lincoln University ⁵, Auckland University⁶, Massey University⁷, University of Canterbury⁸ and Otago University⁹.

In addition to the University policies, 74 human biological research consent forms from three Universities including the University of Canterbury, University of Otago, The University of Auckland, and the Canterbury District Health Board were analysed for references and principals from the three frameworks.

There was no proof that any of the university policies included any reference, principles, or guidelines from the three frameworks. In 73 of the 74 consent forms, there was no reference of any information from the three frameworks. Only one consent form had some principles of the three frameworks, but that consent form lacked complete protection for Māori participants.

⁴ https://www.wgtn.ac.nz/about/governance/policy/policies

⁵ https://www.lincoln.ac.nz/footer/LU-Policy-Library/home/?sti=12&cat=Research

⁶ https://www.auckland.ac.nz/en/about/the-university/how-university-works/policy-and-administration.html

⁷ https://www.massey.ac.nz/massey/about-massey/policies-procedures/policies-procedures_home.cfm

⁸ https://www.canterbury.ac.nz/about/governance/ucpolicy/

⁹ https://www.otago.ac.nz/administration/policies/

3.2 Introduction

Te Ara Tika Guidelines states it "is a framework for researchers and ethics committee members to support researchers to make ethical decisions with Māori human gene research". It outlines a framework for addressing Māori ethical issues within the context of decision-making by ethics committees by bringing together various strands connecting tikanga Māori, the principles of the Treaty of Waitangi, Māori research ethics, and health research context in a way that could be understood and applied in a practical manner by researchers and ethics committees" (Hudson, Beaton, et al., 2016b, p. 2).

He Tangata Kei Tua: Guidelines for Biobanking with Māori states it "is a guideline that outlines a framework for addressing Māori ethical issues within the context of biobanking with Māori tissue and to describe the cultural foundation informing ethical approaches to biobanking, to inform decision-making around ethical issues when conducting biobanking with Māori tissue, and outline best practice approaches for addressing Māori ethical concerns".

Te Mata Ira Framework, the authors claim is "designed to build on the guidance provided by Te Ara Tika because the Māori ethical issues identified in that document are relevant to all research, including genomic research". Furthermore, the authors claim that "the framework aligns with the key principles of Te Ara Tika and considers their application to genomic research from consultation to research and post-project transformation" (Hudson, Russell, et al., 2016, p. 4). "It is the cultural foundation informing ethical approaches to genomics; to inform decision-making around ethical issues when conducting genomic research with Māori; and outline best practice approaches for addressing Māori and ethical concerns".

This review will focus on four primary areas to ascertain what knowledge is missing from the literature:

- 1. How relevant are the publications in 2020, considering they are now between four and ten years and old and discuss ethics in with rapidly evolving sciences and technologies that have changed exponentially in just the past few years.
- 2. What *Kaupapa Māori* research and methodologies were applied by the researchers and the extensiveness of the literature that was consulted in creating the frameworks.
- 3. If and how a *Te Ao Māori* (Māori world view) perspective is applied and how that will likely be understood by Māori language speakers and Māori cultural practitioners.
- 4. What national and international Indigenous resources and instruments that were available at the respected publication dates were utilised.

3.3 Relevance of the Literature in 2020

Gene and Genome technologies are now significantly more accessible and economic to both scientists, amateur DNA researchers and lay people than they were at the dawn of 2010 when Te Ara Tika was published. "Over the past decade, increasing resources have been poured into DNA-based research in most modern industrial countries" (Kolopenuk, 2020). For these reasons, the relevance of aging Indigenous scientific frameworks must be considered against the western scientific developments.

In 2010, geneticists were still grappling with how to make human genome sequencing a more widespread and affordable reality. Illumina advertised a genome sequencing service that cost \$50,000 per person. By 2012 Direct to Consumer DNA testing became mainstream when Ancestry.com launches their new AncestryDNA Service. The U.S. Supreme Court rules that naturally occurring DNA cannot be patented in 2013. "In 2019 Veritas Genetics were offering full genome sequences for less than \$600" (Grant, 2019). Now anyone can purchase DIY CRISPR genomic sequencing kits online and spend a few hundred dollars to have their DNA profile matched with direct to consumer services with a high risk to personal and family privacy" (Hendricks-Sturrup & Lu, 2019).

Te Mata Ira and He Tangata Kei Tua do not consider the access to self-genome testing and the increase of corporates who offer DNA testing that has become popular, economical, and easy to access. Direct-to-consumer genetic testing was also not available in 2010.

"By 2019, more than 26 million people — more people than in all of Australia — have shared their DNA with one of the four leading ancestry and health databases, allowing researchers to extrapolate data on virtually all Americans and raising some serious privacy concerns, according to the MIT Technology Review" (Bursztynsky, 2019). Ancestry.com claimed that "more than 15 million customers have received DNA results from them in 2019" (Ancestry.Com, 2019).

The series of frameworks offer no considerations of current or emerging technologies such as Artificial Intelligence, racial profiling, low costs to purchase self-checking DNA tests, genetic modification, Gene Drives, online DNA web sites, Māori data sovereignty issues.

Specific issues missing from all of the publications, that largely impact Māori such as DNA and profiling, Phenotyping, familial searching, abandoned samples, or bias by the New Zealand Police with taking samples from a disproportionately higher amount of Māori than non-Māori by the New Zealand Police and other authorities (The Law Commission, 2018); the rise of Māori DNA being researched and stored in digital format by overseas researchers.

3.4 Consultation and Research

Within academia and the research world it is vitally important to be aware of all of the available literature and to cite references to give your work credibility, the ability for the reader to fact check your statements and to give credibility and authority to your claims. Without referencing other literature, the publications become personal opinions that cannot be substantiated. In Te Ao Māori, no natural Māori object can exist without a *whakapapa* (genealogy).

Te Ara Tika provides no reference page, only references further reading in footnotes. Overall, there is only one quote from an external source used in Te Ara Tika. He Tangata Kei Tua and Te Mata Ira share the same references. Of the seventeen references listed in the three frameworks, two are not used at all and two are by the authors referencing themselves.

Of the remaining thirteen references, six are used only once in one general sentence, and three in another general statement of no substance. The remaining references are included as examples of projects. Overall, there are no external authors cited in any of the three publications.

All three publications have omitted the volumes of Māori public feedback to The Royal Commission on Genetic Modification public consultation that included a lengthy consultation process with numerous participants (Eichelbaum, 2001). The three frameworks ignore other academic research exploring a Māori view of Genetic Modification to the Royal Commission where a total of 94 individuals from multiple Iwi and regions were interviewed using kaupapa Māori research methodologies to gain results are also excluded (Leonie Pihama, Southey, & Tiakiwai, 2015). Many other consultations that Māori have made submissions on genetic issues to the Crown in the years: 1992, 1994 and 1999 have also been excluded (Hutchings & Reynolds, 2005).

Public consultations by Māori for Māori into The Royal Commission of Genetic modification in New Zealand 2000 identified five primary *tikanga* (Customs): *Wairua, Mauri, Tapu, Kaitiakitanga, Whakapapa* (Cram, Pihama, & Barbara, 2000). Other consultations stated that the main tikanga of biotechnology are *kaitiakitanga, wairua* and *whakapapa* (Hutchings, 2004a). This is consistent with other researcher's findings including (Beaton et al., 2017); (Hutchings, 2004b); (Mead, 1996); (Mead, 1998); (Mead, 2016b); (Pihama et al., 2015) & (Cram et al., 2000). Despite these key *tikanga* being identified by numerous national consultations with Māori, the authors of the series of frameworks have self-identified over 40 *tikanga* and self-defined those *tikanga* with specialised meanings.

Chapter Two of the Waitangi Tribunal Wai 262 report, Ko Aotearoa Tēnei, focused on issues relating to genetic and biological resources in Taonga Species. Key sections of the chapter address topics such as: *Te Ao Māori (Māori Word view)* and *Taonga Species (Species of cultural significance)*; *Te Ao Pākehā* (Non Māori world view) and Research Science; Bioprospecting, Genetic Modification, and Intellectual Property; the Rights of *Kaitiaki* (Māori Guardian) in Taonga Species; and recommended reforms (Waitangi Tribunal, 2011a). Despite this, none of this is referenced in any of the three frameworks, nor was the report itself listed or used as a resource. Neither were conceptual frameworks that had been previously developed to assess

the impact of genetics with Māori, in relation to specific biotechnologies ranging from genetically modified organisms to preimplantation genetic diagnosis (PGD), including but not limited to (Durie, 2005); (Guyatt, McMeeking, & Tipene-Matua, 2006); (Pihama, 2001).

Te Ara Tika, as the foundation framework, in the introduction states it is "a framework for addressing Māori ethical issues within the context of decision-making by ethics committee members. It draws on a foundation of *tikanga Māori* (Māori protocols and practices)" (Hudson et al., 2010, p. 1). Te Ara Tika, He Tangata Kei Tua and Te Mata Ira show no proof in the writings, nor in the research and the style of writing that any *kaupapa Māori* (Māori Framework) methodologies were applied in their research. Te Ara Tika does list seven frameworks and the authors name in Appendix B, but no further information is provided and no *kaupapa Māori* frameworks and methodologies are referenced.

Consultation with selected people to seek their approval and endorsement has been a common issue with genetic research, and in fact with Māori consultations by government. "Selbourne Biological Services consulted only five individuals of a hapū and sought final approval by depicting these five people as consultation with iwi" (Mead, 1997).

The series of publications have no specific references, no *whakapapa* (sources) identifying the research participants, nor do the authors introduce themselves and do not identify their *iwi* (tribal) affiliations in direct contrast to *tikanga* (Māori customs) and *te Ao Māori* (Māori world view).

In *te Ao Māori, whakapapa* (genealogy) interconnects everything from the living to the dead, to all-natural objects and to everything Māori, as a people participate in within life. It is polite and common that Māori identify themselves when in person and with their writings. Researchers who cannot or do not identify the *whakapapa* (genealogy) of their sources or their own *whakapapa* have no authority to speak about or make recommendations about taonga (*valuable information*) and whakapapa (*genealogy*). This is equally applicable on the marae as it is anywhere in society that *whakapapa Māori* (Māori genealogy) is discussed.

Te Ara Tika provides no definition of what an *lwi* (tribal) consultation is. Some of the groups referenced as having been consulted in a footnote are incorrectly called *iwi* as opposed to *hapū* (sub clan) or *whānau* (family). By consulting some *hapū* ignores a *Te Ao Māori* (Māori worldview) perspective of *whakapapa* and Māori societal structure. Further investigation of the research participants show that those interviewed appear to *whakapapa* directly to the researchers which makes the research out-puts conflicted as they may not be neutral or were obtained by casual conversations.

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Te Ara Tika states that "Southern Rūnaka o Ngāi Tahu were consulted". This term 'Rūnaka' is ambiguous and does not clearly state who was involved. A *Rūnaka* is a modern corporate structure that merged *hapū* into a region as part of the Treaty negotiations and settlement. Each *rūnaka* have their own *tikanga* and *kawa* (local protocols). It is not clear who 'Southern Rūnaka' are, whether they are south of Kaikōura in the northern most *Ngāi Tahu Rūnaka* or south of Ōraka Aparima the third southernmost *rūnaka* and how many people were and using what *kawa* and *tikanga*. Te Rūnanga o Ngāi Tahu (Tribal Corporation) estimate that less than ten percent of people with *whakapapa* to a *rūnanga* participate with their own *rūnanga*. "It is only the most influential *whānau* (families) who are participants at *rūnanga* whose voice and decisions are heard" (Prendergast-Tarena, 2015).

Ngāti Rakaipaaka is a *hapū* of the tribe Ngāti Kahungunu in the Hawkes Bay but is listed as an iwi. It is estimated to have about 4,473 Ngāti Rongomaiwahine members¹⁰. It is likely that the representation was from a joint venture with Environmental Science and Research Centre (ESR) who collected DNA samples from members of the iwi in 2005 ¹¹. This was before Data Sovereignty issues were being addressed and customary rights of genomic data was being discussed and considered.

Ngati Porou tribal participation was with staff from the Ngati Porou Hauora who are working combating gout within their *iwi*. As a part of their successful campaign, DNA samples were taken and stored at Otago University (Parata-Walker, 2014).

CHAPTER THREE

¹⁰http://www.tkm.govt.nz/iwi/ngati-kahungunu/
⁴https://www.nzherald.co.nz/hawkes-bay-today/news/article.cfm?c_id=1503462&objectid=10928868

3.5 Te Ao Māori Perspectives

This section analyses and compares the myriad of *tikanga* terms and other Māori language sayings to compare how accurate and understandable they will likely be with Māori language speakers and Māori communities. Terms in the publications are cross referenced using authoritative Māori dictionaries, *tikanga* and *mātauranga* (knowledge) Māori literature.

3.5.1 Comparative analysis of Tikanga terms and their definitions

Mead (2016) states "the underlying principle of tikanga is cosmology". "The primary indigenous reference for Māori values and ethics are the creation stories which highlight specific relationships deemed fundamental to the sustainability of life" and specifically for research with genetic data (Roberts et al., 2004). Cooper (2012) introduces a new Māori framework using traditional Māori stories and cosmology, in particular the story of Māui and Tāwhaki as an analysis of science shortfalls for Māori and a way to address them.

Te Ara Tika does not include any Māori cosmology, despite stating the literature is based on *Te Ao Māori* and *tikanga*. The notion of creation stories to explain concepts of *tikanga* is mentioned only once, but not applied or explained in He Tangata Kei Tua (Hudson, Russell, et al., 2016, p. 2). No further explanation or cosmology stories, nor how cosmology relates to genomics appears in the series.

All three frameworks contain a glossary with the following disclaimer "Disclaimer: Many of the descriptions used in this glossary are specific interpretations for the purposes of this document and do not denote the fullness of meaning normally associated with the word or term (Hudson, Beaton, et al., 2016a, 2016b; Hudson et al., 2010)". Such a disclaimer prevents Māori language speakers and Māori cultural practitioners from being able to interpret the meanings and terms if applied by ethical researchers. It is reminiscent of the different texts of Te Tiriti o Waitangi with the Treaty of Waitangi. It will furthermore complicate the Māori perspectives and will only create confusion and mistrust by Māori to the researchers when they are using Māori terms that are not properly understood or misquoted.

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"From early missionary time onwards, words referring to Māori epistemology and epistemological ideas were translated with English words that refer to Western religious beliefs and practices – atua as 'god (rather than powerful ancestor) and wairua as 'spirit' (rather than a person's immaterial being); tapu as 'sacred', rather than ancestral presence; noa as 'profane', instead of ancestral absence'; tohunga as priest rather than expert; karakia as 'prayer', instead of chant; and Tangaroa, Tāne, Tāwhiri-mātea as the 'gods' of the sea, forest, and winds, instead of these ancestral beings in all of their power" (Salmond, 2017).

The following table analyses ten of the *tikanga* which represent about one quarter of the terms used in the glossaries to use as an example of the usage and obfuscation of the tikanga terms.

Term	Literature definition	Common usages
Aroha	"Faith and Care: (Hudson et	1. Benton 2013 states that "This word conveys the ideas
	al., 2010, p. 6).	of overwhelming feeling, pity, affectionate and
		passionate yearning, personal warmth towards another,
		compassion and empath, originally especially in the
		context of strong bonds to people and places. Its
		meaning was considerably widened (and to some extent
		diluted) after contact with Christianity and Euro-
		American influences, to embrace also charity in a more
		universal sense and romantic love of all kinds" (Richard
		Benton et al., 2013).
		2. Williams Maori Dictionary has the following
		Affectionate regard, Each lave or pitur Show approval"
		(H_M_Milliams_1057)
Kaitiakitanga	"Brave compotent and	(R. W. Williams, 1937).
and Kaitiaki	canable best practice	used by bureaucrats in environmental policies and in
	guardian/advocate" (Hudson	legislation Unoko of Ngāi Tabu Rūnanga Ngāi Tūāburiri
	et al. 2010): (Hudson	states that "Kaitiaki is a term used with such irregularity
	Beaton, et al., 2016a, p. 26);	that it is now meaningless. Today, kaitiaki is a term used
	(Hudson, Beaton, et al.,	by Māori and Pākehā bureaucrats as a gap-filler to mean
	2016b, p. 25)	everything and yet nothing" (Tau, 2017, p. 15). Benton
		states that "the modern usage of the word has come to
		encapsulate an emerging ethic of guardianship or
		trusteeship especially over natural resources" (Benton et
		al., 2013).
		2. Barlow states that "Kaitiaki or guardian are left behind
		by deceased ancestors to watch over their descendants
		and to protect sacred places". Kaitiaki are also
		messengers and a means of communication between
		the spirit realm and the human world. Kaitiaki can be in
		the form of birds, insects, animals, and fish. Many

		 kaumātua act as guardians of the sea, rivers, lands, forests, family and marae" (Barlow, 1991, p. 41). 3. The term tiaki, whilst its basic meaning is 'to guard' has other closely related meanings depending on the context. Tiaki may therefore also mean, to keep, to preserve, to conserve, to foster, to protect, to shelter, to keep watch over. 4. The prefix kai with a verb denotes the agent of the act. A kaitiaki is a guardian, keeper, preserver, conservator, foster-parent, protector. The suffix tanga, when added to the noun, transforms the term to mean guardianship, preservation, conservation, fostering, protecting, sheltering. 5. Kaitiakitanga is defined in the Resource Management Act as "guardianship and/or stewardship. Stewardship is not an appropriate definition since the original English meaning of Stewardship is 'to guard someone else's property'. Apart from having overtones of a masterservant relationship, ownership of property in the precontact period was a foreign concept. The closest idea to ownership was that of the private use of a limited number of personal things such as garments, combs, and weapons. Apart from this, all other use of land, waters, forests, fisheries were a communal and or lwi right. All-natural resources, all life was birthed from Papatūānuku. Thus, the resources of the earth did not belong to man, but rather man belonged to the earth. Kaitiakitanga and Rangatiratanga are intimately linked" (Marsden & Honzre 1002)
Kawa	Primary values, principles (Hudson et al., 2010).	"A class of karakia, or ceremonies in connection with a new house or canoe, the birth of a child, a battle, etc". (Williams, 1957). In addition to the ceremony Williams stated, "in modern usage, the term often indicates the protocol governing ceremonial conduct on a particular marae and in formal contacts between social groups".
Rohe pōtae	Used to define the term Tribal area (Hudson et al., 2010).	The complete and correct term is 'Te Rohe Pōtae' which is best known as applying to the King Country. It was also used elsewhere to mean autonomous Māori land. "Te Rohe Pōtae o Tūhoe' referred to Tūhoe tribal land beyond a confiscation line in the eastern Bay of Plenty in the late 1860s" in Tūranganui (Gisborne). Māori also spoke of the concept in the 1850s. The head is sacred to Māori, and the idea that the 'pōtae' (hat) "related to authority over land was derived from the "crown worn by Queen Victoria – one of the symbols of her authority" (Pollock, 2015).

Taonga	Resources (Hudson et al., 2010, p. 19).	"A socially or culturally valuable object, resource or technique, phenomenon or idea" (Benton et al., 2013, p. 396). 2. Refers to a "wide range of valuable possessions and attributes, concrete and abstract" (Biggs, 1989, p. 140).
Тари	Restricted (Hudson et al., 2010, p. 4).	"A key concept in Polynesian philosophy and religion, denoting the intersection between the human and the divine. Used as a term to indicate states of restriction and prohibition whose violation, often included the death of the violator and others involved, directly or indirectly. "Its specific meanings include "sacred", under ritual restriction, prohibited" (Benton et al., 2013, p. 404). 2. Under religious or superstitious " restriction; "Beyond one's power, inaccessible; Sacred (mod); Ceremonial restriction, quality or condition of being subject to such restriction (Williams, 1971). 3. From a purely legal aspect, it suggests a contractual relationship has been made between the individual and deity.
Te Ao Māori	Māori world (Hudson et al., 2010).	"The Māori world view (<i>te ao Māori</i>) acknowledges the interconnectedness and interrelationship of all living & non-living things in the physical, psychological, theological, and spiritual realms. 2. Māori worldview lies at the very heart of Māori culture - touching, interacting with, and strongly influencing every aspect of the culture. This contributes to the Māori holistic view of the world and the Māori place in it" (M. o. Marsden & Royal, 2003, pp. 19,20). 3. "Māori beliefs, custom, and values are derived from a mixture of cosmogony, cosmology, mythology, religion, and anthropology" (Best, 1924b); (Buck, 1949); (Biggs & Barlow, 1990); (Marsden & Henare, 1992); (Mead, 2003)
Tohunga	cultural experts (Hudson, Beaton, et al., 2016a, p. 15)	1. "An expert in any branch of knowledge, religious or secular, and a skilled practitioner of an art or craft. It includes (but is not limited to) those whose function primarily ritual and priestly" (Benton, 2012, p. 434).2. Is often translated as 'expert'. "Such use is wrong. Tohunga is the gerundive of tohu and means 'a chosen one' or appointed one" (Marsden & Royal, 2003, p. 14).
Whakapono	Faith (Hudson et al., 2010, p. 19).	The definition stated in He Ara Tika are scriptural translations from Paipera Tapu (Bible Society New Zealand, 2012). "Pono was consistently to convey the Hebrew 'mn' belief in adherence to an idea or set of principles and its derivatives, generally translated into English as 'faithful, faithfulness, faith believe, truth" (Benton et al., 2013). 2. The traditional meaning of 'pono' is: "absolutely true; genuine; unfeigned" (Benton et al., 2013).

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Table 1 Te Ara Tika terms

3.5.2 Analysis of Whakataukī

A whakataukī is also known synonymously as whakatauakī and pepeha.

"A *whakataukī* is a concise, formulaic saying, such as a proverb, aphorism, short *karakia* (prayer), or memorable, witty remark. It is used especially (but by no means exclusively) for sayings that encapsulate the boundaries or tribal group or region. By extension, this word can also be used as a general term for a "figure of speech, and as a verb can mean either to make such a remark, or to boast about some accomplishment, or intended action. A *whakataukī* is used to express customary ideas" (Benton et al., 2013).

Hirini Mead (2016) comments that "*whakataukī* are not merely historical relics. "Rather they constitute a communication with the ancestors. Through the medium of the words, it is possible to discover how they thought about life and its problems. Their advice is as valuable today as it was before".

Sir Hirini Moko Mead further describes a whakataukī as "It's a very succinct message which places a high value on a certain aspect of human behaviour. These are stated as universal truths that people need to be aware of, and that people need to use to guide their behaviour and also to guide their judgements about what to say and what not to say and what to do, and what not to do" (Mead, 2016a).

Sir Apirana Ngata emphasized the importance of using the correct version and context of a *whakataukī* to avoid misinterpretations and misunderstandings which are common with uninformed translations (Apirana Ngata, Buck, & Sorrenson, 1986).

Kia aroha ki a Tangaroa

This is translated by the authors of Te Ara Tika as "to be careful and aware of the potential dangers in the sea" (Hudson et al., 2010). Then it appears with a different translation in the glossary where it is defined as "In a traditional context, a person going fishing, or diving might be cautioned with the phrase 'to be careful and aware of the potential dangers in the sea".

The subject of the whakataukī is "Tangaroa". Tangaroa is the deity of the sea/ocean and progenitor of fish (Mead & Grove, 2001). A more correct translation could read "Be respectful of the practices and knowledge of Tangaroa the god of the ocean and ensure you pray and offer thanks to Tangaroa".

"Very great reverence is paid to Tangaroa by Māori when engaged in fishing, and on no account is cooked food allowed to be taken in the canoe at such times, and even old pipes are forbidden" (Gudgeon, 1905). It is custom to always say a *karakia* (prayer) to Tangaroa and Ikatere (Deity of fish) among other Māori deity when fishing and taking food from the ocean. It is also appropriate to offer back to Tangaroa some of the days catch. Strict observances are made by people who take fish from the ocean as to where they will shell and fillet the fish and place the leftovers. "Tangaroa will be angry and will not allow you to have a plentiful fishing trip if you eat or prepare food form the ocean too close to the ocean" (Edwards, 1990).

The most common and universal Māori word and root word for 'ocean' and 'sea' is *moana* (Biggs, 1981; Cormack, 1995; Moorfield, 2011; Ryan, 2012; Sinclair & Calman, 2012; Strickland & Fisheries, 1990; Tauroa, 2006; Tregear, 2014; Williams, 1975).

Tangaroa is the common Māori word for the *Atua* of the ocean and does not have any other definitions applied to the term (Moorfield, 2011; Tregear, 2014; Williams, 1992).

Kei tua i te awe mapara, he tangata ke. Mana e noho te ao nei—he ma

He Tangata kei ua translates this as "Who makes the decisions after consent has been given?".

Sir Peter Buck (Te Rangi Hīroa) translates and discusses the meaning of the whakataukī which differs greatly from the literature. The meaning is about the Māori population being interbred and losing their customs (Buck, 1949, p. 537). The whakataukī is not related to the definition provided by the authors of the literature.

Me ātahaere mā ngā ngaru, kei tōtohu i te aroha o Tangaroa

Te Mata Ira states this whakataukī that is used as a guiding principle and translates it as "Tread carefully in challenging waters".

Combining the words *āta* and *haere* together is linguistically incorrect (Te Taura Whiri I te Reo Māori, 2012). Again, as in the previous example, the subject is Tangaroa the deity of the ocean and this is further reinforced by the use of the word "o" stating of a superior being. The whakataukī is confusing to understand and does not translate to the definition provided by the authors. A more appropriate whakataukī could have been found in Māori epistemology or in the authoritative Ngā Pēpeha o ngā Tipuna (Grove, 1985, pp. 89, 182, 381).

Kanohi ki kanohi

This whakataukī is referenced four times in Te Ara Tika, including in the Glossary. The only explanation provided is a direct translation "face to face". The meaning of this whakataukī implies that if correct contact must be made then people should meet face to face, one on one, so that no misunderstandings, misconstruing, misinterpretations, misapprehensions, misconstructions can occur. This term is commonly used in everyday language by Māori language speakers. A more careful analysis of the statement is that it implies that "by taking the time and energy to arrange and travel to meet somebody you are showing the respect and homage that this person is worthy of your efforts" (Keegan, 2000).

3.5.3 Ira tangata as Taonga Species

Epistemology and *Whakapapa Māori* with many *lwi* states that Māori human beings are the youngest of the children of Tāne Māhuta, the father of all the birds, insects, and all other living forest species. Tāne Māhuta also created the first human being with Hine Ahu-one. A *Te Ao Māori* perspective is that there is no difference with human and non-human species

genetic materials as all species are closely related by *whakapapa*. Humans are the *kaitiaki* for all other species and all other species are the kaitiaki of human beings.

If Te Ara Tika, He Tangata Kei Tua and Te Mata Ira were based on *Te Ao Māori* and *tikanga* as they state, the ethical guidelines would be written for all species as one set of species cannot be separated from another with ethical consideration of Māori genetic and genomic research.

Traditional Māori knowledge has a story that reminds us of the dangers of ignoring or thinking that non-human species are not as important as human species.

"When Māui entered Hine-nui-i-te-po, he began to push harder, and the little kick his feet gave made his brothers laugh, and the birds joined in. If Māui had not been cruel to the Tītwaiwaka (Fantail/Rhipidura fuliginosa), Pakura (Swamp-Turkey/Porphyrio porphyrio), and other birds he might have conquered death, but his treatment of them had made these birds angry, and they did not obey his injunctions to keep well back but pressed up quite close. The fantail came fluttering over her face, and its long tail tickled her nose and she stirred just as the brothers laughed at Māui's wriggles. This made the fantail giggle, and the other birds joined in, and the sound awakened her with such dire results to Māui that he never appeared again" (Tikao & Beattie, 1939, pp. 32-33).

3.6 Indigenous and International Instruments

There are a number of specific treaties and declarations that bind Māori and the Crown to respect ethical considerations of biological research of Māori genetic data. There are also a number of international instruments that should be considered when writing about Māori ethics with genetic research.

3.6.1 He W[h]akaputanga

He W[h]akaputanga o te Rangatiratanga o Nu Tireni is also known as the Declaration of Independence of New Zealand. "Translated, it can mean 'an emergence', referring to the birth of a new nation, Nu Tireni – New Zealand – but also marking steps towards unified forms of governance among the many different rangatira and their hapū and iwi" (Waitangi Tribunal, 2014, pp. 153-154).

He Whakaputanga is not mentioned in any of the frameworks, despite being a nationally significant declaration between Māori and the British (Waitangi Tribunal, 2014). He Whakaputanga offers a significant amount of protection and considerations that any researcher with Māori genetic materials should be aware of. "He Whakaputanga has often been considered no more than a minor prelude on the journey to the Treaty of Waitangi" (Waitangi Tribunal, 2014, p. 195).

"Yet such a viewpoint considerably undersells He Whakaputanga. For one thing, it was British acknowledgement of the validity of the Declaration of Independence that made it necessary to seek a cession of sovereignty when the British government decided to intervene further in New Zealand in 1839. The Crown had recognised the sovereign authority of the United Tribes of New Zealand and would need the agreement of those rangatira in order to alter that situation" (Kawharu, 1989, p. 130).

For many Māori, the Treaty did not, and could not, erase the clear assertion of rangatiratanga – chiefly authority or sovereignty – made through He Whakaputanga. For that reason and others, He Whakaputanga "remains a taonga of great significance today He Whakaputanga was – and remains – proof that the rangatiratanga and mana of Māori had been clearly articulated and asserted. New Zealand had been a sovereign land under the authority of the united tribes before 1840; and, according to the Waitangi Tribunal, that sovereignty was not extinguished by the Treaty of Waitangi. The Treaty itself was another step in the everdeepening alliance or covenant with Britain" (O'Malley & Harris, 2017).

Article I of He Whakaputanga state that the crown will honour its obligations to the tribes who were signatories and that these tribes would not be subjected to the current laws and bio piracy that Māori have endured for decades. While Article II gives the signatories the right to practice their own *kaitiakitanga* with Māori genetic data. It could have been possible that a Māori genetic data academy and a government office would already have been established

to protect Māori. Article III is an agreement that a congress would meet in autumn each year to make laws and decisions that impact on Māori Peoples. This could have also led to a set of ethics being created and legislated to protect Māori.

3.6.2 Te Tiriti

"A treaty is a legally binding international instrument agreed to and signed by two or more sovereign nations. All parties to a treaty are required to abide by its provisions unless they abrogate" (formally withdraw from it) (Healy & Huygens, 2015).

Despite Te Ara Tika stating that the Treaty of Waitangi is one of the strands it is based upon, none of the framework's references or discusses Te Tiriti. In direct contradiction of *Te Ao Māori* values and *Tikanga*, Article II of the Treaty of Waitangi is mentioned several times in Te Ara Tika with no meaningful discussion. Te Ara Tika ignores the Preamble and all three Articles of Te Tiriti and the three principles which are applicable to genetic and genomic research.

The Treaty of Waitangi/Te Tiriti o Waitangi is New Zealand's founding document. The Treaty of Waitangi has texts: one in te reo Māori and one in English. The Māori text is referred to as Te Tiriti o Waitangi and is not an exact translation of the English text called The Treaty of Waitangi. These differences, coupled with the need to apply the Treaty in contemporary circumstances, led Parliament to refer to the principles of the Treaty in legislation, rather than to the Treaty texts. It is the principles, therefore, that the Courts have considered when interpreting legislative references to the Treaty (Te Puni Kōkiri, 2001)

Te Tiriti affords Māori the rights to protection of *rangatiratanga* (chiefly autonomy or authority over their own *whenua* (land) and *taonga* (treasured resources and possessions). Māori genetic resources are a *taonga* as it is the foundation of all *whakapapa* Māori. The frameworks use the term *whakapapa*, but it is used to describe relationships with researchers as opposed to its correct meaning of genealogy and the Māori view of genetic materials, therefore the rights of protection are not recognised.

It is essential that in order to recognise and discuss anything about Māori biological materials and their ownership that Te Tiriti be included and that these principles are observed and respected in good faith. By using the treaty principles will ensure that researchers, Māori Peoples, *whānau*, *hapū* and *Iwi* engage in dialogue about Māori concerns and rights.

- 1. The Principle of Active protection "The Tribunal has elaborated the principle of protection as part of its understanding of the exchange of sovereignty for the protection of rangatiratanga and has explicitly referred to the Crown's obligation to protect Māori capacity to retain tribal authority over tribal affairs, and to live according to their cultural preferences. Later Tribunal reports also place emphasis on the Crown's duty to protect Māori as a people, and as individuals, in addition to protecting their property and culture" (Te Puni Kōkiri, 2001). This is applicable to Māori and genetic and genomic research as this thesis will explain that DNA and any body fluids are tapu. There is a myriad of tikanga and traditional values that must be considered by researchers when accessing and analysing genetic and genomic research.
- 2. The Principle of Redress "The Court of Appeal has acknowledged that it is a principle of partnership generally, and of the Treaty relationship in particular, that past wrongs give rise to a right of redress. This acknowledgment is in keeping with the fiduciary obligations inherent in the Treaty partnership" (Te Puni Kōkiri, 2001). This thesis explains why and how Māori genetic data is a taonga. Ethics and the Crown need to consider this within all legislation and decision-making processes that encompass Māori genetic data. While article III promises to Māori equal rights by the Crown. Currently Māori rights are being ignored and the fact that Māori genetic data is a taonga is also being ignored.
- 3. The Principle of Partnership "Both the Courts and the Waitangi Tribunal frequently refer to the concept of partnership to describe the relationship between the Crown and Māori. Partnership can be usefully regarded as an overarching tenet, from which other key principles have been derived" (Te Puni Kōkiri, 2001). This inherent right creates a new category of Māori rights, Genetic Data Sovereignty. Māori, whānau, hapū and Iwi have the right to govern and manage their own genetic data.

3.6.3 Other binding and guiding instruments to New Zealand

The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) recognises Māori rights to their culture, beliefs, and ownership of genetic materials. It is a significant instrument protecting Māori rights and in addition to Te Tiriti and He Whakaputanga with both documents forming the moral basis for any Māori ethics. Despite this, UNDRIP is mentioned in one sentence in Te Ara Tika, with a footnote to a web site. There is no explanation of how to integrate and understand the relevance of the Declaration with ethical research of Māori genetic materials.

Despite numerous Acts of Parliament that directly impact Māori and their genetic materials including Patents Act 1953; The Criminal Investigations (Bodily Samples) Act 1995, Hazardous Substances and New Organisms Act 1996; Human Assisted Reproductive Technology (HART) Act 2004; Guthrie Cards Public Health Bill 177-1 (2007), none of these were included or mentioned in any of the three frameworks.

3.6.4 International Instruments

The Pacific Islands Indigenous Peoples who have very similar cultures and beliefs to Māori and have been combatting unethical usage of their genetic materials by creating declarations regarding exploitation of gene research, gene modification and Intellectual Property Rights of gene research including: Treaty For A Lifeforms Patent-Free Pacific And Related Protocols 1995; Traditional Biological Knowledge, Innovations And Practices Act 2000; Statement of Bioethics Consultation Tonga National Council Of Churches Centre Nukuoalofa, Tonga 2001; Model Law for The Protection Of Traditional Knowledge And Expressions Of Culture 2002; Paoakalani Declaration 2003. None of these treaties and declarations are mentioned in the literature series.

Globally, there are more than 12 international Indigenous declarations to protect Indigenous genetic data from more than 150 Indigenous Peoples and countries including: The Kari-Oca Declaration, The World Conference of Indigenous Peoples on Territory, Environment and Development. Brazil, May 30, 1992 (The World Conference of Indigenous Peoples on Territory Environment and Development, 1992); Declaration of Indigenous People of the Western Hemisphere Opposing the Human Genome Diversity Project World Council of Indigenous Peoples Resolution on the Human Genome Diversity Project. Phoenix, Arizona on February 19 of 1995 (Original Peoples of the Western Hemisphere of the Continents of North & Central and South America, 1995); Beijing Declaration of Indigenous Women, NGO Forum, UN Fourth World Conference on Women Huairou, Beijing, Peoples Republic of China. 7 September 1995 At The Indigenous Women's Tent, Huairou, Beijing, China (Asia Indigenous Women's Network, 1995); The "Heart of the Peoples" Declaration, From the North American Indigenous Peoples Summit on Biological Diversity and Biological Ethics. August 7, 1997. Gros Ventre and Assiniboine Nations' Territories Fort Belknap Reservation State of Montana, U.S. (Roy. Taylor, 1997); Declaration from Kuna Yala, Panama Organizations and Indigenous nations present in the Workshop on the "Human Genome Diversity Project", Ukupseni, Kuna Yala, 12-13 November 1997 (Organizations and Indigenous nations present in the Workshop on the Human Genome Diversity Project, 1997); Resolution of the Confederated Salish and Kootenai Tribes of the Flathead Reservation, Montana (Tribal Council of the Confederated Salish and Kootenai Tribes of the Flathead Reservation, 1998); Cartagena Protocol on Biosafety on the Convention on Biological Diversity (United Nations, 2000); The International Cancun Resolution of Indigenous Peoples, 5th WTO Ministerial Conference - Cancun, Quintana Roo, Mexico, 12 September 2003 (International Representatives of Indigenous Peoples, 2003); Hawaiian Civic Clubs Resolution Urging the University of Hawai'i to Cease Development of the Hawaiian Genome Project, Adopted November 15, 2003 at the 44th Annual convention of Hawaiian Civic Clubs at Nukoli`i, Kauai, Hawai`I (Hawaiian Civic Clubs Resolution, 2003); Collective Statement of Indigenous Peoples on the Protection of Indigenous Knowledge Agenda Item 4(e): ratified in the UN Permanent Forum on Indigenous Issues, May 12, 2004, New York City (UN Permanent Forum on Indigenous Issues, 2004b); Declaración Colectiva de Pueblos Indígenas sobre la Protección del Conocimiento Tradicional Tercera Sesión, Foro Permanente de la ONU para las Cuestiones Indígenas ratified in New York, 10-21 May 2004 (UN Permanent Forum on Indigenous Issues, 2004a); The Manukan Declaration of the Indigenous Women's Biodiversity Network Manukan, Sabah, Malaysia, 4-5 February 2004 (Indigenous Women's Biodiversity Network, 2004); . Memorandum Of Understanding Between The Government Of Samoa And The Regents Of The University Of California, Berkeley For Disposition Of Future Revenue From Licensing Of Prostratin Gene Sequences, An Anti-Viral Molecule (Sāmoa and Berkeley University, 2004). Again, none of these instruments are mentioned in the three frameworks.

There are also a number of United Nations instruments including: Bonn Guidelines 1992; The Convention on Biological Diversity 1992; Universal Declaration on the Human Genome and Human Rights 1997; International Declaration on Human Genetic Data 2003; UNESCO Universal Declaration on Bioethics and Human Rights 2005; Declaration on Indigenous Peoples' Rights to Genetic Resources and Indigenous Knowledge 2007; United Nations Permanent Forum on Indigenous Issues Sixth Session, May 14-25, 2007 Collective Statement on an International Regime on Access and Benefit Sharing; Nagoya Protocol on Access and Benefit Sharing 20108 that are not referenced in the series of literature.

The only instrument mentioned in the literature is the UNESCO Universal Declaration on Bioethics and Human Rights 2005, which is mentioned but not explained. Te Ara Tika mentions several other international codes of ethics with no further explanation including: Nuremburg Code 1947; Helsinki Declaration 1964; Belmont Report 1979; (Hudson et al., 2010, p. 1).

3.7 Conclusion

The three reviewed frameworks have highlighted the problem that *mātauranga Māori* (Māori knowledge) is neither defined nor taught as a discipline in mainstream education facilities. This creates and allows a free licence by researchers to create as they see fit, new Māori knowledge, despite it being incorrect, misleading, and sometimes offensive.

This review reinforces Te Maire Tau's statement that "it is far better to anchor Māori students in Māori epistemology first before they apply extrinsic disciplines to it" (Tau, 2001, p. 72). The literature review also highlights the issues that the mainstream tertiary institutions need to ask themselves whether they can deal with Māori perceptions of the world adequately.

"It is naive to say in tertiary institutions that there is a 'Māori dimension' to history, education, geography, or any other discipline. To do so imposes one framework of knowledge upon another that orders itself differently" (Tau, 2001, p. 65).

"Mātauranga Māori needs to be accepted as having both a secular and a theological sense" (Te Maire Tau, 2001, p. 67). The fundamental principles of *tikanga Māori* are epistemology and cosmology. Despite this, Te Ara Tika, He Tangata Kei Tua and Te Mata Ira ignore Māori epistemologies reflecting the practices of the early missionaries to deflect traditional meanings. The reviewed frameworks have created confusion and obfuscation by discretely imposing western perspectives that ignore Māori customary beliefs and cultural values.

"You can never have a complete grasp of *mātauranga* Māori without a solid understanding of the language" (Tau, 2001, p. 68). The incorrect usage of the Māori language terms describing *tikanga* and *whakataukī* translations veil their true meanings and intentions reflecting ignorance of traditional Māori customary rights and knowledge contradicting a *Te Ao Māori* perspective. The impact of using incorrect Māori language speakers including the damage to the multiple generations of people who are Māori language speakers including the Kura Kaupapa Māori schools who had just over 6,000 graduates in 2012 (Calman, 2012). Also, to the more than 152,000 Māori school children in mainstream schools who are leaning te reo Māori 2019¹².

To present and research a *taonga* and a *whakapapa* requires decolonised research methodologies be applied to the research. Absent from all of the literature is any proof that any kaupapa Māori research methodologies and or frameworks were applied at any stage.

Despite New Zealand having two founding documents that were created between the Crown and Māori that set the genesis for any ethical discussions about Māori, the reviewed frameworks is wanting of any citations and references to those instruments. Despite there being a myriad of international, UN and Indigenous instruments that share Māori ethical beliefs and concerns, none were utilised in any of the three frameworks.

Te Ara Tika, He Tangata Kei Tua and Te Mata Ira do not represent a *Te Ao Māori* or *tikanga* Māori perspective. The result is that there is a large void of *Te Ao Māori* knowledge and *mātauranga* Māori that can be used to guide ethical decisions with Māori gene research and

¹² https://www.educationcounts.govt.nz/statistics/maori-education/maori-in-schooling/6040
CHAPTER THREE: REVIEW OF THREE CURRENT MAORI GENE ETHICAL FRAMEWORKS

to guide the protection of Māori rights with Māori gene research that has not yet been published.



Figure 26 Chapter Five

Authored by Karaitiana N Taiuru

4.1 What is Tikanga

Tikanga Māori has become a common term in modern society. Understandings what *tikanga* entails can vary considerably. Mead stated in 1970 that "though a few people are quite knowledgeable, the vast majority know little about the subject" (Mead, 2016b).

"Tikanga Māori translates as Māori custom, representing and indicating customs and traditions, heritage, hereditary tribal narratives. Our protocols of responsive Māori and indigenous methods, tikanga are distinctly insightful for reflection and celebration to look to the future with increasing pride of our customary tikanga sources. Reclaiming of our identity, unique tikanga knowledge opportunities that have been handed down through many generations and have been accepted as a consistent, steadfast, and appropriate to infuse our sovereignty as a positive change a transformative progressive agent. A way of achieving and fulfilling certain objectives and goals. Such proven methods together with their accompanying protocols are integrated into the general cultural institutions of society and incorporated into the cultural system of standards, values, attitudes and beliefs" (Marsden & Henare, 1992).

Tikanga is just a subset of a *Te Ao Māori* view. Mead (2016) states "the underlying principle of tikanga is cosmology", therefore, stories that directly apply to Māori DNA are used in this thesis to introduce tikanga Māori with genetic Māori Data.

Tikanga Māori gives clear cultural guidelines about how we treat one another and how the human body is regarded. Every part of a human being (*ira tangata*) including fluids, hair etc., is treated as *tapu* (sacred) and comes complete with the physical, spiritual, and cognitive attributes of that person. All body parts, even severed limbs, are buried at the *urupā*, hair and nails clippings are buried in the ground as each body part includes the human gene – it is a part of *ira tangata* and therefore *tapu*. (Mead, 2004, p. 1).

Tikanga does not preclude new circumstances and needs as they arise. But before creating new *tikanga* for modern day circumstances, one must have an intimate knowledge of *Te Ao Māori* first. *Tikanga* must not be obfuscated to suit one's own needs and personal circumstances as research suggests occurs in academia and government consultations (Hutchings & Reynolds, 2005). Other reasons for obfuscation are likely due to a lack of *te reo Māori* (Māori language), being raised off the *marae* or having non-Māori theological beliefs.

An example of evolving tikanga is seen with many *karakia*. Often *karakia* have been colonised and Christianised in today's modern society, to the point that they are no longer *karakia* practiced by traditional Māori practitioners. A *karakia* for a new building is for the *atua* (deity) Tāne Māhuta who is the *atua* of forests, therefore trees which buildings are made from wood. But with more buildings being built from metal and other minerals, *tikanga* needs to evolve and *karakia* to other deity are now appropriate. The New Zealand Law Commission defines tikanga: "as well as common law, Māori custom law or tikanga must also be taken into account. While there is ongoing debate and discussion as to the precise status of tikanga within New Zealand legal systems, there is no doubt that consideration of tikanga and its underlying values will be taken into account by the courts when adjudicating disputes involving Māori deceased or Māori custom. Rules and customary practices based on tikanga have also evolved over hundreds of years and give expression to the fundamental principles, values, and beliefs which underpin Māori culture" (Law Commission, 2001).

Since 2004, tikanga has been mentioned in more than 253 judicial decisions of New Zealand's Supreme Court, Court of Appeal and High Court (from 2005) twice in Family Court judgements in 2019 and 2020 (The Ministry of Justice, 2020).

Mead further defines *tikanga* as "Referring to the ethical and common law issues that underpin the behaviour of members of whānau, hapū and iwi as they go about their lives and especially when then engage in the cultural, social, ritual and economic ceremonies of their society (Mead, 2016b, p. 16).

All *Taonga Species* share the same parent and grandparents. It is important to note that Māori Human beings were the last *Taonga Species* to be created by Tāne Māhuta, making human beings the younger sibling (*teina*). For this reason, *tikanga* is the same for human beings and other *Taonga Species* with DNA related research. Despite the close genealogical links of all *Taonga Species*, researchers have incorrectly concentrated solely on human species with Māori ethics (Hudson, Beaton, et al., 2016a; Hudson et al., 2010; Hudson, Russell, et al., 2016) or just on one *Taonga Species* (Collier-Robinson, Rayne, Rupene, Thoms, & Steeves).

A common and myopic argument against *tikanga* and customary Māori rights are that they are no longer relevant in modern society. The same is often said of the Holy Bible and other religious literature. Others believe that the Treaty of Waitangi is also obsolete in this age (Archie, 1995). *Tikanga* is a guaranteed right offered to Māori by the Crown in Te Tiriti o Waitangi, therefore embedded into the very fabric of New Zealand society as is religious choices.

Two *pepeha* should be considered when discussing the relevance of *tikanga* in a modern world. *Ko te amorangi ki mua, ko te hāpai ō ki muri.* "In general terms it counsels not to neglect the spiritual side of life" (Ihaka, 1959), and *Ka ora pea I a koe, ka kora koe I au*: "Perhaps I survive because of you, and you survive because of me: Each member of the tribe is essential to the survival of all others" (Pio & Mead, 1980).

A culture cannot be learned from a textbook. True understanding and appreciation are possible only from first-hand experience. Māori have continued to maintain customs that they have developed and nurtured for many, many generations. "It is essential for all New Zealanders that the Māori maintain integrity of their culture rather than permit adjustments that are simply intended to make it easier for the non-Māori to fit in" (Tauroa & Tauroa, 1986, p. 13).

Government consultations have often misused Māori consultants to speak against Māori world views when there are no clear guidelines (Hutchings & Reynolds, 2005). In 2018, MBIE initiated the Plant Variety Rights Act 1987 public consultation. Part of the submission asked if *Taonga* Species were adequately being protected. Yet, by their own admission, MBIE did not know what a *Taonga* Species was and referred to the WAI 262 Claim Report. As a result of the consultation, MBIE without Māori feedback created a new term called "Introduced Waka Species".

The WAI 262 Claim Report has contradictory statements as how to ascertain a *Taonga* Species (Waitangi Tribunal, 2011b) & (Waitangi Tribunal, 2011a). The statements are also outdated and do not consider how quickly science and technologies have evolved.

The following is one of the definitions of Taonga Species from Ko Aotearoa Tēnei (Waitangi Tribunal, 2011b) "In essence, a Taonga Species will have kōrero tuku iho, or inherited learnings, the existence and credibility of which can be tested (Tribunal, 2011)".

The proposed definition above creates issues where people who are not experts in a specific cultural genre or if an *Iwi* have lost much of their traditional knowledge.

Another definition in 2.2.2 of Ko Aotearoa Tēnei that states the following which appears to contradict the definition above (Waitangi Tribunal, 2011a):

"Taonga Species are the species of flora and fauna for which an iwi, hapū, or whānau says it has kaitiaki responsibilities. These kaitiaki–Taonga Species relationships are complex and varied. The purpose of the relationship is defined in mātauranga Māori (the tribe's traditional knowledge about the species), in whakapapa, waiata and other performance arts, and in kōrero or story. No two iwi, hapū, or whānau will have the same mātauranga or the same kōrero about a particular Taonga Species. Rather, relationships will be unique and jealously protected.

Though many Taonga Species were valued for their practical benefits, they were not viewed simply as resources. Rather, the efficacy of a plant or animal depended on its mauri – its physical and spiritual well-being – and the person using it was responsible for that mauri". (Waitangi Tribunal, 2011a)

This definition reinforces that *whakapapa* is a *taonga* and therefore a *Taonga Species* is any species with a *whakapapa* to *ngā atua* (deities)

Māori academics have institutional boundaries they must work within. Western sciences and knowledge institutions do not recognise traditional knowledge, therefore how do Māori academics within western intuitions publish material about *tikanga* and *mātauranga Māori*? Cooper states that Māori knowledge has been cast by Western science into an epistemic wilderness, and Māori are regarded as producers of culture rather than knowledge (Cooper, 2012).

"The position of Kaupapa Māori is paradoxical. It must stand aloof from the concerns of science and centre Māori epistemologies as a starting point for research. At the same time it must critically engage Western knowledge and production practices as part of its decolonizing and transformational strategy" (Cooper, 2012).

The New Zealand Human Rights Commission recognises the need to include Māori spirituality as a fundamental *tikanga* "Maori spirituality is an inherent part of tikanga Māori, linking mana Atua, mana whenua and mana tangata. The recognition and protection of tikanga Māori (culture), in accordance with international human rights standards and with the Treaty of Waitangi, therefore cannot be separated from Māori spiritual beliefs" (Human Rights Commission, 2004, p. 2).

Relevant *tikanga* with Māori genetic data is not new, it has been cloaked by modern day technologies and sciences where Māori knowledge and people are under-represented in the industry. We only need to understand DNA from a Māori perspective and to consider our *Te Ao Māori* knowledge contained in *pepeha* (proverbs), *patere* (chants), *waiata* (songs), *whakataukī* (proverbs), *mōteatea* (laments) and our own *whakapapa*. In addition, for customary *tikanga* to be acknowledged, there is a vital need to consider Māori Data Sovereignty and new and emerging technologies.

In Huakina Development Trust v Waikato Valley Authority [1987] 2 NZLR 188, Chilwell J applied Public Trustee v Loasby (1908) 27 NZLR 801 "customs and practices which include a spiritual element are cognisable in a Court of law provided they are properly established, usually by evidence." He held that "Māori spiritual and cultural values could not be excluded from consideration if the evidence established the existence of spiritual, cultural, and traditional relationships to natural water held by a particular and significant group of Māori people".

It has been argued that *tikanga Māori* and religion have enough in common that the legislative protection of tikanga has the potential to affect New Zealand's status as a secular State and its protection of religious freedoms (Wright, 2007). Furthermore, Wright recommends that "legislative references to *tikanga Māori* should come with a clear statement of purpose. In addition, many *tikanga Māori* provisions should prompt advice to the Attorney-General under section 7 of the New Zealand Bill of Rights Act 1990, even though few may ultimately warrant a section 7 report being tabled in Parliament".

4.1.1 Loss of customary knowledge

The following to pepeha are considered for the section.

Tamariki wāwāhi tahā. Children breaking calabashes. "This stands as a metaphor for the disregard by young people of the beliefs and customs of their forebears" (Mitira, 1944).

Ka maihi te tamariki wāwāhi tahā. Well done, children busy at breaking calabashes. "The saying admonishes those who forsake the ideals of their ancestors, or slander their own people or tribe" (Brougham, 1975, p. 38); (Shortland, 1980, p. 200); (Takatini, 1923, p. 10).

All Māori are born with whakapapa, but not all Māori are Māori practitioners. There is no one Māori world view, in as much as there is no one New Zealand or one Indigenous Peoples world view. Māori are diverse as a people due to genealogical links, geography, and intergenerational social and environmental changes.

For over 260 years, since Captain Cook and his ship the Endeavour visited New Zealand, Māori culture has been integrated into European culture by colonisation, intermarriage, urbanisation, wars, mass murders, land theft, government-imposed cultural assimilation and racist policies including segregation of Māori communities (Bartholomew, 2020). As a result, many Māori ignored or abandoned (forced or by choice) their traditional knowledge systems and beliefs. In 1970, Sir Timoti Karetu expressed his concerns at the lack of understanding of *kawa* in marae (Karetu, 1970).

Māori were quick to adapt to Christian and Eurocentric values and ignore their own deities. "Māori, whose own religious beliefs required rigid observance to ritual, took time to convert to missionary Christianity but, like many Oceanic peoples, did so with fervour, regulating their daily lives according to the Laws of the missionaries' God" (Paterson, 2008).

Elsdon Best an ethnographer remarked "the old men of Tūhoe will assert that the greatest aitua (disaster) of modern times was their forsaking the ancient beliefs, religion, customs, tapu, etc., of their race and the adaption of those of the white man. Hence the degeneration, lack of vitality and lessoned numbers of the Māori people." (Best, 1972, p. 1014).

Tohuka (expert in magic and genealogy) of Ngāi Tahu Tiramōrehu stated that "our ritual, that of the Māori of this land was abandoned since the coming of the Faith resulting in Ngāi Tahu ignoring all these beliefs of their ancestors, however, there are many beliefs of our ancestors which can never be collected, there are so many" (Tiramōrehu, Van Ballekom, & Harlow, 1987, p. 33).

Ngāi Tūāhuriri *Upoko* (Chief) and Canterbury University Scholar, Professor Te Maire Tau has described the lack of cultural knowledge within the Ngāi Tahu i*wi* as wanting, due to successive intergenerational colonisation of Ngāi Tahu individuals, whānau and communities that even saw significant loss of the Māori language within Ngāi Tahu "Ngāi Tahu have been so colonised and have lost their identity, that it would be difficult to garnish any traditional knowledge. By 1996, Ngāi Tahu had no native speakers. In 1992, Pani Manawatu, the Upoko of the Ngāi Tu Ahuriri Rūnanga and last native speaker of the language, died. His death had been preceded by that of his cousin, Rima Te Aotukia Bell (nêe Pitama), who was learned in tribal traditions. In 1996, Jane Manahi, a spiritual elder and leader from Tuahiwi, also passed beyond the shaded veil. These deaths and the 1996 Te Runanga o Ngai Tahu Act saw the end of Ngāi Tahu old and the evolution of a Ngāi Tahu new. Just as the Gaul's and Germanic groups de-colonized themselves and rebuilt their world, so too have Ngāi Tahu" (Tau, 2001, p. 148).

The Tohunga Suppression Act 1907 made Māori theological beliefs illegal and termed them superstition or credulity (New Zealand Parliament, 1907). The Act was not repealed until 1962. Prior to the Tohunga Suppression Act was another Act of suppression, the 1867 Native Schools Act which primary purpose was to assimilate Māori culture and language. This has resulted in more than seven generations learnings of *tikanga* being lost. The knowledge of *tikanga* that was shared was very secretive. Only now is society tolerating speaking about customary *tikanga* and Māori theological beliefs. "The whole issue of cultural change, evolution, development, accommodation or whatever variant form change might take, is a topic of worthy debate" (Rewi, 2010a, p. 179). "To try and live in the past was to show unrealistic was to show unrealistic defeatism, but to abandon the heritage of their ancestors completely in the attempt to acquire Pākehā culture was like starting to cross a dangerous mountain river with no rope" (Pearce & Dansey, 1968, p. 118).

4.2 Key Tikanga Concepts Relating to Māori DNA Research

The following two primary sources of research have been used to identify appropriate tikanga with Māori genetic Data research: Royal Commission on Genetic modification and the International Research Institute for Māori and Indigenous Education (IRI) based at Auckland University. Māori interviewees for this research also concurred that these are the primary tikanga with gene research.

The public consultation and submissions from the Royal Commission on Genetic modification (RCGM) in 2000 involved a number of meetings around the country and public submissions (Eichelbaum, 2001). The Commission heard from over 400 experts, including scientists, environmentalists, and ethical specialists. It considered more than 10,000 public submissions and heard the view of many others during a series of public meetings, *hui*, and workshops around New Zealand. The following seven tikanga were identified: *Hau, Kaitiaki, Mākutu, Mauri, Rangatiratanga, Wairua* and *Whakapapa*.

The feedback recorded by the Commission is consistent with other research findings (Beaton et al., 2017); (Hudson, Southey, et al., 2016); (Hutchings, 2004a); (Mead, 1996); (Mead, 1998); (Mead, 2016b); (Waitangi Tribunal, 2003a); (Pihama et al., 2015).

The secondary research was conducted by the International Research Institute for Māori and Indigenous Education (IRI) based at Auckland University. They produced a report entitled Māori and Genetic Engineering (Cram et al., 2000). The report explored three key areas (food, human health, and biological diversity). This research was conducted with twenty-four key informant interviews with Māori who were knowledgeable about tikanga Māori and/or GE and related issues as well as nineteen general focus groups with a total of ninety-four Māori from a variety of locations, age brackets and backgrounds.

In total there were eight primary *tikanga* and cultural concerns identified are explained in depth below. There are seven other identified tikanga Māori concerns that are widely shared with other Indigenous Peoples regarding DNA and genomic research:

- 1. "Breaches of culture.
- 2. Use of Indigenous knowledge to create new biotechnological inventions:
- 3. Lack of consultation with Indigenous Peoples:
- 4. Lack of benefits to Māori people:
- 5. Inability of Intellectual Property Laws to protect Māori and their traditional knowledge:
- 6. Loss of control of traditional knowledge:
- 7. Commercialisation of genetic materials" (Hutchings, 2004b).

Hau

The primary *tikanga* that impacts the donor, and the recipient is called "*Hau*". *Hau* is the vitality or vital essence of a person, place, or object. Any gift or thing that is given, has the donor's *hau* as a part of that gift. Respecting *Hau* as a *tikanga* ensures the physical, mental, and spiritual wellbeing of the donor person is respected and protected. It covers a wide range of circumstances with gene research and also aligns with Te Whare Tapa Whā (Durie, 1984).

Hau is also used when returning a present in acknowledgement for a present received (Benton et al., 2013). In New Zealand, regarding human gene samples; The Code of Health and Disability Services Consumers' Rights: Health and Disability Commissioner (Code of Health and Disability Services Consumers' Rights) Regulations 1996: Right 6, The right to be fully informed and Right 7 "The right to make an informed choice and give informed consent is one way to start the process of recognising the hau of the donor".

When a DNA sample is taken from a Taonga Species, there must be some reciprocal arrangement with the donor or the *kaitiaki* of the DNA sample.

The following diagram created provides an illustration of how hau operates.



Figure 27 Hau (Payne, D. 2020)

Kaitiakitanga

Kaitiakitanga is defined in the Resource Management Act as guardianship and/or stewardship. M. o. Marsden and Royal (2003) state "Stewardship is not an appropriate definition since the original English meaning of Stewardship is 'to guard someone else's property'. Apart from having overtones of a master-servant relationship, ownership of property in the pre-contact period was a foreign concept. The closest idea to ownership was that of the private use of a limited number of personal things such as garments, combs, and weapons. Apart from this, all other use of land, waters, forests, fisheries were a communal and or lwi right. All-natural resources, all life was birthed from Papatūānuku. Thus, the resources of the earth did not belong to man, but rather man belonged to the earth. Kaitiakitanga and Rangatiratanga are intimately linked".

In recent times, kaitiaki has become a common term used by bureaucrats in environmental policies and in legislation. *Upoko* of Ngāi Tahu Rūnanga Ngāi Tūāhuriri states that "*Kaitiaki* is a term used with such irregularity that it is now meaningless. Today, *kaitiaki* is a term used by Māori and Pākehā bureaucrats as a gap-filler to mean everything and yet nothing" (Tau, 2017, p. 15).

Benton (2013) states that the modern usage of the word has come to encapsulate an emerging ethic of guardianship or trusteeship especially over natural resources, "Kaitiaki are left behind by deceased ancestors to watch over their descendants and to protect sacred places. Kaitiaki are also messengers and a means of communication between the spirit realm and the human world. Kaitiaki can be in the form of birds, insects, animals, and fish. Many kaumātua act as guardians of the sea, rivers, lands, forests, family, and marae" (Barlow, 1991, p. 41).

The term *tiaki*, whilst its basic meaning is 'to guard' has other closely related meanings depending on the context. *Tiaki* may therefore also mean, to keep, to preserve, to conserve, to foster, to protect, to shelter, to keep watch over. The prefix *kai* with a verb denotes the agent of the act. A *kaitiaki* is a guardian, keeper, preserver, conservator, foster-parent, protector. The suffix *tanga*, when added to the noun, transforms the term to mean guardianship, preservation, conservation, fostering, protecting, sheltering.

Each generation has an inherited obligation to act as *kaitiaki* for the genetic data they have and for their *whānau* genetic data in addition to other Taonga Species.

Karakia

Karakia act as intermediary between the spiritual world and the temporal world (Rewi, 2010, p. 138). *Karakia* plays just as an important role in Māori genetic data research as karakia plays in any other aspect of Māori life. Māori "guarded their well-being by observing tikanga, that is, by observing *tapu*, and by *karakia* and rituals which were strictly adhered to lest the hapless practitioner be punished by the deity to whom he had appealed" (Buck, 1949, pp. 489-504).

"Karakia is first mentioned in the story of Ranginui and Papatūānuku. Te Rangikaheke's version of the story tells how Tūmatauenga was given his karakia after he had overcome his brothers, all except Tāwhiri. He was given his karakia as the means by which he would be able to overcome his elder brothers and use them for food. And so Tāwhirimatea elder brothers were made noa and his karakia were sorted out, the particular karakia for Tāne Māhuta, those for Tangaroa, those for Rongo-mā-Tāne, those for Haumia, those for Tūmatauenga. Tāwhirimatea sorted out these karakia so that his elder brothers might be turned back to him to be his food. There is another karakia for Papatūānuku, which renders free from restriction all that is sought by her. And there is ritual for human beings" (Shirres, 1986).

In another text, Te Rangikaheke says that our karakia come down to us from the time of the separation of Ranginui and Papatūānuku and he names different types of karakia. "It is the same power of the word given to Tū, which is given to us. Then Rangi and Papa were separated. People had become many, there in the darkness. It was from that time that life-giving chants, chants for childbirth, chants for the weather, for sickness, for food, for possessions, and for war, came down to us" (*Shirres, 1986*).

Karakia often call on the *atua* and are a means of participation, of becoming one, with the *atua* and the ancestors and with events of the past in the 'eternal present' of ritual. *Karakia* speak the words of the ancestors and are the work of a people, rather than an individual. "Karakia consists of pleas, prayers and incantations addressed to the gods who reside in the spirit world. Karakia are offered so the gods may intercede in the affairs of mortal men by providing comfort, guidance, direction, and blessings for them in their various activities and pursuits. Some prayers have special ritual functions, while others are used for protection, purification, ordination, and cleansing. Karakia are generally used to ensure a favourable outcome to important events and undertakings and can be used for every aspect of life. Karakia call upon many of our Atua for direction" (Barlow, 1991).

Māori *karakia* whenever there is a special occasion or something *tapu* is involved, especially with repatriation of human remains, *whakapapa* and other tapu objects. Taking a genetic sample, whether from saliva, blood, hair etc., or from the surface of a foreign object, a *karakia* is required to acknowledge the *tapu*, *mauri*, *whakapapa* and *wairua* of the species and the associated *atua*.

Mākutu

Mākutu is both the process of injuring a person or a living entity by sorcery, and the spell or incantation directed at harming an individual or group, a natural consequence of theft or breach of tikanga (Richard Benton et al., 2013, p. 150). There are a number of sources that reference unexplained bad luck or the tikanga of *mākutu* that occurred after breaking *tikanga* (Mahuika, 2015); (O'Biso, 1999); (Stirling & Salmond, 1985).

One of the most common forms of *mākutu* is that in which a medium is used in order to connect the spells of the *tohunga* with the object to be acted upon by them. This medium, termed '*ohonga*' and '*hohonga*', "when it is the object, is usually a fragment of a person's clothing, a lock of hair, a portion of spittle, or a portion of earth on which he has left his footprint" (Best, 1901, p. 75). *Tipuna Māori* (Māori ancestors) also considered knowledge to be *tapu*. As Māori genetic data contains vast amounts of genealogical knowledge, DNA must also be considered *tapu*.

Breaching *tikanga* and suffering the consequences are a widely held beliefs among many *lwi* and individuals, though not so relevant in modern day society, as much of the tapu has been lifted and the mauri of the natural world dead. But the risk of *mākutu* is still relevant. Though it may or may not be a spiritual consequence, issues such as bio piracy and Intellectual Property Rights are the modern-day equivalent of *mākutu*.

As it is becoming more common to provide a saliva test to send to an overseas company who will then identify your ancestry through DNA, the risk of *mākutu* is very high. Especially considering the sacred *whakapapa* is being shipped overseas and stored by international staff who have no awareness of *tikanga*. Considerations of how and where Māori genetic data is stored is essential to ensuring the health and wellbeing of Taonga Species is maintained.

Mauri

Traditional knowledge states that every natural object and living thing has a spiritual aspect called a *mauri*. If we sit down, our mauri sits down with us and some mauri can be left behind if not considered. Likewise, a photograph of a person contains the mauri of the person. Hence, photos of the dead are *tapu*. Yet, Māori genetic data is stored somewhere overseas in a laboratory among many other bodily fluids from many other cultures and religions with the DNA from the living and dead.

Māori genetic data is no different. The *mauri* associated with the Taonga Species is a part of the data and must be treated as sacred. Therefore, any Māori genetic data sample that is stored, manipulated, and anonymised will still contain the *mauri* of the person in the same manner as a photo.

In *te ao Māori*, information is tapu and contains the tapu of the person it is about. DNA contains the *mauri* of not only the individual that the DNA was sourced from, but from their entire genealogical lines of descent.

John Rangihau explains the process of gathering and learning new information "I talk about mauri and some people talk about tapu. Perhaps the words are interchangeable. If you apply this life force to all things – inanimate and animate – and to concepts, and give each concept a life of its own, you can see how difficult it appears for older people to be willing and available to give out information. They believe it's a part of them, part of their own life force, and whey they depart they are able to pass this whole thing through and give it a continuing character. Just as they are proud of being able to trace their genealogy backwards, in the same way they can continue to send the mauri of certain things forward" (King, 1978).

"Once you learn new knowledge it becomes a part of your *mauri*" (King, 1978). Hence knowledge was not always provided and could not be provided. Because of this, Indigenous knowledge and artefacts have been taken without permission by researchers and governments without permission.

Rangatiratanga

According to Barlow, this is a new term coined by *Pākehā* "when the Treaty of Waitangi was written, and the land was colonised. But in recent times, some unschooled Māori have widely adopted the term *tino rangatiratanga* to epitomize their sovereign powers instead of using the correct term *arikitanga*" (Barlow, 1991, p. 131). Nevertheless, it is widely understood to be Māori sovereignty. The attributes of Rangatiratanga are possessing authority and being able to act authoritatively, along with nobility, mind and conduct (Benton et al., 2013, p. 325).

This tikanga recognises that the inalienable rights that Māori have with DNA from Taonga Species is essential.

Wairua

Wairua was used in relation to elements such as mauri, whakapapa, karakia and whanaungatanga.

The heavy influence of Christianity has seen the word wairua adopted to be more appeasing to Christianity. The term wairua was adopted in biblical translations to cover terms translated in English as 'soul' and 'spirit (Ballara, 1998); (Benton et al., 2013). At its core, wairua refers to the spirit of a person as distinct from both the body and the mauri "The integrating force of life is the wairua; wairua envelopes the heart, liver, lungs, kidneys, intestines, blood, muscles, ears, it is the cultivator, caretaker, and integrator of all these things, so they stay in that place, within the part of the body. The wairua and its properties are also revered because they are the cause of man's sanctity; if the wairua did not disengage itself, man would not die; and if every part (of the body) that was cleansed of tapu was held onto by the wairua, life would not end" (Benton et al., 2013).

"At its core, *wairua* refers to the spirit of a person as distinct from both the body and the *mauri*" (Benton et al., 2013). *Wairua* lives in and is a part of a DNA. Therefore, once DNA has been taken, that person or other species wairua has also been taken and is stored in a foreign system. Not until the species with which the DNA was taken is dead, will the wairua also die, but the *mauri* will remain.

Wairua is a fundamental aspect of any genetic Māori data that must be recognised and respected.

Whakapapa

"In its simplest sense *whakapapa* is genealogy, in a wider sense *whakapapa* attempts to impose a relationship between an *iwi* and the natural world. For Māori, "the world was ordered and understood by whakapapa and is the skeletal structure to Māori epistemology" (Te Maire. Tau, 2001). Moreover, *whakapapa* is "a metaphysical framework constructed to place oneself within the world" (Tau, 2003). It is one of the most prized forms of knowledge and great efforts are made to preserve it (Barlow, 1991, p. 174) & (Gibbons 2002, p. 7). Whakapapa was the central principle that ordered the universe (Salmond, 2017, p. 42).

Whakapapa can be interpreted literally as 'the process of layering one thing upon another' (Ngata 2011, p. 6). In a wider sense *whakapapa* attempts to impose a relationship between an *iwi* and the natural world. Moreover, *whakapapa* is a metaphysical framework constructed to place oneself within the world (Tau, 2003). Joe Te Rito has written that *whakapapa* grounds him 'firmly in place and time', and connects us to the past in ways that confirm our identity as Māori through a deep sense of 'being' (Te Rito, 2007, p. 9).

"In research, *whakapapa* has been presented in tribal histories, Māori Land Court records, and consistently as a framework for *mātauranga Māori* (Māori knowledge) and Māori research methodologies" (Mahuika, 2019). "*Whakapapa* is a research methodology or tool apt in the analysis of natural 'phenomena', origins, connections and relationships, and even predicting the future" (Te Ahukaramū Charles. Royal, 1992, pp. 6-8).

Whakapapa has always been considered the explanatory framework for the world and everything in it. Whakapapa chronicled evolutions from the beginning of time and explained Māori social and political organisation to each other and the natural and spiritual world. Whakapapa as an approach, whether it be relevant to genetics, history, education, or elsewhere, is inextricably connected to underlying protocols and tribal ethics. "Whakapapa has its own tribal specific, and collective Māori, politics that seek out connections and inclusivity and are necessarily exclusive when it comes to exercising and asserting ownership and authority" (Mahuika, 2019)

The ethics of whakapapa has its own broad array of commentary. Māori have reminded museums and curators, for example, that the true custodianship of Māori artefacts belong first and foremost to those peoples who have specific genealogical relationships with those taonga (treasures). Whakapapa, then, is part of the requirement for one to exercise guardianship or 'kaitiakitanga' (Mahuika, 2010).

"There is a genealogy for every word, thought, object, mineral, place, and person" (Roberts 2015). The importance of whakapapa in the Māori world is paramount because it is considered crucial to assertions of Māori identity and tribal membership. Ngai Tahu leader, Tā Tipene O'Regan, stated that "whakapapa 'carries the ultimate expression' of who he is, and that without it he would be simply an 'ethnic statistic'" (O'Regan 1987, p. 142). Ngāti Porou leader remarked that "whakapapa is the 'heart and core of all Māori institutions from creation to what is now iwi'" (Mahuika, 1998, p. 219).

Whakapapa teaches us of our environment and the relationships each thing has with each other such as fresh water with stones, or kauri with whales. It is all in our whakapapa knowledge. Unfortunately, due to colonisation and Eurocentric influences, much of the knowledge is hard to find, lost or kept secret.

Sir Tipene O'Regan stressed the living and connected nature of whakapapa between ancestors and Māori in the present, stating that "my past is not a dead thing to be examined on the post-mortem bench of science without my consent and without an effective recognition that I and my whakapapa are alive and kicking" (O'Regan, 1987, p. 142).

Māori genetic data contains all of the original hosts whakapapa and various other sensitive information to the host including, diseases, health vulnerabilities, inherited memories etc.

4.3 Cosmology

For many years, and even still today, Māori cosmology is incorrectly referred to as myth, legends, and fairy tales by non-Māori, even by some Māori scholars. Reed & Calman 2008 describes these descriptive words as unfortunate terms and that some people prefer the word 'truth'. The intergenerational misuse and contradiction of these words to describe Māori Cosmology is likely due to New Zealand (prior to the 1990's when immigration criteria were made more open) being dominated by Christian and Eurocentric values and society not having an appetite to use non-Christian terms. It is also an intergenerational sign of the fear of the Tohunga Suppression Act 1907.

"Within the new-comers work, ancestors who were previously accepted as real and living in Māori genealogy were reimagined in fables and legends that colonisers called Polynesian mythologies and fairy tales" (Reed, 1974, p. 1). In a culture that lives and grows, there need be nothing outmoded or discredited about mythology. "Properly understood, Māori mythology and traditions provide myth-messages to which the Māori messages be more clearly sign posted" (Walker, 1978).

"Myth and legend are an integral part of the corpus of fundamental knowledge held by philosophers and seers of the Māori and indeed of the Polynesian people of the Pacific from ancient times. Myth and legend in the Māori cultural context are neither fables embodying primitive faith in the supernatural, nor marvellous fireside stories of ancient times. They were deliberate constructs employed by the ancient seers and sages to encapsulate and condense into easily assimilable forms their view of the World, of ultimate reality and the relationship between the Creator, the universe and man" (Marsden & Royal, 2003, p. 177).

Cosmology contains many warnings about Māori genetic data and the sacredness of body fluids. The first of the cosmology stories that provide warnings about misuse of DNA is about Tāne Māhuta creating the first woman Hineahuone. Tāne, with the help of his brother Tangaroa who ripped off part of his chest. But in the process of making the woman, Tane had inadvertently created many of the species of the forests, monsters, and other evil beings. The lesson in this story is that there are unintentional consequences with gene manipulation if the *whakapapa* is not known and if you research and manipulate genes without caution.

4.3.1 Classes of Atua

The primary meaning of 'divine being' is at the core of the term *Atua*, and other associations flow from this. An *atua* is invisible but may have visible symbolic or tangible manifestations. "Thus in the eighteenth century the term covered gods, ghosts, unexplainable phenomena and representations of divine beings" (Benton et al., 2013).

This thesis proposes seven classifications of *Atua*. All of which are relevant to Māori genetic data. Elsdon Best classed *Atua* into four categories (Best, 1922, p. 140). Sir Peter Buck added a fifth category for tribal gods (Buck, 1949, p. 460). This research has further defined "Class 1" and added two further categories recognising the parents of the Departmental or Tutelary Deities Ranginui and Papatūānuku (point 2 below) and their grandchildren (point 4 below).

Class	Description
1	Kore (The beginning or the darkness).
	Io the Supreme Being – Io is disputed with many Iwi.
	Most, if not all Iwi agree that there was a Kore and that there were between
	10 and 12 spirit worlds with various dieties, some of whom Taonga Species
	are derived from.
2	The parents of the Departmental or Tutelary Deity Ranginui, Tangaroa and
	Papatūānuku.
3	Departmental or Tutelary Deity – The multitude of children of Ranginui and
	Papatūānuku. Some Iwi have the number between 72 and 74 children.
4	Second and subsequent Departmental or Tutelary Deities. These are the
	grandchildren and other generations of Departmental or Tutelary Deity of
	Ranginui and Papatūānuku.
5	Tribal Atua – An example here is an atua of Kūmara for an iwi. These are
	relevant to Taonga Species.
6	Family atua, familiar spirits: These spirits could appear as birds, dogs, lizards
	or sometimes insects. These atua are relevant to human genome research.
7	Cultural heroes with superpowers such as Tāwhaki and Māui.

Table 2 Classes of Atua in Oral Traditions Table

This table differs greatly from Ngāi Tahu Scholar Te Maire Tau who argues there are issues defining what myth is and what is tradition. His proposed "Oral Traditional Chart" created mainly for historians defining historical *whakapapa*, consists of four realms: Realm of Myth (Class 1-7 above); Mytho-history Realm (Class 1-7 above); Historical Realm (Oral) and Historical Realm (Written) which considers physical ancestors who are human beings (Tau, 2003, p. 19).

4.3.2 Taonga Species Atua

All of the various species and orders partook of *mauri* and for that reason were *tapu* to a greater or lesser degree. Each class type, species and genus is under the protection of its tutelary deity (Marsden & Royal, 2003). All species have a whakapapa to a number of children of Ranginui, Papatūānuku, Tangaroa and their children and grandchildren. Some Taonga Species also have a direct descent from the Māori spirit world. A comprehensive list in in Appendix B.

Every human being who has *whakapapa Māori*, has either a direct or indirect descent to Ranginui, Papatūānuku or Tangaroa, noting there are iwi variations to this. As an example, Te Arawa whakapapa states they are descendants from the stars in the heavens "Ohomairangi was born from the union of the ancestor Pūhaorangi, who descended from the heavens and slept with Te Kuraimonoa. Six generations later when war ravaged the Polynesian island of Rangiātea, Ohomairangi's descendant Tamatekapua led his people to the North Island of New Zealand in the canoe named Te Arawa" (Tapsell, 2017).

All non-human species are the tuākana of human beings. Some Iwi can claim closer genealogical links to various species as their direct *tipuna* or *atua*.

The tutelary deities would place guardian spirits over places or things to watch over the property dedicated to them. "These *kaitiaki* manifested themselves by appearing in the form of animals, birds, or other natural objects as a warning against transgression, or to effect punishment for a breach of tapu" (Marsden & Royal, 2003, p. 6).

The figure below (is intended as a general summary and may differ regionally and within Iwi who may have their own variations, including not recognising Io, shows the genealogy from the genesis *atua*, to, to Ranginui and Papatūānuku, to their children who are the primary parents of all Taonga Species. From these children are offspring, the grandchildren of Ranginui and Papatūānuku who are the *atua* of all Taonga Species.



Figure 28 Whakapapa of Atua

Papatūānuku

Papatūānuku was conceived by tangata whenua as the primordial mother who with Ranginui birthed the tutelary deities and humankind. These tutelary deities' role is to take charge over the elements – winds, forests, ocean, cultivated crops etc.

Papatūānuku is our mother who deserves to be nurtured and respected as a human mother. From unicellular through to more complex multicellular organisms each species depends on each other species as well as its own, to provide basic biological needs for existence. The different species contribute to the welfare of other species and together they help us to sustain the biological functions of their mother, as a living organicism. They also facilitate the process of ingestion, digestion, and waste disposal; they cover her and clothe her to protect her against the ravishes of her son Tāwhirimatea. She nourishes them, they nourish her.

Rehua

In Kāi Tahu stories, Rehua is the first son of Rakinui and Papatūānuku and is regarded as a very sacred *atua* who resides in the highest realm (12th) of the spirit world. Rehua gave his younger brother Tāne the seeds of all vegetation and also all of the bird species to being back to earth to decorate their mother Papatūānuku and so that the birds and insects could eat.

In many North Island stories, several *atua* including Māui, Tāwhaki and Tāne were given specific Trees and birds to being back to earth. These species include the senior lines of the forest such as Mānuka, Tōtara and many species of birds including Huia, Toroa, Bittern Cuckoo (Long tailed), Fernbird (*Bowdleria punctate*), Harrier (*Cirus approximans*) Heron/White Heron (*Egretta alba*), Mountain Parrot (*Nestor notabilis*), Kea and Quail (*Coturnix novaezelandiae*).

Tāne

Tāne Māhuta for many iwi is the tutelary deity of the forest and all its species. Tāne then created the first woman Hineahuone and bore many children to her, their first child is Tiki.

A hapū of Ngāi Tahu in Moeraki believe that Tāne Māhuta and his sister Paia produce the first human being (Orbell, 1995, p. 30). While other hapū in Ngāi Tahu state Tāne Māhuta crated Tiki Auaha as the first human being made from earth and then created a companion for himself and that they copulated in Hawaiki before coming to New Zealand (Tiramōrehu et al., 1987, p. 31).

Tangaroa

Tangaroa is the tutelary deity of all oceans, freshwater species, and reptiles. *Ko te mana o uta, o te moana, ko Tangaroa*. "Tangaora the influential being of land and sea" (Best, 1972, p. 772).

In Ngāi Tahu traditional knowledge, Takaroa copulated with Papatūānuku first creating a number of children. Then when he was away, Ranginui copulated with Papatūānuku creating other children.



Figure 29 Whakapapa of Tangaroa (Mere. Roberts, 2013)



Figure 30 Tangaroa Whakapapa - (Mere. Roberts, 2013)

Rongo-mā-Tāne

Rongo is the tutelary deity of cultivated food products such as the *Kūmara* (Ipomoea batatas), *Taro* (Colocasia esculenta), *Hue* (Lagenaria siceraria), *Ari* (bloodless, dry, sapless food and herbs, hence it was used as an offering to the gods in those ancient times), *Korau* (root crops) as well as other crops and vegetation and such other products as may have been cultivated in past times and other lands (Best, 1910, p. 176). As the protector of crops, Rongo was appealed to as the one to cause all crops to flourish and bear abundantly.



Figure 31 Rongo Whakapapa (Mere. Roberts, 2013)

Haumia

The tutelary deity of all uncultivated food particularly associated with the rhizome of the Bracken (Pteridium esculentum). Some *Iwi* including Kāi Tahu and the Takitimu *waka* have Haumia as great grandson of Ranginui and Papatūānuku.

As with any *whānau Māori* in the physical world of humans, there are other siblings of Ranginui and Papatūānuku who act as carers (*tuākana*) to Taonga Species. These include Rūamoko the tutelary deity of minerals and Tāwhirimatea the tutelary deity of the weather.

Haumia is mentioned in a number of *pēpeha*, reinforcing his position as an *atua*.

Ko Rongo, ko Haumia he mea huna. Both Rongo and Haumia are hidden. This refers to the quarrel of Rongo and Haumia when they both hid inside Papatūānuku where they remain today.

Ko Haumia nāna te aruhe. Haumia of the fernroot. A reference to the Atua of fernroot Haumia.

Ko Haumia tiketike, Tangaroa hakahaka. "Lofty Haumia, low Tangaroa. Haumia the atua of bracken grows high on the hills. On the other hand, Tangaroa resides out of sight, below the sea's surface, yet both are important to human existence" (Best & Andersen, 1977, p. 73); (Grey & Solomon, 1857, p. 52).

The following two images are based on Kāi Tahu *iwi* from North Canterbury *whakapapa* of the primary deities of Taoka Species.



Figure 32 Kāi Tahu Whakappa Taoka

In Kāi Tahu the creation stories are very different to most other *Iwi*, but closely resemble the genealogy from Ngāti Porou on the East Coast of the North Island.

Ngāi Tahu Scholars including Te Maire Tau and Eruera Prendergast-Tarena argue that Io was not introduced in traditional Kāi Tahu knowledge till post colonisation. Unlike other stories, Ranginui and Papatūānuku has several relationships with other *atua* before their relationship. Rakinui and Pokoharuatepoo conceived Takaroa the *atua* of the ocean and all related species.

Papatūānuku and Rakinui had numerous children including Tāne, Rehua (of birds and seeds. Tane brought them from the 12th heaven to Earth to clothe his mother Papatūānuku.)

Rongo is the Atua of Kūmara, though Kāi Tahu tradition states that Pou brought Kūmara from Hawaiki on the back of a giant bird named Te Manu Nui-a-Tāne. Te Kāhui Matangi people of the *kaitiaki* of Kūmara seeds while Tipua is the *atua* of uncultivated foods.





Figure 33 Ngāi Tahu Human Creation

In Kāi Tahu traditional knowledge, Tāne created Hinetītama the first human, and then produced their son Tiki. While in other tribal traditions Tāne created the first human Hineahuone.

Tane formed a body from sand then clay. He shaped and moulded it with his hands until there appeared a head. He pulled out of the earth, forming four legs and a tail. Tangaroa gave his ocean water to the clay body and when it mixed with the clay it turned red and become blood.

Tūmatauenga tore off a piece of his chest giving it to the new creation saying it will have a 'heart of courage like mine'. Then Tane gave the clay body the "Breath of Life". (Robinson, 2005, pp. 37-38). "Ruataiepa had a vagina *pedenda muliebria*; Whatai a labia; Punaweko some hair; Māhuta and Tarewa both had a penis" (Tiramōrehu et al., 1987, p. 31).

Each part of the human body has an *atua* associated with it and a story of creation. For example, menstrual blood is *tapu*, as it is the blood of Māui Tikitiki who was crushed to death when he entered Hineahuone thus making human beings' mortal and able to reproduce (Murphy, 2011). The left side of the body is *noa* (free from spiritual restrictions), the right hand is *tapu* (Best, 1972, pp. 1088,1099). A list of *atua* associated with the *Ira Tangata* is in Appendix C.

In addition to body parts, body fluids also have a *whakapapa*. Traditional knowledge states the origins of all fluids from human beings (blood the only exception) originated from the seminal fluid of Tāne Māhuta after he created Hineahuone. Tāne Māhuta interfered with the *whare o te ora* (female reproductive organs) of Hine Ahu-one by trying to insert his penis into various orifices and ejaculating within them.

Tāne inserted his penis into the eye; the result was tears (Best, 1972, p. 767); Tāne inserted his penis into the ear: the result was earwax (Best, 1972, p. 767). Tāne inserted his penis into the nostril: the result was snot and other discharges (Best, 1972, p. 767); Tāne inserted his penis into the mouth: the result is saliva (Best, 1972, p. 767); Tāne inserted his penis into the armpits: the result was sweat (Best, 1972, p. 767), Tāne thrust his penis against the forehead of Hine Ahu-one; the result is sweat (Orbell, 1995, p. 54).

In the ancient Ngāi Tahu *karakia* recording the creation of the first human by Tāne Māhuta, is a similar story that collaborates the above sources:

Where shall I apply my penis? What about your head? That pool is the place of the hair, not that. Where shall I apply my penis? What about your forehead? That pool is the place of the sweat, not that. Where shall I apply my penis? What about your nose? That pool is the place of mucus, not that. Where shall I apply my penis? What about your eye? The pool is the place of tears, not that. Where shall I apply my penis? What about your ears? That pool is the place of wax, not that. Where shall I apply my penis? What about your mouth? That pool is the place for swallowing food, not that place. Where shall I apply my penis? What about your neck? The pool is the place for the Adams apple, not that place. Where shall I apply my penis? What about your armpit? That pool is the place for the smell of sweat, not that place. Where shall I apply my penis? What about your breast? That pool is the place for breasts, not that place. Where shall I apply my penis? What about your bosom? That pool is the place for the breast, not that place.

Where shall I apply my penis? What about your navel? The pool is the place for the navel, not that place. Where shall I apply my penis? What about your hip? That pool is the place for the hip, not that place. Where shall I apply my penis? Your buttock? That pool is the place for buttocks, not that place. Where shall I apply my penis? Your anus? That pool is the place for faces, not that place. Where shall I apply my penis? What about your body? That pool is the place for the body, not that place. Where shall I apply my penis? What about your thigh? That pool is the place for the thigh, not that place. Where shall I apply my penis? What about your knees? That pool is the place for the knees, not that place. Where shall I apply my penis? What about your feet? That pool is the place for the feet, not that place. Where shall I apply my penis? What about your vagina, your vagina is the good place? That place for the penis, the straight erection, for the bent erection. It couples, it sports, it is full, it springs (Tiramorehu et al., 1987, pp. 31,32).

4.3.4 Māui and his knowledge of Taonga Species genetic data

Māui in Māori traditions is a famous Polynesian ancestral hero. In a western construct, we are taught that Māui is a trickster and a troublemaker. The *pepeha Māui tinihanga* appears to confirm this (Te Pipiwharauroa, 1909). The *pepeha* has been translated as Māui the trickster. Māui was noted for his tricks he played that finally this led to his death by Hine-nui-i-te-pō (Mead & Grove, 2001, p. 289). I argue that the *pepeha* has been myopically translated with a Eurocentric perspective.

Māui represented someone who challenged status quo knowledge and traditions, and therefore provided a "destabilising force that guarded against hegemony, and opened up pathways for change" (Claw et al., 2018). Māui was a disruptive leader who provided Māori with a plethora of advancements.

There are many Māui traditions that relate that ancient Māori had intimate knowledge of Māori genetic data of all Taonga Species and that there were a number of *tikanga* practices. Traditional practices of transformation are what are now called genetic modification.

The first is the story of Māui transforming himself into a bird. Māui wanted to find where his mother would visit each day without inviting his brothers. To do this, Māui transformed himself into all manners of birds, of every bird in the world, and yet no single form that he then assumed had pleased his brothers. Eventually he transformed himself into a pigeon (Grey, 1995, p. 16). The story is also found in the following pepeha "*Mehemea a Rupe*": "If I were Rupe". Rupe is the personification of the pigeon. Māui changed himself into a pigeon and thus was able to fly where he wished. The expression is best applied to someone taken prisoner and wishes to escape (Brougham, 1975). Brougham 1975:34; (Grey & Solomon, 1857, p. 68).

In another story Māui turned his brother-in-law Irawaru into a dog after a disputed fishing trip, where Māui was tricked by Irawaru to use a fish hook with no barb so that he could not catch fish (Grey, 1995, p. 32). Ngāti Porou states Irawaru was turned into a dog by Māui as Māui wanted to acquire his dog tail cape (Orbell, 1995, p. 76). Such a cloak made of dog skin was valued by warriors as a defence against spear thrusts.

Māui tricked Irawaru into eating faeces. Hence dogs today often eat faeces. Irawaru is now considered the founding ancestor of dogs. The event is reflected in the following pepeha He tāpahu o Irawaru. A dog skin cloak of Irawaru (Brougham, 1975, p. 45); (Kohere, 1951, p. 136).

Rohe was a wife of Māui. She was beautiful as he was ugly, and on his wishes to change faces with her, she refused his request. Māui, however, by means of an incantation over Rohe while she was sleeping, swapped their faces. In the morning when Rohe awoke she was distraught. She then committed suicide to live in the spirit world (Tregear, 1891, pp. 233-234 & 421).

After Māui tricked Mahuika (*atua* of fire) into providing all of her fire, Mahuika set fire to the world and the oceans to chase Māui. Māui then transformed himself into a hawk to escape. When that proved of no use, he then asked his *atua* for assistance (Cooper, 2012, p. 234; Edward. Tregear, 1891).

"At a certain time, the thought came to Māui that he would strive to gain eternal life for man, that man might revive from decay as the moon does. He called together his people—the forest elves, the birds, and the multitude of the Mahoihoi—and explained to them his design. They said, "Māui, you will perish. Beware! Your spirit has been taken by Hine-nui-te-Po." But Māui persisted, and so he and his people fared on until they found the dread Goddess of Hades, who was asleep. Said Māui to his folk, "You must be very careful not to laugh while I enter the body of Hine, lest she awaken and slay me. When I have gained [or obtained] her manawa, then all will be well. Do as I say and Hine [or her power to inflict death upon mankind] shall be destroyed." Then Māui essayed to enter the body of Hine by the passage whence man is born into the world. But when he had half entered, the strange sight was too much for Pīwakawaka (the fantail, a bird), who laughed aloud. Hence awoke the dread Goddess of Death, who, by closing her puapua (labia) caused the death of Māui. So perished Māui, the hero, he who performed marvellous deeds, but who succumbed in his effort to gain eternal life for man" (Best, 1976b, pp. 380-381).

This is the reason menstrual blood is *tapu*. Menstruation was seen as a medium of *whakapapa* (genealogy) that connected Māori women to our pantheon of *atua* (Murphy, 2011).

Another story states Māui assumed the form of the rat, but to this Tatahore objected, then that of a reptile, which Tiwaiwaka condemned, then that of a form of a worm, which was approved of by his companions (Best, 1924a, p. 378).

The story of Māui's death is remembered in the following Te Aupōuri pepeha: *Ko Hina kai tangata*. Hina holds the power over night and day and is the cause of death. When she spread her legs wide open, it was light. Then a servant Māui-mua laughed at her and she closed her legs, causing darkness, resulting in light and darkness of the world. Māui-Pōtiki urged that death be of short duration like the night. Hina refused; she wanted death to be long so that those left behind would mourn. This is the reason why we weep the dead (White & Didsbury, 1887, p. II.80).

4.4 Kaitiakitanga of Taonga Species

Before implementing any genetic modification systems and practices that utilise or may impact the environment, there is a need for a Taonga Species to be defined and a need for prior consultation with local *whānau*, *hapū*, *marae* and *lwi*. Up until the late 1980's local councils deemed Watercress (*Nasturtium officinal*) in their freshwater drains as a weed and a pest due to the widespread growth and blocking of drains. Yet, Watercress (*Nasturtium officinal*) is a Taonga Species and traditional food source used extensively in hangi to wrap food and as a vegetable. Watercress is also eaten when the leaves are cooked (Best, 1942). Watercress is also a traditional natural medicine used for headaches (Maanaki Whenua, 2020). I recall in my childhood in Tuahiwi, many families going to harvest watercress for medicine and food to either see it had been poisoned or to have an interaction with a landowner or Police.

Consulting appropriate Māori communities is essential and can sometimes produce mixed reactions and feedback. Confusion with Christian religious theologies and philosophies and a lack of understanding about traditional knowledge could see biosecurity risks to our Taonga Species highlighting again the need to engage and consult with caution with the appropriate people while also considering that much traditional knowledge has been lost of the previous 150 years.

Changing an Entire Species a Documentary a Netflix features a consultation meeting about cultural concerns in regard to if New Zealand should use CRISPR technology as a pest control method to remove Rats (*Rattuss spp*) (Kaufman & Egender, 2019). Rats in New Zealand are estimated to kill over 25 million Taonga Species annually, including: Wētā and other insects, snails, frogs, lizards, tuatara, birds, and bats, as well as the flowers, fruits, and seeds of plants.

The consultation group in the docuseries are introduced as a "Māori Biosecurity Network". In the group are local Māori from the in the Bay of Islands, the Environmental Protection Agency's Māori advisory group Ngā Kaihautū Tikanga Taiao and facilitator Dr James Russell a researcher from Auckland University. One elderly Māori male speaks out against Gene Drives and makes a Eurocentric and Christian religious based statement that contradicts Māori traditional knowledge and tikanga. The Koro, in his opposition against gene drives states "God made an order, and Noah, he did have two rats on that ark. We have no right to try and eradicate one of those species unless we want to pay a severe price." (36:55 time remaining).

4.4.1 Hybrids/GMO/GE involving Taonga Species

Some modification is acceptable between some Taonga Species, but the whakapapa of each needs to be known to avoid conflicts in whakapapa.

Centuries of genealogical and traditional knowledge regarding Taonga Species have been succeeded from generation to generation. Māori share a belief with many other Indigenous Peoples that species and germplasm are all intimately interrelated with each other and to human beings because of their genetic whakapapa.

In traditional Māori social society, there were rules of procreation. The pepeha "Honoa te pito ata ki te pito maoa" translates as "Join the raw end to the cooked end". According to Grey "a rangatira (chief) often married a woman of lesser rank". The saying, apparently, was the proverbial basis for such a union. Colenso suggests it also applies to the "allying of a weak or improvised tribe with one better-off, perhaps through intermarriage" (Brougham, 1975): (Colenso, 1879); (Grey & Solomon, 1857). Non-Human Species are no different, hence knowing and respecting the genealogy and local traditions allows for appropriate genetic modification and hybrid practices to be completed.

There is an incorrect colonial argument perpetuated by New Zealand scientists and the New Zealand government that breeding or genetically modifying a non-Taonga Species/Exotic Species with a Taonga Species will not create another Taonga Species. Successive governments all over the world have applied the same argument to Indigenous Peoples who are descendants of mixed heritages.

While New Zealand legislation does not promote blood quantum with human beings, legislation perpetuates blood quantum doctrine with non-Human Taonga Species. Whakapapa rights with non-human Taonga Species are not recognised. The Plant Varieties Act 1987 does not recognise hybrid species that originated with a Taonga Species as being a Taonga Species. The modified species is referred to as a 'Hybrid'. The Patents Act 2013 also does not state that any biological material from a Taonga Species requires Māori Advisory Committee approval.

With no legislative protection in New Zealand for non-Human Taonga Species, the protection of Taonga Species relies on Māori Data Sovereignty, the United Nations Declaration of Indigenous Rights, and the Kyoto Protocol, yet these are not widely acknowledged or recorded in legislation by the New Zealand government.

Any variation and modification of a Taonga species with another non Taonga/Exotic species will produce another Taonga Species. In the same manner that when a Māori and non-Māori human being procreates with each other, their offspring is still Māori as legally stated in New Zealand legislation. If multiple species are used to modify one or more non Taonga Species the end product is still a Taonga Species. It is important to record where all of the Taonga Species were sourced from for the hybrid so that correct consultation with the kaitiaki can occur.

A Taonga Species has whakapapa to New Zealand and to Māori, whānau, hapū and Iwi regardless of parents and conception. While the same species may be found in other parts of the world, those species are not a taonga as they do not have a whakapapa and mauri from being in and on Papatūānuku.

While a certain Iwi may be the overall Kaitiaki in a western sense, the local hapū or whānau are the manawhenua and in many instances the rightful kaitiaki. Therefore, any species that reside or are taken from an iwi boundary are therefore under the auspices of the kaitiakitanga of the hapū or whānau, manawhenua, land trust or Iwi. Regardless of if Māori still own the land or not, it still contains wāhi tapu (sacred places) and mauri of the whānau, hapū and or iwi and these rights must be acknowledged and respected when using Taonga Species.

Because genetic Māori data has a mauri, whakapapa (geographic origins) the exact geographical location of the species that is to be genetically modified must be identified and recorded, not because of any system requirement or law, but because it is tikanga Māori. The responsibility is on the data collector to record where the genetic data came from, what the data is about, lwi and hapū connections, and kaupapa Māori categories for metadata and to treat the data with respect.

By identifying the exact location will enable researchers and scientists to identify the appropriate marae, whānau, hapū or lwi that must be consulted and engaged with before any further developments are completed. If it is not possible to ascertain the appropriate kaitiaki, marae, whānau, hapū or lwi there are two options. Use the same species, but from a different geographical location, or speak to the closest identifiable marae, whānau, hapū or lwi for further information. This step is essential to identify who to discuss any issues identified with Mead's Tikanga Framework.

An example of the importance of knowing where the Taonga Species originated from is told in a Ngāi Tahu story.

Tūāhuriri stayed with his grandfather Kahukura te Paku in his home in Waimea. Shortly after Tūāhuriri departed, the house he stayed in accidentally burnt down. Soon the land where the building was erected was overgrown with the luxurious wild cabbage. Due to a severe shortage of food that year, the people ate the cabbage out of desperation. All of them died. The cabbage was tapu as it was growing on tapu land where chiefs slept (Stack, 1996, pp. 11-12).

The Ngāi Tahu tribe brought with them the knowledge of Kūmara (Ipomoea batatas) from the North Island. But increasingly they were aware that it was not able to be grown in the colder climate of the South Island. Pūrākau and waiata have evidence that Ngāi Tahu of the Banks Peninsula district modified the environmental conditions with shingle and stones that would heat the earth in order to grow Kūmara (Payne, M. 2020, p. 45). While in today's modern scientific world this may seem to be archaic, it was a revolutionary technology of the day that does reflect Māori were technologists and apt to change to the wellbeing of their people.

4.4.2 WAI 262

WAI 262 was brought to the Waitangi Tribunal in 1991. Part of that claim was for Māori cultural rights to genetic data of plants. Other species were ignored in the claim. WAI 262 was innovative for the time, but technology has rapidly grown in the genetic area over the past decade. WAI262 did not seek genetic ownership and recognition of living and dead: Māori humans, endemic native species and introduced by Māori, species. Instead, it offered a limited scope of what a Taonga Species was, which covered a minimal amount of endemic native species and an obligation for whānau, hapū and lwi to prove that a species is taonga, with no regard to whakapapa and mauri.

With the past 240 years of colonisation and bio prospecting, the tribunal's definition could be used (intentionally or unintentionally) as another colonial tool to assist the removal of traditional knowledge from Māori, a weapon that could be used to say if the knowledge is not in the database, then it does not exist. Schedule 97 of the Ngāi Tahu Claims Settlement Act 1998 is one example of the issue.

We already know that much Māori knowledge has been lost due to successful cultural assimilation lead government initiatives: Assimilation proceeds on the assumption that the integration and assimilation of the minority into the dominant majority culture is always a positive step. "Such a social philosophy is itself based upon further judgement that the dominant culture is superior to the minority culture" (Marsden & Royal, 2003, p. 133). Often minority voices and beliefs are termed by the establishment as radical, eccentric, ignorant, or even criminal to justify their oppressive assimilationist polices. From a Māori perspective, these policies are extremely negative.

The requirement to list Taonga Species resembles a colonial assimilation tool similar to the Native Schools Act 1867 (Didsbury, 1890); Tohunga Suppression Act 1907 (New Zealand Parliament, 1907) and the Hunn Report 1961 recommendations which were publicly released in 1967 (Hunn, 1957).

4.4.3 Dead specimens and de extinction

De-extinction has been acknowledged as a real, scientific proposition that scientists, conservationists and bioethicists are taking seriously enough "to start shifting the frame of questions from 'is this technology possible' to considering its implementation" (Neill, 2013). Museum collections hold millions of biological specimens that have a *whakapapa Māori*. "These specimens' function as a reservoir of genetic material distributed throughout the tree of life and collected worldwide" (Buerki & Baker, 2016). Natural history museum collections represent a vast source of ancient and historical DNA samples from extinct taxa that can be utilized by high-throughput sequencing tools to reveal novel genetic and phylogenetic information about them (Anmarkrud & Lifjeld, 2017). Historical site excavations in New Zealand are in the thousands, yet there are no guidelines for archaeologist or museums about DNA extraction and sequencing.

Scientists are increasingly seeking New Zealand's deceased, extinct and living Taonga Species to take them offshore to extract and sequence the complete genome. Intellectual Property ownership is then claimed with the genetic data which is also often digitised and published on the Internet with no consultation and sharing of resources with kaitiaki. Once DNA has been extracted and the complete genome sequence of the Taonga Species is complete, the genetic data is then often stored overseas with little or no Iwi and Māori co-operation or knowledge. The Department of Conservation guidelines do not currently consider the genomes of dead Taonga Species that are sought by scientists seeking Iwi approval.

The Huia (*Heteralocha acutirostrisa*) has had its complete genome sequenced without Māori or *Iwi* consultation. The Kiwi (*Apteryx sp.*) has had its genome sequenced without any New Zealand research input (Anmarkrud & Lifjeld, 2017). The extinct Taonga Species the South Island Kōkako (*Callaeas cinereus*) has had its complete genome sequenced by the University of Otago and Swedish Museum of Natural History (Dussex et al., 2019). "Researchers examined museum samples collected from both sexes and from a number of locations to understand the population genetic structure of Huia and the nature of their sexual dimorphism. Several nuclear genotyping markers isolated from extant Saddleback Philesturnus spp to amplify ancient DNA from Huia were used. Using rigorous ancient DNA methodologies, the researchers were able to determine the genotypes of a number of individuals unambiguously" (Lambert et al., 2009).

With the advent of world food shortages, scientists have discussed genetically modifying the Taonga Species Moa (*Megalapteryx didinus*; *Anomalopteryx didiformis*; *Pachyornis elephantopus*; *Pachyornis geranoides*; *Pachyornis australis*; *Emeus crassus*; *Emeidae, Euryapteryx*; *Dinornis novaezealandiae* and *Dinornis robustus*) with a chicken to produce bigger chickens (Neill, 2013).
The Tuatara (*Sphenodon punctatus*) has had its complete genome sequenced by a number of local and international researchers (Gemmell et al., 2020). There are a number of cultural issues that were not considered, despite working in partnership with the *kaitiaki* iwi Ngātiwai of where the specific Tuatara was retrieved from. This is likely due to the facts that most *lwi* lack the scientific background knowledge to understand the full impacts of genome sequencing and the potential cultural impacts.

If patents for commercial products and other commercial agreements arise including other research, consideration must be made to who will have rights to royalties. Other considerations that were not recorded was the impact on other *kaitiaki* of Tuatara from other parts of New Zealand and the impact of their cultural and *whakapapa* rights and obligations. "The genomic data of the Tuatara was released into the public domain, extinguishing any Treaty of Waitangi obligations and rights – as well as and Indigenous/Māori data sovereignty. So too, any opportunities that could have benefited from any derived commercial or medical products or services" (Wilcox, 2020).

This research would have benefited from more informed and open engagement with more effective mechanisms to ensure that such rights are maintained – especially for those *iwi* and $hap\bar{u}$ where such species are now locally extinct as a result of colonisation – and that the ostensibly noble cause of advancing knowledge does not continue to be a conduit for Māori dispossession.

Benefits that researchers could consider as a part of partnering with Māori, *whānau*, *hapū* and *lwi* could include education opportunities and mentoring for Māori to enter into genetic research and other sciences and joint ownership of research outcomes including any acknowledgements of individuals and groups who contributed traditional knowledge and access to species (Wilcox, 2020).

4.4.4 Ethical Engagement Model for Gene Drives

The following Ethical Engagement model (based on the original table by Riley Taitingfong (2019) should be followed by researchers when engaging in a genetic modification involving or impacting on any Taonga Species.

Recommendation	Implementation		
Te Tiriti considerations	i. Ensure that the principles of Te Tiriti/Treaty of Waitangi ar		
	at the forefront of any engagement and decision making.		
Centre Māori self-	i. Conduct field trials and open releases of organisms only		
determination	when authorized by the appropriate <i>kaitiaki</i> , <i>marae</i> , <i>whānau</i> ,		
	hapū or iwi.		
Replace the deficit model of	i. Do no conflate unidirectional educational efforts (e.g.,		
engagement with a	science communication) with participatory community		
participatory approach.	engagement. ii. Recognise that consent is not guaranteed outcome of partnership (and pursue collaborative partnerships appropriate kaitiaki, marae, whānau, hapū or iwi regardless. iii. Model participatory practices after other appropriate kaitiaki, marae, whānau, hapū or iwi led research or other		
	published best practices.		
	iv. Share results and learnings with Māori.		
Integrate Māori knowledge	i. Identify culturally specific values ad concepts relevant to		
and values.	gene drives and risk assessment.		
	ii. Draw on culturally specific values and knowledge to		
	codesign making related to gene drive.		

Table 3 Ethical Engagement model

4.5 Indigenising DNA

Indigenising western concepts is to alter concepts so as to make it fit in with the local culture. Pre-colonial Māori knowledge was shared through many different mediums, such as $p\bar{u}r\bar{a}kau$ (stories), *karakia* (prayer), *waiata* (song), and "inscribed into *whakairo* (carvings) and *raranga* (woven patterns), that adorned *waka* (canoe), *wharenui* (meeting houses) and *kākahu* (clothes). *Tā moko* (tattoo) was a method of etching *whakapapa* (genealogy) directly onto the face of the wearer. In doing so, a face etched with tā moko expressed the story of the wearer's life, their *whakapapa*, accomplishments, and triumphs as well as their status within their *hapū*" (Deana Walker, 2019). In the same manner as Māori shared knowledge pre-colonial times and now, this section will identify three Māori concepts to describe genetics and genomics.

4.5.1 Ruatau in Weaving

The interwoven form of the DNA structure is well known today. Double helix is the description of the structure of a DNA molecule. A DNA molecule consists of two strands that wind around each other like a twisted ladder. Each strand has a backbone made of alternating groups of sugar (deoxyribose) and phosphate groups. Attached to each sugar is one of four bases: adenine (A), cytosine (C), guanine (G), or thymine (T). The two strands are held together by bonds between the bases, adenine forming a base pair with thymine, and cytosine forming a base pair with guanine.

WAI 262 Claimant witness Mana Cracknell spoke of *te ruatau*, a dual helix formation, sometimes seen in *kōwhaiwhai* patterns, that represents the interwoven nature of different forms of knowledge (Waitangi Tribunal, 2011b, p. 80). The *ruatau* in weaving is the symbolic symbol of the *atua Ruatau*. In traditional knowledge among some *lwi*, Rehua and Ruatau are two of the twelve *whatukura* or male attendants of the Māori spirit worlds. There were also twelve female attendants called *Māreikura*. The *whatukura* were messengers, while the *Māreikura* greet the dead spirits when they enter the home in the 12th spirit world known as Tikitiki-o-rangi.

Their home is called Te Rauroha. On another occasion they were sent by Io to see which of children of Ranginui and Papatūānuku would be worthy of the three baskets of knowledge. They chose Tane Māhuta the creator of humans and many other species of the forest. Whakamoeariki was the name of the house where dwelt the gods Ruatau, Aitu-pawa, Rehua, and the Pono-aua, called 'The Many of Pono-aua (Best, 1924a, p. 36).

In an ancient karakia highlighting the relationship of *ira atua* and *ira tangata* recited during a person receiving their moko, a reference is made to Ruatau. "From Io knowledge is passed through Ruatau." This descent from Io to Ruatau and finally to Tane-te-waiora describes how knowledge was passed down from the spirit world to the latter, who ultimately passed it on to humans.

Variations of Tane's name which includes Tane-te-waiora indicating "life, prosperity, welfare, sunlight", an appropriate term during the process of tā moko (King, M., 1973, pp. 20-22). DNA represents the relationship between the physical and the spiritual, a connection to all ancestors and atua since the beginning of time as does Ruatau.

Common DNA images are a metaphoric symbol of our human *whakapapa*. Our human chromosomes and genes determine our genetic makeup of individual existence. The molecule is packaged as a double stranded structure that is twisted into a helix. Similarly, the *whiri whenu* resembles a helix shape. They are physical manifestations of esoteric knowledge from our ancient past brought to life by the art forms of raranga and whatu muka, and all of the knowledge contained within these. This symbol is not unlike the process of *miro* (spin or roll together), which combines two strands of harakeke and forms a whiri (Taituha, 2014).

Whenu is a single-pair twining' weaving technique which can be likened to Deoxyribose Nucleic Acid or DNA symbolised by the helix shape, because the living entities; each has an individual whakapapa and are unique because they are individually conceptualized and therefore carry their own story.

4.5.2 Wharenui as a genome

An original WAI 262 claimant Del Wihongi of the Ngā Puhi tribe stated a genome is a representation of a *wharenui* (Wihongi, H., 2019). This section analyses and extrapolates that statement, providing an indigenised account of how a *wharenui* represents a genome.

A *wharenui* has many names, including *tipuna whare*, *whare tipuna*, meeting house, *marae*, etc. In nearly all cases the *wharenui* proper is not only named after an ancestor but is a physical representation of the tribal ancestor it is named after and resembles the human body in structure.

There is a tendency to use the word '*marae*' to mean the total complex of buildings and land. In fact, the *marae* is the open grassed or concrete space immediately in front of the ancestral meeting house. It is correct to use the word *marae* in either context, but the different meanings should be kept in mind (Richardson et al., 1988).

To comprehend the dynamics involved in maintaining a Māori tribal identity within New Zealand, it is important to understand the most central of all Māori institutions is the *marae*. It is a physically bounded three-dimensional space, capable of spiritually joining Papatūānuku (land) with Ranginui (sky) into which *ira tangata* may enter and commune with ira atua (the divine ancestors) (Tapsell, 2002).

The floor of the *wharenui* represents Papatūānuku, while the roof represents her husband, Ranginui. Tāne Māhuta, who separated the two, is metaphorically represented by the building as the poles that separate the roof and floor. The same representation of a DNA molecule. The two sides of the Phosphate backbone represent Ranginui and Papatūānuku, while the ATCG is a representation of Tāne Māhuta and the separation. The sacred courtyard in front of a meeting house is *Te Maraenui-atea-o-Tūmatauenga* - the *marae ātea* is the domain of Tūmatauenga the Atua of war.

Before entering the *wharenui*, guests enter into an encounter situation, where challenges are met, and issues are debated on the *marae ātea*. Speeches and discussions that take place on the *marae ātea* are allowed to be forceful, representing the nature of Tūmatauenga.

The *wharenui* is the domain of Rongo, the Atua of peace. Speeches that take place within the wharenui are expected to be more conciliatory. The *marae atea* is the place where issues about genomic research and data storage, debates and the intentions of the researcher should occur. This allows for full and frank discussions as part of the Full, Prior and Informed Consent process.



Figure 34 DNA Strand. Source <u>https://www.pngitem.com/</u>

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The associated *wharenui* and other prominently named buildings and structures of the *marae* further reinforce both individual and kin group identity in relation to outsiders by physically representing ancestors to which all members of the marae community genealogically trace their origins.

Consequently, the *marae* can be interpreted as a dynamic, Māori-ordered, metaphysical space, embracing the fundamental kin-based values of *whakapapa* (genealogical ordering of the universe according to *mana* descent and *whanaungatanga* kinship) and *tikanga* (the lore of the ancestors maintained by senior elders), where rights of access, especially in times of ritual, continue to be proscribed or prescribed solely by kin leaders. The marae is a living genealogical connection. The very essence of Māori genealogical identity to both the individual, *whānau*, *hapū*, *iwi*, present past and in the future. A DNA is interpreted the same way as explored within this research.

While turangawaewae is used to refer to the people who belong to a place, or the host people, it is also used to refer to the *marae*, a locale with deeply embedded identity. "The *marae* is the succession of things Māori from generation to generation" (Awatere & Dewes, 1969, p. 1). *Turangawaewae* applies to a shared or collective *hapū* or tribal identity and of belonging within a recognised geographic region (Rewi, 2010, pp. 38-39). "*Turangawaewae* is the identity base of its people" (Tauroa, 1989, p. 11).

DNA is a biological form of a *turangawaewae* that is embedded within all Taonga Species. It is the identity of a place that is from generation to generation discretely succeeded into descendants. A donor who provides the sample is also referred to as the turangawaewae.

The tekoteko (carved figure) at the apex of the barge boards represents a renowned ancestor and represents the head. DNA is a biological material representing a shared identity from a *whānau, hapū* and *Iwi* tracing back to the original *tipuna*.

The *maihi* or *mahua* (front barge boards) angled down towards the ground represents the arms held out in welcome to visitors. The *amo* are short boards at the front of the *wharenui* representing legs, while the *tāhuhu* (ridge pole), a large beam running down the length of the roof, represents the spine.

The *heke* (rafters), reaching from the *tāhuhu* to the *poupou* (carved figures) around the walls, represent the ribs. Phosphate backbone is the DNA representation of the *maihi*.

Inside, the horizontal ridge pole that runs through the centre of the building is seen as the backbone and the rafters are sometimes painted with $k\bar{o}whaiwhai$ reaching down from the central ridge to the carved figures around the walls (*poupou*) representing the ribs.

The carved *poupou* represent an ancestor or relationships the people of the whare have with other people whilst sheltered inside the body of their tipuna (See 19 in Figure 9).

Some people choose to rub noses with the *pou*, the same way that warriors rub noses with their *taiaha* (weapon) or a *waka* (canoe) as it is like greeting an ancestor and reiterates that idea that there is this living presence in every object, their *mauri*.

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Connecting each carved *poupou* (top and bottom) is the *papaka*, a narrow panel usually decorated with *kōwhaiwhai* (See 23 in Figure 9). Significantly this represents the *mauri* (life force) and it goes right around the house (Richardson et al., 1988). Art in meeting houses always relate to particular ancestors and their stories (Mead, 1997, p. 163). A survey of a hundred years of tribal carvings, revealed a sophisticated intergenerational negotiation of internal and external cultural knowledge (Ellis & Robertson, 2016).

The *Pou* or carved poles represent the Base Pair: guanine, cytosine, adenine, and thymine. The *Pakitara* or side walls represent the Sugar phosphate backbone.

On the *wharenui*, we put up photographs of the ancestor who has passed on. The back wall in particular called a *Tuarongo*, but often all of the walls have photos of the deceased. We know photos are not the person, but they can become the person. It is the memory of that person being kept alive. A part of their *mauri* becomes a part of the back wall.

As our DNA is passed from generation to generation, so too is a part of the mauri of the deceased. It serves to remind us of we are and where we come from. The inheritance of DNA from generations to generations is symbolic of the wall of a *marae*.



Figure 35 Wharenui sourced from http://education-resources.co.nz/whare-nui.html



Figure 36 Whare. Source Te Ara The Encyclopedia of New Zealand





All of the physical attributes of a wharenui encapsulate the general attributes of a genome.

4.5.3 Māori DNA as whenua

All Indigenous Peoples around the world have emotional, spiritual, genealogical, and lived experiences to their lands and natural resources that co-exist with the land. All Indigenous Peoples have had their lands and natural resources confiscated by settler colonial military and governments resulting in their inalienable rights to the natural resources being abolished.

Indigenous biological materials/Māori genetic data is no different. The unique stage of this colonial evolution that Māori are presently at, is still in the early stages of significant exploitation and abuse of their genetic data, compared to other Indigenous Peoples such as the First Nations and Native Americans who due to their unique DNA markers, are being exploited by commercial research and scientists.

Unlike Māori DNA at this stage, "the blood of Indigenous Peoples, understood as storehouses of unique genetic diversity due to their presumed long physical and cultural isolation, is highly sought after, and to be collected quickly" (TallBear, K. 2013). Many Māori *whānau, hapū* and *lwi* have been producing biracial children with colonial settlers for centuries. In a similar manner, native forests that once attracted other Taonga Species such as birds, insects, fungi etc., were quickly replaced much of New Zealand's native forests, and in turn the indigenous eco systems which caused the extinction of many Taonga Species and Māori knowledge of them.

Ngāi Tahu had its first contact with Pākehā sealers and whalers from around 1795 (57 generations). By the 1830s Ngāi Tahu had built up a thriving industry supplying whaling ships with provisions such as pigs, potatoes, wheat and many Ngāi Tahu women married whalers. This may account for one reason a significant Māori bio maker has yet to be found. Once a Māori bio marker is found, it is probable that commercial exploitation of Māori DNA will occur as it has with other Indigenous Peoples. The exploitation will likely be justified by the government as a means to address health equities, in the same manner that confiscated land was justified to socially, and economically, serve the nation as an agricultural country with land that was not apparently of any value or owned by anyone.

The colonisation and interbreeding did not occur with all tribes at the same scale, the same way as the development of Māori land did not occur everywhere in the country, despite being confiscated. This creates future issues and potential for exploitation of specific tribes such as Tūhoe who were least likely to have been colonised and interbred with the colonizer. There is a hypothetical possibility that these Māori tribes who were least likely to have interbred with Pākehā may have a unique bio marker. Land that was not colonised, has many Taonga Species including rare and near extinct species that also include many other species that are still being re identified.

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Māori are in the pre-1830's DNA ownership stage of our physical New Zealand history. Before the Māori land wars, Māori had deep emotional, *whakapapa* ties to the land and the environment and nurtured it in communal ownership to keep it in perpetual safety. In traditional Māori society, land and natural resources are held collectively by families and tribes for the next generation to avoid loss of land. It is acknowledged that the people are merely the *kaitiaki* of the land, unlike the commercial exploitation, disregard of cultural values and the destruction of land and natural resources by the colonisers. Present day researchers act in the same way, they assume ownership of samples and Māori genetic data.

The "right to gift access to one's own body or bodily specimens on the individual is a notion that is rooted in Western bioethics but is culturally incongruent with Indigenous group or communitarian ethics" (Tsosie, Yracheta, Kolopenuk, & Geary, 2021). Māori genetic data that is provided to researchers must follow the same principles as land using intergenerational stewardship (kaitiaki). "Indigenous-derived samples and data accepted for research should be considered the continued property of the donor/community involved; hence DNA is considered "on loan" (Arbour & Cook, 2006) to the researcher as opposed to being a gift (Tsosie et al., 2021). By only loaning biological samples to researchers, as Māori do with land when they lease or rent land, then the potential to participate in the genetic economy is greater, but the risk of having their identities misrecognized, commodified, and sold as ancestry tests will still exist (Fox, K., 2020).

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Māori DNA Evolution of bio piracy and Sovereignty.

Phase	Historical moment in NZ	Task
	history	
Phase 1	The Colonial settler period to	Prove DNA is a Taonga and
	the Māori Land wars and	seek Tikanga Sovereignty
	land confiscations of the	(this research).
	1860's.	
Phase 2	1860's when Māori had to	Rely heavily on International
	identify their whakapapa to	Indigenous Peoples
	the Crown and prove title to	experiences with bio
	their own native lands.	commercialisation of gene
		research. Comparing and
		proving colonisation,
		imperialism, bio
		prospecting, bio colonialism,
		bio commercialisation of
		Taonga
Phase 3	1975 when the Waitangi	Taking breaches of Te Tiriti
	Tribunal Act was introduced.	with Māori genetic data to
		the Tribunal and seek
	Modern era of Waitangi	redress.
	Tribunal claims and	
	repatriations.	

Table 4 Māori DNA Evolution of bio piracy and Sovereignty

Many Indigenous Peoples have already lost much of their sovereignty with genetic data and research outcomes with commercial, ownership exploitation and bio prospecting. This is Phase 1 of the Māori DNA Evolution.

Māori have a small window of opportunity in phase 1 to prove traditional value of their genetic data and prove that it is a taonga as Māori do with land. This research has already highlighted that for Taonga Species that it may be too late for many, but there is still myriad of Taonga Species that have not been bio pirated to date despite it currently being an academic normal practice to sequence and share the genome in online repositories.

The Second stage for Māori is to prove their identity and indigeneity as occurred in the Māori Land Courts. If Māori are unfortunate to get to stage 2 of this evolution, then Māori will need to rely heavily on the international community of Indigenous arguments.

Unlike other Indigenous Peoples, Māori have the binding treaty obligation of the Crown to the right of protection of *Taonga* with Te Tiriti. Before stage 3 is considered, wider understanding of traditional *tikanga* and traditional knowledge and an acceptance of a definition of Taonga Species is required.

4.6 Tikanga With Testing, Storage and Disposal

There are cultural, ethical, and spiritual implications of working with Māori genetic data from any Taonga Species. This thesis has already ascertained, DNA from a Taonga Species is *tapu* and contains *whakapapa* from the physical, cognitive, and spiritual realms. The place of extraction, analysis and research must therefore be made clear of all spiritual obstructions (*noa*).

Article II Te Tiriti o Waitangi/The Treaty of Waitangi gives Māori the right to "tino rangatiratanga over their own taonga. In relation to the disposal of a taonga biological materials this is the right to practice traditional cultural practices that were practices when disposing of a body or a body part including body fluids such as blood and other materials from accidents and warfare.

To make the laboratory or place of extraction, testing or sequencing *noa* is the same practices as if you have a physical *taonga*, or a *tūpāpaku* (dead body) in any physical place in the laboratory. The physical area should be made off limits to all food and beverages, this includes in the pockets of people and in any containers such as bags and lunch boxes. Cell phones and computers should be away from the area and if possible, all Wi-Fi and Bluetooth should be switched off.

The people working with the Māori genetic data from a Taonga Species should not be ill or have any terminal illness. For women, some caution should be considered it they are pregnant or menstruating. The people should all be fully versed in their own *whakapapa*.

Fresh running water for the specific purpose of making *noa* the physical location and the researcher should be available. If this is not possible, a container with fresh water should be available for the exclusive purpose of removing *tapu*. To be effective, the water must be flowing, so an area where the water can be flicked onto and around the person and the physical environment. Any left-over water should be directly placed back in Papatūānuku.

Step 1 Karakia

A *karakia* is required to be recited at the start of any work with DNA from a Taonga Species. The *karakia* should acknowledge the relevant *tipuna* and *atua* of the Taonga Species. At this stage if it has not already occurred, the water should be used in this step.

Step 2 – Extraction of sample

As the genetic data is being extracted, a small and short *poroporoaki*, even of just a few words should be recited for the non-human species, or if a human, then the donor should be given the opportunity to recite a short *poroporoaki*.

Step 3. Powhiri/Whakatau

Once the sample has been extracted, it has left its *turangawaewae* and is now in a new environment. A small *karanga* to acknowledge the new environment is appropriate.

Step 4: Closing Karakia

Once the DNA has been extracted and put into storage, a *karakia* to thank the *atua* for the taonga is appropriate.

Step 5 – Disposal

Any left-over biological matter whether fluid, in a tissue, swab, gel, syringe, glove or other consumable, should be offered to the donor, or disposed of in a culturally appropriate manner that may involve a religious person or *a kaumatua/whānau/hapū* or other culturally competent person.

New Zealand health facilities have guidelines in place for disposal of human remains and organs. Māori genetic data on foreign materials is no different. If equipment needs to be sterilised, then where possible, the water that was set aside for *karakia* and to make *noa*, could be used to initially rinse the equipment over Papatūānuku.

4.6.1 Storage and disposal

Indigenising a perspective of a gene bank is to consider it as a *waka huia*. *Waka huia* were used to store valuables and treasures (Phillipps, G., 1963). Because of the sacred contents of the *waka huia*, the container was treated as a *tapu* object. A gene bank and its software and database(s) and the physical server and computers also should be treated as *tapu* and considered as a *waka huia*.

Māori genetic materials need to be stored and handled as they are a complete *tūpāpaku* or *koiwi* (corpse). Māori genetic data should be stored in a *wāhi tapu* (sacred place with secure and limited access). A separate bio bank for Taonga samples is most appropriate and a system that catalogues the donor's *iwi* and *hapū*.

Access to the Māori genetic data held in the *wāhi tapu* database and biobank should be restricted and provided only in consultation with a Māori Advisory Committee, *kaumātua* or other Māori authority acting upon the advice of the *whānau*, *hapū* or *Iwi*.

The Māori genetic data should be handled, stored and transported with appropriate traditional Māori customs including separate and clearly labelled packing that highlights the contents as sensitive items (Otago Museum Trust Board, 2014, p. 11).

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Care and consideration for an appropriate label is required and it is not acceptable to merely find an image off the Internet to use. An appropriate sticker should be a colour sticker that is easily identifiable to the lab clinician/researcher. The colour could be blue representing the epistemology of blood from the Māori creator of blood Tangaroa, or red/brown which also represents the origins of blood as the Papatūānuku who provided Tāne with red ochre to mix with his body fluids to create blood for human beings. If there is a desire to use an image, then the most appropriate image is of a *Kawakawa* leaf (Macropiper excelsum) which is used to protect the living from the dead and the dead from bad luck etc.

4.6.2 Research Involving Māori Guidelines for Disposal or Retention of Samples and Specimens

Any organisation with Māori genetic data should have appropriate plans to cooperate with *whānau*, *hapū*, *iwi* or *kaitiaki* for the repatriation of Māori genetic data in its care, under the guidance of a Māori Advisory Committee, *kaumātua* or other Māori authority acting upon the advice of the *whānau*, *hapū*, *Iwi* or *kaitiaki*.

Te Whare Tapa Whā kaupapa Māori Framework should be applied to all extracted data including the source material to ensure the specimen of the DNA is respected and protected (Durie, 1984).

As Data has a *mauri*, consideration must be taken when storing data and genetic material of the living and the dead. The Māori genetic data of the living and the dead should be separated. Consideration of the genealogical narratives of the species Māori genetic data is also important. Storing Māori genetic data of *Kūmara* with Fern samples is not appropriate (Henare, Holbraad, & Wastell, 2007).

4.6.3 Key Questions with digitised DNA

The following are a number of key questions that should be considered and documented prior to digitising DNA from a Taonga Species. These questions should then be discussed with the donor or the *kaitiaki* as a part of a full informed process that recognises the Te Tiriti/Treaty of Waitangi obligations and the *mana* and *rangatiratanga* of the donor or *kaitiaki*.

- What is the origin of the DNA?
- How was the issue of multiple *iwi* affiliations addressed?
- In which country will the data be stored?
- Where is the storage solutions provider headquartered?
- Does the transmission of data go through countries outside of New Zealand?
- Do you sell data to third parties?
- Do you sell data as personal identifiable data?
- Do you sell data as patterns on an aggregated level?
- Do you use third-party cookies? Does this include SoMe (social media) cookies and SoMe logins?
- If you use third-party cookies, are your users fully aware that your cookie uses leads to sharing of data about your users with third parties and do they agree with it?
- Do you require and control the data ethics of your subcontractors and partners?
- Purpose of the data storage?
- Access and licence types?
- What testing and preventative measures are in place to monitor a Te Tiriti obligation?
- What are all of the foreseeable risks of the system and its data?
- Benefits of the system and or data to Māori, iwi, hapū, whānau and individuals?

4.7 Māori Customary Rights Framework for Māori Genetic Data Ownership.

There are two different *kaupapa Māori* frameworks required for Taonga Species. One for a human being Taonga Species and one for non-Human Taonga Species. This allows for the genealogical difference between the spiritual realm of Ranginui, Papatūānuku and the Māori spirit world s, and the physical realms of the marae for human beings, and the fact that many iwi recognise a primary deity Tāne and his daughter Hine Ahuone, as the creator of human beings. Whereas non-human Taonga Species have departmental or tutelary deities and a myriad of secondary departmental or tutelary deities.

Usually, *whakapapa* is hierarchical. DNA is a combination of a multiple generations and their environmental impacts. Therefore, the two frameworks proposed in this research use a Nondirectional Cycle. This allows the representation of a continuing sequence of stages to show customary Māori genealogy and ownership in a circular flow. It also allows representation of Māori customary ownership rights that are communal as opposed to individual rights. Each genealogical entity has the same level of importance in regard to genetic data.

The following two frameworks are generic to many lwi. Some lwi have slight variances with the genealogical entities which must be considered and acknowledged by researchers.

4.7.1 Māori Genetic Data Customary Ownership of the Ira Tangata Framework



Figure 38 Māori Genetic Data Ira Tangata Framework. Source: K. Taiuru 2020

The blue lines which form a circle in the nondirectional cycle represents *wairua, mauri* and *mātauranga* that is inherited from each genealogical entity to the next forming DNA. This is the overall basis of *whakapapa*.

Io the Supreme Being, or the Māori spirit world created natural entities in *Te Ao Māori* including Ranginui and Papatūānuku who are the parents of the departmental or tutelary deities. Rangi and Papa bore Tāne, the creator of the first human Hine Ahuone.

Hine Ahuone committed suicide upon finding out who her lover was also her father, so she became Hine-nui-i-te-pō which is also represented in the same box as Hine Ahuone. This represents both the living and the dead.

Tiki the first son of Tane and Hine Ahuone, is a shared *atua* to all human beings. Tiki is the deity of reproduction of human beings. An *atua* may be another Taonga Species or a natural phenomenon. *Atua* are intergenerational and exist in *Te Ao Māori*.

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Every Māori individual person descends from an ancestor who has at least one marae. Each marae has at least one *Iwi* that is comprised of multiple *hapū* which is made up from multiple *whānau* who are made up from multiple individuals.

All of these genealogical entities, in the same manner as a *wharenui* represents a genome. Unlike a physical *taonga* such as land, water, jewellery, etc., which can be taken away from its origin; *whakapapa* and *mauri* cannot be taken away from the DNA. It continues to grow and is inherited to the next generation.

4.7.2 Māori Genetic Data Customary Ownership of non-Human Taonga Species Framework



Figure 39 Māori Genetic Data Taonga Species Framework. Source: K. Taiuru 2020

Whānau, hapū, Iwi and individual Māori have a spiritual, historical, genealogical, and an emotional bond and relationship with the natural environment including to land and water. A species that grows in or on the land or water in an iwi district contains a part of the mauri from that iwi.

A customary Māori perspective of the land and natural resources such as rivers, mountains, ocean etc., within an *iwi* boundary is that it is a part of the person, *hapū*, *whānau* and *Iwi* that reside on that land. The bond is seen in the following *pēpeha*; *Ko Papatūānuku*, *Ko Ranginui ngā mātua o te tangata*: We are all descendants of Ranginui and Papatūānuku; "*Ko au to awa*, *Te Awa ko au*: I am the river, the river is me" (Waitangi Tribunal, 2015, p. 3); "*Ko au to moana, ko te moana au*: I am the ocean, the ocean is me" (Matthews, 2018).

The blue lines which form a circle in the nondirectional cycle represents *wairua, mauri* and *mātauranga* that is inherited from each genealogical entity or species to the next forming a DNA.

Io the Supreme Being or the Māori spirit world created everything in Te Ao Māori including Ranginui the father of the sky and Papatūānuku earth mother.

Rangi and Papa are the parents of the departmental or tutelary deities. Of their more than 70 children, were the primary departmental or tutelary deities of all Taonga Species.

Each of the four primary departmental or tutelary deities of non-human Taonga Species had their own children who became deities of all of the Taonga Species.

Māori ancestors identified a number of Taonga Species in their Pacific homeland to bring with them on their voyaging waka to New Zealand. These Taonga Species include: Aute (*Broussonetia papyrifera*), Hue (*Lagenaria siceraria*), Karaka (*Corynocarpus laevigatus*), Kiore (*Rattus exulans*), Kōpī (*Corynocarpus laevigata*), Kuri (*Canis lupus familiaris*), Kuru (*Artocarpus incisa*), Paratawhiti (*Maritta fraxinea*), Perei (*Gastrodia Cunninghammi*) and (*Orthoceras strictuum*), Pukeko/Pakura (*Porphyrio melanotus*), Kakariki (*Cyanoramphus novaezelandiae*), Kūmara (*Ipomoea batatas*), Taro (*Colocasia esulenta*), Tī pore (*Cordyline fruticose*) and Whikaho (*Dioscorea sp*) (Buck, 1949).

Many Taonga Species are associated with other atua and or human tīpuna. An example from the following pēpeha is one example. Ngā mahi a Paikea whaka-Tangaroa; The deeds of Paikea, who took on himself the power of Tangaroa. The refers to Paikea having come to Aotearoa on a whale (Humpback whale, *Megaptera novaeangliae*) rather than in a canoe (White & Didsbury, 1887, p. III.15).

Many Taonga Species have a direct genealogical link to an iwi or are a kaitiaki to an Iwi or a hapū. In some instances, the Taonga Species is an atua to a specific whānau. Mōteatea, pēpeha, pūrākau and waiata often express Taonga Species qualities, comparisons, and behaviours and lessons for human beings.

As with a human DNA, all of these genealogical entities, in the same manner as a wharenui represents a genome.

4.8 Maramataka

The most important functions of the Māori lunar calendar (*Maramataka*) are to regulate planting, harvesting, fishing, hunting, and planning for the community. "The *Maramataka* is the basis of the cultural life of the community, acting as an indicator of appropriate times for the onset or cessation of various activities. Much like whakapapa, the maramataka is deeply interwoven with *atua*, stars, weather, land, ocean and living species" (Matamua, 2017).

The names and meanings of the moon nights have ecological knowledge encoded in them, which described the influence of the moon cycle on fishing and planting activities (Ropiha, 2010). One night of the moon is referred to as a division of time and includes the whole 24 hour period (Tāwhai, 2013, p. 13). Various phases of the moon will impact on various Taonga Species and their spiritual and emotional wellbeing.

Each *Iwi* have their own subtle different names and times of the *maramataka*, so it will be dependent on the *iwi* affiliations of the person providing a gene sample or where the geographical location of the *Taonga* Species was sourced. There are more than 43 published and unpublished *maramataka* from a number of iwi and a preliminary analysis of the meaning of the moon nights (Roberts et al., 2006).

Consideration of relevant *atua* of both human and Taonga Species is required. If the person providing the genetic sample has a *whakapapa* to stars in the sky of the period, then the *tipuna* should be acknowledged. Taonga species *atua* in relation to the *maramataka* is also important.

Within the *maramataka* are three different periods when the human body experiences different levels of energy of High Energy, Medium Energy and Low Energy. The higher the energy the healthier the physical, mental, and spiritual sides of the human body are. During these high energy days, are when human beings should have any gene extraction, editing and sequencing should occur. On the low energy phases, disposal of un-needed samples should occur. This will ensure that the Physical, Mental and Spiritual impacts will be reduced.

There are three different periods when Tangaroa, Haumia, Rongo, Rehua and Tāne Māhuta's children are plentiful to scarce. Gene extraction, analysis and sequencing should be done in the plentiful days. On the low energy phases, disposal of un-needed samples should occur. These practices will ensure the respect the *mauri* and *wairua* of the species.

Consideration of the maramataka and iwi affiliations are vital to ensure that the *mauri* and *wairua* of the person is respected. If there is a low or a medium energy day, taking the sample or analysing the sample should be differed till a high energy day.

Within Ngāi Tahu, *mahinga kai* have their own *maramataka* and knowledge in different areas. This, in the same manner as with the human being *maramataka* should be considered. On days, that *mahinga kai* species are prolific and are good times to harvest, then these periods of time are the periods that taking a sample and analysing should be done. For other non *mahinga kai* Taonga Species, knowledge of when the species flowers, shed skin, hibernate and their epistemological knowledge should be considered as to when the best period of time is to extract and analyse the biological samples.

4.9 Summary

Western scientific research states that all species share varying amounts of DNA with humans, and that humans originate from a few common ancestors. Traditional Māori knowledge verifies this western scientific research. Māori society has relied on intergenerational knowledge that explains the interconnectedness of all-natural things in the world. Knowledge of the sacredness, and the need to protect genetic and genomic data of Taonga Species exists in Māori epistemologies, but has largely been lost or confined to a select few, due to decades of colonisation and government lead cultural assimilation programmes.

The *mātauranga Māori* that is still in existence today clearly states that as human beings, our older siblings are the other species that were created by the children of Ranginui and Papatūānuku and brought to earth by ancestors. Despite this, Māori academics in recent years have made a differentiation of human and non-human Taonga Species (Hudson, Beaton, et al., 2016a, 2016b; Hudson et al., 2010; Hudson et al., 2018); (Collier-Robinson et al., 2019). This distorted belief system has resulted in the normalisation of our biological *taonga* being taken overseas with no Māori, *whānau*, *hapū* or *Iwi* consultation, in a manner similar to the collection and theft of artefacts and *mokomokai* (steamed heads) from the early settlers. These actions will likely result in a future time that once Taonga Species have been identified, the next step for Māori will be how to repatriate Taonga Species DNA and remove digital repositories from public access.

Each part of the Human body including organs and fluids are tapu to Māori and closely protected as is *whakapapa*. Each organ and body fluid had its own genealogical link to an *Atua* who was a descendant of Io the creator. Blood and body fluids have always been regarded as *tapu* to Iwi Māori. As DNA is a biological form of *whakapapa* and a *taonga*, it needs to be treated as such.

In a western world, a dead species has no rights. Yet in *Te Ao Māori*, a dead species or any part of the species has a spiritual connection with genealogical connections back to the Māori and *atua*. DNA is a living taonga. Each part of a species traditionally had *karakia* recited to the relevant *atua* to seek protection and good fortune. The *maramataka* was closely used for fishing and harvesting and to monitor peoples mental and spiritual wellbeing. The *maramataka* must also be used to monitor when to extra DNA and to sequence and perform tests on it to ensure the donors physical, spiritual, mental, and spiritual well-being is protected.

Earlier this century Māori and *Iwi* from all around the country were consulted by both government and academia regarding Gene Modification. A clear set of *tikanga* principles were formed. Analysing the customary meaning of these primary *tikanga* for DNA research provides a clear set of *tikanga* principles that should be applied to genetic and genomic research and practices.

CHAPTER FOUR: DNA RELATED TIKANGA

The WAI 262 Claim was lodged by a number of learned *kaumātua* who have now passed on, along with their mātauranga. This thesis has identified some of that mātauranga and the unique Māori view of the world that many kaumātua of the past were once knowledgeable in. In particular, past kaumātua saw a genome as a whare nui and as an atua of knowledge who is represented with the same helix symbol as a genome.

There is a need to treat a DNA as a living taonga that is or was Turangawaewae inside a body of a Taonga Species, and that is or will be in a new environment as a manuhiri once it is extracted. Consideration of widely accepted customs and protocols for dealing with taonga and whakapapa including the repatriation of mokomokai need to be used when extracting biological samples for gene usage.

By recognising and understanding the tikanga of DNA research and testing, culturally appropriate safety measures can be put in place protecting the atua, tipuna, the Taonga Species and their future generations from spiritual, cognitive, and physical harm. We are accustomed to such practises when workplaces pōwhiri for new staff members, or when we visit a mare. The same respect needs to be applied to DNA extraction, research, and storage.

It is crucial that anyone who works with Taonga Species DNA understands their own whakapapa and the species intimate connections and relationships of whom they work with, in order to better protect Māori knowledge and the species.

CHAPTER FIVE: DNA AND ITS OUTPUT DATA IS A TAONGA



Figure 40 Chapter Six

5.1 Introduction

Genetic materials including genomes are biological repositories of *whakapapa* that are data and that need to be considered as a *taonga*. "While Indigenous Peoples have long claimed sovereign status over their lands and territories, debates about 'data sovereignty' have been dominated by national governments and multinational corporations focused on issues of legal jurisdiction. Missing from those conversations have been the inherent and inalienable rights and interests of Indigenous Peoples relating to the collection, ownership and application of data about their people, lifeways and territories" (Taylor & Kukutai, 2016).

The four chemicals: Adenine, Guanine, Cytosine, and Thymine, that make up the genetic code in DNA can be shortened to A G C and T. The letters in the DNA alphabet pair up because of their chemical structure. The pairing is precise: A pairs with T, C pairs with G. Once these letters are put together to get a piece of genetic code is created that looks something like this for DNA: AGCTGATCGATGTGCTGATCGATGCTGATG.

In the following example is a partial Genome alphabet representation of the extinct Taonga Species Huia (Heteralocha acutirostris) ATAAACCCAAGTGATCCTACCT (Lambert et al., 2009). Every object and living thing in *te Ao Māori*, whether inanimate or animate has a *mauri* (life force) that can only be removed by a *karakia* to a deity (Benton et al., 2013, pp. 239-254). Despite the fact the code consists of sequence of four different letters, this is still a representation of the *Huia*, therefore all genomic data in alphabetic code still contains the *mauri* of the species it was taken from. In the same popular belief that a carving, image, or other representation of a *tipuna* still contains the *mauri* of the person that is being represented.

The thoughts and mental visions of *tipuna* and their experiences can be inherited. Recent research has shown that trauma can also be inherited from parents to children including nightmares (Youssef et al., 2018). These dreams and visions are a *taonga* that are inherited intergenerationally. In Māori culture, it is believed that a person's *wairua* leaves the body and the dreams the person has, are from the *wairua* that is still on the earth. (Tregear, 1904, p. 209); (Best, 1900, p. 175).

Such inherited dreams and experiences fall within the domain of a number of *atua*: Rua-te-Pukepuke - *Atua* of knowledge, thoughts and deep thoughts: Progeny of Tangaroa (Ngata & Jones, 2006, p. 49); Rua-te-mahara - *Atua* of knowledge, thoughts and deep thoughts: Progeny of Tangaroa (Ngata & Jones, 2006, p. 49); Rua-te-hotahota - *Atua* of knowledge, thoughts and deep thoughts: Progeny of Tangaroa (Ngata & Jones, 2006, p. 49); Rua-te-hotahota - *Atua* of knowledge, thoughts and deep thoughts: Progeny of Tangaroa (Ngata & Jones, 2006, p. 49); Rua-te-hotahota - *Atua* of knowledge, thoughts and deep thoughts: Progeny of Tangaroa (Ngata & Jones, 2006, p. 49); Rua-te-hotahota - *Atua* of knowledge, thoughts and deep thoughts: Progeny of Tangaroa (Ngata & Jones, 2006, p. 49); Rauru, *atua* of the hair of the head (Salmond, 2017, p. 256); Tonga-meha, *atua* of the eyes (Salmond, 2017, p. 256).

Some *iwi* may also state that all fear and instinct come from the stomach, therefore also the *atua* Tutangata-kino, *atua* of the stomach should be considered (Salmond, 2017, p. 256).

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In certain parts of the world in which social systems are highly centralized, environmental information that might have influenced families can be obtained. For example, "Swedish scientists recently conducted investigations examining whether nutrition affected the death rate associated with cardiovascular disease and diabetes and whether these effects were passed from parents to their children and grandchildren" (Kaati et al., 2002). "These researchers found that if a father did not have enough food available to him during a critical period in his development just before puberty, his sons were less likely to die from cardiovascular disease" (Simmons, 2008). Thus, the Taonga Species which formed a daily staple of our *tipuna*, and its *mauri* can be intergenerationally inherited. Traces of inherited weaknesses would have been treated as tapu and as a *taonga* to avoid attacks, both physically and spiritually.

5.2 Definitions of Taonga

There are a numerous legal and other definitions of Taonga, including:

- The term taonga defies any exhaustive definition, and in summing up the findings of a number of Tribunal reports the Tribunal "Though the term has a number of other more mundane meanings, successive carefully reasoned reports of the Tribunal over many years now have come to treat 'taonga', as used in the Treaty, as a tangible or intangible item or matter of special cultural significance" (Waitangi Tribunal, 2003b).
- 2. The courts have also acknowledged that the status of taonga applies to the tangible and intangible, accepting both language and familial organisation as examples of intangible taonga. See in respect of language see New Zealand Māori Council v Attorney-General HC Wellington CP942/88, 3 May 1991; New Zealand Māori Council v Attorney-General [1987] 1 NZLR 641 (CA) and [1994] 1 NZLR 513 (PC); in respect of familial organisation see Barton-Prescott v Director-General of Social Welfare [1997] 3 NZLR 179 at 184.
- 3. Lord Woolf of the Privy Council followed the approach of the Court of Appeal as well as the Tribunal in the final Broadcasting Assets decision stating "The Māori language (Te Reo Māori) is in a state of serious decline. It is an official language of New Zealand, recognised as such by the Māori Language Act 1987. It is "a highly prized property or treasure (taonga) of Māori" (Cooke P [1992] 2 NZLR 576, at p 578 in the Court of Appeal) and it is also part of the national cultural heritage of New Zealand" New Zealand Māori Council v Attorney General [1994] 1 NZLR 513 (PC) at 513.
- 4. New Zealand courts have also discussed the notion that taonga may not necessarily be held by Māori, made by Māori, or hold any Māori content or association. See Jacinta Ruru's discussion of the cases of Page v Page (2002) 21 FRNZ 275 and Perry v West HC Auckland CIV-2002-404-002114, 15 December 2003 in Jacinta Ruru "Taonga and Family Chattels" [2004] NZLJ 297.
- "A socially or culturally valuable object, resource or technique, phenomenon, or idea. Taonga generally denotes tangible, and intangible valuables (such as values, traditions, and customs) handed down from antiquity" (Benton et al., 2013, p. 396; N. Williams, Carroll-Lind, & Smith, 2015).
- 6. Refers to a "wide range of valuable possessions and attributes, concrete and abstract" (Biggs, 1989).

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One of the definitions of a *taonga* used by the Waitangi Tribunal states that any *taonga* is protected under the guarantees in article 2 of the Māori text of the Treaty of Waitangi which states "The Queen of England agrees to protect the chiefs, the subtribes and all the people of New Zealand in the unqualified exercise of their chieftainship over their lands, villages and all their treasures. But on the other hand, the Chiefs of the Confederation and all the Chiefs will sell land to the Queen at a price agreed to by the person owning it and by the person buying it (the latter being) appointed by the Queen as her purchase agent".

It is important to note that some claims to the Waitangi tribunal regarding *taonga* have been unsuccessful. To date there is not yet a claim for data as a *taonga*.

5.3 Proposed definition of a Taonga Species

During the three years of consultation and engagements by the author in the Plant Variety Rights Act 1987 review, a substantial amount of engagement with more than 53 Māori and non-Māori scientists, researchers, academics, kaumātua, tohunga, government officials and policy makers was used to form and define the base of definition of a Taonga Species. Part of this proposed definition was then included in the revised Act.

Further scrutiny of the definition occurred in the Waitangi Tribunal in 2018 where the author was an expert witness against the Crown in Wai 2522 - The Trans-Pacific Partnership Agreement (Reid and others) Claim. A part of this claim argued that the PVR definition of a Taonga Species was not broad enough. The definition proposed for Taonga Species from this thesis was not subjected to any further scrutiny.

While this section does not propose any new definitions for the term Taonga Species, but rather revives customary beliefs and the foundation that inside *Te Ao Māori*: *Whakapapa, Mauri, Kaitiaki, and Whānau* are all *taonga* and are all the essences of what makes up DNA.

The term Taonga Species is a term that is often used in New Zealand legislation and by governments without a definition. It is a fluid term that is used by bureaucrats when it is convenient to include some species while excluding others. The Environmental Reporting (Topics for Environmental Reports) Regulations 2016 mentions Taonga species with no definition as does a number of Department of Conversation resources.

There are several differing and often contradictory references to Taonga species in Waitangi Tribunal reports (Waitangi Tribunal, 2011; 2011a, 2011b). It is important to note that that these definitions were written before New Zealand became a signatory to the United Nations Declaration of Indigenous Rights 2007. It must also be understood that genomics, familial technologies, DNA testing, data sovereignty, digital access and technology such as Artificial Intelligence and machine learning that can take our *mātauranga* Māori into new realms did not exist or were not prominent in 2007 or at the time of the WAI 262 report in 2011 (Taiuru, 2019).

Taonga species are mentioned in New Zealand legislation with no definitions. The Hurunui/Kaikōura Earthquakes Recovery (Coastal Route and Other Matters) Order 2016, section 16.5 refers to Taonga Species as in Schedule 97 of The Ngai Tahu Settlement Act 1988 which is the only written definition.

The Ngai Tahu Settlement Act 1988 Schedule 97 lists only 117 Taonga Species. The schedule does not recognise any extinct species, despite them having significant place in traditional Ngāi Tahu history, including but not limited to *Moa* Dinornithiformes and the Haast's Eagle Hieraaetus moorei which are both in many Ngāi Tahu traditional knowledge stories. Another significant omission from the schedule is the Taonga Species *Tuna* (eel) Anguilla dieffenbachii and Anguilla australis. Te Taumutu Rūnanga are the *kaitiaki* of Waihora lake and have significant *whakapapa* and traditional knowledge to the *Tuna* of the lake as seen in the following proverb:

Ko ngā hau ki ētahi wāhi Ko ngā kai kei Orariki No matter which way the wind blows (season), one can always procure food at Taumutu.

The statutory joint land management plan between *Iwi* [Ngāi Tahu] and the Crown refers to the value of the *mahinga kai* (cultivated food) "eel" 97 times (Ngāi Tahu & Department of Conservation, 2005). In the glossary the term *Taonga* Species refers back to Schedule 97 (Tahu & Department of Conservation, 2005, p. 215). This implies that by the admission of the *iwi* corporate Te Rūnanga o Ngāi Tahu and the Crown through the Department of Conservation that eels as a *mahinga kai* are not a *Taonga Species*.

In November 2018, Te Rūnanga o Ngāi Tahu in their submission to the Plant Varieties Act review: Issues Paper stated that Schedule 97 is not complete. In direct contradiction to their own November submission, on September 09, 2019 Te Rūnanga o Ngāi Tahu in their submission to the Plant Varieties Act review: Options Paper, Te Rūnanga o Ngāi Tahu in addition to recommending a definition for *Taonga* Species, suggest adding Algae to the *Taonga* Species list, again neglecting other *Taonga Species*.

At the same time, but in separation of the WAI 2522 tribunal hearing, a new definition of Taonga species was created by Ngāi Tūāhuriri and Pākehā researchers who identified two *Taonga Species* "Kōwaro (Canterbury mudfish; *Neochanna burrowsius*)" and "Kēkēwai (kōura /freshwater crayfish; *Paranephrops zealandicus*) (Collier-Robinson et al., 2019). Both species which are also not included in Schedule 97.

Kōwaro is one of the most endangered endemic freshwater fish species in New Zealand, currently classified as" Nationally Critical by the Department of Conservation" (Dunn et al. 2018). Kōwaro are restricted to the Canterbury Plains, and they have a "fragmented distribution between the Rakahuri (Ashley) and Waitaki river catchments" (Cadwallader, 1975).

Kēkēwai are a declining Taonga Species found in lakes, streams and ponds in the east and south side of Te Wai Pounamu/South Island as well as Rakiura/Stewart Island (Grainger et al., 2014). The "Paranephrops genus has been a traditional food source for Māori across New Zealand for centuries and has more recently been the focus of aquaculture initiatives for customary and commercial harvest" (Parkyn & Kusabs, 2007).

Schedule 97 highlights the risks to assimilated *iwi* such as Ngāi Tahu have in relation to the WAI 262 definitions of a Taonga Species. How can traditional knowledge be recorded by an *iwi* with little traditional knowledge, where the remaining traditional knowledge lays with *whānau*. Te Rūnanga o Ngāi Tahu are one of the New Zealand governments Treaty partners, yet Ngāi Tahu is an *iwi* corporate. Ngāi Tahu consists of a colonial structure of 18 *Papatipu Rūnanga* (Corporate entities) as a result of a Treaty settlement. Papatipu Rūnanga have an estimated 10% of whānau participation (Prendergast-Tarena, 2015).

It also raises questions of the colonial notion that things need to be itemised and categorised to be legitimate.

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The 2013 Census reported that 98 percent of people of Māori ethnicity who stated a religious affiliation were Christian ¹³. The New Zealand Census does not consider *Ngā Atua* (traditional Māori theology) as a religious option, an inherited bias from the Tohunga Suppression Act. Māori society today, as with traditional society have individuals and groups with specific knowledge of *Taonga Species* and their usages. These are often descendants of the victims of the Tohunga Suppression Act. This knowledge is protected by *whānau* and individuals to avoid further exploitation, humiliation, and bio prospecting.

All species that were present in New Zealand prior to the first European contact with Māori in 1642 (Abel Tasman's Dutch East India Company expedition) and the descendants of those species who have a *whakapapa* that can be traced back to Ranginui and Papatūānuku, Tangaroa, the Māori spirit world deities.

It is important not to state species in Aotearoa, as Aotearoa was once only applied to the North Island of New Zealand. In modern day usage Aotearoa is the name of what could be interpreted as "the main two islands and a smaller island that are recorded by the colonial government as North Island, South Island and Stewart Island. The Chatham Islands is referred to by its own Māori name Rekohu when Aotearoa is applied.

New Zealand consists of approximately 700 islands all of which have their own unique Māori name, whakapapa and many their own Taonga Species.

This definition also relates to all bones and biological materials of dead and living species as their *mauri* and *wairua* are still present. If there is no DNA available, then the species still have whakapapa and are therefore *tapu*.

CHAPTER SIX

¹³ http://archive.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-culture-identity/religion.aspx

Taonga Species a definition.

- 1. Human body or part of the body of Māori descent. The human body.
- 2. Endemic species that were born and raised that were resident in New Zealand prior to the first European contact.

Endemic native species means exclusively native to the biota of a specific place such as Kiwi. Their *whakapapa* is clearly directly to Tāne Māhuta, Tangaroa, Rongo, Haumia or to their parents Ranginui and Papatūānuku and in some instances directly to the Māori spirit worlds.

3. Indigenous species/Native Species of New Zealand that were resident in New Zealand prior to European contact. These species have arrived in New Zealand by themselves and established themselves here.

Indigenous species/Native Species that originate in New Zealand. The difference between endemic and Indigenous species/Native Species of New Zealand is that Indigenous species/Native Species are also found overseas. From a western perspective they may be scientifically the same.

Indigenous species/Native Species are *tapu* as the species originated in Ranginui, Papatūānuku, Tangaroa or in the Māori spirit world.

The species are unique due to the individual species containing *mauri* of the area they originated from, the *tangata whenua*, *Iwi*, *hapū* and *whānau* of the land. The land at one time belonged to an *Iwi*, therefore there will be *wairua*, *mauri* and physical objects in the land from the *iwi* that once occupied that land.

4. Introduced Species that arrived with the migrating waka.

A species that is a part of Māori culture and was brought to New Zealand by the multiple waves of migration waka. The *whakapapa* of these species from the ancient homelands of Māori makes these species *tapu* and therefore a *taonga* as listed in Appendix A.

The *whakapapa* of these species from the ancient homelands makes these species tapu and therefore a *taonga*. Ancient Māori would not have endured the hardship of bringing these species to New Zealand if they were not of significant importance. The *Kūmara* is unique as there were many *atua* associated with *Kūmara* and many *pepeha*.

5. Hybrid species that use a species in sections 1-4.

In biology, a hybrid is the result of combining the qualities of two organisms of different breeds, varieties, species, or genera through sexual reproduction. If a hybrid uses a *Taonga Species* as identified in sections 1-4, then the hybrid will still contain *whakapapa* and the *mauri* of the Taonga Species. Therefore, must be treated as a Taonga Species. The same principles as inter racial relationships in a Māori view need to be considered for hybrid species. It is a colonial tool to describe blood quantum and deny *whakapapa*.

6. **Cosmopolitan species** that are found in New Zealand/Aotearoa boundaries whether air, sea, or land.

In biology, Cosmopolitan typically describes a species with global distribution, it is assumed the polar regions, deserts, high altitudes, and other extremes are
automatically excluded. The label may be used to describe species that might be found on most continents but not all, or many ocean habitats but not all. The term is mostly used to describe species that are generally widespread but does not necessarily mean that the species is found absolutely everywhere.

7. **Cryptogenic species** that are found in New Zealand/Aotearoa boundaries whether air, sea, or land.

In biology, this a species whose origins are unknown.

5.4 Māori Data & Data Sovereignty

In addition to the considerations of the need for a *tapu* physical and software environments for digitised genetic data, Māori Data Sovereignty principles must be considered.

As data is 'the new oil' and most new business models are being built around ownership of data - corporates are hoarding data and it is driving disparities across our societies (Walker, 2020). If data is the new oil, Genetic Data is the unleaded-filtered high-octane version of this oil (Sidhu, 2019). Genomic research is contributing trillions of dollars to the world's economy. Health, Pharmaceutical, Science, Phycology, Artificial Intelligence, Conservation, Warfare, and genetic modification to assist global warming and poverty are all areas that governments and corporates are focusing on genomic research.

Genomics is a fast-moving, dynamic research field that underpins a wide range of sciences that are of importance to New Zealand, including health, the environment and primary production. In 2017, Ministry of Innovation Business and Innovation (MBIE) announced it "will invest \$35 million over seven years in Genomics Aotearoa, a new science platform supporting advanced genomics research" (MBIE, 2017).

DNA data has become a commodity sought after by scientists and biotech companies, each hoping to collect enough data to seek out new knowledge in new ways in areas including health studies, ethnic identity, targeted medicines, insurance, genetic modification of crops and species including discussions of de-extinction (Cohen, 2014). In today's modern-day society, public, and private organisations understand the economic value of data. "Data is a key asset to improve efficiency in today's dynamic and competitive business environment" (Oliveira, Rodrigues, & Henriques, 2005).

Sequencing of human and non-human genomes is increasingly becoming more and more affordable for everyone. There's never been data available on as many people's genes as there is today" (Regalado, 2018b). The huge drop in operational costs for this technology, combined with the enormous potential for personalised medicine, "means that we are looking at a future where all of humanity, all seven Billion plus people have their genomes sequenced" (Zwart, 2009). The potential for exploitation of people's personal genomic data is therefore a huge concern.

The number of people who have had their DNA analysed with direct-to-consumer genetic genealogy tests more than doubled during 2017 and now exceeds 12 million, according to industry estimates (Regalado, 2018a). "By the start of 2019, more than 26 million consumers had added their DNA to four leading commercial ancestry and health databases" (Regalado, 2019).

The global genomics market is expected to reach \$USD 27.6 billion by 2025, according to US based company Grand View Research, Inc¹⁴. This places people's *whakapapa* (and their entire family past and present) genomic data at risk of exploitation, third party ownership, research, analysis and potential commodity in overseas countries (Winston, 2017).

¹⁴ https://www.grandviewresearch.com/press-release/genomics-market-analysis

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The American based direct-to-consumer '23andMe' provide ancestry data based on DNA samples provided by people around the globe¹⁵. This company is a direct competitor to Ancestry.com. In 2020, 23andMe used their customers DNA samples to create a new drug that they sold to a company in Spain. "23andMe claimed that people who use their services often don't read the Terms of Service which gave the company permission and the customer an opt out" (Linder, 2020).

"The concept of data sovereignty is linked with Indigenous Peoples' right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as their right to maintain, control, protect and develop their intellectual property over these" (Kukutai & Taylor, 2016). Data Sovereignty is sometimes called jurisdictional risk. Jurisdictional risks occur where data is subject to the laws of the country where cloud services providers store, process, or transmit data. 'Data sovereignty' is often used interchangeably with jurisdictional risks.

Data sovereignty is the concept that information/data which has been converted and stored in digital form is subject to the laws of the country or sovereign nation in which it is located. It includes a person's right to control access to, and disclosure of their own personal data. It typically refers to the understanding that data is subject to the laws of the country or sovereign nation within which it is stored and perceives data as subject to the laws of the country or nation from which it is collected.

Indigenous Data Sovereignty perceives data as subject to the laws, customary rights and treaties of the nation or Indigenous Peoples from which it is collected.

Rights of Indigenous data sovereignty and the need for collective consent are now being recognised with in the UN, further reinforcing that genetic Māori data is a taonga.

The UN Special Rapporteur on the Right to Privacy has been engaged with indigenous data sovereignty. The Special Rapporteur's Report on the work of the Big Data Open Data Taskforce in October 2018 "explicitly addresses indigenous data sovereignty and Indigenous Peoples' inherent sovereignty over the data collected from them, about them and their resources in paragraphs 52., 72. 73.74, 75" (Cannataci, 2018). And again, "in the 2019 Report from the Special Rapporteur on the Protection and Use of Health-Related Data where several definitions were introduced" (Cannataci, 2019).

The United Nations Declaration on the Rights of Indigenous Peoples GA Res 61/295 (2007) is a comprehensive international human rights document on the rights of Indigenous Peoples (United Nations, 2007). The declaration covers a broad range of rights and freedoms, including the right to self-determination, culture and identity, and rights to education, economic development, religious customs, health, and language.

The Declaration was adopted on 13 September 2007 as a non-binding, aspirational declaration of the General Assembly of the United Nations. New Zealand officially endorsed the UNDRIP in 2010. In 2019 the New Zealand government undertook a road map to

¹⁵ http://www.23andme.com

compliance, although not yet creating any binding legal obligations, UNDIR is consistent with and complements the Treaty principles.

Articles three and four provides international support for the recognition of rangatiratanga in New Zealand. In addition, article 31 of the Declaration imposes a duty on States to assist in the protection of Indigenous Peoples resources including their "cultural heritage", "traditional knowledge" and "human and genetic resources".

The following clauses are applicable to the protection and recognition of Māori genetic Data: Articles: 1,2,3,4,7,8,11,15,18,19,32,37,38,39,40,41,42,43,44,45,46.

Article 31 paragraph 1 of the United Nations Declaration on the Rights of Indigenous Peoples "recognises that Indigenous Peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games and visual and performing arts. They also have the right to maintain, control, protect and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions" (United Nations, 2011)

Many of the current concerns that surround data sovereignty relate to enforcing privacy regulations and preventing data that is stored in a foreign country from being subpoenaed by the host country's government (Taiuru, 2017). Much of New Zealand's data is stored overseas in countries like Australia, America, India, and Singapore, where it is exponentially cheaper to store data. The more obvious issue that people do not consider is where the data is stored in their computers and social media and who actually owns that data and the fact that you have to pay an international company to store and access your own data from your computer.

Three primary pieces of legislation from the United States of America directly impact New Zealanders and in particular Māori Data Sovereign Rights for any data that is stored overseas or by a company that is owned by an American entity or individual. These are:

- The Clarifying Lawful Overseas Use of Data Act (CLOUD Act) (H.R. 4943) was enacted on 23 March 2018. The CLOUD Act amends the Stored Communications Act of 1986 (SCA) to allow federal law enforcement to compel US-based technology companies via warrant or subpoena to provide requested data stored on servers regardless of whether the data are stored in the US or foreign jurisdictions.
- 2. The USA PATRIOT Act (commonly known as the Patriot Act) is an Act of the United States Congress allows American law enforcement agencies a wide and varying scope of powers to seize, analyse and copy data in certain circumstances.
- 3. The Stored Communications Act (SCA, codified at 18 U.S.C. Chapter 121, 2701–2712) permits the United States government to seize data of any American companies, whether physically located or the data is stored in New Zealand.

5.4.1 Definition of Māori Data

Data (singular: datum) are individual units of information (Shannon, 1948). A datum describes a single quality or quantity of some object or phenomenon. Although the terms "data" and "information" are often used interchangeably, these terms have distinct meanings. In popular publications, data is sometimes said to be transformed into information when it is viewed in context or in post-analysis.

The online Merriam Webster Dictionary defines data as; 1. factual information (such as measurements or statistics) used as a basis for reasoning; 2. discussion, or calculation; information in digital form that can be transmitted or processed; 3. information output by a sensing device or organ that includes both useful and irrelevant or redundant information and must be processed to be meaningful way.

Māori Data is Datum, data and information or knowledge, in any format or medium, which is about, from, is produced by Māori, *whānau*, *hapū*, *Iwi* or Māori organisations, describes Māori, *whānau*, *hapū*, *Iwi* or Māori organisations and the environments, has relationships with, made by Māori, *whānau*, *hapū*, *Iwi* or Māori organisations or contains any Māori, *whānau*, *hapū*, *Iwi* or Māori organisations content or association or may affect Māori, *whānau*, *hapū*, *iwi* and Māori organisations either collectively or individually.

A system which has Māori data or analyses Māori Data is a part of the person, *whānau*, *hapū* and *Iwi* of the subjects of the data due to the *mauri*.

5.4.2 Revised Definition of Māori Data Sovereignty

Over the past four years there has been such a directed focus on *Iwi* rights with Data held by the Crown that the definition of Māori Data Sovereignty has neglected traditional and modern Māori societal hierarchy and inherited rights.

Another issue is that the term Māori Data Sovereignty has been modelled on Indigenous Data Sovereignty principles, despite Māori having different societal hierarchy and treaties such as He Whakaputanga, Te Tiriti and other significant instruments and legislation. This has created confusion with both Māori, government, and academia. Despite the global Indigenous model being used, the United Nations Declaration of Indigenous Rights 2010 has also been omitted, despite the New Zealand government being a signatory to the Declaration and a large effort by government to implement it.

The following is a common definition in New Zealand that is used by the Crown:

Māori Data Sovereignty supports tribal sovereignty and the revitalisation of Māori and Iwi aspirations ¹⁶.

This definition is useful and has provided protection to date, for government to engage with Iwi as this allows the government to work with only one Iwi representative group, the Iwi Leaders Forum, and their sub group the Iwi Leaders Data Forum. The Iwi Leaders Forum only represents a portion of Iwi (about 50). StatsNZ and the New Zealand government recognise 170 *Iwi* (StatsNZ, 2017).

The 2013 Census data that states 20% of Māori do not know their iwi, therefore do not have a representative authority with an Iwi body or any way to have their voice heard (StatsNZ., 2013, p. 6). By registering with an *Iwi* does not mean that everyone participates and are able to have an authoritative voice. As an example, is Ngāi Tahu tribe, in 2018 it had over 54,000 registered members but less than 10 % participated in tribal matters. Yet in 2013 Census, 54,819 people identified as Ngāi Tahu.

Te Mana Rauranga definition does not consider that Māori society is hierarchical and complex. Māori People belong to a *whānau* and often more than one generation can reside in one home. Multiple *whānau* form at least one *hapū* who can also belong to multiple *marae*. Multiple *hapū* form an iwi. Māori society within an Iwi all closely interact. While all Māori people come from at least one *iwi*, most do not participate with one or more of their *iwi*.

The aspirations of *iwi* are very different from Iwi to Iwi. Some *iwi* is multimillion-dollar corporates, while other *iwi* has no finances or property and are seeking to reclaim their identity. Each *iwi* has their own aspirations which differ or contradict other *iwi*.

Māori is a general term used by colonial settlers to categorise the Indigenous Peoples of New Zealand. New Zealand statutes allow any person who has a descendant who is Māori to claim to be Māori. There is no way to prove that a person is Māori and rightfully so.

¹⁶ https://www.temanararaunga.maori.nz/

The term Māori does not mean an *iwi* or a *hapū* which is a collective of Māori Peoples with intergenerational inherited rights and obligations. Thus, it is important to differentiate between Māori and *Iwi*, *hapū*, *whānau* and organisations.

Iwi Māori are also not sovereign nations and are typically legal structures such as Trusts and companies with corporate policies as opposed to practicing traditional tribal values. Wakatū Incorporation is an example of an organisation that maintains and develops interests on behalf of a number of Iwi members, but it is not recognised by the Crown as an Iwi (Spiller, 2017, p. 3).

The definition of Māori Sovereignty also does not adequately consider Māori genetic data, or the fact it is a *taonga*. The existing definition is based on Indigenous Peoples societies and the fact that many of these international Indigenous Peoples have their own Sovereign Nations and multiple individual tribal treaties with their colonial government. In direct contrast, Māori do not have sovereign nations and are statistically more likely to not know their tribe, sub tribe and *marae*. The existing definition is popular as it is a colonial tool that is convenient for the New Zealand government and their colonially appointed tribal group "The Iwi Leaders Forum" who represent less than 30% of Māori tribes, who in turn represent in some cases less than 9% of their tribal membership.

The proposed new definition below has been refined over the past three years with multiple engagements with Māori who work in the digital and GLAM industries and with a private Facebook group of more than 580 Māori digital practitioners.

This definition considers that Māori society is made up of individuals who form *whānau* and that multiple generations of *whānau* may live in the same residence. Multiple *whānau* make up multiple *hapū* and multiple *hapū* form multiple tribes. Also, the fact that New Zealand Māori have two government and courts recognised constitutional documents that provide Māori democratic rights, in addition to the New Zealand government supporting The United Nations Declaration on the Rights of Indigenous Peoples.

This definition was also used in Wai 2522- the Trans-Pacific Partnership Agreement (Reid and others) Claim in the tribunal in 2020 where it was lightly refined based on feedback.

Māori Data Sovereignty recognises that Māori data should be subject to Māori governance by Māori *whānau, hapū* and *Iwi* aspirations. Māori Data Sovereignty issues often arise from Digital Colonialism which has been defined to identify that data can be colonised (Taiuru, 2015).

Digital colonialism deals with the ethics of digitizing Māori genetic data and information without prior and fully informed consent. Digital colonialism is the new deployment of a quasi-imperial power over a vast number of people, without their explicit consent, manifested in rules, designs, languages, cultures, and belief systems by a vastly dominant power (Avila, 2018). A new form of imperialism by technology conglomerates for commercial gains; academics and researchers to advance science, technology, and research (Taiuru, 2017). "Data colonialism is an emerging order for the appropriation of human life so that data can be continuously extracted from it for profit" (Mejias, 2019).

Therefore, it is essential that before you digitise any Māori genetic data that you apply the treaty principles and full disclosure of why you want to digitise the data, what impacts there are, potential for biases, benefits, ownership issues etc all need to be considered and explained.

The following is a new definition of Māori Data Sovereignty that more accurately reflects traditional and modern-day Māori society and recognises the protection to Māori by the Crown with New Zealand's founding constitutional documents He Whakaputanga and Te Tiriti. This definition is the umbrella definition of Māori Data Sovereignty and should be adapted depending on the circumstances as seen below. The new definitions allow for the sovereignty of Māori DNA to rightly be recognised by *whānau* rights as opposed to *lwi* rights. Māori DNA is the sovereign right of the *whānau* as opposed to *lwi*.

Māori Data Sovereignty refers to the inherent rights and interests of Māori, whānau, hapū, iwi and Māori organisations have in relation to the creation, collection, access, analysis, interpretation, management, dissemination, re-use, and control of data relating to Māori, whānau, hapū, iwi and Māori organisations as guaranteed in He Whakaputanga and or Te Tiriti and the provided recognition of rights with the United Deceleration of Rights of Indigenous Peoples.

Iwi Māori Data Sovereignty

Iwi Māori Data Sovereignty refers to the inherent rights and interests that iwi have in relation to the creation, collection, access, analysis, interpretation, management, dissemination, reuse, and control of data relating to a specific Iwi as guaranteed in He Whakaputanga and or Te Tiriti and the provided recognition of rights with the United Deceleration of Rights of Indigenous Peoples.

Hapū Māori Data Sovereignty

Hapū Māori Data Sovereignty refers to the inherent rights and interests of hapū (individual or collectively) in relation to the creation, collection, access, analysis, interpretation, management, dissemination, re-use, and control of data relating to hapū as inherited by whakapapa with mana atua, mana tangata and or reflected in He Whakaputanga and or Te Tiriti and the provided recognition of rights with the United Deceleration of Rights of Indigenous Peoples.

Marae/Rūnanga Data Sovereignty

Marae/Rūnanga Data Sovereignty refers to the inherent rights and interests of *Marae/Rūnanga* (individual or collectively) in relation to the creation, collection, access, analysis, interpretation, management, dissemination, re-use, and control of data relating to a Marae/Rūnanga as inherited by whakapapa with mana atua, mana tangata and or reflected in He Whakaputanga and or Te Tiriti and provided recognition of rights with the United Deceleration of Rights of Indigenous Peoples.

Rōpū Māori Data Sovereignty

Ropū Māori Data Sovereignty refers to the inherent rights and interests of Māori organisations (commercial, not for profit, collectives, representatives, consortiums) have in relation to the creation, collection, access, analysis, interpretation, management, dissemination, re-use and control of data relating to Māori organisations Māori Peoples as inherited by whakapapa with mana atua, mana tangata and or guaranteed to Māori Peoples members in He Whakaputanga, Te Tiriti and the provided recognition of rights with the United Deceleration of Rights of Indigenous Peoples.

Whānau Māori Data Sovereignty

Whānau Māori Data Sovereignty refers to the inherent rights and interests Whānau Māori, whānau have in relation to the creation, collection, access, analysis, interpretation, management, dissemination, re-use, and control of data relating to whānau Māori as inherited by whakapapa with mana atua, mana tangata and as guaranteed in He Whakaputanga and or Te Tiriti and the provided recognition of rights with the United Deceleration of Rights of Indigenous Peoples.

5.4.3 Licenses

Another subtle issue for Māori Data Sovereignty rights is licences and legal agreements to use software and services which often allow the provider to claim full Intellectual Property Rights, copy and distribute your information. Such licenses are usually associated with social media service providers.

Māori Data Sovereignty must in addition to the physical location of Māori data, include the software/hardware/services licenses and country where the company and its parent company are located. Proprietary licenses and licenses that prevent or limit any access to the source code, Māori Data or by product of Māori data or that take any intellectual property rights to the Māori Data or by product of Māori data is a direct breach of Māori Data Sovereignty principles.

The use of proprietary licences with Māori Data could be considered the same as the natural resources and land that was confiscated during colonisation. While the natural environment and lands were protected by Māori who had an intimate knowledge of each aspect of the environment and who needed the natural environment to survive, tell their own stories of histories, whakapapa, lore's and much more. Then colonisation forced Māori to pay for the right to access and protect their own resources through confiscations, purchases, sales, transfers, rates, and legislation that removed many of the original rights and created a limited way knowledge could be kept and utilised.

The use of Social Licenses for Māori Data is often promoted within the New Zealand government exclusively for Iwi Data. The fundamental flaw with a Social License for Māori

Data is that the rights of Māori Peoples, *hapū*, *whānau*, *Iwi* and Māori organisations are not recognised with Māori Data Sovereignty. Fundamentally, a social license has the potential to protect Māori Data, but it would require significant engagement with the relevant Māori societal groups.

Other potential licenses are Creative Commons which more closely align to Māori cultural practices with knowledge, including but not limited to *whakapapa, koha, hau, tapu* and *noa*. Consideration and collaboration could also be given to the living Kaitiakitanga License by Hiku Media¹⁷.

There are currently no single solutions to recognise Māori Data Sovereignty and the protection of Māori genetic material. This creates the dire need for a Māori Data Sovereignty License that recognises to the full extent the rights and obligations to Māori Peoples, *Whānau*, *Hapū*, *Iwi* and Māori Organisations Data.

Māori genetic data after consultation with Māori, *whānau, hapū* and *Iwi*, has been digitised, must be stored in New Zealand using appropriate software and services that recognise and respects the data as a *taonga*.

¹⁷ https://github.com/TeHikuMedia/Kaitiakitanga-License/blob/tumu/LICENSE.md

5.4.4 Eurocentric & Commercial Perspectives of Data

"The collection and circulation of data is now a central element of increasingly more sectors of contemporary capitalism. Data has become central and essential for increasingly more sectors of contemporary capitalism. Industries focused on technology, infrastructure, finance, manufacturing, insurance, and energy are now treating data as a form of capital. "No longer is data just a concern of scientists or a by-product of other processes. The imperative to capture all data, from all sources, by any means possible influences many key decisions about business models, political governance, and technological development. Understanding data as a form capital, we can better analyse the meaning, practices, and implications of datafication as a political economic regime" (Sadowski, 2019, p. 1).

"As a paradigm and logic, the idea of data-as-capital affects and transforms many spaces and sectors. Thanks to technologies like the Internet of Things (IOT), online platforms, and data analytics the list of things that now count as 'digital products and services' – and hence what counts as part of the digital economy – is growing at a rapid pace" (Srnicek, 2017). This, in turn, means that "data is a foundational form of capital for everything from the 'smart home' to the 'smart city,' finance to governance, production to distribution, consumer devices to enterprise systems, and much more" (Kitchin, Lauriault, & McArdle, 2015).

"There are now a variety of labels that refer to the political economic relationship between data and capitalism, such as 'surveillance capitalism" (Foster & McChesney, 2014); (Zuboff, 2015), 'informational capitalism' (Fuchs, 2014), 'communicative capitalism'(Dean, 2005), 'platform capitalism' (Srnicek, 2017) and 'iCapitalism' (Duff, 2016).

Storing and studying people's everyday activities, even the seemingly mundane, has become the default rather than the exception' (Angwin & Valentino-DeVries, 2012), Fulfilling the data imperative involves more than just passively collecting data; it means actively creating data (IBM, 2014). This entails the (total) datafication and surveillance of people, places, processes, things, and relationships among them (Van Dijck, 2014). Cisco, one of the companies building this all-encompassing system, calls it 'the Internet of Everything.' Similarly, IBM states that, "Everything is made of data these days" (IBM, 2014).

5.4.5 The New Zealand Government Chief Data Steward's perspectives of Data and Māori rights

The Government Chief Data Steward's Data Strategy and Roadmap for New Zealand (2018) makes statements that allude the importance of data and refers to Data being a *taonga*. The roadmap states "Two Māori values in particular will support a trusted data system: manaakitanga (data users show mutual respect) and Kaitiakitanga (all New Zealanders become the guardians of our taonga by making sure that all data uses are managed in a highly trusted, inclusive, and protected way)" (Government Chief Data Steward, 2018).

Other statements from the Roadmap for New Zealand, that reinforce that Data is a *taonga* recognized by government:

- We envisage a future where data is regarded as an essential part of New Zealand's infrastructure.
- Our ambition is to unlock the value of data for the benefit of New Zealanders.
- The value of data lies in its use.
- The availability of new data sets and sophisticated technologies has enabled new and exciting data uses that continue to transform how individuals see, act, and engage with the world.
- Data fuels the digital economy, modernising our way of life and enabling innovation across industries and sectors.
- We are increasingly seeing new uses of data that will impact our world in profound ways in the near future.
- The uptake in new technologies such as cognitive computing and Artificial Intelligence (AI) are enabling new and innovative data uses that continue to transform how individuals see, act, and engage with the world.

Within the roadmap is another section called "Commitment to the Crown-Māori Treaty Partnership". While there is a misunderstand about the tikanga involved, it does form a good basis for a foundation with which to work upon. The section states "New Zealand recognises the importance and value of the Treaty of Waitangi that establishes Māori as Partners with the Crown. There are new opportunities for the Crown to engage with Māori on the full breadth of issues in the current environment to ensure the Crown is meeting its Treaty obligations and supporting Māori to activate their full potential in a new world of possibility. Two Māori values in particular will support a trusted data system: manaakitanga (data users show mutual respect) and Kaitiakitanga (all New Zealanders become the guardians of our taonga by making sure that all data uses are managed in a highly trusted, inclusive, and protected way)".

In July 2020, the New Zealand government committed to an Algorithm charter for Aotearoa New Zealand which disregarded the previous Chief Data Stewards commitment to data as a taonga¹⁸.

In relation to digitising genetic data and 'digital sequence information', the New Zealand Government has taken a line similar to other Eurocentric governments with disproportionate power to control digital resources that, among other things, digital resources are neither physical nor genetic (Heinemann & Coray, 2018)

5.5 Indigenous Perspective of the Importance of Data and DNA

Understanding why DNA is a *taonga* is best described by (Tapsell, 1997, p. 330), cf. (Henare et al., 2007); (Metge, 1995); (Mead & McCredie, 1985); (Stirling & Salmond, 1985), cited in (A. J. M. Henare et al., 2007, p. 57); (Tapsell, 2000, p. 15) who argue Māori understandings of *taonga* collapse time and fuse tipuna with iwi in a single *whakapapa* identity.

Hamiora Mangakahia (1838-1918), of Ngāti Whanaunga and an advocate of Māori traditional law, offered some thoughts in the Māori newspaper Te Puke ki Hikurangi, harking back to the old days of the ancestors (Benton et al., 2013, p. 124). Our blood is passed on to us from our ancestor's generations, the character of our ancestors is in their histories, in the words of Māori karakia and the genealogies, which are all divine. Layer upon layer of sacred authority is bestowed on the body and blood of each and every individual, of each and every generation, of our ancestors, of our parents, and that blood, that legacy that sacred authority is ours (Mangakahia, 1900).

Many Māori epistemologies inform us why data is a *taonga*. One story that relates to all human data is a story about Tāne who climbed up to the spirit world to seek the baskets of knowledge for mankind. The following narrative varies slightly depending on the *lwi* but the principles that data is a *taonga* remain.

When Tāne Māhuta ventured up to the spirit world to seek the baskets of knowledge for mankind, his older brother Whiro was angry about the situation. Whiro believed he had more right to the baskets than Tāne, because he was the elder brother. The two brothers struggled for power, but it was Tāne who was favoured by Io.

Tāne's task was made more difficult by Whiro who sent plagues of insects and reptiles to attack Tāne. But Tāne, with the aid of the winds, was able to proceed until he reached the uppermost spirit world. Here, Tāne was welcomed by Io and received the three baskets of knowledge and two sacred stones.

¹⁸ https://www.data.govt.nz/use-data/data-ethics/government-algorithm-transparency-and-accountability/algorithm-charter/

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The baskets were called; Kete-aronui which held all the knowledge that could help mankind; Kete-tuauri which held the knowledge of ritual, memory, and prayer; Kete-tuatea which contained knowledge of evil, which was harmful to mankind. The stones, or *whatukura* held the power of knowledge and added *mana* to the teaching of knowledge.

On his return journey, Tāne was again attacked by Whiro and his allies. The winds blew the birds and insects back down to earth where they remain today.

Upon Tāne's return to earth, he placed the baskets and stones in a special house he had previously built called a Whare Kura. This is the origin of Whare Kura. The Whare Kura was the highest of the schools of learning where *whakapapa*, tribal history, religion, cosmology and wizardry were taught (Beattie & Anderson, 1994, p. 366). Only selected young males who were deemed worthy and intelligent enough to be taught the highest knowledge of the tohuka were invited. These young males were then given the responsibility to then teach the next generation of young males.

When Whiro was back on earth, he demanded that he should be the one to take care of the baskets. But Tāne and his supporters refused Whiro's demands and Whiro was eventually banished to the underworld where he still lives, and continually tries to cause trouble for everyone.

Māori society was always, and still to a large extent a knowledge society with experts in sciences, religion, astrology, navigation, spirituality, arts, knowledge, history, medicines, social issues and many more disciplines. Traditional Māori society was hierarchical with a myriad of rules and a justice system for breaking those rules. One of those rules was that knowledge and information was only to be shared under strict circumstances and within an acknowledged hierarchy of appropriate people ascertained by genealogy who after long and strict initiations in within learning schools within their own clan or tribe where specific people trained in certain knowledge areas.

It is a customary belief that when you share knowledge with people, that the person who you are sharing information with, then acquires a spiritual part of you. From a Eurocentric perspective, if you imagine a thought of a person in your mind, you have no control of that thought existing. No one else can see it, but you know it is in your brain and a part of you. In a customary Māori perspective, Māori Data contains *wairua* and a *mauri* and becomes a form of genealogy of whakapapa and therefore becomes sacred or *tapu*.

Likewise, once Māori Data is in a system, that system becomes part of the people the data is about. An AI system has many more cultural complications such as the system being a part of a person, *hapū*, *whānau* and *iwi whakapapa*, depending on the Māori data inside it.

In New Zealand, the government and museums are aware of the need to repatriate physical human remains and other objects of cultural significance, but it is still not understood that data is property, therefore no different.

This is the reason Māori Data is a *taonga* as stated in Article II of *Te Tiriti*. Māori Data from a Eurocentric perspective is also a property and a commodity and therefore all principles of Te Tiriti are applicable.

The following Pepeha are examples of traditional knowledge of body fluids. "*Ko te kura i huna ki roto ki te toto*; It is the treasure hidden in the blood" (Taylor, 1974, p. 129). Mead offers a modern-day interpretation of this old Pepeha that equates to "the 'treasure' with the genes in the blood" (Mead & Grove, 2001, p. 254).

Another pepeha is further proof that Māori knew about genetic mixing and the value to the hapū and Iwi. Marry your cousin and there will be diminishing. This expresses the belief that marriage of persons closer than second cousins results in degeneracy of that marriage the offspring (Best, 1924).

Moea tōu tuahine. Kia riri, kia riri ki a kōrua anō. Marry your cousin; if you quarrel, you quarrel only with your own relative. In this "admonition meant marriage within the same hapū but not between first cousins. The purpose was to avoid conflict with other groups if a dispute should arise" (Biggs, 1970).

These pepeha show an intimate knowledge of not only the personal issues but issues for the $hap\bar{u}$ and *Iwi* of their *taonga* DNA.

Genetic material is often converted into digital data and shared in databases and on the Internet with other researchers and scientists. The extinct Huia and the Tuatara are examples of Taonga species that have been digitized and shared on the Internet (Gemmell et al., 2020); (Lambert et al., 2009). Human genomes are also digitized and shared in the same manner. This practice ignores that the data is a *taonga*, breaches Māori Data Sovereignty rights and ignores The United Nations Declaration on the Rights of Indigenous Peoples.

When researchers and corporates analyse Māori DNA for ancestry analysis, digitise Māori data and information without permission or consultation of the whānau, hapū and Iwi, they have breached traditional Māori customary rights and beliefs. It is too late to prevent the digitisation and dissemination of *taonga* in the digital ecosystem, but it is not too late to be considerate of customary rights/beliefs and to lessen any future impacts.

Often the defence to storing, digitising, and sharing of Māori genetic data is that it has been anonymised. For non-Māori speakers and those who are not knowledgeable in the various aspects of Māori culture may also consider a *waiata, pepeha, pātere, carvings* etc., simple as art with the same principle of anonymised data. Yet, to the learned person these objects are much more than just art, they are data banks of intergenerational knowledge that has been nurtured and protected within the various objects of knowledge. Anonymised data has the same principles and therefore is still tapu to Māori. Anonymised Māori Data is only anonymised in a Eurocentric perspective as in In *Te Ao Māori* data cannot be anonymised. There is no concept of the idea as all Māori data has *whakapapa* and *mauri* associated with and in it. There are ceremonies that remove *tapu*, but these ceremonies require the use of water and *karakia* on the physical object. All data resides not only on a hard drive or a system travels through digital channels, airwaves and is copied and shared all over the world.

Māori Data has a history, genealogical connections, and a spiritual connection to it. Similar to Māori art and other traditional customs that appear to be unlearned people as art or music, is rich in data to a learned person.

CHAPTER FIVE: DNA AND ITS OUTPUT DATA IS A TAONGA

When genetic data is digitised, there are many breaches of tikanga that can occur when data such as sequenced genomes are shared on the Internet. Before digitising any DNA sequences, the following ethical frameworks should be used: Te Whare Tapa Whā (Durie, 1984); Wānanga (Barlow, 1991); Māori Ethics (Henare, 1998) ; Ata (Pohatu, 2004); Te Waka Mātauranga ; Crown Engagement with Māori (if applicable) (Te Arawhiti, 2018) ; Oranga Mokopuna (King, Cormack, & Kōpua, 2018) and Māori Data Ethical Data Framework (Taiuru, 2020).

5.6 Summary

Māori data is a living *taonga* such as *mōteatea, karakia and whakataukī*; it is an intergenerational format that is housed in every Taonga Species (Black, 2019). Māori Data is a *taonga* and a highly valuable strategic asset to Māori (Taiuru, 2018a).

Governments and commercial entities consider genomics to be important data. Internationally genomics has become a new commodity that is sold and traded on markets. Because of the Eurocentric perspective that genomes are owned by the individual and can be traded and researched, the New Zealand government and other governments have treated genomes as terra nullius¹⁹. Genomes are extracted and digitised and stored on the Internet for other researchers. By digitizing Māori data and information without permission or consultation they have breached traditional Māori customary rights and beliefs.

If we consider the early colonisers to New Zealand who normalized the practice of collecting human body parts such as heads. Society and government did not see anything wrong with this barbaric practice. It is now no longer socially acceptable. Only recently has repatriation of these human remains began. With the same knowledge learnt by history, we now must contemplate how many years will go by till we repatriate our data? Māori are committed to settling treaty claims and the return of stolen land, managing cultural misappropriation and repatriation of *mokomokai* and other *taonga*. However, despite these key areas of focus, there is little understanding of the theft and usage of Māori DNA and genomic data.

Tipuna Māori often gave ethnographers small parts of tapu information for paper medium created by metal plates. The distribution was severely restricted to those who could purchase a book. Informants had no idea of the Internet and information flow and speed of that flow. Genomic Data exposes all hereditary information form the past and the future. Virtual Reality, Artificial Intelligence and other yet to be created and emerging technologies will affect Māori Data in ways that has yet to be realized unless it is recognised as a *taonga*.

Genetic Māori data whether in its original biological state or a secondary state, is subject to *Māori/whānau/hapū/lwi* governance that enables the realization of *whānau, hapū* and *lwi* aspirations and is subject to Te Tiriti, He Whakaputanga o te Rangatiratanga o Nu Tirene: The Declaration of Independence and The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

CHAPTER SEVEN

¹⁹ Terra nullius (/'tɛrə. nʌ'laɪəs/, plural terrae nullius) is a Latin expression meaning "nobody's land", and is a principle sometimes used in international law to describe territory that may be acquired by a state's occupation of it. Retrieved from https://definitions.uslegal.com/t/terra-nullius/.

CHAPTER SIX: RECOMMENDATIONS, FINDINGS: GENOMICS AND TIKANGA



Figure 41 Chapter Seven

6.1 Introduction

Māori social, cultural, and economic spectrum of voices and customary intellectual property connection to *whakapapa* are directly addressed in this chapter by introducing cultural ownership and engagement frameworks to ensure that all Taonga Species DNA rights are considered as a whole.

Internationally there are widespread reports and cases of discrimination against minority groups including: Indigenous Peoples, People of Colour, LGBT+ and Women with science and technologies. In turn, this has created international discussions about the need to regulate science and technology for the better of the wider community. The heightened risks for Māori communities are they require ethical and ownership guidelines, and engagement frameworks.

Previous (arguably successive) governments have created legislation and initiatives that were supposed to be for the betterment of Māori; Instead, they were cultural assimilation tools that promoted colonial settler beliefs over Māori beliefs. This has resulted in the near assimilation of the Māori language, culture, whānau values and created intergenerational social, economic, and psychological impacts on Māori. The detrimental impacts are still being addressed by modern day governments.

Examples include:

- (i) The Native Schools Act 1867 that established a national system of village primary schools under the control of the Native Department. The primary aim was to educate Māori children so they could be integrated into society. The consequences included land was stolen from Māori and Māori children were physically beaten for speaking Māori language (Didsbury, 1890).
- (ii) Tohunga Suppression Act 1907 (New Zealand Parliament, 1907). The government of the day believed it was best to outlaw traditional Māori practices of healing and spirituality, and Māori religious beliefs. The Tohunga Suppression Act 1907 made it illegal to practice traditional Māori healing and spirituality and Māori religious beliefs. A form of healing that is now making a comeback due to the success of natural remedies. We see an ongoing detriment to this with the discrimination of Māori in the health system in WAI 275 and high rates of sickness and mortality among Māori.
- (iii) The Hunn Report 1960 claimed that integrating Māori into Pākehā society was the answer, rather than strengthening their separate cultural identity would assist Māori (Hunn, 1957). The ramifications were huge on communities and Māori and are still evident today with social, economic and loss of culture.
- (iv) Section 7A of the Oranga Tamariki Act 1989. The section assured Māori partnerships with Iwi and Māori and that Māori cultural rights would be considered. The result was the Children's Commissioner Judge Becroft speaking out about the racist and illegal actions of Oranga Tamariki (The Children's Commissioner, 2020); a Waitangi Tribunal Claim Wai 2915.

Māori DNA is a *taonga* that is currently not recognised as a *taonga* by researchers, academics and the Crown including the New Zealand Government, despite Māori having inalienable rights to DNA from Taonga Species.

This chapter will empower *whānau* and individuals and guide them in their roles as *kaitiaki* to retake their autonomous inalienable rights of their own DNA. Then recommendations are intended for researchers, The Crown and for policy makers who review legislation and policies that directly impact on Taonga Species. Also included is a strong thread of obligations under the Treaty of Waitangi/Te Tiriti and statements that the New Zealand Government should recognise its commitments to international instruments of which it is a party to.

These recommendations and guidelines are intended to be a living set of principles that can be adapted and grown as biotechnology is continually advancing, changing, and adapting to societal requirements, but while still recognising the basic principles of taonga and *whakapapa* through inalienable rights of Māori DNA.

6.2 Ethical Recommendations for Scientists and Researchers when Working with Māori DNA and Genetic Data

6.2.1 Consent

It cannot be assumed that a Māori donor or kaitiaki of a Taonga Species who is not culturally aware and technologically savvy, does not want to be fully informed of the cultural safety risks of genetic and genomic research.

As there is no one Māori world view, fully informed consent should be given to the person providing, or the group authorising the sample. It could be that the donor was not brought up with Māori culture and customary beliefs, or the donor could have a scientific comprehension, who discredits religion and spirituality and information that cannot be proved or disproved in a western perspective. Or it may be that the donor has not thought about the implications or does not understand the implications. Or it could be that the Māori donor does not care or want to know. But it is an ethical obligation for a researcher/scientist to ensure that the *hau* and *mauri* of the donor is upheld and respected. The full disclosure needs to cater to all Māori views.

Whenever possible, consent should be sought from the participants whose biological data is to be extracted and analysed. In practice this means it is not sufficient to simply get participants to say "Yes". The participant also needs to know what it is that they are agreeing to. So far as is practicable, it should be explained what is involved in advance and obtain the informed consent of participant(s) to have their genetic data used.

To ensure the *hau* and *mauri* are properly protected and noting that there is not one Māori world view, a full and open discussion needs to occur including a consent form that fully informs the donor of both modern day, future, and customary issues. This is the *marae atea* aspect of the process. It is expected that any issues are discussed and rectified at this stage so that going forward there will be peace and unity.

In order that consent, be 'informed', consent forms may need to be accompanied by an information sheet for participants setting out information about the proposed system (in lay terms in English and te reo Māori) along with details about the staff involved and how they can be contacted. This aspect in *Te Ao Māori* is termed *kanohi ki kanohi* (face to face); though contact will likely be in other forms than in person communication.

The disclosure needs to consider customary ownership rights and *tikanga*, modern day issues such as data sovereignty, storage, Artificial Intelligence, technologies that will allow for profiling as well as non-Māori religious values.

CHAPTER SIX: RECOMMENDATIONS, FINDINGS: GENOMICS AND TIKANGA

However, it is not always possible to gain informed consent. Where it is impossible, a similar group of people, *whānau*, *hapū* or *iwi* could be asked how they would feel if it was their genetic data being. If they think it would be OK, then it might be assumed that the real participants or *Kaitiaki* of the genetic data will also find it acceptable. This is known as presumptive consent.

There is an ever-increasing number of Māori students who have attended bilingual and full immersion Māori langue education institutes their whole lives, who are now entering the work force and becoming adults. This cohort expect *tikanga* and *te reo Māori* to be normalised. All disclosure documentation should be written in both English and Māori.

As part of the full, priory informed consent, it is recommended that all samples of the deceased human beings be offered back to the *whānau* or *hapū* of the deceased or disposed of in a culturally appropriate manner if Health and Safety is a concern.

A culturally appropriate manner could be as simple as a *karakia* by a Chaplain or Minister, or a more formal ceremony by the donor's *whānau*, *hapū*, *iwi* or *kaumātua*.

The most appropriate model of informed consent for Māori genetic research is the Free, Prior and Informed Consent (FPIC) model.

"Free, Prior and Informed Consent is a universal norm of international law as stated in the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) (United Nations, 2011), the Indigenous and Tribal Peoples Convention (International Labour Organisation, 1989), and the Convention on Biological Diversity (CBD)" (Secretariat of the Convention on Biological Diversity Montreal, 1992).

Other relevant, legally binding instruments include: the International Covenant on Civil and Political Rights (ICCPR) (United Nations, 1966a); the International Covenant on Economic, Social and Cultural Rights (ICESCR) (United Nations, 1966b) the International Convention on the Elimination of All Forms of Racial Discrimination (ICERD) (United Nations, 1965); the American Convention on Human Rights (Inter-American Commission on Human Rights, 1969); and the African Charter on Human and Peoples' Rights (ACHPR) (Food and Agricultural Organization of the United Nations, 2016, p. 31)

Free, Prior and Informed Consent allows Indigenous Peoples to give or withhold consent to a project that may affect them or their territories. For Māori, territories include customary *iwi* boundaries and the natural resources within the customary boundary. Once *whānau*, *hapū*, *Māori* or *Iwi* have given their consent, they can withdraw it at any stage. Furthermore, Free, Prior and Informed Consent enables Māori to negotiate the conditions under which the research will be designed, implemented, monitored, and evaluated. This is also embedded within the universal right to self-determination.

Subject	Description
Free	Consent given voluntarily and without
	coercion, intimidation, or manipulation. A
	process that is itself directed by the
	community from whom consent is being
	sought, unencumbered by coercion,
	expectations or timelines that are externally
	imposed.
Informed	Nature of the engagement and type of
	information that should be provided prior to
	seeking consent and also as part of the on-
	going consent process.
Prior	Consent is sought sufficiently in advance of
	any authorisation or commencement of
	activities.
Consent	Collective decision made by the right
	holders and reached through a customary
	decision -making processes of the
	communities.

Table 5 Free, Prior and Informed Consent (FPIC). United Nations

6.2.3 Transparency and engagement

"It is essential that Indigenous Peoples are full participants in research projects that concern them, share an understanding of the aims and methods of the research, and share the results of this work" (The Australian Institute, 2012). In *Te Ao Māori*, transparency is accomplished with a customary practice of recognising *whakapapa*.

The sacred courtyard in front of a meeting house is Te Maraenui-atea-o-Tūmatauenga (the realm of Tūmatauenga the Māori War god). Going on the *marae* means entering into an encounter situation, where challenges are met, and issues are debated. The *marae atea* is the place where issues about genetic research and data storage occur. The discussions should be open and frank. Once the discussions are complete, both parties should be able to progress to the specimen extraction stage.

6.2.4 Explicit Te Tiriti/ Treaty of Waitangi Clause

All documentation, policies and procedures should include and strictly follow a Te Tiriti/Treaty of Waitangi clause or similarly named clause that contains the following points and information.

(a) The testing and or storage organisation recognises its Treaty of Waitangi/Te Tiriti obligations and will ensure that all decisions reflect this commitment.

(b) The testing and or storage organisation recognises its Treaty of Waitangi/Te Tiriti obligations and will ensure that all actions regarding Māori DNA reflects a Te Ao Māori perspective whether that is physical, mental, or spiritual.

(c) Any partnerships with international organisations will include a Treaty of Waitangi/Te Tiriti clause.

(d) Recognition of The United Nations Declaration on the Rights of Indigenous Peoples GA Res 61/295 (2007) 2010. The testing and or storage organisation will adhere to the Declaration, in particular the following sections:

1,2,3,4,5,8,9, 11, 12, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 31, 34, 35, 37,38, 39, 40, 41, 42, 43, 44, 45, 46.

A Māori expert advisory group should be established to contribute Māori views and ensure Treaty compliance of all governance and processes.

Māori have continued to maintain customs that they have developed and nurtured for hundreds of generations. Therefore, hiring a specialist advisor(s) will be necessary in order to fulfil the basic requirements of these ethical guidelines. Choosing the right people is also necessary. By just saying you have a Māori person on staff, or the board is not acceptable. Any Māori representative should be comfortable with all of the frameworks and principals in these guidelines as a minimum requirement.

Membership should consist of Māori with an understanding of science, *tikanga Māori, te ao Māori, mātauranga Māori,* Te Tiriti and Indigenous Rights. Consideration to diversity of *iwi* memberships and professional and community backgrounds is essential to provide a balance. An additional criterion for consideration membership should consider whether the proposed member has the mana, standing in the community, skills, knowledge, or experience to participate effectively in the Board and contribute to achieving the purposes of the group or board. This criteria is found in New Zealand legislation in section 21 of the Te Urewera Act 2014 (New Zealand Parliamentary Counsel Office, 2014).

6.2.5 Ethical Engagement model for non-human Taonga Species

Every part of New Zealand, including all of its 700 plus outlying islands have traditional and customary boundaries recognised by *whānau*, *hapū* and *lwi*. New Zealand statutory regulations and legislation do not recognise many of those boundaries, but *whānau*, *hapū* and *lwi* still do. The *whānau*, *hapū* and *lwi* are the *kaitiaki* of all Taonga Species and natural resources within those traditional and customary boundaries.

It is important to know the exact or near to exact geographical location that a Taonga Species or their remains were taken from. This applies to both living, dead and parts of a Taonga Species. If the Taonga Species was taken from a water way, the details are still required. Many physical locations have *iwi* histories and or are sacred. It could be an unmarked cemetery, a place of worship, an ancient battleground, a significant cultural spot, a place where afterbirth is buried. There is a myriad of reasons for the land, water way or species being sacred.

The following is an identification framework to begin as soon as Taonga Species or their remains are sourced.



Figure 42 Taonga Species Consultation Model

Any Taonga Species or biological material from a Taonga Species will require engagement with its *Kaitiaki*.

The following engagement Framework is a guide that is suitable for most *Iwi*. Some exceptions could be with post settlement *Iwi* who have corporate structures.

Identify who the *kaitiaki* and or *manawhenua* are of the area the Taonga Species was retrieved from. It is likely that this stage will require identifying the marae or Iwi.

Notify the *kaitiaki* and or *manawhenua* that you have a Taonga Species from their boundary and of your intentions.

Consult the *kaitiaki* or *manawhenua*. Depending on the Taonga Species and the research involved, you may be given permission on the spot. Others will want to form a relationship with you and want intimate details of what you will do with the Taonga Species and what cultural protocols you will follow. This will also likely involve returning any part of the Taonga Species back to the *kaitiaki* once you have completed your research.



Figure 43 Kaitiaki Engagement Model

When engaging with *kaitiaki*, the following principles model should be considered to ensure cultural safety of kaitiaki and a meaningful relationship.

Tikanga	Explanation
Tino Rangatiratanga; Centre Māori self- determination	i. Conduct field trials and open releases of organisms with gene drive only when authorized by indigenous community
	ii. Recognise that consent is not a guaranteed outcome of partnership (and pursue collaborative partnerships with <i>Iwi, hapū</i> , Māori Peoples regardless).
Mana; Replace the deficit model of engagement with a participatory approach.	 i. Do not conflate unidirectional educational efforts (e.g., science communication) with participatory community engagement. ii. Pursue participatory approaches to community engagement (e.g., collaboration, mutual learning, community expertise). iii. Model participatory practices another other indigenous-led research.
Tikanga; Integrate <i>mātauranga</i> Māori	 i. Identify culturally specific values and concepts relevant to gene drive research and risk assessment. ii. Draw on culturally specific values and knowledge to codesign questions in continued research and decision making related to gene drive.

Table 6 Kaitiaki Principles

6.2.6 Guiding Principles for Māori Genetic Data Research

Guided by the direction of the interviews and the key themes that emerged, the following guiding principles were modified from Aboriginal and Torres Strait Islander ethical guidelines (The Australian Institute of Aboriginal Torres Strait Islander Studies, 2003, pp. 85-94) and Guidelines for Ethical Research in Australian Indigenous Studies (The Australian Institute, 2012).

Consultation, negotiation, and free and informed consent are the foundations for Genomic research.

Researchers must accept a degree of Māori community input into and control of the research process. This also recognises the obligation on the Crown to give something back to the community. It is ethical practice in any research on Māori issues to include consultation with those who may be directly affected by the research or research outcomes whether or not the research involves fieldwork.

The responsibility for consultation and negotiation is ongoing. Consultation and negotiation are a continuous two-way process.

Ongoing consultation is necessary to ensure free and informed consent for Māori genetic data research, and of maintaining that consent. Research should be staged to allow continuing opportunities for consideration of the design build by Māori Peoples, *whānau*, *hapū* and *Iwi*.

Consultation and negotiation should achieve mutual understanding.

Consultation involves an honest exchange of information about aims, methods, and potential outcomes (for all parties). Consultation should not be considered as merely an opportunity for researchers to tell Māori Peoples, *whānau*, *hapū* and *iwi* what they may want. Being properly and fully informed about the aims and methods of Māori genetic data research, its implications, and potential outcomes, allows Māori Peoples, *whānau*, *hapū* and *iwi* to decide for themselves whether to oppose or to embrace the research and the outcomes.

Māori knowledge systems and processes must be respected.

Acknowledging and respecting Māori Peoples, *whānau*, *hapū* and *iwi* knowledge systems (*mātauranga Māori*) and processes are not only a matter of courtesy but also recognition that such knowledge can make a significant contribution to the research and outcomes. Researchers must respect the cultural property rights of Māori Peoples, *whānau*, *hapū* and *iwi* in relation to knowledge, ideas, cultural expressions, and cultural materials (*mātauranga Māori*).

The intellectual and cultural property rights of Māori must be respected and preserved.

Māori Peoples, *whānau*, *hapū* and *iwi* cultural and intellectual property rights are part of the heritage that exists in the cultural practices, resources, and knowledge systems of *te Ao Māori*, and that are passed on in expressing their cultural identity. Māori Peoples, *whānau*, *hapū* and *iwi* intellectual property is not static and extends to things that may be created based on that heritage. It is a fundamental principle of research to acknowledge the sources of information and those who have contributed to the research.

Negotiation should result in a formal agreement for the conduct of a research project, based on good faith and free and informed consent.

The aim of the negotiation process is to come to a clear understanding, which results in a formal written agreement, about research intentions, methods and potential data that is produced. Good faith negotiations are those that have involved a full and frank disclosure of all available information and that were entered into with an honest view to reaching an agreement. Free and informed consent means that agreement must be obtained free of duress or pressure and fully cognisant of the details, and risks of the proposed research. Informed consent of the people as a group, as well as individuals within that group, is important.

The rights of Māori and Iwi to self-determination must be recognised.

Genetic Māori data research must be conducted in accordance with the Te Tiriti/Treaty of Waitangi and the United Nations Declaration on the Rights of Indigenous Peoples, including principles of Indigenous peoples' rights to self-determination and to full participation (appropriate to their skills and experience) in developments that impact on their lives.

Māori Peoples, whānau, hapū and Iwi have the right to full participation appropriate to their skills and experiences in research projects and processes.

Research projects should be based on an awareness of the rights of Māori Peoples, whānau, $hap\bar{u}$ and iwi to full participation in decision making in matters that affect their rights.

Research on Māori issues should incorporate *mātauranga Māori*. This is often most effectively achieved by facilitating direct involvement in the research from the start of a project.

If a participant withdraws, then it should mutually agree, what should be done with the contributions made to the research project up to the date of the withdrawal.

Māori Peoples, whānau, hapū and Iwi involved in research, or who may be affected by research, should benefit from, and not be disadvantaged by, the research project.

Research in Māori studies should benefit Māori Peoples, whānau, hapū and iwi.

Māori Peoples, *whānau*, *hapū* and *iwi* who contribute traditional knowledge, practices and innovations, cultural expressions and intellectual property, skills, know-how, cultural products and expressions, and biological and genetic resources should receive fair and equal benefits.

A reciprocal benefit should accrue for allowing researchers access (often intimate) to personal and community knowledge.

Research outcomes should include specific results that respond to the needs and interests of Māori People.

Research outcomes should respond to the needs and interests of Māori People, including those who participate in the project and others in the community who may be affected by the research. Among the tangible benefits that a community should be able to expect from a research project is the provision of research results in a form that is useful and accessible.

Researchers should be aware that research outcomes of interest to Māori Peoples, *whānau*, *hapū* and *iwi* directly involved, may differ from those envisaged by researchers.

Plans should be agreed for managing use of, and access to, research results.

Māori make significant contributions to research by providing knowledge, resources, and access to data. These contributions should be acknowledged by providing ongoing access for Māori Peoples, *whānau*, *hapū* and *iwi* to research results and negotiating rights in the research at an early stage.

Māori Peoples, *whānau*, *hapū* and *iwi* expectations, the planned outcomes and access to research results should be agreed. Written agreements are encouraged.

Research projects should include appropriate mechanisms and procedures for reporting on ethical aspects of the research and complying with these guidelines.

Researchers and research funding bodies should ensure that there are appropriate, ongoing processes in place for reporting research progress, especially with regard to any actual or potential changes in the ethical conditions/contexts.

6.3 UNESCO

"The United Nations Educational, Scientific and Cultural Organisation (UNESCO) is a specialised agency of the United Nations. It works through the broad programme areas of education; the natural, social, and human sciences; culture; and communication and information. New Zealand joined UNESCO and the National Commission, as required by Article VII of the Constitution, was established to be an advisory and liaison body, linking the work of UNESCO with the interests of New Zealand in 1946" (Tait, 2012).

To fulfil New Zealand's obligations as a UNESCO Member State, New Zealand must support UNESCO's vision, goals, and programmes within the context of New Zealand and the Pacific, and by helping to set the direction of the global UNESCO programme and policies in line with New Zealand priorities and values ²⁰. New Zealand has responsibilities to UNESCO, our Pacific neighbours, and its Treaty of Waitangi/Te Tiriti obligations. Therefore, the New Zealand Crown should consider ratifying and signing and or implementing key recommendations into New Zealand legislation of the following UNESCO instruments which all imply and provide protection to Māori genetic data with Taonga Species:

- Universal Declaration on the Human Genome and Human Rights 1997 (UNESCO, 1997) and The Universal Declaration on the Human Genome and Human Rights and follow-up action 1999;
- 2. International Declaration on Human Genetic Data 2003 (UNESCO, 2003);
- 3. Universal Declaration on Bioethics and Human Rights (UNESCO, 2005)

²⁰ https://unesco.org.nz/about-us-menu/

Due to New Zealand's UNESCO commitment to the Pacific; the following Pacific Islands treaties and declarations should also be considered and implemented where applicable by the New Zealand government in New Zealand legislation to protect Pacific Island nations as well as Māori genetic data of Taonga Species:

- 1. Treaty For A Lifeforms Patent-Free Pacific And Related Protocols 1995 (Peteru, 1995) as cited in (Mead & Ratuva, 2007a, pp. 201-213)
- 2. Traditional Biological Knowledge, Innovations And Practices Act 2000 (Mead & Ratuva, 2007a, pp. 237-244)
- International Treaty on Plant Genetic Resources for Food and Agriculture [2001] PITSE 8 (3 November 2001) (Food and Agricultural Organization of the United Nations, 2001) (Food and Agricultural Organization of the United Nations, 2001)
- 4. Agreement for the Establishment of the Global Crop Diversity Trust [2004] PITSE 13 (1 April 2004) (Food and Agricultural Organization of the United Nations, 2004)
- Memorandum of Understanding between the Government of Samoa and the Regents of the University of California, Berkeley for Disposition of Future Revenue from Licensing of Prostratin Gene Sequences, an Anti-Viral Molecule [2004] PITSE 1 (13 August 2004) (Government of Samoa and the Regents of the University of California, 2004)
- 6. Statement of Bioethics Consultation Tonga National Council Of Churches Centre Nukuoalofa, Tonga 2001 (Mead & Ratuva, 2007a, pp. 245-248)
- 7. Model Law for The Protection Of Traditional Knowledge And Expressions Of Culture 2002 (A. Mead & Ratuva, 2007a, pp. 249-261)
- 8. Paoakalani Declaration 2003 (Mead & Ratuva, 2007a, pp. 263-269)

6.4 The Nagoya Protocol on Access and Benefit-Sharing

The Nagoya Protocol is the first international instrument of particular relevance to Indigenous Peoples negotiated since the adoption of the United Declaration on the rights of Indigenous Peoples (September 2007). The purpose of the Protocol is to effectively implement the fair and equitable sharing of benefits arising from the utilisation of genetic resources.

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization was adopted by the Conference of the Parties to the Convention on Biological Diversity at its tenth meeting on 29 October 2010 in Nagoya, Japan. In accordance with its Article 32, the Protocol was opened for signature from 2 February 2011 to 1 February 2012 at the United Nations Headquarters in New York by Parties to the Convention. The Protocol entered into force on 12 October 2014.

There were 124 countries (Parties) who participated in the discussions. 92 of the participating countries signed the protocol. New Zealand has neither signed nor ratified the Nagoya Protocol.

The protocol in its entirety is comparable with Te Tiriti/The Treaty of Waitangi, Māori customary rights and mātauranga Māori with Māori genetic data. In particular are two articles that relate directly to Indigenous Peoples. Article 7 and Article 12 specifically identity Indigenous Peoples and their knowledge. The articles ensure that Māori genetic data and mātauranga Māori with Taonga Species are protected in both a national jurisdiction and international jurisdiction.

Article 7 states:

"In accordance with domestic law, each Party shall take measures, as appropriate, with the aim of ensuring that traditional knowledge associated with genetic resources that is held by indigenous and local communities is accessed with the prior and informed consent or approval and involvement of these indigenous and local communities, and that mutually agreed terms have been established."

Article 12 States:

"1. In implementing their obligations under this Protocol, Parties shall in accordance with domestic law take into consideration indigenous and local communities' customary laws, community protocols and procedures, as applicable, with respect to traditional knowledge associated with genetic resources.

2. Parties, with the effective participation of the indigenous and local communities concerned, shall establish mechanisms to inform potential users of traditional knowledge associated with genetic resources about their obligations, including measures as made available through the Access and Benefit-sharing Clearing-House for access to and fair and equitable sharing of benefits arising from the utilization of such knowledge.
3. Parties shall endeavour to support, as appropriate, the development by indigenous and local communities, including women within these communities, of:

(a) Community protocols in relation to access to traditional knowledge associated with genetic resources and the fair and equitable sharing of benefits arising out of the utilization of such knowledge.

(b) Minimum requirements for mutually agreed terms to secure the fair and equitable sharing of benefits arising from the utilization of traditional knowledge associated with genetic resources; and

(c) Model contractual clauses for benefit-sharing arising from the utilization of traditional knowledge associated with genetic resources."

To ensure Māori customary rights are protected from international bio prospectors and researchers and to cease the current practice of terra nullius of Taonga Species, the New Zealand must act to ratify and sign The Nagoya Protocol.

6.5 Māori Genetic Data Academy and Commission

There is a need for the establishment of two separate Māori DNA organisations; a research entity and a Commission. The entities will ensure inalienable Māori rights to Taonga Species are preserved and Māori are able to monitor the commercialisation or otherwise of Māori genetic data in the public domain. The entities would advise and encouraging Māori to take steps to protect their cultural heritage of Māori genetic data while providing a mandatory consultative process with respect to any new legislation and to review any existing legislation that impacts on Māori genetic data and intellectual property rights.

The Māori DNA academy will be a research institute of excellence where embedded Māori cultural and conceptual frameworks, it can suggest that a strong defining academy of collaborative *mātauranga* Māori around DNA with a focus on outputs of *kaitiakitanga* towards knowledge exchange, transferability of learning, based on this research. To foster the growth and *kaitiakitanga* and ensure partnerships with Eurocentric sciences, the academy should be situated within a New Zealand academic institute with an existing well-established science faculty with a partnership with a *Whare Wānanga* (Māori University) that offers Doctoral studies.

The Māori Genetic Commission should be modelled on the Australian "The National Centre for Indigenous Genomics"²¹ and the Native American/Alaskan Native initiative "Indigenous Peoples Council on Biocolonialisim²². This will recognise and protect Māori genetic data and be an oversight body that recognises the need for Māori partnerships that consider and implement Te Tiriti and its principles.

The Commission's primary purpose would be to collect and act as *kaitiaki* of Taonga biospecimens and their associated data and documents, with the aims to establish a national resource for appropriate and respectful genetic and genomic research that will benefit Māori Peoples, *whānau*, *hapū* and *Iwi*.

The Commission should have legislative authority and act in an independent manner of the Crown. Its primary role would be to act as a central role in oversight and advise on cultural ethics with Māori genetic data from all Taonga Species, to review all current legislation, to review and engage with existing and new research/medical ethics guidelines such as the New Zealand Medical Association Code of ethics and provide expert advice to other government agencies Māori advisory groups that include Māori genetic data as a part of their oversight.

²¹ https://ncig.anu.edu.au/

²² http://www.ipcb.org/resolutions/htmls/Decl_GR&IK.html

CHAPTER SIX: RECOMMENDATIONS, FINDINGS: GENOMICS AND TIKANGA

In the development of policies and practices, the following should be considered:

- 1. Recognise that Māori, *whānau*, *hapū* and *lwi* are the guardians of their customary knowledge and have the right to protect and control dissemination of that knowledge.
- 2. Recognise that Māori, *whānau*, *hapū* and *Iwi* also have the right to create new knowledge based on cultural traditions.
- 3. Note that existing protection mechanisms are insufficient for the protection of Māori, *whānau, hapū* and *Iwi* Cultural and Intellectual Property Rights with Māori genetic data.
- 4. Accept that the cultural and intellectual property rights of Māori are vested with Māori, *Hapū* and *Iwi*.
- 5. Develop in full co-operation with Māori, whānau, hapū and Iwi an additional cultural and intellectual property rights regime incorporating the following: a) collective (as well individual) ownership and origin as e) retroactive coverage of historical as well as contemporary research
 - h) protection against debasement of Māori genetic data.

This research and interview responses show there is a need to create a specific for Māori genetic declaration and a resolution that should reside within the proposed Commission.

Globally, more than 150 Indigenous Peoples and countries have created their own Genetic Declarations and resolutions and have imposed moratoriums on researchers pirating their genetic data and resources. In In 2003, the Havasupai Indians of Arizona issued a banishment order against Arizona State University, forbidding researchers from setting foot on their reservation in response to prior unauthorized DNA research done on tribal members' blood samples (Garrison, 2013). In 2002. The Navajo Nation banned DNA studies out of fear of how their samples might be used by scientists (Bhanoo, 2020).

To prevent further bio piracy of genetic data of Taonga Species, it is recommended that Māori Peoples, whānau, hapū, Iwi and kaitiaki enforce a moratorium of further sequencing, digitising, and making public the genomes of all Taonga Species. This proposed moratorium should be in place until such time that the Academy and Commission are established, the New Zealand government accept and implement relevant protections that Taonga Species are as such and require special protection.

CHAPTER SIX: RECOMMENDATIONS, FINDINGS: GENOMICS AND TIKANGA

A Māori genetic resolution should consider the following:

- 1. Taonga Species Genome represents the genetic whakapapa of our ancestors both physical and spiritual and is the collective property of all Māori Peoples, whānau, hapū and Iwi.
- 2. No Entity may seek to patent or commercialise any genetic materials from Taonga Species, including original samples, any cell lines containing copies of the original genetic sample, and data derived from these samples.
- 3. Māori Peoples, whānau, hapū and Iwi have not given their consent to licensing or patenting genetic material from Taonga Species.
- 4. The principle of full disclosure recognises the importance for Māori Peoples, whānau, hapū and Iwi to have disclosed to them, in a comprehensible way, the manner in which research is to be undertaken, how information is to be gathered and the ultimate purpose for which such information is to be used and by whom it is to be used.
- 5. The principle of free prior informed consent recognises that the prior informed consent of all Māori Peoples, whānau, hapū and Iwi must be obtained before any research is undertaken.
- 6. Māori Peoples, whānau, hapū and Iwi have the right to veto any program, project, or study that affects any Taonga Species.
- 7. The principle of confidentiality recognises that Māori Peoples, whānau, hapū and Iwi at their sole discretion, have the right to exclude from publication and/or to be kept confidential any information concerning their culture, traditions, mythologies, spiritual beliefs and any other mātauranga Māori and that such confidentiality will be observed by researchers and other potential users.
- 8. The principle of compensation recognises that communities, include Māori Peoples, whānau, hapū and Iwi, should be fairly, appropriately, and adequately remunerated or compensated for access and use of their knowledge and information.
- 9. The principle of restitution recognises that where, as a result of research being undertaken, there are adverse consequences and disruptions to Māori Peoples, whānau, hapū and Iwi those responsible for all undertakings of research will make appropriate restitution and compensation.
- 10. Whereas the principle of reciprocity recognises the inherent value to Western sciences and humankind in general from gaining access to knowledge and genetic materials from Taonga Species, and the desirability of reciprocating that contribution.
- 11. The principle of equitable sharing recognises the right of Māori Peoples, whānau, hapū and Iwi to share in the benefits from products or publications developed from access to and use of their knowledge and the genetic material and the duty of scientists and researchers to equitable share these benefits with Māori Peoples, whānau, hapū and Iwi.

CHAPTER SIX: RECOMMENDATIONS, FINDINGS: GENOMICS AND TIKANGA

A Māori genetic declaration should consider the following:

- 1. Māori flora and fauna are inextricably bound to the territories of Māori communities and any property right claims must recognise their traditional guardianship.
- 2. Commercialisation of any Taonga Species plants and medicines must be managed by Māori, Hapū and Iwi who have inherited such knowledge.
- 3. A moratorium on any further commercialisation and academic research of Māori Taonga Species genetic materials must be declared until Māori, whānau, hapū and Iwi have developed appropriate protection mechanisms.
- 4. Companies, institutions both governmental and private must not undertake experiments or commercialisation of any biogenetic resources of Taonga Species without the consent of the appropriate Māori, whānau, hapū and Iwi.
- 5. Ensure current scientific environmental research is strengthened by increasing the involvement of Māori, whānau, hapū, Iwi and of customary environmental knowledge.
- 6. All human remains and objects that contain Māori genetic data held by museums and other institutions must be returned to their traditional areas in a culturally appropriate manner.

CHAPTER SEVEN: INDIGENOUS IMPLICATIONS OF GENE RESEARCH



Figure 44 Chapter Four

7.1 Introduction

Advances in genetics and genomic research technologies, and other related biological engineering technologies, are likely to have substantial impacts on global society with little regard to minority populations and Indigenous Peoples including Māori. Therefore, this chapter discusses future potential issues for Māori to define intellectual, cultural, and customary property rights with regard to human and non-human Taonga Species genetic data and what moral, ethical, socio-economic, physical, and political implications of genetic and genomic research could be to Māori.

Gene research and related technologies have a key role to play in advancing solutions to complex issues affecting Māori. The opportunities will go unrealised if Māori are not included with the co-governance, co-design, and co-development of these technologies. Māori communities are especially vulnerable to privacy-related risks that come with (for example) the collection and storage of genetic data on individual persons. The risk of individuals and *whānau* being re-identified through anonymised genetic data is heightened when dealing with minority groupings and with sparsely distributed populations such as Māori.

To explore potential Māori implications (many of which are not possible today) of future gene research, this chapter has identified three risks from twenty future global biological risks identified in the University of Cambridge literature "A transatlantic perspective on twenty emerging issues in biological engineering" (Wintle et al., 2017). This research first identified seventy potential issues using the horizon scanning procedure (Sutherland, Fleishman, Mascia, Pretty, & Rudd, 2011). The researchers then used an iterative process to prioritise twenty issues that they considered to be emerging, to have potential global impact, and to be relatively unknown outside the field of biological engineering (Wintle et al., 2017).

In addition to the three risks identified by the University of Cambridge, this chapter analyses five new risks that it proposes will directly and uniquely impact Māori. These new risks have been identified by analysing New Zealand research reports that directly impact Māori, including Waitangi Tribunal reports, national and international media and research of Indigenous issues that could possibly impact Māori with future biotechnologies.

7.2 Blood Quantum

Blood quantum is an intergenerational colonising weapon used by settler coloniser states to assimilate Indigenous Peoples. It is still often used today in New Zealand society by individuals questioning the ethnic backgrounds of Māori and appears in legislation in other countries.

Te Tiriti and He Whakaputanga, guarantee *Iwi* and Māori the right to *'tino rangatiratanga'* the right to self-govern, and to question who has the institutional, legal, and intellectual authority to determine who or what counts as Māori. "Indigenous peoples' 'ancestry' is not simply genetic ancestry evidenced in 'populations' but biological, cultural, and political groupings constituted in dynamic, long-standing relationships with each other and with living landscapes that define their people-specific identities and, more broadly, their indigeneity" (TallBear, 2013).

The origins of the term blood quantum were used as a colonial definition for Native Americans. It was first introduced in Virginia in the early 18th Century as a means of restricting the rights of Native Americans. The term is applied to anyone deemed to be less than 50% Native American. "The term only became widespread after the Indian Reorganization Act of 1934" (Sandefur, Rindfuss, Cohen, & National Research Council . Committee on, 1996). One issue with blood quantum argument is the widespread removal of Native American and Alaskan Native rights and recognition due to miscegenation children.

Legislators around the world continue to grapple with the age-old colonial question of "how do you define an Indigenous Person?". The risks to Māori are if this question is raised in the New Zealand parliament again, then the likely option will be to use DNA testing to prove blood quantum.

In 1986 the UN Working Group on Indigenous Populations offered the following description, prepared by Special Rapporteur José Marinez Cobo, of what is meant by Indigenous community, peoples, and nations:

"Indigenous communities, peoples and nations are those which, having a historical continuity with pre-invasion and pre-colonial societies, consider themselves distinct from other sectors of the societies now prevailing in those territories They form at present non-dominant sectors of society and are determined to preserve, develop and transmit to future generations their ancestral territories, and their ethnic identity, as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions and legal systems"²³

²³ http://www.un.org/esa/socdev/unpfii/documents/MCS_v_en.pdf

7.2.1 Kānaka Māoli/Native Hawaiian

The Indigenous Peoples of Hawai'i are referred to by a number of terms. Hawai'i and Kānaka Hawai'i are the two terms that are translated as "Hawaiian" for "native". There are several other terms "Maoli, 'Ōiwi, Kama'āina, Kupa, Keiki papa, Kulaiwi, Keiki hānau o ka 'āina, Ewe hānau o ka 'āina". (Pukui, 1986). Over time, the terms "Kānaka Māoli and Kānaka 'Ōiwi have evolved as the popular Hawaiian terms for Native Hawaiian" (McGregor & MacKenzie, 2014). "Politically, the distinction between Native Hawaiians and non-Native Hawaiians did not become significant until the Kingdom of Hawai'i allowed foreigners to become naturalized citizens and subjects of the Kingdom" (McGregor & MacKenzie, 2014).

The Hawaiian Homes Commission Act, 1920 provides for the rehabilitation of the native Hawaiian people through a government-sponsored homesteading program. Native Hawaiians are defined as individuals having at least 50 percent Hawaiian blood. In 2017 a House Bill 451 was passed changing inheritance rules from requiring 1/4 Hawaiian blood quantum to 1/32 in order to inherit a parent's homeland lease. The law identifies 1/32 Hawaiian as "the new blood quantum in order to inherit land from a lessee who dies. But it does not change the 50 percent blood quantum required to apply for an original homeland lease. And, the U.S. Congress must still consent" (Hansel, 2017). Many Native Hawaiian's believe this Act to be racist. While other "Native Hawaiian's who are homeless or have spent years on waiting lists who are 50% or more Native Hawaiian believe they should have preferential rights over other Native Hawaiians of a lesser blood quantum" (Lyte, 2016).

One of the consequences of legislating blood quantum for Native Hawaiians is that family land that may have been settled upon for generations by a family, and there is a generation of children who do not meet the bloody quantum criteria, they will be forced to leave the land once the older generations have died. Despite the land being Indigenous and family land.

7.2.2 Native American/Alaskan Native

Alaskan Natives identify to a tribe or village similar to the methods Māori identity to a marae and tribe. Native Americans identify to a traditional tribe. Due to colonisation, Native Alaskans now identify to Indian corporations and federally recognised tribes. Native Americans identify to federally recognised tribes. Not all traditional tribes are federally recognised. It is also important to note that colonisation created boarders through tribal lands isolating families and tribal members from each other on the boarders of Canada and Mexico.

Individuals enrolled in federally recognized tribes receive a Certificate of Degree of Indian or Alaska Native Blood, authorized by OMB Control Number 1076-0153 (referred to as a CDIB) from the Bureau of Indian Affairs, specifying a certain degree of Indian blood, i.e., a blood quantum. The Bureau of Indian Affairs uses a blood quantum definition—"generally onefourth Native American blood—and/or tribal membership to recognize an individual as Native American (Renewal of agency information collection for certificate of degree of Indian or Alaska native blood" (Bureau of Indian Affairs, 2000).

Native American individuals who want to register as a tribal member must do so with a federally recognised tribe (controlled by the United States federal agency the Bureau of Indian Affairs). "Applicants are then required to meet each tribes' own criteria which can discriminate based on blood quantum, tribal affiliates, or genealogy. The ability of an American Indian tribe to determine its own membership is limited by the various statutes of Congress defining the membership of certain tribes for purposes of allotment or for other purposes, and by the statutory authority given to the Secretary of the Interior to promulgate a final tribal roll for the purpose of dividing and distributing tribal funds" (Sandefur et al., 1996).

7.2.3 First Nations/Métis/Inuit

In Canada, the term Aboriginal peoples or Indians refers to First Nations, Inuit, and Métis, which was determined in Section 35 of the Constitution Act of 1983. There are legal reasons for the continued use of the term "Indian". "Such terminology is recognized in the Indian Act and is used by the Government of Canada when making reference to this particular group of Aboriginal people" (Aboriginal Affairs and Northern Development Canada, 2013).

Inuit are an Aboriginal people in Northern Canada, who live in Nunavut, Northwest Territories, Northern Quebec, and Northern Labrador. The word means "people" in the Inuit language — Inuktitut. The singular of Inuit is Inuk (Aboriginal Affairs and Northern Development Canada, 2013).

Métis People of mixed First Nation and European ancestry who identify themselves as Métis, as distinct from First Nations people, Inuit, or non-Aboriginal people. "The Métis have a unique culture that draws on their diverse ancestral origins, such as Scottish, French, Ojibway and Cree" (Aboriginal Affairs and Northern Development Canada, 2013).

First Nation is a term that came into common usage in the 1970s to replace the word "Indian," which some people found offensive. Although the term First Nation is widely used, no legal definition of it exists. Among its uses, the term "First Nations peoples" refers to the Indian peoples in Canada, both Status and non-Status. "Some Indian peoples have also adopted the term "First Nation" to replace the word "band" in the name of their community" (Aboriginal Affairs and Northern Development Canada, 2013).

Indigenous Peoples in Canada are categorised by blood quantum and not by genealogy. Section 6 of The Indian Act 1876 (An Act to amend and consolidate the laws respecting Indians) defines what is a First Nations member. "In 1985 Indian men, their wives, and descendants, born before 1985, were all registered as 6(1)a Indians, while re-instated Indigenous women were registered as 6(1)c Indians. There is a difference between 6(1)a and 6(1)c categories in that while the second generation cut off rule is applied to men and their descendants after 1985, it is applied backwards or retroactively to Indian women and their descendants to births before 1985" (Gehl, 2017).

7.2.4 Swedish Sami

To register for the right to vote in elections to the Swedish Sami Assembly, a person must define themselves as Sami and either speak the Sami language as a home language or have a parent or grandparent who spoke the language as a home language. To cater for those whose families had lost their language under assimilation pressures but who still thought of themselves as Sami, "if the applicant's parents or grandparents did not speak Sami but were registered to vote for the Sami Assembly, the applicant can be registered" (Korsmo, 1996, p. 173). There is no official census of the Sami population which is estimated at 17,000 people or 0.2 per cent of the Swedish Population. 3808 Sami were registered to vote for the Sami Parliament in 1993 (Korsmo, 1996, p. 170). Sweden recognises the Sami as a minority, not an indigenous group.

7.2.5 Norway Sami

According to the 1987 Sami Act relating to the Sami Parliament and other Sami legal issues, a Sami is a person who considers himself or herself a Sami, lives in accordance with rules of the Sami society, and is recognised by the representative Sami body as Sami, or who has Sami as his/her first language, or whose father, mother or one of whose grandparents has Sami as their first language, or has a father or mother who satisfies the above-mentioned conditions for being a Sami. There is no official census of the Sami population which is estimated to be between 40 000 and 45 000 or approximately 1 per cent of the Norwegian population (Ministry of Foreign Affairs, 1997).

7.2.6 Indigenous Australians

"The term Indigenous Australians refers to Aboriginal Australians as well as Torres Strait Islander peoples, and the term should only be used when both groups are included in the topic being addressed, or by self-identification by a person as Indigenous. Torres Strait Islander peoples, are ethnically, culturally, and linguistically distinct from Australian Aboriginal peoples" (Torres Strait Shire Council, 2019). However, many Aboriginal and Torres Strait Islander people do not like to be referred to as 'Indigenous' as the term is considered too generic.

Torres Strait Islander people prefer to use the name of their home Island to identify themselves to outsiders, for example a Saibai man or woman is from Saibai, or a Meriam person is from Mer. Many Torres Strait Islanders born and raised in mainland Australia still identify according to their Island homes. Another way Aboriginal and Torres Strait Islander people might describe themselves, which again relates to their country (including the waters), is 'saltwater people' for those who live on the coast, or 'freshwater', 'rainforest', 'desert' or 'spinifex' for people who live in that ecological environment.

Similar to Māori and other Indigenous Peoples, Aboriginal people identify themselves as belonging to mobs or by their language groups and traditional country (a specific geographic location), for example, Gunditjamara people are the traditional custodians of western Victoria, the Gadigal people of the Eora nation are from Sydney, and the Yawuru people are the traditional custodians of Broome in Western Australia.

"Blood-quantum classifications entered the legislation of New South Wales in 1839, South Australia in 1844, Victoria in 1864, Queensland in 1865, Western Australia in 1874 and Tasmania in 1912. Thereafter till the late 1950s States regularly legislated all forms of inclusion and exclusion (to and from benefits, rights, places etc.) by reference to degrees of Aboriginal blood. Such legislation produced capricious and inconsistent results based, in practice, on nothing more than an observation of skin colour" (Gardiner-Garden, 2003).

A lot of legislation defined an 'Aboriginal' as 'a person who is a member of the Aboriginal race of Australia'. Then in the 1980s a new definition was proposed in the Constitutional Section of the Department of Aboriginal Affairs' Report on a Review of the Administration of the Working Definition of Aboriginal and Torres Strait Islanders (Canberra, 1981). The section offered the following definition:

"An Aboriginal or Torres Strait Islander is a person of Aboriginal or Torres Strait Islander descent who identifies as an Aboriginal or Torres Strait Islander and is accepted as such by the community in which he (she) lives." The definition also found its way into State legislation (e.g., in the NSW Aboriginal Land Rights Act 1983 where 'Aboriginal means a person who: member Aboriginal (a) is а of the race of Australia, (b) identifies as an Aboriginal, and (c) is accepted by the Aboriginal community as an Aboriginal') and was accepted by the High Court as giving meaning to the expression 'Aboriginal race' within s. 51 (xxvi) of the Constitution" (Bowles, 1977).

In 1999, in the Tasmanian elections for the Aboriginal and Torres Strait Islander Commission, a number of candidates were questioned about their ethnicity. "This resulted in a High Court challenge to determine the ethnicity of candidates" (Gardiner-Garden, 2003).

In 2019, Australian politician Pauline Hanson, member of the political party One Nation suggested that all Indigenous Peoples of Australia should be DNA tested to prove Indigenous genealogy before being able to claim a financial assistance from the Australian government for Australian Indigenous Peoples. She stated "Too many people claim Aboriginal status because of some distant link just because they want easy handouts from the Government — some of them are blue-eyed with blond hair" (Lackey, 2019).

7.2.7 Māori

Pre-colonial settlement of New Zealand, Māori Peoples identified themselves primarily as descendants of Ranginui and Papatūānuku and or as a descendant of Tiki as seen in the following *pepeha*:

- 1. *Te aitanga a Tiki*. "The offspring of Tiki. This is applied to human beings. Tiki from the world of Chaos (Po) married Ea of the world of light. They had Kurawkaka who married Tane-nui-a-rangi, the beginning of the human race" (Best, 1903, p. 17)
- 2. *Ngā uri o Tiki*. "The descendants of Tiki. These are the human race as Tiki was its progenitor" (Colenso, 1879, p. 91).
- 3. Nā Rangi taua, nā Tūānuku e takoto nei; ko ahau tēnei, ko mea a mea. "We are descended from Rangi and Tūānuku; as for me, I am so-and-so, child of so-and-so. This was the prescribed formula for responding to a chief who welcomed one to his village. The stranger established their common ancestry and then related essential elements of their own lineage" (Brougham, 1975, p. 70).

Secondly, Māori identified themselves from the many levels of their tribal structures that consist of *whānau*, *hapū*, *iwi* and *waka* (Barlow, 1991); (Buck, 1949); (Firth, 1972); (Gibbons, Temara, & White, 1994); (Papakura, 1986); (Willmott, 1989, pp. 1-20). "Tribal structures provided a format in which Māori could undertake their political relations enriched by their traditions and strengthened by their sense of tribal identity" (Ministerial Advisory Committee, 1988).

Early colonial settler governments in New Zealand introduced the term "Half Caste" into New Zealand legislation to differentiate full blooded Māori to those who were not. This lead to generations of Māori using the term and others including the derogatory term *rīwai* (potato) (Kahukiwa, Irwin, & Ramsden, 1995). *Rīwai* implies that someone has brown skin but acts against Māori interests. It is still not uncommon to hear non-Māori ask, "what percentage of Māori are you?". In the early 1980's in Canterbury it was almost expected that you would be asked what percentage Māori you were?

In the New Zealand legal system, Māori are able to self-identify as being of Māori descent by identity. The common definition used across multiple statutes is "A person has Māori descent if they are of the Māori race of New Zealand; this includes any descendant of such a person ".

Other examples of statute definitions of Māori include:

- 1. Māori means a person of the Māori race of New Zealand; and includes a descendant of any such person (New Zealand Parliamentary Counsel Office, 1993)
- 2. Māori means a person belonging to the aboriginal race of New Zealand; and includes any descendant of a Māori" (New Zealand Parliamentary Counsel Office, 1955).

Perceived future risks for Māori regarding blood quantum issues are primarily based on Native American blood quantum issues (Hamill, 2003; Hoffmann, Dana, & Bolton, 1985; Jacobsen-Bia, 2014; Thornton, 1997; Wilson, 1992). This is then cross referenced with Māori identity issues (O'Regan, 2001); (Moeke-Pickering, 1996), (Kukutai, 2004, 2011) & (Katene & Katene, 2017a).

There is a real risk that blood quantum with genetic and genomic research could be used to prove and disprove a person is or is not of Māori descent. New Zealand society has since the time of colonisation tried to impose a colonial view of blood quanta. It is becoming more and more discussed in recent decades. "In the United States and Canada, the use of DNA tests for tribal enrolment for First Nations and Native Americans is emerging" (Bardill, 2010; TallBear, 2008).

Treaty settlements will likely one day be completed, but *iwi* membership will continue to grow indefinitely. There is a future risk that Iwi finances and resources may one day be consumed by membership growth, pandemics, global economic recessions, or bad business practices. It is feasible that future Iwi may look to blood quantum as a solution for economic survival while their membership continually grows.

It is a widely and common practice for *iwi* entities to invite their beneficiaries or *iwi* members to register. Registration is based on a birth certificate and stating some *whakapapa*, usually back three generations. Pre-colonial settlement and the introduction of Eurocentric practices, Māori society had a tikanga called *'whāngai'* which is a customary practice that continues today. *Whāngai* can occur in multiple different ways and often involves a couple's first child who is given to relations, though sometimes non-blood relatives, to be raised as their own child. New Zealand law does not recognise whāngai as being legal under the Adoptions Act 1955. There are usually no documents involved and the child is taught from a young age about the whāngai and their genealogy to both paternal and whāngai parents. In other common cases in the past, prior to digitisation of records and centralised systems, a couple may go to the hospital using an alias of the couple who will whāngai the new born. This would allow the new-born to have a legal identity with the *whāngai* parents.

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Paternal disputes are currently occurring within whāngai relationships and Iwi registrations for some iwi. Te Rūnanga o Ngāi Tahu whakapapa registrations only allow members who are born as Ngāi Tahu and they rely on hospital records and birth certificates as proof when whāngai beneficiaries register. There is a dichotomy with Māori cultural practices and New Zealand legislation regarding adoptions. Despite this, Te Rūnanga o Ngāi Tahu are guided by New Zealand legislation and not customary practices. When there is a traditional whāngai of either two Ngāi Tahu parents or a baby from a Ngāi Tahu parent to a non Ngāi Tahu parent or parents, then Te Rūnanga o Ngāi Tahu require a DNA test from a specified list of authorised providers to prove the applicant does have whakapapa. Indigenous Scholar Kim Tall Bear warns that "genomic testing to determine tribal membership will be to the detriment of tribes" (TallBear, 2013). This practice has the potential to grow to require all members to provide a DNA test if a Māori DNA marker or a Ngāi Tahu marker is identified.

Direct to Consumer DNA online services referred to as "bioeconomic consumption" by Indigenous Scholars are ever increasingly popular. Bioeconomic consumption services such as Ancestry.com and 23andMe.com are already assisting people to find lost relatives. Amateur genealogy researchers use such services to assist finding missing family members by offering services that allows anyone who has their DNA uploaded to the site to match with other family members and for the other family members to see each other. One implication that is becoming more and more common is with Māori who upload their DNA sample and match with other family members who then think that because they have connected with a family member who is Māori that they must also be Māori. This will likely result in iwi registrations of non-Māori who unintentionally think they are Māori. The only way to address these inconsistencies will be a Māori genetic marker and then DNA testing.

Belonging to an *Iwi* and being a member of a corporate Iwi with the benefits could one day be two different categories of membership. While not feasible now, we have seen the cultural and whānau values of a corporatized Iwi replaced with a Eurocentric corporate values as has occurred with Te Rūnanga o Ngāi Tahu (Prendergast-Tarena, 2015).

Another risk that could impact Māori is seen with some Native American and First Nations of Canada tribes with financial issues and Native Hawaiians with land occupation and the need to identify blood quantum.

In recent years, Māori media have fallen victim to promoting the blood quantum debate. In 2017, a Māori television presenter took a DNA test to ascertain the percentage of Māori the presenter was. "The sceptical results revealed that the presenter was 100% Māori" (Walters & Kenny, 2018). Despite the fact that there are no genetic markers to identify being Māori based on DNA, only familial DNA testing that could find close relatives.

Again, in the same year, 2017, mainstream media in New Zealand reported that the National Party elected Simon Bridges (Ngāti Maniapoto) and Paula Bennett (Tainui) to be leader and deputy leader of the National Party (Katene & Katene, 2017b, p. 123). Barry Soper a political editor (and self-proclaimed non-Māori political reporter) wrote an article using the blood quantum tool:

"Bridges' generational change then is about as solid as his claims to his Māori heritage and that of his deputy, neither of whom have made much of it in their rise up through the ranks; not altogether surprising considering their new leader is just three sixteenths Māori and Bennett's grandmother was half-Māori" (Soper, 2018).

In response to the two National Party leaders being elected, in mainstream media Winston Peters (Ngāti Wai), leader of the political party New Zealand First, made the following statement about the National Party leader, co-leader and Jami Lee Matenga Ross (Ngāti Porou) a caucus member.

"... they discovered their Maori-ness the same way Columbus discovered America, purely by accident. They didn't start talking about that until they got into politics. On the way through and all the things that really matter in life as an apprenticeship and training, no one ever heard that before" (Winston Peters). October 17 2018²⁴.

Another factor to consider is that New Zealand's ever growing and diversifying population of cultures could see huge demand for iwi memberships. By 2026, it is projected that New Zealand's Pacific population will increase to 480,000 people and by 2038 will number 650,000 (StatsNZ, 2015). The Māori population in 2013 was 690,000 and is expected to increase to 830,000–910,000 in 2025 and then to 980,000–1.16 million in 2038 (StatsNZ, 2017). This could put increasing financial pressure on Iwi who will be growing at large rates. It is therefore feasible that a future generation will demand genetic and genomic testing to prove that a person of Māori descent is more than a prescribed percentage.

In the WAI 262 Report the Tribunal decided that both contradicts tikanga Māori and one that could promote and justify the blood quantum issues for Māori. In report 'One' of the WAI 262 report the term "Taonga Derived Works' is introduced:

"A taonga-derived work is a work that derives its inspiration from mātauranga Māori or a taonga work, but does not relate to or invoke ancestral connections, nor contain or reflect traditional narratives or stories, in any direct way. A taonga-derived work is identifiably Māori in nature or contains identifiably Māori elements, but has neither mauri nor living kaitiaki in accordance with tikanga Māori" (Waitangi Tribunal, 2011b, p. 96).

If an artwork uses Māori art, then the newly produced art must have a whakapapa to the art it was inspired from. In the same way a human being or other Taonga Species transfers DNA and *mauri*. Such decisions by the Waitangi Tribunal must be addressed to avoid this being a benchmark for blood quantum of Māori.

In November 2018, Ministry of Business, Innovation and Employment referenced and differentiated Taonga with Taonga derived works in their Issues Paper: Review of the Copyright Act 1994.

The most significant damage to tikanga Māori with the definition of a Taonga Derived Work is seen with the policy document "Collection Policy & Procedures" used by Ngā Taonga Sound and Vision in their policy document by stating that taonga is not taonga. Ngā Taonga Sound and Vision is a charitable trust who is responsible for New Zealand's audio-visual archive which includes a large amount of Māori resources.

Section 3.6 of the Collection Policy & Procedures states:

"3.6. Taonga-derived works do not relate to or invoke ancestral connections, nor contain or reflect traditional narratives or stories, in any direct way. They are identifiably Māori in nature but have neither mauri nor living kaitiaki in accordance with tikanga Māori. Examples include

²⁴ Radio Waatea https://www.waateanews.com/waateanews/x_news/MjAzNzA/Paakiwaha/Maori-sidelinedin-National-Party-raruraru?story_id=MjAzNzA=

the stylised koru symbol used by Air New Zealand, and contemporary artworks using generic koru, tiki, and other Māori symbols".

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Tiki is the ancestor and *atua* of all Māori human beings, and the various designs reflect a period in history and the whakapapa of the piece. Each design is unique to *lwi* and the individual wearer and their descendants who will likely recognise the *Tiki* has an intergenerational family heirloom that contains the *mauri* and *hau* of the previous wearers.

The *koru*, which is often used in Māori art as a symbol of creation, is based on the shape of an unfurling fern frond. Its circular shape conveys the idea of perpetual movement, and its inward coil suggests a return to the point of origin. The *"koru* therefore symbolises the way in which life both changes and stays the same" (Royal, 2005). This is reflected in the following *whakataukī* "*Ka hinga atu he tete-kura - ka hara-mai he tete-kura*" "As one fern frond dies - one is born to take its place" (Mead & Grove, 2001).

In *Tā Moko* the *koru* represents parenthood, ancestry, and genealogy. In *Te Ao Māori* the *koru* has human characteristics - a head, an eye, a neck, body, and tail. Because of these human characteristics, designs with a single *koru* and multiple koru growing from it are said to represent *whakapapa*, essentially a family tree made from the koru design.

For a New Zealand government funded organisation and the Waitangi Tribunal to make such statements reflects the lost knowledge of *Te Ao Māori* in modern day society and the risks of creating new cultural practices will likely negatively impact Māori and the blood quantum debate.

The first detrimental possibility of such a statement as "Taonga Derived Works" is that non-Māori will ask why the difference between a Taonga Derived work and a Taonga Species that is has mixed heritage. The issue being that genetic and genomic testing can prove Taonga Species resulting in a further risk of blood quantum rules.

Without Māori genetic data being considered a Taonga now by Iwi and the Crown, Māori risk being legislated against with blood quantum or risk further iwi membership criteria requiring DNA testing to become the new normal for tribal registration.

7.3 Human Taonga Species

Genome editing, often also called gene editing, is a group of technologies that give people the ability to change an organism's DNA. These technologies allow genetic material to be added, removed, or altered at particular locations in the genome.

There are three genome modifying techniques: zinc-finger nucleases (ZFNs), transcription activator like effectors nucleases (TALENs), and CRISPRs. The most popular technology for editing genomes is CRISPR-Cas9. Compared with the other two techniques, CRISPR-Cas9 is faster, less expensive, and more precise (Li, Walker, Nie, & Zhang, 2019). The Internet has many free downloads of CRISPR-Cas9 software that allow anyone to read and edit genome sequences.

"Since 2010, uploading DNA profiles to online databases such as Ancestry.com and 23andMe.com to fill in the details of our family trees, explore our ethnic roots, and find people who share overlapping sequences of DNA has become so popular that it has become like Facebook for genes, driven by the same fundamental human desire to connect. And, as with Mark Zuckerberg's social media behemoth, this is the decade we reckoned with what it really means to hand over some of our most personal data in the process" (Aldhous, 2019).

While changing genes for traits such as physical attributes, intelligence or even instincts like aggression is currently not possible, it has been speculated that it will be possible within this century (Arora, 2018). The technology to have Māori babies by non-Māori, a technology that is already scientifically possible via in vitro fertilization but could become a genetic modified issue.

Genome engineering technologies like CRISPR/Cas9 offer the possibility to improve human life expectancy and health. "Researchers are changing the genes in human embryos to repair disease-causing mutations" (Ma et al., 2017). In November of 2018, Dr Jian-kui HE, a Chinese scientist, claimed to have "created" the first gene-edited babies, "designed to be naturally immune to the human immunodeficiency virus (HIV)" (Li et al., 2019).

One impact for Māori could be that Māori are targeted and encouraged to have genetically modified babies. Māori are genetically four times more likely than non-Māori to have diabetes (Poa, 2001). Considering the resources on the already stretched New Zealand health system, it is feasible that the health system of the government of the day could legislate that all Māori babies be genetically modified to remove the genes that cause Māori related diseases.

As knowledge about the genetics of increasingly subtle and complex human attributes accumulates, it is feasible that parents or states with the financial and technological means may elect to provide strategic advantages to future generations. For example, "one Chinese leader previously stated that their government would use all means available to improve the health of the population, including direct genetic modification of its citizens" (Carlson, 2012). With limited international discourse on individual and collective rights to genome editing, non-uniform use or regulation of the technology could transform social mobility and international order in unpredictable ways (Wintle et al., 2017).

Designer Māori babies by non-Māori parents seeking certain Māori genetic traits could become a trend. In June 2017, The Dominion Post had a classified post from a couple in Australia seeking a "Māori Egg Donor" (Williams, 2017). In this instance the advert was placed by a gay male couple, one of whom was Māori. The advert received over 40 replies form Māori women. In May 2020, the couple's baby was born with their surrogate mum (Williams, 2020). The current risks are that any couple could claim Māori descent and seek a Māori donor. There is no way to prove or disprove ethnicity in New Zealand.

Once genetically modified superhumans are created and deployed into communities, "there are going to be significant political problems with the unimproved humans, who won't be able to compete" (Arora, 2018). Derya Unutmaz, a Connecticut-based immunologist and principal researcher at Jackson Laboratory stated that "At the military level you can imagine you want to create super-soldiers who can withstand all kinds of diseases and tough weather and carry hundreds of kilograms. These were science fiction, but now we have the tools that could enable them," (Galvan, 2018).

Globally some of the largest economies who invest billions of dollars into warfare. Defence force budgets for 2019 in \$US Billion; USA 732.0; India 71.1; Russia 65.1; Saudi Arabia 61.9 (Tian, Fleurant, Kuimova, Wezeman, & Wezeman, 2019). China's defence force is US\$178.2 billion (Yeo, 2020). It is feasible that defence force budgets will include genetic modification of soldiers. Russia for example is creating a "genetic passport" that genetically identifies soldiers genetic dispositions for specialist areas (Vedyashkin, 2019).

There is a risk that global scientists could use Māori genetic data to create super soldiers. Māori soldiers since the New Zealand wars were known as fierce warriors. During World War II, the 28th (Māori) Battalion earned a formidable reputation as a fighting force which has subsequently been acknowledged by both Allied and German soldiers. It was also the most decorated New Zealand battalion during the war.

It is feasible that DNA could be extracted by world super powers, from any number of Māori veterans' graves around the world without permission or knowledge of the *whānau*, *hapū* or *lwi* to genetically modify super soldiers. Or DNA could be extracted from ancient Māori human skeletons or other body parts that are stored in museums around the world.

Evidence exists that data from genetic studies targeting Māori have the potential to be used and abused by mainstream media and politicians to concoct provocative media headlines and feed existing stereotypes. In 2005, a speech given by a politician, the now infamous Orewa speech, did just that, "resulting in racist hysteria across the nation as a result of which some Māori lost their jobs and were harassed" (Pelkowitz & Crengle, 2004). How the media and politicians could use and interpret information that might emerge from genetic research about Māori should be considered before such information is released.

In 2006, Dr Rod Lea and others presented a paper at the 11th International Congress of Human Genetics conference stating that Māori have a warrior gene that disposes Māori to risk taking and aggressive behaviour. This work was published in 2007 (Lea & Chambers, 2007). During this time, the false claims gripped local and international media with the announcement that Māori men were genetically predisposed to "violence, criminal acts, and

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risky behaviour". The basis for this release was the report of a study that purported to show that a genetic variant of the monoamine oxidase (MAO)-A gene, dubbed the "warrior gene" by the media, had previously been "strongly associated with risk taking and aggressive behaviour" and was "strikingly over-represented" in Maori men (Merriman & Cameron, 2007). In this case there was no exclusive to Māori gene and the research was proved to be flawed.

Biopiracy happens when researchers or research organisations take biological resources without official sanction or open disclosure. This is commonly occurring with largely less affluent countries and land occupied by Indigenous Peoples. The widespread accessibility and cost effectiveness of genome editing tools such as CRSPR has created a multitude of biohackers - hobbyists, amateur geneticists, students, and enthusiasts. These amateur biohackers do not need to act in an ethical manner and operate without regulation.

Biopiracy is not limited to drug development. It also occurs in agricultural and industrial contexts. A less politically charged word for biopiracy is bioprospecting. "Historically, biopiracy has been linked to colonialism, with formerly colonised countries having many of their resources forcibly removed" (Rose, 2016).

In New Zealand, a human gene cannot be patented (Intellectual Property Office New Zealand, 2018). The Patent manual does not stop an international company from taking a genome from a Taonga Species and applying for a patent or even assuming copyright ownership by an overseas jurisdiction (Taiuru, 2018b). But currently in New Zealand there are no legal protections for biopiracy of Taonga species. The matter is further complicated with no legal or government accepted definition of what is a Taonga Species.

The first patent on human genes was in 1976. "A US citizen John Moore had his spleen removed due to cancer. When analysed by his Doctor, it was found that Moore's cell line had unique characteristics" (Wald, 2005). The doctor patented the gene and on sold the rights to a Swiss pharmaceutical company Sandor which has since made millions of dollars from a drug derived from the gene. Moore challenged the decision in the Californian Supreme Court, which decided that citizens do not have any rights to their own cells once they have left the body.

In 1984, the Hagahai, an Indigenous Peoples of the highland forests in Papua New Guinea of the Solomon Islands made their first contact the outside world seeking medical help. One of the people who responded was an American anthropologist was Carol Jenkins. Jenkins took blood samples for medical diagnosis. Without the Hagahai informed consent nor knowledge of their Papua New Guinea government, "Jenkins performed extra tests on the blood samples and found the genes had a unique genetic characteristic (HTLV-1) that potentially resisted a certain type of leukaemia. In particular, the cell line of an anonymous 28-year-old man contained a retro-virus which held the possibility to develop diagnostic screening kits and vaccines" (Lane, 1998).

The US National Institute of Health (NIH) patented his gene line creating a US government owned DNA sample from a non-US citizen. The Solomon and Papa New Guinea governments challenged the US government but were rejected their concerns taking the view that the source of the DNA (and by implication the process in which they were collected) was of no consequence (A. Mead & Ratuva, 2007b). The former US Commerce Secretary Ron Brown in response to the gene patent states "Under our (US) laws, as well as those of many countries, subject matter relating to human cells is patentable and there is no provision for considerations relating to the source of the cells that may be the subject of a patent application" (Bereano, 1995).

While the use (and misuse) of genetic information historically required the transportation of specimens, today's biological engineers increasingly order the synthesis of any DNA sequences that they wish to use from a commercial provider, using the sequence resources held in online databases as the template (Wintle et al., 2017). Moreover, it is now possible to travel with a hand-held sequencer and to go from sample to sequence in less than 24 hours (Quick et al., 2016).

Bioengineers and large pharmaceutical companies could extract DNA and sequence the genome of any and all of the non-human Taonga Species while searching for pharmaceutical properties to gain (Howard, 2001; McFarlane, Schabus, & BC, 2017; Mead, 1996, 1997; Reynolds, 2004; Mere Roberts & Fairweather, 2004; Secretariat of the Convention on Biological Diversity Montreal, 1992; Whitt, 1998; Wintle et al., 2017).

Social scientists and Indigenous Peoples have voiced concerns that media messages about genetics and race may increase the public's belief in genetic determinism and even increase levels of racism (Kowal & Frederic, 2012).

In its DNA for criminal investigations 2018, the New Zealand Law Commission raised the issue as to whether the New Zealand Police should have permission to access online DNA databases such as Ancestry.com and 23andMe.com to solve criminal cases or if the Guthrie cards should be sequenced under a law change. Essentially giving the New Zealand Police every born New Zealanders DNA. In 2019 the New Zealand Police made enquiries into using Ancestry.com to analyse DNA in a murder case (Keogh, 2019). Countries such as America and Australia use online consumer DNA databases for DNA investigations in criminal cases (Scudder et al., 2019).

In New Zealand the Justice System and Police, bias is a documented fact and well-known fact that too many innocent Māori and minority people (Jackson, 1989); (Cobo, 1983; Maxwell & Smith, 1998; Mihaere, 2015; Pack, Tuffin, & Lyons, 2016). Combined with the fact that Māori have the highest statistics for incarceration per population, this would also logically make Māori at high risk to have their DNA and their family DNA subpoenaed by law enforcement agencies in New Zealand. The Law Commission in their 2018 public DNA consultation also highlighted Police bias as a risk with Māori DNA samples.

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It is also feasible to suggest a mass sterilization program could be created that only effected a specific kind of ethnic DNA. A study by the U.S. General Accounting Office found that "4 of the 12 Indian Health Service regions sterilized 3,406 American Indian women without their permission between 1973 and 1976 and other research suggests this was a common issue from the 1960's and 1970's" (Carpio, 2004). There are still reported causes in Canada as recently as 2021 ²⁵.

In America, the state of Virginia passed a law "Eugenical Sterilization Act of 1924" allowing the state to sterilize anyone with criminal or mental health tendencies. It is estimated that between 7,200 and 8,300 people were sterilized in Virginia from 1927-1979 because they were deemed by society at the time to be unworthy or unfit to procreate (Wong, 2013).

Using genetic data, enforcement agencies could use Artificial Intelligence in an attempt to reduce crimes or to decide who is more likely to have criminal tendencies and seek court orders for sterilisation or gene modification.

Ten years ago, DNA tests were the future of medicine, "now They're a Social Network - and a data privacy mess" (Aldhous, 2019). Insurance companies do not already have all the information they require to make calculated decisions. They want to know about pre-existing conditions to remove the calculated risk they make. The larger mass of DNA available to health insurance companies, makes for better training data to predict the likelihood of a certain condition. Māori could be charged higher premiums not because of an existing condition, but that because a condition in their DNA. A simple DNA test or criteria that you must have a DNA in order to obtain health insurance could be bias against Māori.

Pharmacogenomics is the study of how an individual's genetic inheritance affects the body's response to drugs. Pharmacogenomics holds the promise that drugs might one day be tailormade for individuals and adapted to each person's own genetic makeup. Your DNA can reveal which medications and dosages will work for you (Aneesh, Sonal Sekhar, Jose, Chandran, & Zachariah, 2009). The risk for Māori is if pharmaceutical companies can produce medications cheaper and more efficiently for the wider population, there is a possibility that Māori DNA is not fully compatible with the popular medication. This would create a bias and an economic and social divide for Māori accessing medications.

Māori people, pre-colonisation were healthy and had a more natural lifestyle that used Taonga Species for medications. There is a possibility that Taonga Species would be a better source of medication for Māori than for non-Māori. If Māori inalienable rights were recognised and protected with Taonga Species, this could remove the negative bias and discrimination of being a minority in pharmacogenomics. If Māori rights are not recognised, Māori could face the possibility of paying for access to Taonga Species that have been patented by corporations.

CHAPTER FIVE

²⁵ https://globalnews.ca/news/7920118/indigenous-women-sterilization-senate-report/

7.4 Ethnic Bioweapons

One of the first modern fictional discussions of ethnic bioweapons is in the fictional book Sixth Column, also known under the title The Day After Tomorrow (Heinlein, 1949). Today in 2020, it is no longer science fiction, but a new technological reality.

The Unites States Defence Advanced Research Projects Agency (DARPA) invested \$110 million in synthetic biology in 2014, "which accounted for almost 60% of funding for synthetic biology in the US that year, and this figure increases to 67% when other Department of Defence funding is included" (Kuiken, 2015). The UK government has identified synthetic biology as a key high-growth emerging technology. "The Defence Science and Technology Laboratory (DSTL) is committing up to £18 million over the next 4 years exploring the potential impact of synthetic biology on the UK's defence and security capabilities" (Defence Science and Technology Laboratory, 2017).

DARPA's Insect Allies Program intends to use insects to disseminate engineered plant viruses that confer traits to the target plants they feed on, with the aim of protecting crops from potential plant pathogens (DARPA, 2016). Many ongoing military-funded bioengineering projects focus on potential dual-use technologies (Reardon, 2015).

The Unites States of America Office of the Director of National Intelligence in 2016 raised concerns that bioweapons and gene edited humans are being created by countries without the same ethics as those in the western world. "That given the broad distribution, low cost, and accelerated pace of development of this dual-use technology, its deliberate or unintentional misuse might lead to far-reaching economic and national security implications" (Clapper, 2016).

Genetic research that enables personalised health care and medicines could also be used for the opposite intentions. A bio-engineered virus that disabled or killed only when it encountered a specific DNA signature, or the DNA signatures of certain people has been discussed among many global superpower countries in relation to modern day warfare.

Advances in genetics may soon make possible the development of ethnic bioweapons that target specific ethnic or racial groups based upon genetic markers (Appel, 2009). Cambridge University's Centre for the Study of Existential Risk (CSER) says that world governments have failed when it comes to preparing against threats like futuristic bioweapons powered by Artificial Intelligence (AI) and genetic manipulation. Such weapons would have the power to target specific DNA, and kill certain races of people leaving other swaths of the population unharmed (Muanya, 2019).

At this stage there is no genetic Māori marker for human beings. The likelihood that Māori as a human race could be targeted could be a possibility in the future based on the mixed ethnic population forecasts by StatsNZ.

7.5 Guthrie Cards Public Health Bill 177-1 (2007)

Since 1969 most babies born in New Zealand have a blood sample taken shortly within 48 hours of birth for the purposes of certain screening tests. (Thomas, 2004). Of the 55,000 babies tested each year, around 30 to 35 are found to be positive (after retests to make sure) for one or other of the conditions tested for (Privacy Commissioner, 2003). These metabolic tests are also known as the 'heel prick', 'Guthrie' or 'PKU' test. The test cards are analysed by the National Testing Centre, a division of Auckland Healthcare.

In 1986 it was discovered that approximately 200,000 Guthrie cards were damaged by water. The damaged cards equated to about 50% of the cards. The Auckland District Health Board do not know when the damage occurred. It was only due to shifting the cards from the attic of The Auckland University School of Medicine to the Wallace Block at Auckland Hospital that it was discovered. There are no records of whose cards were damaged, but all damaged cards were incinerated (Auckland District Health Board, 2019).

There is no fully informed disclosure, but parents or the child when they are an adult may have the card returned by request. There are no forms provided at the time of the heel prick, nor is there any mandated requirement to advise parents that they card can be requested back. In order to request a sample back, the form must be downloaded from the Internet. This discriminates against Māori households who are statistically less likely to be connected to the Internet (Figuracion, 2015).

In 2011 the New Zealand government decided that all Guthrie cards should be kept indefinitely (New Zealand Government, 2011). Since 1993, a National Health Index number (NHI number) that is a unique identifier that is assigned to every person who uses health and disability support services in New Zealand was also recorded with the Guthrie card. NHI information includes: Surname, first name, Gender, Date of Birth, Place of Birth, Birth Weight, Gestation age, Sample collection date, feeding (breast or formula), mothers' surname, mothers first name and lead maternity's details.

The Guthrie cards are accessible by external government agencies. The Privacy Commissioner reported in 2003 that the Guthrie card blood sample can be used by the New Zealand Police with an order from the High Court to access DNA in criminal cases. In some cases, the Police have done so without permission or notifying their whānau or the individual.

Since 1995 to 2019 there were a total of 31 requests made for Guthrie cards.

The requesting agencies are made up of:

- 23 requests from the New Zealand Police
- 2 requests from the Coroner
- 3 requests from the New Zealand Courts
- 1 request from the Otago University Very Low Birth Weight Babies research
- 1 request from Starship Children's Hospital: VLCADD report Analyte study
- 1 request from Auckland University: Growing up in NZ Vitamin D Study.

In 2003 a High Court order required the National Testing Centre to produce the Guthrie Card for a child whose mother would not cooperate in a paternity test procedure demanded by a man who claims to be the child's father (S v T [2003] NZFLR 223) (Privacy Commissioner, 2003)

Another High Court case, this time using a deceased child's Guthrie card as cited in the Privacy Commissioners article "Guthrie Test Samples: Is the Problem Solved?" (Privacy Commissioner, 2003);

"In the High Court Case H v G (unreported High Court, Auckland, Salmon J 14 May 1999 M.1868/98), a putative father sought to disprove paternity of a deceased child by way of DNA testing of the Guthrie Card sample. The putative father relied on Rule 322 of the High Court Rules which provides for the making of orders for the inspection of 'property'. The Rule provides: (3) In this rule 'property' includes any land and any document or other chattel, whether in the ownership, possession, custody, or power of a party or not. Salmon J stated (unreported High Court, Auckland, Salmon J 14 May 1999 M.1868/98 at p.5): 'I have no doubt that the samples come within the very wide definition of property contained in the Rule and I find accordingly'. Whilst acknowledging the applicability of the Privacy Act and the Health Information Code to the situation, Salmon J held that although the samples were taken for a specific purpose, they would be permitted to be used for a purpose clearly not contemplated at the time they were taken. He held that the man had a legitimate interest in knowing whether he was the father of a living child and this could be extended to cover a deceased child, so that the man could have certainty on the issue and be able to grieve properly. Such interests were allowed to override the objections of the mother. The High Court upheld this decision on appeal" (H v G (2000)18 FRNZ 572).

Guthrie cards could be used to generate high-quality DNA methylomes. Researchers have proven that high-quality DNA methylomes from Guthrie cards are able to be retrieved and sequenced (Beyan et al., 2012). Recently there has been much discussion about the possibility of using dried blood spots on Guthrie cards as a source of DNA for research or testing purposes (McCabe, 1991). "The collections of Guthrie cards stored state new born screening laboratories can thus be viewed as inchoate "DNA banks" (McEwen & Reilly, 1994). In 2018, The New Zealand Law Commission in its public consultation "The Use of DNA in Criminal Investigations" raised the possibility that legislation could be used to access the Guthrie's Cards and extract DNA for a national criminal DNA database. This poses a real risk to Māori based on the Law Commissions noted bias against Māori.

New legislation is required to ensure that every donor who identifies as being of Māori descent of a Guthrie card is fully informed of the privacy and cultural risks that are caused by their genetic data being stored on the cards. Donors should be provided information about their privacy and information about how to request their samples to be returned. A paper form should be provided to at least the mother of the new born at the time of the test. This will ensure whānau with no Internet access and modern-day equipment can ask for the card to be returned. It should not be assumed that if the cards are not requested that they are abandoned.

Whānau, hapū and Iwi should be made aware of these issues and encouraged to seek their samples back so that they may be disposed of in culturally safe and appropriate ways. This will ensure that the wairua and mauri of the people will be protected and at peace. By allowing the samples to remain in storage will cause spiritual harm to the person and creates a future risk that the samples will be used for other initiatives if Parliament change the current laws.

The samples that remain in storage should have the Māori samples separated and stored in a culturally appropriate manner with restrictive access as with Māori samples in a bio bank. Any samples of the dead should be removed from storage and offered back to the whānau of the deceased, or the card should be destroyed in a culturally appropriate manner should the whānau not want the sample returned. A Treaty of Waitangi clause and recognition of the United Nations Declaration of Indigenous Peoples is required in a review of the Bill to ensure that the genetic data stored on the Guthrie cards are recognised and treated as taonga.

7.6 Summary

More so now than ever before, a Māori voice and recognition of Māori inalienable rights to Māori genetic data is required. Technology is advancing so rapidly and automating tasks and providing answers to questions that are currently on speculated, that it could enhance human racial biases and concentrate on the more dominant and represented population.

Technology from a customary Māori perspective will create a number of new ethical dilemmas about whakapapa and increasingly our taonga genetic data could be used to profile all individuals and for researchers to seek out new drugs and new weapons which may be used against minorities such as Māori.

The need to identify and protect Māori interests in genetic and genomic research is at a critical juncture in our lifetime, that we can no longer be complacent. Legislation and academic protections are due now and the need to further protect Māori genetic data against future technologies is upon us.

There are significant economic and social benefits for Māori if Māori genetic data is recognised as a taonga and protected as such. Māori could become world leaders in genetic research and ensure that future Māori generations are safe guarded and capitalise further from future bio technologies.

CHAPTER EIGHT: CONCLUSION



Figure 45 Chapter Eight

8.1 Māori Peoples, Whānau, Hapū and Iwi Sovereignty Issues

"Until we are our own owners, we are denying the rangatiratanga that our $t\bar{u}puna$ placed upon us to protect or recover" (O'Regan, 2001).

The *whakatauakī* relates directly to Māori genetic data and the research findings and recommendations of this thesis. It serves as a reminder that Māori of this current generation have moral obligations and rights imposed upon them by the connectivity of *whakapapa*, that connects them to all Taonga Species, as I have argued in the previous chapters. It is also a reminder that Māori recognise human beings as the younger siblings of all non-human Taonga Species and that Māori Peoples, *whānau*, *hapū* and *iwi* are the *kaitiaki* of all Taonga Species – human and non-human. Genetic Māori data contains mauri and wairua that is inherited from our *tīpuna* who inherited it from their *tīpuna* connected to the continuum of *Atua* who created each Taonga Species who genealogically connect directly to Ranginui and Papatūānuku encapsulated in the continuum of the Māori spirit world.

The *whakataukī* also relates to how technology has evolved, that a Taonga Species genome can be sequenced and how the full *whakapapa* can be viewed, analysed in intimate ways we never thought possible, sold, modified, mixed with other species, shared, and manipulated in unknown ways. It tells us that it is this generations role to protect the inalienable rights and to stop the exploitation of Māori genetic data. Moreover, it is this generations responsibility to claim ownership of *taonga* genetic Māori data, as the current *kaitiaki* to protect and to ensure the integrity, purpose and the autonomy of Māori data is an ongoing progressive dialogue to connect the past, present and future generations. In the current regime, all Taonga species are vulnerable to DNA ownership and exploitation by non-Māori.

In a Eurocentric perspective, genetic data is considered to be simply body fluids: this research has identified and argued that Māori genetic data is as significant as a living family member, as *whenua*, water, and the natural environment. Māori cannot be Māori without their genetic data of all Taonga Species being protected and treated as Taonga in a *tikanga* safe environment.

All physical bodies of deceased Taonga Species were at some stage a living *wakahuia*. The *taonga* inside was and still is a living and evolving *whakapapa* in the form of genetic Māori data. Despite the Eurocentric perspective that dead species have no rights, Māori do not differentiate between the living and the dead but recognise the ongoing different dimensions and spirituality that the western world does not. "The Māori perception of the past is not the same as that held by *Pākehā*, our ancestors whom we continue to communicate with, regardless of whether they died yesterday, last year, or a decade ago" (Tau, 2001, p. 62).

CHAPTER EIGHT: CONCLUSION

The world has recently entered a significant science and technology (r)evolution where biotechnology will, often without consent, indiscreetly and discreetly, forcibly penetrate and impact significantly a direct role in all aspects of every individual's life. The once secluded and exclusively private to each individual species DNA has now been exposed and commercialised making all species vulnerable. Researchers, national and international, commercial entities, governments, and individuals are all seeking ways to extract DNA and sequence genomes for educational, research, power, authority, profiling, warfare, and commercial gains in what is currently an unregulated area. Corporate conglomerates already have exclusive access to many Taonga Species genetic data, including human being's DNA that is often unwittingly volunteered to companies who then research, analyse, create drugs from, experiment with, trade and sell, often in a legally protected manner that Māori have no legal right to access or lay claim to their own whakapapa, nor to any benefits from the commercialisation of their *whakapapa*.

Māori must become significant decision makers and voices in the Legal, Science and Technology industries now and continue to do so to further protect Māori genetic data from future unknown risks and benefits to ensure that the environments maintain *tikanga* sovereignty. The need to continue to build creative collaborations and partnerships with our knowledge communities, *whānau*, *hapū*, *iwi*, *marae* and *whenua* is essential to realise this potential.

8.2 Cultural & Inalienable Rights

Without proper recognition of the inalienable rights of Māori genetic data, Māori Peoples, *whānau, hapū* and *Iwi* risk further confiscation, abuse, illegal and immoral sales and transfers to non-Māori of their *taonga* - genetic Māori data to non-Māori who will continue to nurture and research Māori genetic *taonga* to profile, exploit and make profits while charging Māori a fee for the right to access the benefits in the same manner as has occurred with land, oceans and other natural environmental taonga.

In the future the Crown could face the challenge of repatriation of Māori genetic data from the unregulated incidents that are occurring now. In a similar manner that Māori lost land and other possessions and were left with only colonised and damaged land and other damaged natural resources, that each generation has a responsibility to heal. For Māori Peoples, *whānau*, *hapū* and *iwi* to prosper and heal from colonisation, they must have their inalienable rights to genetic Māori data recognised and protected.

The lack of recognition of inalienable rights and bio piracy of Māori genetic data has caused lasting damage to Māori Peoples, *whānau*, *hapū* and *iwi*, *mana*, character, and reputation must be restored. Any Māori descendants who have had their DNA forcefully or voluntarily taken by the New Zealand government or provided to a DNA consumer testing company or other third party could face suffering deep hurt, shame, and stigma as a result once it becomes obvious of the intergenerational consequences of their whānau, hapū and iwi whakapapa being exploited and commercialised.

To protect Māori and their genetic data from the past, present and future, it is essential that respectful and *mana* enhancing discussions with the Crown should begin to seek a culturally appropriate definition of Taonga Species and then for the recognition of Māori Peoples, *whānau*, *hapū* and *lwi* inalienable rights to their *taonga* – Genetic Data of Taonga Species to be recognised and how an intergenerational positive and mutual partnerships can occur between both parties.

8.3 Strengthen Connections to Whānau, Hapū, Iwi, Local and National Stakeholders to Gain Benefits

The priority for Genetic Māori Data is to strengthen Māori Peoples, *whānau*, *hapū* and *Iwi* as world class researchers by growing informed knowledge sharing strategies. It should be a priority to nurture, recruit, and grow more *whānau*, *hapū*, *iwi* scholars who are acknowledged leaders in bio-technology and other technical technologies that impact our genetic Māori Data.

Māori cannot ignore their inalienable rights to Māori genetic data, otherwise the status quo of non-Māori researchers taking *mātauranga Māori* without the proper understanding of spiritual realms and our intimate connections to the natural environment will continue to derogate. This is an opportunity for Māori to be world class researchers in biological sciences while also acting as *kaitiaki* of Taonga Species. The potential to share knowledge resources with other Indigenous People and to claim Intellectual Property rights to Māori Genetic data that can be used in medicinal products, food crops and many other issues that impact the world could provide a substantial increase to Iwi and Māori economy.

Māori Genetic Data contains within it, invaluable knowledge that if it is protected in a *tikanga* environment, can cultivate vitality and communication, and strengthen Māori essence while also enriching Māori identity, personality, and distinctiveness to reveal essential connecting expressions with resonance and cadence and building Māori excellence, wisdom, and resilience.

When Māori genetic data knowledge is transferred back to a *tikanga* safe environment, our *taonga* will restore the connectivity of historical and contemporary epistemological Māori knowledge, to transmit and define refreshed attitude to understanding, experience, inquiry, and enlightenment. Māori genetic data will promote a pathway to environment circumstances knowledge guardianship and create capability & confidence to support career aspirations within the bio sciences and data industries.

Māori genetic data knowledge creativity validates past *Te Ao Māori* genetic data theory, academic pathways to gain higher qualifications and produces new critical Māori knowledge epistemologies, pedagogy, and sovereignty. It will continue to build relevant and effective new Māori genetic data research projects, scholarships, aspirations while strengthening and reinforcing Māori genetic data knowledge resilience, capability, and aesthetics (Black, 2014).

Māori genetic data knowledge reclamation will restore the character, *mana*, reputation embedded knowledge of Māori genetic data scholarship and unlock multiple pathways to knowledge coherence and scholarship and strengthen scholarship acquisition competencies to support career opportunities.
8.4 International Stakeholders to Gain Benefits

This thesis has exposed the global issue that other Indigenous Peoples share with Māori about access, security, relationships, and preservation of their own genetic resources that are being exploited and ignored by governments, researchers, and commercial entities around the world. The issues can no longer be considered on an Indigenous Peoples by Indigenous Peoples, nation by nation issue as the cultural, Intellectual Property Rights and bio piracy is occurring at exponentially fast rates and with intergenerational significance and trauma for all Indigenous Peoples. This research has further identified that Indigenous People are working in silos, in isolation from each other trying to seek their own sovereignty to their genetic data with limited success in some instances.

The recommendations chapter from this thesis provides an opportunity for global Indigenous Peoples to cooperate with each other and to share traditional knowledge and implement ways in a collaborative manner to regain the inalienable rights and sovereignty of all Indigenous Peoples and to establish international academies of excellence for the protection, sharing of knowledge and development of Indigenous genetic data as a resource of cultural significance lead by New Zealand Māori.

Māori and the Crown are in a unique position of working together to recognise traditional rights to genetic resources both in national and international instruments and to lead the rest of the world to better recognise human rights obligations to Indigenous Peoples and to rectify past wrongs and to empower Indigenous Peoples.

The direction and strength of *whakapapa* relevance to Māori are the Indigenous Peoples of Pacific Island descent and the non-human Native and Indigenous species, whether living, dead or deceased. The fact that originating waka to New Zealand travelled from the Pacific islands as descendants and visitors to settle in New Zealand. New Zealand Māori share direct whakapapa and traditional knowledge with these islands, their species, and their whenua. In particular for the Crown is a unique opportunity to realise their UNESCO obligations with its Pacific Islands neighbours whom many have independently created standalone treaties to combat bio piracy and to protect their cultural inheritance. It is an opportunity for New Zealand to create an Indigenous collaboration – partnership and treaties to protect other Indigenous Peoples and their inalienable rights to their sacred and intergenerational resources of genetic data.

8.5 Research, Teaching & Learning to Ensure Exceptional Teaching & Learning Experience

Māori genetic data is a living literary form connected to Māori and world Indigenous Knowledge with an abundance knowledge to retrieve identity of place, personality and history, to foster diverse connectivity of Māori genetic data to awaken teaching and learning passion; a vision for career opportunities and future study (Black et al., 2014).

The need to nurture and build a sustainable centre of genetic excellence defining areas of research specialisation, interconnected platforms of knowledge is absolutely necessary. Māori need to implement a *whānau*, *hapū*, *iwi* genetic research strategy which focuses on academic leadership, kaitiakitanga and being key players in the local, national, and global markets as essential players.

Genetic Māori Data will grow *whānau*, *hapū* and *iwi* research communities and will be a major contributor to advance critical Māori scholarship as the voice of Genetic Māori Data is a forward-thinking investment strategy as it is about heritage, life aspirations, a life philosophy. Once genomes of Taonga Species have been sequenced Māori will have the potential ability to invest in new mātauranga Māori with the genetic data that will be used for a range of investment strategies in individuals, whānau, hapū, Iwi and Māori organisations. New partnerships with researchers will unfold unlimited benefits to everyone while supporting Māori spiritual and physical wellbeing.

A critical thinking Māori world view to support Māori Peoples, *whānau*, *hapū* and *iwi* knowledge acquisition, vision will sustain, keep alive values of traditions, customs, and wisdom and will be a teaching and learning tool of research relevance, evidence-based processes. It is a *whānau*, *hapū*, *iwi kōrero tuku iho*, inter-generational process of sharing and empowerment. The potential to unlock our own histories and science lays within Māori genetic data. Māori will not have to wait for Eurocentric science to catch up and verify Māori science and mātauranga Māori. When Māori genetic data are recognised as an inalienable right of Māori, Māori will then own and control those values, traditions, customs, and wisdom that is within our Māori genetic data.

Genetic Māori Data is a continuous learning investment tool to improve both Māori individuals and whānau, hapū and Iwi. Within our Māori genetic data is the makeup of who we are as individuals, *whānau*, *hapū* and *Iwi*. The knowledge within our non-human Taonga Species will allow for better sustainability and protection of all of the natural environment. Similar to the way Māori pre-colonisation protected and nurtured the environment, modern day sciences can unlock the long forgotten mātauranga Māori from genetic data allowing Māori to once again be the kaitiaki of Ranginui and Papatūānuku and all of their children.

The opportunities gained from Māori genetic data ownership will lead to an increase in Māori scholars and Māori employment opportunities. This in turn will improve social and cultural opportunities. The skills acquired by investing in people and not partnering with international conglomerates is that the people will directly benefit and will have new skills in an emerging technology that is being used all over the world.

8.6 Government Legislation & Policy

This thesis has identified a number of government policies and legislation that does not include or recognise the rights of Māori to protect their inalienable rights to their taonga genetic Māori Data. There is a need for Māori to work with the Crown in *mana* enhancing partnerships to discuss this new and reclaimed knowledge and the obligations guaranteed to Māori Peoples, in Te Tiriti, He Whakaputanga and The United Nations Declaration on the Rights of Indigenous Peoples, all of which guarantee Māori Peoples the right to govern and to protect their *taonga* - Genetic Māori Data, from biological piracy, Intellectual Property Rights offences, spiritual, cognitive and physical harm from the exploitation by governments and researchers and for the recognition of traditional Māori values and tikanga associated with Māori Genetic Data.

It is the default of the successive New Zealand governments to refer back to the WAI 262 recommendations from 2001, yet society has evolved significantly since then in terms of science, technology, and New Zealand's general acceptance of Māori values. Findings from this research have exposed some of those outdated recommendations and decisions and shown how some *iwi* will likely be disadvantaged due to loss of cultural displaced knowledge. Many of the statements from Ko Aotearoa Tēnei Report's now need to be reviewed using new and modified consulting and engagement methods with stakeholders who did not exist in 2001 and it must be remembered that the Tohunga who made the original claim and their whakapapa of knowledge have also gone.

A review of all legislation, bills, and policies that impact on Māori genetic data of Taonga Species is required to be undertaken in partnership with Māori Peoples, whānau, hapū, iwi and Māori organisations to protect Taonga Species genetic data from further intended and unintended exploitation by for profits, researchers, and the Crown, to protect the cognitive, spiritual, economic, physical intergenerational harm that is caused by the unregulated market of Māori genetic data.

Ka mutu.

ENDNOTES

CHAPTER ONE

APPENDICIES

Appendix A: Introduced Taonga Species Appendix B: Class 4 Atua relating to Taonga Species. Appendix C: Atua of the human body Appendix D: Indigenous Declarations

Appendix A: Introduced Taonga Species

These species described were brought to New Zealand by the original waka to New Zealand over at least three settlement periods.

The waka names are: Aotea, Aotearoa, Arahura, Āraiteuru, Arautauta, Te Arawa, Hīnakipākauo-te-rupe, Horouta, Kahutara, Kāraerae, Kurahaupō, Mahangaatuamatua, Māhuhu-ki-terangi, Mānuka, Māmari, Mataatua, Matahourua, Moekākara, Motumotuahi, Ngātokimatawhaorua, Nuku-tai-memeha, Nukutere, Ōkoki, Ōtūrereao, Pangatoru, Riukākara, Ruakaramea, Tahatuna, Taikōria, Tainui, Tākitimu, Tauira, Tāwhirirangi, Te Aratāwhao, Te Hoiere, Te Kōhatuwhenua, Te Paepae-ki-Rarotonga, Te Rangimātoru, Te Rangiuamutu (also Tairea), Te Rīrino, Te Waka a Māui, Te Wakaringaringa, Te Wakatūwhenua, Tinana (also Te Māmaru), Tokomaru, Tohora, Tōtara-i-kāria, Tūnui-ā-rangi, Tūwhenua, Uruaokapuarangi (also Uruao), Waipapa (Buck, 1949).

Māori Name	English and Latin	Whakapapa
Kiore is the common name. Williams also lists Hāmua, Hinamoki, Inamoki, Kiore tuapuku, Matapo, Moke, Rūrūwai, Tokoroa(H. W. Williams, 1975). Elsdon Best adds to the list: Mohorangi (East Coast), Muritai, Pouhawaiki, kiore tawai (Whanganui), kiore kai tawai , kiore mohunu (Whanganui), uhina, koka, Pouhakaiki or Pou-o- hawaiki (Best, 1942)	Rat <i>Rattus exulans</i>	Kiore were brought here by the Aotea waka, then on another waka. Hine-mataiti who gave birth to the Kiore (Best, 1942). Another account states that Māui-pōtiki took on the form of the harrier hawk, the New Zealand falcon, the morepork, the kea, the bat, the rat, the pigeon, and the worm; until he was finally killed by Hine- nui-te-pō in her house at Pōtaka-rongorongo. The Ngātiwai tribe consider themselves guardians of the kiore. They believe there are cultural and historical reasons that the rats should survive (Bradford, 2008).
Kuri is the common name. Also lists Kuri Māori, Kuri ruarangi, Kuri mohorangi, Mohorangi (H. W. Williams, 1975)	Māori Dog, Polynesian Dog, <i>Canis lupus</i> familiaris	The Deity of kurī is Irawaru, Māui's brother-in- law. Kupe brought dogs with him to New Zealand: Moekahu is a female god in the shape of a kuri. Like the wairua of deceased people, dogs that had died also to go to Te Rēinga, but travell a different path from that of humans. The Mohorangi variety of dogs were brought on the Mangarara waka under the command of Wheketoro (Buck, 1949)
Kuru	Breadfruit Artocarpus incisa	The Māori has preserved the name of the breadfruit (kuru) in song and story, but has forgotten the particulars concerning it (. Best, 1930) Hinewai—a woman of the Ngati-Uenuku-kopako tribe—for Te Arakau, her grandson, who was killed at Ohinemutu, Rotorua wrote a lament speaking of the Kuru. The lament states Tama-te-Kapua had to leave his homeland due to

		the theft by his brother Whakaturia and himself
		of the Kuru belonging to the high Chief Uenuku
		(Cowan, 1910).
Hue is the common name	Gourd calabash	Pū-te-hue, the son of Tane Mahuta is the Deity
(H W Williams & New	Lagenaria siceraria	of the gourd. Matatua apply the name of hue to
Zoolond Advisory	Lugenana sicerana	a constellation of four stars called Di a wai
Committee on the		a constenation of four stars called Pra-wai,
Tooshing of the Magni		possibly of account of its form Devry honor it
1002) also liabo Association,		252). The gourd emanated from Rauru; hence it
1992)also lists: Arero-uru,		is le ika roa a Rauru. On the death of Rauru it
Whakahaumatua, Ikaroa,		was allowed to become prostrate and to spread
Hue kaatu (Ngati Pporou),		out; and it was also then eaten." In the old
Hue kiato, Kõkakoware,		legend concerning Maia-poroaki of the East Cape
Mānukaroa, Omoomo,		district, Maia is said to have, by pressure and
Pahaua, Paretarakihi,		other means, caused gourds to assume different
Pūau, Pūtēhue, Uma,		forms, to each of which was assigned a
Upokotaipū, Upokotaupō,		distinctive name (Best, 1925, p. 255). The Tainui
Upokotaipu, wenewene,		waka brought the Hue/Gourd and it was planted
Whāngai-rangatira,		without success by Whakaotirangi (Buck, 1949,
Wharehinu (H. W.		p. 62). Another story shows the introduction of
Williams, 1975). Elsdon		the Hue in this thanksgiving before food. This
Best adds to the list:		karakia suggests that the Hue came from Mata-
Pahawa, Pahaua, Pare-		te-Ra. Aena te uru, ka uru, there is the head that
tarakihi – a large form of		is forming, Tena te toro, ka toro. There is the
Gourd, Rorerore,		spreading, advancing, Ka toro ki hea? Advancing
Whangai-rangatira, Kiato		to where? Ka toro ki Wae-roti, ki Wae-rota,
used for water vessels,		Extending to Wae-roti, to Wae-rota, Ki te
Puau used as a food vessel		tupuranga mai o te hue, To the place where
Wairarapa district, Tatara		sprung the hue, He hue nunui, hue roroa; 'Tis a
used as a food vessel		large hue, a long hue; Tapa hue, tapa tetere i a
Wairarapa district, Ikaroa		hue, Plant the hue, that the hue may swell, Kia
(Ngati-Awa and Tuhoe).		whawhakia ra te kawekawe, then pluck off the
Kokako-ware (Ngati-Awa		tendrils. O Puta-i-te-Hue. Of Puta-i-te-Hue (
and Tuhoe). Manuka-roa		Smith. 1896).
used in making bowls for		
which purpose they were		
cut in half (Ngati-Awa and		
(Ngati-Awa and Tuboe)		
Whakabua-mātua used		
for the large vessels styled		
tahā huahua (Nosti-Awa		
and Tuhoo) Wharehinu		
(Ngati-Awa and Tuboe) To		
live roa a Pauru Lina		
kotuku rangi a gourd with		
a curved stem and Du		
a curveu stern enu, Pu-		
matao a gourd with a big		

base and narrowing toward the stem. Tawake piri a round form, Ponotinoti a diminutive form, Te Karure a diminutive form. Hue kautu was applied to gourds that grew in an upright position, Hue kaupeka denoted a gourd that decreased in size at the stem end (East Coast). Page 245 (Best, 1925).		
Aute	Paper-Mulberry, Broussonetia papyrifera.	The Tainui waka brought the Aute-Paper Mulberry and it was planted with success by Whakaotirangi (Buck, 1949, p. 63).
Karaka is the common name. Buck and Williams also lists Karaka ōturu and Karaka huarua as dwarf varieties found in Patea (Buck, 1949);(H. W. Williams, 1975)	Corynocarpus laevigatus	
Кōрī	Corynocarpus laevigata	The introduction of this Indigenous plant to the Kermadecs and Chatham islands, is generally conceded to Turi of the Aotea where traditional knowledge states he planted them in Patea (Buck, 1949, p. 63).
Paratawhiti	Maritta fraxinea	The Aotea waka likely introduced this species (Buck, 1949, p. 6).
Paraa		Was brought by the Tainui waka and probably the same as the Paratawhiti.
Perei	Gastrodia Cunninghammi and Orthoceras strictuum.	The Aotea waka likely introduced this species (Buck, 1949, p. 6).
Pukeko/Pakura	Swamp Hen Porphyrio melanotus	Was brought by the Aotea and called the Pakura on the Horouta waka (Buck, 1949, p. 63).

Kakariki	Parakeet	Was brought by the Aotea waka
	Cyanoramphus	
	novaezelandiae	
Kūmara is the common	Ipomoea batatas.	A staple of the Māori diet. The deity of Kumara is
name. Also known as:	,	Rongomaraeroa the son of Tane Mahuta. Ko
Akakura. Anurangi.		Rongo-maraeroa te putake o te kai, o nga hua o
Anutai Anutipoki		te whenua." Rongomaraeroa was the origin of
Anutinoki Aorangi		food of the fruits of the (Best 1925)
Arikaka Hakinono Hamo		
Hāwere Hinamoremore		The Horouta waka brought the Bongomaraeroa
Hitara Home Hujunoko		variety of kumara (Buck 1949 n 63) The Aotea
Hutibuti Harikaka Kaeto		brought 9 varieties in the double belt of
Kabutoto Kaibaka		Bongorongo bence the bonorific name given to
Kailakā, Kailaka,		the kumara in the Actea area was Tatua o
Kaikaka, Kaipo,		Rongorongo - Belt of Rongorongo One tuber was
kakau Kanawa aro said to		used as a ritual offering for the hirth of Turi's con
have been the first		Tutawa Whanaumoana, who was horn at sea
variation introduced		The eight remaining tubers of the Kakau variety
Kanobi nāus Kaoto		wore planted in the cultivation names
katokato Katoto Kauto		Hekehekeinana at Patea (Puck 1040 n 62) The
Katokato, Katoto, Kauto,		Tainui brought the Anurangi variety of Kumara
Kautowilai, Kawakawa,		which the chieftainess Whakagtirangi tied to the
		corport of a small backet. Honce, in the Tainui
Kawau, Kawau, Kengo,		correction of a sinal basket. Hence, in the failur
Klokiorangi, Kirikaraka,		area the kulliara was known as the honornic
Konobu tai		Mahakaatirangi (Buck 1040 n 62) Ta Arawa
Копепи-са, корака,		whakaourangi (Buck, 1949, p. 63). Te Arawa
Kopuangaanga,		records landing at whangapararoa where the
Korenerene, Kura,		kumara were planted on the cliffs (Buck, 1949, p.
Kurarangi, Makakauri,		6).
Makatiti, Makururangi,		
Makutu, Manakauri ,		East Coast different varieties of kumara were
Mangatawhiti,		fetched from Hawaiki in the canoe Horouta
Mangatawhiti (generic		under the direction of Kahukura (Best, 1930).
term), Maomao, Maori,		
Mapua, Maramawhiti,		
Matakauri (dark blue in		
colour), Matatu,		
Matawaiwai, Maukura,		
Mengerangi, Moī,		
Mōnenehu, Nehutai,		
Ngākau-kurī, Ngako-moa,		
Nonomea, Nonouri, Paea,		
Paihau kākā, Panahi, Pane,		
Pāpāhaoa, Papahuia,		
Parakaraka, Parawaipuke,		
Paretaua, Pātea, Pātōtara,		
Pāuārangi , Pāuātaha,		

Dobu Dībā Dio Dīpiko	
kaubangaraa	
Raunangaroa,	
Ponutukawa, Pokerekanu,	
Pokerekahua, Pongi,	
Poranga, Pounamu,	
Puatahoe, Punuiarata,	
Purata, Pūwhatawhata,	
Rangiora, Raumānawa,	
Raumataki, Tānehurangi,	
Taputini, Taratamata,	
Tārehurangi, Tātairongo,	
Taurāpunga, Tēterereia,	
Toikahihatea, Tokoū,	
Toroamahoe,	
Torowhenua, Tūkau,	
Tūkou, Tūtae-tara,	
Tūtanga, Ururangi, Waihā,	
Waniwani, Weni,	
Whakahoro, Whakakumu,	
Wini (H. W. Williams,	
1975).	
Elsdon Best adds to the	
list:	
Ihupuku.Kakahoroa.Kakan	
o-tonga Kaka-	
tarahae Kakaunaturi Kana	
ta Kautowhau Konehu Kor	
ebe Kotinu Kowhai Kuraw	
akaneki Makakauere (dark	
blue in colour) Makawe	
Mākutu (said by Ngati	
Parau to flower) Marara	
Maio Manahu Manahu	
Noneriu, Moneriu-	
rangi, Ngakau-kuri,	
Nurangi. A Taranaki	
variety (called also	
Tokoke), Pakua, Panatana	
(has reddish	
Tiesn), Papania, Papapa-	
neeke (Ngati Porou),	
Parea, Puangana, Rau-	
tainui a, Toenga a tahi,	
Toi-kahikatea, Toitoi	
(Best, 1925)	

Taro is the common name.	Colocasia esulenta	
(Williams, 1957) also lists:		
Akarewa, Awanga,		
Hanina, Haukopa,		
Kahuorangi, Kahuōrangi,		
Kākātarahae, Kauere,		
Kinakina. Kōareare.		
Kohuhurangi.		
Kohukohurangi.		
Kohuorangi, Kohurangi,		
Kohurangi Kōkohurangi		
Makatiti Mamaku Māori		
Matatiti Ngāuo		
Dagangaanga Dakayo		
Paeangaanga, Pakaue,		
Patal, Penu, Pongi,		
Potango, Rau o Mauri,		
Takatakapo, Tanae, Taro		
hoia, l'autaumahei,		
Tokotokohau, Turitaka,		
Tutahi-ki-runga,		
Upokotiketike,		
Wairuaārangi,		
Whakahekerangi,		
Whakatauare. Elsdon Best		
adds to this list: Ipurangi,		
Kakatupari, Kaokao-		
paraoa ,		
Kaunaunga,Keakea,		
Kiekie, Maehe, Maire,		
Manuwenua, Ngongoro,		
Pongo, Tangae, Taropo,		
Uhikoko, Uhiraurenga,		
Wakahekerangi,		
Wakarewa, (239: (Best,		
1925)		
Tīpore	Pacific cabbage tree	
	Cordyline fruticose	
Whikaho is the common	Yam Dioscoreg spp	The Mahuhu waka brought the Uhi-kaho variety
name. (Williams, 1992)		of Yam (Buck, 1949, p. 62).
also lists: Ngangarangi		
Pounamu Ilwhi Ilhi		
Llwhikābo Elsdon Best		
states two Ngāti Porou		
Names I whi kumara and		
India pararaka (Past		
1772)	1	

APPENDICIES

Appendix B: Class 4 Atua Relating to Taonga Species

Ahirangi and Mata-Kupenga atua of spiders (Roberts, 2013)

Aka-kura, a child (kumara) of Pani (Best, 1972, p. 289).

Anuhe caterpillar took its bright markings from the Mackerel fish (Best, 1972, p. 994).

Anuhu (caterpillar) son of Whanui (star) who Whanui told to attack the Kumara (Best, 1972, p. 832).

Anurangi, a child (kumara) of Pani (Best, 1972, p. 289).

Elephant fish A goddess called Te maro o Hine te iwaiwa. A cousin of Māui's Wind aunties (Tikao & Beattie, 1939, pp. 38-39).

Haere-awaawa (Go through hollows) deity of Weka (Orbell, 1995, p. 33).

Haumia Atua of the medicinal property of Ti Kouka (Roberts, 2013)

Haumia of fern root (Orbell, 1995, p. 41).

Hinamoki is the father of native rats on the West Coast of North Island.

Hine Kaikomako the deity of the Kaikomako tree (Pennantia corymbose) (Best, 1972, p. 795).

Hine Karoro (child of Ra the sun god), deity of sea gulls (Best, 1972, p. 789).

Hine Mata-iti, (Pani the mother of Kumara) mother of kiore (Best, 1972, p. 831).

Hine Ruru deity of Owls (MorePork) (Orbell, 1995, p. 63).

Hine Tara (child of Ra the sun god), deity of sea tern (Best, 1972, p. 789).

Hine-mahanga origin of the Tutu (Best, 1972, p. 765).

Hine-mataiti is the mother of the native rats in the East Coast of the North Island (Orbell, 1995).

Hine-moana deity of seaweed that shelter fish (Orbell, 1995, p. 86).

Hine-rau-whārangi the deity of plant development and fertility (Orbell, 1995, p. 60).

Hine-te-waiwai. Ko te rangiura a Hine-te-waiwai. The red bark of Hine-te-waiwai. An honorific term for Tōtara bark used to store preserved Kūmara (Smith, 1914, p. 67).

Hinewaoriki is the Maid-of-small-forests. She gave birth to twins in the form of the Kahika and Matai trees (Buck, 1949, p. 450)

Huna origin of the Harakeke (Best, 1972, p. 765).

Hunga (son of Rangi and Papa) is the father of lice in Ngāti Porou (Orbell, 1995, p. 144).

Hurumanu of sea birds (Orbell, 1995, p. 33).

Ika-tere (son of Tangaroa) is the father of fish (Orbell, 1995, p. 144).

Authored by Karaitiana N Taiuru

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Irawaru deity of dogs (Orbell, 1995, p. 76).

Kaiwaiwaru Tutelary god of all feathered creatures (Tikao & Beattie, 1939, p. 42).

Kakaho origin of the Toetoe (Best, 1972, p. 765).

Kakapo . The kakapo skins were of high value in Māori society. A party of young Ngai Tahu chiefs known as Wharaunga puraho nui, the sons of prominent Ngai Tahu chiefs who were brought up in the North by their Kahungunu family in their desire for more Kakapo skins, approached the mountain Whataarama, each chief claimed a peak of the range for themselves so they could acquire Kakapap. Moki, upon claiming a peak stated "That is mine, so that my daughter Te Ao Tukia may possess a kilt of Kakapo skins to make her fragrant and beautiful. Tane Tiki stated "Mine, that the Kakapo skins may make a kilt for my daughter Hine Mihi. Hikatutae stated "Mine, that the Kakapo skins may make a girdle for my daughter Kaiata. Another member of the party called Moki, with the assistance of his slave who climbed a tree to seek the best spot for Kakapo stated, "My mountain Kura Tawhiti, Ours!". Descendants of Moki have enjoyed rights to the Kakapo there ever since. (Stack, 1996)

Kāore e ārikarika te tama a Tūmataika e rere nei! What a flock of the children of Tūmataika are flying yonder. Tūmataika is the progenitor of Kākā Brown Parrot (Best, 1909, p. 257); (Brougham, 1975, p. 7); (Best & Andersen, 1977, p. 193).

Karihi (Punga's brother) gave rise to other 'repulsive' offspring, among them certain fish (frostfish, barracuda, conger eel and freshwater eel), along with lizards and insects (Best, 1982b, p. 261; 433)

Kia tū tangata te ara ki Mokoia. Let the way be open to Mokoia. Regards the kumara god Te Matuatonga that reposed on Mokoia island. In the planting season, tribes of the Rotorua district journeyed thither to touch their seed kumara to some effigy, sometimes said to have been brought from Hawaiki. The ceremony was calculated to ensure fertility and to protect against frost and blight (Reed & Turner, 1973, p. 56).

Ko ngā kākano o roto I a au heu utu wai mō āku mokopuna; ko tētahi o ngā kākano he tāne, tēnā e kore ia e whai uri. The seeds within are to provide water for my descendants; one of those seeds is a male but shall not bear fruit. The saying concerns the Hue (Gourd). In traditional knowledge, Pūtēhue, the offspring of Tāne is the personified form of the Gourd (Best, 1908, p. 186); (Best, 1976a, p. 245); (Best, 1996, p. 782); (Best, 1982a, p. 274).

Ko te nanua pounamu, ko te mīmiha. Like the sea fish the red Moki, a wonderer. A saying for Kiwa's daughter Hinewehe, who, according to Smith, lived in the dark ages before Māui. The species named Chironemus sp., is a kelpfish with a patterned body and serves as a metaphor for beauty. Smith n.d. b:33; (Williams, 1908).

Ko Whaene tipi kai. Whaene that nips food. Whaene, or Punga, is the mythical ancestor, or personification of the shark. The saying is applied to one unsuccessful in fishing, suggesting the catch has already been caught and eaten by the shark (Grey & Solomon, 1857, p. 52); (Williams, 1908, p. 30),

Kua tata ngā pō o ngā Pōtiki a Rehua. The nights of the children of Rehua have arrived. This means that the time for Rehua, or summertime has arrived. This phrase was applied to the Maomao (Scorpis violaceus) and Moki fish (W. L. Williams, 1875); (Buck, 1926, p. 33).

Kukuraho is the penis of Tuna (Best, 1972, p. 834).

Kumukumu (offspring of Punga and Tu-te-wehi-wehi) deity of Gurnard

Mā te aha e hahau te tama a Mumuwhango. Who shall seek after the son of Mumuwhango? Mumuwhango is the parent of the Tōtara tree (from which canoe were made) hence the name stood for a fast sailing canoe (White & Didsbury, 1887, p. III.40).

Mahuru (Spring) was related to Shining Cukoos as they were his messengers (Orbell, 1995, p. 51).

Māia of the gourd (Orbell, 1995, p. 98).

Manu a Rehua. Bird of Rehua. Name of the Kēkerewai Chafer Beetle/Mānuka Beetle (Pyronota festiva). In relation to the beetle being abundant in the summer time and used as a food source (Best, 1902, p. 63).

Mapau (shrub, Myrsine Urvillei) the maro of Whanui (Star) wands or branchlets were used in kumara rites (Best, 1972, p. 833).

Matatu, a child (Kūmara) of Pani

Matuatonga deity of fertility of kumara (Mokia Island) (Orbell, 1995, p. 113).

Moa The bones were used for tokens signifying the importance of the owner or for religious ceremonial work. Examples of the necklaces are found in museums. Other stories talk of the Moa being used as a pet in addition to a food source (Pybus, 1954, p. 35).

Moekahu (daughter of Houmea-taumata and Tautu-porangi), dog god of Ngati Pōtiki and Kahuyngunu (Best, 1972, p. 861).

Mōkehu (Child of Haumia) of bracken fonds and the Mosquitos and sand-flies that live on bracken (Orbell, 1995, p. 50).

Moko (caterpillar) son of Whanui (star) who Whanui told to attack the Kumara (Best, 1972, p. 832).

Moko-hiku-waru (Moko-hiku-aru, Mojo-hiku-waru) deity of certain reptiles. See Tū -tangatakino (Orbell, 1995, p. 120).

Mokopapa Tutelary god of all tree Lizards (Tikao & Beattie, 1939, p. 42).

Monehu (descendant of Haumia) deity of sand-flies and mosquitos (tuākana) (Best, 1972, p. 993).

Mosquito and sand-fly are the messengers of Hine-nui-te-po (Best, 1972, p. 833)

Mumuhanga gave birth to the Totara tree (Buck, 1949, p. 450)

Nehutai, a child (Kūmara) of Pani

Ngā ika a Wahitiri. The fishes of Whaitiri. Refers to the mythological origin of fish as the offspring of Whaitiri. Best states it is in reference to snow, hail, frost and ice (Best, 1899). Best 1899:107; (Best, 1977, p. 917).

Ngā taero o Kupe, e ngā rōrī o te whare o Uenuku. The obstructions which Kupe found were the knots Uenuku used to fasten his door. The obstruction referred to are supplejacks. When knotted by one person is put to a practical use by another. Today when the phrase is quoted alone, it refers to supplejacks (Kareao), Brambles or Bush Lawyer (Tātarāmoa), Speargrass (Tūmatakuru) and stinging nettles (Ongaonga) which made travel so difficult when Kupe arrived. They are now used to symbolise mental difficulties and obstructions (Grey, 1853, p. 105); (Grey & Solomon, 1857) (Williams, 1971, p. 356).

Pani (Some stories say Pani was the mother of Māui and his brothers, others say sister of Tangaroa. Other variations at pg 825) the mother of the many varieties of kumara. Rongo-Māui the father who stole it from Whānui (Vega Star) and impregnated Pani. (Ngati Awa). Māui-whare-kino the husband of Pani (Porou) (Orbell, 1995, p. 131). Williams states Pani Tinaku was her full name. (Best, 1972, p. 825).

Parauri - deity of the Tūī (Orbell, 1995, p. 33) & (Buck, 1949, p. 450)

Para-whenua-mea is the mother of glow worms (and rivers that flow from the mountains and flood waters) that live near water. She is the daughter of Tane and Hine-tūpari-maunga. (Orbell, 1995, p. 134)

Pari-kiokio (Tangotango is the parent), parent of the Kiokio Fern (Lomaria procera) (Best, 1972, p. 782).

Patea, a child (kumara) of Pani

Peketua the father of Tuatara (East Coast). Peketua and his wife Mihamiha are the parents of all reptiles and insects (Orbell, 1995, p. 137).

Peketua, Punaweko and Hurumanu (Tane Māhuta's brothers) created Tuatara, Land birds and Sea birds by fashioning clay into an egg. They then sought advice from Tane Mahuta who told them to endow the clay egg with life. Peketua produced the tuatara from the shell that he had fashioned from clay. Hurumanu created sea birds and Punaweko created land birds (1927, pp. 290-291).

Pio, a child (kumara) of Pani

Poananga the originator of Clematis plant with large white flowers offspring of Rehua and Puanga. Rūamoko caused the birth (Best, 1972, p. 836).

Pou created Kahikatea and Māhaki-rau brought it to the land (Orbell, 1995, p. 95).

Pou, god of fish at the mouths of rivers that flow into the sea. Seaweed was the offering to Pou. That seaweed is called Makanga-a-rimu (Ngata, 2004, p. 45).

Puahou the originator of the tree (Panax arboretum) offspring of Rehua and Puanga. He is the most important of the children. Rūāmoko caused the birth (Best, 1972, p. 836).

Puarangi, a child (kumara) of Pani

Puhi-kai-naonao is an eel that represents all wasting sickness (Best, 1972, p. 836).

Punaweko Atua of birds (Best, 1922, p. 76)

Punaweko Deity of forest birds (Orbell, 1995, p. 33).

Punga and Karihi on the west coast (ugly brothers of Tāwhaki) are the fathers of sharks and reptiles (Orbell, 1995, p. 144).

Punga is referred to as a woman who copulated with Tane and had insects. Including the giant weta who is known as Pungā's Weta (Orbell, 1995, p. 144).

Punga is the atua of insects and vermin (Buck, 1949, p. 450)

Punga is the father of sea mammals such as the sea lion in Ngai Tahu (Orbell, 1995, p. 144).

Punga the father of all ugly creatures including Stingrays, reptiles, sharks. In Te Arawa he is the son of Tangaroa. Punga had two children Ika-tere and Tū-te-wehiwehi (Orbell, 1995, p. 144).

Pū-tē-Hue (last born of Tane and Rauāmoa) the mother of the Gourds. Pū-tē-Hue was married to either Tangaroa or Tāwhirimatea and had a daughter Rona. During the quarrels with Rangi and Papa, Pū-tē-Hue took side with Rongo (Kūmara) and Haumia (Fernroot). These three are peaceable plants. (Orbell, 1995, p. 42).

Raukata-uri (also her sister Raukata-Uri) the originator of games, music, and dancing. has a flute that is believed to be the case moth. She is referred to as the Cicada. The mountain FoxGlove found on Taranaki Mountain is her gourd plant. The hanging spleenwort fern is her ringlets of hair (Orbell, 1995, p. 152).

Raupō roots is the penis of Tuna (Best, 1972, p. 834).

Rehua and Pekehawani produced Rūhi whose offspring consists of all food cultivated by man (Best, 1972, p. 821).

Rehua Atua of Hapuku, Ponga' including Mamaku (Cyathea medullaris), Te Poka (C. dealbata) and Katote (C. smithii) (Roberts, 2013)

Rehua is the creator of the Huia (Phillipps, 1963)

Rehua is the origin or caretaker of Koko (Tui) (Best, 1972, p. 769).

Rehua the parent of Īnanga, Marearea, Pahore, Koputea, Porohe, Pahore, Koeaea and other small fresh water fish. Koko bird and the Kaiherehere eel. Also, of the small green beetle found on Manuka and the Tutaeruru a flying beetle (Best, 1972, p. 820).

Rongo, son of Rangi and Papa is the father of Kūmara. In Ngāti Porou the name is Rongomarae-roa. (Orbell, 1995)

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Rongo-maraeroa Atua of kumara (Best, 1922, p. 76)

Ruaea brought lice to Aotearoa on the Takitimu waka (Orbell, 1995, p. 158).

Rūāmoko. Ko te tini o Rūāmoko. The many of Rūāmoko. A figurative way of referring to lizards. Turnbull n.d. 17; (Williams, 1908, p. 35).

Ruruotangi-akau Personification of the Ake (Dodonea viscosa), Kahikātoa (Leptospermum scoparium) and other hard woods used for making weapons (Ngata & Jones, 1990)

Ruruotangi-akau Personification of the Ake (Dodonea viscosa), Kahikatoa (Leptospermum scoparium) and other hard woods used for making weapons (Ngata & Jones, 2006, p. 165)

Tahu-mate, the originator of the originator of the bloom of the Panax arboretum or the first Puahou that blooms. The offspring of Rehua and Puanga. Rūāmoko caused the birth (Best, 1972, p. 836).

Tane and Apunga begat shrubs and small birds (Best, 1972, p. 765).

Tane and Hine-wao-riki begat the Kahika and Matai trees (Best, 1972, p. 765).

Tane and Mango-nui and begat Tawa and Hinau trees (Best, 1972, p. 765).

Tane and Mumuhanga begat the Totara (Best, 1972, p. 765).

Tane and Punga begat the Kotukutuku Patate trees and all insects (Best, 1972, p. 765).

Tane and Rere-noa bore the Rata as well as all climbing, parasitic and epiphytic plants (Best, 1972, p. 765).

Tane and Ruru-tangi-akau and begat the Ake and Kahikatoa trees (Best, 1972, p. 765).

Tane and Te Pu-whakahara begat the Maire and Puriri trees (Best, 1972, p. 765).

Tane and Tu-kapua begat the Tawai, Kahikawakawa and other trees (Best, 1972, p. 765).

Tane and Tutoro-whenua bore Haumia deity of rhizomes of fern (Best, 1972, p. 765).

Tane Moehau is the mother of Tatare – Dogfish (Stack, 1996, p. 18).

Tangaroa God of the ocean. Karakia was performed to him by voyagers for good weather and calm waters (Tikao & Beattie, 1939, p. 38)

Taranga is another name for Pani (kumara) who the daughter of Māui was. Tuna and Taranga created the kumara (Best, 1972, p. 833).

Taro is the penis of Tuna (Best, 1972, p. 834).

Tawake-toro origin of the Manuka (Best, 1972, p. 765).

Tawhara-nui origin of the Kiekie (Best, 1972, p. 765).

Te Arawaru Atua of shell-fish (Best, 1922, p. 76)

Te hao te kai a te aitaka a Tapuiti. Eels are the descendants of Taputiti. Tapuiti was the wife of Te Rakihouia, so of Rākaihautū, who constructed many eel weirs on the South Island (Beattie, 1915, p. 142).

Te kanohi o Tāwhaki. The eyes of Tawhaki. As Tawhaki fell from the spirit world, he plucked out his eyes and threw them on to the Rātā (Metrosideros robusta). This, according to the story, was the origin of the red blooms of the Rata tree and accounts for the saying still used by the Mātaatua people for them. Another version attributes for the red blooms of the Pōhutukawa as well to the blood of Tāwhaki which fell on them (Best, 1908, p. 222); (Best, 1972, p. 916).

Te mokopuna a Terepunga. The offspring of Terepunga. The Shag or Cormorant was known as such (Best & Andersen, 1977, p. 344).

Te Monehu Atua of fern fonds - the rust-coloured dust (spores) found on the undersides of the fronds (Roberts, 2013)

Te rau o Hunā. The leaf of Huna. Applied to dressed flax fibre, also to fine garment made of this flax (Best, 1909, p. 231); (Williams, 1971, p. 328).

Te rau o Mauri. The leaf of Mauri. Poetical name for Taro (Williams, 1971, p. 328).

Te rau o Pāpoua. The leaf of Pāpoua. Applied to rough flax, or a rough cape (Best, 1909, p. 231); (Williams, 1971, p. 328).

Te whānau a Punga. The family of Punga. The father of Punga was Tangaroa. His progeny included all reptiles, sharks and even insects. The term was also extended to an ugly person (Williams, 1908, p. 35).

Tiki Tuna, deity of Tuna (Orbell, 1995, p. 227).

Tinirau is the rangatira of all fish (Orbell, 1995, p. 214).

Tinirau shaped the nose of the Sole Fish (Tikao & Beattie, 1939, p. 38).

Toroa-ma-hoe, a child (kūmara)

Toronu (caterpillar) son of Whanui (star) who Whanui told to attack the Kumara (Best, 1972, p. 832).

Tū -tangata-kino deity of certain reptiles. Moko-hiku-waru (Orbell, 1995, p. 120).

Tuna deity of Eels (Orbell, 1995, p. 53).

Tū-te-koropanga the originator of plant prickly and obstruction plants such as Ongaonga (Tree Nettle), Bush Lawyer and Spiky Matagouri (Orbell, 1995, p. 234).

Tū-te-wehiwehi the father of reptiles (Orbell, 1995, p. 144).

Tu-te-wehiwehi, originator of insects including spiders (Orbell, 1995, p 144).

Tutunui, offspring of Tinirau is the origins of Whales (Best, 1972, p. 773).

Uru-te-ngangana and Rehua are atua of Ti Kouka's various unique properties (Roberts, 2013)

Waiha, a child (kumara) of Pani.

Whare-rimu (Child of Kiwa and Hine-Moana) deity of Seaweed that shelter fish (Orbell, 1995, p. 86).

Appendix C: Atua of the Human Body

Hina. Ko Hina whakapau tangata. Hina the consumer of people. A Te Rarawa Pepeha. Māui suggests that Hina lets men die and live again as does Hina herself. She refuses, wishing death to be the cause of grief and wailing (White & Didsbury, 1887, pp. II,80).

Korokoiewe, atua of birth (Salmond, 2017, p. 256).

Mauhi, Taiepa, Mokonui, Ti-whaia/Te-whaia are the attendants of Korokoiewe (Salmond, 2017, p. 256).

Mokotiti, atua of the chest (Salmond, 2017, p. 256).

Purakau, atua of witchcraft (Salmond, 2017, p. 256).

Ranginui and Papatūānuku. Nā Rangi taua, nā Tūānuku e takoto nei; ko ahau tēnei, ko mea a mea. We are descended from Rangi and Tūānuku; as for me, I am so-and-so, child of so-and-so. This was the prescribed formula for responding to a chief who welcomed one to his village. The stranger established their common ancestry and then related essential elements of their own lineage (Brougham, 1975, p. 70).

Rauru, atua of the hair of the head (Salmond, 2017, p. 256).

Rongo, atua of the left side of the body (Salmond, 2017, p. 256).

Rongomai, atua of the lungs (Salmond, 2017, p. 256).

Rongo-mai-taha-nui a deity who personify the ability to absorb readily, the teachings of the house of sacred learning (Ngata & Jones, 1990, p. 17).

Rongo-mai-taha-nui a deity who personify the ability to absorb readily, the teachings of the house of sacred learning (Ngata & Jones, 2006, p. 17).

Rongo-mai-taha-rangi - Deity who personify the ability to absorb readily, the teachings of the house of sacred learning (Ngata & Jones, 1990, p. 17).

Rongo-mai-taha-rangi - Deity who personify the ability to absorb readily, the teachings of the house of sacred learning (Ngata & Jones, 2006, p. 17).

Rua-te-hotahota - Atua of knowledge, thoughts, and deep thoughts. Progeny of Tangaroa (Ngata & Jones, 1990, p. 49).

Rua-te-hotahota - Atua of knowledge, thoughts, and deep thoughts. Progeny of Tangaroa (Ngata & Jones, 2006, p. 49).

Rua-te-mahara - Atua of knowledge, thoughts, and deep thoughts. Progeny of Tangaroa (Ngata & Jones, 1990, p. 49).

Rua-te-mahara - Atua of knowledge, thoughts, and deep thoughts. Progeny of Tangaroa (Ngata & Jones, 2006, p. 49).

Rua-te-Pukepuke - Atua of knowledge, thoughts, and deep thoughts. Progeny of Tangaroa (Ngata & Jones, 1990, p. 49).

Rua-te-Pukepuke - Atua of knowledge, thoughts, and deep thoughts. Progeny of Tangaroa (Ngata & Jones, 2006, p. 49).

Taitai, atua of hunger (Salmond, 2017, p. 256).

Te aitanga a Tiki. The offspring of Tiki. A term for human beings. Tiki from the world of chaos (Pō) married Ea of the world of light (te ao mārama). They had Kurawaka who married Tānenui-a-rangi, the beginning of the human race (Best, 1903, p. 17).

Te aitanga a Tiki. The offspring of Tiki. This is applied to human beings. Tiki from the world of Chaos (Po) married Ea of the world of light. They had Kurawkaka who married Tane-nui-a-rangi, the beginning of the human race (Best, 1903, p. 17).

Tiki. Ko ngā uri koe o Tiki. You are of the descendants of Tiki. Tiki is the personification of procreative energy and is often described as the progenitor of the human race, which is sometimes described as Te Aitanga a Tiki, the progeny of Tiki. (Rangikāheke, 1849:113)

Tiki. Ngā uri o Tiki. The descendants of Tiki. These are the human race as Tiki was its progenitor (Colenso, 1879, p. 91).

Tonga, atua of the forehead (Salmond, 2017, p. 256).

Tonga-meha, atua of the eyes (Salmond, 2017, p. 256).

Tua Waihananga - Prodigy of learning. Progeny of Tangaroa (Ngata & Jones, 1990, p. 49).

Tua Waihananga - Prodigy of learning. Progeny of Tangaroa (Ngata & Jones, 2006, p. 49).

Tupari (inaewa, Tupua), atua of the liver (Salmond, 2017, p. 256).

Tupe, atua of the calf of the leg (Salmond, 2017, p. 256).

Tura. Kua tau ngā taru o Tura. The weeds of Tura have appeared. The weeds of Tura are grey hairs (Best, 1905).

Tutangata-kino, atua of the stomach (Salmond, 2017, p. 256).

Appendix D: Indigenous Declarations

- The Kari-Oca Declaration, The World Conference of Indigenous Peoples on Territory, Environment and Development. Brazil, May 30, 1992 (The World Conference of Indigenous Peoples on Territory Environment and Development, 1992).
- 2. The Mataatua Declaration on Cultural and Intellectual Property Rights of Indigenous Peoples, Whakatane, Aotearoa New Zealand June 1993.
- 3. Declaration of Indigenous People of the Western Hemisphere Opposing the Human Genome Diversity Project World Council of Indigenous Peoples Resolution on the Human Genome Diversity Project. Phoenix, Arizona on February 19 of 1995 (Original Peoples of the Western Hemisphere of the Continents of North & Central and South America, 1995).
- 4. Beijing Declaration of Indigenous Women, NGO Forum, UN Fourth World Conference on Women Huairou, Beijing, Peoples Republic of China. 7 September 1995 At The Indigenous Women's Tent, Huairou, Beijing, China (Asia Indigenous Women's Network, 1995).
- The "Heart of the Peoples" Declaration, From the North American Indigenous Peoples Summit on Biological Diversity and Biological Ethics. August 7, 1997. Gros Ventre and Assiniboine Nations' Territories Fort Belknap Reservation State of Montana, U.S. (Roy. Taylor, 1997).
- Declaration from Kuna Yala, Panama Organizations and Indigenous nations present in the Workshop on the "Human Genome Diversity Project", Ukupseni, Kuna Yala, 12-13 November 1997 (Organizations and Indigenous nations present in the Workshop on the Human Genome Diversity Project, 1997).
- 7. Resolution of the Confederated Salish and Kootenai Tribes of the Flathead Reservation, Montana (Tribal Council of the Confederated Salish and Kootenai Tribes of the Flathead Reservation, 1998).
- 8. Cartagena Protocol on Biosafety on the Convention on Biological Diversity (United Nations, 2000)
- 9. The International Cancun Resolution of Indigenous Peoples, 5th WTO Ministerial Conference - Cancun, Quintana Roo, Mexico, 12 September 2003 (International Representatives of Indigenous Peoples, 2003)
- 10. Hawaiian Civic Clubs Resolution Urging the University of Hawai`i to Cease Development of the Hawaiian Genome Project, Adopted November 15, 2003 at the 44th Annual convention of Hawaiian Civic Clubs at Nukoli`i, Kauai, Hawai`l (Hawaiian Civic Clubs Resolution, 2003).
- 11. Collective Statement of Indigenous Peoples on the Protection of Indigenous Knowledge Agenda Item 4(e): ratified in the UN Permanent Forum on Indigenous Issues, May 12, 2004, New York City (UN Permanent Forum on Indigenous Issues, 2004b).
- 12. Declaración Colectiva de Pueblos Indígenas sobre la Protección del Conocimiento Tradicional Tercera Sesión, Foro Permanente de la ONU para las Cuestiones Indígenas ratified in New York, 10-21 May 2004 (UN Permanent Forum on Indigenous Issues, 2004a).

- The Manukan Declaration of the Indigenous Women's Biodiversity Network Manukan, Sabah, Malaysia, 4-5 February 2004 (Indigenous Women's Biodiversity Network, 2004).
- 14. . Memorandum Of Understanding Between The Government Of Samoa And The Regents Of The University Of California, Berkeley For Disposition Of Future Revenue From Licensing Of Prostratin Gene Sequences, An Anti-Viral Molecule (Sāmoa and Berkeley University, 2004)

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