



Whakamanahia Te mātauranga o te Māori: empowering Māori knowledge to support Aotearoa's aquatic biological heritage

James Ataria (Rongomaiwahine, Ngāti Kahungunu, Ngāti Raukawa), Melanie Mark-Shadbolt (Ngāti Kahungunu, Ngāti Porou, Te Arawa, Te Ati Awa, Ngāti Raukawa), Aroha Te Pareake Mead (Ngāti Awa, Ngāti Porou), Kevin Prime (Ngāti Hine, Ngāti Whātua, Tainui), Jim Doherty (Ngāti Manawa), James Waiwai (Ngāi Tūhoe, Ngāti Ruapani, Ngāti Awa, Ngāti Kahungunu, Tūhourangi), Tohe Ashby (Ngāti Hine, Ngā Pūhi), Simon Lambert (Ngāi Tūhoe, Ngāti Ruapani) & Gary Owen Garner (Ngāti Ranginui)

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REVIEW ARTICLE



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James Ataria (Rongomaiwahine, Ngāti Kahungunu, Ngāti Raukawa)^{a,b,k}, Melanie Mark-Shadbolt (Ngāti Kahungunu, Ngāti Porou, Te Arawa, Te Ati Awa, Ngāti Raukawa)^{a,c,k}, Aroha Te Pareake Mead (Ngāti Awa, Ngāti Porou)^d, Kevin Prime (Ngāti Hine, Ngāti Whātua, Tainui)^{c,e,k}, Jim Doherty (Ngāti Manawa)^{f,g}, James Waiwai (Ngāi Tūhoe, Ngāti Ruapani, Ngāti Awa, Ngāti Kahungunu, Tūhourangi)^h, Tohe Ashby (Ngāti Hine, Ngā Puhī)ⁱ, Simon Lambert (Ngāi Tūhoe, Ngāti Ruapani)^{j,k} and Gary Owen Garner (Ngāti Ranginui) ^k

^aBio-Protection Research Centre, Lincoln University, Lincoln, New Zealand; ^bNgā Pae o te Māramatanga, Auckland, New Zealand; ^cBiological Heritage National Science Challenge, New Zealand; ^dThe IUCN Commission on Environmental, Economic and Social Policy (CEESP), Gland Switzerland; ^eEnvironment Court of New Zealand, Wellington, New Zealand; ^fTūhoe Tuawhenua Trust, Ruatahuna, New Zealand; ^gEnvironmental Protection Authority, Wellington, New Zealand; ^hMātauranga Māori holder and Spiritual Healer; ⁱMātauranga Māori holder, Rongoa expert, Educationalist; ^jDepartment of Indigenous Studies, University of Saskatchewan, Saskatoon, Canada; ^kTe Tira Whakamātaki Māori Biosecurity Network, Canterbury, New Zealand

ABSTRACT

As Aotearoa New Zealand grapples with developing solutions to complex issues surrounding its unique freshwater and marine biological heritage, there is a growing recognition that mātauranga Māori can be 'unlocked' and used with great effect alongside western science. Examples where appropriate consideration and development of robust methodologies for the application of mātauranga Māori coexisting alongside western science are increasing. Unfortunately, despite the benefits that can be derived from this collaboration, the quality of engagement is not always satisfactory often due to poor interpersonal relationships and misidentification of the knowledge holders. By providing an appropriately historical context, this article is able to consider the critical issues now facing mātauranga and the Māori knowledge holders today, and fundamental requirements that will empower application of this knowledge within bio-heritage management. We consider how the development of a methodology between mātauranga Māori holders and potential end-users might contribute to improved outcomes for Aotearoa's biological heritage.

TUHINGA-WHAKARĀPOPOTO

I a Aotearoa ka taukumekume me pehea te utu i ngā pēhitanga maha e pā mai ana ki tā tātou taiao me āna taonga koi ora-taonga tuku iho, ka piki ake te tautoko mō te whakaaro kei rō tonu i tō tātou mātauranga Māori he utu hai hāngai pū atu ki ērā painga a te pūtaiao Pākehā. Kua ngaringari ake ngā tauria pai e whakaatu mai i ngā tukanga tika kia nohotahi ai ēnei mātauranga e rua hai whakaputa huanga papai. Ahatia ngā painga o te nohotahi o te

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mātauranga Māori me te mātauranga Pākehā, kei raro tonu te taha Māori e putu ana. Nā te kūare o te whanaungatanga ki waenganui i te taha Māori me te taha Pākehā, me te ngoikore hoki o te tautohutanga i ngā waka huia o te mātauranga Māori, i pēnei ai tēnei putanga aukati. Mā te titiro whakamua ka āhei tēnei tuhinga ki te āta kōrerohia ngā pēhitanga nui whakaharahara i kitea i ēnei rā e whakaaweawetia mai ana ki ō tātou mātauranga Māori me ngā kaipupuri o te mātauranga Māori kātahi, kārua, ka kōrerohia ngā mea e whakamana ana e whakamahia ana a tātou mātauranga Māori hai tiaki i a tātou taonga koiora-taonga tuku iho. Ka kōrero mātou mō ngā rangahau mai i te NZ Biological Heritage National Science Challenge me tāna arotahinga ki te mahitahi, ki te whakatū tikanga ki waenganui i ngā mea Māori e pupuri ana ki te mātauranga me ngā mea e whiwhia e whakamahia tēnei mātauranga hai whakatau huhua pai mō ngā taonga koiora-taonga tuku iho puta noa i Aotearoa whānui.

Introduction

He hanga nā te waha o te ngutu nō mua iho anō. (Williams HW 1908)

‘Although seeming to be only from the lips, it is actually of ancient origin’. Ancient sayings and customs gain force from their antiquity, providing precepts for modern times. (para 374, Mead and Grove 2001)

The unique freshwater and marine biological heritage in Aotearoa is currently facing unprecedented pressures from exploitative and extractive industries and land-use activities, pollution, unwanted species incursions, and the negative effects of climate change. The imperative to reverse this anthropologically-induced decline in biological heritage is clearly demonstrated by a range of flora and fauna species now classified as threatened or at risk (Goodman et al. 2014; Baker et al. 2016; Duffy et al. 2016). Many of these organisms have cultural significance to Māori and therefore connect to a considerable body of associated mātauranga Māori.

Mātauranga Māori has been described as a modern term for the body of knowledge brought by the original Polynesian settlers to Aotearoa New Zealand (Royal 2009; Mead 2017). Mead (2012) also describes it as being ‘Māori knowledge complete with its values and attitudes’. It represents the corpus of Māori knowledge—both historic and contemporary (Landcare Research 2018). However, mātauranga Māori is more complex than just ‘knowledge’—as Mead (2012) points out it is actually a part of Māori culture, and even more so, linked to Māori identity and in fact, contended as a unique part of the identity of all New Zealand citizens. Importantly, mātauranga includes knowledge thought to be lost and now currently under recovery. This activity is being spurred on by a cultural renaissance in Māori communities over the last few decades, and embraced by many enjoying being part of the revival process (Mead 2012). Moreover, ‘Mātauranga Māori has a past, a present and a future’—meaning that this Māori knowledge system is continually being used, adapted and incorporated into people’s lives. This allows for new, innovative ideas and practices including that evolving from fresh discoveries and research. Rather than being cast aside and replaced by a different system of knowledge, mātauranga Māori re-establishes itself both before and after colonialism (Mead 2012), with each new generation adding, subtracting or amending the knowledge.

Traditional knowledge can be shown to provide demonstrable insights into the value of biological diversity (Nicholas 2018). The critical role of mātauranga Māori in protecting New Zealand's freshwater, estuarine and marine bio-heritage is exemplified through the intimate, holistic and embedded relationship that Māori have developed over hundreds of years with the natural environment. Codification of the natural world created frameworks of understanding and knowledge (Hikuroa 2017). This knowledge was reinforced through whakapapa (the interconnection and relationships between physical and meta-physical objects) (Roberts et al. 1995; Edwards 2012; Harmsworth and Awatere 2013) and kōrero tukuiho (creation narratives) which has informed cultural values and ethics (Patterson 1994). These are manifest throughout the Māori culture, being reflected in taonga toi (carvings, panels and paintings), te reo Māori (the Māori language), literary devices like whakataukī (proverbial sayings) and kī peha (figurative expressions) (Mead and Grove 2001), and manifest in practices like rāhui (localised ban or restriction) that specifically manage human interactions with the environment and replenish resources (Wheen and Ruru 2011).

This paper undertakes a review of the level of engagement with mātauranga Māori knowledge holders in the area of freshwater and marine biological heritage in Aotearoa New Zealand, and the extent to which this is congruent with aspirations of indigenous peoples. This leads to an exploration of the relevance, scope and importance of indigenous peoples' observance of tikanga Māori, and its engagement in mātauranga.

Critical issues–background and context

Mismatched mindsets

There is a growing body of evidence detailing the significant declines in freshwater, estuarine and marine quality in Aotearoa (Larned et al. 2016; Ministry for the Environment & Stats NZ 2017). A significant volume of literature has been written on the ecological and economic consequences of this biological decline (Roberts et al. 1995; Dick et al. 2012; Food and Agriculture Organization of the United Nations 2013). Attempts to manage such declines, such as quota management systems, are mistakenly believed to adequately safeguard such problems. However, as recorded by Dick et al. (2012) in the case of New Zealand's Quota Management System (QMS) there is a deep flaw 'because its focus is purely on stocks and not ecosystems, and because of serious information deficits in the state of the fish stocks' (p. 120).

By way of comparison, Māori are concerned not only with threats to New Zealand's biological heritage in terms of ecological impacts, but also the cultural consequences. Kaitiaki (environmental guardians) express such concerns and in particular the cultural consequences of severance of links between people and the food species, reduced connections between people in the community, erosion of ways that kinship is maintained, severed transmission of cultural knowledge, and impaired health and tribal development (Dick et al. 2012). Thus, in the Māori worldview, known as Te Ao Māori, there can be undermining of both cultural and individual identity.

Furthermore, Roberts et al. (1995) suggest that threats to biodiversity are sometimes a consequence of the denial of Māori rangatiratanga (chieftainship)—the continuing decline of native pigeons or kererū (*Hemiphaga novaeseelandiae*) is used as an illustration. In this

instance, positive results obtained from reinstating the role of mana whenua (power associated with occupation and custody of tribal land) through the permitting of sustainable harvesting is argued to more likely result in greater levels of taonga (prized possessions or treasures) conservation. However, Roberts et al. (1995) point out that under the New Zealand 1987 Conservation Act an underlying western concept of morality occurs—promoting a dichotomy between ‘man’ and ‘nature’. This dichotomy serves to alienate all humans, including and more particularly Māori, from their lands. This is quite apart from an inability to practice kaitiaki responsibilities.

The possibilities for positive ecological outcomes and the associated importance of kaitiakitanga (guardianship or stewardship) is further illustrated by an example found in New Zealand’s Southland where implementation of a customary fisheries management regime replaced the former Ministry of Fisheries management of toheroa (*Paphies ventricosa*) (Moller et al. 2009; Futter 2011). Williams JR et al. (2013) suggests similar outcomes are likely in a wider geographical context especially where ‘loss of Māori stewardship ethic’ is less in evidence.

Thus, on one hand, we have environmentalists and conservationists often basing their assessment on an essentially ecological focus. On the other hand, we have Māori kaitiaki conducting their assessment on not only the impact on ecology and economics, but also adopting a much broader worldview which incorporates culture and identity, as well as considering the whakapapa or interconnectedness of the issues. Whakapapa is unique to Māori without an exact English language equivalent, it facilitates higher levels of understanding and an ability to explain phenomena within a cultural context (Sadler 2012).

The endemic history of devaluing and concealing indigenous knowledge

Globally, the value of indigenous knowledge is not always readily recognised by governing authorities. For example, in America, government officials rejected Comanche Indians agricultural expertise in growing corn (Brown (1970). In Australia, the period between 1900 and the 1960s has been referred to as ‘The Great Australian Silence’ because Aborigines were virtually written out of Australian history (Reynolds (1999). This was despite early colonial explorers acknowledging that Aborigines ‘were the advisers, the consultants, whose skill and knowledge made all the difference between success and failure’ with abilities to ‘find water and food when no white man was able to’ and ‘track animals and people, make emergency shelters, and quickly construct canoes from locally available bark for transportation across rivers and creeks’ (Reynolds 1999 p. 257).

In Aotearoa New Zealand, it would seem that little credence was given to the opinion of early missionaries whom ‘often praised Māori wit, intelligence, and commented favourably on their kindness and generosity’ (Troughton 2014). Indeed, going back much earlier in time, it is obvious that the original Māori-Polynesian pioneer settlers were highly adaptable, with the knowledge to survive and even prosper in their adjustment to an almost totally new food supply (Stafford 1997). Mead (2016) suggests that active suppression of tikanga Māori and the accompanying repudiation of culture has historically led to a general belief among politicians and educationists that ‘progress and development meant turning away from Māori culture and accepting only ‘proper knowledge’ from the western world’ (p. 3). In prioritising western science, Government policies and systems have actually marginalised mātauranga and slowed its continuum (Broughton and McBreen 2015).

Scepticism by many scientists over the years concerning the value of indigenous knowledge (Berkes 2009), has given way to a growing recognition internationally (Nicholas 2018) and in Aotearoa New Zealand (Moller et al. 2004; Sinner and Harmsworth 2015; Harmsworth et al. 2016) that traditional knowledge has become a highly valued source of information for a range of disciplines including archaeology, ecology, biology, ethnobotany, climatology and others. ‘Eurocentric’ views have been openly challenged. A new era of Māori renaissance has brought about perspectives more conscious of Māori agency during the second half of the twentieth century (Troughton 2014). This process has been coined by some as ‘internal decolonisation’ (Phillipson 2014), a phenomenon which may be observed not just in New Zealand, but in Australia, the United States, Canada and parts of Latin America. It has resulted in indigenous peoples as minorities in settler-dominated states seeking self-determination, which in the case of Aotearoa New Zealand includes attempts to effect true partnership with nation states, re-appropriation of culture and cultural treasures, reassertion of treaty rights and tribal autonomy, and redress of past wrongs including dispossession of land natural resources. Ultimately, the response to internal decolonisation has been the hallmark of socially significant responses and upheaval in New Zealand, such as the New Zealand Wars and the 1975 Land March (O’Malley et al. 2010 record these significant events as part of the story of Māori and Pākehā relations and ‘partnership’), the relatively recent advent of wide-ranging claims due to Crown breaches of Te Tiriti o Waitangi (Treaty of Waitangi) (Garner 2017), and the establishment of the Waitangi Tribunal to assist with historical grievances (Wheen and Hayward 2012).

The relevance of the Treaty of Waitangi (Te Tiriti o Waitangi) and WAI 262

Treaty settlements underway in Aotearoa New Zealand are potentially a way for biological heritage, particularly indigenous flora, to be further highlighted as an integral part of Māori taonga, culture and identity. The importance of biological heritage is implicit within Article 2 of the English version of the Treaty of Waitangi [Te Tiriti O Waitangi] 1840). It states that ‘Her Majesty the Queen of England confirms and guarantees to the Chiefs and Tribes of New Zealand ... the full exclusive and undisturbed possession of their Lands and Estates **Forests Fisheries and other properties** which they may collectively or individually possess’ (our emphasis).

Whilst the economic importance of flora and fauna is undoubted, its importance to Māori is demonstrably even more fundamental. Indeed, it can be observed that the insights offered by Māori culture are beneficial in addressing a range of vexing environmental and social issues in ways that embrace a broader set of principles other than those based on individual property rights and economic values (Craig et al. 2012). There is strong evidence that such Māori values include enormous mātauranga about the natural environment including bio-heritage which Māori traditionally and characteristically interact with on a daily basis.

The Wai 262 claim extends the scope of Treaty of Waitangi to clarify ownership of Maori culture and its products (Levine 2010). The origins of the Wai 262 Inquiry are strongly rooted in concerns relating to conservation and biodiversity of indigenous flora, with the claim recommending ‘wide ranging reforms to law and policies affecting Māori culture and identity’ (Ministry of Justice 2017). Fundamentally, the Wai 262

claims that under the Treaty of Waitangi, Māori rights to taonga katoa (all their treasures) are guaranteed—and that indigenous culture, flora, and fauna are all taonga. However, the Crown maintains that the government was under no obligation to protect Māori rights to them under the Treaty.

In relation to Māori culture and identity, the Ministry of Justice (2017) concluded that although ‘iwi and hapū have authority over taonga ... which are core aspects of Māori culture and identity’, ‘in a modern New Zealand context full authority will not always be possible, and that the interests of iwi and hapū will instead have to be balanced alongside the interests of other New Zealanders’. This was despite an ‘... established a partnership between Māori and the Crown’ which included ‘the guarantee of “tino rangatiratanga” (full authority) for iwi and hapū over their “taonga katoa” (all their treasured things)’.

Therefore, despite the principle of tino rangatiratanga being firmly established and even acknowledged, it becomes apparent that attempts to ‘balance’ kaitiaki relationship and the interests of the wider community will not be without a struggle. In fact, the Waitangi Tribunal admits that whilst ‘New Zealand’s law and policy has to catch up’ (Waitangi Tribunal 2011c), it is hard to imagine Māori being content with the Tribunal’s conclusion—after all, the concept of tino rangatiratanga infers full authority to Māori, not just what might be considered ‘reasonable’ by its Treaty partner.

There has been a lack of progress on the WAI 262 claim (Black 2016), despite the release of a multi-volume Waitangi Tribunal Report in 2011 (Waitangi Tribunal 2011a, 2011b, 2011c). However, acknowledgement of mātauranga Māori as a legitimate tool may well complement WAI 262 submissions and accelerate progress in the struggle to improve management of New Zealand’s marine and freshwater heritage.

Quality of engagement with mātauranga Māori

There has been significant engagement and debate concerning the awareness, recognition and understanding of what is the modern phenomenon known as mātauranga Māori (Haemata Ltd et al. 2012). This includes increasing engagement on the topic with whānau (family), hapū (sub-tribe) and iwi (tribe). However, the current wave of interest is not without its difficulties and challenges. Some of these difficulties have historical roots. For example, in the past, early writers had an unfortunate habit of de-contextualising Māori knowledge gleaned from different tribal districts (Doherty 2012). This resulted in conflicted, muddled stories and information, whereby history and practices were often passed off unfairly as being mythological, or perhaps just quaint folklore. Therefore, typically it was not granted the same platform as western narratives.

Currently, confusion often exists with related terms that seek to define Māori identity and Māori knowledge, such as kaupapa Māori theory, and mātauranga ā-iwi. The inter relationships and the role each plays in the definition of the other is not always well appreciated (Doherty (2012)). As a result, the quality of engagement between mātauranga and western science has struggled, and at times may be demonstrated to be predominantly extractive and disempowering. Despite this however, exemplars such as the development of the Moriori Cultural Database shows that it is possible to successfully recruit indigenous engagement. The project has built effective collaborative partnerships, resulting in the development of improved digital information systems by blending archaeological field

work with traditional elder (indigenous) knowledge, and the designing of a new accession system for artefact conservation of taonga Māori (Thorpe et al. (2014).

Positive steps forward

Application of mātauranga Māori alongside western science

The ascension of western science post-colonisation has been enabled by the unequitable provision of power and resourcing, and marginalisation through successive government legislation and policies, at the expense and abasement of mātauranga Māori (Barnes 2006; Broughton and McBreen 2015). However, many excellent examples of research and efforts to mitigate this disparity exist. Many such examples of mātauranga being successfully applied alongside western science are embedded in environmental issues. For example, the ‘titi project’ was a 14-year collaboration between Rakiura Māori and scientists involving the sound management of the customary harvesting of the seabirds (sooty shearwater, *Puffinus griseus*) and their guardianship (Don (2010). Here it was found that although, because of their very different epistemologies, the blending of mātauranga and science was to be avoided, they were nevertheless complementary and dialogued ‘effectively to strengthen themselves and each other’ (p. 39).

Another project involving fishing innovation facilitated a paradigm shift in the conduct of a Māori-owned harvest operations, where new options for harvesting New Zealand’s scampi (*Metanephrops challenger*) fishery were explored (Ogilvie et al. 2018). Innovative potting technology involved alignment of western science (acoustic telemetry and chemo-attractants) with mātauranga Māori and an expression of kaitiakitanga—particularly around the protection of marine bio-heritage. This collective knowledge has provided a conduit for the development of a new, lower-impact method of catching scampi. This results in not only a greater proportion of undamaged animals being available for live sale but also provides other ecological advantages such as reduction of damage to the sea floor and reduction in the amount of fuel used. The latest report, featured in this special issue, clearly demonstrates the good potential to create intergenerational wealth via the development of a new premium market for live pot-caught scampi (Ogilvie et al. 2018).

Three examples of Māori environmental monitoring initiatives that incorporate both mātauranga and science methods are provided as follows. Firstly, a Mauri-o-meter (Morgan 2006, 2007, 2008) was developed as an alternative decision support tool that integrates qualitative indigenous values. The resultant Mauri Model enables a direct comparison between the results of conventional engineering analysis and the results based on analysis of impacts on mauri (‘life-force’). Another example is the Mauri Compass (Ruru 2015) where the dual use of scientific approaches and culturally based indicators assist in the understanding and management for health and wellbeing of waterways. Finally, Ngāi Tahu ‘State of the Takiwā’ (Ngāi Tahu 2018) and Freshwater Cultural Health Index (Tipa 2006) and Marine Cultural Health Index monitoring tools (Akins et al. 2013) are environmental monitoring and reporting tools that integrate mātauranga Māori in the form of tangata whenua (local indigenous peoples) values, and western science methods. The resultant information merge between established scientific

approaches and traditional Māori values facilitates policy development, informing a ki uta ki tai (mountains to sea) environmental strategy.

Most recently, mātauranga Māori has been described as ‘the ūkaipō (source or origin) of knowledge in New Zealand’ (Hikuroa (2017)). It spans knowledge, culture, values and worldview, and incorporates knowledge generated using techniques consistent with the scientific method but explained according to a Māori world view (Smith 1999; Ministry of Research Science & Technology 2005; Royal 2009; Doherty 2012; Hikuroa 2017; Nathan and Priestley 2017). It is this understanding of mātauranga that supports application alongside western science in the future.

Increasing participation in, support for, and recognition of Māori scholarship

The Royal Society of New Zealand promotes and advances scholarship excellence in science, technology and the humanities. Originally known as the New Zealand Institute, it recently received the name Te Apārangi in recognition of the organisation’s cultural heritage and its partnership with Māori researchers (Royal Society NZ 2017). Another notable achievement in Māori scholarship was the establishment in 2002 of New Zealand’s Māori Centre of Research Excellence (CoRE)–Ngā Pae o te Māramatanga (NPM). Funded by New Zealand’s statutory Tertiary Education Commission (TEC), its vision includes a focus on ‘realising the creative potential of Māori communities and bringing positive change and transformation to the nation and the wider world.’ This indicates a philosophy based on a belief that ‘Māori can lead New Zealand into the future, using the knowledge and capability that they already have and will continue to generate through NPM and its associated networks and collaborations’ (NPM 2018a). Notions of mātauranga are tightly embedded throughout the organisation (NPM 2018b) including its investment strategy that is grounded in mātauranga Māori, Māori science, kaupapa Māori and tikanga Māori methods.

Currently underway, ‘Project Te Takarangi’ is a joint effort by Te Apārangi and Ngā Pae o te Māramatanga (NPM) to celebrate the long history of Māori scholarship that exists in Aotearoa. The project involves the compilation of 150 non-fiction books as a representative sample collection to provide ‘understanding of the depth and breadth of Māori academic excellence and mātauranga’ (quotation of Royal Society Te Apārangi President Professor Richard Bedford, in Royal Society NZ 2018) and an insight into ‘... some of the most important Māori leaders, thinkers and authors of our time’. (NPM Co-Director Professor Jacinta Ruru, in Royal Society NZ 2018). The list prioritises non-fiction publications and mainly monographs, however includes some periodicals, as well as language textbooks, dictionaries, and edited collections. Although the list is heavily weighted to the later twentieth century and beyond, the 150 books chart a wide variety of Māori authorship and its richness, stretching back into the nineteenth-century (Royal Society NZ 2018).

The role of vision Mātauranga

The Vision Mātauranga (VM) science policy framework had its genesis in Hui Taumata March 2005–mooted as a Māori economic development summit that would set a path for Māori economic development for the next 20 years (Whitehead and Annesley 2005). Simultaneously, there was a groundswell of opinion increasingly recognising the validity of

Māori knowledge, but also a time where reclaiming of greater control over Māori research was being carried out (Smith 1999; Wilkie 2005).

Vision Mātauranga was adopted by Government in 2005, premised on the notion that important opportunities exist in Māori communities that can and should be harnessed through effective engagement for the benefit of New Zealand. Royal (2018) defines the term *mātauranga* as used in VM to broadly mean knowledge both traditional and contemporary created, valued and used in Māori communities according to their needs, aspirations and circumstances.

Encouraging public policy to view the Māori world as a ‘national opportunity’ was central. Especially recognising Māori communities (people, knowledge, resources, assets) as a source of innovation that could contribute to national economic, environmental and social/health/well-being goals; incentivising and enabling Māori involvement in research of relevance to Māori, whilst acknowledging that at times Māori themselves—on the basis of their capabilities and not ethnicity—would lead and conduct the research, set priorities, create and apply methodologies (Royal 2018).

Vision Mātauranga was an enabling policy, rather than a more rules-based or restrictive policy, which acknowledged that ‘unlocking Māori potential’ required a flexible approach. However, the lack of prescription could also be viewed as a weakness and possibly why VM was siloed during its implementation into a science system that was devoid of any capacity and capability to realise the potential of this policy framework. Arguably, the early years of VM policy created outcomes that were contrary to the original intent including marginalisation of VM to a ‘cultural objective’ and inappropriate engagement and recognition of Māori across research provision.

The science system restructure in 2010 sought to raise expectations right across the whole science system. This has resulted in increased recognition and greater attempts to conform to the VM policy. Vision Mātauranga has evolved to become a more meaningful assessment criteria for government funded research and recently it was incorporated as a distinct stream in all eleven of the National Science Challenges. As science providers continue to review what this policy means for their science, VM will transition more towards the goal of harnessing the distinctive innovation potential within Māori culture and society as explained by Royal:

As my research interest is upon our historical and traditional knowledge, many think that VM is about this only. Whilst VM does indeed look to our traditional knowledge a lot, its focus is really on distinctive knowledge—knowledge created via the distinctive circumstances of Māori communities. This captures both traditional knowledge as well as the new knowledge being created every day in Māori communities (in places like marae, education institutions, Māori health providers, Māori businesses, Iwi authorities). (Royal 2018)

However, capacity and capability deficits still remain the biggest challenge facing the science sector in order to realise the potential embodied in VM policy. This includes discussion on meaningful consultation with Māori knowledge systems regarding natural resource management issues.

New Zealand’s biological heritage project 1.1

Mātauranga Māori characterisations of NZ’s biodiversity: Whakamanahia ngā mātauranga o nehe hai oranga tangata, oranga taiao (Project 1.1), is a research project funded

by New Zealand's Biological Heritage (NZBH) National Science Challenge. The VM science policy was a fundamental driver for the project, and in particular, a growing view that the policy was leading to perverse outcomes through what could be viewed as an extractive approach to mātauranga. Project 1.1 is designed to co-develop a methodology between mātauranga Māori holders and potential users that allows the application of this knowledge to first, restore and futureproof the pre-colonial transfer of mātauranga Māori; and second, contribute to achieving the Challenge Mission, i.e. to reverse the decline of New Zealand's biological heritage (Ataria and Mark-Shadbolt 2017).

With a clear kaupapa (customary) Māori philosophy and research approach, the Māori research team has at its heart a group of knowledge holders who discuss and debate issues pertaining to mātauranga Māori and bio-heritage and its application alongside western science. Importantly, knowledge holders were engaged at the outset in a way that enables them to discuss, debate and define the parameters of their engagement within the research. This includes implementing culturally-safe practices that promote a 'mana' enhancing environment (an environment upholding a person's agency, inherited authority and common good) (Huriwai and Baker 2016) and allow intellectual property protection via knowledge agreements. This approach has built trust, which in turn has created not only a culturally safe environment for the researchers but facilitated a research space that is uniquely Māori. Appropriate cultural practices (tikanga Māori) and the use of te reo Māori (the Māori language) are normalised. Critically, wānanga (seminars incorporating important tribal knowledge) engagements are located within spaces that are meaningful to the knowledge holders and where they feel most comfortable hosting and discussing these issues. Project 1.1 is ongoing, but preliminary findings relating to the methodology of engagement between mātauranga Māori holders and potential users of this knowledge are revealed herein.

The Project 1.1 investigation includes an overview of the goals of conservation and other efforts related to the preservation and maintenance of freshwater and marine biological diversity in Aotearoa New Zealand, seeking to affirm a context which is underpinned by kaupapa Māori and tikanga Māori. In so doing, it pursues the establishment of a suitable foundation for the potential formation of an implementable framework by which scientists and other stakeholders can engage with mātauranga Māori knowledge holders in the area of freshwater and marine biological heritage in Aotearoa New Zealand.

Integral to this process is an examination and consideration of two mātauranga wānanga held in late 2017 and early 2018. Participants in these wānanga included five kaumātua (distinguished elder) from differing communities able to offer informed views as to the nature and role of mātauranga relating to losses in biodiversity and impact on the culture of their people. Rich and diverse experiences, thoughts and aspirations from these knowledge holders, in both English and te reo Māori according to the preference of each kaumātua at the time, were recorded and later transcribed and checked. Wānanga sessions often lasted several hours for each session ensured liberal time sufficiency. The conversations involved were largely unstructured but inevitably returned back to matters related, one way or another, to the changing habitat of Aotearoa New Zealand. Express permission was sought, both before and after these sessions, for researchers divulging observations and commentary provided in this manuscript. Dialogue conducted in these wānanga inform the discussion herein and ensure the proper adherence to tikanga Māori throughout.

Opportunities and challenges

This section summarises some of the fundamental requirements to empower application of mātauranga in the active protection of freshwater, estuarine and marine bio-heritage. These fundamental requirements are supported by kaumātua narratives recorded in the NZBH Project 1.1.

Adopting te ao māori—a complex and holistic worldview

The Māori worldview considers that, in terms of science, you cannot consider matters in isolation. Indeed, the very definition of whakapapa has greater complexity than sometimes interpreted, as observed by a kaumātua:

In our world everything is connected ...

Whether we are talking ... about ngangara [*insects*], whether we are talking about the worms, the fish—the whatever. You all ‘ana’ ... it’s a family tree. That’s why we use that kupu [*word, or message*] all the time: whakapapa ... It’s our family tree.

But when we talk in terms of our family tree we are not just talking about ourselves as humans. That’s that whole connectiveness in terms of everything ... So, in terms of our so-called science—if I wanted to do a science project on say studying the totara (*Large trees, the timber of which is often used in carving*)—it’s not just about the totara. It’s about the totara’s nieces, nephews, brothers, sisters. Not just about the tree standing there, but the whenua (*land*) it is sitting on, ngā ngangara [*the insects*] ... , ngā kai whāngai [*the food*]. (Kaumātua–Doherty J 2018)

Apart from advantages derived from supporting cultural identity, as well as obtaining benefits to research approach and processes through the incorporation of kaupapa Māori philosophy combined with the embedding of cultural processes such tikanga Māori, embracing Te Ao Māori and the associated complexities of whakapapa facilitates a mechanism for improving biological heritage management by providing even greater focus on ecosystems and the support of an established system of environmental guardianship. It also capitalises on a long-established and intimate environmental relationship developed over hundreds of years.

Recognising the role of rāhui

Natural resource management and protection requires a system to modulate human interactions with the environment. Historically, the practice of rāhui underpinned by mātauranga, were used to prohibit or stop a specific human activity from occurring and were classified according to the severity of the repercussion brought to bear upon anyone who transgressed them (Mead 1984; Maxwell and Penetito 2007). Rāhui still persist today and are increasingly observed as the ‘mild’ form of rāhui commonly associated in the restoration of environmental productivity or in active protection of culturally significant sites or taonga.

In a contemporary New Zealand legal setting demonstrable uptake of this concept is observed, albeit inconsistently, via different legislative contexts, e.g. Fisheries Act and Treaty Settlement Acts (Wheen and Ruru 2011). The effectiveness of contemporary rāhui is also varied, possibly directly dependent to the severity of the consequence for

breaching, such as legal and financial ramifications versus cultural. This is exemplified by two examples; 1) the kauri dieback and the rāhui that was established in the Waitākere Ranges to prohibit foot traffic spread of a plant pathogen; 2) the Tauroa (Reef Point) rāhui designed to protect rapidly depleting paua beds from over-exploitation. Both rāhui were implemented by mana whenua groups and relied on community members and users to conform voluntarily. Unfortunately, the Waitākere rāhui has failed to stop park users entering the infected forest, while the Tauroa rāhui in the far north community (dominated by a Māori demographic) has been extremely successful (Te Runanga o Te Rarawa chairman Haami Piripi, as quoted by Jackson 2017). This exemplifies the challenges faced when expressing an indigenous worldview where there are dominant and/or competing views on natural resources.

Fundamentally, environmental rāhui and the associated mātauranga represent a realistic and meaningful management tool for the protection of our freshwater, estuarine and marine ecosystems and bio-heritage. However, consideration of how to build sufficient consequence into these tools to ensure the necessary confirmation is critical.

Addressing the disassociation of māori from their biological heritage

It may be demonstrated that Māori consider themselves, as humans, to be deeply part of the biological heritage—and the association of people with the taiao (natural world / environment) being very important to their physical, mental and spiritual wellbeing. However, there is considerable risk that Māori are becoming increasingly disconnected with their environment despite their critical role to play in bio-heritage protection. The underpinning rationale for the establishment of the ‘Water Warriors’ education initiative (Callaghan et al. 2018) featured in this special issue, exemplifies the urban disconnect that Māori youth have with their natural environment. Similarly, the social and environmental ‘disconnect’ of Māori who live away from their place of origin is weakening the intergenerational knowledge transfer process as remarked by Kaumātua James Waiwai and supported by his peers:

How do we engage our tamariki ... there are three different levels ... we have our rangatahi who are at the whare wānanga, there are our own tamariki mokopuna that are being raised in the cities and then we have our tamariki and mokopuna that are being raised off-shore. Jim touched on it last night about how we would transfer that mātauranga and that information to them was by watching them growing up amidst us and on the marae. Then we would get an insight into just what are the skills and attributes that child has and where she would be strategically best utilised ... to serve their people. Because we have a lot of our tamariki and mokopuna living in the cities and offshore that process is no longer as strong as it used to be. (Waiwai 2018)

Therefore, any disassociation of Māori from their biological heritage is viewed with concern—this is by virtue of their very essence being tied up in creation itself. Kaumātua Waiwai describes this in the context of the creation story of Hineahuone (the first women created from clay) as follows:

The creation story ... tells that all the children of Rangi and Papa contributed a piece of themselves. Nā rātou i tākoha tā rātou, tētahi wāhanga o tō rātou ira ki a Hineahuone. So, every part of our indigeneity is made up of that creation story of the children of Rangi and Papa. So ... if anything is affecting me its gonna show up in that environment because I was created

out of Tane Mahuta. I was created from Tangaroa, I was created from Tawhirimatea, I was created from Haumietiketike from Rongomātane, ngā tamariki katoa o Rangi rāua ko Papa kei roto I ahau nei—and if there is anything that is going to impact on me or on that environment its either gonna show up on me, in me, or out there. (Waiwai 2017)

Waiwai considers it imperative that scientists and others wishing to engage with Māori knowledge holders understand the creation story—‘Koira (*strictly speaking*) in a nutshell me mārama rātou (*to be absolutely clear*) they get the creation story of Te Ao Māori’ (Waiwai 2017). The implication here is that without this awareness, such persons run the risk of creating even more pressures and negative outcomes among communities than might already exist.

The interaction of humans and the environment is, of course, a matter of widespread concern for all humanity. It is probably in response to this that western scientists have developed a protected areas framework, allowing for increasingly higher categories of protection based on levels of human contact (cohabitation) in the environment. Although there is recognition of its limitations, especially as a unidimensional indicator of political commitment to biodiversity conservation, the importance of protected areas is reflected in their widely accepted role as an indicator for global targets and environmental assessments; there are now over 1,00,000 protected areas worldwide, covering over 12% of the Earth’s land surface (Chape et al. 2005).

New Zealand has relatively low conservation categorisation, making it one of the most restricted frameworks in the world. The whole ethos of categorisation is based on an assumption that improved conservation is achieved by excluding humans. However, increasingly there is evidence demonstrating that the opposite is true, i.e. you get better conservation when people are living in an environment. If this is true, then it might explain why indigenous peoples are often considered good custodians—perhaps they see the triggers early.

However, cultural processes likely to invoke such an empathetic understanding of the Māori world-view have long been eroded by a colonial mindset that has historically rejected notions of Te Ao Māori, and other mātauranga. Indeed, there appears to be a continuing, possibly even growing scientific penchant for analysing, incorporating, subsuming, appropriating or discounting such knowledge. This may be exemplified by oppressive actions by governing authorities whom have activated instruments such as the Tohunga Suppression Act 1907 (preventing the utilisation of traditional medicines), instigated the construction of numerous educational policies, and implemented various other repressive legislation. All these things have conspired to effectively dissociate Māori from their bio-heritage knowledge.

Vision Mātauranga offers a genuine opportunity to reverse this trend. It offers a way for both Māori and Pākehā (New Zealander of European descent, or foreigner) to respond in more culturally safe and appropriate ways, recognising the value of traditional knowledge being utilised alongside western science.

Fostering succession

The revitalisation of mātauranga extends to the rebuilding of all parts of the knowledge system, i.e. everything that is important to people, and not just that relating to science (Broughton and McBreen (2015)). This notion extends from the question of ‘what counts as knowledge’, the struggle between Pākehā and ‘subordinate’ Māori knowledge,

and the potential for extending the body of Māori knowledge alongside existing western knowledge (Wilkie 2005). A methodology that partners Māori and western knowledge has a much better chance of serving the interests of all New Zealanders, rather than just serving the interests of a politically, socially, and economically dominating Pākehā society, and avoids any ethnocentric bias that assumes cultural or other superiority.

A key challenge for mātauranga Māori holders to be part of this partnership relates to succession. With increasing urbanisation and mobility, modern society in New Zealand has promoted the development of spatial barriers that make engagement and sharing increasingly difficult. Kaumātua Kevin Prime relates the difficulties this causes in terms of succession planning:

Normally they grow up on Marae around us. We get an idea of their skills and start to think about where they would be best placed to serve. But now, they in the city and offshore so we no longer have that—so the process is lost. (Prime 2018)

The question remains as to how best engage young people in this process. As stated by Prime ‘... some were being groomed for certain things ... we didn’t just pass (*mātauranga*) onto anyone. We have lost the closeness we had’. Further, that in relation to the tribal politics of Waikaremoana [lake area in Te Urewera forest] ‘heads of each hapū and whānau need to come together to discuss a shared ‘strategy and vision’ Need to operate as a collective—and not for the needs of individuals’. However, Prime maintains that individuals remain important to the extent that Māori ‘... need to get, and engage, the right people ... identify the knowledge holders’.

Conclusions

Mātauranga Māori is a significant corpus of knowledge that has relevancy in a contemporary and future context. It is robust and exhibits strong complementarity alongside western science. Although the term mātauranga is a recent addition to the modern vernacular it encapsulates an accumulation of experience, testing and peer review that challenges the Eurocentric view of other forms of ‘non-scientific’ knowledge. A perspective that is reminiscent of colonial domination otherwise resistant to notions of true self-determination by indigenous peoples. Table 1 summarises much of the detail discussed in this manuscript and provides a convenient comparison between traditional western scientific approaches, and those incorporating Te Ao Māori. More importantly, at the same time as comparing these differences, it also highlights the potential of mātauranga Māori to enrich contemporary scientific thinking.

Mātauranga Māori has been used with great effect across a range of unique projects and initiatives. There is a growing and compelling weight of evidence that demonstrates that it offers unique solutions, and releasing hitherto untapped potential, in preserving and even reversing the propensity for loss of Aotearoa’s unique freshwater and marine biological heritage. It offers Te Tiriti o Waitangi partners an opportunity to engage in a more genuine relationship that has promised not only for more equitable behaviour, but most importantly, demonstrable benefits going well beyond just the socio-economic. Moreover, embracing mātauranga Māori not only proffers support of Māori taonga, culture and identity but extends benefits and presents new opportunities for all New Zealanders.

Table 1. Comparison of western science and Te Ao Māori approaches to assessing biological heritage.

	Western science	Māori world-view (Te Ao Māori) and mātauranga Māori
Research approach	- Investigation generally conducted in isolation to things considered unrelated - Incorporates world-wide body of scientific knowledge generated via the scientific method (although increasing recognition of the Vision Mātauranga science policy framework within New Zealand)	- Investigation considers the complexity of whakapapa—the interconnectedness of all things - Knowledge generated using techniques consistent with the scientific method but also incorporating mātauranga Māori - Incorporates kaupapa (customary) Māori philosophy - Employment of cultural safety, in particular the promotion of a ‘mana’ enhancing environment
Research process	Recognition of human ethics guidelines	Recognition of human ethics guidelines, subject to the normalisation of cultural practices such as tikanga Māori, and the use of te reo Māori.
Primary impacts / concerns	- Ecological impacts and consequences - Economic impacts and consequences	- Ecological impacts and consequences - Economic impacts and consequences - Cultural consequences
Typical management methods	- Quota management system—focus on stocks - Trespass control through governmental or judicial / by-law legislature.	- Quota management system—focus on ecosystems - Employment of kaitiaki (environmental guardians) - Rahui—localised ban or restriction that manages human interactions with the environment
Explanation of phenomena	Based solely on scientific investigation, or the development of a plausible scientific theory	- Acknowledgement of the scientific process, but facilitated within a cultural context - Higher levels of understanding achieved through whakapapa
Consequences /impact assessment	Loss of biological species or habitat	- Loss of biological species or habitat - Loss of traditional food supply or resource - Undermining of cultural and individual identity - The upset of whakapapa
People and roles	- Protection of bio-heritage through establishing relationships with the natural environment empowered by legislative controls - Recognition of subject area “experts” or “world-authorities” - Denial or ambivalence towards Māori rangatiratanga (chieftainship) and mana whenua - Historical record indicating devaluation, de-contextualising or concealment of indigenous knowledge	- Protection of bio-heritage through the intimate, holistic and embedded relationship developed over hundreds of years with the natural environment - Recognition and engagement of Māori “knowledge holders” - Embracing Māori tino rangatiratanga (chieftainship and authority) over taonga (treasures) which includes indigenous culture, flora, and fauna. - Recognition of mana whenua (power associated with occupation and custody of tribal land)

The recently introduced Vision Mātauranga science policy framework has provided a means to more effectively engage with Māori communities. It is more flexible in approach, and more likely to harness innovation activated by indigenous knowledge. However, despite its consistency with the scientific method, VM has challenged those who have

difficulty accepting a Māori world-view. This has particular application in the case of bio-heritage where environmentalists and conservationists are confronted by a mindset that gives equal, and sometimes even greater weight, to matters of culture and identity, alongside ecology and economics.

Widespread implementation of mātauranga Māori is not without its challenges. The nature of modern society, particularly the impacts of urbanisation and mobility that tend to draw whānau away from their homelands—from their hapū and iwi—make the task of succession planning, and passing on the knowledge to successive generations, that much more difficult. This, in turn, presents difficulties for the process of tikanga which advocates these and other normative practices under cultural praxis. Nonetheless, and particularly in the context of biological heritage, the co-development of a methodology between mātauranga Māori holders and potential end-users represents a worthwhile endeavour.

The NZBH Project 1.1 will continue to address these issues by exploring the following questions:

- (1) What pastoral care and resourcing do mātauranga Māori knowledge holders need for their own well-being, and therefore the well-being of the knowledge they hold?
- (2) Are there key pastoral support approaches that would significantly increase the well-being of knowledge holders, with a view to future-proofing the existence of, and accessibility of the knowledge in a safe and respectful way?
- (3) How do knowledge holders identify who will be the recipients of their knowledge and how do they engage them?
- (4) Are there issues identifying these future recipients?

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ORCID

Gary Owen Garner  <http://orcid.org/0000-0002-1200-9550>

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