


## Enhancing awareness and adoption of cultural values through use of Māori bird names in science communication and environmental reporting

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**Auheke:** I roto i ngā whakaputanga rerenga koiora, e whakamahia ana ngā ingoa Māori o ngāi kīrehe, e tautoko ana i ngā wawata o te ahurea Māori, e mau ana te reo Māori me ōna mita huhua, e whai wāhi ana te whanaungatanga o te iwi taketake me te pūtaiao, tae noa ki te mātauranga Māori me te koiora, ngā hua, ngā uara hoki. Nā te tipu mai o Ngāi Niu Tireni i te reo Māori, kua tūwhera he tatau hei whakapai ake i ngā whakaputanga rerenga koiora. Heoi anō, ahakoa e kitea ana te tautoko haere o te whakauru whakaaro Māori, o te whakatakotoranga kupu Māori (ngā ingoa o ngāi kīrehe) me ētahi mātauranga Māori, puta ana he raru ko ēhea o ngā ingoa hei whakamahi, ā, te rerekē hoki o te mita o te reo o tēnā rohe o tēnā rohe. Hei konei mātou kōrero ai i te whānui o ngā ingoa Māori o ngā manu me te whakamahi i aua ingoa i ngā whakaputanga rerenga koiora, ngā whakahaere, ngā rangahau, tae noa ki ngā pūrongo pūtaiao. E whakaaro ana, e whakamātau ana hoki mātou i ētahi āhuatanga para huarahi hei whakatairanga mōhiotanga, hei whakamahi anō hoki i ngā ingoa o ia rohe kia mātau ai, kia mārāma ai i ngā manu, i te ahurea Māori hoki, i te orokohanga mai o ngā ingoa o aua manu. Ka whakaatu hoki mātou i te huringa o ētahi o ngā ingoa o ngāi kīrehe i roto i te wā poto me te tohu i ētahi ara torohū i hua ake ai ēnei āhuatanga.

**Abstract:** In biodiversity reporting, use of Maori species names supports the cultural aspirations of Maori. It helps to retain the Maori language and its dialects, and implicitly acknowledges indigenous relationships with the environment. However, although it is clear that there is growing support for incorporating Maori views, terminology (including species' names) and knowledge in New Zealand environmental reporting, there is often confusion about which Maori name to use, and about some of the regional nuances of the language. Here, we discuss the range and use of Maori bird names in biodiversity reporting, management and research as well as science communication. We piloted some potential mechanisms for improving awareness and adoption of regional names as well as the knowledge and understanding of both birds and culture those names contribute. We show that shifts in the use of species names can occur within short periods of time and identify potential pathways through which such shifts might occur. We emphasise that working with communities should be central to the incorporation of Maori bird names in regional and national reporting to support regional language variants that reflect the relationships of those groups to specific places and build community capability. We propose that creating a federated dataset to build maps of Maori bird names will support such reporting.

**Keywords:** geographic distributions, indigenous knowledge, matauranga Maori, local ecological knowledge, New Zealand, traditional ecological knowledge, TEK

## Introduction

The diversity of life comprises not only the variety of species and cultures that have evolved on earth, but also the variety of human languages. All of these diversities interact with each other in complex ways (Maffi 2005). The fundamental link between biological, cultural and linguistic diversity lies at the root of the term 'biocultural diversity' and underpins documents on ecosystem conservation emerging from the 1992 Rio Summit on Environment and Development and following (UNESCO 1992; United Nations 2010, 2015; International Union for Conservation of Nature 2016). Certainly, humans have attempted to maintain, protect, and enhance biocultural diversity through the ages, and developed detailed knowledge and environmental management systems that aim to protect biodiversity for future generations (see, for example, Horstman & Wightman 2001; Ens et al. 2015; Wehi et al. 2018, IPBES 2019). Maintaining connections between biological diversity, language and culture creates a strong pathway for conserving the future wellbeing of people and nature (Maffi 2005; Bond et al. 2019; Cisternas et al. 2019; Walker et al. 2019).

Indigenous languages worldwide are under threat, and Māori is no exception (Benton 1991; Christensen 2001; Kawharu 2013; UNESCO 2017; Olsen-Reeder 2018). Indeed, the risk to indigenous languages greatly exceeds extinction risk to birds and mammals (Sutherland 2003). Language is a primary means for expressing the connections between humans and nature. Like species, languages have high diversity; they differentiate over space and time and emerge and disappear much as species do (Solé et al. 2010). Regional nuances in language can tell us much about locally distinct human relationships with biodiversity, such as those held by hapū, or sub-tribal groups, and iwi, or tribal groups (see Turner 2014). Increasing interest in the Māori language, *te reo Māori*, allows expression of some of these connections for Māori and non-Māori. Concepts drawn from a Māori world view are increasingly referenced in New Zealand national and regional policy documents (for example, the Biodiversity Strategy for the Canterbury Region 2008; Waikato Regional Coastal Plan 2014; Parliamentary Commission for the Environment (PCE) Report 2017; Environmental Reporting Act (New Zealand) 2015; Ministry for Environment and the Department of Conservation 2017). These include, for example, *kaitiakitanga*, a practical philosophy based on reciprocal relationships with the environment. However, the linkages between *mātauranga Māori*, or Māori knowledge, and the environment are not always well recognised or understood, despite the significant potential contribution of Māori knowledge to environmental management (Stephenson & Moller 2009; Lyver et al. 2017; Clapcott et al. 2018; Ogilvie et al. 2018).

Using Māori species names would help incorporate indigenous ecological knowledge in reporting, acknowledges indigenous relationships with the environment, and supports the retention of the Māori language and its dialects. Despite support for incorporating Māori views, terminology (including species' names), and knowledge in national documents and websites (for example, PCE report 2017; Department of Conservation web resources; NZ Birds Online; Wikipedia List of Birds of New Zealand), there is confusion about which particular names to use and in what context. It seems likely that this confusion can be partly attributed to poor understanding of nuances of *te reo Māori* by New Zealanders (Statistics New Zealand 2013; Ministry of Social Development 2016).

A recent MBIE-funded project on birds as indicators

(Building Trustworthy Biodiversity Indicators; TBI, see [www.landcareresearch.co.nz/science/plants-animals-fungi/animals/birds/biodiversity-measures](http://www.landcareresearch.co.nz/science/plants-animals-fungi/animals/birds/biodiversity-measures)) stimulated conversation on the use of Māori bird names in reporting. Discussion with communities about the dissemination of scientific knowledge highlighted that using Māori bird names and Māori ecological knowledge in reporting can support science communication and engagement by reaching segments of the public that tend to be under-engaged in science. In addition, such initiatives can help to sustain the Māori language for all New Zealanders, a responsibility embedded in one of our founding documents, *Te Tiriti o Waitangi* (Report of the Waitangi Tribunal on the *Te Reo Māori Claim* 1989). However, scientists and policy makers have a number of issues to resolve around both communication and reporting. In this paper, we highlight some of these issues, and illustrate potential approaches and solutions using examples from the Building Trustworthy Biodiversity Indicators project.

## Building Trustworthy Biodiversity Indicators

The TBI project had three over-arching goals to improve bird monitoring and reporting in New Zealand. The first goal was to understand what matters to people and how to engage them. Second, we asked how we could make best use of existing biodiversity data. Third, we asked how we could improve communication to better reach target audiences. In the TBI research programme, we conducted eight focus groups at four locations (Karitāne, Christchurch, Wellington, and Hawke's Bay) to review and refine communication materials on bird biodiversity that we had developed (see: <https://www.landcareresearch.co.nz/science/plants-animals-fungi/animals/birds/biodiversity-measures/how-to-build/building-engagement-and-trust/facilitating-engagement>). We were interested in what content, illustrations, and messages were the most comprehensible and appealing, including website and booklet material about bird species and their abundance. We also asked how Māori bird names could be better used in both national and regional reporting in a way that honours the relationship of Māori with birds. Topics of interest were around biodiversity values and beliefs (including species of most interest), measures (including what people want to know about birds), as well as preferred forms of presentation and communication.

We include observations offered in two focus groups, from Karitāne in the South Island and Hawke's Bay in the North Island, that relate to our work on Māori bird names specifically. In brief, these groups consisted of Māori community members in the Hawke's Bay of the North Island, and a mixture of Māori and Pākehā community members based at Karitāne in the South Island. There were between five and eight individuals in these groups, ranging in age from 10 years old through to *kaumatua*, or elder, status. Individuals with an interest in birds were identified via a snowballing process (Bishop 1996), initiated through hapū and Department of Conservation contacts. Focus group questions were open ended to encourage discussion around the themes stated above. All research was conducted in accordance with social ethics obtained from Manaaki Whenua - Landcare Research. All focus group material was recorded and transcribed. Themes were coded, including comments on the use of Māori bird names in biodiversity reporting.

In the rest of this paper we outline some of the issues that arise when using Māori bird names in reporting, then discuss pathways for dealing with these. We incorporate material from

online resources that we developed for the conversations we had with communities of interest, as well as observations and discussion that arose from our experiences in TBI.

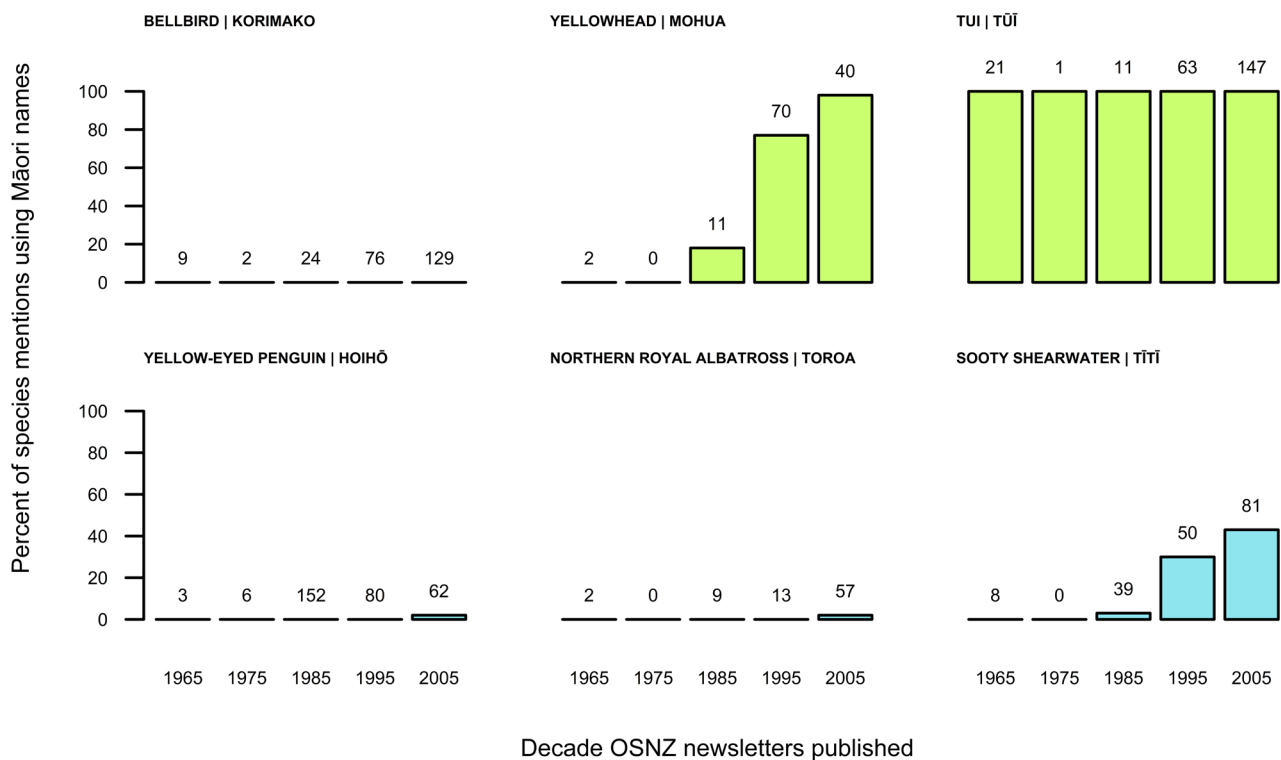
### The visibility of Māori bird names

The TBI research found that New Zealanders enjoy using and finding out about Māori bird names and do so as an expression of their identity and connection to New Zealand. Some might argue that using only scientific names is appropriate for biodiversity reporting, as it avoids confusion about specific species identifications and follows international taxonomic convention. That is, an important concept in the Linnaean naming system is that there is a single published scientific name linked to a single species. However, among communities, Māori and common English names are preferred since, as one person observed, “we do not relate to the Latin names at all” (Karitāne focus group). Notably, New Zealand birds have very few Māori words incorporated into species epithets (Veale et al. 2019); it is unknown whether incorporating Māori words would change such views.

From the focus group comments, it is clear that use of Māori bird names in local biodiversity projects helps build awareness of biocultural connections and Māori values in communities. One focus group participant commented that “The beautiful thing about those Māori names is that they have their own whakapapa. There is a specific reason for every one of those names” (Karitāne focus group).

Whakapapa refers to genealogical connections, but also to the stories that explain the meanings behind these names. In addition, many Māori bird names contain embedded ecological knowledge. For example, they may be based on the calls that birds make, or their appearance (Tom Roa, pers. comm.; Te Waiarani Harawira, pers. comm.). This embedded knowledge aids recognition of these species in the field and helps to correctly assign Māori bird names to the appropriate bird species. Furthermore, Māori bird names are endemic to Aotearoa, as are most of our native birds. Māori bird names thus provide a globally unique identifier for our globally unique avifauna.

Using Māori bird names in reporting, as well as research and conservation activities, raises awareness of the Māori species names themselves, in addition to the cultural value of species. For example, increased awareness and use of tītī as the southern name for the muttonbird (*Puffinus griseus*) appears to have been influenced by a 15-year research partnership (1993 to 2008) between Rakiura Māori and University of Otago researchers: Kia mau te tītī mo ake tonu atu (Keep the tītī forever) (Moller et al. 2009). Use of this Māori name increased ten-fold in newsletters published by Ornithological Society of New Zealand’s (OSNZ, also known as Birds New Zealand) Otago branch, in parallel with this research partnership (Fig. 1). In contrast, the use of Māori names for yellow eyed penguins (hoihō; *Megadyptes antipodes*) and northern royal albatross (toroa; *Diomedea sanfordi*) in these publications was rare, despite these seabirds having a high conservation profile. This suggests a missed opportunity to raise awareness of these species’ Māori names and cultural values.



**Figure 1.** Bird name occurrence (percent of species mentions) in English and Māori for three passerine birds (bellbird / korimako, yellowhead / mōhua and tūī) and three seabirds (yellow-eyed penguin / hoihō, albatross / toroa and sooty shearwater / tītī) in the Otago Ornithological Society of New Zealand (OSNZ) newsletters over five decades (1965 to 2014). Total number of species mentions for each decade are provided (above the respective bar), where the year specifies the start of a decade. Note that albatross and toroa both refer to the group of albatrosses, including northern and southern royal, rather than a specific species. Names were manually extracted, and all species mentions were checked for validity. All known English and Māori names mentioned for a bird species are included and grouped by language (e.g. muttonbird and sooty shearwater: tītī).

A national-scale conservation drive can also provide a good platform for raising awareness of Māori bird names and values. In the early 1990s, a campaign launched for a threatened endemic bird, the yellowhead (*Mohoua ochrocephala*), used its Māori name, mōhua, in social media and publicity as well as research publications (Elliott & O'Donnell 1988; O'Donnell 1996). Prior to the mid-1980s, this now southern-distributed species was rarely mentioned in newsletters published by the OSNZ's Otago branch (Fig. 1); over the next three decades, this species' profile increased in these publications, along with use of its Māori name. Meanwhile, the names of some common species remained unchanged: bellbird (*Anthornis melanura*) and tūī (*Prothemadera novaeseelandiae*), for example, always occurred in English and Māori respectively (Fig. 1). This suggests the mōhua campaign successfully raised awareness and adoption of its Māori name within this community of bird enthusiasts.

## A multiplicity of names

Increasing the visibility of more Māori bird names engages people in the community and acts as a learning tool. However, many, if not most, New Zealand native bird species have a multitude of Māori names (Gill 2010). Hence, it is not always clear to many New Zealanders how these names are related or which ones to use. For example, in the TBI focus groups, a community member involved in restoration work in the Karitāne area commented: "We have the rocky shore guides - and the Māori guides. We had to put a disclaimer on it, because hapū and iwi have different understandings of the names. I noticed that the things you can eat have lots of names" (Karitāne focus group).

It is also often difficult for researchers and communicators to know which Māori name to use in biodiversity reporting. National reporting is particularly problematic in this regard. Some names that are apparently different instead simply express dialectal forms of the same word. For example, the national report on the state of birds (PCE, 2017) used 'tarāpunga' for red-billed gull (*Chroicocephalus scopulinus*), and 'tarāpuka' for black-billed gull (*Chroicocephalus bulleri*) when these are actually dialectal variants of the same word in Māori: the South Island Kai Tahu dialect replaces the 'ng' sound with a 'k' sound, but in the Waikato dialect there is no such replacement of the ng sound with a k, and 'tarāpunga' therefore refers to both species. This error is perpetuated on NZ Birds Online. Another issue is that Māori may not recognise, classify and name birds at species level (Whaanga et al. 2013).

A pervasive issue is the promotion of one correct Māori name for a species. Gill (2010) observed that in the late 19th Century, Māori bird names were taken from the works of prominent Pākehā who lived and worked with particular iwi. This is how the names used by certain iwi became more prevalent in recent usage than other tribal names for the same bird.

This trend to use the dominant term masks the particulars of Māori ecological knowledge: often the predominately used word may be only one of a suite of names used for a particular species. For example, the use of pīwakawaka for fantail (*Rhipidura fuliginosa*) is widespread (for example, PCE 2017), yet this name for fantail is only used by some iwi, such as Kai Tahu in the South Island. Amongst Māori language speakers, commonly heard words for fantail include fīrairaka, pīrairaka and pīwaiwaka. In total there are 19

recorded variants for the 'New Zealand fantail' (Whaanga et al. 2015; P. Scofield, unpubl. database): hīrairaka; hītakataka; hīwai; hīwaiwaka; hīwakawaka; kōtiutiu; kōtiutiu; pīrairaka; pīrakaraka; pīrangirangi; pītakataka; pīwaiwaka; pīwakawaka; tīaiaka; tīaka; tīakaaka; tieaka; tīrairaka; tīrakaraka; tītaiwaka; tītakataka; tītakataka; tītīrairaka; tīwaiwaka; tīwakawaka; wakawaka.

This high variability of Māori names for this one species illustrates the range of dialectical and spelling variants, and the variance in the marking of vowel length (Gill 2010). Other notable species have similar Māori language naming variability (Table 1; Whaanga et al. 2015; P. Scofield unpubl. database).

One well-known name, tūī, arose from an unusual set of circumstances (Wehi et al. 2019). Although the dominant name used by non-Māori speakers has varied over the years (Wehi et al. 2019), tūī is in almost universal usage among non-Māori speakers today. However, the Māori name kōkō, favoured and still used by many Māori speakers, remains largely unrecognised, as are many of the variants that embed information about the sex of the bird, the season in which it is seen, and its activity. Māori names for tūī, for example, recognise its sexual size dimorphism, a trait only formally quantified in the scientific literature recently (Wells et al. 2014). It is clear that much of the Māori environmental knowledge associated with the kōkō, and communicated by variations in the Māori name, remains poorly acknowledged and reported, as is likely the case with other bird species.

## Unpacking Māori bird names and their meaning

Traditional ecological knowledge (TEK) has been described as a cumulative body of knowledge, know-how, practices and representations maintained and developed by peoples with extended histories of interaction with the natural environment. These sophisticated sets of understandings, interpretations and meanings are part and parcel of a cultural complex that encompasses language, naming and classification systems, resource use practices, ritual, spirituality and worldview (International Council for Science 2002).

Such knowledge is embedded in species names. For example, species names are often associated with landscapes of particular iwi and local peoples' knowledge of that landscape. Knowing why names vary regionally is important as they

**Table 1.** Examples of New Zealand bird species with recorded name variants.

Common name	Scientific name	Recorded number of name variants
New Zealand robin	<i>Petroica australis</i>	34
bellbird	<i>Anthornis melanura</i>	33
kākā	<i>Nestor meridionalis</i>	30
rifleman	<i>Acanthisitta chloris</i>	26
banded rail	<i>Gallirallus philippensis</i>	24
whitehead	<i>Mohoua albicilla</i>	23
stitchbird	<i>Notiomystis cincta</i>	20
fernbird	<i>Bowdleria punctata</i>	18
grey warbler	<i>Gerygone igata</i>	17

serve different purposes and connect to different knowledge traditions. Bird names (like place names) are keys to unlocking hapū understandings of the local landscape, mahinga kai, or food gathering, sites, whakapapa, or genealogical connections, and resource tenure. The names also relay important information about the local ecosystems and how birds adapt and shift in response to dynamics in that environment, such as changes in the type and availability of current and future food sources. As species distributions change, the embedded link to the original stories and information about the environment may not travel with them. Weakening of this knowledge and understanding of regional bird names may erode cultural links with regional whakapapa and association with the landscape. Whakataukī, or traditional Māori aphorisms, highlight some of the meanings associated with birds, for example, linking kākā (*Nestor meridionalis*) with chiefs, or cuckoos (*Chrysococcyx lucidus*) with seasonal changes (see Orbell 1985; Wehi et al. 2018a).

## How might I find the correct name to use?

There is increasing appreciation of Māori bird names, their purpose, their value, and the embedded knowledge. This can be seen in the Ngāi Tahu Claims Settlement Act 1998, where taonga, or highly valued, species (including birds) are listed to signal the importance (spiritually and physically) of particular species to Ngāi Tahu whānui. Within these lists are regional name variations that reflect local knowledge and genealogical linkages. This is a good step to raise awareness of wider Ngāi Tahu species name preferences along with regional, or rūnaka, preferences. However, it is limited in scope and tends to list only the more commonly seen species. Some variations are not given, and the reasons for the variations are not apparent. Knowledge of the whakapapa, purpose, and activity of the birds and bird names remains to be considered and at present, it is up to the individual be aware of and motivated to find this information, which can prove difficult to obtain.

How, then, might we recommend reporting using Māori bird names in regional context? As highlighted by Gill (2010): “To create a list of single preferred Māori names for each native New Zealand bird is a difficult and often controversial task, which is why we have gathered the names into an appendix. Māori name different ages, sexes, and growth stages of birds, based primarily on the species’ use and its role in whakapapa (genealogy) and mythology”.

For example, in the south of the South Island and Eastern Bay of Plenty, kōparapara is used to denote bellbird, although others say this term should be used only for female bellbirds. In reporting on biodiversity, we suggest that the use of regional name variants in reporting, that recognise the authority and guardianship of hapū, is an important way of incorporating their TEK in any regional reporting, or indeed, national framework.

For Māori speakers, a sensitive issue is the propagation and teaching of external dialects within a region. With the huge increase in Māori mobility nationally, particularly in the 1960s and 1970s, many Māori introduced their own local names for species to other regions. Speaking one’s own dialect is a mark of identity, yet supporting the local dialect is also desirable. This issue can be addressed creatively: by asking children, for example, to find local words, or through questioning that leads to reflection. A simple example might ask “What is this?”, and provide alternate answers based on the dialect of the speaker, and of the local dialect: “He aha tēnei? Ko te pūhā – ehara i

te pūhā. He aha tēnei? He pōhatu – ehara i te pōhatu. He aha rā te kupu kōwhai? Kua wareware te kupu o Ruatoki.”

Elders consider that learning multiple dialectal words is both appropriate and respectful: tikanga, or processes that emphasise doing what is right, are about understanding that others’ usage is different, but of no lesser value. Nonetheless, the reality is that many non-local words are used within a tribal region. As with organisms themselves, names are transportable (Biggs 1991). Language evolves and shifts over time and is influenced by ‘new’ languages and vocabulary that enters linguistic space (Harlow 2007). Thus, bird names move with people, and people will use what is familiar to them (Riley 2001). In the context of language, this means names of species and/or habitats change according to how newcomers understand their association with the new place.

Media such as television, radio, or even kōhanga reo, can also introduce generic terms. For example, the word kōwhai is used generically for the colour yellow and the yellow flowered native tree (*Sophora microphylla*) but for Tūhoe, according to one esteemed tribal elder, “Kei te tika te kōwhai, enari ki a tātou a Tūhoe, ko kōhai.” That is, the word kōwhai is correct, but to those who are Tūhoe, the word is kōhai.

People who report on New Zealand birds, including scientists and members of community groups, can help to spread knowledge of regionally-appropriate Māori bird names through providing these names at the same time the English common name is used, e.g. korimako/bellbird. Such reporting can be in publications, presentations, and on websites. As well, regional names can be used on signage, as is currently the case for Department of Conservation and regional council signs which use the appropriate regional name kūkupa north of Auckland for the kererū (*Hemiphaga novaeseelandiae*). With the increasing number of partnerships between scientists and communities throughout New Zealand, and the development of community engagement tools and outreach, researchers will therefore need to be aware of local linguistic variations and usages and avoid making value judgements about them, especially local variations. As hapū develop their own language strategies (for example, the Hāmua reo strategy), the decisions about acceptable linguistic variants will be made by the hapū since it is they who have the best awareness of the particular TEK embedded in species names.

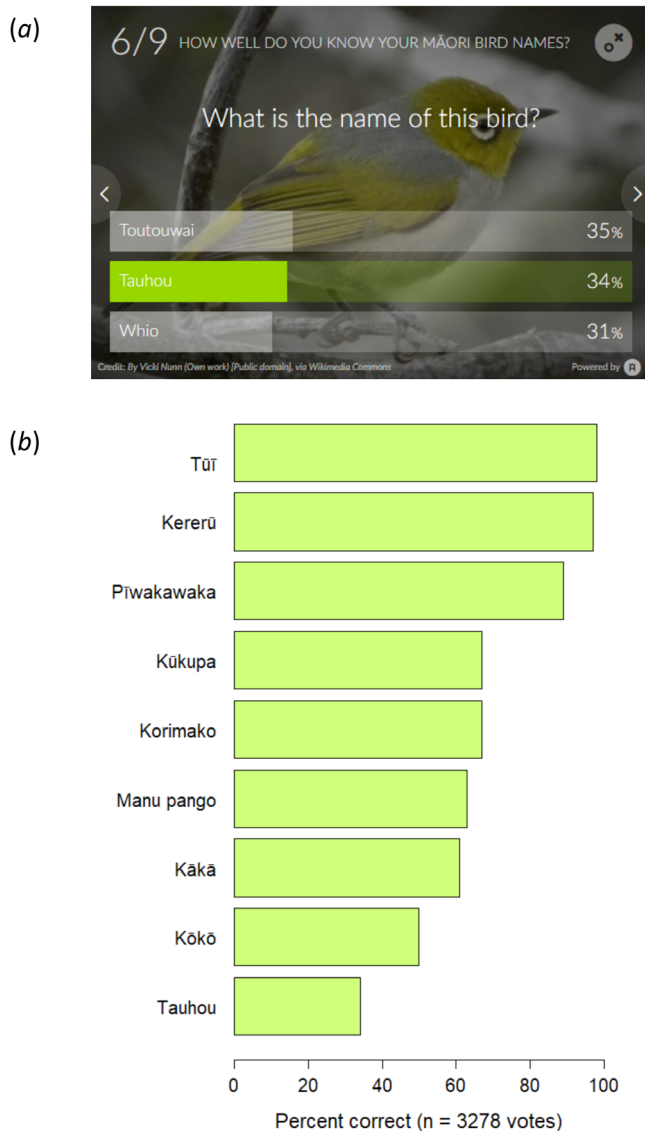
## Pilot-testing solutions

Stakeholders involved in the TBI project signalled a strong desire for intergenerational educational resources for raising awareness and knowledge of birds and their significance. In response, we pilot tested three mechanisms for addressing these challenges. The goals were to improve biodiversity reporting to better reflect local values, engage people and build capability, and to overcome barriers to information and engage diverse audiences. First, we worked with local hapū and a private consultant to facilitate the use of Ngāi Tahu bird names in a research report documenting relationships between forest birds and habitats in Otago (Wildlands Consultants 2016). Despite a consultation process with local hapū, one funding organisation (OSNZ) reporting on the project still incorrectly assigned Māori bird name toutouwai (South Island robin; *Petroica australis*) to information relating to miromiro (South Island tomtit; *Petroica macrocephala*). This highlights the challenges of addressing confusion about which names are the ‘correct’ ones to use.

Second, we built on people's interest in birds, developing interactive tools for learning. Using an online platform to design multi-choice quizzes in both Māori and English, these quizzes used bird photographs to help the user develop their species identification skills and, at the same time, raise awareness of both generic and localised Māori bird names. As the user completes the quiz, the user learns the correct answer and how their response compared to others. One such quiz, promoted on social media as part of a citizen science campaign, reached 4700 people within two weeks (Fig. 2). Another quiz, developed as a direct response to a request for learning resources from a hapū partner, included local names for species that the hapū felt were of particular interest to visitors to their wetlands.

Third, we built Māori capability into our project, and highlighted mātauranga Māori, through an illustrated history

of usage of names such as 'tūi' (Wehi et al. 2016a, b). Partnerships between illustrators, community knowledge holders, researchers and many others were critical to the desired result (Figs. 3, 4): a set of resources suitable for dissemination via a variety of communication channels to engage and educate a diverse range of New Zealanders. The team members involved in the co-design process came from different cultural backgrounds (Māori and Pākehā), generations (from elders to teenagers) and capabilities (fulfilling seven design roles; Fig. 4). The team worked together to incorporate shared values, bicultural practices, worldviews and intergenerational perspectives. For instance, we created narrated videos ('The Tūi Story') in both Māori and English, explaining the variety of the bird's names and their cultural significance (Fig. 3; Wehi et al. 2018b). These were promoted on a social media platform (Facebook) as part of Māori Language Week in 2017 and 2018, reaching approximately 30 000 people and receiving around 9500 views.



**Figure 2.** Sample question and results from an online quiz inviting people to test their knowledge of NZ birds and their Māori names. This quiz, released as part of the NZ Garden Bird Survey 2016 campaign, was built on the Apester platform and embedded on the Manaaki Whenua – Landcare Research website. Within two weeks of its release, it had c. 4700 views, 213 shares and 3278 votes (based on the Apester platform engagement statistics).

## Recommended next steps

We have considered different scenarios to help New Zealanders discover regional variants in species names and overcome information barriers, including building a national mapping tool that contains the regional contributions of hapū. This could be achieved through the use of a federated data framework. In this scenario, we envisage hapū would have oversight and control of their regional contributions to the mapping project, contributing their stories and names for species in their region as they see fit. This kind of map would thus support the authority of hapū within a national framework, include material on the presence of birds in that area, and link to stories about those birds. That is, it would link to whakapapa, how known and connected. Currently, however, we do not know of resourcing for such an endeavour, although it might first be possible to develop this as a pilot study, for example in the South Island, to be followed by an app based on this mapping network, or other educational tools and resources.

In regional governmental reporting we emphasise the importance of creating strong pathways and partnerships between councils and hapū groups that have responsibility and connection to the land in that place, and of providing practical support to construct resources with appropriate bird or species names. Building associations between maps, photos of the bird, stories and names will assist people to build their understanding of TEK associated with species. *Nō reira, e te iwi, he mihi ki a koutou e tautoko nei i te kaupapa, e mau ana ki ngā kupu o neherā.*

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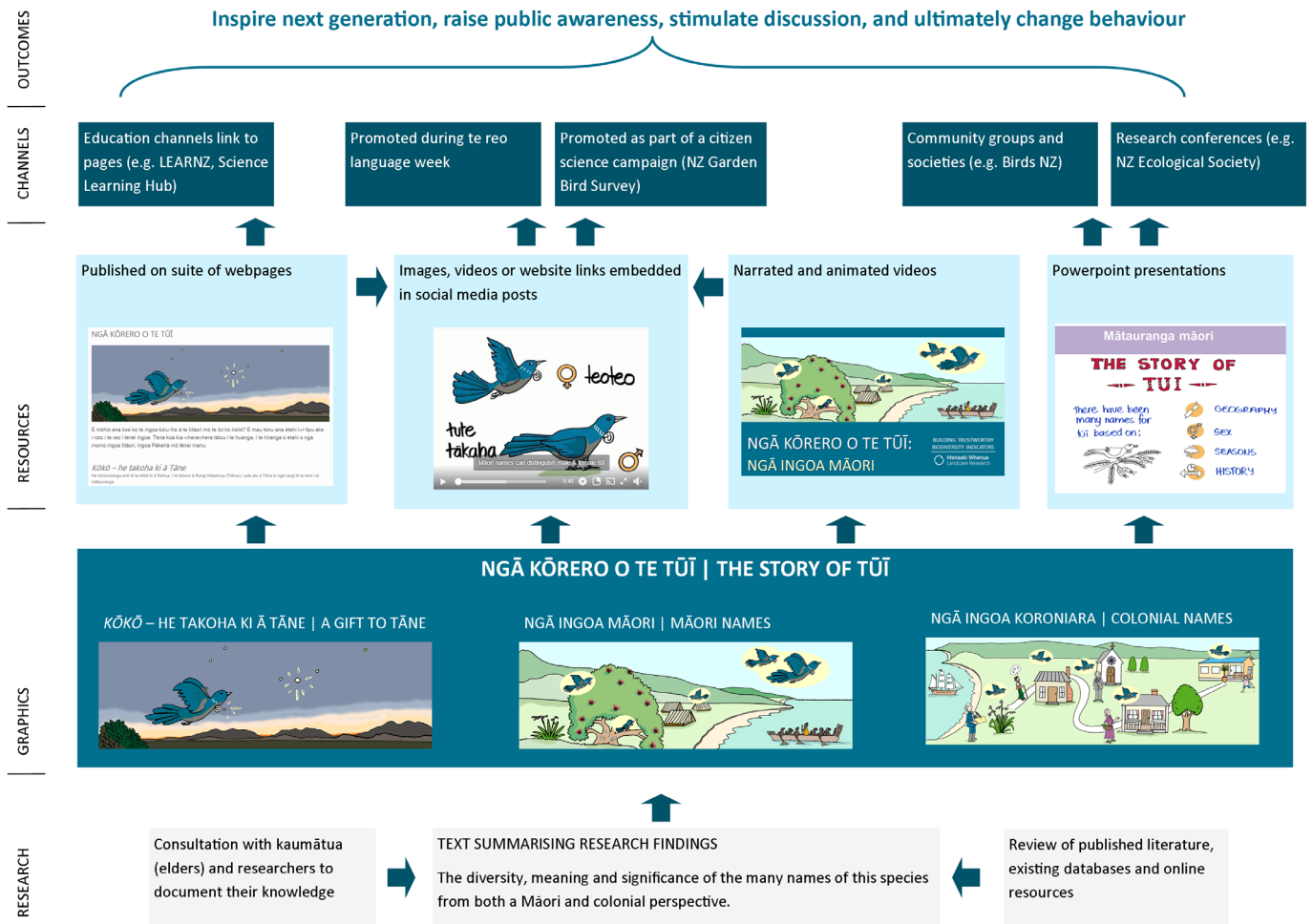


Figure 3. Development and communication of The Tūi Story using a variety of resources/platforms to a diverse range of audiences.

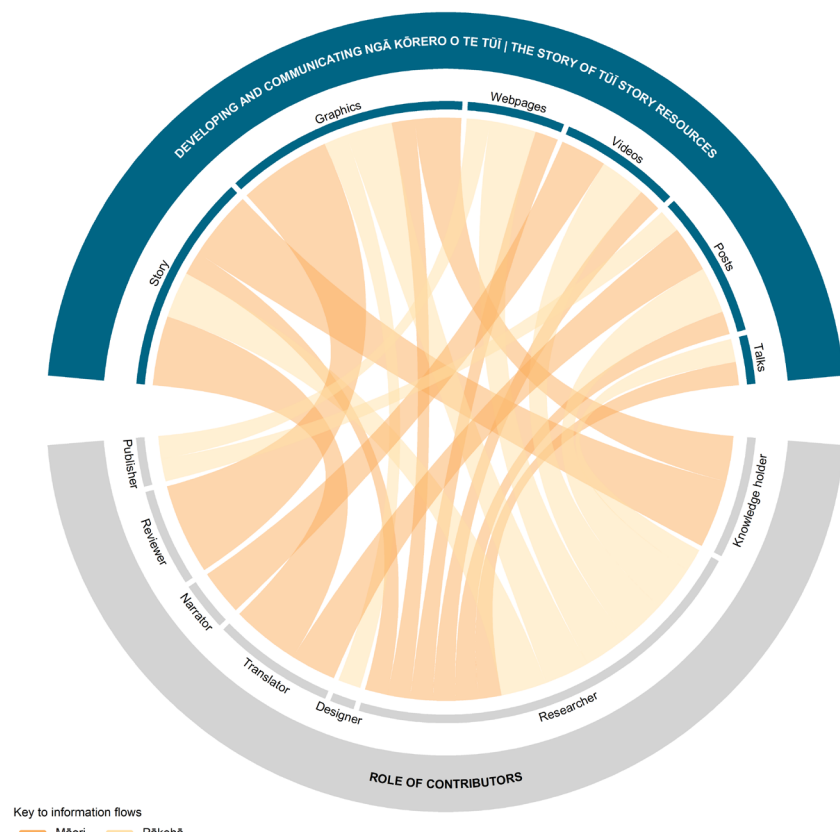


Figure 4. The co-design process for the developing ‘the tūi story’ resources and communicating them. The different roles of contributors are shown in the lower half of the circle, and different types of outputs are shown in the upper half. Size of each connecting strand reflects the size of the contribution.

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