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The vegetation associations and flora of Hi'Tara, a shell cay, Te Whanga, Rēkohu / Wharekauri / Chatham Island

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Abstract

The islands of Te Whanga Lagoon, Rēkohu / Wharekauri / Chatham Island are scarcely documented. Two of the islands are shell cays, Moturangaranga and Hi'Tara. In this paper the geology, physiography, landforms, vegetation associations and some of the biota of Hi'Tara are documented. Hi'Tara has a vascular flora of 50 taxa and four fungi (two rusts, one leaf spotting fungus and a mildew). Fifty-two percent of the vascular plants and fungi are naturalised to the Chatham Islands. Five vegetated landforms and vegetation associations are described. The role gulls and terns (Laridae) have in dispersal of plants, especially naturalised species to islands, is noted, and a plea for further study and formal publication of this in studies involving greater Aotearoa / New Zealand is made. Similarly, there seems to be a dearth of accessible, formally published literature on shell cay systems in Aotearoa / New Zealand. To rectify this, more research into these islands is needed.

Keywords

Chatham Islands, Te Whanga Lagoon, shell cay system, geology, physiography, biota, landforms, vegetation associations

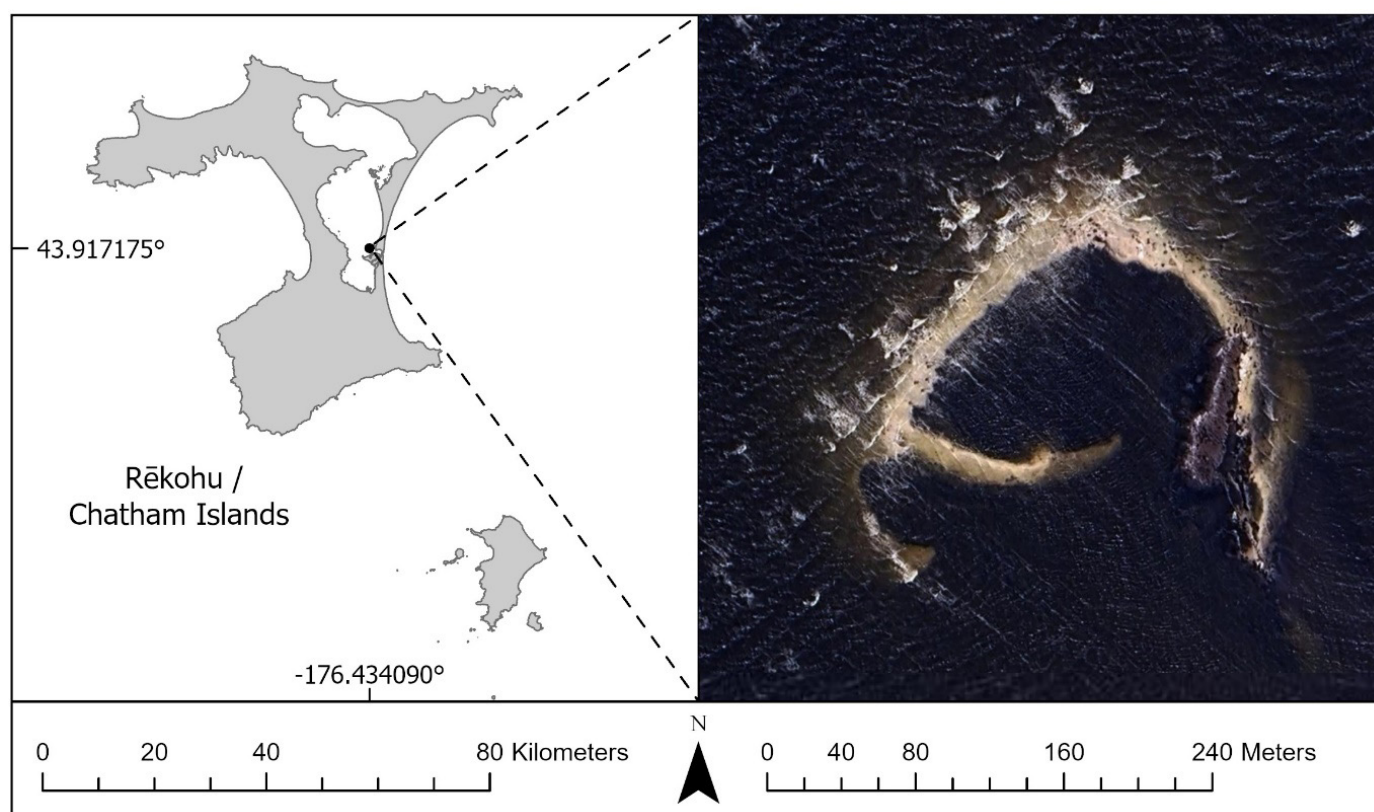


Figure 1. Left: location of Hi'Tara island in Te Whanga Lagoon, Rekohu / Wharekauri / Chatham Island, Chatham Islands. Right: the landform during a time of high water levels when the cay was submerged (Google Earth Pro 7.3, 10 September 2023, -43.917589°, -176.307550°, eye altitude, 360 m, Airbus Imagery, accessed 15 January 2026). Note the development of an outer western hook that was just starting to form in 2011. This outer hook had, by December 2025, formed another small embayment (Figure 7).

Introduction

The vegetation associations and flora of the eastern islands of Te Whanga, Rēkohu / Wharekauri / Chatham Island appear to lack documentation, a fact confirmed by the Chatham Islands Museum researchers (J. Powell, pers. comm., January 2026). Near the entrance of the lagoon (Hikurangi Passage), Te Whanga, there is a cluster of islands, including Moturangaranga, Waikawa, and Hi'Tara Islands. The most isolated and smallest of these is Hi'Tara / Noddy Island (Figure 1) located at -43.917175°S, -176.434090°W, 0.35 km west of the nearest land (Tāia) and 1.53 km from Hikurangi Passage. Hi'Tara is mostly known to locals as 'Noddy Island' (H. Preece and T. Tuuta-Thompson, pers. comm., 19 December 2025). 'Noddy' is a local name for tara / white-fronted terns (*Sterna striata* Gmelin, 1789) that nest on the island; similarly ta rē Moriori 'Hi'Tara' also alludes to this fact. On 14 December 2025, one of the authors (P. J. de Lange) visited Hi'Tara with a team of ornithologists banding birds. During this time, observations on the flora, landforms, geology and vegetation associations

were made, and these are reported here to provide an accessible record for future field workers.

Methods

Hi'Tara was visited for two hours on 14 December 2025, during which time the entire island was traversed. Observations of the geology, vegetation, flora and mycobiota were made during this visit, and these data were collated for this paper. Some collections were made and these are lodged in UNITEC (Herbarium code follows Thiers 2008–). Taxa observed are arranged taxonomically by family using, for flowering plants, the Angiosperm Phylogeny Group (APG) II–IV classification system and, for fungi, Mycobank (<https://www.mycobank.org/page/Home>). Vegetation associations were distinguished in the field using the empirical field-based vegetation classification system of Atkinson (1985).

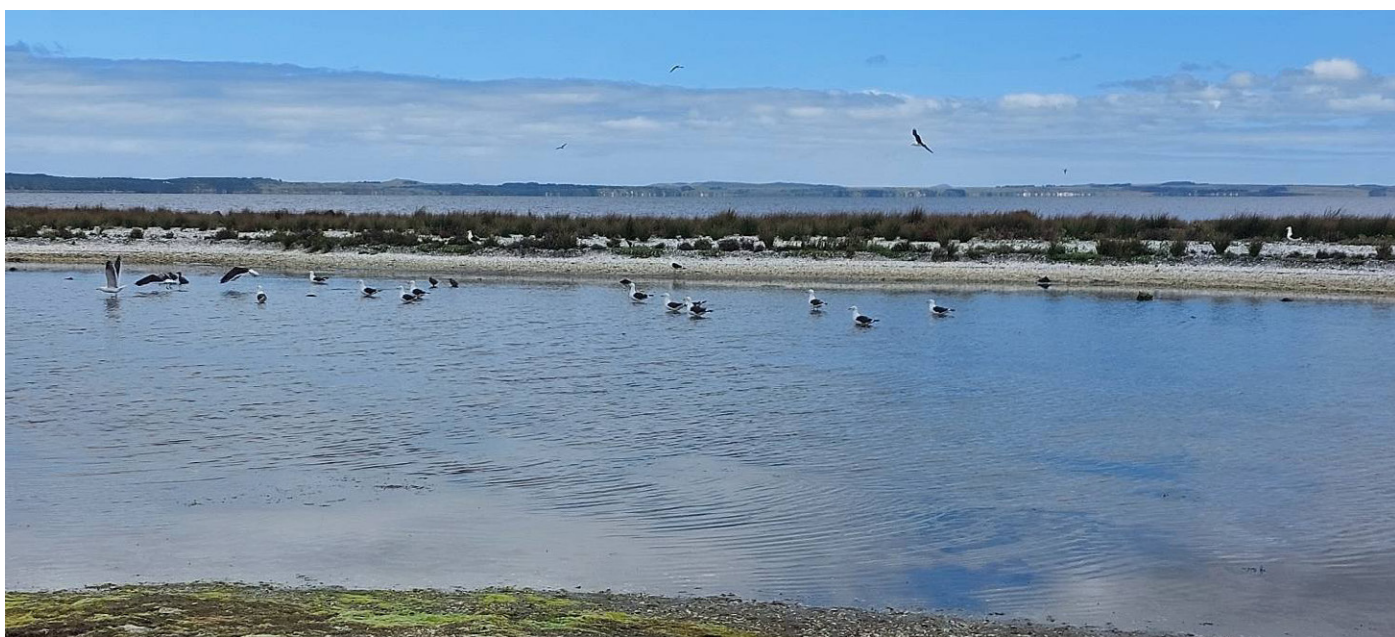


Figure 2. Eastern embayment, looking north-west to Te Mātārae.



Figure 3. Western embayment, looking north to Waikato and Kahupiri Point.

Geology and Physiography

Hi'Tara is a shell cay with shells present dominated by tuangi / New Zealand cockle (*Austrovenus stutchburyi* (W.Wood, 1828)) and tuatua (*Paphies subtriangulata* (W.Wood, 1828)), with occasional mud whelk (*Cominella glandiformis* (Reeve, 1847)) and fragmented horse mussel (*Atrina zelandica* (Gray, 1835)). It consists of an arcuate shell bank with three lobes that rises to a maximum of about 1 m above mean water level, recognising that the water level in Te Whanga Lagoon is

very variable in response to rainfall and the blockage/opening of the Hikurangi Passage, and largely encloses two small lagoons (Figures 1–4). The highest point is on the northern side of shell bank forming the cay and is associated with the steepest beach slope. Notably, at the time of the survey, all the island was above sea level, whereas, subject to lagoon levels, Hi'Tara can be completely submerged.

Cays such as Hi'Tara form in shallow coastal lagoons with sufficient coarse sediment supply, such as shells from nearby shell beds, and sufficiently strong opposing



Figure 4. Hi'Tara viewed from the northern portion of the cay, showing shell accumulation and vegetated interior of the island.

transport mechanisms to concentrate the coarse sediment and form the cay. Typically, the sediment transport results from a combination of tidal currents and wave action, and is often found on or near flood-tidal deltas around the coast of Aotearoa / New Zealand (hereafter Aotearoa) (Black et al. 1989). At Hi'Tara, tidal flows through the Hikurangi Passage just to the east of the cay are intermittent due to episodic blockage and reopening of the channel connection to the ocean. The shape of the cay suggests that it is predominantly affected by ebb flows that limit migration towards the eastern passage and elongate the shell bank towards the ocean along the tidal channel margin. Due to accumulation of freshwater from rainfall while the Hikurangi Channel is blocked, ebb flows shortly after reopening are likely to be the strongest tidal currents affecting the cay.

Overall, wave action is likely to be the main process supplying coarse sediment and shaping the cay. Limited satellite images (Google Earth Pro: <https://earth.google.com/web/>) indicate that the predominant wave direction controlling the evolution of the cay is from the north-west. Wind data reported by Pierce (2016) indicate wind directions for Rēkohu are bimodal with predominant directions being from the south-west and north-west. The observation site at Chatham Islands / Tuuta Airport is likely to be more exposed to the south-west than the southern Te Whanga Lagoon, which is sheltered by the southern tablelands, and there is a very limited fetch to the south-west of Hi'Tara, so it is inferred that north-westerlies are the predominant wind generating waves

capable of transporting sediment near Hi'Tara.

The maximum elevation of a cay depends on the distribution of wave heights, with the maximum elevation limited by the extent to which coarse sediment can be transported by the wave uprush, and erosion and the landward transport as overwash caused by overtopping waves. There is little evidence of overwash at Hi'Tara, so the maximum height is likely due to wave uprush during elevated water levels in Te Whanga.

Results

Flora and mycobiota

A total of 54 taxa from 22 families (19 Angiosperm (flowering plant) and three fungi) and 43 genera (39 flowering plant, four fungi) were recorded from Hi'Tara (Table 1). Four of the families (Brassicaceae, Caryophyllaceae, Erysiphaceae, Fabaceae, Orobanchaceae) and 19 of the genera present on the island are also only represented there by naturalised taxa. Twenty-eight (26 vascular plants, two fungi [52%]) of the taxa recorded are naturalised to the Chatham Islands. The most notable find was three plants of pūhā pārākau rahi / embergeria (*Sonchus grandifolius* Kirk) (Figure 5), endemic to the Chatham Islands and listed as 'At Risk / Recovering' by de Lange et al. (2024). This species is now locally common over much of the Chatham Islands. That said, this is the first time the senior author has seen it growing in a shell bank. Further, its occurrence here

Table 1: Terrestrial flora and mycobiota of Hi'Tara / Noddy Island, Te Whanga, Rēkohu / Wharekauri / Chatham Island

* – taxa naturalised to the Chatham Islands

I – 'Indigenous' biostatus

N – 'Naturalised' biostatus

iNaturalist NZ (<http://inaturalist.nz>) species identification numbers are provided for taxa not supported by vouchers.

Taxon	Family	Voucher	iNaturalist NZ	Abundance
Angiosperms (50)				
Monocots II – Commelinids (14) (I:8 N:6)				
<i>Carex trifida</i> Cav.	Cyperaceae	UNITEC 15172		one plant
<i>Ficinia nodosa</i> (Rottb.) Goetgh., Muasya & D.A.Simpson	Cyperaceae	UNITEC 15173		abundant
<i>Isolepis cernua</i> (Vahl) Roem. & Schult. var. <i>cernua</i>	Cyperaceae	UNITEC 15174		uncommon
<i>Schoenoplectus pungens</i> (Vahl) Palla	Cyperaceae	UNITEC 15175		one plant
<i>Juncus kraussii</i> subsp. <i>australiensis</i> (Buchanau) Snogerup	Juncaceae	UNITEC 15176		abundant
* <i>Anthoxanthum odoratum</i> L.	Poaceae	UNITEC 15177		uncommon
* <i>Bromus diandrus</i> Roth	Poaceae	UNITEC 15178		uncommon
* <i>Calamagrostis arenaria</i> (L.) Roth	Poaceae	UNITEC 15179		common
* <i>Holcus lanatus</i> L.	Poaceae	UNITEC 15180		abundant
<i>Lachnagrostis filiformis</i> (G.Forst.) Trin.	Poaceae	UNITEC 15181		uncommon
* <i>Lolium perenne</i> L.	Poaceae	UNITEC 15182		uncommon
* <i>Poa annua</i> L.	Poaceae	UNITEC 15183		uncommon
<i>Puccinellia chathamica</i> (Cheeseman) Allan & Jansen	Poaceae	UNITEC 15184		common
<i>Apodasmia similis</i> (Edgar) B.G.Briggs & L.A.S.Johnson	Restionaceae		331025201	one plant
Core Eudicots (36) (I:18 N:18)				
<i>Atriplex australasica</i> Moq.	Amaranthaceae	UNITEC 15185		common
* <i>Atriplex prostrata</i> Boucher ex DC.	Amaranthaceae	UNITEC 15186		common
<i>Oxybasis ambigua</i> (R.Br.) de Lange & Mosyakin	Amaranthaceae	UNITEC 15187		common
<i>Salicornia quinqueflora</i> (Bunge ex Ung.-Sternb.) A.J.Scott subsp. <i>quinqueflora</i>	Amaranthaceae	UNITEC 15188		uncommon
<i>Apium prostratum</i> subsp. <i>denticulatum</i> P.S.Short	Apiaceae	UNITEC 15189		common
* <i>Cirsium vulgare</i> (Savi) Ten.	Asteraceae	UNITEC 15190		uncommon
<i>Cotula coronopifolia</i> L.	Asteraceae	UNITEC 15191		one plant
<i>Leptinella potentillina</i> F.Muell	Asteraceae	UNITEC 15192		common
<i>Pseudognaphalium lanatum</i> (G.Forst.) Smitten, Breitw. & de Lange	Asteraceae	UNITEC 15193		common
* <i>Senecio elegans</i> L.	Asteraceae	UNITEC 15194		abundant
<i>Senecio lautus</i> Willd.	Asteraceae	UNITEC 15195		common
<i>Senecio glomeratus</i> Poir.	Asteraceae	UNITEC 15196		one plant
<i>Senecio radiolatus</i> F.Muell.	Asteraceae	UNITEC 15197		common

* <i>Senecio elegans</i> L. × <i>S. lautus</i> Willd.	Asteraceae	UNITEC 15198	one plant
<i>Sonchus grandifolius</i> Kirk	Asteraceae	UNITEC 15199	three plants
* <i>Sonchus oleraceus</i> L.	Asteraceae	UNITEC 15200	common
* <i>Cakile edentula</i> (Bigelow) Hook. subsp. <i>edentula</i>	Brassicaceae	UNITEC 15201	uncommon
* <i>Lepidium didymum</i> L.	Brassicaceae	UNITEC 15202	uncommon
<i>Lobelia anceps</i> L.f.	Campanulaceae	UNITEC 15203	uncommon
<i>Lobelia arenaria</i> (Hook.f.) Heenan & de Lange	Campanulaceae	UNITEC 15204	uncommon
* <i>Sagina procumbens</i> L.	Caryophyllaceae	UNITEC 15205	uncommon
* <i>Medicago lupulina</i> L.	Fabaceae	UNITEC 15206	common
* <i>Medicago polymorpha</i> L.	Fabaceae	UNITEC 15207	one plant
* <i>Geranium molle</i> L.	Geraniaceae	UNITEC 15208	uncommon
<i>Haloragis erecta</i> (Murray) Oken subsp. <i>erecta</i>	Haloragaceae	UNITEC 15236	uncommon
<i>Epilobium billardioreanum</i> DC.	Onagraceae	UNITEC 15237	common
* <i>Bellardia viscosa</i> (L.) Fisch. & C.A.Mey	Orobanchaceae	UNITEC 15238	common
* <i>Plantago australis</i> Lam.	Plantaginaceae	UNITEC 15239	uncommon
* <i>Plantago coronopus</i> L.	Plantaginaceae	UNITEC 15240	abundant
* <i>Plantago lanceolata</i> L.	Plantaginaceae	UNITEC 15241	uncommon
* <i>Plantago major</i> L.	Plantaginaceae	UNITEC 15242	uncommon
* <i>Rumex crispus</i> L.	Polygonaceae	UNITEC 15243	uncommon
* <i>Lysimachia arvensis</i> (L.) U.Manns. & Anderb.	Primulaceae	UNITEC 15244	uncommon
<i>Samolus repens</i> (J.R.Forst. & G.Forst.) Pers. var. <i>repens</i>	Primulaceae	UNITEC 15245	abundant
<i>Argentina anserinoides</i> (Raoul) Holub	Rosaceae	UNITEC 15246	one plant
<i>Urtica australis</i> Hook.f.	Urticaceae	UNITEC 15247	uncommon

Mycobiota (4)**Ascomycota (2) (I: N:2)**

* <i>Podosphaera epilobii</i> (Wallroth) de Barry	Erysiphaceae	UNITEC 15248	common
<i>Septoria apiicola</i> Speg.	Mycosphaerellaceae	UNITEC 15249	uncommon

Basidiomycota (2) (I:1 N:1)

* <i>Peristemma pseudosphaeria</i> (Mont.) Jørst.	Pucciniaceae	UNITEC 15250	uncommon
<i>Puccinia embergeriae</i> McKenzie & P.R.Johnst.	Pucciniaceae	UNITEC 15251	uncommon



Figure 5. One of three pūhā pārākau rahi / embergeria (*Sonchus grandifolius*) seen on Hi'Tara. This plant is growing with *Senecio laetus*, *Leptinella potentillina* and marram grass (*Calamagrostis arenaria*) on the northern shell beach of the cay.

is testimony to effective seed dispersal as the nearest known population to Hi'Tara is c.8.5 km north-west on the west-facing Red Bluff.

While lichenised mycobionts were not evident on Hi'Tara, four fungi were found, one mildew, two rust and one spot fungus. Of these, *Sonchus* rust (*Peristemma pseudosphaeria* (Mont.) Jørst.) is introduced to the Aotearoa region, and so, by extension, the Chatham Islands (McKenzie & Johnston 2004). *Septoria apiicola* Sacc. may or may not be introduced. There is some morphological evidence to support there being an Australasian race of it (Verkley et al. 2013); these authors state that further morphological and molecular investigations of more specimens of *Apium* L. from various host species and geographical regions is required before conclusions can be drawn about the number of taxa involved in this host genus. So, for now, it seems wise to treat *Septoria apiicola* as possibly indigenous. *Podosphaera epilobii* (Wallr.) de Bary, common on Hi'Tara plants of *Epilobium billardioreanum* DC. growing amongst wīwī (*Ficinia nodosa* (Rottb.) Goetgh., Muasya & D.A.Simpson)) is also introduced to Aotearoa, and thus the Chatham Islands. The discovery of embergeria rust (*Puccinia embergeriae* McKenzie & P.R.Johnst.) (Figure 6) was unexpected because its sole host, pūhā pārākau rahi / embergeria, is so uncommon on Hi'Tara. A few rust spots were noted on one of the plants seen. In a review



Figure 6. *Puccinia embergeriae* on pūhā pārākau rahi / embergeria (*Sonchus grandifolius*). **A**, Abaxial view of *Puccinia* infection. **B**, Abaxial view of *Puccinia* infection showing urediniospores.

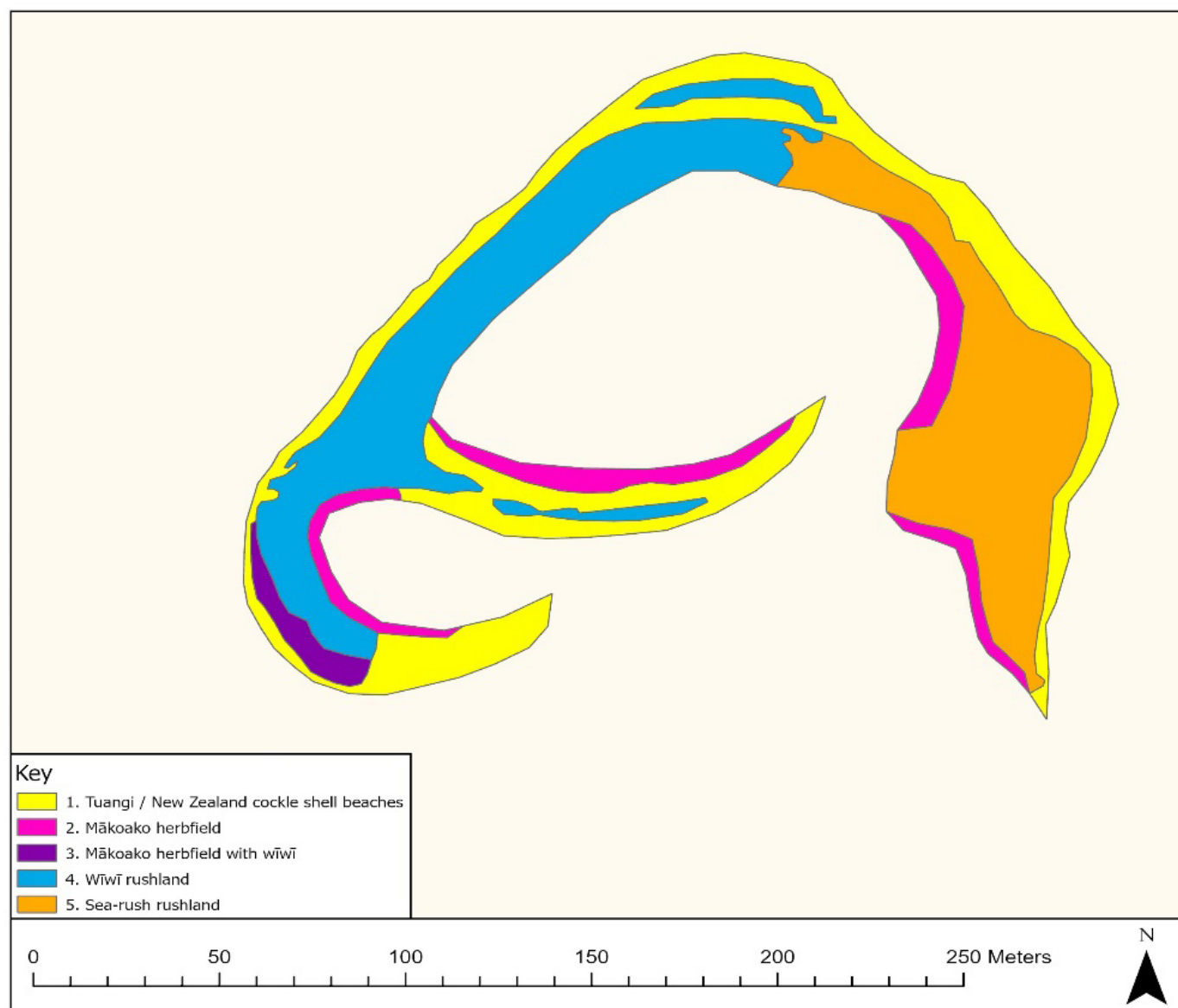


Figure 7. Landforms and vegetation associations of Hi'Tara as mapped in December 2025.

of the status and distribution of *Puccinia embergeriae*, de Lange (2021) noted two natural and two 'accidental' populations stemming from growing infected plants. Since 2021, one of the accidental populations has been destroyed by accident, and one of the natural sites has been severely damaged by serious cattle-browsing of host plants. This discovery on Hi'Tara therefore offers some hope that the rust will, as de Lange (2021) had anticipated, be found in other pūhā pārākau rahi / embergeria populations across the islands.

Vegetation Associations

Using the Atkinson (1985) vegetation description framework to define landforms and vegetation associations, five units were noted (Figure 7):

Tuangi / New Zealand cockle shell beaches

Forming a broad band between the lagoon and the more densely vegetated portions of Hi'Tara, this landform is also the apparent highest point on the cay, reaching an estimated 1 m a.s.l. along the northern side of the island, where it is also at its narrowest; in places an estimated ≤ 2 m wide at most (Figure 8). For the most part, this landform is either not vegetated or sparingly so; it is only where tara / white-fronted terns, tarāpunga / red-billed gulls (*Chroicocephalus novaehollandiae scopulinus*



Figure 8. Tuangi / New Zealand cockle shell beach – northern side of Hi'Tara, looking north-east to Tāia.



Figure 9. Tara / white-fronted terns (*Sterna striata*), tarāpunga / red-billed gulls (*Chroicocephalus novaehollandiae scopulinus*) nesting at the ecotone between shell beach and sea-rush rushland at the eastern end of Hi'Tara.

(J.R.Forster, 1843)) (Figure 9) and karoro / southern black-backed gulls (*Larus dominicanus dominicanus* Lichtenstein, 1823) nest that vegetation becomes more diverse and conspicuous. The northern portion of the shell beach is mostly sparsely vegetated in places with *Apium prostratum* subsp. *denticulatum* P.S.Short, marram (*Calamagrostis arenaria* (L.) Roth), both perennials, and the spring–summer annuals *Atriplex australasica* Moq., *A. prostrata* Boucher ex DC., *Oxybasis ambigua* (R.Br.) de Lange & Mosyakin, *Senecio elegans* L., *S. lautus* Willd. and *S. radiolatus* F.Muell. Three plants of the perennial pūhā pārākau rahi / embergeria were noted toward the main tara / white-fronted tern–tarāpunga / red-billed gull colony at the eastern end of Hi'Tara. Within the nesting sites at the western and eastern ends of the shell beach, the summer annuals *Atriplex australasica*, *A. prostrata*, *Oxybasis ambigua*, *Senecio lautus* and *S. radiolatus*, and the perennials *Apium* and Yorkshire fog (*Holcus lanatus* L.), at the time of the visit, reached their greatest extent and stature. Perhaps, due



Figure 10. Mākoako herbfield showing ecotone with sea-rush rushland. Note the *Puccinellia chathamica* tussocks growing within the mākoako herbfield; at times this annual to short-lived perennial species forms a co-dominance, but of insufficient extent to warrant recognition as a separate vegetation association.

to guano input, some specimens of *Atriplex australasica* and *Oxybasis ambigua* reached 1 × 1 m.

On the south-western, central and south-eastern portions of the island, the shell beach extends as shell spits. The western-most of these is 10 or more metres wide before narrowing into a narrow hook, whereas the central spit is only 2–3 metres wide at its widest before quickly narrowing into a small hook. The eastern-most spit is densely vegetated with sea-rush (*Juncus kraussii* subsp. *australiensis* (Buchenau) Snogerup) to its extremity (Figure 10). These three spits are scarcely above the water table. In the western and central spits, the shell is sparsely vegetated by wīwī – conspicuous because of its stature – mākoako (*Samolus repens* (J.R.Forst. & G.Forst.) Pers. var. *repens*), *Apium*, *Geranium molle* L., *Isolepis cernua* (Vahl) Roem. & Schult. var. *cernua*, *Medicago lupulina* L., *Senecio elegans*, *S. lautus*, *S. glomeratus* Poir. and *S. radiolatus*. At the far end of these, at the time of the visit, plant growth was limited to patches of low-stature *Senecio lautus* and *Oxybasis ambigua*.

Mākoako herbfield

Confined to the southern margins of Hi'Tara, and reaching its greatest extent along the southern margins of the western embayment and associated spits of the island, this association is almost a monoculture of mākoako. Occasional associates include *Apium*,



Figure 11. An example of where *Puccinellia chathamica* is co-dominant with mākoako (*Samolus repens* var. *repens*) – at the head of the small western embayment of Hi'Tara.

Isolepis R.Br. and *Salicornia quinqueflora* (Bunge ex Ung.-Sternb.) A.J.Scott subsp. *quinqueflora*, and, in a few places along the ecotone between this association and wīwī rushland, *Puccinellia chathamica* (Cheeseman) Allan & Jensen is locally common (Figure 11), made all the more conspicuous by its taller growth habit. The dominance of *Puccinellia* could warrant recognition of a mākoako / *Puccinellia* turf or tussockfield, as a further vegetation association, but the extent is so small that this distinction was not made.

Mākoako herbfield with wīwī

Confined to the north-western portion of Hi'Tara, this association abuts the western most extent of wīwī rushland (Figures 12 and 13). The dominant cover is mākoako, forming a compact turf through which only a few plants of *Isolepis*, *Epilobium* Dill. ex L. and *Puccinellia* Parl. seem able to penetrate. Associated with the mākoako are scattered wīwī, which are all the more conspicuous because of their taller stature. The association is sharply truncated at its southern and western extremities by a thick accumulation of shells of the tuangi / New Zealand cockle shell beach described earlier.

Wīwī rushland

Along with sea-rush (*Juncus*) rushland, the co-dominant vegetation cover on Hi'tara. Wīwī may at times reach up to 1 metre tall and form a thick monospecific sward, especially in the north and north-west of the island. However, toward the margins of these swards and especially along the western side of Hi'Tara and the embayments, in those places where shell has



Figure 12. Wīwī rushland.



Figure 13. Wīwī rushland looking east across the main embayment to the outlet of Te Whanga, Hikurangi Channel and Te Awapatiki (forested area to the right of image).



Figure 14. Wīwī (*Ficinia nodosa*) regrowth through a recent deposition of shells (western end of Hi'Tara).

accumulated, *Apium*, *Epilobium*, *Leptinella potentillina* F.Muell. and *Senecio elegans* increase in dominance. The most common associate, however, is Yorkshire fog, which may occupy between 5 and 15% of the wīwī rushland; especially increasing in dominance where gulls and terns are nesting, perhaps as a dual response to the increased nutrients and opening up of the rushland afforded by these birds' nesting behaviour. Also, along the southern margins of the wīwī rushland, in patches

of wīwī dieback, *Cirsium vulgare* (Savi) Ten., *Lobelia arenaria* (Hook.f.) de Lange & Heenan, *Plantago australis* Lam. and *P. major* L. can be found; also *Cirsium* Mill., increasing in abundance on the margin of the shell beach lobes. Furthermore, the spring–summer annual, *Lachnagrostis filiformis* (G.Forst.) Trin. was, at the time of the visit, locally common in these more open sites.

The deeply rooted rhizomes of wīwī also trap sediment, and, depending on the depth of burial, this allows plants to resprout, through potentially smothering freshly deposited shell. During the December 2025 visit, it was evident that fresh deposition of shell had temporarily smothered a portion of the rushland on the western side of Hi'Tara, but regrowth from buried plants was already vegetating and stabilising this area (Figure 14).

Sea-rush rushland

As with the wīwī rushland already described, sea rush forms an almost monospecific association within the north-eastern and eastern-most lobe of Hi'Tara. Plants can attain heights of 1 m, and the growth can be so dense as to preclude other competitors from gaining ground. It is only where sea rush abuts seabird nesting sites – the margins of the eastern embayment and where it forms an ecotone with wīwī rushland – that a few other species have a presence. The most conspicuous of these, at the time of the visit, was Yorkshire fog, but *Apium*, *Cirsium*, wīwī and *Epilobium* may also be locally common.

Discussion

The presence of vegetation on cays such as Hi'Tara tends to stabilise them (Figure 14). In the case of Hi'Tara, this helps reduce the landward transport of coarse sediment when the beach ridge is overtopped (mostly likely during elevated water levels in Te Whanga Lagoon). Loss of sediment is exacerbated when vegetation is absent or reduced, and tends to result in migration of the cay in response to the dominant sediment transport process. Waves from the north-west will inevitably push the Hi'Tara cay south-east into the Hikurangi Passage.

As would be expected for a low-relief island subjected to periodic immersion during high lagoon levels, Hi'Tara has a floral composition dominated by hardy halophytes such as *Atriplex prostrata*, mākoako, sea rush and *Plantago coronopus* (Al Hassan et al. 2016; Bak et al. 2025; Bueno et al. 2016; Gillham 1956; Koźmińska et al. 2024; Koźmińska et al. 2025; Thannheiser & Holland 1994) and spring–summer annuals, e.g., *Bromus*

diandrus Roth., *Senecio lautus* and *S. radiolatus*. The naturalised plants of the island are mostly grasses, short-lived herbs or annual taxa that are typical of the shoreline of Te Whanga and gull nesting sites on Rēkohu / Wharekauri / Chatham Island.

From a review of the literature, it seems that the vegetation of Aotearoa gull colonies has been little documented. Gillham (1956, 1960–1) noted the role that the lesser black-backed gulls (*Larus fuscus* Linnaeus, 1758) had in dispersing seeds on the south-western coast of Wales in the United Kingdom. She found viable seeds of *Anagallis arvensis* L. (now *Lysimachia arvensis* (L.) U.Manns. & Anderb.), *Geranium molle*, *Plantago lanceolata*, *Poa annua* and *Rumex* spp. in lesser-black-backed-gull pellets, and noted the dominance of *Atriplex* spp., *Holcus lanatus*, *Plantago coronopus*, *Poa annua* L. and *Rumex crispus* L. around sea-bird nesting sites; such observations were confirmed and expanded on by Sobey and Kenworth (1979). These are all species and genera found in the naturalised flora of Hi'Tara. Notable too was that *Plantago lanceolata* was only found in association with karoro nests (see: <https://inaturalist.nz/observations/331013963>), in a pattern similar to that reported by Gillham (1956) for lesser black-backed gulls.

From a Chatham Islands perspective, this paper provides a baseline for further investigation of the islands of Te Whanga Lagoon, not only the only other evident cay island, the nearby (c. 0.36 km north-east of Hi'Tara) Moturangaranga, but the five larger islands collectively called Tītīhaukai (and the many smaller ones associated with the nearshore coastline of Tāia, near Kahupiri Point) in the north-eastern portion of Te Whanga, and those associated with Waikawa Island, near Te Awapatiki.

This paper also highlights the apparent dearth of accessible, formally published literature on the vegetation associations and dynamics of cay islands in greater Aotearoa. Further, it is apparent that there is critical need to better understand the role that seabirds, especially gulls (Laridae), have in dispersing plant propagules, particularly those of naturalised taxa to islands. Much of this research exists, but is not yet collated into a single review paper.

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Data Accessibility Statement

No additional database.

Author Contributions

Peter J. de Lange: Conceptualisation (lead); data curation (lead); validation (lead); visualisation (lead); writing – original draft (lead); writing – review and editing (lead).

Willem P. de Lange: Investigation; writing – review and editing.

Andrew J. Marshall: Figure and image preparation; review and editing.

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