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Landcare Research

Review of threatened and iconic plant, bat, lizard, frog, terrestrial invertebrate, and fungi species in Cape to City and Poutiri Ao ō Tāne

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Summary

Project and Client

- Two large-scale ecological restoration projects, Cape to City and Poutiri Ao ō Tāne, in Hawke's Bay aim to transform the way pest management, research, and education is carried out and to create new ways to inspire community involvement. There is a high proportion of modified pastoral habitat on the alluvial plains and coastal lowlands within Hawke's Bay, and particularly in Cape to City, resulting in very little habitat left for the preservation of threatened species. Apart from birds and plants, it is unclear which species in Cape to City and Poutiri Ao ō Tāne are threatened and/or iconic. Nor do we fully understand their propensity to recover with wide-spread predator control, or whether they are more likely to respond to habitat restoration. This report addresses these knowledge gaps.

Objectives

- Review threatened and iconic plant, bat, invertebrate, lizard, frog, and fungi species in the Cape to City and Poutiri Ao ō Tāne project areas, and their key threatening processes.
- Recommend which threatened or iconic taxa could be selected for further survey, and conservation/restoration actions.

Methods

- Information about the threatened and iconic species known from the Cape to City and Poutiri Ao ō Tāne project areas was searched using electronic databases and literature, and information was obtained from specialists regarding their knowledge of taxa found within the project areas.

Results

- Twenty-one threatened plant species are known from the Cape to City project area with a number of these found within coastal sand dune habitats. Most of the fourteen threatened plant species known from the Poutiri Ao ō Tāne are forest dwelling species, inhabitants of limestone outcrops or those that prefer open habitats on the Maungaharuru Range crest. Iconic plant species include canopy species such as tawa, rimu, and kahikatea.
- The distribution of New Zealand's two bat species in Hawke's Bay is poorly understood. Long-tailed bats have been detected at Mohi Bush Scenic Reserve within Cape to City and at Boundary Stream Mainland Island in Poutiri Ao ō Tāne.
- Two threatened gecko species (ngahere gecko and barking gecko) and three threatened skink species (Cape Kidnappers skink, small-scaled skink and Northern spotted skink) have been recorded within in or near the Cape to City project area/Cape Sanctuary. Two gecko lizard species (ngahere gecko, barking gecko) have been confirmed to be present in Poutiri Ao ō Tāne, with the majority of the records coming from Boundary Stream Mainland Island.

- No threatened native frog species are currently known from the project areas.
- No threatened beetles, bugs, flies, sticks insects, peripatus, slugs, and earthworms are known from either Cape to City and at Poutiri Ao ō Tāne. However, there have been limited invertebrate surveys within the project areas. The only known threatened spider from Cape to City is the katipō, which is classified as 'At Risk – Declining'. One threatened snail is known from Cape Kidnappers within Cape to City. Three potential iconic invertebrate species include two coastal Lepidoptera (*Notoreas perornata* and the Boulder Copper) and the Hawke's Bay tree wētā.
- There are currently no known threatened fungal species from either the Cape to City or the Poutiri Ao o Tane project areas.

Conclusions

- This report has highlighted that for a number of groups, Hawke's Bay has had very little survey and collection effort.
- Due to the high proportion of modified pastoral landscape within Hawke's Bay, and particularly in the Cape to City project area, there is very little habitat left for the preservation of threatened species.
- The Cape to City Project area lacks quantitative data on vegetation composition or site-specific species lists to determine confidently which threatened plant species are present. However, there are a number of threatened plant taxa that are confined to coastal habitats. Within the Poutiri Ao ō Tāne project area the majority of threatened plants are associated with forest habitats or limestone outcrops and open habitats on the Maungaharuru Range crest
- The lizard fauna of Hawke's Bay is poorly known, poorly recorded, and depauperate today. Isolated populations of threatened skink species persist in low numbers or restricted range in Hawke's Bay (e.g. the Cape Kidnappers skink, small-scaled skink, and northern spotted skink).
- There is little known about the invertebrate communities for the two project areas. The threatened species (e.g. katipō) that are known provide opportunities to engage with the public through restoration projects benefiting these taxa.
- A number of taxa that are present within the two project areas are not threatened but are considered iconic species (e.g. Hawke's Bay tree wētā, brightly coloured day-flying Lepidoptera, and lizards). These are species that offer opportunities to engage the public in species conservation and restoration.
- Iconic forest canopy species, such as tawa, rimu and kahikatea, provide important resources (e.g. food) for a number of other plants and animals within the two project areas.
- There are a number of taonga species that are important to hapu within the two project areas.

Recommendations

- Resurveying threatened plant taxa in some habitats (e.g. coastal sand dunes) and initiating new surveys of ecosystems and regions where quantitative data are lacking are required, coupled with conservation effort for some species.

- Undertaking systematic surveys to determine where and when bats occur with radio-tracking studies would identify breeding roosts and priority management areas for protection.
- Targeted surveys are recommended within Cape to City for regionally significant lizard species, such as barking gecko, Cape Kidnappers skink, northern spotted skink, and small-scaled skink. Habitat restoration and improving habitat connectivity should be considered for lizards.
- As the threatened moth, *Pyroderces* sp. "yellow", has been collected near the Poutiri Ao ō Tāne project area it is recommended that surveys for this species inhabiting dead kowhai branches occur within the project area.
- Survey work for Lepidoptera is required to determine current taxon distributions and status in the project areas. In addition, surveys targeting certain species (e.g. *Pyroderces* sp. "yellow", Boulder Copper and *Notoreas perornata*) are important as they are potential candidates for engaging with the public.
- Initiate public participation in the survey and conservation of Hawke's Bay tree wētā via engaging children through practical research/translocation.
- Iwi views on threatened and iconic species should be obtained in a culturally appropriate way.

1 Introduction

The Cape to City project (Fig. 1) was launched in Hawke's Bay in 2015 with the strategic objective of enabling indigenous taxa to co-exist with human habitation, food production, and recreation at large scales in an agricultural landscape. The 5-year project involves integrating possum control with large-scale control of feral cats, stoats, and ferrets across 26,000 ha, with rats targeted at specific sites, and is supplemented by additional habitat restoration (Norbury & McLennan 2015).

Poutiri Ao ō Tāne, the 'sister' project of Cape to City, is a joint ecological and social restoration project located in the northern Hawke's Bay (Fig. 1) in partnership with Maungaharuru-Tangitū Trust (<http://www.poutiri.co.nz/>). Lake Opouahi and the Department of Conservation's (DOC) Boundary Stream Mainland Island is the focus of this project. Poutiri Ao ō Tāne aims to bring native flora and fauna back into the lives of the local people. The project plans to see the return of native species that have been lost to the area over time – and to see these species flourish, not only in the habitats in which we expect them to be, such as native bush, but also in the agriculture and forestry landscape.



Figure 1. Location of Cape to City (white polygon) and Poutiri Ao ō Tāne (red polygon) in Hawke's Bay. Cape Sanctuary occupies the eastern-most area from Cape to City.

Only 23% of native forests remain in Hawke's Bay, with the majority inland on mountainous and hilly landscapes (Hashiba et al. 2014). There is a high proportion of modified pastoral habitat on the alluvial plains and coastal lowlands within Hawke's Bay, and particularly in the Cape to City project area, resulting in very little habitat left for the preservation of threatened species that depend on lowland and coastal settings. Detailed habitat information has been compiled for 44 threatened or 'At risk' bird species present in Hawke's Bay (Hashiba et al. 2014). Apart from birds and plants, it is not clear which threatened or iconic species occur in Cape to City and Poutiri Ao ō Tāne project areas. Furthermore, for all groups, we do not fully understand their propensity to recover with widespread predator control, or whether they are more likely to respond to habitat restoration. This report reviews threatened and iconic plant, bat, invertebrate, lizard, frog, and fungi species for Cape to City and Poutiri Ao ō Tāne project areas.

2 Objectives

To review threatened and iconic plant, bat, invertebrate, lizard, frog, and fungi species for Cape to City and Poutiri Ao ō Tāne project areas, and their key threatening processes. The review will recommend which threatened or iconic taxa could be selected for further survey, and also conservation/restoration actions.

3 Methods

To collect information about the threatened and iconic species known from the Cape to City and Poutiri Ao ō Tāne project areas, electronic databases and literature were searched, and information was obtained from specialists regarding their knowledge of taxa found within the project areas. Further details of each of these are outlined below.

In the context of this report, a 'threatened species' was defined as a taxon that is listed on the New Zealand Threat Classification System (<https://www.doc.govt.nz/about-us/science-publications/conservation-publications/nz-threat-classification-system/> accessed 13 June 2018). The Concise Oxford defines iconic as 'an image or portrait; following a conventional type'. Here an 'iconic species' follows the definition outlined by Burns et al. (2006). They are those species that: (1) are most identified and liked by the general public; (2) are iconic for scientists and managers because of the ecological work done on them (although they are less known to the general public); (3) provide a vague notion of old New Zealand – a biological antiquity or oddity (e.g. flightlessness, gigantism, K-selection (few offspring, long gestation, long parental care, and a long period until sexual maturity), and conservation threat); and (4) signal traditional ways of life for Māori, or Māori spirituality (e.g. as tribal guardians).

3.1 Searching electronic databases and literature

Electronic databases of published and unpublished accounts containing records of threatened or iconic taxa found from Heretaunga, eastern Hawke's Bay, and Maungaharuru Ecological Districts were investigated. Searches included:

- Department of Conservation's Bioweb database
- iNaturalist – An online tool to record biological observations throughout New Zealand
- New Zealand Fungarium Collection – Online database of New Zealand fungi, Manaaki Whenua – Landcare Research
- Atlas of amphibians and reptiles of New Zealand (<https://www.doc.govt.nz/our-work/reptiles-and-frogs-distribution/atlas/>)
- Museum of New Zealand Te Papa Tongarewa Entomology Collection, Wellington
- Museum of New Zealand Te Papa Tongarewa Herbarium
- Auckland War Memorial Museum Herbarium
- Allan Herbarium (CHR), Manaaki Whenua – Landcare Research

3.2 Obtaining information from specialists

Relevant specialists and taxonomists (see Table 1) were contacted and asked to compile a list of threatened or iconic taxa known to be present within Cape to City and Poutiri Ao ō Tāne project areas.

Table 1. Specialists or taxonomists consulted on taxa

Taxa	Scientist	Affiliation
Plants	Dr Mike Thorsen	ERA Ecology NZ
Plants	Dr Geoff Walls	Freelance conservation ecologist
Bats	Dr Colin O'Donnell	Department of Conservation
Lizards	Mr Trent Bell	EcoGecko Consultants Ltd
Frogs	Dr Amanda Haigh	Department of Conservation
Beetles	Dr Richard Leschen	Manaaki Whenua – Landcare Research
Plant bugs	Dr Marie-Claude Larivière	Manaaki Whenua – Landcare Research
Butterflies and moths	Dr Robert Hoare	Manaaki Whenua – Landcare Research
Flies	Mr Richard Toft	Entecol Consultants, Nelson
Stick insects	Dr Thomas Buckley	Manaaki Whenua – Landcare Research
Spiders	Dr Phil Sirvid	Museum of New Zealand Te Papa Tongarewa
Spiders	Mr Arnim Littek	Local expert
Snails	Mr David Roscoe	Research Associate, Department of Conservation
Slugs	Dr Gary Barker	Manaaki Whenua – Landcare Research
Earthworms	Mr Scott Bartlam	Manaaki Whenua – Landcare Research
General invertebrates	Dr Brian Patrick	Wildlands
General invertebrates and lizards	Mr Mike Lusk	Local expert
Fungi	Dr Jerry Cooper	Manaaki Whenua – Landcare Research

3.3 Iwi aspirations for threatened and iconic species

Nineteen hapū representatives from the Cape to City and Poutiri Ao ō Tāne project areas were contacted via email via Melissa Brignall-Theyer (DOC, Napier) seeking their advice on iwi aspirations for threatened and iconic species within the project areas.

4 Results

4.1 Plants

Twenty-one threatened plants are known from the Cape to City project area (Mike Thorsen, ERA Ecology, pers. comm.; Table 2). Two plant species (*Sebaea* (*Sebaea ovata*) and *Nau* (*Lepidium oleraceum*)) were historically recorded once at a coastal site within Cape to City but are now presumed locally extinct (Mike Thorsen, pers. comm.; Table 2). There are a number of other threatened plants found within Cape to City that inhabit coastal sand dune habitats. For example, a small population of Leafless pohuehue (*Muehlenbeckia ephedroides*) is present at Te Awanga and this species is severely threatened by weed invasion and human impacts (Mike Thorsen, pers. comm.). Within Cape to City, there are four threatened plant species from the Myrtaceae family threatened by the arrival of myrtle rust, including kanuka (*Kunzea robusta*), manuka

(*Leptospermum scoparium* var. *scoparium*), white rata (*Metrosideros diffusa*), akatorotoro (*Metrosideros perforata*).

Table 2. Threatened plant species found within the Cape to City project area

Species	Common Name(s)	Threat Category	Threat ranking
<i>Sebaea ovata</i>	Sebaea	Threatened	Nationally Critical
<i>Lepidium oleraceum</i>	Nau, Cooks scurvy grass	Threatened	Nationally Endangered
<i>Anogramma leptophylla</i>	Jersey fern, Annual fern	Threatened	Nationally Vulnerable
<i>Geranium retrorsum</i>	turnip-rooted geranium	Threatened	Nationally Vulnerable
<i>Kunzea robusta</i>	kanuka	Threatened	Nationally Vulnerable
<i>Leptospermum scoparium</i> var. <i>scoparium</i>	manuka, tea tree, kahikatoa	Threatened	Nationally Vulnerable
<i>Metrosideros diffusa</i>	white rata	Threatened	Nationally Vulnerable
<i>Metrosideros perforata</i>	akatorotoro, akatea	Threatened	Nationally Vulnerable
<i>Muehlenbeckia ephedroides</i>	Leafless pohuehue	Threatened	Nationally Vulnerable
<i>Myosurus minimus</i> subsp. <i>novae-zelandiae</i>	New Zealand mousetail	Threatened	Nationally Vulnerable
<i>Coprosma acerosa</i>	sand Coprosma	At Risk	Declining
<i>Juncus caespiticius</i>	grass-leaved rush	At Risk	Declining
<i>Mazus novaezeelandiae</i> subsp. <i>novaezeelandiae</i>	dwarf musk	At Risk	Declining
<i>Oxybasis ambigua</i>		At Risk	Declining
<i>Scandia</i> aff. <i>rosifolia</i> (AK 344466; "inland")		At Risk	Declining
<i>Ficinia spiralis</i>	pingao, golden sand sedge, pikao	At Risk	Declining
<i>Anemanthele lessoniana</i>	Gossamer grass	At Risk	Relict
<i>Cotula australis</i>	common Cotula, soldiers button	At Risk	Naturally Uncommon
<i>Senecio banksii</i>		At Risk	Naturally Uncommon
<i>Senecio colensoi</i>		At Risk	Naturally Uncommon
<i>Tetragonia tetragonoides</i>	kokihi, New Zealand spinach	At Risk	Naturally Uncommon

There are another eight threatened plants (Appendix 1A) that are known regionally in Hawke's Bay but it is unclear whether they occur within the Cape to City project area (Geoff Walls, Freelance conservation ecologist, pers. comm. 2018).

There are fourteen threatened plants known from the Poutiri Ao ō Tāne project area (Mike Thorsen, pers. comm.; Table 3). The majority of threatened plants found within Poutiri Ao ō Tāne are forest dwelling species or inhabitants of limestone outcrops. For example, the 'Nationally Critical' kākābeak (*Clianthus maximus*) inhabits unstable cliff faces within forests. There are possibly no remaining 'wild' kākābeak plants in the project area (Mike Thorsen, pers. comm.). However, conservationists have replanted a number of individuals within Boundary Stream Mainland Island. As with species in the Cape to City area, some threatened plants, such as *Neomyrtus pedunculata*, white rata and akatorotoro, are listed as 'Nationally Critical' due to the threat posed by myrtle rust. The record of Creeping

Cudweed (*Euchiton ensifer*) is likely to be an erroneous record for another *Euchiton* species (Mike Thorsen, pers. comm.).

Table 3. Threatened plant species found within the Poutiri Ao ō Tāne project area

Species	Common Name	Threat Category	Threat ranking
<i>Clianthus maximus</i>	kākābeak	Threatened	Nationally Critical
<i>Myosotis saxosa</i>		Threatened	Nationally Critical
<i>Neomyrtus pedunculata</i>	Rohutu, myrtle	Threatened	Nationally Critical
<i>Euchiton ensifer</i>	Creeping Cudweed	Threatened	Nationally Endangered
<i>Carex rubicunda</i>	Sedge	Threatened	Nationally Vulnerable
<i>Metrosideros diffusa</i>	white rata	Threatened	Nationally Vulnerable
<i>Metrosideros perforata</i>	akatorotoro	Threatened	Nationally Vulnerable
<i>Alepis flavida</i>	Yellow mistletoe, pirita	At Risk	Declining
<i>Linum monogynum</i>	Rauhuia, NZ true flax,	At Risk	Declining
<i>Mida salicifolia</i>	willow-leaved maire	At Risk	Declining
<i>Caladenia variegata</i>		At Risk	Naturally Uncommon
<i>Corybas hypogaeus</i>	Spider Orchid	At Risk	Naturally Uncommon
<i>Festuca luciarum</i>	Fescue	At Risk	Naturally Uncommon
<i>Pimelea barbata</i> C.J.Burrows <i>subsp. barbata</i>	Pimelea	At Risk	Naturally Uncommon

In addition, there are another 12 threatened plants (Appendix 1B) that are known from the crest of the Maungaharuru Range, either on thin soils, rocky microhabitats or tarn margins (Wilmshurst et al. 2018).

Iconic forest canopy species within the two project areas include tawa (*Beilschmiedia tawa*), rimu (*Dacrydium cupressinum*) and kahikatea (*Dacrycarpus dacrydioides*). In addition, red beech (*Fuscospora fusca*), silver beech (*Lophozonia menziesii*), and hinau (*Elaeocarpus dentatus*) are also important canopy species within the Poutiri Ao ō Tāne project area, while mataī (*Prumnopitys taxifolia*) is also important within Cape to City (Mike Thorsen, pers. comm.).

Walls (1998a) lists eleven plant species as having high cultural value to Māori including Harakeke (*Phormium tenax*), Aruhe (*Pteridium esculentum*) and Karaka (*Corynocarpus laevigatus*). These plant species had varying uses, such as kai, rongoā, weaving, carving, and building materials. Nikau (*Rhopalostylis sapida*), mountain totara (*Podocarpus laetus*), hinau, toi (*Cordyline indivisa*), rengarenga (*Arthropodium cirratum*) and kowhai (*Sophora microphylla* and *S. tetraptera*) also have significant cultural values to Māori (Geoff Walls, pers. comm. 2018). In addition, the Hawke's Bay sand dune research outlined in Walls (1998b, 2002) was initiated by the local Māori weavers and their concern regarding declining pingao (*Ficinia spiralis*).

4.2 Bats

Two species of bats are known from Hawke's Bay, the central lesser short-tailed bat (*Mystacina tuberculata rhyacobia*) and the long-tailed bat (*Chalinolobus tuberculatus*). Both species are threatened, with long-tailed bats being in the category at most risk of extinction – 'Nationally Critical', whereas the short-tailed bat is classed as 'At Risk – Declining'.

Surveys for both species in Hawke's Bay are limited, so their current distribution is poorly understood. Long-tailed bats can feed across more open habitats that have forest remnants, but short-tailed bats are restricted to the major forest blocks (e.g. Ruahine Ranges). Long-tailed bats have been recorded within Cape to City at Mohi Bush Scenic Reserve during surveys carried out by DOC and two other records from independent sources. Long-tailed bats have also been detected in Boundary Stream Mainland Island in Poutiri Ao ō Tāne by DOC surveys (Colin O'Donnell, Department of Conservation, pers. comm.).

4.3 Lizards

Two gecko species (Ngahere gecko (*Mokopirirakau* 'southern North Island') and barking gecko (*Naultinus punctatus*); Appendix 2), with a threat listing of 'At Risk – Declining' in Hitchmough et al. (2016) have been recorded within the Cape to City project area/Cape Sanctuary. Both species are arboreal and are threatened due to the loss of their preferred lowland native forest and scrubland habitat and the presence of mammalian predators (Trent Bell, EcoGecko Consultants Ltd, pers. comm.). In addition, the non-threatened Raukawa gecko (*Woodworthia maculata*; Appendix 2) has been recorded in lizard monitoring plots within Cape to City (Glen & Norbury 2018). The 'Threatened – Nationally Vulnerable'¹ Cape Kidnappers skink (*Oligosoma* aff. *infrapunctatum*; Appendix 2) has been recorded within Cape Sanctuary and at Waimarama (Trent Bell, pers. comm.). In addition, the 'Threatened – Nationally Vulnerable' small-scaled skink (*Oligosoma microlepis*; Appendix 2) has been discovered at Whanawhana in the Heretaunga Ecological District but it could potentially be present within Cape to City (Trent Bell, pers. comm.). Northern spotted skink (*Oligosoma kokowai*; 'At Risk – Relict'; Appendix 2) has been recorded along the Napier foreshore with the southernmost record at Haumoana. These three skinks are threatened from mammalian predation and loss and modification of their preferred habitat (Trent Bell, pers. comm.). The non-threatened Northern grass skink (*Oligosoma* aff. *polychroma* Clade 1a; Appendix 2) has been recorded at Ocean Beach and at Rangaiika Beach, Cape Kidnappers and the shore skink (*Oligosoma smithii*; Appendix 2) has recently been discovered on Ocean Beach in Cape Sanctuary – the southernmost record for the species (Trent Bell, pers. comm.).

Three lizard species are confirmed to be present in the Poutiri Ao ō Tāne project areas: the ngahere gecko, barking gecko and northern grass skink. Threats and threat classifications

¹ This species is currently 'Nationally Vulnerable' but is likely to be revised upwards to 'Nationally Endangered'.

are discussed in the preceding paragraph. The majority of the records of these species within Poutiri Ao ō Tāne come from Boundary Stream Mainland Island.

4.4 Frogs

No native frog species (*Leiopelma* spp.) are currently known from the project areas (Amanda Haigh, Department of Conservation, pers. comm.). However, subfossil bones likely to be from the *Leiopelma hamiltoni* species complex have been found at Patoka in Hawke's Bay, suggesting that members of this group were formerly distributed there (Worthy 1987). Two species of introduced frog (*Litoria ewingii* and *Ranoidea raniformis*) are known to be present within Hawke's Bay region and are likely to be in the project areas (<https://www.doc.govt.nz/our-work/reptiles-and-frogs-distribution/atlas/> accessed 12 June 2018).

4.5 Invertebrates

No threatened beetle species are known from the project areas (Rich Leschen, Manaaki Whenua – Landcare Research, pers. comm.). One possible exception is the large (31 mm in length) reddish/brown carabid beetle, *Mecodema chaiup* Seldon, which was recently described and is known from only one specimen that was collected from Mohi Bush Scenic Reserve (Seldon 2015). It is likely that this species will be given a threat status during the next assessment of threatened New Zealand beetles (Rich Leschen, pers. comm.). However, Seldon (2015) notes that other smaller native forest fragments within the Maraetotara Plateau are likely to have *M. chaiup* present but have not been surveyed.

No threatened plant bugs are known from the project areas (Marie-Claude Lariviere, Manaaki Whenua – Landcare Research, pers. comm.).

The Lepidoptera (butterflies and moths) fauna of Hawke's Bay is not particularly well known with only intermittent small-scale surveys over the years in a few localities. No threatened moths are known from the project areas (Robert Hoare, Manaaki Whenua – Landcare Research, pers. comm.). However, a small striking bright yellow-orange moth, *Pyroderces* sp. "yellow", with the threat status 'Nationally Vulnerable' (Hoare et al. 2017) has been collected from Lake Tutira and the Esk Forest near the Poutiri Ao ō Tāne project area. This undescribed species has been reared from dead kowhai (*Sophora tetraptera*) branches. It is unknown why this species is threatened. A threatened leaf-roller, *Ericodesma aerodana*, is listed by Hoare et al. (2017) as 'At Risk – Declining' has been reared from larvae and pupae found on *Pimelea prostrata* at Tangoio Beach and Hawke's Bay Coastal Walkway near the Cape to City project. The larvae feed in spun leaves of *Pimelea* spp., and it has declined along with its host-plants, especially in coastal situations due to habitat loss and modification. Two potentially iconic Lepidoptera species are found near or within the Cape to City project area. The first is *Notoreas perornata*, a brightly coloured orange, black and white diurnal moth which is very butterfly-like (Appendix 3). A good population of larvae of *N. perornata* was found on *Pimelea prostrata* on the Hawke's Bay Coastal Walkway in December 2000 (Robert Hoare, pers. comm.). The current status of this population is unknown. *Notoreas perornata* has a number of North Island populations with moths of different size and wing pattern that are believed to represent undescribed

subspecies, some of which are classified as threatened (Hoare et al. 2017). All are restricted to *Pimelea* species, both inland and on the coast. The second butterfly is *Lycaena boldenarum* White (Lycaenidae; Boulder Copper; Appendix 3). Boulder Coppers occur from the central North Island to the southern South Island in numerous local populations. Larvae feed on *Muehlenbeckia axillaris*, and the butterfly is found in open, sunny habitats, such as roadsides and shingly banks. It can be regarded as an 'iconic' species, being one of our most distinctive and attractive endemic butterflies in spite of its small size. The current status and distribution in Hawke's Bay is not exactly known: Davies (1973) recorded it from a single specimen on the beach at Haumoana.

There are no known threatened species of flies from the project areas (Richard Toft, Entecol, pers. comm.).

No threatened stick insects or peripatus are known from the project areas but they have not been well surveyed (Thomas Buckley, Manaaki Whenua – Landcare Research, pers. comm.).

There are no known threatened wētā species known from the project areas. However, *Hemideina trewicki* (Hawke's Bay tree wētā; Appendix 3) is considered an iconic tree wētā species as it is to be restricted to the southern Hawke's Bay coast in a narrow zone approximately 40 km wide and about 100 km in length (Trewick & Morgan-Richards 1995). This distribution is within the Cape to City Project. There is a zone of sympatry with *Hemideina thoracica* (Auckland tree wētā) in the northern part of this range. Monitoring of tree wētā in rifleman nest boxes at Cape Sanctuary has only found *H. trewicki*. There has been a decline in wētā abundance in monitoring boxes perhaps due to the rapid improvement of understorey vegetation since stock have been excluded resulting in increased natural refuges which weta prefer to use (Mike Lusk, pers. comm.). Both *H. trewicki* and *H. thoracica* are found in Mohi Bush Scenic Reserve. These species may hybridise but the F1 hybrids are apparently sterile (Trewick & Morgan-Richards 1995). Within the Poutiri Ao ō Tāne project area, at Boundary Stream Mainland Island, both *H. thoracica* and *H. trewicki* occur. However, there is a peculiar distribution, as no *H. trewicki* have been found below Pohokura Road, while above the road there is a mix of both species, but in relatively small numbers (Mike Lusk, pers. comm.).

Within the Cape to City area, one specimen of the 'National Critical' snail Charopidae sp. 34 (temporary tag name "*Korukoura meadsi*") was found at Cape Kidnappers in a remnant *Knightia* grove in the 1980s (David Roscoe, Research Associate, Department of Conservation, pers. comm.). In the vicinity, there are records of the iconic microsnails Charopidae No. 39 (temporary tag-name "*Flammoconcha meadsi*") at Cape Kidnappers and *Climocella segregata* at Waimarama inhabiting limestone outcrops (David Roscoe, pers. comm.). The snail, *Powelliphanta 'Maungaharuru'*, is known from the Maungaharuru Range near the Poutiri Ao ō Tāne project area. Hitchmough et al. (2007) listed this species as 'Nationally Endangered'. However, when the threat status of New Zealand's snail fauna was reassessed in 2010, this species was not evaluated so does not currently have a threat status.

There are no known threatened species of native slugs from the project areas (Gary Barker, Manaaki Whenua – Landcare Research, pers. comm.).

The only known threatened spider from the Cape to City project area is the katipō (*Latrodectrus katipo*) which is classified as 'At Risk – Declining' (Sirvid et al. 2012). It is a coastal sand-dune specialist which has been found at Ocean Beach and Waimarama in Hawke's Bay (Patrick 2002). Throughout New Zealand, katipō populations have been declining in abundance and distribution as suitable habitat is reduced by land development and because of competition from introduced spiders (Patrick 2002). The iconic seashore wolf spider (*Anoteropsis litoralis*) is known from coastal dunes and beaches in Cape to City (Arnmin Littek, pers. comm.). There are no known threatened spiders from the Poutiri Ao ō Tāne project area (Phil Sirvid, Museum of New Zealand Te Papa Tongarewa, pers. comm.). In addition, Lamont et al. (2017) found no threatened spiders during a ground-dwelling spider survey in Boundary Stream Mainland Island between 1998–2015. However, they did discover a number of interesting species. For example, they collected *Uzakia unica*, a rarely collected taxa known previously from only two locations 1000 km south in Fiordland, South Island (Lamont et al. 2017).

There are currently no known threatened earthworm species from either the Cape to City or the Poutiri Ao o Tane project areas.

4.6 Fungi

In the New Zealand Fungarium Collection, there are 537 taxa of fungi known from Hawke's Bay. None of the fungi are on the current threatened species list (Jerry Cooper, Manaaki Whenua – Landcare Research, pers. comm.). However, the area has not been well surveyed for fungi.

5 Discussion

5.1 Lack of ecological survey data for some groups within Hawke's Bay

This report has highlighted that for a number of groups, Hawke's Bay has received very little survey and collection effort. For example, an analysis of New Zealand Fungarium Collection data indicates that 26% of the total data is from Auckland, followed by 8% from Canterbury, with Hawke's Bay being well down the list, with just 0.8% (Jerry Cooper, pers. comm.). This is probably because there are no longer large expanses of native vegetation left in the region.

There have been few (if any) formal lizard-specific surveys within the Cape to City project area. This is reflected in the lack of lizard records in the area, although some lizard monitoring programmes have recently started: that for Cape Kidnappers skink, northern grass skink and Ngahere gecko undertaken by Cape Sanctuary, and the Cape to City lizard monitoring undertaken by Glen and Norbury (2018). Within Poutiri Ao ō Tāne, some lizard surveys and monitoring effort has been undertaken at Boundary Stream Mainland Island, Bellbird Bush Scenic Reserve, Opouahi Kiwi Creche and Thomas Bush by Manaaki Whenua Landcare Research and EcoGecko Consultants. The species found were Raukawa gecko, Ngahere gecko and northern grass skink. The majority of these records came from Boundary Stream Mainland Island.

It is likely that with enough survey effort of threatened species, particularly invertebrates, new threatened species will be found within the project areas. This is particularly true for Poutiri Ao ō Tāne as this area has more native forest habitat than Cape to City.

The majority of Cape to City is on privately-owned land, so there are few biodiversity surveys and data are less accessible than from public land. For example, while the region has been searched by botanists, there are no plot-based vegetation data (which is typical of private land) or plant species lists that covered the whole area (Sarah Richardson, pers. comm., 2018). However, there are a number of location records on iNaturalist, which could be a starting point for updating threatened plant lists in the region.

5.2 Threatened species inhabiting the Cape to City and Poutiri Ao ō Tāne project areas

Native forest, scrub and grassland provide important habitat for threatened species. Continuous tracts of native forest are now confined to the ranges in Hawke's Bay along with the native species that rely on these habitats (Hashiba et al. 2014). Due to the high proportion of modified pastoral landscape in Hawke's Bay, and particularly in the Cape to City project area, there is very little habitat left for the preservation of threatened species.

There are a number of threatened plant taxa that are confined to coastal habitats in Cape to City. Within the Poutiri Ao ō Tāne project area, most threatened plants are associated with forest habitats, limestone outcrops or ephemeral tarns on the Maungaharuru ridge crest. Walls (1998a) reported only two known wild plants of kākābeak in Hawke's Bay and these occurred on the north-western Maungaharuru Range. An intensive planting programme over many years at Boundary Stream Mainland Island has occurred. However, the effectiveness of the programme in the project area is not known but is likely to require intensive control of herbivorous introduced mammals and a number of invertebrate pests (e.g. slugs) to allow the plants to flourish (Mike Thorsen, pers. comm.).

Records of bats within Hawke's Bay are scattered with detections occurring at Mohi Bush Scenic Reserve within Cape to City and at Boundary Stream Mainland Island in Poutiri Ao ō Tāne. Contemporary and ongoing causes of decline include predation and competition from introduced mammals, habitat degradation and disturbance are still the major factors implicated in declines. Another emerging threat is myrtle rust impacting bat roost trees in parts of their range. Deforestation and fragmentation continue in bat habitats, especially in the North Island so it is important to retain linkages among forest areas supporting bats to preserve genetic diversity. Long-tailed bats can be very long lived (>20 years). They shelter and breed in trees, most frequently in forest. They usually select the oldest trees in the landscape for breeding, largely because these trees are well insulated, and protect the vulnerable young when the mothers are out feeding at night. They usually avoid roosting under bark, and avoid caves and buildings. Where long-tailed bats persist in modified rural landscapes, such as those on the edge of Hamilton and in South Canterbury, they still select the largest and oldest trees available (Colin O'Donnell, pers. comm). Bats require large home ranges to find enough resources in the landscape for both feeding and roosting, and individual bats tend to space themselves in different parts of the landscape to reduce competition (Colin O'Donnell, pers. comm.).

Currently, the lizard fauna of Hawke's Bay is poorly known, poorly recorded and depauperate (in abundance and/or localised extinctions) (Trent Bell, pers. comm.). This is primarily due to four factors: the long-term and chronic effects of predatory mammals on the New Zealand mainland; habitat loss and fragmentation; a high cryptic of lizards within their habitats, making detection of individuals very difficult; and incomplete reporting of sightings.

Local extinction has occurred for at least three – possibly more – lizard species: species affiliated to the Duvaucel's gecko (*Hoplodactylus duvaucelii*), robust skink (*Oligosoma alani*) and marbled skink (*O. oliveri*). The first two are represented by subfossil deposits in caves, including one located within the Cape to City project area. All three are also represented by subfossil in caves less than 25 km south from Poutiri Ao ō Tāne (Worthy & Holdaway 2000). Reintroductions of Duvaucel's gecko are possible but probably difficult to achieve and would likely to be approved only for Cape Sanctuary due to near-complete exclusion of predatory mammals (Trent Bell, pers. comm.).

Isolated populations of threatened skink species persist in low numbers or restricted range in Hawke's Bay (e.g. the Cape Kidnappers skink, small-scaled skink and northern spotted skink). The Cape Kidnappers skink is known only from nationally significant populations located within the Cape Sanctuary, but it could potentially be discovered in suitable habitats within Cape to City. The small-scaled skink could also potentially be discovered in Cape to City and Poutiri Ao ō Tāne, if rocky habitat types in the area are surveyed. This includes rocky habitat within pastureland, as this species is known to be able to persist in highly degraded habitat if rock is present (Trent Bell, pers. comm.). Discoveries of hitherto unknown Cape Kidnappers skink and small-scaled skink populations in Hawke's Bay would be nationally significant. Barking geckos in the Cape to City region are virtually non-existent today, with records mainly historical (1960–'70s); however, more recent records (1990s–2000s) exist for Poutiri Ao ō Tāne, especially within Boundary Stream Mainland Island. Any discovery of an extant, sustaining population of this species in Hawke's Bay would be regionally significant. Discovery within Cape to City would depend on whether moderately extensive shrubland and scrubland patches have been able to persist in the area. The Ngahere gecko, an 'At Risk – Declining' species, is one of the more frequently recorded lizards of both the Cape Sanctuary, Cape to City and Poutiri Ao ō Tāne areas (Trent Bell, pers. comm.; Mike Lusk, pers. comm.; Glen & Norbury 2018). The northern spotted skink, an 'At Risk – Relict' species, reaches its northernmost extent in distribution on the Napier foreshore, and is also isolated from any other spotted skink populations by c. 130 km, to the south. However, the Napier populations are likely to be highly reduced in a limited coastal strip habitat, due to proximity of domestic cats and rats. Since this species can exist in grassland, shrubland, and scree, unknown populations may survive elsewhere in Hawke's Bay, including the Cape to City area. The Napier population is nationally significant because it represents the northernmost extent and is the most isolated population for the species in the country. However, it is at very high risk of extinction. Any new populations found within or adjacent to Cape to City would also be nationally significant (Trent Bell, pers. comm.). It is unlikely to be recorded in inland Hawke's Bay, unless extensive rock and boulder piles are known and can be surveyed.

As the threatened moth, *Pyroderces* sp. "yellow", has been collected near the Poutiri Ao ō Tāne project area it is likely that surveys of dead kōwhai branches within the project area

would find this moth present. Survey work should probably focus on searching for and rearing the larval stages, as the adult moths appear to be very elusive. It is also likely that the moths are very local and require kōwhai trees in a particular situation or of a particular age; further studies are required once the moths are discovered.

Whether the threatened katipō spider is admired or feared, it is regarded as symbolic of the health of coastal dune ecosystems that they inhabit (Patrick 2002). This habitat has been lost, highly modified and impacted on resulting in the national distribution of katipō becoming highly fragmented. However, the Cape to City project provides an opportunity to carry out or encourage community groups to do coastal dune restoration projects that would benefit katipō populations in the Cape to City project area.

5.3 Iconic species inhabiting the Cape to City and Poutiri Ao ō Tāne project areas

A number of taxa present within the two project areas are not threatened but are considered iconic species. These are species that offer opportunities to potentially engage with the public in species conservation and in relation to mammal control and habitat restoration.

Iconic forest canopy species, such as tawa, rimu and kahikatea, provide important resources (e.g. food) for a number of other plants and animals within the two project areas. These long-lived emergent or canopy trees, along with red beech, silver beech, and hinau in Poutiri Ao ō Tāne, often only survive as relict trees or isolated stands after large-scale logging in these areas (Mike Thorsen, pers. comm.). One exception is that they are common in Boundary Stream Mainland Island.

As well as a generally high threatened status overall for the fauna, all native lizards are strictly protected by the Wildlife Act 1955. Lizard populations, even non-threatened species (e.g. Raukawa gecko, northern grass skink), are therefore considered significant. It has been noted that children, in particular, are quite taken by lizards. A well-designed survey or monitoring programme involving children under the supervision of a DOC-permitted herpetologist is possible. This has been successfully undertaken elsewhere involving school groups (Trent Bell, pers. comm.). Citizen scientists have undertaken lizard monitoring in both project areas, working with Ngahere geckos (At Risk — Declining) and northern grass skinks. In addition, the Cape Kidnappers skink – a threatened species – of Cape Sanctuary, and possibly also present within Cape to City, and the northern spotted skink – an At Risk – Relict species both meet the iconic species status requirements. These two species are large and relatively easy to monitor and are likely to respond to mammal control. Research opportunities lie in monitoring these species' responses to mammal control, especially to mice, habitat restoration, and habitat enhancement.

The Hawke's Bay tree wētā is considered an iconic species. Watts et al. (2016) recommended monitoring large-bodied taxa, such as the Hawke's Bay tree wētā, because of their known responsiveness to mammal control. As this iconic tree wētā species is restricted to Hawke's Bay, it could stimulate public participation and ownership. Glen and Norbury (2018) are monitoring Hawke's Bay tree wētā with artificial retreats focussing on sites with rat control.

A number of Lepidoptera are obligate on particular plant species. These obligate relationships are of immense value for education purposes, and in some cases (e.g. *Orocrambus xanthogrammus*) may require translocation of species that are now missing. The obvious iconic Lepidoptera for public engagement are the brightly coloured day-flying species, such as the Boulder Copper and *Notoreas perornata*. The importance of conserving coastal *Pimelea* and its associated moths has been highlighted in the past (e.g. Patrick et al. 2010) and both *Ericodesma aerodana* and *Notoreas perornata* should benefit from restoration plantings of their host in places where it has been lost or populations have been reduced. *Pimelea* is easily grown in cultivation and often planted as a native component in garden rockeries, thereby enhancing populations of the plant where it is under threat, such as from weed invasion in coastal habitats. The conservation actions for these iconic coastal Lepidoptera are relatively straightforward, the results are fairly obvious (people will observe flying adults), and the results are measurable (Robert Hoare, pers. comm.). Further survey work for iconic (and potentially threatened) Lepidoptera is needed to determine their current range and status in the project areas.

5.4 Iwi aspirations for threatened and iconic species

Lawrence et al. (2017) summarised the taonga species for hapu within the Poutiri Ao ō Tāne project area. Listed were 65 plant species, including some iconic canopy species such as tawa and rimu. These taonga plant species had varying uses, including rongoā, kai, weaving, carving, and building materials (Lawrence et al. 2017). Six invertebrates, including huhu, nuke (worms), pokorua (small flying insects), snails, and wild bees, were listed. Their uses included kai, bait for tuna, and rongoā. The snail, *Powelliphanta* 'Maungaharuru', was specifically mentioned by Lawrence et al. (2017) as being a taonga species as it is 'unique to Maungaharuru'. While this species does not have a current threat status, it is likely to be threatened. Lawrence et al. (2017) also mention that mokomoko (reptiles) and pekapeka (bats) are taonga species.

Lizards, known as *moko* or *mokomoko*, are recognised by iwi as animals of significance. Some early Māori feared lizards, with lizards associated with the spirit world, death, and tapu, while others saw lizards as guardians with great mana (power). In contemporary Māori, lizards are increasingly becoming highly treasured as taonga species.

5.5 What are the next steps in developing a focus on threatened and iconic species inhabiting the Cape to City and Poutiri Ao ō Tāne project areas?

For the threatened species discussed above, we do not fully understand their propensity to recover with wide-spread predator control. Some species (e.g. moth species obligate on particular plant species, and northern grass skinks) are probably more likely to respond to habitat restoration. However, other threatened species (e.g. Cape Kidnappers skink, northern spotted skink) may continue to decline, even to the point of localised extinction. Therefore, understanding of their population status and their responses to habitat restoration, predator control, and the combination of both management activities, are important first steps.

Resurveying ecosystems (e.g. dune systems at Ocean Beach) where threatened plants have been documented and monitored in the past is warranted to determine resilience and persistence of species since the early surveys in the 1980 and 1990's (Walls 1998b, 2002). Conservation effort, such as species translocations, may be required in the future. Initiating new surveys of ecosystems and regions where quantitative data are lacking, such as limestone and calcareous sedimentary rocky cliffs and outcrops, is needed (Geoff Walls, pers. comm., 2018). In addition, research is needed on the ecology of a number of plant taxa within the Poutiri Ao ō Tāne project area. For example, kākābeak has had an intensive replanting programme at Boundary Stream Mainland Island but the regeneration ecology is poorly known (Mike Thorsen, pers. comm.).

A systematic survey to determine where and when bats occur in the project areas and across the region is required (Colin O'Donnell, pers. comm.). Once the current distribution is determined, control of introduced pests particularly predators (e.g. rats, mustelids, feral cats) at key sites should occur.

To improve the knowledge of the resident lizard fauna, targeted surveys (using a variety of tools and techniques, including trapping and artificial retreats) should be undertaken within the Cape to City and Poutiri Ao ō Tāne areas for the following regionally significant lizard species: barking gecko, Cape Kidnappers skink, northern spotted skink, and small-scaled skink (Trent Bell, pers. comm.). These focused lizard surveys may also record unknown populations of other species such as Ngahere gecko, Raukawa gecko, northern grass skink, and copper skink. Improved knowledge of the lizard fauna and distribution will likely lead to improved conservation management (guiding possible future species translocations) and long-term lizard monitoring programmes locally. A species-specific conservation management and monitoring programme should be developed for the Cape Kidnappers skink.

Survey work for Lepidoptera is required to determine their current range and status in the project areas. Conserving coastal habitat, especially *Pimelea*, and its associated moths is important. These Lepidoptera should benefit from restoration plantings of their host plants where it has been lost or populations have been reduced.

It is appropriate to continue to monitor the response of Hawke's Bay tree wētā to mammal control. Of all the invertebrate taxa discussed here, the Hawke's Bay tree wētā is the species most likely to motivate public participation in the conservation of an invertebrate. It is advised that this is initiated by engaging children via practical research/translocation.

5.6 Estimation of costs for further surveys

This report has highlighted a number of groups that require further survey. Table 4 outlines the estimated costs of those recommended surveys. These costings are an approximation and would need to be refined if further survey work proceeds.

Table 4. Estimated costs of recommended surveys

Taxon	Activity	Approximate minimum cost
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Plants	Surveys particularly focussing on threatened taxa or habitats.	<\$50,000
Bats	Survey to determine where and when bats occur in the project areas and across the region. Labour costs for one person for the survey season (October–March); automatic bat detectors as a one off set up (20 detectors = c. \$8,000; 40 = \$16,000), service recorders and analyse calls and record data.	\$45,000
	Radio-tracking studies would identify breeding roosts and priority management areas for protection. Minimum of one season (2–3 years would be ideal): Two person job (+volunteers helpful). One off cost of Harp trap (\$15,000); Radiotracking gear (2 sets c. \$6,000); Radio transmitters per season (e.g. 5/month = \$7,000); + vehicle and sundry costs	\$110,000
Lizards	Targeted surveys within the Cape to City area for barking gecko, Cape Kidnappers skink, northern spotted skink, and small-scaled skink.	≤\$25,000
Lepidoptera	Survey for the threatened moth, <i>Pyroderces</i> sp. "yellow" in the Poutiri Ao ō Tāne project area.	≤\$15,000
	Survey work for Lepidoptera (particularly Boulder Copper and <i>Notoreas perornata</i>) is required to determine current taxon distributions and status in the two project areas.	≤\$20,000
Hawke's Bay tree wētā	Survey in forest fragments in Cape to City.	≤\$15,000
	Depending on survey results, translocation programme including engaging/involving with public.	≤\$20,000

6 Recommendations

- Resurveying threatened plant taxa in some habitats (e.g. coastal sand dunes) and initiating new surveys of ecosystems and regions where quantitative data are lacking are required, coupled with conservation effort for some species.
- Systematic surveys should be undertaken to determine where and when bats occur in the project areas and across the region. In addition, radio-tracking studies would identify breeding roosts and priority management areas for protection.
- Targeted surveys should be undertaken within the Cape to City area for the following regionally significant lizard species: barking gecko, Cape Kidnappers skink, northern spotted skink, and small-scaled skink. If positive responses can be measured in some of the rarer lizard species, this will be a significant achievement for Cape to City and Poutiri Ao ō Tāne. Habitat restoration and improving habitat connectivity should be considerations for lizards in restoration planning, as well as predatory pest control.
- As the threatened moth, *Pyroderces* sp. "yellow", has been collected near the Poutiri Ao ō Tāne project area it is recommended that surveys for this species inhabiting dead kohai branches occur within the project area.
- Survey work for Lepidoptera is required to determine current taxon distributions and status in the project areas. The importance of conserving coastal habitat, especially *Pimelea*, and its associated moths is important. These Lepidoptera should benefit from restoration plantings of their host plants where it has been lost or populations have been reduced. The iconic Lepidoptera for engaging with the public are the brightly coloured day-flying species, such as the Boulder Copper and *Notoreas perornata*.

- Public participation in the survey and conservation of Hawke’s Bay tree wētā should be initiated by engaging children via practical research/translocation.
- Iwi views regarding threatened and iconic species should be obtained in a culturally appropriate way.

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Appendix 1 – Regionally threatened plants

A) Within Cape to City

Species	Common Name(s)	Threat Category	Threat ranking
<i>Pimelea mimosa</i>	Pimelea	Threatened	Nationally Critical
<i>Lophomyrtus bullata</i>	Ramarama	Threatened	Nationally Vulnerable
<i>Lophomyrtus obcordata</i>	New Zealand myrtle	Threatened	Nationally Vulnerable
<i>Metrosideros colensoi</i>	Rata	Threatened	Nationally Vulnerable
<i>Neomyrtus pedunculata</i>	Rohutu	Threatened	Nationally Vulnerable
<i>Pittosporum obcordatum</i>	Kohuhu	Threatened	Nationally Vulnerable
<i>Coprosma pedicellata</i>		At Risk	Declining
<i>Pimelea villosa</i>	Autetaranga, Sand daphne	At Risk	Declining
<i>Teucrium parvifolium</i>		At Risk	Declining
<i>Tupeia antarctica</i>	Taapia, white mistletoe	At Risk	Declining
<i>Urtica linearifolia/perconfusa</i>	Swamp nettle	At Risk	Declining

B) Within Poutiri Ao ō Tāne

Species	Common Name(s)	Threat Category	Threat ranking
<i>Myosotis petiolata</i>	Forget-me-not	Threatened	Nationally Critical
<i>Olearia gardneri</i> *	Gardner's tree daisy	Threatened	Nationally Critical
<i>Dactylanthus taylorii</i> *	pua o te reinga, Wood rose	Threatened	Nationally Vulnerable
<i>Kunzea robusta</i>	Kanuka	Threatened	Nationally Vulnerable
<i>Lophomyrtus bullata</i>	Ramarama	Threatened	Nationally Vulnerable
<i>Lophomyrtus obcordata</i>	New Zealand myrtle	Threatened	Nationally Vulnerable
<i>Metrosideros colensoi</i>	Rata	Threatened	Nationally Vulnerable
<i>Wurmbea novae-zelandiae</i>		Threatened	Nationally Endangered
<i>Anaphaloides subrigida</i>		At Risk	Naturally Uncommon
<i>Asplenium subglandulosum</i>	Blanket fern	At Risk	Naturally Uncommon
<i>Carex enyssi</i>	Enys's Sedge	At Risk	Naturally Uncommon
<i>Festuca luciarum</i>	Fescue	At Risk	Naturally Uncommon

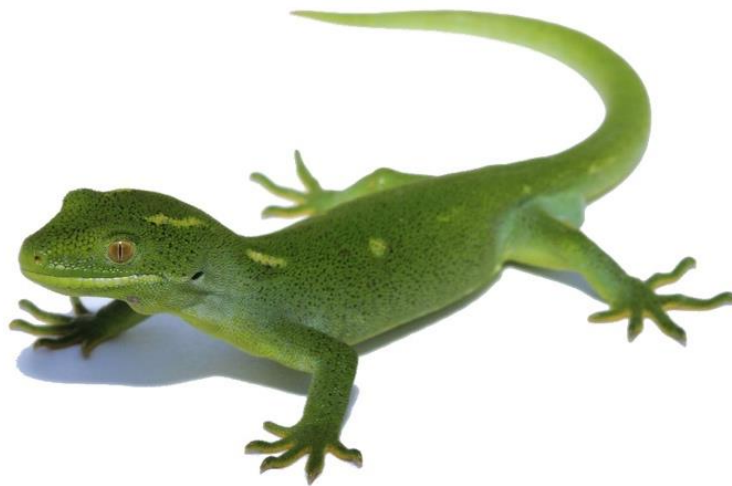
*These species could still be present (Geoff Walls, pers. comm. 2018)

Appendix 2 – Threatened and/or iconic lizards near or within the Cape to City and Poutiri Ao ō Tāne project areas

Photographs approximate life size for adult.



Ngahere gecko (*Mokopirirakau* 'southern North Island'); 'At Risk – Declining' (Photo credit: EcoGecko Consultants Limited).



Barking gecko (*Naultinus punctatus*); 'At Risk – Declining' (Photo credit: EcoGecko Consultants Limited).



Raukawa gecko (*Woodworthia maculata*); non-threatened (Photo credit: EcoGecko Consultants Limited).



Cape Kidnappers skink (*Oligosoma* aff. *infrapunctatum*); 'Threatened – Nationally Vulnerable', possibly upgrade to 'Threatened – Nationally Endangered' (Photo credit: EcoGecko Consultants Limited).



Small-scale skink (*Oligosoma microlepis*); 'Threatened – Nationally Vulnerable' (Photo credit: EcoGecko Consultants Limited).



Northern spotted skink (*Oligosoma kokowai*); 'At Risk – Relict' (Photo credit: EcoGecko Consultants Limited).



Northern grass skink (*Oligosoma* aff. *polychroma* Clade 1a); non-threatened (Photo credit: EcoGecko Consultants Limited).



Shore skink (*Oligosoma smithii*); non-threatened (Photo credit: EcoGecko Consultants Limited).

Appendix 3 – Iconic insects near or within the Cape to City project area



Notoreas perornata (Photo credit: Brigit Rhodes, Manaaki Whenua – Landcare Research).



Lycaena boldenarum, Boulder Copper butterfly (Photo credit: Mike Lusk).



Hemideina trewicki, Hawke's Bay tree wētā (Photo credit: Mike Lusk).