

An assessment of sites for ecological restoration and karure /kakarua /Chatham Island black robin (*Petroica traversi*) reintroduction on Rēkohu /Wharekauri /Chatham Island and Rangihau /Rangiauria /Pitt Island

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PUBLISHER'S NOTE

Primacy of naming of places and species on Rēkohu / Wharekauri / the Chatham Islands can be legitimately claimed under both tikane Moriori and tikanga Māori. We cannot offer any satisfactory solution as to whether ta rē Moriori or te reo Māori has primacy in this document and accept that any attempt to do so may cause equal upset for the Hokotehi Moriori Trust and the Ngāti Mutunga o Wharekauri Trust. For consistency, we have presented ta re Moriori, te reo Māori and English names on first mention in this document and then used English names thereafter, on the understanding that the order in which names are presented in no way reflects the priority given to each. Official place names are provided in footnotes on first mention in the main text, as well as in Appendix 1 alongside ta rē Moriori and te reo Māori names.

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Executive summary

The karure/kakaruaia/Chatham Island black robin (*Petroica traversi*) (hereinafter black robin) is an internationally renowned conservation success story following its rescue from the brink of extinction in the 1970s. Black robins are a critical source of identity and pride for the Rēkohu /Wharekauri/Chatham Island (hereinafter Chatham Island) and Rangihau /Rangiauria/Pitt Island (hereinafter Pitt Island) communities, as well as a conservation touchstone for Aotearoa New Zealand and the world. Conservation management has recovered the population from 5 birds in the early 1980s to c.330 birds today. However, black robins are still at high risk of extinction, with just two small populations remaining and negligible population growth in each. Consequently, this species is considered Nationally Critical in Aotearoa New Zealand and Vulnerable internationally.

To identify the best conservation management options for black robin recovery, the New Zealand Department of Conservation Te Papa Atawhai (DOC) initiated a structured decision-making (SDM) process in 2020, which included an SDM workshop in August 2021. The workshop was attended by representatives from the Hokotehi Mori Trust, DOC, the Chatham Island Land Restoration Group, the Chatham Island Taiko Trust, the Chatham Island and Pitt Island communities, and Toroa Consulting Ltd. Ngāti Mutunga o Wharekauri Trust representatives did not attend the SDM workshop as aspects of the organisation of the workshop fell short of their expectations. However, this non-attendance should not be perceived as disengagement, as Ngāti Mutunga o Wharekauri are broadly supportive of the outcomes of the workshop and are Te Tiriti o Waitangi/Treaty of Waitangi partners in all decision making for kakaruaia/black robin management.

The working group articulated seven values (objectives) that they considered fundamental to black robin recovery, including maximising the resilience of black robins, minimising costs, maximising ecosystem gains, maximising the sense of identity of local communities with black robin, maximising public appreciation, ensuring that Mori principles and values are embodied in karure/black robin management, and ensuring that Ngāti Mutunga o Wharekauri are recognised as Te Tiriti o Waitangi partners in all decision making for kakaruaia/black robin management. The working group identified that a combination of improved monitoring, site restoration, reinforcement of the Maung'Rē/Mangere/Mangere Island population, translocation to new sites on Chatham Island and Pitt Island and improving the connection of the Rēkohu/Wharekauri/Chatham Islands community, and the public more generally, with black robins would provide the best outcome for black robin recovery across the multiple objectives. This report has been written to support one aspect of the SDM working group's recommendation – the selection of new sites for ecological restoration and black robin reintroduction on Chatham Island and Pitt Island.

In October 2022, seven biological experts assessed six sites: five on Chatham Island and one on Pitt Island. The consequences of selecting each site for restoration and translocation in relation to five of the seven fundamental objectives were then predicted using a variety of modelling techniques and expert elicitations, while explicitly accounting for uncertainty. Once the consequences had been predicted, the biological experts were able to navigate the decision landscape explicitly and transparently to identify the best sites for ecological restoration and black robin reintroduction to these islands.

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The biological experts recommend that Big Bush on Chatham Island and Caravan Bush on Pitt Island undergo ecological restoration for black robin reintroduction. If legal access to Big Bush cannot be secured in a manner that is satisfactory to all partners, then Pat Smith's/Plum Tree and/or Chudleigh Conservation Area should be restored for black robin reintroduction on Chatham Island.

The black robin SDM process provided an inclusive environment for participants and facilitated a rational and transparent recommendation for selecting sites for ecological restoration and reintroduction of black robins to Chatham Island and Pitt Island, despite competing objectives, differing value judgements and uncertainty. However, it should be noted that while Moriori and Ngāti Mutunga o Wharekauri representatives participated in site visits, fundamental objectives relating to each were not addressed by the biological experts. Therefore, the final site selection is subject to ongoing discussion.

1. Background

The heroic story of the rescue of the karure/kakaruia/Chatham Island black robin (*Petroica traversi*) (hereinafter black robin) from the very brink of extinction is a conservation touchstone in Aotearoa New Zealand and the world (Butler and Merton 1992). The story is well known, with the global population having been reduced to just five individuals on Maung'Rē/Mangere/Mangere Island¹ (hereinafter Mangere Island) after a dramatic last-ditch translocation of all remaining birds from the neighbouring Tapuaenuku/Little Mangere Island² in 1976/77. Close-order management and further translocations to Hokoreoro/Rangatira/South East Island³ (hereinafter South East Island) were subsequently achieved through the dedication, insights and sheer hard work of staff from the New Zealand Wildlife Service and, later, the Department of Conservation Te Papa Atawhai (DOC), with critical support from the Rēkohu/Wharekauri/Chatham Island⁴ (hereinafter Chatham Island) and Rangihaua/Rangiauria/Pitt Island⁵ (hereinafter Pitt Island) communities throughout. Today, the global population numbers c. 330 birds, with c. 30 birds on Mangere Island and c. 300 birds on South East Island (Welch 2022, unpublished, see Notes). However, the black robin is still a highly threatened species, being listed as Nationally Critical under the New Zealand Threat Classification System (Robertson et al. 2021) and Vulnerable under the International Union for Conservation of Nature (IUCN) Red List system (Birdlife International 2022).

The black robin still faces several significant threats. While the initial agents of decline, especially introduced mammalian predators and habitat loss, have been addressed, thereby resolving Caughley's (1994) 'declining population paradigm', the global population remains small, with one very small population on South East Island and another extremely small population on Mangere Island. Because all black robins are descendants of just one female (the world famous 'Old Blue'), the ongoing impacts of inbreeding depression and the loss of genetic diversity through genetic drift are often cited as major risks to the species' survival. However, small populations are subject to multiple threats, many of which act in concert, so all threats must be considered when designing and implementing recovery programmes. As such, the species remains subject to Caughley's (1994) 'small population paradigm', whereby it is at increased risk of extinction because of demographic and environmental stochasticity (e.g. fluctuating sex ratios, incursions by introduced mammalian predators, the emergence of a novel pathogen, extreme weather events) alongside inbreeding depression and genetic drift.

In 2021, DOC applied a structured decision-making (SDM) process to identify the best management options for black robin recovery (Parker 2020, unpublished, see Notes; Parker et al. 2023). SDM is a transparent, iterative, values-based process that can be used to identify the best options for management while balancing multiple objectives (Gregory et al. 2012; Fig. 1). The SDM workshop was attended by representatives from the Hokotehi Moriori Trust, DOC, the Chatham Island Land Restoration Group, the Chatham Island Taiko Trust, the Chatham and Pitt Island communities, and Toroa Consulting Ltd. Representatives from the Ngāti Mutunga o Wharekauri Trust did not attend as aspects of the organisation of the meeting fell short of their expectations. However, they are broadly supportive of the SDM outcome and a Te Tiriti o Waitangi/Treaty of Waitangi partner in all kakaruia/black robin management and decision making.

¹ Official name: Mangere Island; <https://gazetteer.linz.govt.nz/place/13903>.

² Official name: Little Mangere Island (Tapuaenuku) The Fort; <https://gazetteer.linz.govt.nz/place/13890>.

³ Official name: South East Island (Rangatira); <https://gazetteer.linz.govt.nz/place/14001>.

⁴ Official name: Chatham Island; <https://gazetteer.linz.govt.nz/place/13830>.

⁵ Official name: Pitt Island (Rangiauria); <https://gazetteer.linz.govt.nz/place/13962>.

During the SDM workshop, the working group identified seven fundamental objectives for black robin management (Table 1) and selected their preferred management alternatives for achieving these objectives. These management alternatives included maintaining and enhancing existing biosecurity and monitoring protocols, carrying out supplemental translocations to Mangere Island, providing more opportunities for Chatham Islanders to connect with black robins as a key source of their identity, and establishing new populations of black robins on Chatham Island and Pitt Island (see Appendix 2 for details).

This report is intended to support the establishment of new populations by describing the process and SDM framework that were used to assess six possible release sites for black robins: five on Chatham Island and one on Pitt Island.

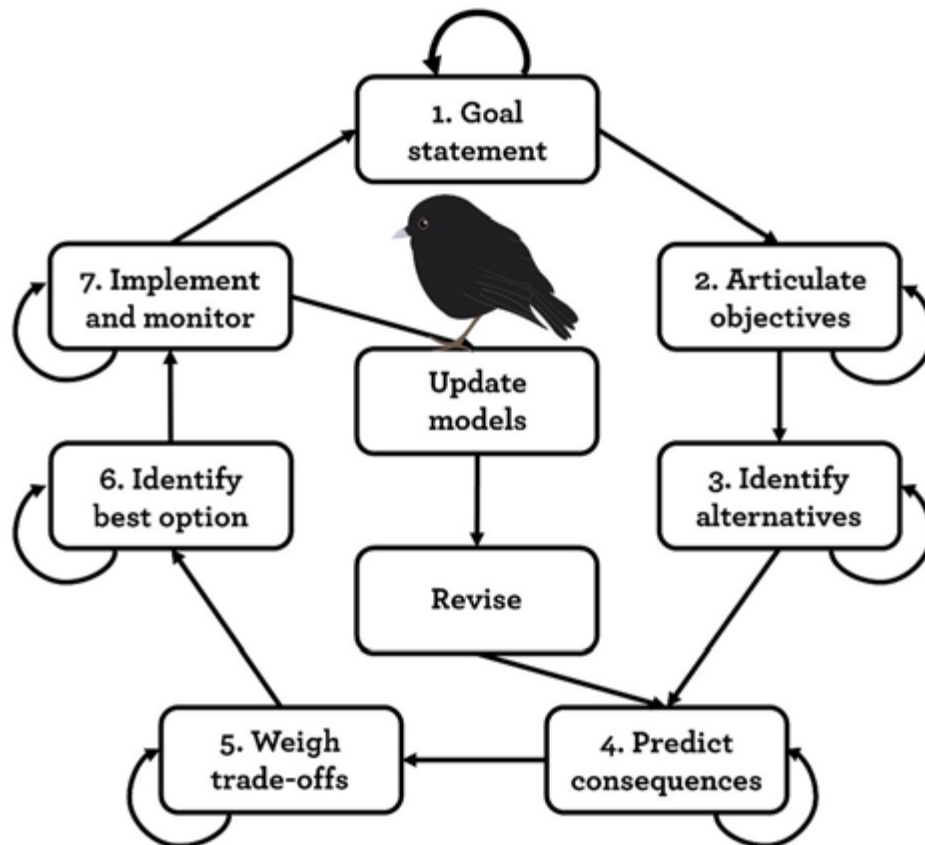


Figure 1. The seven steps in the structured decision-making cycle (adapted from Gregory et al. 2012). *Illustration: N Forsdick*

Table 1. Fundamental objectives and their associated performance measures for karure /kakaruaia / Chatham Island black robin (*Petroica traversi*) recovery planning

FUNDAMENTAL OBJECTIVE	PERFORMANCE MEASURES
Maximise the resilience of black robins	Total number of adult females ^a in 2040 Number of adult females on Maung'Re / Mangere / Mangere Island ^b in 2040 Number of adult females on Hokoreoro / Rangatira / South East Island ^c in 2040 Total number of black robin populations in 2040 Probability of extinction in 2040
Minimise costs	Cost in New Zealand dollars over the first 5 years of implementation, i.e. 2021–2026
Maximise ecosystem gains	Number of populations of other species, or species groups, that benefit from black robin management
Maximise the sense of identity of local communities with black robins	Percentage of the Rēkohu / Wharekauri / Chatham Islands ^d community with physical access to black robins
Maximise public appreciation	Wider outreach of black robin management (qualitative scale)
Ensure that Mori principles and values are embodied in karure / black robin management ^e	‘When Mori migrated to Rēkohu/Rangihau, the islands were forested and home to many bird species, including karure (black robin). Due to habitat loss, the introduction of pests and predators, and the conversion of much of the larger islands to pasture, humans have caused the significant decline of native species. Our vision is to see these birds thriving once more through the enhancement of biodiversity in their favourite forest environment. ‘The foundation principles of unity, sharing and peace-making that Mori espouse form the core of our response to this report and subsequent plans. We believe that a collective, respectful approach that places biodiversity resilience at its heart will see beneficial results for this little bird. We believe that the whole island community has an interest in fostering the survival of karure and see bird recovery programmes in general as part of an “island identity”. ‘Mori have a leadership role to play in supporting this work as the waina pono (first inhabitants), through exclusive Treaty settlement redress over the two nature reserves, through conservation settlement redress that offers engagement with species recovery programmes, and through our own conservation initiatives on land we either own or co-manage (for example, Caravan Bush / Ellen Elizabeth Preece covenant).’
Ensure that Ngāti Mutunga o Wharekauri are recognised as Te Tiriti o Waitangi partners in all decision making for kakaruaia / black robin management ^f	Ngāti Mutunga o Wharekauri are Te Tiriti o Waitangi partners in all decision making for kakaruaia / black robin management

^a The number of adult females is used as a performance measure because they drive population growth. However, historical data show that there will be at least as many adult black robin males as females in the population at any one point in time, and often there will be a male bias (i.e. more males than females).

^b Official name: Mangere Island.

^c Official name: South East Island (Rangatira).

^d Official name: Chatham Islands.

^e The Hokotehi Mori Trust representatives who were present at the workshop did not think a specific performance measure was required for this objective. Rather, they provided this statement to ensure that their broad objectives for karure / black robins are met.

^f Ngāti Mutunga o Wharekauri Trust representatives did not attend the structured decision-making workshop because aspects of the organisation of the workshop fell short of their expectations. However, this non-attendance should not be perceived as disengagement. Ngāti Mutunga o Wharekauri are broadly supportive of the outcomes of the workshop and Te Tiriti o Waitangi partners in all decision making for kakaruaia / black robin management.

2. Initial site selection criteria

Potential translocation sites on Chatham Island and Pitt Island were initially discussed by the SDM working group during the workshop in August 2021. A desktop exercise, and an appeal to the Chatham Island and Pitt Island communities, was then undertaken to identify potential black robin sites. The key criteria for considering a site were as follows.

1. **The perceived habitat quality of the potential release site.** The concept of habitat is often poorly used and poorly defined (Stadtman and Seddon 2018). Therefore, the definition of Hall et al. (1997) was used, who described habitat ‘... as the resources and conditions in an area that produce occupancy – including survival and reproduction – by a given organism’. This includes all physical (e.g. climate, aspect) and biological (e.g. predators, vegetation associations, landscape connectivity) aspects of an area where a species lives. In turn, habitat quality refers to ‘... the ability of the environment to provide conditions appropriate for individual and population persistence’ (Hall et al. 1997), specifically survival, reproduction and population growth. Habitat quality is a continuous variable ranging from low to high and can be very difficult to define explicitly, although there are useful proxies (Hall et al. 1997). High-quality habitat is typically perceived as places where animals formerly occurred. However, habitat conditions need not replicate past states as long as they provide the critical habitat characteristics that a translocated species requires.
2. **The degree of connectivity with the surrounding landscape.** Dispersal from managed release sites into adjacent unmanaged areas appears to be an important cause of failure for many translocations (Richardson et al. 2014). Dispersal generally affects population growth at two levels. First, post-release dispersal following the initial release can cause the loss of individuals from the founding population, thereby reducing the probability of establishment and persistence. For example, in an analysis of 14 reintroduced toutouwai/North Island robin (*P. longipes*) populations, Parlato and Armstrong (2013) showed that habitat connectivity was a key factor in determining individual establishment following translocation, with individuals released at highly connected sites having a lower establishment probability than those at less connected sites, such as on an island or in an isolated mainland reserve. Second, natal dispersal (i.e. the loss of juveniles raised at the release site) can also reduce establishment and persistence if juveniles move from managed to unmanaged sites (Richardson et al. 2014). Critically, the interaction between post-release dispersal and natal dispersal can limit population growth, erode genetic diversity and reduce the likelihood of the long-term persistence of a translocated population.
3. **The size of the site.** It is difficult to define the minimum size that a site must be to support a new black robin population because the carrying capacity of any site will be directly related to its quality, i.e. high-quality sites can support high-density populations whereas low-quality sites will only support low-density populations. Small populations are also subject to Caughley’s (1994) ‘small population paradigm’ (see section 1), making them generally more at risk. Therefore, larger high-quality sites are usually preferred over smaller high-quality sites. This is especially relevant on Chatham Island and Pitt Island, as the carrying capacities (numbers of birds per hectare) of sites on these islands might be lower than on South East Island and Mangere Island, which are considered more ecologically intact and have a longer history of protection.

4. **The ability to install and maintain a predator-proof fence at the site.** The presence of mammalian pests has a critical impact on the survival of many native and endemic species (Innes et al. 2010; Richardson et al. 2014). These impacts are so pervasive that the removal or control of pests is almost always a prerequisite for translocated populations to establish and persist. Black robins will only survive on Chatham Island and Pitt Island if their habitat is protected from rats (*Rattus* spp.), cats (*Felis catus*), weka (*Gallirallus australis*), mice (*Mus musculus*), possums (*Trichosurus vulpecula*), pigs (*Sus scrofa*) and feral livestock.
5. **The accessibility of the site for Chatham Islanders.** Maximising the sense of identity of local communities with black robins is a fundamental objective that was very strongly expressed during the 2021 workshop. If a potential site is inaccessible to Chatham Islanders, this key objective cannot be met. Accessibility includes both physical accessibility, through driving and walking, as well as legal accessibility, by agreement with the landowners.

Based on these criteria, six sites were identified as potential ecological restoration and black robin reintroduction sites and assessed for their suitability (Table 2). Short site descriptions and aerial photographs are provided in Appendix 3.

Table 2. Characteristics of the six sites assessed as potential ecological restoration and karure /kakarua /Chatham Island black robin (*Petroica traversi*) reintroduction sites

ISLAND	SITE	PERCEIVED QUALITY	CONNECTIVITY	SIZE (HA)	ABLE TO BE PREDATOR FENCED?	PHYSICAL ACCESS?	LEGAL ACCESS?
Chatham ^a	Nikau Bush Conservation Area	Remnant and regenerating forest; stock fenced	Low	33	Yes	Yes	Yes – PCL
Pitt ^b	Caravan Bush / Elizabeth Ellen Preece Conservation Covenant	Remnant and regenerating forest; partially predator fenced ^c (cats [<i>Felis catus</i>], weka [<i>Gallirallus australis</i>], pigs [<i>Sus scrofa</i>]) for > 20 years)	Low	54	Yes	Yes	Yes – conservation covenants and landowner agreements in place
Chatham	Chudleigh Conservation Area	Remnant and regenerating forest; stock fenced	Low	42	Yes	Yes	Yes – PCL
Chatham	Big Bush	Remnant and regenerating forest; partially stock fenced	Low	59	Yes	Yes	By negotiation with landowners
Chatham	Halfway Bush	Remnant and regenerating forest; partially stock fenced	Low?	17	Yes	Yes	By negotiation with landowners
Chatham	Pat Smith's / Plum Tree	Remnant and regenerating forest; partially stock fenced	Low?	100	Yes	Yes	By negotiation with landowners

Abbreviations: PCL, public conservation land.

^a Rēkohu /Wharekauri /Chatham Island; official name: Chatham Island.

^b Rangihau /Rangiauria /Pitt Island; official name: Pitt Island (Rangiauria).

^c The fence at Caravan Bush has performed well but is high maintenance, due for replacement and only protects 36 of the 54 hectares of forest.

3. Site visits by black robin experts, imi, iwi, community members and landowners

Assessing the habitat quality of sites for new animal populations is very difficult, especially when the animals have been absent for a very long time and there are few sites available that meet the needs of translocated animals. Unfortunately, both issues apply to black robins – they have been absent from Chatham Island and Pitt Island for at least several decades, and possibly several centuries (aside from a brief reintroduction attempt at Caravan Bush in 2002-2007; Parker 2020, unpublished, see Notes), and almost all the habitat that is thought to be required by black robins has been cleared since human settlement. Therefore, when assessing the potential of a site to meet the biological needs of black robins, it is important to acknowledge and quantify the uncertainty about the quality of the site.

Sitting alongside the biological requirements of black robins, and of equal importance, are the responsibilities, connections and objectives of imi, iwi, community members and landowners. These are a critical factor in decision making but must match the biological needs of black robins – otherwise, any translocation attempt will almost certainly fail.

We visited each potential release site with:

- seven black robin experts – these people had specific expertise that was of relevance to ecological restoration and the translocation of black robins, including working with black robin populations on Mangere Island and South East Island, selecting release sites for multiple species in Aotearoa New Zealand, translocating black robins and many other species, managing small populations of a range of species, and undertaking ecological restoration more broadly; the primary role of this group was to predict if the sites could meet the biological needs of black robins, alongside assessing potential access to each site for management purposes and the Rēkohu / Wharekauri / Chatham Islands⁶ community
- imi representatives
- iwi representatives
- community members
- landowners of the privately owned sites.

A list of the participants in each of the site visits can be found in Appendix 4.

⁶ Official name: Chatham Islands; <https://gazetteer.linz.govt.nz/place/55352>.

4. Estimating the consequences of each site for achieving the fundamental objectives for black robin management

4.1 Process

The consequences of selecting each site relative to five of the seven fundamental objectives for black robin management were estimated by experts during site visits in October 2022 (Moriari and Ngāti Mutunga fundamental objectives will require further consideration). These experts used expert elicitations, population models, existing data and the objectives developed during the 2021 SDM workshop to predict the degree to which each site would meet each of the fundamental objectives. The steps taken to estimate the consequences for each objective are detailed below.

4.1.1 Maximise the resilience of black robins

1. Each site was visited for 3–5 hours between 1 and 5 October 2022. On arrival at each site, the group was given an overview of the key characteristics and management history of the site by the landowners, managers or local DOC staff. They then walked through the site as a group, attempting to cover all representative vegetation types and microhabitats, and informally discussing the quality of the site as they walked. They were especially interested in site boundaries, the forest interior, forest gaps, the aspect and exposure, the dominant vegetation, regeneration, impacts from introduced mammals (including domestic and feral stock), resident birdlife, and potential dispersal corridors (i.e. connected vegetation) that translocated black robins could use to disperse from managed ‘safe’ habitat to unmanaged ‘dangerous’ habitat. They were also interested in how the site felt relative to existing black robin habitat and what it might offer to other threatened birds, lizards, invertebrates and plants if restored for black robins.
2. Following the site visit, an expert elicitation was conducted following best-practice protocols (Martin et al. 2012, Hemming et al. 2018), where the seven black robin experts were asked to estimate how black robins would fare following translocation to the site.
3. For each site, the seven black robin experts estimated three different vital rates for a theoretical black robin population (adult female survival, juvenile survival and number of juveniles produced per female), the carrying capacity of the site and the percentage of translocated birds that might disperse from the site (assuming that juvenile dispersal would be similar to post-release dispersal). These elicited values were then used in a population model to project future population trajectories at each potential site.

4.1.2 Minimising costs

1. The group used existing costings for staff (i.e. full-time equivalents [FTEs]), planning, predator-proof fencing, pest eradication, site management, and monitoring, translocation, transportation and logistics to estimate the cost of preparing and maintaining each site in a state that would allow a black robin population to establish, grow and persist following translocation.
2. These costings were presented as the total 5-year (2022–2027) cost for each alternative.

4.1.3 Maximising ecosystem gains

1. The seven black robin experts listed additional threatened species native to the Chatham Islands archipelago that might benefit from the restoration and management of each site for black robins.
2. Unlike in the first SDM, ecological replacements for extinct Chatham Island species (e.g. the Chatham Island bellbird [*Anthornis melanocephala*]) as potential benefactors of black robin management were not included in these site assessments.

4.1.4 Maximising the sense of identity of local communities and public appreciation

1. A point estimate of the proportion of the Chatham Islands community that could have physical access to each potential black robin site was made during the first SDM workshop and reconfirmed during the site visits. It was considered that public access would be essentially the same.
2. Where a site was on private land, potential **physical** and **legal** access were both considered, with the latter being subject to formal agreement with landowners.

4.1.5 Ensuring that Moriori principles and values are embodied in karure/black robin management

1. Cassidy Solomon, a Hokotehi Moriori Trust representative, was part of the group that visited Caravan Bush and Big Bush, and EP, KAP and Tiriana Smith (DOC Operations Manager, Rekohu/Wharekauri/Chatham Island Office) also met with Tom Lanauze from the Moriori Imi Settlement Trust to discuss the site selection process.
2. There has been an initial indication that the Hokotehi Moriori Trust has a preference for the Caravan Bush and Chudleigh Conservation Area sites. However, formal support for the final site selection is subject to ongoing discussion.

4.1.6 Ensuring that Ngāti Mutunga o Wharekauri are recognised as Te Tiriti o Waitangi partners in all decision making for kakarua/black robin management

1. Hone Tibble, a Ngāti Mutunga o Wharekauri Trust representative, was part of the group that visited Nīkau Bush Conservation Area, and KAP also met with Hone to discuss the site selection process in a more general manner.
2. Hone expressed a particular preference by Ngāti Mutunga o Wharekauri for the Pat Smith's/Plum Tree site. However, formal support for the final site selection is subject to ongoing discussion.

4.2 Outcome

Each site was predicted to perform differently in relation to different objectives (Table 3). Population modelling predicted that Big Bush would support the most black robins in the 10 years following the release of 20 females (and 20 males). However, this would also be the most expensive site to restore (\$7.2 million) and is on private land, meaning that access to Chatham Islanders and the general public is currently uncertain (1-90%).

Caravan Bush and Pat Smith's/Plum Tree were estimated to have similar population trajectories. However, Pat Smith's/Plum Tree was associated with greater uncertainty around the population projections, would have higher costs (\$7.1 million) and is also on private land, meaning that access and engagement opportunities are uncertain (1-90%). By contrast, Caravan Bush would be a cheaper site to restore (\$5.8 million), would be accessible to 30-50% of Chatham Islanders and has high engagement opportunities.

It was predicted that Chudleigh Conservation Area would support half the number of black robins relative to Big Bush, and the lower credible interval for this site included zero, i.e. extinction. However, Chudleigh Conservation Area would be a cheaper site to restore (\$4.6 million), would be accessible to 90% of Chatham Islanders and has high engagement opportunities.

The population trajectories for Nikau Bush Conservation Area and Halfway Bush were both pessimistic and included zero in the lower credible intervals. The costs for these sites would be similar to Chudleigh Conservation Area, and Nikau Bush Conservation Area would also be accessible to 90% of Chatham Islanders and has high engagement and appreciation opportunities. There is greater uncertainty around Halfway Bush because it is on private land. The predicted population outcomes for each site are shown in Fig. 2.

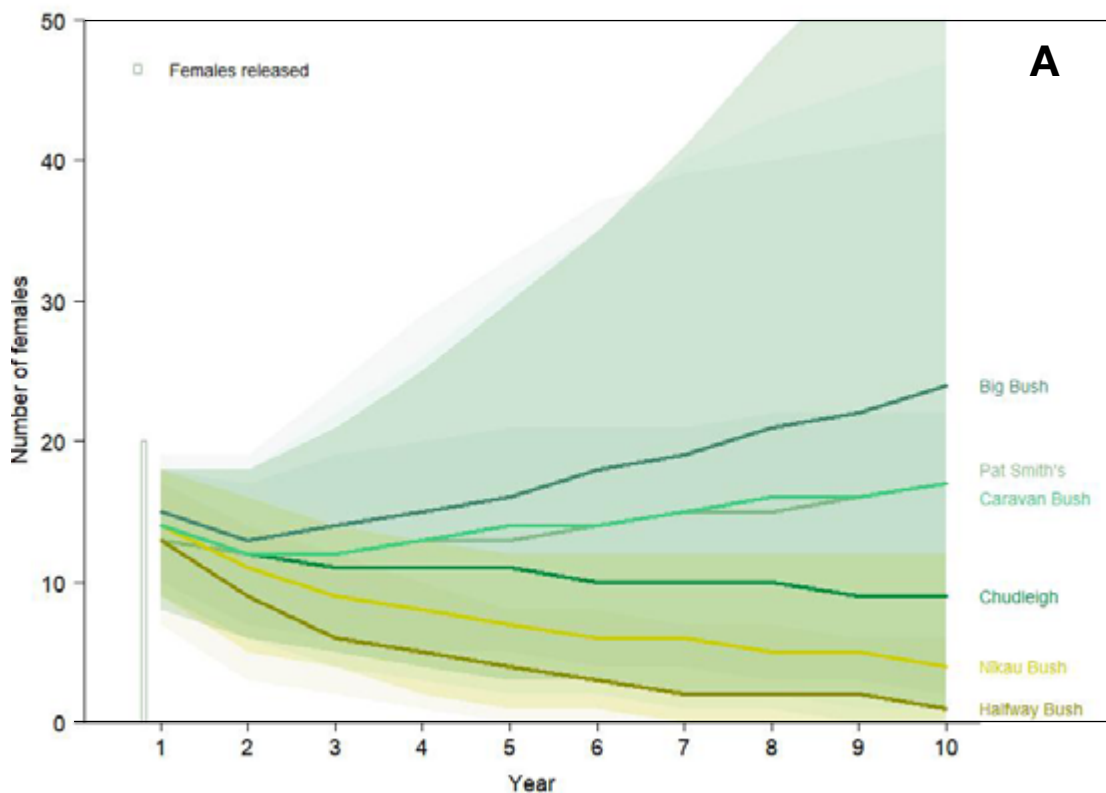
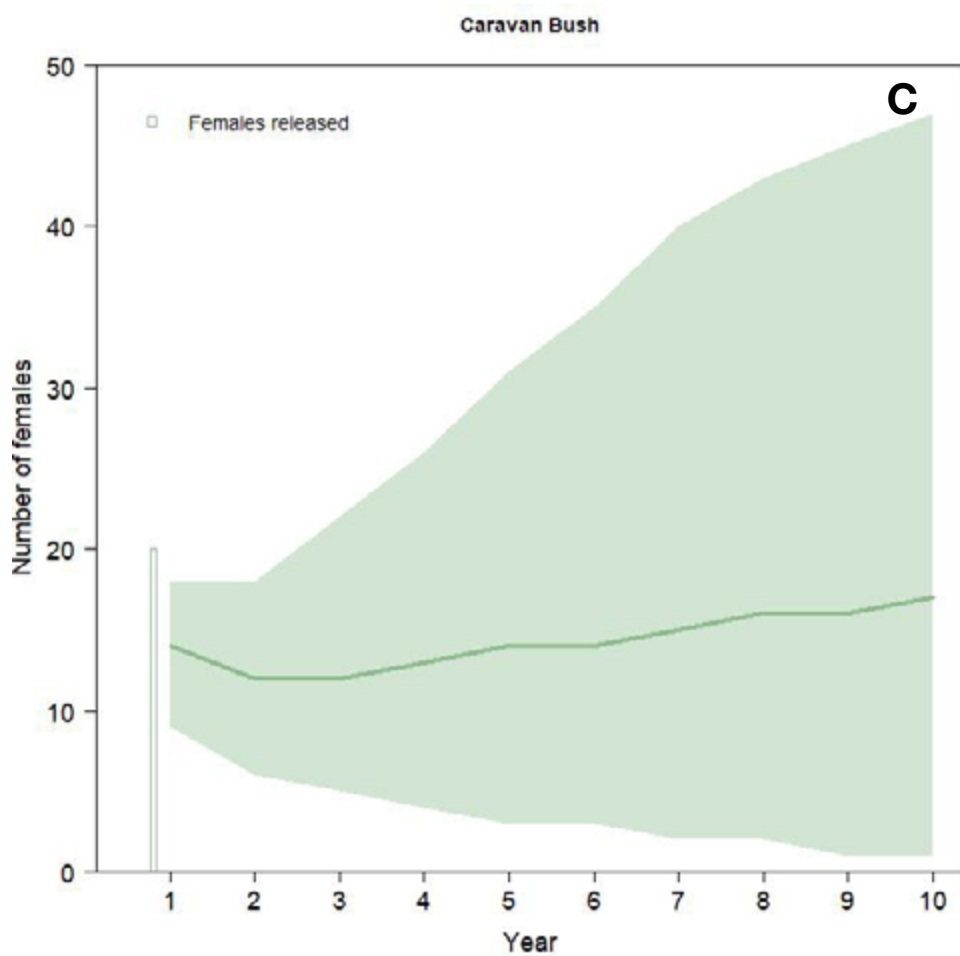
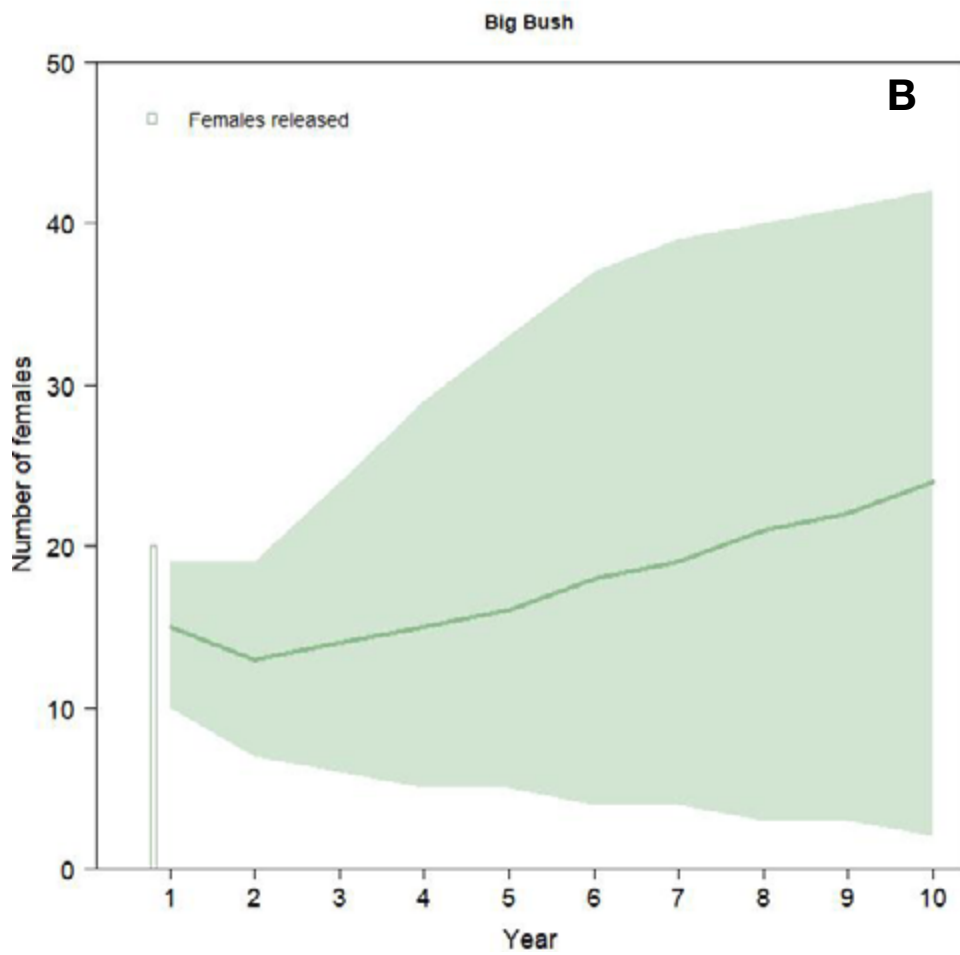
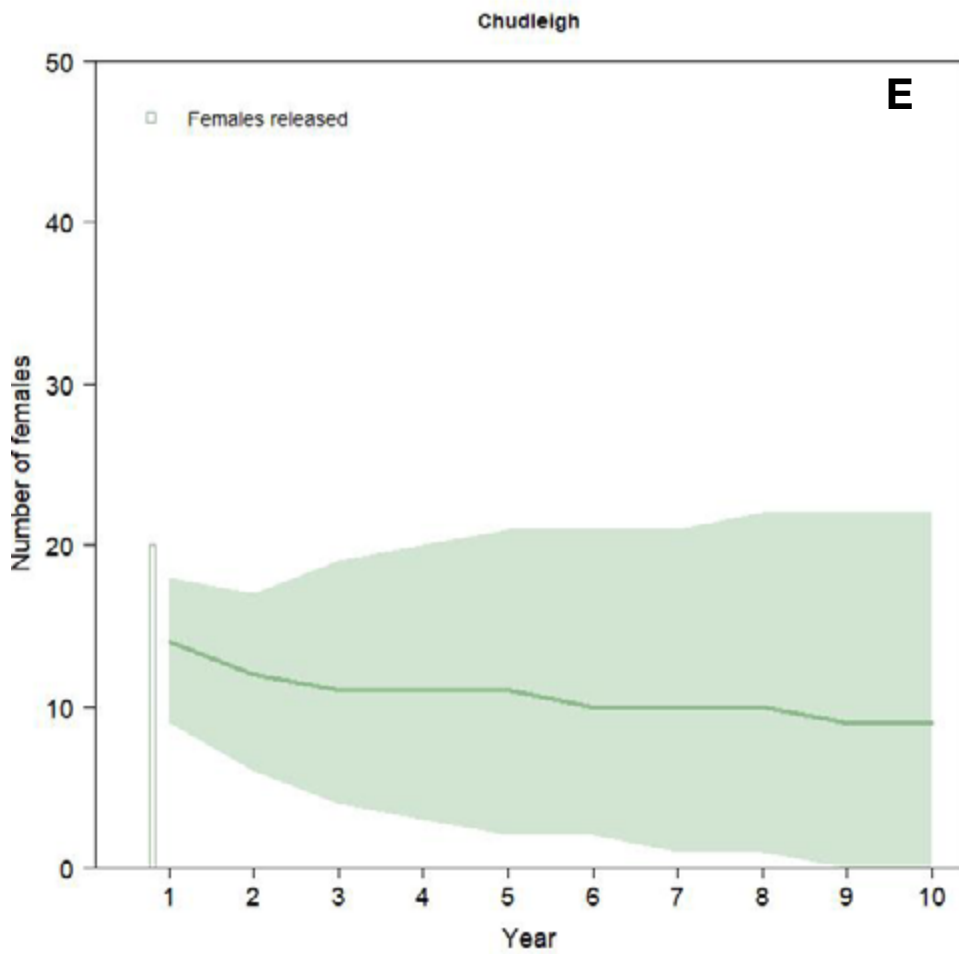
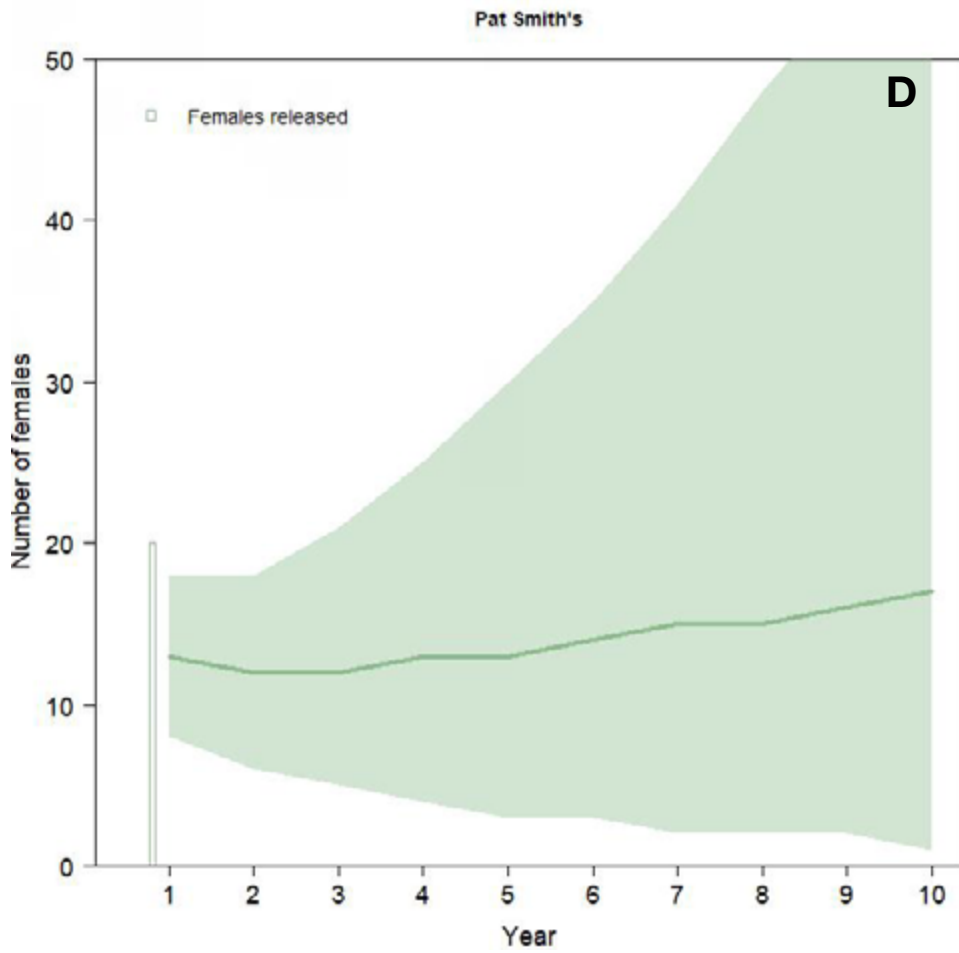
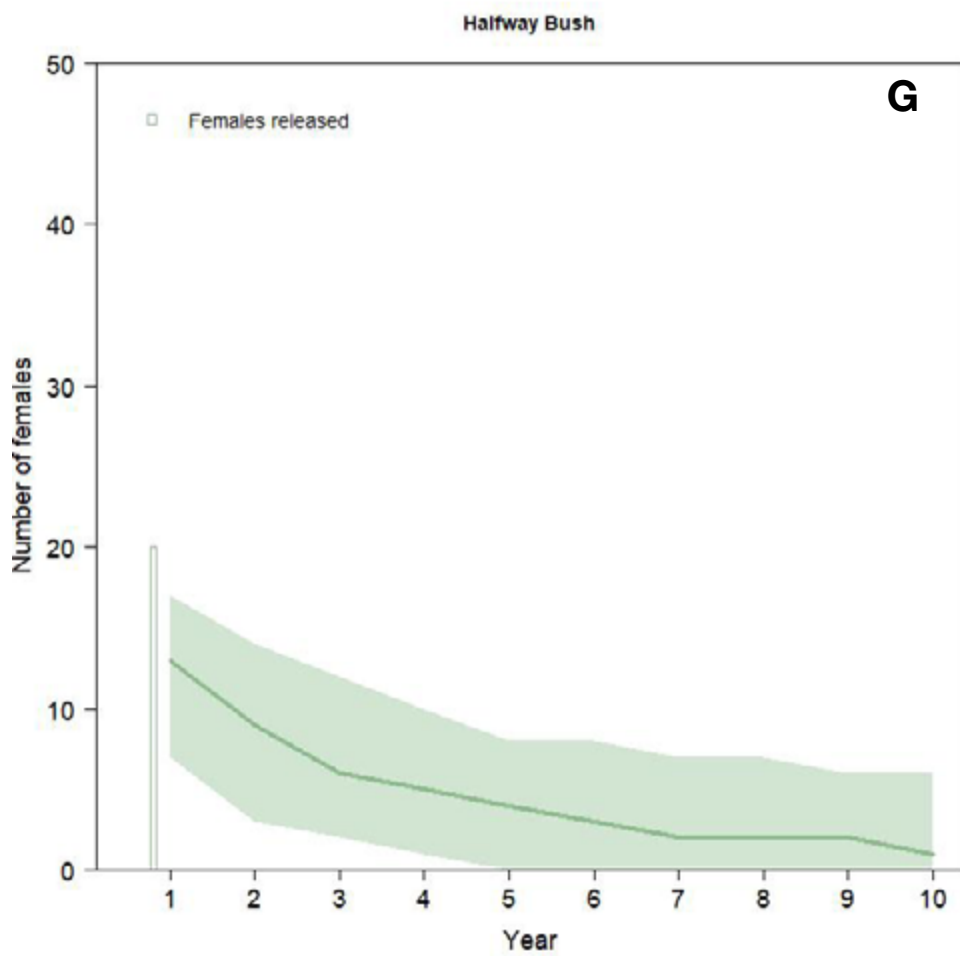
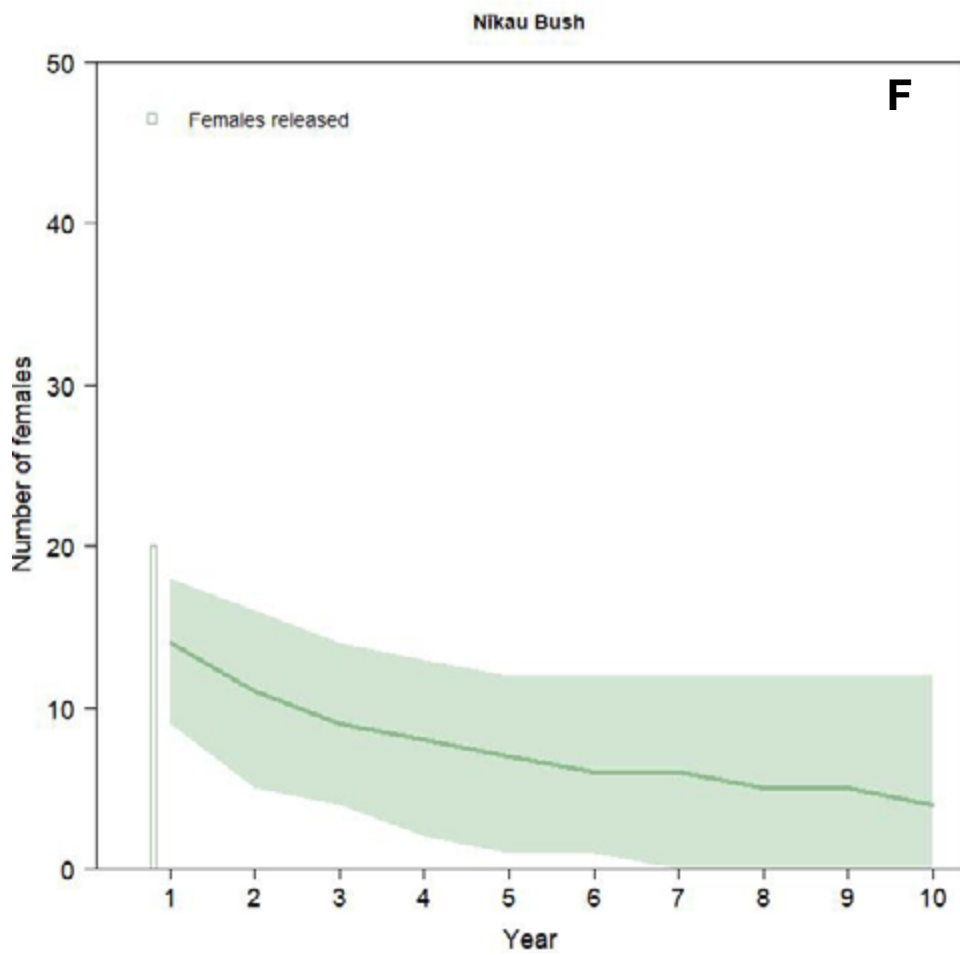


Figure 2. Predicted numbers of adult female karure/kakarua/Chatham Island black robins (*Petroica traversi*) up to 10 years post-translocation at (A) all six sites that were assessed for ecological restoration and black robin reintroduction in October 2022, (B) Big Bush, (C) Caravan Bush, (D) Pat Smith's Plum Tree, (E) Chudleigh Conservation Area, (F) Nikau Bush Conservation Area and (G) Halfway Bush. Lines represent the median numbers of birds at each site, while the shaded areas show the 95% credible intervals. The number of adult females was modelled because they drive population growth. However, historical data show that there will be at least as many adult black robin males as females in the population at any point in time, and often there will be a male bias (i.e. more males than females).







5. Trade-offs and identifying the best option

5.1 Process

The biological experts specifically assessed how many black robins each site could support, the likely black robin population vital rates at each site and the probability of dispersal from each site. They initially examined trade-offs between maximising the resilience of black robin populations, minimising costs, maximising ecosystem gains, and maximising the sense of local identity and public appreciation in the completed consequence table (Table 3). The intention was to simplify the consequence table in a rational manner, account for uncertainty, facilitate deliberation, and identify the best option or options for new sites for ecological restoration and the establishment of new black robin populations. The process was as follows.

1. Upon completion of the consequence table, the expert group voted anonymously on the sites they considered acceptable and their single preferred site.
2. The expert group then removed unacceptable sites from the consequence table.
3. Once the consequence table had been simplified, the expert group anonymously ranked the remaining sites from their most to least preferred site for restoration and reintroduction of black robins. The ranks were then summed for each site, with the most preferred alternative receiving the lowest score and the least preferred the highest score.

5.2 Outcome

During the first round of voting, three sites (Big Bush, Caravan Bush and Pat Smith's/Plum Tree) were unanimously considered acceptable, two sites (Nikau Bush Conservation Area and Halfway Bush) were unanimously considered unacceptable and one site (Chudleigh Conservation Area) was considered acceptable by some but unacceptable by others. Therefore, the consequence table was simplified by removing the two unacceptable sites, Nikau Bush Conservation Area and Halfway Bush (Table 4). This was followed by extensive discussion about the various sites and their performance as indicated by the consequence table.

Overall, there was broad agreement that Big Bush, Caravan Bush and Pat Smith's/Plum Tree were the best performers in a strictly biological sense, with most participants stating that they felt there was little difference between them. However, there was a strong desire by some participants to retain Chudleigh Conservation Area as a potential site for ecological restoration and black robin reintroduction. There were two primary reasons for this. First, while all the biological experts considered that Chudleigh Conservation Area would only be marginally acceptable for black robins in its current state, some strongly believed that with 5–10 years of active restoration, specifically extensive plantings, predator-proof fencing and pest eradication, the carrying capacity of the site and vital rates of the black robin population would be much better than predicted by the population model. Furthermore, the landowner of the adjacent hill has indicated that this could also be included in the fenced area, thereby increasing potential black robin habitat. Second, Chudleigh Conservation Area is on public conservation land (PCL), so management access would be guaranteed, as would meeting the fundamental objectives 'Maximise sense of identity of local communities with black robins' and 'Maximise public appreciation' and their associated performance measures of '90% of the Chatham Islands community with physical access to black robins', 'High local engagement opportunities' and 'High wider outreach', as set by the SDM working group during the 2021 SDM workshop.

Table 3. Consequence table for each assessed site in terms of ecological restoration and karure/kakarua/Chatham Island black robin (*Petroica traversi*) reintroduction

ALTERNATIVE MANAGEMENT STRATEGY	OBJECTIVE						
	MAXIMISE RESILIENCE	MINIMISE COSTS	MAXIMISE ECOSYSTEM GAINS	MAXIMISE SENSE OF IDENTITY OF LOCAL COMMUNITIES WITH BLACK ROBINS	MAXIMISE PUBLIC APPRECIATION	MORIORI PRINCIPLES AND VALUES ARE EMBODIED ^e	NGĀTI MUTUNGA O WHAREKAURI ARE RECOGNISED AS TE TIRITI O WAITANGI PARTNERS ^f
	Number of adult females at the new site 10 years post release ^a	Cost (NZ\$)	% of Rēkohu/ Wharekauri/ Chatham Islands community ^b with physical access ^c	% of Rēkohu /Wharekauri /Chatham Islands ^d community with physical access to black robins	Local engagement opportunities (qualitative scale)	Wider outreach (qualitative scale)	
Nikau Bush Conservation Area	4 (0–12)	< \$4,589,300	13	90	High	High	
Caravan Bush	17 (1–47)	\$5,783,000	12	30–50	High	High	
Chudleigh Conservation Area	9 (0–22)	\$4,589,300	20	90	High	High	
Big Bush	24 (2–42)	\$7,234,300	20	1–90	Low to high	Low to high	
Halfway Bush	1 (0–6)	< \$4,589,300	13	1–90	Low to high	Low to high	
Pat Smith's/ Plum Tree	17 (1–60)	\$7,139,300	20	1–90	Low to high	Low to high	

^a The number of adult females is used as a performance measure because they drive population growth. However, historical data show that there will be at least as many adult black robin males as females in the population at any point in time, and often there will be a male bias (i.e. more males than females).

^b This refers to both the Rēkohu/Wharekauri/Chatham Island (official name: Chatham Island) and Rangihau/ Rangiauria/Pitt Island (official name: Pitt Island [Rangiauria]) communities.

^c Only physical access is considered here. Legal access would be by agreement with the landowner when a site is on private land.

^d A Moriori representative (Cassidy Solomon) attended several site visits, and KAP, EP and Tiriana Smith (DOC Operations Manager, Rēkohu/Wharekauri/Chatham Island Office) met with Thomas Lanauze from the Moriori Imi Settlement Trust during the site visits. However, this consequence table has been partially completed by the biological expert group, so the degree to which these sites uphold Moriori principles and values is subject to further discussion.

^e A Ngāti Mutunga o Wharekauri representative (Hone Tibble) attended one site visit and expressed a preference for one site. However, this consequence table has been partially completed by the biological expert group, so the degree to which these sites are acceptable to Ngāti Mutunga o Wharekauri is subject to further discussion.

Table 4. Round two consequence table for ecosystem restoration and the establishment of a new karure /kakarua /Chatham Island black robin (*Petroica traversi*) population at each alternative site

SITES	OBJECTIVE						
	MAXIMISE RESILIENCE	MINIMISE COSTS	MAXIMISE ECOSYSTEM GAINS	MAXIMISE SENSE OF IDENTITY OF LOCAL COMMUNITIES WITH BLACK ROBINS	MAXIMISE PUBLIC APPRECIATION	MORIORI PRINCIPLES AND VALUES ARE EMBODIED ^e	NGĀTI MUTUNGA O WHAREKAURI ARE RECOGNISED AS TE TIRITI O WAITANGI PARTNERS ^f
	Number of adult females at the new site 10 years post release ^a	Cost (NZ\$) for planning and establishment of the site over the first 5 years	Number of populations of other threatened species that could be established at the site	% of the Rēkohu /Wharekauri / Chatham Islands community ^b with physical access ^c	Local engagement opportunities (qualitative scale)	Wider outreach (qualitative scale)	
Caravan Bush	17 (1–47)	\$5,783,000	12	30–50	High	High	
Chudleigh Conservation Area	9 (0–22)	\$4,589,300	20	90	High	High	
Big Bush	24 (2–42)	\$7,234,300	20	1–90	Low to high	Low to high	
Pat Smith's / Plum Tree	17 (1–60)	\$7,139,300	20	1–90	Low to high	Low to high	

^a The number of adult females is used as a performance measure because they drive population growth. However, historical data show that there will be at least as many adult black robin males as females in the population at any point in time, and often there will be a male bias (i.e. more males than females).

^b This includes both the Rēkohu /Wharekauri /Chatham Island (official name: Chatham Island) and Rangihau /Rangiauria /Pitt Island (official name: Pitt Island [Rangiauria]) communities.

^c Only physical access was considered here. Legal access would be by agreement with the landowner when a site is on private land.

^d A Moriori representative (Cassidy Solomon) attended several site visits. However, this consequence table has been partially completed by the biological expert group, so the degree to which these sites uphold Moriori principles and values requires further discussion.

^e A Ngāti Mutunga o Wharekauri representative (Hone Tibble) attended one site visit and expressed a preference for one site. However, this consequence table has been partially completed by the biological expert group, so the degree to which these sites are acceptable to Ngāti Mutunga o Wharekauri requires further discussion.

Big Bush and Pat Smith’s/Plum Tree are both on private land, so there would be greater uncertainty around access for Chatham Islanders, conservation managers and island visitors until legal access agreements are in place. It is possible that such legal access agreements could be achieved in a manner that is satisfactory to all parties, and there was no intention to pre-empt the outcome of that process. However, this uncertainty needed to be expressed in the consequence table for these sites and meant that the expert group wanted a PCL site to be retained as an option on Chatham Island, alongside explicit acknowledgement that Chudleigh Conservation Area is a more uncertain site in its current state but might be improved with management.

Therefore, a second round of voting was carried out, whereby the expert group ranked the four remaining sites from their most to least preferred for ecological restoration and black robin reintroduction, with equal ranking allowed for sites. This ranking exercise showed that Big Bush on Chatham Island and Caravan Bush on Pitt Island were the preferred sites for ecological restoration and black robin reintroduction. The selection of these sites would also meet the preferred management alternative from the 2021 SDM working group, which was for black robins to be reintroduced to both Chatham Island and Pitt Island. Pat Smith’s/Plum Tree was the third ranked site by the group overall, while Chudleigh Conservation Area was the fourth, although three participants gave the latter site a higher individual ranking (Table 5).

Therefore, consistent with the management alternative selected by the 2021 SDM working group, the final recommendation of the expert group is that two sites undergo ecological restoration for black robin reintroduction: Big Bush on Chatham Island and Caravan Bush on Pitt Island. If legal access to Big Bush cannot be secured in a manner that is satisfactory to all partners, then Pat Smith’s/Plum Tree and/or Chudleigh Conservation Area should be restored for black robin reintroduction on Chatham Island.

Table 5. Anonymised individual rankings of preferred sites for ecological restoration and the reintroduction of karure/kakarua/Chatham Island black robins (*Petroica traversi*). The sites with the lowest score are the most preferred sites, listed from the most preferred (Caravan Bush and Big Bush, total score = 10) to least preferred (Chudleigh Conservation Area, total score = 23).

SITE	P1	P2	P3	P4	P5	P6	P7	TOTAL
Caravan Bush	2	2	1	1	1	2	1	10
Big Bush	1	1	2	1	3	1	1	10
Pat Smith’s/Plum Tree	3	2	4	1	4	2	1	17
Chudleigh Conservation Area	4	4	3	2	2	4	4	23

6. Implementation

After arriving at their final recommendation, the expert group immediately set about planning implementation of ecological restoration for black robin reintroduction.

A budget and planning requirements brief has already been completed for circulation among potential funders for ecological restoration of sites for black robin reintroduction.

Next steps include:

- further discussing the site recommendations with Moriori
- further discussing the site recommendations with Ngāti Mutunga o Wharekauri
- formally discussing the site recommendations with the landowners at Caravan Bush, Big Bush, Pat Smith's/Plum Tree and Halfway Bush
- circulating this report among the 2021 SDM workshop participants, the Chatham Island Conservation Board and the broader Chatham Islands community.

7. Acknowledgements

We are grateful to all the people who contributed to, participated in, and/or provided a cup of tea and cake during the site visits, especially the landowners of Caravan Bush, Halfway Bush, Big Bush and Pat Smith's/Plum Tree. Three of the co-authors of this report, MB (Toroa Consulting Ltd), EHP (Massey University) and DPA (Massey University), kindly donated their time and expertise on a voluntary basis. Nat Forsdick did the beautiful illustration that graces the SDM figure and Amanda Todd provided thorough and helpful editing of the final report. Enzo MR Reyes kindly provided the stunning cover image of a black robin on Mangere Island.

8. References

- Birdlife International. 2022. Species factsheet: *Petroica traversi*. Cambridge, UK: Birdlife International [accessed 2022 Feb 22]. <http://www.birdlife.org>.
- Butler D, Merton DV. 1992. The black robin. Saving the world's most endangered bird. Oxford, UK: Oxford University Press. 294 p.
- Caughley G. 1994. Directions in conservation biology. *Journal of Animal Ecology*. 63:214–244.
- Gregory R, Failing L, Harstone M, Long G, McDaniels T, Ohlson D. 2012. Structured decision making: a practical guide to environmental management choices. Chichester, West Sussex: Wiley-Blackwell. 312 p.
- Hall LS, Krausman PR, Morrison ML. 1997. The habitat concept and a plea for standard terminology. *Wildlife Society Bulletin*. 25:173–182.
- Hemming V, Burgman MA, Hanea AM, McBride MF, Wintle BC. 2018. A practical guide to structured expert elicitation using the IDEA protocol. *Methods in Ecology and Evolution*. 9:169–180.
- Innes J, Kelly D, Overton J, Gillies C. 2010. Predation and other factors currently limiting New Zealand forest birds. *New Zealand Journal of Ecology*. 34:86–114.
- Martin TG, Burgman MA, Fidler F, Kuhnert PM, Low-Choy S, McBride M, Mengersen K. 2012. Eliciting expert knowledge in conservation science. *Conservation Biology*. 26:29–38.
- Parker KA, Parlato EH, Fischer JH. 2023. A structured decision-making approach for recovery of the karure/kakarua /Chatham Island black robin (*Petroica traversi*). Wellington: Department of Conservation. 37 p.
- Parlato EH, Armstrong DP. 2013. Predicting post-release establishment using data from multiple introductions. *Biological Conservation*. 160:97–104.
- Richardson K, Doerr V, Ebrahimi M, Parker KA. 2014. Considering dispersal in reintroduction and restoration planning. In: Armstrong DP, Hayward MW, Moro D, Seddon PJ, editors. *Advances in reintroduction biology of Australian and New Zealand fauna*. Clayton, VIC: CSIRO Publishing; p. 59–72.
- Robertson HA, Baird KA, Elliott GP, Hitchmough RA, McArthur NJ, Makan TD, Miskelly CM, O'Donnell CFJ, Sagar PM, Scofield RP, et al. 2021. Conservation status of birds in Aotearoa New Zealand, 2021. *New Zealand Threat Classification Series* 36. Wellington: Department of Conservation. 47 p.
- Stadtman S, Seddon PJ. 2018. Release site selection: reintroductions and the habitat concept. *Oryx*. 54:687–695.

9. Notes

Parker KA. 2020. A review of the translocation of Chatham Island black robins from Rangatira and Mangere Islands to Caravan Bush, Pitt Island, 2002–2005. Internal report prepared for the Department of Conservation, Wellington. 19 p.

Welch J. 2022. Kākāruia/karure/black robin (*Petroica traversi*) 2021–22 season report. Department of Conservation, Chatham Islands Office, Aotearoa New Zealand. 20 p.

Appendix 1

Names of places used in this document

OFFICIAL NAME	TA RĒ MORIORI	TE REO MĀORI	ENGLISH
Chatham Island	Rēkohu	Wharekauri	Chatham Island
Chatham Islands	Rēkohu	Wharekauri	Chatham Islands
Little Mangere Island (Tapuaenuku) The Fort	Tapuaenuku	Tapuaenuku	Little Mangere Island
Mangere Island	Maung'Re	Mangere	Mangere Island
Pitt Island (Rangiauria)	Rangihau	Rangiauria	Pitt Island
South East Island (Rangatira)	Hokoreora	Rangatira	South East Island

Appendix 2

Fully specified management alternatives for karure /kakarua /Chatham Island black robin (*Petroica traversi*) management

Note that the Multi-Translocation management alternative was recommended as the best option for black robin recovery by the 2021 structured decision-making (SDM) working group.

MANAGEMENT ALTERNATIVE	BIOSECURITY	MONITORING	NEST BOXES	HABITAT RESTORATION	REINFORCEMENT	TRANSLOCATION	POST-RELEASE MANAGEMENT	IDENTITY/ APPRECIATION
Status Quo	Status quo levels	Status quo level (pre-and post-breeding monitoring on both Maung'Rē/Mangere /Mangere Island ^a and Hokoreeroo /Rangatira / South East Island ^b)	None	Status quo levels	n/a	n/a	n/a	Light – use existing staff for very low social media engagement
Conservation Monitoring	As per Status Quo	Full breeding monitoring, including territory mapping of pairs, mate changes, nest outcomes and chick banding; potentially also including hybrid monitoring and habitat quantification on at least Mangere Island, but ideally also South East Island	Douglas Basin	As per Status Quo	n/a	n/a	n/a	Light – use existing staff for site visits but add three school visits per year, one black robin public evening per year and low social media engagement
Restoration Mangere	As per Status Quo	As per Conservation Monitoring	As per Conservation Monitoring	Restore Mangere Island through increased planting and potentially through artificial fertilisation, leaf-litter translocations and starling (<i>Sturnus vulgaris</i>) control	n/a	n/a	n/a	As per Conservation Monitoring
Restoration Both	As per Status Quo	As per Conservation Monitoring	As per Conservation Monitoring	As per Restoration Mangere but extend to South East Island	n/a	n/a	n/a	As per Conservation Monitoring
Status Quo Reinforcement	As per Status Quo	As per Status Quo	As per Conservation Monitoring	As per Status Quo	10 adult females from South East Island to Mangere Island	n/a	n/a	As per Conservation Monitoring
Reinforcement Monitoring	As per Status Quo	As per Conservation Monitoring but translocated birds will also be fed ad libitum whenever encountered and regular island-/site-wide searches will be conducted to locate any missing birds	As per Conservation Monitoring	As per Status Quo	As per Status Quo Reinforcement	n/a	n/a	As per Conservation Monitoring

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Table continued

MANAGEMENT ALTERNATIVE	BIOSECURITY	MONITORING	NEST BOXES	HABITAT RESTORATION	REINFORCEMENT	TRANSLOCATION	POST-RELEASE MANAGEMENT	IDENTITY/ APPRECIATION
Reinforcement Monitoring Plus	As per Status Quo	As per Reinforcement Monitoring	As per Conservation Monitoring	As per Restoration Both	As per Status Quo Reinforcement	n/a	Supplementary feeding on Mangere Island over the breeding season	As per Conservation Monitoring
Reinforcement Monitoring Plus New Population	As per Status Quo	As per Reinforcement Monitoring	As per Conservation Monitoring	As per Restoration Both but with additional restoration at a new site on Rangihaua / Rangiauria / Pitt Island ^c or Rēkohu / Wharekauri / Chatham Island ^d consisting of plantings, predator-proof fencing, predator eradication, and potentially fertilisation, leaf-litter translocations and starling control	As per Status Quo Reinforcement	Translocation of 20 females and 20 males to either Pitt Island or Chatham Island in 10 years' time	As per Reinforcement Monitoring Plus	Medium – allocate 0.5 full-time equivalent (FTE) for more site visits, eight school visits per year, one black robin day per year and medium social media engagement; the 0.5 FTE might be shared across multiple organisations
Translocation Pitt	As per Status Quo	As per Reinforcement Monitoring	Douglas Basin and potentially Pitt Island	Restore a new site on Pitt Island through plantings, predator-proof fencing, predator eradication, and potentially fertilisation, leaf-litter translocations and starling control	As per Status Quo Reinforcement	Translocation of 20 females and 20 males to Pitt Island in 10 years' time	Supplementary feeding and potentially cross-fostering on Pitt Island	As per Reinforcement Monitoring Plus New
Translocation Chatham	As per Status Quo	As per Reinforcement Monitoring	Douglas Basin and potentially Chatham Island	Restore a new site on Chatham Island through plantings, predator-proof fencing, predator eradication, and potentially fertilisation, leaf-litter translocations and starling control	As per Status Quo Reinforcement	Translocation of 20 females and 20 males to Chatham Island in 10 years' time	Supplementary feeding and potentially cross-fostering on Chatham Island	As per Reinforcement Monitoring Plus New

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Table continued

Translocation Chatham Plus	As per Status Quo	As per Reinforcement Monitoring	As per Translocation Chatham	As per Translocation Chatham	As per Status Quo Reinforcement	As per Translocation Chatham	As per Translocation Chatham	Max – allocate 1 FTE for more site visits, 16 school visits per year, one black robin day per year and high social media engagement; the 1 FTE might be shared across multiple organisations
Multi-Translocation	As per Status Quo	As per Reinforcement Monitoring	Douglas Basin and potentially one or both new sites	As per Restoration Both but with additional restoration at the new sites on Pitt Island and Chatham Island consisting of plantings, predator-proof fencing, predator eradication, and potentially fertilisation, leaf-litter translocations and starling control	As per Status Quo Reinforcement	Translocation of 20 females and 20 males to Pitt Island in 10 years' time and a further 20 females and 20 males to Chatham Island in 15 years' time	As per Reinforcement Monitoring Plus but with additional supplementary feeding and potentially cross-fostering on Pitt Island and Chatham Island	As per Translocation Chatham Plus

^a Official name: Mangere Island.

^b Official name: South East Island (Rangatira).

^c Official name: Pitt Island (Rangiauria).

^d Official name: Chatham Island.

Appendix 3

Site descriptions

A3.1 Nīkau Bush Conservation Area

Ecosystem types: (1) Chatham Island akeake (*Olearia traversiorum*), karamū (*Coprosma chathamica*), māhoe (*Melicytus chathamicus*), ribbonwood (*Plagianthus regius* subsp. *chathamicus*) forest; (2) swamp akeake (*Olearia telmatica*), *Coprosma propinqua martinii* low forest/flaxland

Land category: Public conservation land

Land area: 33 ha

Nīkau Bush Conservation Area (Fig. A3.1) holds the largest natural nīkau (*Rhopalostylis sapida*) population on Rēkohu/Wharekauri/Chatham Island,⁷ and this tree is common in all tiers through most of upper Nīkau Bush. Areas of rich mixed Chatham Island broadleaf forest, with structure and diversity in all tiers, are juxtaposed against areas of bracken fern (*Pteridium esculentum*)/scrubland, young plantings and exotic rank grassland. Kōpī (*Corynocarpus laevigatus*) is present in upper and lower Nīkau Bush and common in the canopy in areas of mature forest, while rautini (*Brachyglottis huntii*), swamp akeake and *Hebe barkeri* occur naturally and have been supplemented through plantings. Chatham Island astelia (*Astelia chathamica*) and Chatham Island toetoe (*Austroderia turbaria*) have been established through plantings.

Figure A3.1. Aerial photograph of Nīkau Bush Conservation Area



⁷ Official name: Chatham Island.

A3.2 Caravan Bush /Ellen Elizabeth Preece Conservation Covenant

Ecosystem type: Chatham Island akeake, karamū, māhoe, ribbonwood forest

Land category: Privately owned land under conservation covenant

Land area: 54 ha

Caravan Bush (Fig. A3.2) is characterised by a rich mixed Chatham Island broadleaf forest with structure and diversity in all tiers that is set in a mosaic with small areas of bracken fern /scrubland, young plantings and exotic rank grassland. Natural populations of nīkau, *Hebe barkeri*, rautini, Chatham Island ribbonwood and *Myoporum semotum* occur here, and the site has been supplemented through plantings of these species plus Chatham Island astelia and Chatham Island toetoe. A large area outside the cat- and pig-proof fence is heavily impacted by pigs, so the ridges are dominated by bracken fern and low dracophyllum (*Dracophyllum arboreum*), while the gullies and coastal slopes have a healthy canopy but a heavily impacted understorey. Restoration plantings of akeake and other species have closed some gaps. However, further plantings would be required to speed the recovery of the forest once pigs have been fenced out, particularly at the southwestern end.

Figure A3.2. Aerial photograph of Caravan Bush /Ellen Elizabeth Preece Conservation Covenant



A3.3 Chudleigh Conservation Area

Ecosystem type: Chatham Island akeake, karamū, māhoe, ribbonwood forest

Land category: Public conservation land

Land area: 42 ha

Chudleigh Conservation Area (Fig. A3.3) is a rich mixed broadleaved forest. Chatham Island endemics feature strongly in the canopy, and this is one of the few remnants in which Chatham Island ribbonwood is protected. Several decades of protection from stock has allowed the forest to recover and the understorey to develop good structure. However, the groundcover tier continues to be impacted by pigs, often severely. The natural diversity in all tiers has been supplemented through plantings, although further plantings are required to close gaps between forest patches, particularly in the western block. Kōpī is present and common in the canopy in parts of the forest remnant. The remnant *Hebe barkeri* population has been supplemented through plantings, while Chatham Island toetoe has been established through plantings. Records indicate that *Linum monogymum* var. *chathamicum* was once present on the cliff faces above the forest, but there are no recent records, likely due to grazing pressure. A selaginella (*Selaginella kraussiana*) infestation is present but this could be removed with sustained management.

Figure A3.3. Aerial photograph of Chudleigh Conservation Area



A3.4 Big Bush

Ecosystem type: Chatham Island akeake, karamū, māhoe, ribbonwood forest

Land category: Privately owned land

Land area: 59 ha

At Big Bush (Fig. A3.4), a small (6.4-ha) covenanted and fenced portion of the forest is protected from grazing animals and has good structure and diversity. The remainder of the southern block also has good structure and diversity, although parts are dominated by areas of straight vertical poles with a distinct lack of structure and ground cover. The forest is tall, likely due to the surrounding terrain and high soil fertility. Large specimens of Chatham Island karamū are common across the southern block. Kōpī is a dominant feature in the canopy over large areas of the wider Big Bush block, but the presence of this species in the understorey is mostly limited. Small planted areas around Big Bush include *Hebe barkeri*. Small clearings in the bush could be closed through restoration plantings.

Figure A3.4. Aerial photograph of Big Bush



A3.5 Halfway Bush

Ecosystem type: Swamp akeake, Chatham Island karamū, *Coprosma propinqua martinii* low forest/flaxland

Land category: Privately owned land

Land area: 17 ha

The central portion of Halfway Bush (Fig. A3.5) has been fenced off for decades and has a dense understorey under a closed canopy. Pigs are impacting this forest, with evidence of browsing and tracking in the understorey. The surrounding areas are either grazed or subject to feral stock incursions and so are typically open under a patchy canopy of swamp akeake. Large rautini are present with recruitment in the surrounding bracken fern/scrubland. This is a remnant of an underrepresented Chatham Island ecosystem and consequently should be well protected.

Figure A3.5. Aerial photograph of Halfway Bush



A3.6 Pat Smith's /Plum Tree

Ecosystem type: Chatham Island akeake, karamū, māhoe, ribbonwood forest

Land category: Privately owned land

Land area: 100 ha

The forest in Pat Smith's block (southeastern block; Fig. A3.6) appears to have been protected from grazing animals for some time and has good structure and diversity, including established supplejack (*Ripogonum scandens*) in some areas. Kōpī is present but not noticeably dominant or inhibiting other species. The forest is tall in areas, likely due to a combination of the surrounding terrain and high soil fertility. The canopy of Pat Smith's block is largely intact apart from the area on the lagoon edge. There are stands of mature pine (*Pinus* spp.) and macrocarpa (*Hesperocyparis macrocarpa*) near the house, alongside important invasive weeds such as broom (*Cytisus scoparius*), English ivy (*Hedera helix*), banana passionfruit (*Passiflora mixta*), pampas (*Cortaderia selloana*) and ornamental plants. The Goomes' half of this block was not assessed but the kawenata (29 ha) of bush has provided some protection since 1995, although occasional stock incursions have likely impacted the lower tiers of this forest. The remaining sections of this site are either not fenced or poorly fenced, so the understory is degraded and the canopy is patchy.

Figure A3.6. Aerial photograph of Pat Smith's/Plum Tree



Appendix 4

Participants in the October 2022 karure /kakarua /Chatham Island black robin (*Petroica traversi*) site assessments

PARTICIPANT	AFFILIATION	1 OCT	2 OCT	3 OCT	4 OCT	5 OCT	6 OCT
		Caravan Bush	Nikau Bush Conservation Area	Big Bush	Chudleigh Conservation Area	Halfway Bush and Pat Smith's	Office day
Mike Bell	Toroa Consulting Ltd /CI community	✓	✓	✓	✓	✓	✓
Hamish Tuanui Chisholm	CILRG /PF2050 /CI community				✓		
Jamie Cooper	DOC Chathams	✓	✓	✓	✓	✓	✓
Jesse Friedlander	DOC Chathams	✓					
Gemma Green	DOC Chathams /CI community				✓	✓	✓
Martie Gregory-Hunt	PI community	✓					
Tom Hitchon	DOC Chathams	✓			✓		
Robert Holmes	Owner Halfway Bush					✓	
Ryan Holmes	Owner Halfway Bush					✓	
Jenna Hoverd	DOC Chathams /CI community /PI community					✓	
Moana King	Representing Pat Smith					✓	
Courtney Lanauze	PI community	✓					
Nadine Lanauze	PI community	✓					
Troy Makan	DOC Rotorua	✓	✓			✓	✓
Rachel O'Sullivan	DOC Chathams	✓					
Kevin Parker	Parker Conservation Ltd	✓	✓	✓	✓	✓	✓
Erin Patterson	DOC Chathams	✓	✓	✓	✓	✓	✓
Denny Prendeville	Chatham Island Conservation Board /CI community		✓	✓	✓	✓	✓
Cassidy Solomon	HMT /DOC Chathams	✓			✓		
Tash Sweeny	PI community	✓					
Tertia Thurley	DOC Palmerston North	✓	✓	✓	✓	✓	✓
Hone Tibble	Ngāti Mutunga o Wharekauri Trust		✓				
Marcel Tuuta	Part owner Big Bush /CI community			✓			
Jemma Welch	DOC Chathams	✓	✓	✓	✓	✓	✓

Abbreviations: CI, Rēkohu /Wharekauri /Chatham Island (official name: Chatham Island); CILRG, Chatham Island Land Restoration Group; DOC, Department of Conservation Te Papa Atawhai; DOC Chathams, Rēkohu / Wharekauri /Chatham Island Office, DOC; DOC Palmerston North, Te Papaioea /Palmerston North Office, DOC; DOC Rotorua, Rotorua Office, DOC; HMT, Hokotehi Mōriori Trust; PF2050, Predator Free 2050; PI, Rangihau / Rangiauria /Pitt Island (official name: Pitt Island [Rangiauria]).