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A structured decision-making approach for recovery of the karure /kakaruia /Chatham Island black robin (*Petroica traversi*)

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Department of Conservation
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Cover: Karure/kakaruia/Chatham Island black robins on Maung'Re/Mangere/Mangere Island. *Photo: Enzo MR Reyes*

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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/kakaruia/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 Rangihaute/Rangiauria/Pitt Island (hereinafter Pitt Island) communities and a conservation touchstone for Aotearoa New Zealand and the world. Conservation management has recovered the global black robin population from 5 birds in the early 1980s to c. 330 birds today. However, this species is still at a high risk of extinction, with just two small populations remaining and negligible population growth in each. Consequently, the black robin 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.

As part of the SDM process, a working group was formed consisting of representatives from the Hokotehi Moriori Trust, DOC, the Chatham Island Land Restoration Group, the Chatham Island Taiko Trust, the Chatham Island and Pitt Island communities, and Toroa Consulting Ltd. Representatives from the Ngāti Mutunga o Wharekauri Trust did not attend the SDM workshop because 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 Te Tiriti o Waitangi/Treaty of Waitangi partners in all decision making for kakaruia/black robin management.

The working group articulated seven values (objectives) that they considered fundamental to black robin recovery, along with 12 potential conservation strategies (management alternatives). The fundamental objectives included maximising the resilience of black robins, minimising costs, maximising ecosystem gains, maximising the sense of identity of local communities with black robins, maximising public appreciation, ensuring that Moriori principles and values are embodied in karure/black robin management, and recognising Ngāti Mutunga o Wharekauri as Te Tiriti o Waitangi partners in all decision making for kakaruia/black robin management. Potential management alternatives included maintaining the status quo, improving monitoring, carrying out habitat restoration and enhancement, reinforcing existing populations, translocating individuals to new sites, and improving the connection of the Rēkohu/Wharekauri/Chatham Islands (hereinafter Chatham Islands) community, and the public more generally, with black robins. The consequences of each alternative in relation to each fundamental objective were then predicted using a variety of modelling techniques and expert elicitations, while explicitly accounting for uncertainty. Once the consequences had been predicted, the working group was able to navigate this decision landscape explicitly and transparently using a variety of qualitative and quantitative decision-analytic tools to identify the best option for black robin conservation.

The working group identified that a combination of improved monitoring, site restoration, reinforcement of the Maung'Re/Mangere/Mangere Island (hereinafter Mangere Island) population, translocation to new sites on Chatham Island and Pitt Island, and improvement of the connection of the Chatham Islands community, and the public more generally, with black robins, would provide the best outcome for black robin recovery across the multiple objectives. Therefore, these components are being applied in a stepwise manner.

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Monitoring of the black robin population on Mangere Island was initiated over the 2021/22 breeding season, a reinforcement translocation from Hokorereoro/Rangatira/South East Island to Mangere Island was carried out in September 2022, and potential translocation sites on Chatham Island and Pitt Island were identified in October 2022. Further work will be implemented with the different representatives of the working group once adequate funding has been obtained.

The SDM process provided an inclusive environment for participants and facilitated a rational and transparent recommendation for black robin recovery, despite competing objectives, differing value judgements and uncertainty.

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'Re / Mangere / Mangere Island[1] (hereinafter Mangere Island) after a dramatic last-ditch translocation of all remaining birds from the neighbouring Tapuaenuku / Little Mangere Island[2] in 1976/77. Close-order management and further translocations to Hokorereoro / Rangatira / South East Island[3] (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 New Zealand Department of Conservation Te Papa Atawhai (DOC), with critical support from the Rēkohu / Wharekauri / Chatham Island[4] (hereinafter Chatham Island) and Rangihaute / Rangiauria / Pitt Island[5] (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 (Heather and Robertson 2015). 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.

A fundamental objective that is common to nearly all recovery programmes is to increase the number of individuals and populations of a threatened species. This has been a long-standing objective for the black robin, specifically by carrying out close-order management of breeding birds to increase productivity, increasing the amount of habitat (through plantings on Mangere Island) and establishing one or more additional populations through translocation (the last failed translocation attempts were to Pitt Island in 2002–2005; see review by Parker [2020a, unpublished, see Notes]). However, there were no robust population models to guide management and opinions varied as to the best course of action.

[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.

Since 2005, management actions have focused on population monitoring. This monitoring has shown that the black robin population on South East Island is relatively robust and stable, whereas female numbers are declining in the Mangere Island population (Fig. 1). Therefore, to optimise use of the available data and the broad breadth of black robin expertise, DOC applied a structured decision-making (SDM) process to identify the best management options for black robin recovery.

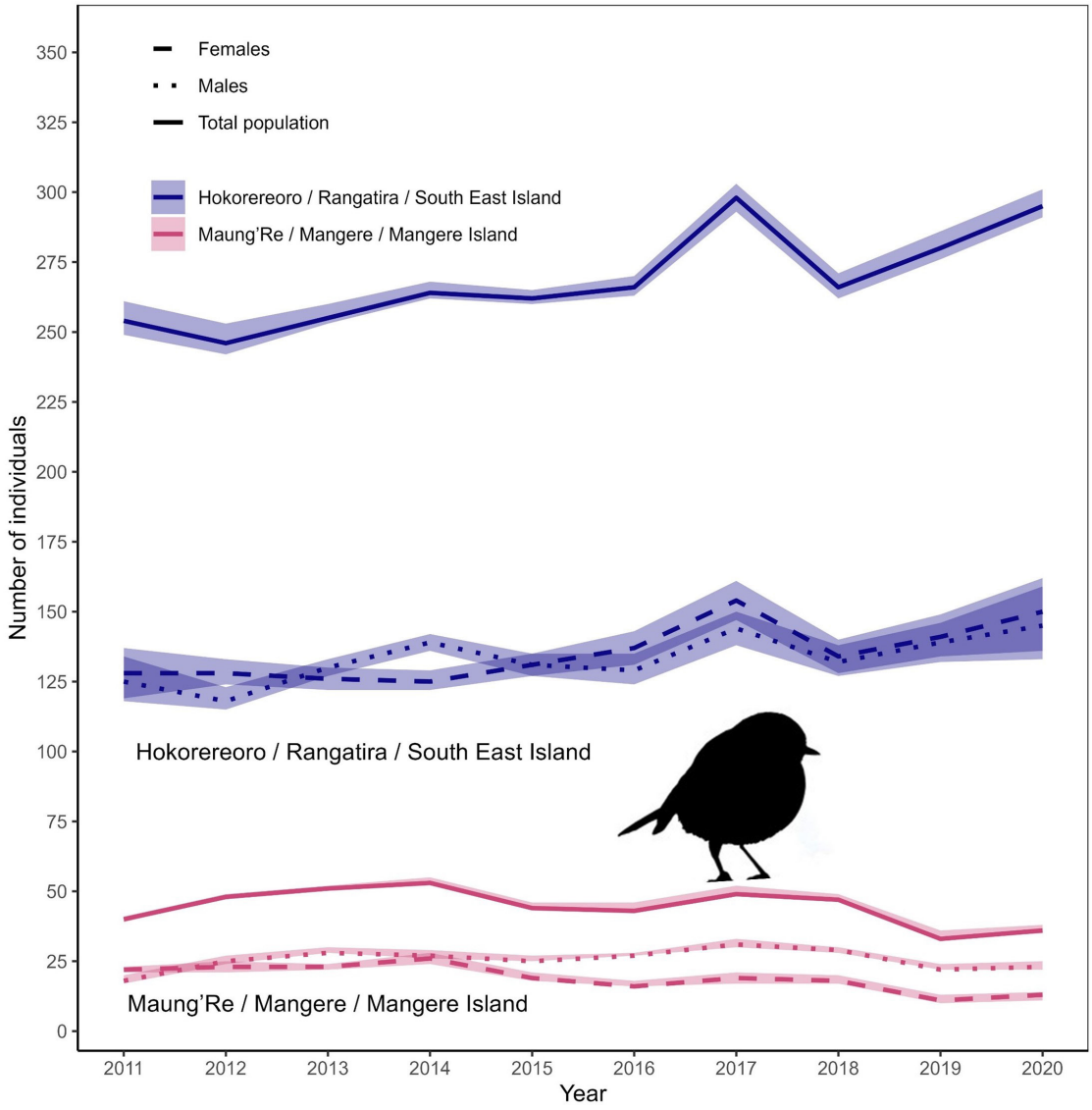


Figure 1. Karure/kakaruia/Chatham Island black robin (*Petroica traversi*) population history, 2011–2020. The shaded areas show the 95% credible intervals.

2. Structured decision making and species recovery

Species recovery programmes present conservation managers with formidable challenges as they typically involve multiple objectives, values and attitudes, a need or desire to implement novel techniques or intensive management (e.g. translocation and supplementary feeding), and considerable uncertainty. These attributes create risks and trade-offs, as managers are required to make decisions with few data and limited resources – and poor decisions can mean the loss of populations or even entire species. Consequently, these programmes are ideal candidates for the application of decision-analytic methods (Maguire et al. 1987), although this approach has only recently gained momentum (Moore and Runge 2012; Converse et al. 2013; Ewen et al. 2014; Panfylova et al. 2019; Canessa et al. 2020; Ferrière et al. 2021; McMurdo Hamilton, Canessa, Clarke, et al. 2021; McMurdo Hamilton, Canessa, Makan, et al. 2021; Fischer et al. 2022).

SDM is a transparent, iterative and values-based process that can be used to identify the best options for management while balancing multiple objectives (Gregory et al. 2012). The values focus means that the optimal choice will depend on the preferences and values of **all** stakeholders, e.g. imi, iwi, hapū, whānau, community members, industry representatives, and conservation scientists and managers. The SDM process consists of seven stages (Fig. 2).

1. Formulating a goal statement that defines the decision context
2. Articulating the fundamental objectives
3. Identifying potential management alternatives
4. Predicting and modelling the consequences of management alternatives
5. Weighing the trade-offs associated with different management alternatives
6. Identifying the best management option
7. Implementing the best management option

A feedback loop is also incorporated to update existing models, facilitating learning and adaptive management following the initial identification of the best option (Nichols and Armstrong 2012; Converse et al. 2013). Ultimately, the focus of SDM on values-led decision making is rational and enables effective working relationships among stakeholders (Maguire and Boiney 1994; Redford et al. 2011).

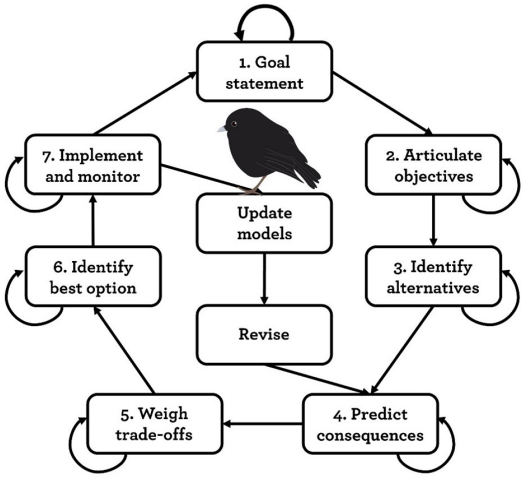


Figure 2. The seven steps in the structured decision-making cycle. Adapted from Gregory et al. (2012). *Illustration: N Forsdick.*

3. Methodology

In early 2020, DOC commissioned a review of the failed 2001–2005 translocations of black robins to the Ellen Elizabeth Preece Conservation Covenant on Pitt Island (Parker 2020a, unpublished, see Notes). This review identified the decision-making process as a contributing factor to the translocation failures and recommended the use of an SDM process to progress black robin recovery. A proposal for an SDM workshop was subsequently accepted (Parker 2020b, unpublished, see Notes) and DOC engaged a facilitator in late 2020.

An SDM process typically includes two 2–3-day workshops. However, travel to Rēkohu / Wharekauri / the Chatham Islands[6] (hereinafter the Chatham Islands) adds extra expense for participants from the Aotearoa New Zealand mainland (see Appendix 2). Therefore, DOC decided to run a single 6-day workshop instead, with shorter days and a field trip to Pitt Island. In conjunction with the Black Robin Technical Advisory Group (TAG) and DOC Chatham Island staff, the facilitator brought together a working group and co-facilitators for the black robin SDM process. The working group progressed through the SDM process from February 2021 to October 2022. This included a 4-day working group meeting[7] at Kōpinga Marae and frequent communication between the facilitators and the working group (in person and online). The process taken and the outcome of each of the seven steps in the SDM process are detailed in the following sections, and a timeline for the entire process is presented in Fig. 3.

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

[7] Note that the original 6-day agenda needed to be compressed into 4 days due to weather delays for participants coming from the Aotearoa New Zealand mainland.

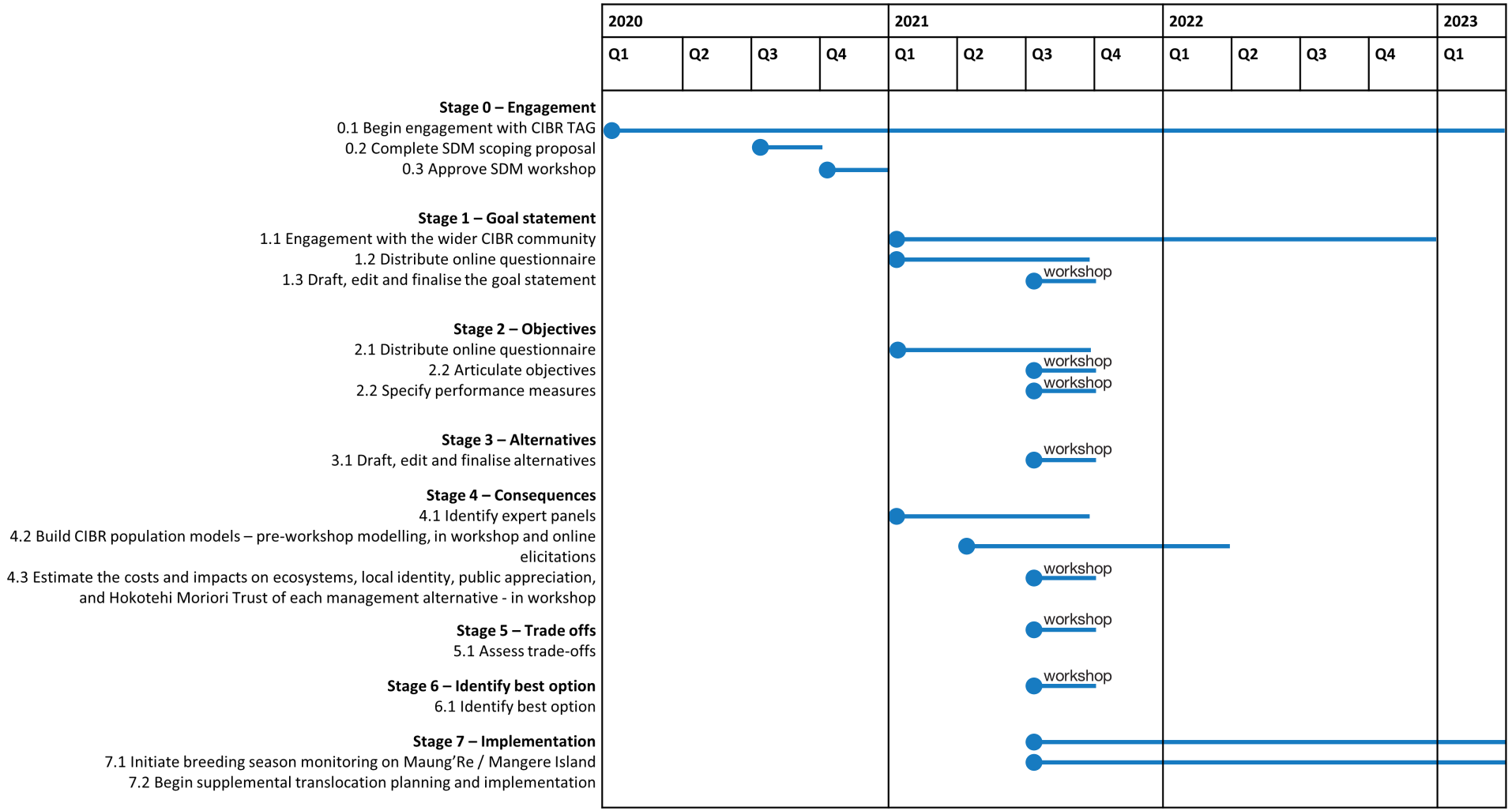


Figure. 3. Timeline for the karure/kakaruia/Chatham Island black robin (*Petroica traversi*) structured decision-making (SDM) process for recovery planning showing the key steps of the SDM cycle (see Fig. 2). The workshop was initially planned for the first quarter of 2021 and the supplemental translocation for the third quarter of 2021. However, both were delayed because of COVID-19 lockdowns. Abbreviations: CIBR, Chatham Island black robin; TAG, Technical Advisory Group.

4. Goal statement

Step 1 of the SDM process

The conservation goal statement highlights the focus and scope of the decision problem, describes why it has arisen, and identifies the decision-makers, as well as the time frame and legal framework within which a decision must be made (Gregory et al. 2012; Hemming et al. 2022). It may include up to seven core elements.

1. **Trigger:** Why does a decision need to be made? Why does it matter?
2. **Action:** What actions need to be taken?
3. **Constraints:** What are the constraints (legal, financial, political) on taking the stated action(s)? Are these perceived or real?
4. **Class or type of problem:** How many objectives are there? Do they conflict? What is the level of uncertainty?
5. **Decision-maker:** Who has the power to make the final decision?
6. **Frequency and timing:** How often do decisions need to be made? Are other, related decisions needed?
7. **Scope:** How broad or complicated is the decision?

4.1 Process

The conservation goal statement was initially drafted by the facilitators based on responses gathered through an online questionnaire that was sent to all participants prior to the in-person workshop (Appendix 3). The working group then edited the goal statement during the workshop to ensure that it was fit for purpose. The initial edits were completed in a dedicated session on the first day of the workshop, after which the goal statement was revisited at the beginning of each day, with minor, but critical, edits being made throughout.

4.2 Outcome

The karure / kakaruia / Chatham Island black robin (*Petroica traversi*) was rescued from the brink of extinction in the 1970s and 1980s. They are a conservation touchstone for Rēkohu / Wharekauri / Chatham Island and Rangihaute / Rangiauria / Pitt Island communities, Aotearoa New Zealand, and the world. Habitat restoration, translocations and close order management recovered the population from 5 birds to c. 330 today (c. 30 on Maung'Rē / Mangere / Mangere Island and c. 300 on Hokorereoro / Rangatira / South East Island). Black robins are still at high risk of extinction with just two small populations remaining and negligible population growth. Further conservation management must expand their range and abundance to increase their resilience. Other biological, cultural, community and financial objectives are also fundamentally important, including restoration of former habitats and reconnecting Ngāti Mutunga o Wharekauri, the Hokotehi Moriori Trust and local communities with the species. Balancing multiple fundamental objectives and the uncertainty surrounding the outcomes of management alternatives within the Chatham Islands archipelago will influence choices. Careful consideration will allow decision-makers to assess, approve and support future black robin management. The decision-makers are the Hokotehi Moriori Trust, Ngāti Mutunga o Wharekauri, local communities, private landowners and the Department of Conservation. They consider it imperative that management of karure / kakaruia / black robin intensifies from 2021.

5. Objectives

Step 2 of the SDM process

SDM recognises that the 'best' decision is that which best achieves the objectives of the participants. Therefore, the 'best' strategy cannot be defined unless the underlying objectives are clear. SDM recognises at least three important types of objectives.

1. **Fundamental:** These objectives reflect the group's core values or end goals and are useful for comparing and choosing between a range of possible management strategies.
2. **Means:** These objectives are important for highlighting ways of achieving the fundamental objectives.
3. **Process:** These objectives state the desired approach to the decision-making process.

Articulating fundamental objectives is crucial to SDM (Gregory et al. 2012; Hemming et al. 2022). Each fundamental objective should be expressed as a statement that captures the underlying value and includes a verb indicating the desired direction of change (e.g. minimise/maximise). It is critical that means objectives are separated from fundamental objectives, as focusing on a means objective risks judging alternatives incorrectly (e.g. double counting a value). A fundamental objective cannot be 'optimised', as optimisation (or efficiency) indicates that several fundamental objectives are being combined, which leads to hidden value judgments about what is 'optimal'. Fundamental objectives should be separate, allowing the decision to be approached rationally.

Each objective requires one or more performance measures to provide a metric by which to predict and compare the expected outcomes of alternatives. Performance measures can be direct, indirect proxies or constructed scales.

5.1 Process

The black robin working group articulated their fundamental objectives for black robin recovery using the following systematic approach.

1. Before the in-person workshop, an online questionnaire was sent to all participants (see Appendix 3 and https://docs.google.com/forms/d/1r-EiM7fDesna3sFuAk7MewpXy4OCGHjp3eZS0DByDFE/edit).
2. During the workshop, each participant started out by individually listing their aspirations and concerns (their values) for black robin recovery.
3. The participants then formed sub-groups and separated means and process objectives from fundamental objectives, and combined similar objectives, until a final set of fundamental objectives was agreed upon.
4. Each sub-group then reported back to the entire working group and similar objectives were combined until a final set of objectives was agreed upon.
5. During this process, the facilitators compared the fundamental objectives identified by the working group with the responses to the online questionnaire. They found that these did not differ, so there was no further discussion of the online questionnaire responses.
6. The working group then jointly identified appropriate performance measures for each objective.

5.2 Outcome

The working group identified seven fundamental objectives and associated performance measures for black robin recovery planning (Table 1). Predicting the future is notoriously difficult so, to keep the model predictions realistic and useful, 2040 was chosen as the horizon. It was decided that the objective 'Ensure that Moriori principles and values are embodied' did not need a specific performance measure but rather an explanation of the position of the Hokotehi Moriori Trust, which was provided.

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. The Ngāti Mutunga o Wharekauri Trust is broadly supportive of the outcomes of the workshop, and a fundamental objective that recognised Ngāti Mutunga o Wharekauri as Te Tiriti o Waitangi / Treaty of Waitangi partners in all decision making for kakaruia / black robin management was included throughout the SDM process.

Table 1. Fundamental objectives and their associated performance measures for karure / kakaruia / 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 Hokorereoro / Rangatira / South East Island[c] in 2040
	Total number of black robins 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 who have physical access to black robins
Maximise public appreciation	Wider outreach of black robin management (qualitative scale)
Ensure that Moriori principles and values are embodied in karure / black robin management[e]	'When Moriori migrated to Rēkohu / Rangihaute, 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 peacemaking that Moriori 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".
	'Moriori 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 kakaruia / black robin management[f]	Ngāti Mutunga o Wharekauri are Te Tiriti o Waitangi partners in all decision making for kakaruia / 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 Moriori Trust representatives 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 kakaruia / black robin management.

6. Alternative management strategies

Step 3 of the SDM process

Once the fundamental objectives have been established, it is possible to define and evaluate alternative strategies (i.e. management strategies) that could achieve these. This step often includes the identification of threats to populations. Given the biological and non-biological complexity of most species recovery programmes, these alternative strategies will typically involve combinations of actions. The same actions can appear as components of more than one alternative.

6.1 Process

The alternative management strategies for black robin recovery planning were identified using the following process.

1. The working group divided into four sub-groups and identified management actions for the black robin. These included broad ideas and categories of actions, along with specific management actions.
2. Each sub-group then presented and discussed their ideas with the main working group. Common themes among groups were identified and listed together.
3. The common ideas, themes and actions were then extensively discussed and debated, ultimately resulting in the creation of 12 composite management strategy alternatives, one of which was the status quo.

6.2 Outcome

The 12 alternative management strategies proposed for black robin recovery are summarised in Table 2 and fully described in Appendix 4. All alternatives were formulated based on current levels of knowledge and uncertainty. To address knowledge gaps, the working group also created an additional list of research priorities (see Appendix 5).

Table 2. Summary of alternative management strategies for karure / kakaruia / Chatham Island black robin (*Petroica traversi*) recovery planning, indicating the key differences in their component actions and how they compare with the status quo. The number of tick marks indicates the intensity of a component action, with more ticks representing a higher intensity. See Appendix 4 for a full description of each management strategy.

ALTERNATIVE MANAGEMENT STRATEGY	ACTIONS							
	Biosecurity	**Population Monitoring**	**Provision of nest boxes**	**Habitat restoration**	**Reinforcement translocations**	**New translocations**	**Post-release management of translocated birds**	**Identify with and appreciate black robins**
Status Quo	✓	✓		✓				✓
Conservation Monitoring	✓	✓✓✓	✓	✓				✓✓
Restoration Mangere	✓	✓✓✓	✓	✓✓				✓✓
Restoration Both	✓	✓✓✓	✓	✓✓✓				✓✓
Status Quo Reinforcement	✓	✓	✓	✓	✓			✓✓
Reinforcement Monitoring	✓	✓✓✓	✓	✓	✓			✓✓
Reinforcement Monitoring Plus	✓	✓✓✓	✓	✓✓✓	✓		✓	✓✓
Reinforcement Monitoring Plus New Population	✓	✓✓✓	✓	✓✓✓✓	✓	✓	✓	✓✓✓
Translocation Pitt	✓	✓✓✓	✓✓	✓✓✓✓	✓	✓	✓✓	✓✓✓
Translocation Chatham	✓	✓✓✓	✓✓	✓✓✓✓	✓	✓	✓✓	✓✓✓
Translocation Chatham Plus	✓	✓✓✓	✓✓	✓✓✓✓	✓	✓	✓✓	✓✓✓✓
Multi-Translocation	✓	✓✓✓	✓✓✓	✓✓✓✓✓	✓	✓✓	✓✓✓	✓✓✓✓

7. Consequences

Step 4 of the SDM process

Alternatives can be compared according to their expected outcomes (or consequences) for the different objectives, which are in turn quantified using performance measures. These outcomes can be estimated from a model of the system, which is informed by available empirical data (e.g. from monitoring), data from similar systems as a surrogate or expert judgement. When expert judgement is required, assessments should be obtained using best-practice protocols that include uncertainty (Martin et al. 2012; Hemming et al. 2018).

7.1 Process

The consequences of each alternative for each objective were estimated by participants during the workshop, with an additional online elicitation in March 2022 for estimating population vital rates and the carrying capacities of new translocation sites on Pitt Island and/or Chatham Island for black robins. Participants used a range of tools to estimate consequences, including population models, expert elicitations and existing data. The steps taken to estimate each consequence are detailed below.

7.1.1 Maximising black robin resilience

1. Black robin monitoring data collected between 2011 and 2021 were initially compiled and analysed using an integrated population model (IPM) in the Bayesian modelling program OpenBUGS (Spiegelhalter et al. 2014). The IPM estimated adult male and female survival, the number of juveniles produced per female (estimates were based on post-breeding surveys conducted in March), juvenile survival, and the population size and trajectory under the status quo, while accounting for covariance between vital rates and environmental stochasticity (Kéry and Schaub 2011; Schaub and Abadi 2011).
2. An expert elicitation following best-practice protocols (Martin et al. 2012; Hemming et al. 2018) was then conducted during the in-person workshop, whereby eight black robin experts were asked to estimate how black robins on Mangere Island, on South East Island and at new translocation sites would respond to each alternative strategy.
3. The experts estimated three different vital rates (adult female survival, juvenile survival and number of juveniles produced per female) and the carrying capacity for each site. These elicited values were then used in a population model to project future population trajectories under the different management alternatives. This approach also estimated extinction probabilities. However, because the elicitation-based models could not account for covariance between vital rates, these extinction probabilities were higher than they would have been had covariance been accounted for (due to greater uncertainty in the projections).
4. The estimates provided by the eight black robin experts for translocated populations were pessimistic and predicted translocation failure within 10 years. However, the experts felt these projections did not reflect their beliefs and that their inexperience in estimating vital rates was the cause of the pessimistic projections. Therefore, a second online elicitation was conducted in March 2022, which incorporated a training exercise that used a simple spreadsheet model prior to the elicitation, allowing participants to learn and gain a better understanding of the impacts of small changes in vital rates on population projections.

5. The working group did not decide on a specific translocation site, but rather estimated vital rates based on a site that was broadly similar to those initially assessed in the workshop. This was because selecting a translocation site is complex and site availability was uncertain at the time. Ultimately, a final decision on translocation sites for Chatham Island and Pitt Island would require a separate decision-making process incorporating expert elicitation of vital rates for the sites available for translocation.

7.1.2 Minimising costs

1. Participants used existing costings for staff (i.e. full-time equivalents [FTEs]), equipment (e.g. predator-proof fencing, aerial eradications, ongoing monitoring), transportation and logistics to estimate the cost of each alternative.
2. These costings were annualised and then presented as the total 5-year (2021–2026) cost for each alternative, accounting for inflation and including a 10% contingency. Note that the costs presented in this report reflect the global geopolitical state at the time of the workshop and will now be higher.

7.1.3 Maximising ecosystem gains

1. Participants listed other threatened species native to the Chatham Islands archipelago that might also benefit from black robin management. This included 13 bird species, 3 plant species and 1 skink species.
2. It was recognised that there are unnamed mega-invertebrates, micro-invertebrates and threatened plants that would also likely benefit from black robin management. Therefore, these were listed as three broad species groups.
3. In addition to species and species groups within the Chatham Islands, ecological replacements from the Aotearoa New Zealand mainland (e.g. the korimako / New Zealand bellbird [*Anthornis melanura*] as an ecological replacement for the extinct Chatham Island bellbird [*A. melanocephala*]) were considered as potential benefactors from black robin management, when embedded in the context of ecological restoration. Ecological replacements were included as a single category but included at least six bird species.
4. The number of additional populations of each species, species group or ecological replacement benefiting from black robin management were then presented as a range (lowest to highest number of new populations) for each management alternative in the consequence table.

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

1. The Chatham Islands community is small, consisting of approximately 780 people, 95% of whom reside on Chatham Island and the remainder of whom are found on Pitt Island. Representatives from both communities were part of the working group and, together, provided a point estimate of the proportion of Chatham Islanders who would have physical access to black robins under each management alternative.
2. Meaningful engagement opportunities are also seen as an important part of maximising the sense of identity of Chatham Islanders with black robins, and for generating public appreciation of black robins outside of the Chathams community, i.e. on the Aotearoa New Zealand mainland and internationally. Therefore, the degree to which each management alternative provided engagement opportunities for Chatham Islanders and the public was assigned a qualitative value (very low, low, medium or high).

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

1. The SDM workshop was held at Kōpinga Marae, and Hokotehi Moriori Trust representatives ensured that the entire process, including the selected management alternative, and the deliberation and selection process, was consistent with Moriori principles and values throughout.

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

1. Representatives from the Ngāti Mutunga o Wharekauri Trust were invited to the SDM workshop but were unable to attend. Therefore, the lead author, KAP, met with Deena Whaitiri and Gail Amaru online on 6 September 2021 and then with Gail Amaru and Hone Tibble in person on 21 April 2022.
2. Non-attendance at the workshop should not be interpreted as disengagement with the process. However, aspects of the organisation prior to the workshop fell short of the Ngāti Mutunga o Wharekauri Iwi Trust's expectations as Te Tiriti o Waitangi partners.
3. The Ngāti Mutunga o Wharekauri Iwi Trust does not oppose black robin conservation management and is broadly supportive of the workshop outcomes.
4. Informal support of the selected alternative has been indicated. However, formal support will be subject to ongoing discussion.

7.2 Outcome

The management alternatives were predicted to perform differently in relation to the various objectives.

The Multi-Translocation option performed the best through to 2040 when considering maximising the numbers of adult female black robins and populations, maximising ecosystem gains, maximising the sense of identity of local communities with black robins, maximising engagement, and ensuring that Moriori principles and values are embedded in karure / black robin management (Table 3, Fig. 4 and Fig. 5). However, this option would be the most expensive.

Reinforcement Monitoring Plus New Population, Translocation Pitt, Translocation Chatham and Translocation Chatham Plus also performed reasonably well against similar objectives, albeit with fewer ecosystem gains (Table 3, Fig. 4 and Fig. 5). However, only Translocation Chatham and Translocation Chatham Plus were high performers in providing physical access for Chatham Islanders to black robins, and only Translocation Chatham Plus provided high engagement opportunities for Chatham Islanders (Table 3).

Conservation Monitoring, Restoration Monitoring, Restoration Both, Status Quo Reinforcement and Reinforcement Monitoring were predicted to provide fewer adult black robin females, fewer populations, and low physical access and opportunities for engagement for Chatham Islanders, as well as low appreciation from the general public (Table 3, Fig. 4 and Fig. 5).

Finally, Status Quo was the least expensive option but was considered unacceptable across all objectives to the entire working group (Table 3, Fig. 4 and Fig. 5).

A full comparison of the consequences for each of the alternatives can be found in the consequence table (Table 3).

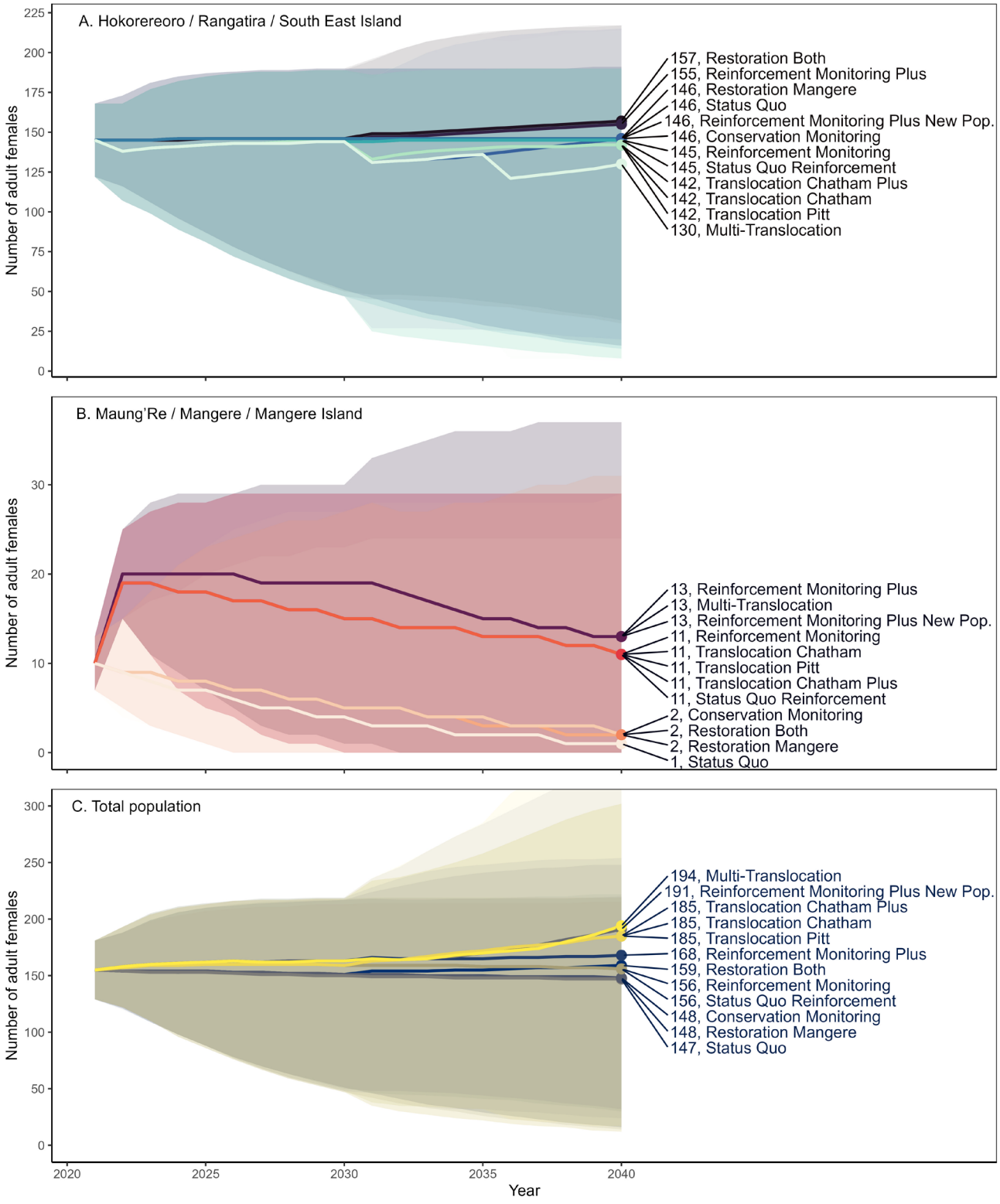


Figure 4. Predicted population projections for adult female karure / kakaruia / Chatham Island black robins (*Petroica traversi*) under different management alternatives (A) on Hokorereoro / Rangatira / South East Island, (B) on Maung'Re / Mangere / Mangere Island and (C) in total. Lines represent medians and the shading indicates the 95% credible intervals.

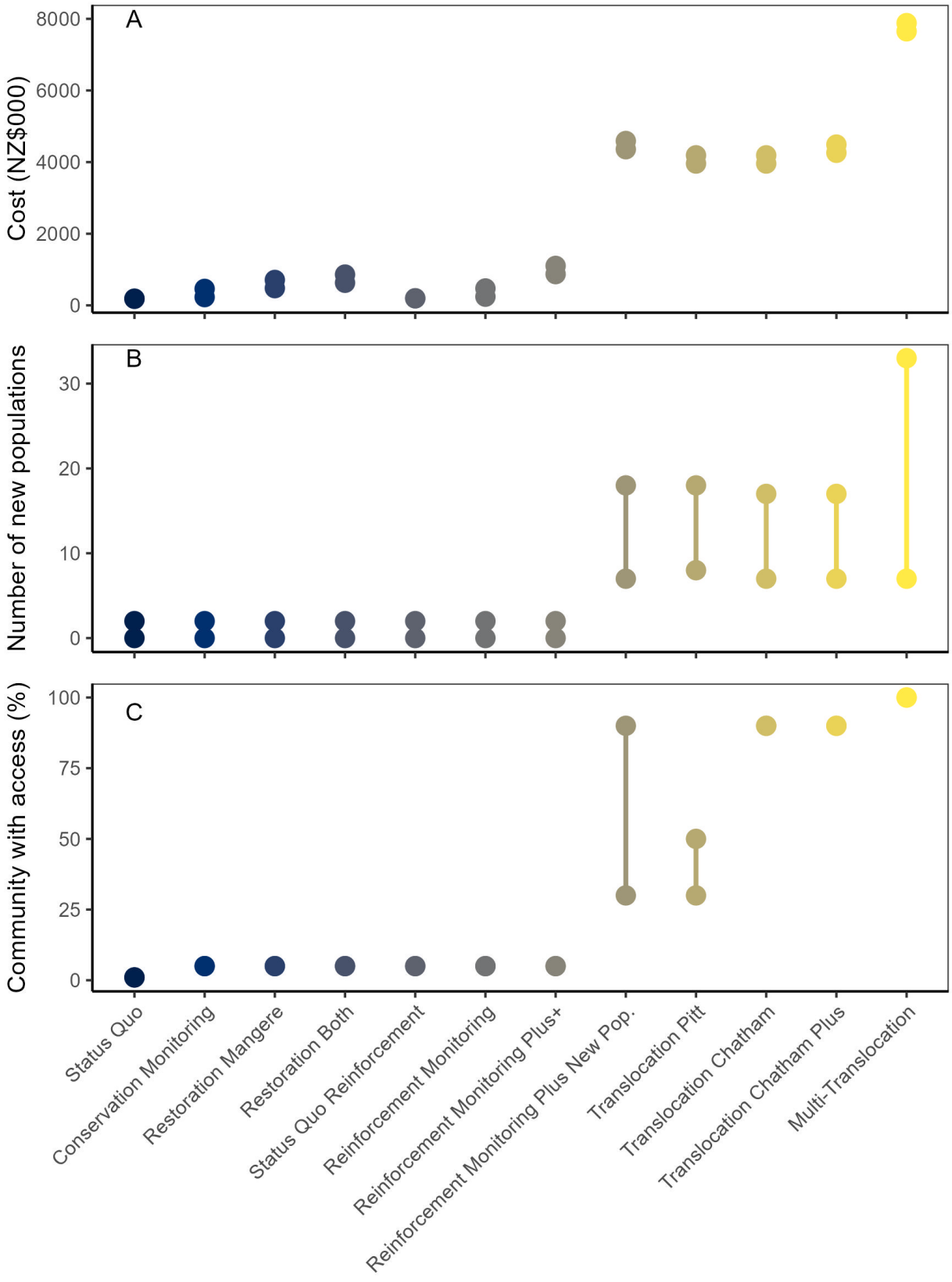


Figure 5. (A) Estimated 5-year costs, (B) estimated number of new populations of threatened Chatham Island flora and fauna species, including ecological replacements, that could be created, and (C) estimated percentage of the Rēkohu / Wharekauri / Chatham Islands community that could gain physical access to karure / kakaruia / Chatham Island black robins (*Petroica traversi*) for each management alternative.

Table 3. Consequence table for karure/kakaruia/Chatham Island black robin (*Petroica traversi*) management under each alternative. Uncertainty is represented by 95% credible intervals for total numbers of adult females; ranges are presented for the number of populations, costs, number of populations of other species and the percentage of the Chatham Islands community with physical access to black robins; and point estimates are provided for local engagement opportunities and outreach to the public. The best-performing alternative for each objective is in bold. The Hokotehi Moriori Trust ensured that all alternatives were consistent with their values during the workshop. Ngāti Mutunga o Wharekauri Trust representatives did not attend the workshop (see main text).

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]
	Total no. adult females (2040)	**No. adult females on Maung'Re / Mangere / Mangere Island[b] (2040)**	**No. adult females on Hokorereoro / Rangatira / South East Island[c] (2040)**	**Number of populations**	**NZ$ (2021–26)**	**No. populations of other species**	**% of Rēkohu / Wharekauri / Chatham Islands[d] community with physical access to black robins**	**Local engagement opportunities (qualitative scale)**	**Wider outreach (qualitative scale)**		
Status Quo	147 (16–215)	1 (0–24)	146 (16–191)	1–2	**185,000**	0–2	1	Very Low	Very Low		
Conservation Monitoring[a]	148 (16–220)	2 (0–29)	146 (16–191)	1–2	230,000–460,000	0–2	5	Low	Low		
Restoration Mangere[a]	148 (16–222)	2 (0–31)	146 (16–191)	1–2	480,000–710,000	0–2	5	Low	Low		
Restoration Both[a]	159 (32–248)	2 (0–31)	**157 (32–217)**	1–2	630,000–860,000	0–2	5	Low	Low		
Status Quo Reinforcement	156 (14–219)	11 (0–29)	145 (14–190)	1–2	197,000	0–2	5	Low	Low		
Reinforcement Monitoring	156 (14–219)	11 (0–29)	145 (14–190)	1–2	242,000–472,000	0–2	5	Low	Low		
Reinforcement Monitoring Plus	168 (30–254)	**13 (0–37)**	155 (30–217)	1–2	872,000–1,102,000	0–2	5	Low	Low		
Reinforcement Monitoring Plus New Population	191 (24–335)	**13 (0–37)**	146 (20–215)	1–3	4,359,000–4,589,000	7–18	30–90	Medium	Medium		
Translocation Pitt	185 (12–302)	11 (0–29)	142 (8–190)	1–3	3,959,000–4,189,000	8–18	30–50	Medium	Medium		
Translocation Chatham	185 (12–302)	11 (0–29)	142 (8–190)	1–3	3,959,000–4,189,000	7–17	90	Medium	Medium		
Translocation Chatham Plus	185 (12–302)	11 (0–29)	142 (8–190)	1–3	4,259,000–4,489,000	7–17	90	**High**	**High**		
Multi-Translocation	**194 (17–374)**	**13 (0–37)**	130 (7–214)	**1–4**	7,651,000–7,881,000	7–33	**100**	**High**	**High**		

[a] Removed from the consequence table by the group during the trade-off phase (see section 8).
[b] Official name: Mangere Island.
[c] Official name: South East Island (Rangatira).
[d] Official name: Chatham Islands.
[e] See the text for an explanation of how Moriori principles and values were incorporated throughout the decision-making process.
[f] See the text for an explanation of how Ngāti Mutunga o Wharekauri were recognised in this SDM process.

8. Trade-offs and identifying the best option

Steps 5 & 6 of the SDM process

The best strategy is the one that is believed to be the most likely to achieve the objectives. For single-objective decisions, it is easy to choose the strategy that provides the best outcome. However, when faced with multiple objectives, it is important that all the alternatives are carefully considered, particularly when there are conflicting objectives and so trade-offs are required. The final selection of a management strategy may be affected by the uncertainty that surrounds the estimated outcomes of the candidate strategies. SDM provides several tools to account for uncertainty and trade-offs, which can improve transparency and provide decision-makers with a more complete assessment of the problem.

8.1 Process

The working group used the consequence table (Table 3) to examine trade-offs between maximising the resilience of black robins, minimising costs, maximising ecosystem gains, maximising the sense of identity of local communities and public appreciation for black robins, and ensuring that Moriori principles and values are embodied in black robin management. The specific process involved simplifying the consequence table in a rational manner, accounting for uncertainty, facilitating deliberation and identifying the best option for black robin management as follows.

1. Upon completion of the consequence table, the working group voted anonymously on the management alternatives that were acceptable to them and their single preferred management alternative.
2. The working group then examined the consequence table for alternatives that were outperformed across all objectives by other alternatives and removed these.
3. Once the consequence table had been simplified, the working group anonymously ranked the remaining alternatives from their most preferred to their least preferred management option. The ranks were then summed for each alternative, with the most preferred alternative receiving the lowest score and the least preferred the highest score.

8.2 Outcome

There was extensive discussion about the various alternatives and their performance as indicated by the consequence table. The working group agreed that Conservation Monitoring, Restoration Mangere and Restoration Both were outperformed by other alternatives, i.e. they were expensive but provided no or few extra birds, no new populations, no or few ecosystem gains, and little change in the sense of identity of local communities and public appreciation for black robins. Therefore, these alternatives were removed from the consequence table for the final anonymous ranking exercise.

When the working group ranked the remaining nine management alternatives from most to least preferred, the Multi-Translocation option was the top ranked alternative by nearly all participants (Table 4). Consequently, this is the option that the working group recommends to the final decision-makers as the best option for black robin conservation management.

The top five preferred alternatives all included a supplemental translocation to Mangere Island; breeding season monitoring at a minimum on Mangere Island and in any new translocated population; at least one new translocated population on either Chatham Island or Pitt Island; and improved connection between Chatham Islanders, and the public more generally, and black robins through the provision of a 0.5–1.0 FTE role (Table 4). The four least preferred alternatives did not include the establishment of a new population, any improvement in the connection between Chatham Islanders and black robins, or any improvement in advocacy more broadly. The status quo was considered unacceptable to all participants.

Table 4. Anonymised individual rankings of preferred management alternatives for karure / kakaruia / Chatham Island black robin (*Petroica traversi*) conservation management. The management alternatives are listed from the most preferred (Multi-Translocation, total score = 25) to least preferred (Status Quo, total score = 135). Participants 16 and 17 only ranked their top four and top three preferred alternatives, respectively, so their preferences are not included in the total scores. However, they are shown here in italics to illustrate the consistency of their preferred management alternatives with the rest of the working group.

MANAGEMENT ALTERNATIVE	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	Total	(P16)	(P17)
Multi-Translocation	1	1	5	1	1	1	1	1	1	1	1	6	1	1	2	**25**	1	1
Translocation Chatham Plus	2	2	3	4	2	3	2	3	2	2	2	3	3	2	3	**38**	2	
Translocation Pitt	3	5	2	3	3	2	5	2	4	4	5	2	3	4	5	**52**	3	2
Translocation Chatham	4	3	4	5	4	5	3	4	3	3	3	7	4	3	1	**56**	4	
Reinforcement Monitoring New Population	5	4	1	2	6	4	4	5	8	7	4	1	5	5	4	**65**		3
Reinforcement Monitoring Plus	7	6	6	6	5	7	6	7	5	8	8	4	6	6	8	**95**		
Status Quo Reinforcement	6	7	7	7	8	6	8	6	6	5	7	5	8	8	7	**101**		
Reinforcement Monitoring	8	8	8	8	7	8	7	8	7	6	6	8	7	7	6	**109**		
Status Quo	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	**135**		

9. Implementation

Step 7 of the SDM process

The final step in the SDM process is to identify mechanisms for the implementation of the recommendation, ongoing monitoring to ensure accountability with respect to on-the-ground results, and review so that new information can be incorporated into future decisions.

After arriving at their final recommendation, the working group immediately set about planning implementation of the Multi-Translocation management alternative. Three tasks were considered the most urgent priorities: a reinforcement translocation of 10 female black robins from South East Island to Mangere Island, breeding monitoring on Mangere Island during the 2021/22 season and ensuring proper representation of Ngāti Mutunga o Wharekauri in this process. The following progress has been made to date.

- DOC Chatham Island staff initiated black robin breeding monitoring on Mangere Island in October 2021. Two temporary staff, with support from permanent staff and volunteers, worked on Mangere Island from November 2021 through to mid-February 2022 and from September 2022 to February 2023. This work is being led by DOC Chatham Island staff.
- A translocation of 10 female black robins was planned for September/October 2021. Unfortunately, a nationwide COVID-19 lockdown meant that this work could not progress in 2021, so the translocation was carried out in September 2022 instead. This work was led by DOC Chatham Island staff and Parker Conservation Ltd.
- The DOC staff members who monitored black robin breeding on Mangere Island during the 2022/23 season also monitored the 10 black robin females translocated from South East Island in September 2022. This work is being led by DOC Chatham Island staff.
- Ongoing informal discussions have been held with Ngāti Mutunga o Wharekauri around if and how they might support the working group's recommendation for black robin conservation management. This work is being led by the Ngāti Mutunga o Wharekauri Trust with support from Parker Conservation Ltd.
- Strict biosecurity protocols remain in place for both Mangere Island and South East Island. These will be updated by DOC as new threats are identified. The predator-fenced translocation sites on Pitt Island and Chatham Island will require site-appropriate biosecurity protocols. This work is being led by DOC Chatham Island staff.
- The potential translocation sites identified during the SDM workshop were assessed and augmented in October 2022, and a short list of recommended sites was completed in January 2023. This work is being led by DOC Chatham Island staff, the Black Robin TAG and Parker Conservation Ltd.
- Potential translocation site management and restoration were costed from September to December 2022. This work was led by DOC Chatham Island staff and Parker Conservation Ltd.
- Habitat restoration options are being incorporated into research priorities for black robin management. This work is being led by the Black Robin TAG.

10. Acknowledgements

The authors are deeply grateful to all participants of the black robin SDM process who kindly and patiently provided their time, energy, knowledge and insights, both inside and outside the workshop, mostly on a voluntary basis. Gail Amaru and Hone Tibbles very kindly and graciously met with KAP on several occasions to discuss the position of Ngāti Mutunga o Wharekauri in the SDM process and for ongoing kakaruia/black robin management. The authors are also indebted to the many additional experts who generously provided their insights and wisdom, particularly Doug Armstrong (Massey University) and John Ewen (Zoological Society of London). Enzo MR Reyes kindly provided the stunning cover image of black robins on Mangere Island and Nat Forsdick produced the beautiful illustrations that grace the figures. Amanda Todd provided thorough and very helpful editing of the final report.

11. References

Birdlife International. 2022. Species factsheet: Petroica traversi. Cambridge, UK: Birdlife International [accessed 2022 Feb 22]. http://datazone.birdlife.org/species/factsheet/black-robin-petroica-traversi.

Butler D, Merton DV. 1992. The black robin. Saving the world's most endangered bird. Oxford, UK: Oxford University Press. 294 p.

Canessa S, Spitzen-van der Sluijs A, Stark T, Allen BE, Bishop PJ, Bletz M, Briggs CJ, Daversa DR, Gray MJ, Griffiths RA, et al. 2020. Conservation decisions under pressure: lessons from an exercise in rapid response to wildlife disease. Conservation Science and Practice. 2:e141.

Caughley G. 1994. Directions in conservation biology. Journal of Animal Ecology. 63:214–244.

Converse SJ, Moore CT, Folk MJ, Runge MC. 2013. A matter of tradeoffs: reintroduction as a multiple objective decision. Journal of Wildlife Management. 77:1145–1156.

Ewen JG, Walker L, Canessa S, Groombridge JJ. 2014. Improving supplementary feeding in species conservation. Conservation Biology. 29:341–349.

Ferrière C, Zuël N, Ewen JG, Jones CG, Tatayah V, Canessa S. 2021. Assessing the risks of changing ongoing management of endangered species. Animal Conservation. 24:153–160.

Fischer JH, Parker KA, Kenup CF, Taylor GA, Debski I, Ewen JG. 2022. A structured decision-making process for the recovery of kuaka/Whenua Hou diving petrel (*Pelecanoides whenuahouensis*). Wellington: Department of Conservation. 39 p.

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.

Heather B, Robertson H. 2015. The field guide to the birds of New Zealand. Auckland: Penguin Random House. 464 p.

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.

Hemming V, Camaclang AE, Adams MS, Burgman M, Carbeck K, Carwardine J, Chades I, Chalifour L, Converse SJ, Davidson LNK, et al. 2022. An introduction to decision science for conservation. Conservation Biology. 36:e13868. https://doi.org/10.1111/cobi.13868.

Kéry M, Schaub M. 2011. Bayesian population analysis using WinBUGS: a hierarchical perspective. Sempach: Academic Press.

Maguire LA, Boiney LG. 1994. Resolving environmental disputes: a framework incorporating decision analysis and dispute resolution techniques. Journal of Environmental Management. 42:31–48.

Maguire LA, Seal US, Brussard PF. 1987. Managing critically endangered species: the Sumatran rhino as a case study. In: Soulé ME, editor. Viable populations for conservation. Cambridge, UK: Cambridge University Press; p. 141–158.

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.

McMurdo Hamilton T, Canessa S, Clarke K, Gleeson P, Mackenzie F, Makan T, Kani GM, Oliver S, Parker KA, Ewen JG. 2021. Applying a values-based decision process to facilitate comanagement of threatened species in Aotearoa New Zealand. Conservation Biology. 35:1162–1173.

McMurdo Hamilton T, Canessa S, Makan T, Ewen JG. 2021. A structured approach for the recovery of tara iti / New Zealand fairy tern (*Sternula nereis davisae*). Wellington: Department of Conservation. 37 p.

Moore JL, Runge MC. 2012. Combining structured decision making and value-of-information analyses to identify robust management strategies. Conservation Biology. 26:810–820.

Nichols JD, Armstrong DP. 2012. Monitoring for reintroductions. In: Ewen JG, Armstrong DP, Parker KA, Seddon PJ, editors. Reintroduction biology: integrating science and management. Oxford, UK: Wiley-Blackwell; p. 223–255.

Panfylova J, Ewen JG, Armstrong DP. 2019. Making structured decisions for reintroduced populations in the face of uncertainty. Conservation Science and Practice. 1:e90.

Redford KH, Amato G, Baillie J, Beldomenico P, Bennett EL, Clum N, Cook R, Fonseca G, Hedges S, Launay F, et al. 2011. What does it mean to successfully conserve a (vertebrate) species? BioScience. 61:39–48.

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.

Schaub M, Abadi F. 2011. Integrated population models: a novel analysis framework for deeper insights into population dynamics. Journal of Ornithology. 152:227-237.

Spiegelhalter D, Thomas A, Best N, Lunn D. 2014. OpenBUGS user manual v.3.2.3. Cambridge, UK: MRC Biostatistics Unit.

12. Notes

Parker KA. 2020a. 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.

Parker KA. 2020b. Structured decision making for Chatham Island black robin management. Internal report prepared for the Department of Conservation, Wellington. 15 p.

Appendix 1

Names of places used in this document

OFFICIAL NAME	TA RĒ MORIORI	TE REO MĀORI	ENGLISH
Places			
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)	Rangihaute	Rangiauria	Pitt Island
South East Island (Rangatira)	Hokorereora	Rangatira	South East Island

Appendix 2

Structured decision-making workshop details

The original agenda for the karure/kakaruia/Chatham Island black robin (*Petroica traversi*) workshop was spread over 6 days (see below). However, due to weather delays for participants coming from the Aotearoa New Zealand mainland, the workshop was compressed into 4 days. Weather also prevented a site visit to Caravan Bush on Rangihaute/Rangiauria/Pitt Island.[8]

It was much more challenging to complete the workshop in just 4 days (11–16 August 2021), so we have retained the original agenda here to illustrate how this workshop should have been completed.

Location: Kōpinga Marae, Rēkohu/Wharekauri/Chatham Island[9]

Date: 9–16 August 2021

Accommodation for participants visiting from the Aotearoa New Zealand mainland: Kōpinga Marae

Facilitators:

1.	Kevin Parker	Parker Conservation Ltd
2.	Johannes Fischer	Department of Conservation Te Papa Atawhai (DOC)
3.	Liz Parlato	Massey University
4.	John Ewen (online support)	Zoological Society of London
5.	Doug Armstrong (online support)	Massey University

Invited participants:

1.	Erin Patterson	DOC
2.	Susan Thorpe	Hokotehi Moriori Trust
3.	Duane Trafford	Hokotehi Moriori Trust
4.	Tertia Thurley	DOC
5.	Katelyn Prendeville	Ngāti Mutunga O Wharekauri Iwi Trust
6.	Gail Amaru	Ngāti Mutunga O Wharekauri Iwi Trust
7.	Deena Whaitiri	Ngāti Mutunga O Wharekauri Iwi Trust
8.	Jemma Welch	DOC
9.	Thomas Emmitt	DOC
10.	Dave Houston	DOC
11.	Tammy Steeves	University of Canterbury
12.	Troy Makan	DOC
13.	Euan Kennedy	Independent/Black Robin Technical Advisory Group member
14.	Hamish Chisolm	Chatham Island Land Restoration Group
15.	Liz Tuanui	Chatham Island Taiko Trust
16.	Lois Croon	Community member
17.	Mike Bell	Toroa Consulting Ltd
18.	Di Gregory-Hunt	Pitt Island resident and Chatham Island Conservation Board member

[8] Official name: Pitt Island (Rangiauria).

[9] Official name: Chatham Island.

Actual participants:

Note that the list of participants varied daily.

PARTICIPANT	AFFLIATION	12 AUG	13 AUG	14 AUG	15 AUG
Tryphena Cracknell	DOC	✓			
Thomas Emmit	DOC	✓	✓	✓	✓
Tammy Steeves	University of Canterbury	✓	✓	✓	✓
Jamie Cooper	DOC	✓	✓	✓	✓
Celine Gregory-Hunt	Pitt Island / Chatham Island community	✓	✓	✓	
Di Gregory-Hunt	Pitt Island resident / Chatham Island Conservation Board member	✓	✓	✓	
Katrina Graydon	Chatham Island Museum / community	✓	✓		✓
Liz Tuanui	Chatham Island Taiko Trust	✓	✓		✓
Jenna Hoverd	DOC / community	✓			
Hamish Tuanui Chisholm	Chatham Island Land Restoration Group / Predator Free 2050	✓	✓	✓	✓
Mike Bell	Toroa Consulting Ltd	✓	✓	✓	✓
Nathan McNally	Predator Free 2050 / ex-DOC ranger on Pitt Island	✓	✓	✓	✓
Duane Trafford	Hokotehi Moriori Trust	✓	✓	✓	✓
Susan Thorpe	Hokotehi Moriori Trust	✓	✓		
Gemma Green	DOC/community	✓	✓		✓
Denise Fastier	DOC	✓	✓	✓	✓
Tertia Thurley	DOC	✓	✓	✓	✓
Euan Kennedy	Independent/DOC	✓	✓	✓	✓
Troy Makan	DOC	✓	✓	✓	✓
Erin Patterson	DOC	✓	✓	✓	✓
Jemma Welch	DOC	✓	✓	✓	✓
Kevin Parker	Parker Conservation Ltd	✓	✓	✓	✓
Liz Parlato	Massey University	✓	✓	✓	✓
Johannes Fischer	DOC	✓	✓	✓	✓
Bridget Gibb	DOC / community		✓		✓
Cassidy Solomon	Hokotehi Moriori Trust			✓	✓
Chris Hickford	DOC			✓	

Draft agenda:

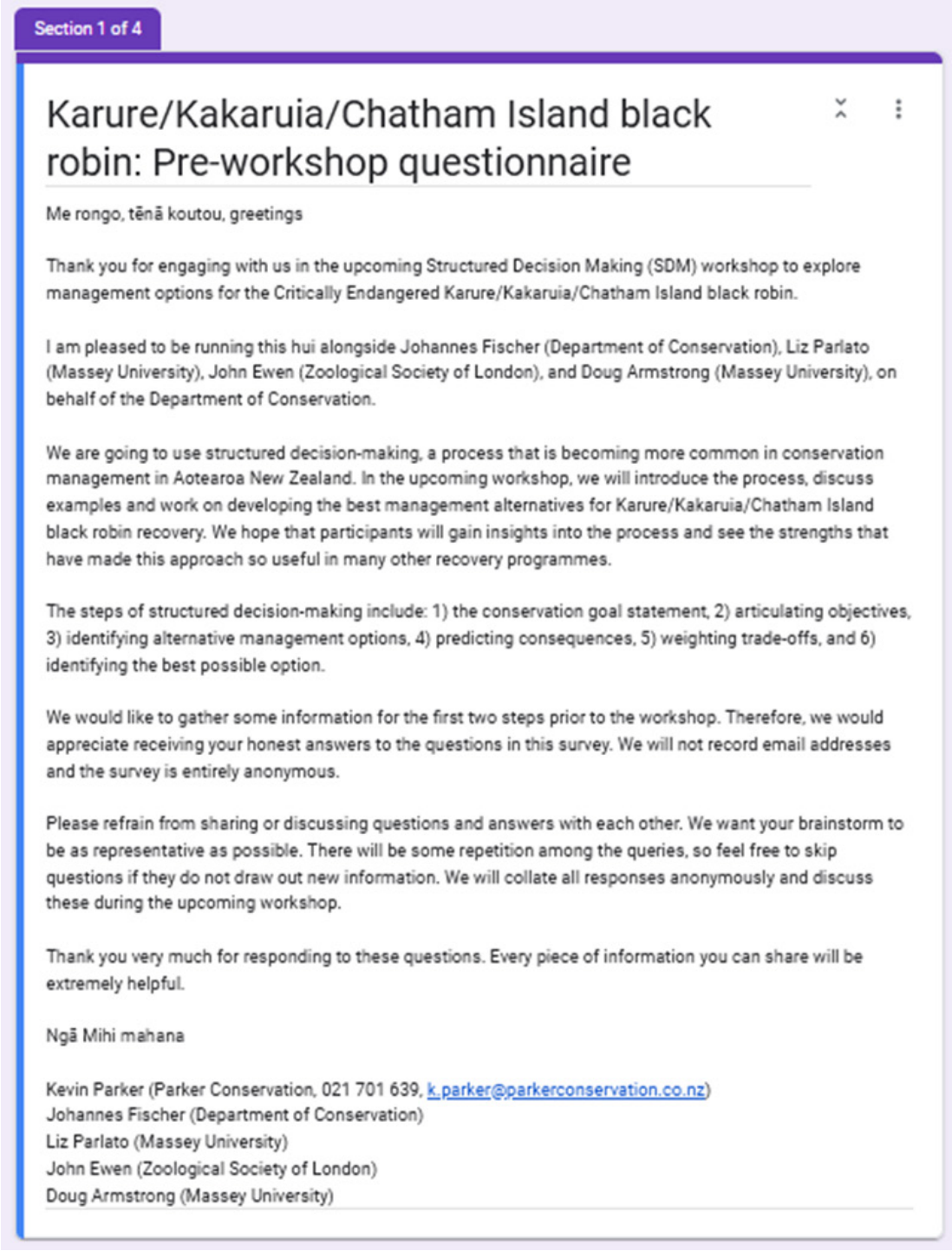
DATE	TIME	ACTIVITY
Monday 9 August	1630	Hokomaurahiri at Kōpinga Marae Visitors from the Aotearoa New Zealand mainland arrive and settle into accommodation
Tuesday 10 August	0830–0930	Introductions and ground rules
	0930–1030	Presentation and discussion on black robin population dynamics
	1030–1045	Morning tea
	1045–1230	Presentation and discussion on the structured decision-making (SDM) process (Johannes)
	1230–1330	Lunch
	1330–1530	Draft goal statement for black robin
	1530–1545	Afternoon tea
	1545–1630	Defining objectives and performance measures
	1900	Public talks at Kōpinga Marae
Wednesday 11 August	0830–0900	Overview and recap
	0900–1030	Defining objectives and performance measures – spend 5–10 minutes repeating process from the previous afternoon to see if objectives need to be added or emphasised
	1030–1100	Morning tea
	1100–1230	Defining objectives and performance measures
	1230–1330	Lunch
	1330–1530	Developing management alternatives
	1530–1600	Afternoon tea
	1600–1730	Developing management alternatives
Thursday 12 August	0830–0900	Overview and recap (Pitt Island visit?[a])
	0900–1030	Developing and refining management alternatives
	1030–1100	Morning tea
	1100–1230	Developing and refining management alternatives Completing a draft consequence table
	1230–1330	Lunch
	1330–1530	Defining consequences
	1530–1600	Afternoon tea
	1600–1730	Defining consequences
Friday 13 August	0830–0900	Overview and recap (Pitt Island visit?[a])
	0900–1030	Defining consequences
	1030–1100	Morning tea
	1100–1230	Defining consequences
	1230–1330	Lunch
	1330–1530	Defining consequences
	1530–1600	Afternoon tea
	1600–1730	Defining consequences
Saturday 14 August	0830–0900	Overview and recap (Pitt Island visit?a)
	0900–1030	Making trade-offs and identifying the best management alternative(s)
	1030–1100	Morning tea
	1100–1230	Making trade-offs and identifying the best management alternative(s)
	1230–1330	Lunch
	1330–1530	Review / where to from here?
	1530–1600	Afternoon tea
	1530–1700	Concluding comments and discussion
Sunday 15 August	0830–1730	(Pitt Island visit?[a])
		Back up day to cover for Pitt Island visit
Monday 16 August	0945	Visitors from the Aotearoa New Zealand mainland depart

[a] The trip to Pitt Island is weather and boat dependent, so we will have to be flexible in our scheduling. If we cannot visit Pitt Island, there might be an opportunity to visit other potential restoration sites on Chatham Island, depending on interest and access to potential sites.

Appendix 3

Questionnaire

The following Google Forms questionnaire was sent to most participants prior to the August 2021 structured decision-making workshop at Kōpinga Marae, Chatham Islands. The responses to the questionnaire were used for the initial draft of the conservation goal statement.



Section 1 of 4

Karure/Kakaruia/Chatham Island black robin: Pre-workshop questionnaire

Me rongo, tēnā koutou, greetings

Thank you for engaging with us in the upcoming Structured Decision Making (SDM) workshop to explore management options for the Critically Endangered Karure/Kakaruia/Chatham Island black robin.

I am pleased to be running this hui alongside Johannes Fischer (Department of Conservation), Liz Parlato (Massey University), John Ewen (Zoological Society of London), and Doug Armstrong (Massey University), on behalf of the Department of Conservation.

We are going to use structured decision-making, a process that is becoming more common in conservation management in Aotearoa New Zealand. In the upcoming workshop, we will introduce the process, discuss examples and work on developing the best management alternatives for Karure/Kakaruia/Chatham Island black robin recovery. We hope that participants will gain insights into the process and see the strengths that have made this approach so useful in many other recovery programmes.

The steps of structured decision-making include: 1) the conservation goal statement, 2) articulating objectives, 3) identifying alternative management options, 4) predicting consequences, 5) weighting trade-offs, and 6) identifying the best possible option.

We would like to gather some information for the first two steps prior to the workshop. Therefore, we would appreciate receiving your honest answers to the questions in this survey. We will not record email addresses and the survey is entirely anonymous.

Please refrain from sharing or discussing questions and answers with each other. We want your brainstorm to be as representative as possible. There will be some repetition among the queries, so feel free to skip questions if they do not draw out new information. We will collate all responses anonymously and discuss these during the upcoming workshop.

Thank you very much for responding to these questions. Every piece of information you can share will be extremely helpful.

Ngā Mihi mahana

Kevin Parker (Parker Conservation, 021 701 639, k.parker@parkerconservation.co.nz)
Johannes Fischer (Department of Conservation)
Liz Parlato (Massey University)
John Ewen (Zoological Society of London)
Doug Armstrong (Massey University)

Section 2 of 4

Conservation goal statement

These questions will help start our conversation regarding the context (scope and bounds) of Karure/Kakaruia /Chatham Island black robin management.

Why is there a need for Karure/Kakaruia/Chatham Island black robin management?

Long answer text

What is the exact decision that needs to be made?

Long answer text

What is the intended conservation goal?

Long answer text

What is the scale of the decision (e.g., are we limited to management within existing populations)?

Long answer text

When should the best options for Karure/Kakaruia/Chatham Island black robin management be identified?

Long answer text

What are the constraints for Karure/Kakaruia/Chatham Island black robin management (e.g. biological, cultural, spiritual, legal, financial, economic, others)?

Long answer text

Who are the important decision makers, in your view, that need to support the identified management options?

Long answer text

Section 3 of 4

Articulating objectives

These questions will help start a conversation regarding the objectives (what do we really care about?) for Karure/Kakaruia/Chatham Island black robin management.

What do you hope to achieve?

Long answer text

What are the challenges for Karure/Kakaruia/Chatham Island black robin management?

Long answer text

What would be the best outcome for you?

Long answer text

What would be the worst outcome for you?

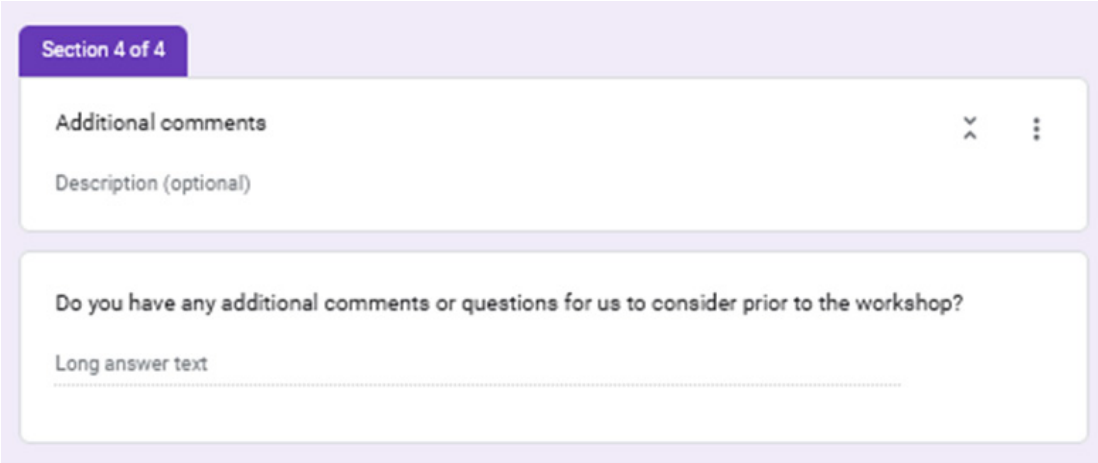
Long answer text

What do you want to avoid when deciding on management options?

Long answer text

Beyond the recovery of the Karure/Kakaruia/Chatham Island black robin, what additional factors influence your choice?

Long answer text


Section 4 of 4
Additional comments
Description (optional)
Do you have any additional comments or questions for us to consider prior to the workshop?
Long answer text

Appendix 4

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

MANAGEMENT ALTERNATIVE	BIOSECURITY	MONITORING	NEST BOXES	HABITAT RESTORATION	REINFORCEMENT	TRANSLOCATION	POST-RELEASE MANAGEMENT	IDENTITY/ APPRECIATION
Status Quo	Status quo levels	Status quo levels (pre-and post-breeding monitoring on both Maung'Re / Mangere / Mangere Island[a] and Hokorereoro / 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 artificial fertilisation, leaf-litter translocations and starling (*Sturnus vulgaris*) 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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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 Rangihaute / 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 a 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 Population
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 Population
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

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MANAGEMENT ALTERNATIVE	BIOSECURITY	MONITORING	NEST BOXES	HABITAT RESTORATION	REINFORCEMENT	TRANSLOCATION	POST-RELEASE MANAGEMENT	IDENTITY/ APPRECIATION
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 5

Questions raised during the workshop

The following key research questions for the potential focus of future karure/kakaruia/Chatham Island black robin (*Petroica traversi*) research and management were raised during the workshop.

- What is the quality of black robin habitat on Maung'Re/Mangere/Mangere Island,[10] Hokorereoro/Rangatira/South East Island[11] and at potential translocation sites?
- What are the locations of potential translocation sites for black robins on Rēkohu/Wharekauri/Chatham Island[12] and Rangihaute/Rangiauria/Pitt Island[13] and are they high quality?
- How do soil and nutrient profiles influence black robin habitat? How important are seabirds to high-quality black robin habitat and can the artificial application of fertiliser compensate for low-density seabird populations?
- How will climate change affect existing and future black robin populations? How can this be incorporated into recovery planning?
- How can we improve our monitoring to provide useful estimates of vital rates for black robin recovery, including breeding probability, lay rate, fledge rate and early post-fledging survival?

Additionally, the following future work was proposed.

- Develop a specific black robin contingency plan to cope with a catastrophic extinction risk that would require translocating birds to areas outside Rēkohu/Wharekauri/the Chatham Islands.[14]
- Investigate how black robins fit in with, support and enhance Predator Free Chatham Islands aspirations?

[10] Official name: Mangere Island.

[11] Official name: South East Island (Rangatira).

[12] Official name: Chatham Island.

[13] Official name: Pitt Island (Rangiauria).

[14] Official name: Chatham Islands.