# Winning the hearts and minds – proceeding to implementation of the Lord Howe Island rodent eradication project: a case study

*A. Walsh[1], A. Wilson[1], H. Bower[1], P. McClelland[2] and J. Pearson[3]*

*[1]Lord Howe Island Board, P.O. Box 5, Lord Howe Island, NSW Australia, 2898. <andrew.walsh@lhib.nsw.gov.au>. [2]Pete McClelland Conservation Services, 237 Kennington – Roslyn Bush Road, Invercargill 9872, New Zealand.[3]Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire SG19 2DL United Kingdom.*

**Abstract** Lord Howe Island (LHI) is a World Heritage listed volcanic remnant island, 600 km from mainland Australia. Home to many threatened endemic species, and an important nesting site for many migratory seabirds, LHI is also home to an established community of 350 people. The island economy relies heavily on tourism, based around the World Heritage landscapes, and terrestrial and marine biodiversity. The impact of rats and mice on the world heritage values of the island are well documented. A feasibility study in 2001 considered the eradication of both rats and mice on the Lord Howe Island Group (LHIG) in a single operation as feasible and achievable. Since then, numerous studies and community consultations have been undertaken; and the methodology, risks and benefits of an eradication effort have been carefully considered and evaluated. The project has long been topical in the community, with both ardent support and opposition. Though funding for the project was secured in 2012, implementation of the project has had repeated delays, and consequently, additional consultation efforts, studies and assessments have been required to address lingering community concerns. This paper describes a wide range of techniques that were used in an effort to gain community support and acceptance of the project, and ultimately, to enable its implementation. The paper also outlines those aspects of the social process that have led to greater support and those which led to less support and, in some cases, opposition. Within these lessons learnt, the paper presents some insights around how communities engage with and respond to scientific information and pest control (including perceived influence on livelihoods, conservation, health and the legacy to be left for future generations). These insights are explained in the context of psychological processes such as emotional responses (fear/trust) and personal values (economic, environmental, social). Given that the eradication of invasive predators on larger inhabited islands is the next logical step for island conservation, projects such as the LHI Rodent Eradication Project are of particular value as real life hard-earned lessons. We hope that these findings can help facilitate future successful island eradication programmes that work with the community.

**Keywords:** community, economic, engagement, human health, inhabited, tourism

## INTRODUCTION

### Purpose

The purpose of this paper is to present a case study of eradication planning on an inhabited island, illustrating the importance of social impact considerations and presenting some guiding principles and lessons learnt.

### The island

Lord Howe Island (LHI) is located 570 km east of Australia (Fig. 1). It covers 1,455 ha, is 12 km long, and 1.0–2.8 km wide. The LHIG was listed as a World Heritage Area in 1982 and is located within the Lord Howe Island Marine Park (NSW).

LHI is part of the State of New South Wales and is administered by the Lord Howe Island Board (LHIB), which comprises four locally elected islanders and three ministerially appointed mainland members. The LHIB (and its administrative arm) are directly responsible for the care, control and management of the island's natural values and the affairs and trade of the island and carry out all local government functions on behalf of approximately 350 island residents.

The settlement area covers about 15% of the island (400 ha) and is used predominantly for residential, pastoral/agricultural and commercial purposes. Tourism is the most significant industry and major source of income on the island and is heavily focused around the world heritage values of both the marine and terrestrial environments (Lord Howe Island Tourism Association, 2015).

### Current impacts of rodents on LHI

*Ecological impacts*

The devastating ecological impacts of introduced rodents on offshore islands around the world are well documented (Groombridge, 1992; Towns, et al., 2006; Jones, et al., 2008). Similar impacts on LHI have been observed since the arrival of mice (*Mus musculus*) in approximately the 1860s and ship rats (*Rattus rattus*) via a shipwreck in 1918. The Lord Howe Island Biodiversity Management Plan (DECC, 2007a) summarises the immediate and ongoing impact the introduction of rodents has had on flora and fauna species on LHI, including extinction of several species of birds, plants and invertebrates.

*Socio-economic impacts*

From the perspective of the human population, rats and mice are major domestic pests. They infest residences, destroy foodstuffs and vegetable gardens; and contaminate homes with excrement. They are also a known health risk to humans as they harbour and transmit diseases and parasites such leptospirosis and rat lungworm disease (Shiels, et al., 2014).

From an economic perspective, rats cause considerable economic loss to the island's kentia palm industry, with predation of seed as high as 30% (Parkes, et al., 2004) severely reducing seed production (Pickard, 1983; Billing, 1999; further detail in Wilkinson & Priddell, 2011).

Tourism, the LHIG's main industry, is based on the islands' unique biodiversity and World Heritage values. These values are significantly threatened by rodents (IUCN, 2017) therefore reducing the visitor experience offered by the island.

### History of rodent control on LHI

Islanders and the LHIB have been involved in the control of rodents (rats and mice) on Lord Howe Island since about

In: C.R. Veitch, M.N. Clout, A.R. Martin, J.C. Russell and C.J. West (eds.) (2019). Island invasives: scaling up to meet the challenge, pp. 522–530. Occasional Paper SSC no. 62. Gland, Switzerland: IUCN.

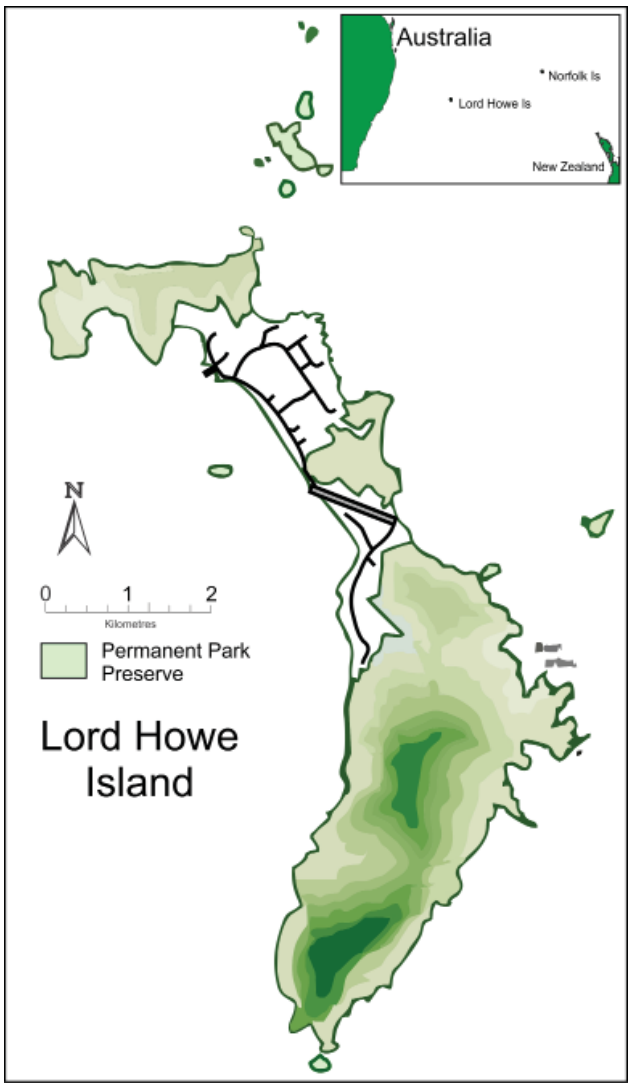


**Fig. 1** Lord Howe Island showing the Permanent Park Preserve, airstrip and roads.

1920, highlighting both the long-recognised impacts of rodents and difficulty in achieving meaningful outcomes through ongoing control on the island (Saunders & Brown 2001). Previous control methods included a bounty on rat tails, hunting with dogs and shooting, introduction of owls and the use of various poisons including barium chloride, diphacinone, warfarin and brodifacoum (ibid). Control baiting on the island has undergone several reviews over time with Billing (1999) the most recent, resulting in a current pulse baiting schedule delivering over 4.5 tonnes a year of Ratex (coumatetralyl) and Roban (difenacoum) over approximately 10% of the island. While the use of brodifacoum has been discontinued by the LHIB in the lead up to the eradication, many Island residents continue to use brodifacoum-based rodenticides such as Talon™ and Tomcat™ to control rats and mice around their properties and inside dwellings. The above is intended to highlight the long-term and extensive use of rodenticides on the island, which could be avoided through a one off eradication, but also to highlight that the use of poison on the island is not new and residents are quite familiar with it.

### The project

The LHIB is proposing to undertake the Lord Howe Island Rodent Eradication Project (LHI REP) to eradicate introduced rodents from LHI. A secondary outcome would be eradication of the masked owl (*Tyto novaehollandiae),* which was deliberately introduced to LHI in the 1920s and 1930s to control rats. The species now also preys on on many island birds (Milledge, 2010).

The one-off eradication proposes to distribute a cereal-based bait pellet (Pestoff 20R) containing the toxicant brodifacoum across the LHIG via dispersal from helicopters to the uninhabited parts of the island, and by a combination of hand broadcasting and the placement of bait in bait stations in the settlement area (for more information, see LHIB, 2016). Post eradication, rodent prevention and surveillance monitoring would be ongoing to prevent reinvasion and would need a high level of community vigilance.

The LHIB received significant funding (AUS$9.5M) in 2012 for planning and implementation of the REP from the Federal Government's former Caring for Our Country programme (now National Landcare program) AU$4,500,000 and the NSW Environment Trust AU$4,542,442.

## PROJECT DEVELOPMENT AND EARLY CONSULTATION

During the turn of the century, successes in island eradications undertaken primarily in New Zealand (summarised in Russell & Broome (2016)) were gaining international attention. At the same time there was growing recognition by government in Australia (state and federal) of the impacts of rodents on LHI (summarised in NSW Scientific Committee, 2000; TSSC, 2006 and DECC, 2007a).

In 2001, a LHIB staff member and a community member attended an international eradication conference and subsequently submitted a proposal to the LHIB seeking support for research into feasibility of eradicating rodents on LHI. This led to commissioning of a feasibility study (Saunders & Brown, 2001) jointly funded by the LHIB and WWF. Saunders and Brown concluded that eradication on LHI was feasible using a combination of aerial broadcast, hand broadcast and bait stations with a brodifacoum based product. Based on some initial consultation undertaken with community on the island during the study, it was considered that the socio-political environment on LHI was conducive to supporting a possible eradication. The study identified potential ecological and social risks and gaps that needed to be further explored and recommended key next steps including:

- a cost benefit analysis
- additional field trials on rodent densities, bait uptake and non-target species impacts
- that a process be established to allow the community to be kept informed and be able to influence decisions
- establishment of a Taskforce to drive implementation
- the feasibility report be made available to the community and briefing sessions provided.

Following the feasibility study, a Rodent Eradication Taskforce was established by the LHIB through an "expression of interest" process in the community, meeting initially in 2002.

Receipt of a donation (ca. AUD$34,000) from the Foundation for National Parks and Wildlife allowed commissioning of a Cost Benefit Analysis (Parkes, et al., 2004). The study looked at additional feasibility, risks and benefits of eradication on LHI and again confirmed that eradication was feasible and highly beneficial, provided risks could be appropriately managed and

funding and approvals obtained. The analysis identified social constraints suggesting that people may oppose any proposed eradication attempt at two levels: some may not see the need to attempt it, while others may disagree with the methods required. A process to involve the LHI community in considering options and an active process to seek agreement for baiting on properties and in houses was recommended in the study, but not detailed.

For several more years the LHIB sought funding to deliver facilitated community engagement and on island trials prior to implementation of the REP. Further funding (ca. AUD$ 200,000) was secured in 2008 from the Australian Government Caring for our Country Program to continue planning and trials, community consultation and engagement of a project manager. Consultation in 2008 included several rounds of public hall meetings including:

- specific sessions for livestock, poultry and dog owners
- for residents on the fringe of the settlement area where special consideration are required
- follow up sessions to address concerns previously raised.

A theme emerged that the meetings quickly disintegrated as some community members become vocal and dominating, particularly those opposed. Over several meetings, this led to a reduction in numbers of attendees. It was also unfortunately stated by a scientist at one of the public hall meetings at the time that "the eradication would not go ahead unless there was 100% support". This created an undeliverable promise still haunting the project today.

Ad-hoc consultation also occurred through development of fact sheets, individual meetings and through briefing papers and updates at Board meeting open sessions.

Based on recommendation in Saunders & Brown (2001) and Parkes, et al. (2004), additional studies were also conducted on the LHI currawong (Carlile & Priddel, 2006) and non-toxic field trials (DECC, 2007b) that examined rodent and non-target species uptake of the bait pellets, bait breakdown in the environment and spread of the bait using helicopter.

In July 2009, locally elected Board members went door to door surveying residents on their views and concerns regarding the REP based on set questions. In total 125 residents were interviewed and detailed responses showed that there was sufficient community support to proceed. The survey results were used together with results of field trials to develop the Draft LHI Rodent Eradication Plan (LHIB, 2009) which then underwent external peer review. The Draft Plan was peer reviewed by the Island Eradication Advisory Group (IEAG) of the New Zealand Department of Conservation; the Invasive Species Specialist Group of the Species Survival Commission of the World Conservation Union; the Worldwide Fund for Nature (WWF), Australia; Birds Australia; Landcare Research, New Zealand; CSIRO and Professor Tim Flannery. All peer reviews of the Plan were supportive.

Public comment on the Draft Plan was sought in November 2009. Of the 83 submissions received, 39 submissions opposed the Plan, 33 supported it, four gave in-principle support, while one submission was undecided. All 39 submissions opposing the Plan were from LHI residents, organisations acting on their behalf, or had strong links with LHI community members. Of the 37 submissions supporting the proposal, 11 originated from LHI, and four came directly from scientists or scientific groups with experience in rodent eradication. All four submissions giving in-principle support originated from LHI as did the single undecided submission. It should be noted that 84 submissions is considered a very high level of response on LHI.

The most frequently raised issue (25 submissions) was concern about non-target impacts during the proposed eradication operation. Other dominant issues included concerns about possible impacts on the health of the community, the tourism industry and the marine environment, as well as the need for improved consultation. The most commonly mentioned issue supporting the Draft Plan was that eradication would deliver clear environmental benefits to LHI (13 submissions) (see Table 1).

The submissions provided a valuable snapshot of opinion, setting the direction for future studies and consultation for the project once additional funding could be secured. A submission analysis report was prepared but unfortunately due to not being able to secure funding for consultation, was not released to the community until 2013. A revised Draft Plan was also prepared addressing submissions but was never released, for reasons unknown.

One study that was progressed immediately was a Human Health Risk Assessment (HHRA) undertaken by a toxicology consultant Toxikos (2010). The HHRA considered all potential pathways related to direct and indirect contact with the poison from the REP (e.g. ingestion, inhalation, skin contact, ingestion of contaminated water and food) and found there to be no significant risk associated with any pathway with the proposed mitigation in place. The HHRA was presented to community and helped to satisfy some community concerns. However, although the LHIB undertook a competitive tender process to select the consultant Toxikos, some members of the community criticised the independence of the study and therefore disregarded the results. Subsequent third-party reviews of Toxikos' HRRA by New South Wales Health, South Australian Health and Pacific Environment Pty Ltd (outlined in LHIB, 2016) did little to change the perception of some community members.

From 2010 to 2012 the LHIB continued to seek staged funding for progression of the REP. In May of 2012 it was recognised by the Board, that despite information provided to date it was clear that community concerns remained, and further work was required to address these. To enhance community awareness of the benefits that eradication would deliver for the environment, tourism and public health, it was recommended that a professional facilitator be engaged to consult with the LHI community. It was also recommended that a Community Liaison Group (CLG) was created. In June 2012 the project manager at the time resigned.

In July 2012, the LHIB received funding of AU$9.5M to implement the REP in full from the New South Wales Government's Environment Trust and the Australian Government's Caring for Our Country programme. The project was divided into three stages:

- Stage 1 – to complete all planning and preparations for the eradication operation
- Stage 2 – to implement the baiting strategy including captive management and post baiting monitoring
- Stage 3 – to monitor the environmental outcomes of the baiting operation.

Again, unfortunately, receipt of the full funding at once led to some perception in the community that the REP was a *fait accompli* and no longer open for community discussion.

In late 2012, a selection process for engaging a community consultation facilitator was undertaken. This included involvement of Board members and 13 community

panel members to choose an applicant that would be able to "connect" with islanders. Two shortlisted consultants travelled to the island and were interviewed individually by the 13-member community panel. Consultants 'Make Stuff Happen' were selected and contracted to establish the CLG and, together with the CLG, to develop a draft Communication and Community Engagement Strategy. The CLG (12 members from 17 nominations) held their first meeting on Friday 8 February 2013. Terms of reference were to:

- Review REP information so it is clear, correct and relevant
- Identify ways to communicate with the community about implementing the REP
- Discuss issues and concerns about the REP

Additional meetings were held in March, April and June 2013, facilitated by the consultants. These meetings, whilst unpicking community issues also brought to light that community support: opposition was approximately 50:50. A Community Engagement Report and Plan (Make Stuff Happen, 2013) was developed recommending:

- Providing sufficient resources to restore trust and information flow
- Maintaining the momentum of the CLG and relationship with the LHIB
- Creating a compelling case by focussing on key drivers of change
- Providing content information at different levels
- Providing a variety of options for *how* information is received focusing on small scale approaches
- Demonstrating respect for community concerns and local knowledge.

Further detail can be found in the report (Make Stuff Happen, 2013).

As a recommendation of the report was to try and build support, the consultant facilitated an "open house" bringing experts relevant to the eradication to LHI in Aug 2013. This included a toxicologist, a medical doctor who has worked on eradications (Macquarie and South Georgia), an animal husbandry expert and project staff. Experts were available separately at small tables where community members could sit and ask questions of them over two days. This was held in the neutral ground of the museum and was attended by about 65 residents. Some individuals, however were known to actively boycott the event.

Additional activities in 2013 included:

- Meeting with Tourism Association to discuss risk analysis
- Targeted discussions with specific businesses related to tourism issues
- Key messages refined and communicated through a variety of means.

Following the open house, 'Make Stuff Happen' provided additional recommendations and proposed a Stage 2 engagement strategy to the LHIB. However, given the value of the contract, it had to be retendered on the open market.

**Table 1** Key issues raised in submissions to the 2009 Draft Rodent Eradication Plan.

| Issue | Number of submissions | % of submissions |
|---|---|---|
| Non-target impacts | 25 | 30.1 |
| Human health concerns | 18 | 21.7 |
| More consultation required | 18 | 21.7 |
| Tourism impacts | 16 | 19.3 |
| Marine impacts | 14 | 16.9 |
| Economic impacts | 13 | 15.7 |
| Eradication will deliver environmental benefits | 13 | 15.7 |
| Proposed eradication too risky | 10 | 12.0 |
| Children's health concerns | 9 | 10.8 |
| Threat posed by negative media associated with eradication | 9 | 10.8 |
| Question rodent impacts | 8 | 9.6 |
| Feasibility – it won't work! | 8 | 9.6 |
| Captive management issues | 7 | 8.4 |
| High cost of operation | 7 | 8.4 |
| Use of divers to remove bait | 7 | 8.4 |
| Rodents have significant impacts | 7 | 8.4 |
| Don't support aerial baiting | 6 | 7.2 |
| Peer review process flawed | 6 | 7.2 |
| Quarantine efficacy – new protocols to prevent reinvasion | 6 | 7.2 |
| Expand current control programme | 5 | 6.0 |
| The eradication is an experiment | 5 | 6.0 |
| Need to work with community to gain support | 5 | 6.0 |
| Distrust of Board | 5 | 6.0 |

In recognition of the differing views within the community putting successful implementation at risk, the LHIB decided in early 2014 to put the proposed eradication on hold, and to go back to the community and to discuss the available options. The Board made the decision to divide the project into two separate but linked stages.

Stage One: community engagement and consultation which would go back to basics and ask what the community wants in relation to the eradication of rodents so that they can make an informed decision on the future of the project. This included the consequences of not doing the eradication. At the completion of that process an assessment was to be made of the level of support to gauge whether it is sufficient to progress to Stage Two.

Stage Two: operational implementation, which would commence in June 2015, but would only take place if there was sufficient community support for the project following the consultation process.

The tender process to select a consultant for the additional community engagement was undertaken with the assistance of the Department of Premier and Cabinet in early 2014 with Elton Consulting selected. Between July 2014 and February 2015, Elton Consulting undertook a series of community consultation visits to Lord Howe Island. They spoke on a one-on-one basis, through personal visits or open sessions at the public hall, to many island residents, (on a number of occasions) concerning the issue of rodent control and potential eradication on the island. They implemented an incremental approach to consultation to unpack the complexity of the community response to the previous rodent eradication process, and to identify what it would take for the community to actively engage in the evaluation of alternatives and options, with the aim of obtaining community support or endorsement of one of the options.

A Community Working Group (CWG) was established, based on residents who indicated a willingness to participate, along with an open call for nomination / involvement, put out through a newsletter to community residents. In working towards a solution, the CWG identified many issues (particularly regarding human health, potential impacts to business and tourism and potential impact to the environment) and considered a range of options. The option to "do nothing" was generally not considered as an alternative, as there was broad agreement that rats and mice are a problem, and that Lord Howe Island would be better off with no rodents.

Two scenarios were therefore further investigated and discussed:

1. Ongoing control through the existing baiting program, and the potential to expand this.
2. An eradication programme as previously proposed or modified where possible to address island residents' concerns.

The CWG agreed to develop and implement a community survey to test community support for these scenarios, whilst recognising that many of the community concerns with the proposed eradication could be addressed during the Planning and Approvals Phase. The CWG also agreed that an additional independent HHRA was needed and should be progressed.

In May of 2015, an options paper (Elton Consulting, 2015a), providing detailed explanation of options and answers to key questions, was disseminated to all people registered on the electoral roll for Lord Howe Island, together with an anonymous survey (Elton Consulting, 2015b) to allow the community to choose between:

Option 1 – Retain and expand the current management programme

Option 2 – moving to the planning and approvals stage of an eradication programme.

The survey also asked for level of agreement on whether the rodent problem needed to be addressed and ranking of areas concerns for both options.

A total of 212 respondents (71% of the 299 people on the electoral roll) participated in the survey. 208 survey responses were received before the closing time. A consensus was reached that the rodent problem on Lord Howe Island needs to be addressed with the majority of respondents (91%) agreeing (38%) or strongly agreeing (53%). A marginal majority 52 of the respondents expressed a preference for Option 2, while 48% of respondents expressed a preference for Option 1.

In line with the agreed Process for Resolution (Fig. 2), the LHIB responded to the majority view and on 19 May 2015 made the decision to proceed to the Planning and Approvals Phase (Option 2).

## PROGRESSING TO IMPLEMENTATION

Since 2015, the project team focussed jointly on progressing the necessary approvals and operational planning; and continuing to increase community support for and/or acceptance of the REP, recognising that some people who may not support the REP would however accept it. The latter is critical to ensuring that baiting can be conducted on every property on the island. Residual community issues and how we are attempting to resolve them are detailed below.

### Human health

Safety of people has always been a priority for the LHIB and the community when considering the LHI REP. Given the criticism of the independence of the original HHRA described previously, the community suggested that a further additional study be undertaken.

The NSW Office of the Chief Scientist and Engineer (OCSE) was identified by the community / CWG as an agency with a high level of independence and credibility and was subsequently requested to oversee an additional

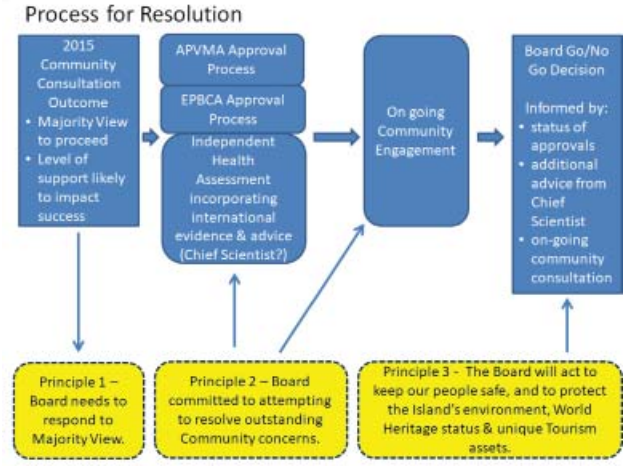


**Fig. 2** The agreed process for resolution.

independent HHRA for the project in line with the agreed Process for Resolution (Fig. 2). The OCSE was requested by the NSW Minister for the Environment to convene an Expert Panel in 2016 to:

- Provide advice to the Board on processes for commissioning the HHRA including identification of suitable experts and scope of the request for proposal. (The CWG endorsed the Scope.)
- Review proposals to undertake the HHRA and select a preferred candidate; review project plans and methodologies, and review draft and final reports of the HHRA as required. (Proposed membership of the panel was endorsed by the CWG.)
- Provide advice to the Minister for the Environment on the HHRA.
- Respond to media enquires as they relate to the Terms of Reference for the Expert Panel.

The Expert Panel (with the assistance of two nominated CWG members) selected Ramboll Environ Pty Ltd. to undertake the HHRA. This work, overseen by the OCSE, concluded that estimates of exposure from all potential sources associated with the REP are below those likely to result in adverse health effects for residents and visitors. (Ramboll Environ, 2017).

The outcomes from this additional HHRA and expert panel review concur with the results of previous HHRA undertaken by Toxikos Pty Ltd (2010), which found that, with the proposed mitigation in place, the REP would be safe for the community and visitors. Whilst the outcome was the same as the previous study, it should be noted the process undertaken by the OCSE to select Ramboll was very different to how Toxikos were originally selected, giving the report substantially more credibility within the community.

**Economics, tourism and livelihoods**

Ongoing concern from some elements of the community regarding potential impacts to tourism (specifically reduction in visitors) before, during or post eradication led the LHIB to commission an economic evaluation of the project in 2016. Community input was sought for the development of the scope of the evaluation and a prominent local business owner was included on the tender selection panel.

A study by Gillespie & Bennett (2017) looked at the costs and benefits (market and non-market services) of not proceeding with the REP compared to the costs and benefits of proceeding (i.e. a Cost-Benefit Analysis) as well as the distribution of said costs and benefits. Though all costs and benefits were considered, particular focus was placed on the potential impacts or benefits to biodiversity (non-market services) and tourism (market service) as the major contributors. This is based on the fact that a key motivation for visiting LHI is to experience the natural, undeveloped and unspoilt surroundings (Lord Howe Island Tourism Association, 2015), some of which are under threat from rodents.

Using choice modelling undertaken for other relevant studies, Gillespie & Bennett (2017) applied the benefit transfer technique to provide an economic value estimate for the biodiversity value of protecting species from extinction. Considering the economic importance of tourism to LHI, tourism impacts or benefits were modelled using supply and demand data in peak and off-peak tourist periods, before, during and after the REP. The study showed that accommodation providers on the island would be the biggest beneficiaries during the REP as the workforce required for the project would more than offset any temporary reduction in tourism. It also showed that tour and accommodation providers would be the major beneficiaries of increased tourism after the eradication. The REP was demonstrated to have a Benefit to Cost ratio of 17:1, resulting in an estimated net social benefit of AU$142M, with AU$58M of that returning directly to LHI residents. Hence, the REP was justified on economic efficiency grounds.

Overall, the cost-benefit analysis was considered an important tool for the REP in overcoming some residents' concerns about tourism and the economy. Others, however, will not be convinced until they actually see the visitors on island during or after the REP.

**The eradication method**

There has been considerable debate in the community about the method proposed for the eradication and, in particular, the aerial distribution delivery method.

A range of alternatives for eradicating rodents were considered for LHI including alternative techniques and mortality agents. Many were considered to have fatal flaws and were unsuitable for use for eradication on LHI because: a) the technique was not suited to the terrain or size of the island, b) it did not ensure that all individuals would be killed or c) was too experimental. However, early in the project these flaws in alternative methods were not well communicated with the community. The only method identified as capable of removing every rat and mouse on LHI was aerial distribution, in conjunction with minimal hand broadcast and bait stations where required (i.e. the settlement area), of highly palatable bait containing an effective toxicant.

To overcome concerns in the community relating to the method, the project team has recently taken the community through the process of looking at all the options and ruling out options with fatal flaws and therefore not suitable for deployment on LHI (see Table 2). In addition, the project team have undertaken one on one property management plans with all residents to agree the particular baiting method to be used on their property considering their concerns. These two tools have led to a greater understanding in the community of the methods proposed and why other methods were unsuitable.

**Environmental and non-target impacts**

Some members of the community have been concerned about environmental and non-target impacts. We have used a combination of methods to help allay concerns including:

- Undertaking monitoring on the island to provide evidence of rodent damage to a range of species on LHI and communicated those results back to the community regularly. We have found that a single photo of a rat taking a seabird chick or egg at a local nesting ground to be much more powerful than scientific reports of images of rodent damage locally or images from other locations around the world.
- Conducting a range of studies on the island to determine locally at-risk species and those not at risk (detail in Wilkinson & Priddell, 2011) and repeatedly communicating the results to community.
- Engaging world experts in captive management to manage the captive management programmes on LHI for the two high risk species and conducted trials on-island to show the community how the species can be managed without harm (Taronga Conservation Society, 2014).

**Table 2** Assessment of eradication options.

| Eradication technique | Suitable for eradication | Feasible for eradication on LHI | Justification |
|---|---|---|---|
| Disease | No | No | No suitable pathogen yet developed that could eliminate all individuals. |
| Trapping | Yes | No | May be feasible for eradication on small islands, however may cause individuals to become trap shy. Size and inaccessible terrain of LHI makes this option unfeasible. |
| Biological | No | No | Currently experimental. Likely to fail to completely eradicate the target species. |
| Fertility Control | No | No | No suitable fertility control yet developed that could eliminate all individuals. |
| Toxicant – bait station / hand broadcast only | Yes | No | May be feasible for eradication on small islands. Size and inaccessible terrain of LHI makes this option unfeasible. |
| Toxicant – aerial broadcast only | Yes | No | Highly successful on uninhabited islands. Socially unacceptable on LHI. Problematic with the number and nature of buildings. |
| Toxicant – combination of aerial and hand broadcast / bait stations | Yes | Yes | Allows for bait to be made readily available to all individual rodents. Brodifacoum in the form of Pestoff 20R has been selected as the preferred toxicant on LHI considering proven success, efficacy and non-target impacts. |

- Talking to the community about the differences (particularly in species) between LHI and other islands where non-target impacts have been observed. This included talking through differences in ecology and feeding behaviour leading to different risk profiles.
- Being open and up front with people about our expectations of non-target impacts, how we have formed those expectations and how those impacts compare to current impacts from rodents.
- Conveying the thoroughness, scientific rigour, and independence behind the environmental assessments undertaken by the various regulatory agencies that have assessment and approval roles on the project.
- Highlighting recovery of species and ecosystems from eradications around the world, through sharing recovery stories, science and media on other eradications.
- Developing appropriate mitigation plans for domestic animals and livestock at an individual level.

### Lack of trust

Lack of trust of new people, new technologies, and the LHIB in general, was perhaps the most difficult issue to address. It manifests as suspicion of non-island experts and scientific reports, unwillingness to accept change, spreading of misinformation and criticism of LHIB decisions and communications. It stems partially from a sense of resentment by islanders of Government control of the island. It also stems partially from a history of poor communication and follow through by the LHIB on many issues unrelated directly to the REP. Trust is essential to being able to communicate all aspects of the REP, including new information risk, benefits, mitigation and for people to feel comfortable expressing their true concerns. Trust is not easily given and has to be earnt over a long time through listening, demonstrating genuine interest in all aspects of the community (not just those related to rodent eradication), doing what you say you will and following through on commitments.

The most important mechanism we have found to build trust is to have our core project staff living on the island and living in the community for as long as possible. Our Project Manager and Assistant Project Manager have both been resident on LHI for at least two years. Wherever possible we engaged locals in the project including in communications roles, in advocacy, in adding local knowledge, in brainstorming and in any other aspect where they are willing and able.

## CURRENT STATUS

The Planning and Approval phase was completed in 2017. At the Sept 2017 Board meeting, the LHIB made the final decision to proceed with the eradication based on the technical, social and financial feasibility of the project as per the agreed process for resolution that was an outcome of ongoing community consultation in 2015 including:

- the status of approvals
- level of community support
- recommendations from an additional independent HHRA.

In March 2018, a decision was made to delay implementation of the REP until winter 2019 due to not having received one of the permits (previously received and surrendered due to a technical administrative flaw).

## LESSONS LEARNT

Planning a rodent eradication project on an inhabited island over a long period of time has given us many chances to reflect on what has worked well and what hasn't and to adapt our strategies over time.

**Least effective tools**

On reflection, the tools we have found least effective were:

- Having a predetermined solution (eradication by the methods proposed) with little opportunity for genuine community input and influence on the decision-making process at the start. This has left some members of the community disenfranchised.
- Flooding the community with more and more technical, scientific information. While science plays a critical role in providing information and answers, it needs to be provided in a way that key concepts and results can be easily understood, are relatable and align with people's values. Many scientific reports are too technical and too detailed for many people to understand, easily, or relate to. More information is not always better.
- Public Town Hall meetings. We have found that these have generally been dominated by a select minority of people (either supporters or opposition), which leaves many people unheard or losing interest.
- Scientists and ecologists are not always the best at community engagement. Often pure science does not address the emotional issues particularly when they concern people's children or livelihoods.
- Mainland consultants and experts. We have found generally (although not always) poor engagement outcomes where we have flown specialists from the mainland to help with various technical aspects. Often the consultants are there for very short timeframes and may not return. As a result, the required depth of understanding of community issues is often overlooked and, consequently, there is little opportunity to build rapport and trust. While we recognise that subject matter and consultation experts are required, they may be best deployed behind the scenes providing the right advice to the core project team.
- Presenting information from other sites – each community considers their island to be different from all others.

**Most effective tools**

We have found the most effective tools for communicating with our community to be:

- Having key members of the project team based on the island for as long as possible before implementation. This gives the community the opportunity to get to know the team and start to build trust. An open-door policy allows people to come to the project team at any time to discuss any concerns they have with the project. Being based on LHI also allowed the team to understand the broader issues that face the community and to interact with the community outside of work.
- One-on-one consultation with every resident, repeatedly and as many times as necessary on their properties. This has allowed us to identify individual concerns (and underlying motivations) and work with residents to address them. Working through with residents about exactly how they would like baiting undertaken on their properties considering their concerns (i.e. vegetable gardens, pets, children, etc.) has been critical for getting people comfortable with the project.
- The economic evaluation was an important piece of work as it converted biodiversity values (negative outcomes without eradication and positive outcomes with eradication) into economic (tourism) terms that our community could relate to in a meaningful way (livelihoods) and understand key concepts and implications.
- Independence and credibility of the OCSE in undertaking the HHRA.
- Engaging locals on as many aspects of the project as possible where skills allowed.
- Being patient, passionate, resilient and willing to go the extra mile to succeed. These personality traits of individuals in the core project team are essential to gaining trust in the community.

## DISCUSSION

The LHI REP has been a long time in planning and community consultation. Implementation of the project was likely drawn out most due to the fact that early planning and consultation was not done as effectively as it could have been. Additionally, funding was received in full which could have sent the message to the community that the project was a *fait accompli*. This did not engender the initial community support that was essential and has led to a long road to recovery. Though many of the tools from the emerging Strategic Environmental Assessment/ Social Impact Assessment toolbox (Russell, *et al*, 2018) were eventually employed on the project, these were often reactive, not integrated and used too late in the process.

The project would have likely encountered much less community resistance if these tools were used much earlier and in an integrated and methodological fashion. It is likely that the plan that was taken to community was too far developed down a particular path and was therefore considered not open to community input. This meant that it wouldn't have allowed sufficient opportunity for the community to adapt the plan to their needs or to feel a sense of ownership of the plan. Although extensive community engagement has since identified issues, and these were addressed, it would have been much more effective if this was done at the start of the planning process. Early community engagement (not information sharing) to gain support needs to be the top-priority for future eradications.

## ACKNOWLEDGEMENTS

The LHI REP is funded by the Australian Government's National Landcare programme and the New South Wales Environmental Trust. This paper provides an update to a previous paper published by Wilkinson & Priddell (2011) and builds on a paper by Hutton, et al. (2016) at the Island Arks 2016 conference.

Thanks to previous and current staff involved in the project. This paper has been prepared with the benefit of hindsight and is by no means criticism of those previously involved.

## REFERENCES

Billing, J. (1999). *The Management of Introduced Rodents on Lord Howe Island*. Unpublished report. Lord Howe Island. Lord Howe Island Board.

Carlile, N. and Priddel, D. (2006). *Population Size and Distribution of the Lord Howe Currawong* Stepera graulina crissalis. Unpublished Report prepared for the Lord Howe Island Board. NSW: Department of Environment and Conservation.

DECC (2007a) *Lord Howe Island Biodiversity Management Plan*. Hurstville: Department of Environment and Climate Change.

DECC (2007b). *Report on Non-toxic Bait Trials Lord Howe Island – August 2007.* Unpublished report for the Lord Howe Island Board. Hurstville: Department of Environment and Climate Change.

Elton Consulting. 2015a. *Rodent Control on Lord Howe Island – Towards a Solution*. Unpublished report for the Lord Howe Island Board. Elton Consulting Pty Ltd.

Elton Consulting. 2015b. *Lord Howe Island Rodent Consultation Community Survey*. Unpublished report for the Lord Howe Island Board. Elton Consulting Pty Ltd.

Gillespie, R. and Bennet, J. (2017). 'Costs and benefits of rodent eradication on Lord Howe Island, Australia'. *Ecological Economics* 140: 215–224.

Groombridge, B. (1992). *Global Biodiversity: Status of the Earth's Living Resources: A Report*. Report prepared for the World Conservation Monitoring Centre, British Museum (Natural History), and International Union for Conservation of Nature and Natural Resources. London: Chapman and Hall.

Hutton, I., Brice, L., Kelly, D. and Murray, C. (2016) *The Social Aspect to Successful Island Conservation Programs: Lessons Learnt from the Proposed Rodent Eradication on Lord Howe Island*. Paper Presented at Island Arks IV Conference, Norfolk Island, 2016.

IUCN (2017). 'World Heritage Outlook Lord Howe Island Group'. <https://www.worldheritageoutlook.iucn.org/node/990>.

Jones, H.P., Tershy, B.R., Zavaleta, E.S., Croll, D.A., Keitt, B.S., Finkelstein, M.E. and Howald, G.R. (2008). 'Severity of the effects of invasive rats on seabirds: a global review'. *Conservation Biology* 22: 16–26.

LHIB. (2009). *Draft Lord Howe Island Rodent Eradication Plan.* NSW: Lord Howe Island Board.

LHIB. (2016). *Lord Howe Island Rodent Eradication Project: Public Environment Report. EPBC 2016/7703*. Prepared by Lord Howe Island Board. NSW: Lord Howe Island Board. <http://www.lhib.nsw.gov.au/sites/lordhowe/files/public/images/documents/lhib/Environment/Rodent%20Eradication/LHI%20REP%20Final%20Public%20Environment%20Report_21Dec2016.pdf>.

Lord Howe Island Tourism Association, 2015. *Lord Howe Island Destination Management Plan 2014–2017*. Unpublished report for Destination NSW. Lord Howe Island: Lord Howe Island Tourism Association.

Make Stuff Happen. 2013. *Community Engagement Report and Plan*. Unpublished report for the Lord Howe Island Board. Annandale, New South Wales: Make Stuff Happen Pty Ltd.

Milledge, D. (2010). *Research to Inform the Eradication of the Introduced Masked Owl Population on Lord Howe Island*. Unpublished report. Landmark Ecological Services.

NSW Scientific Committee, (2000). *Final Determination to List the Predation by the Ship Rat* Rattus rattus *on Lord Howe Island as a KEY THREATENING PROCESS.* <http://www.environment.nsw.gov.au/determinations/ShipRatLordHoweKTPListing.htm>. Accessed 8 June 2016.

Parkes, J., Ruscoe, W., Fisher, P. and Thomas, B. (2004). *Benefits, Constraints, Risks and Costs of Rodent Control Options on Lord Howe Island*. Unpublished report to the Lord Howe Island Board. Lincoln, New Zealand: Landcare Research.

Pickard, J. (1983). 'Vegetation of Lord Howe Island'. *Cunninghamia* 1: 133–265.

Ramboll Environ (2017), *Human Health Risk Assessment – Proposed Lord Howe Island Rodent Eradication Program*. Unpublished report for the NSW Office of the Chief Scientist. The Junction, NSW, Australia: Ramboll Environ Pty Ltd.

Russell, J.C. and Broome, K.G. (2016) 'Fifty years of rodent eradications in New Zealand: Another decade of advances'. *New Zealand Journal of Ecology* 40(2): 197–204.

Russell, J., Taylor, C.N. and Aley, J. (2018). 'Social assessment of inhabited islands for wildlife management and eradication'. *Australasian Journal of Environmental Management* 25(1)*:* 24–42.

Saunders, A. and Brown, D. (2001). *An Assessment of the Feasibility of Eradicating Rodents from the Lord Howe Island Group*. Unpublished report to the Lord Howe Island Board. Hamilton, New Zealand: Endangered Species Recovery Council.

Shiels, A.B., Pitt W.C., Sugihara R.T., Witmer G.W. (2014). 'Biology and impacts of Pacific island invasive species 11. The black rat, *Rattus rattus* (Rodentia, Muridae)'. *Pacific Science* 68(2): 145–184.

Taronga Conservation Society Australia, (2014). *Captive Management for Woodhen and LHI Currawong Associated with the Lord Howe Island Rodent Eradication Project.* Unpublished report for the Lord Howe Island Board. Sydney: Taronga Conservation Society.

Towns, D.R., Atkinson, I.A.E. and Daugherty, C.H. (2006). 'Have the harmful effects of introduced rats on islands been exaggerated?' *Biological Invasions* 8: 863–891.

Toxikos (2010). *Human Health Risk Assessment for the use of Brodifacoum for the Lord Howe Island Rodent Eradication Plan*. Unpublished Report for the Lord Howe Island Board. Caulfield East, Vic., Australia: Toxikos Pty Ltd.

TSSC (2006) *Commonwealth Listing Advice on Predation by Exotic Rats on Australian Offshore Islands of Less than 1000 km² (100,000 ha).* Threatened Species Scientific Committee. Canberra: Australian Government Department of the Environment.

Wilkinson, I.S. and Priddel, D. (2011). 'Rodent eradication on Lord Howe Island: challenges posed by people, livestock, and threatened endemics'. In: C.R. Veitch, M.N. Clout and D.R. Towns (eds.) *Island invasives: eradication and management,* pp. 508–514. Occassional Paper SSC no. 42. Gland, Switzerland: IUCN and Auckland, New Zealand: CBB.