

# Hawai`i-New Zealand Conservation Exchange Program, 2007

## Trip Report

Holly Freifeld, Ph.D.  
U.S. Fish and Wildlife Service  
300 Ala Moana Blvd., Rm. 3-122  
PO Box 50088  
Honolulu, Hawai`i, 96850

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Hawai`i Conservation Alliance, Honolulu  
Manaaki Whenua - Landcare Research, Lincoln, New Zealand  
U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu

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## Learning Seabird Translocation Methods: The Fluttering Shearwater or Pakaha (*Puffinus gavia*) Project on Mana Island, New Zealand

### ***Executive Summary***

I traveled to New Zealand in January of 2007 to learn first-hand about methods for translocating seabirds by participating in the second year of a three-year project to translocate the Fluttering Shearwater or Pakaha (*Puffinus gavia*) to Mana Island, a scientific reserve off the coast of Wellington. Ninety-one chicks between two and five weeks from fledging were transferred from their natal colony on Long Island (Marlborough Sounds) to Mana Island on January 4. I participated from January 4 to 14 along with other volunteers in preparing artificial burrows, monitoring and hand-feeding chicks, managing data, and preparing food and equipment. By February 10, at least 81 chicks were presumed to have fledged successfully. Field time permitted extensive discussion of the evolution of translocation techniques, critical decision points for individual birds and translocation efforts, and lessons learned for taxa that are similar to Hawaiian seabirds. In addition, ideas and suggestions were raised for the application of seabird translocation as a tool for the conservation of imperiled Hawaiian seabirds and the restoration of seabird communities.

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## ***Introduction and Itinerary***

I traveled to New Zealand in January of 2007 to participate in the translocation and hand-rearing of Fluttering Shearwater or Pakaha chicks (*Puffinus gavia*) on Mana Island, a scientific reserve off the west coast of Wellington. This was the second year of a three-year project to establish a population of this burrow-nesting seabird on predator-free Mana Island. This project is funded, organized, and carried out by the community conservation group Friends of Mana Island (FOMI), based in Wellington, with oversight and guidance from the New Zealand Department of Conservation's (DOC) Wellington Conservancy.

In addition to assisting with fieldwork on Mana Island, I met with DOC seabird biologists and the current president of FOMI, gave a brief interview to the local newspaper, the Kapiti-Mana, and traveled to Lincoln to give a seminar at the headquarters of Landcare Research and meet with scientists there.

The primary purpose of my application to the Conservation Exchange Program was to (1) learn about New Zealand translocation techniques and the variables that influence their success through direct participation and discussion with New Zealand's seabird conservation experts, and (2) generate ideas for adapting and applying these methods for use in Hawai'i.

## ***Itinerary***

31 January 2006: Depart Honolulu

2 January: Arrive Auckland, connect to Wellington

3-4 January 2007, Wellington: Assist Friends of Mana Island (FOMI) staff with preparation for trip to Mana

4-14 January 2007, Mana Island: Assist with preparing artificial colony and facilities, processing of Fluttering Shearwater chicks delivered from Long Island and placing them in artificial burrows; prepare feeding formula for chicks; feed and monitor weight, growth, and overall health of chicks.

14-16 January 2007, Post-field meetings with FOMI president and coordinator, former president, and New Zealand DOC biologists.

16 January: Fly from Wellington to Christchurch, travel to Lincoln

17 January: Meet with Landcare Research biologists; present a seminar on seabird conservation and research in Hawai'i

[18-27 January: Annual leave; arrive Honolulu 26 January]

## ***Seabird Translocation***

Seabird translocation or transfer refers to the process of moving birds (in this case, chicks) of a particular species from their natal colony to an artificial colony at another location and hand-

rearing them to fledging, with the objective of imprinting the birds on the new site to encourage their return to breed there. Efforts to develop and apply methods for seabird translocation have taken place in various locations around the world for nearly half a century, and have involved a wide range of ground surface- and burrow-nesting species (for a detailed review, see Gummer 2003). The success of these efforts is predicated on the strong philopatry exhibited by seabirds, especially members of the order Procellariiformes, which includes albatrosses, shearwaters, petrels, storm-petrels, and their allies (petrels hereafter). The overarching goals of seabird translocation are to establish additional colonies of rare or endangered species in locations where they can be protected from threats or otherwise improve their status and/or to restore seabird species or communities as components of ecosystems from which they have been extirpated.

In New Zealand, translocation projects have been undertaken for six species of petrels, and projects for two more are in the planning phase. Several of these projects have resulted in nascent breeding colonies at the release sites. Owing to a pre-breeding period of as long as five or six years before young petrels are recruited into the breeding population, it is too soon to determine the success of projects currently underway or most recently completed. Most of these projects have been initiated to create more colonies in safe places for species at risk.

## ***Mana Island Seabird Translocations***

### **Background**

Mana Island Scientific Reserve lies off the west coast of Wellington, at the south end of New Zealand's North Island. This small (217 hectare) island has been the focus of intensive ecological restoration efforts since the 1980s, including the removal of mammals, control of invasive plants, propagation and outplanting of native plants, and reintroduction of many native vertebrate and invertebrate species, including many that are threatened or endangered nationally (Miskelly 1999). The community of seabirds currently nesting on Mana comprises five species. This does not include the three which have been translocated to the island: the Common Diving Petrel (*Pelecanoides urinatrix*), translocated between 1997 and 1999 (Miskelly 2004, Miskelly & Taylor 2004); Fairy Prion (*Pachyptila turtur*), translocated between 2002 and 2004 (Miskelly & Gummer 2004); and the Fluttering Shearwater, translocated in 2006 and 2007, with a third effort planned for 2008 (Gummer & Adams 2007).

The goal of these projects has been to translocate several hundred birds of each species to Mana. Because some chicks are likely to be lost prior to fledging, and a relatively high rate of juvenile mortality is expected in natural seabird populations, the largest number of hand-reared fledglings possible is needed to maximize the likelihood of even a small number of birds returning to breed. Three translocations for each species have been planned in consecutive years to reach the goal. Logistical constraints on (a) identifying sufficient good candidates for translocation in the donor colony and (b) hand-rearing and monitoring chicks at the release site for as long as five weeks preclude reaching that goal in a single year. In addition, spreading the translocation effort over

several years provides some insurance for the project in the event of the failure of any one year's effort (*e.g.*, because of a climatic event that causes breeding or fledging failure or an epizootic in the artificial colony) as well as an opportunity to adapt methods to reflect new information gleaned from each effort.

In contrast with most seabird translocation projects in New Zealand, the objectives of the Mana Island seabird translocations that have taken place so far are to contribute to large-scale restoration of the island's ecosystem rather than establish new colonies of species at risk of extinction. All three seabird species translocated to Mana have the potential to nest there in large numbers and thereby provide a significant influx of marine nutrients to the island's terrestrial ecosystem that will enhance the invertebrate and reptile communities (Miskelly 1999).

### **Fluttering Shearwater translocation**

An unpublished study of Fluttering Shearwater breeding (1988-89; summarized in Gummer & Adams 2007) and a translocation of this species to Maud Island (Bell *et al.* 2005) have provided some morphometric criteria and other information as a starting point for the translocation, feeding, and release of this species on Mana. In 2006, the first year of the project, 40 chicks were translocated in January from Long Island, in the Marlborough Sounds, to the artificial colony constructed at South Point on Mana Island; of these, more than half were thought to have fledged successfully (DOC unpublished data). This first trial raised questions and revealed methodological and timing considerations that could be addressed in 2007 and 2008.

#### 2007 translocation

Annotated timeline:

- In the winter of 2006, the artificial colony at South Point was moved and completely reconstructed by FOMI volunteers under the guidance of Helen Gummer, using improved materials and design to provide the chicks with increased protection from weather. The artificial colony includes an automatic system that plays calls of Fluttering Shearwaters and several other seabird species during the night. This method of social attraction is used in combination with translocation to help draw passing adult birds into the island.
- On January 1, 2007, a team from New Zealand DOC began survey of the donor colony on Long Island to locate candidate chicks for transfer to Mana. Petrel species breed relatively synchronously within a colony, however, there is sufficient variation within the season in egg dates that age and size criteria for selecting chicks for transfer must be broad enough to allow a sufficient number of chicks to be collected and moved. These criteria are detailed in Gummer and Adams (2007).
- At the same time, the project leader and first crew of FOMI volunteers arrived on Mana Island to prepare the artificial colony site and facilities for the translocation, in cooperation with DOC personnel. The vegetation around the burrows was trimmed and each burrow was supplied with a shallow scrape and dry grass and a temporary gate on the tunnel entrance to prevent the chicks' premature emergence and potential loss from the project. Four of the

newly constructed burrows contained evidence that seabirds had prospected them as potential nest sites; these burrows had scrapes in their drainage gravel and some nesting material.

- On January 4, 2007, 91 chicks in 46 pet-carriers were delivered by helicopter from Long Island to the colony site on Mana Island. Prior to being hydrated, logged in, and installed in their burrows, they were officially welcomed to Mana in a powhiri ceremony conducted by Ngati Toa, a representative of the local Maori iwi.
- From January 5 to February 10, the chicks were fed daily on a liquid diet (canned sardines in soy oil and water) prepared daily and administered by syringe and crop-tube. Each chick was weighed daily, and wing measurements were made every other day. Food quantities were closely monitored and adjustments made for each individual to compensate for variable growth rates (Gummer & Adams 2007). The goal of monitoring weight and adjusting feed is to reach a target fledge weight: light enough to fly, but heavy enough to sustain a period without food while the bird is learning to forage at sea. The last chick fledged on the night of February 10.

Preliminary results (detailed in Gummer & Adams 2007):

- Of 91 translocated chicks, at least 81, or roughly 89%, were thought to have fledged successfully and at sufficient weight to survive at sea.
- In this second year of the project, new information was gleaned to improve collection at Long Island in Year 3, adjust timing of gate removal from the artificial burrows, and increase flexibility in the feeding rate for the oldest chicks in the group.

Based on the average age of translocated Fluttering Shearwaters that have returned to breed on Maud Island (6.8 years; Bell *et al.* 2005), translocated birds that fledged from the artificial colony on Mana in 2006 and 2007 may not return to breed until 2012 or 2013, at the earliest; non-breeders may return sooner to prospect for nest sites. Therefore, an unavoidable lag time exists before the ultimate success of this project can be determined.

## ***Potential Applications in Hawai`i***

### **Recovery and conservation of threatened and endangered species**

The Hawaiian Petrel (‘Ua`u, *Pterodroma sandwichensis*) and Newell’s Shearwater (‘A`o, *Puffinus auricularis newelli*) are listed as endangered and threatened, respectively, under the U.S. Endangered Species Act. Both species nest in remote montane locations in the main Hawaiian islands, and introduced predators pose a threat to both (Ainley *et al.* 1995, Simons & Hodges 1998, Ainley *et al.* 2001, Hodges & Nagata 2001); recent analyses have suggested declines in these species, especially Newell’s Shearwater (Ainley *et al.* 2001, Day *et al.* 2003, N. Holmes, Hawaii Division of Forestry and Wildlife, *pers. comm.* 2007). Devising and implementing colony-based conservation projects for these seabird species has proven extremely difficult for several reasons. At present, proven techniques, as well as plans and permits, do not exist for

large-scale predator control in wet, montane Hawai`i. Furthermore, numerous logistical, economic, and political challenges surround the construction of extensive fences, the removal of ungulates from non-Federal lands in the state, and the use of toxicants to control predators on a landscape scale.

In addition to conservation work necessary for recovery of these imperiled seabirds, the Endangered Species Act requires that death, injury, or other forms of harm or “take” of listed species that occurs incidental to otherwise legal activities must be avoided and minimized to the extent reasonable and prudent, and mitigated to an extent commensurate with the take that does occur. Specific techniques and projects are needed so that providers of public utilities and other businesses that cause take in the form of light attraction and/or collision with power lines, wind turbines, communications towers and other structures can meet their requirements under Federal law to mitigate loss of listed seabirds. Owing to the difficulties described above, such projects currently are difficult to develop and implement.

Finally, study of even the basic breeding biology and demography of these species has been hampered by the remote and inaccessible location of nesting colonies. Even in relatively accessible colonies, such as the Hawaiian Petrel colony on the summit of Lāna`i, concern about creating trails that could be used by predators has all but precluding finding and monitoring nest sites. Creating new colonies in safe places where the birds can be monitored and studied would vastly increase our knowledge of these species’ basic biology and vital rates and improve the development and monitoring of management actions.

We are thus in need of new strategies for the interim recovery and conservation of these seabirds while solutions to these challenges are sought. Numerous opportunities exist to create or enhance populations of listed seabirds using translocation and social attraction. Several examples are listed below. It is important to emphasize that acting on these opportunities would represent only medium-term progress toward recovery of these species. Landscape-scale control of alien species on the Main Hawaiian Islands is necessary to ensure the existence of safe, suitable nesting habitat for these species in the long-term.

- In general, any attempt to translocate the threatened Newell’s Shearwater will benefit from the translocations done or planned in New Zealand for the very similar Fluttering and Hutton’s Shearwaters (*Puffinus huttoni*). Methods worked out in New Zealand for the Pycroft’s (*Pterodroma. pycrofti*) and Chatham Petrel (*P. axillaris*), and eventually for the critically endangered Taiko (*P. magentae*), will provide a basis for developing translocation methods for the endangered Hawaiian Petrel.
- Offshore islands such as Lehua, Molokini, Manana, and Kaho`olawe, once cleared of predators, hold great promise as refugia for our listed seabirds. Lehua is scheduled for the first eradication of rats in Hawai`i using aerial broadcast of rodenticide. This islet, a cinder cone off the coast of Ni`ihau Island, may harbor a small population of Newell’s Shearwaters. This population could be augmented using a playback system and translocation from a colony where *in situ* management of threats currently is not feasible.

- Hawai'i's first predator-proof fence project has been initiated at Ka'ena Point, a small peninsula at the Northwestern tip of the island of O'ahu. This project will enhance and protect habitat for a large colony of Wedge-Tailed Shearwaters (*Puffinus pacificus*) and a small, growing colony of Laysan Albatrosses (*Phoebastria immutabilis*). Once free of predators, this peninsula could be an ideal site for translocation of Newell's Shearwaters and/or Hawaiian Petrels.
- The small (2 to 4 pairs) breeding population of Newell's Shearwaters at Kilauea Point National Wildlife Refuge on Kaua'i currently is the only predator-protected and monitored "colony" of this species. This year, additional artificial burrows were added to the site, along with an automatic playback system for Newell's Shearwater calls, to enhance the potential for increased breeding activity. This effort could be jump-started with translocation.

### **Restoration of native seabird communities and ecosystems**

As described above, Ka'ena Point on O'ahu is the site of the first (non-experimental) predator-proof fence project in the state. Once the fence is constructed and predators eradicated from the peninsula, this will be the first predator-free site available to us for seabird translocation, and owing to its size and relative accessibility, may be an ideal location for a first, experimental project and to work out methods for our birds based on experience accumulated for a variety of related species in New Zealand. Experimental translocation projects at Ka'ena Point would pave the way for restoration of seabirds in future predator exclosures in the Main Hawaiian Islands and as part of restoration of offshore islets. In addition to introducing listed seabirds to Ka'ena eventually, other native species now restricted to offshore islets could be reintroduced to the O'ahu mainland here. Bulwer's Petrel (*Bulweria bulwerii*) would be an ideal candidate from a seabird community standpoint, but might pose challenges in terms of developing translocation and hand-rearing methods; some key breeding biology information must be assembled first. Surface-nesting species such as boobies and terns eventually could be introduced, too.

The largest uninhabited island in Hawai'i is Kaho'olawe (117 km<sup>2</sup>), which lies about 11 km northeast of West Maui. This island was used by the U.S. Navy as a bombing range until the 1990s; in 1994 ownership of the island was returned to the state, and restoration activities began. Much unexploded ordnance was removed from the island, but because much is unrecoverable and will remain indefinitely, the island is too dangerous for development and permanent settlement. In addition, because of Kaho'olawe's relatively low elevation (450 m asl) and location in the lee of Maui, it is a dry island and currently has no permanent freshwater source. Goats were removed from the island by the Navy, but rats and feral cats remain. Proposals to eradicate mammals are under development; once predators are removed, Kaho'olawe has immense potential to become a high-island bastion for many or most of the seabird species that breed in Hawai'i. Some species may already occur on the island or may colonize it naturally; others could be brought Kaho'olawe using a combination of social attraction and translocation.

## **Other Hawaiian applications for New Zealand seabird translocation methods and results**

### Improving rehabilitation of fledgling seabirds

Each year in Hawai`i, between late September and early December, hundreds of fledgling petrels are attracted by artificial lights during their first flight to the sea and either collide with structures or fall exhausted to the ground after circling these lights for hours. Some proportion of these “fallout” birds can be retrieved alive before they are hit by cars or taken by predators. This phenomenon has led to the grounding and death of thousands of Newell’s Shearwater fledglings on Kaua`i, where a well known program, Save Our Shearwaters, patrols for “fallout” birds, cares for birds picked up by members of the public, rehabilitates them if necessary, and releases them from remote coastal hack sites. Criteria for releasing these birds have included a target weight, but if birds appear to be strong and uninjured, they often are released at weights below or far below the average for the species. Many decades of fallout, and thus chronic low recruitment over the long term, is thought to have contributed to a likely decline in Newell’s Shearwaters on Kaua`i, which harbors the majority of the global population.

Although data exist describing the average fledge weight in natural populations of many seabird species, rarely are there data with which to assess the relationship between fledge weight and recruitment into the breeding population. In a typical seabird colony, the chances are low of discovering new breeders that were banded as chicks and weighed up until fledging. In an artificial colony created through translocation, every bird fledged has an excellent record of weight and other growth parameters, and such colonies are monitored closely for returning birds. In two translocated species for which recruitment data are available, the Common Diving Petrel (Miskelly & Taylor 2004) and Fluttering Shearwater (Bell *et al.* 2005), the majority of birds that returned to breed had fledged at weights higher than average fledge weights recorded for their species.

These data from New Zealand translocation projects demonstrate that average fledge weights are not optimal fledge weights. This information allows us to maximize the likelihood that rehabilitated fallout birds will survive—simply by feeding them more. This is an unanticipated and important application of seabird translocation that has implications for minimizing the population-level impact of a chronic anthropogenic threat to our imperiled seabird species.

### Avoiding interspecific competition for artificial burrows

Experiments in New Zealand to devise means of excluding larger, more aggressive seabird species from artificial burrows intended for translocated endangered species (*e.g.*, Chatham Island Petrels) provide results that could be adapted to exclude larger Wedge-Tailed Shearwaters, which are abundant on Lehua and at Ka`ena Point, from nest boxes intended for Newell’s Shearwaters.

### Translocation and hand-rearing logistics, teamwork, hygiene, and other details

Because seabird translocations have been conducted in a wide range of places and with a variety of seabird species in New Zealand, detailed methods have been developed over the past decade to account for various working conditions and seabird life histories. Although flexibility and improvisation evidently have played an important role in every translocation project, some enduring considerations for planning have emerged. Remoteness from veterinary and other assistance; access to water, electricity, and refrigeration; the distance between the source colony and the translocation site; and other environmental circumstances have a huge impact on the methods employed (and resources required), *e.g.*, the number of birds and people involved, the type of food fed and manner and timing of its preparation, the protocol for sterilizing feeding equipment. A good understanding of chick growth rates; the size, frequency, and seasonal pattern of meals delivered by adult birds; the emergence period; and average fledge weight for the species is necessary for translocation to be successful, as well as a recognition that every bird is different. Knowledge of these traits informs the development of release criteria and a feeding regime that maximize the chicks' imprinting on the release site (the likelihood of their return) and ensure good weight and health (the likelihood of their survival). Careful consideration of all of these variables, as well as innovation, will be essential in developing translocation methods for Hawaiian seabirds.

### **Acknowledgements**

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**Contacts**

Lynn Adams  
181 Thorndon Quay  
PO Box 5086  
Wellington 6145  
Phone: +64 4 472 5821  
Email: ladams@doc.govt.nz

Peter Bellingham  
Maanaki Whenua Landcare Research  
PO Box 40  
Lincoln 7640 New Zealand  
Phone: +64 3 321 9999  
Email: bellingham@landcareresearch.co.nz

Barry Dent and Susan Freitag  
BDG Synthesis  
PO Box 38 627, Wellington Mail Centre  
Wellington 5045, New Zealand  
Phone +64 4 569 0520; Fax +64 4 569 0521  
barry.dent@bdg.co.nz; <http://www.bdg.co.nz>

Helen Gummer  
6 Weku Rd., Puekrua Bay  
Wellington, New Zealand  
Email: helengummer@paradise.net.nz

Phil Lyver  
Maanaki Whenua Landcare Research  
PO Box 40  
Lincoln 7640 New Zealand  
Phone: +64 3 321 9999  
Email: lyverp@landcareresearch.co.nz

Colin Miskelly  
181 Thorndon Quay  
PO Box 5086  
Wellington 6145  
Phone: +64 4 472 5821  
Email: cmiskelly@doc.govt.nz

Brian Paget

President, Friends of Mana Island Inc.  
P O Box 54 101  
Mana, Porirua, New Zealand  
Phone: 04-472-4827  
Email: Brian@caduceus.co.nz

Colin Ryder  
Email: rydercj@xtra.co.nz

Eric Spurr  
Maanaki Whenua Landcare Research  
PO Box 40  
Lincoln 7640 New Zealand  
Phone: +64 3 321 9999  
Email: SpurrE@landcareresearch.co.nz

Graeme Taylor  
Conservation House - Whare Kaupapa Atawhai  
18 - 32 Manners Street  
PO Box 10420  
Wellington 6143, New Zealand  
Phone: +64 4 471 0726  
Email: gtaylor@doc.govt.nz

Janet Wilmshurst  
Maanaki Whenua Landcare Research  
PO Box 40  
Lincoln 7640 New Zealand  
Phone: +64 3 321 9999  
Email: wilmshurstj@landcareresearch.co.nz