The State of New Zealand's Birds 2006

Special Report
New Zealand's Seabirds

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Special Report Seabirds

Compiled and edited by Kerry-Jayne Wilson

The State of New Zealand's Seabirds 2006 report presents an overview of the current status of this country's seabirds. It seeks to identify those species that are in decline and not subject to active management and those for which we have insufficient knowledge to know their true status. This statement has been written on behalf of the Ornithological Society of New Zealand (OSNZ) by ornithologists who share a concern for the well being of our birds and their habitats. We hope this publication will highlight the plight of our seabirds and encourage the Department of Conservation, OSNZ, other NGOs, universities and authorities to focus on research and management that address the problems we identify.

Introduction

New Zealand is a major centre for seabird diversity. Globally, only about 350 species of birds obtain all or most of their food at sea and at least 84 of these breed in the New Zealand Region. About 38 species of seabird are endemic to New Zealand, meaning they breed here and nowhere else. New Zealand now has about as many species of threatened or endangered seabirds as we have threatened non-marine birds, yet seabirds receive far less attention than their terrestrial counterparts.

This report presents an overview of the current status of each group of New Zealand seabirds. It seeks to identify species that are in decline and the main threats faced by those species. In this report we deal only with species that breed in New Zealand or on the Kermadec, Chatham, Snares, Auckland, Campbell, Antipodes and Bounty Islands. Many New Zealand breeding seabirds, including most of the endemic species disperse beyond our Exclusive Economic Zone (EEZ) during migration or on foraging forays. A major threat to New Zealand's seabirds is fisheries bycatch, much of which occurs in waters outside our jurisdiction, in some cases as far away as Alaska or Argentina. While mention is made of threats beyond our EEZ, the emphasis here is on local issues that we in New Zealand can directly address.

When it comes to bird conservation the focus of the Department of Conservation (DoC), the government department charged with the conservation of New Zealand's biota, is, and is likely to remain, on critically endangered species. In recent years DoC and other organisations have focused on non-marine species at the expense of seabirds. For most endangered species that are under direct management, declines have been halted or in some cases reversed. However, there are a large number of seabird species that are still relatively common but whose populations are in decline, and other species whose status is unknown. We hope this report will identify those seabirds for which further conservation action is required and those species which are, or may be, in decline, but are not yet sufficiently rare to have become a DoC priority.

Some of the seabird survey priorities identified in this report could be carried out by the Ornithological Society of New Zealand (OSNZ) or other non-government organisations. The best available information on black-billed gulls (*Larus bulleri*), white-fronted terns (*Sterna striata*), black-fronted terns (*S. albostriata*) and Caspian terns (*S. caspica*) was obtained during OSNZ surveys in the 1980s or 1990s. The Society should once again take a more active role in the survey of these and other accessible species. OSNZ in particular, but other organisations also, have among their membership a host of volunteers who would enjoy the opportunity to assist with research and management of seabirds. The Mana Island translocations and Chatham Island taiko (*Pterodroma magentae*) recovery show what can be achieved at modest cost when this pool of willing and able volunteers is tapped.

We trust that the State of New Zealand's Seabirds report will provide OSNZ, NGOs, regional councils and universities with direction so that they can supplement the good work undertaken by DOC.

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THE KEY FINDINGS

- The number of seabirds that are under threat is increasing.
- Reliable estimates of population size have been made for very few of New Zealand's seabird species.
- Research is required on the breeding biology, population dynamics, foods and foraging ecology for most New Zealand seabird species.
- Fisheries bycatch is a serious threat to most New Zealand breeding albatrosses and some petrels. Mitigation measures are being developed for some species.
- Migratory albatrosses, shearwaters and other petrels are killed in fisheries bycatch and perhaps through other marine-based threats in waters far from New Zealand. Even very common migratory species such as the sooty shearwater are in decline.
- Recreational set-net fishing poses an unquantified threat to some penguins, shearwaters and shags.
- Changes in oceanic conditions, perhaps linked to global warming have the potential, and may already have contributed to declines in albatross and petrel numbers by shifts in the Antarctic Front, reduced food stocks and an increase in the frequency of storm events.
- The ozone hole may adversely affect oceanic foraging species as increased UV levels may result in a reduction in primary productivity thus reducing the food available to seabirds.
- As a result of predation by introduced mammals many New Zealand seabirds survive only on predator free islands. These populations are at risk from invasion of their island sanctuaries by introduced predators.
- The eradication of introduced mammals, in particular rats, from islands is a vital conservation strategy.
- It is now possible to translocate petrel chicks from their natal island to another site. This presents exciting new options for re-establishing petrels on islands recently cleared of predators or to predator-fenced areas on the mainland.
- With the loss of virtually all of the once huge mainland petrel colonies, over crowding on small islands and stacks is apparent and burrow competition may be contributing to declines in some species. There has been almost no research to document the extent to which this impacts on burrow-breeding species.
- Greater public awareness is required of the threat that dogs, off-road vehicles and certain recreational activities pose to ground nesting seabirds.
- The shags are the most neglected group of seabirds, little is known of the population dynamics, breeding biology, foods, foraging ecology or population status for any of the endemic forms.
- The taxonomy of the *Leucocarbo* shags, albatrosses and mollymawks needs to be clarified. Likewise the taxonomic status of the Codfish population of the South Georgian diving petrel and the New Zealand storm petrel need to be determined.
- Much of the research conducted by DoC on seabirds is driven by pressure from external agencies or issues such as fisheries bycatch, rather than the needs of threatened species.
- Much of the research and management on seabirds is reactive; there is no strategic plan for addressing the needs of seabirds. A seabird strategy currently being prepared will hopefully rectify this situation.
- New Zealand currently has a shortage of researchers and conservation managers with seabird expertise. The Department of Conservation no longer has a scientist or technical officer employed solely to work on seabirds and field staff seldom have adequate technical or financial support for the work they are undertaking. The universities and other research organisations are similarly under resourced when it comes to work on seabirds. A heavy reliance on contract workers and students means there is little continuity and loss of skilled workers as people move on at the end of their term. Funding and student interest has directed seabird specialists to work on other taxa.
- There is opportunity to make more use of OSNZ volunteers. Here is a resource of keen people looking for opportunities to contribute to the knowledge and conservation of birds.
- Seabirds need greater advocacy. Most people have little knowledge of them. Even penguins and albatrosses, the most iconic groups, need greater support. Petrels and terns are 'out of sight, out of mind' and shags and gulls lack the charisma that attracts public support for their conservation. There is a need to increase the opportunities the public have for seeing, experiencing and learning about seabirds.

Top Left: Pancake Rocks, Dolomite Point, Punakaiki
Photo by **Richard Holdaway**

Left: Black-winged petrel (*Pterodroma nigripennis*)
Photo by **Richard Holdaway**

Below: Taiko (*Pterodroma magentae*)
Photo by **Graeme Taylor**

Above: Yellow-eyed penguin (*Megadyptes antipodes*)
Photo by **Dave Houston**

Birds to Watch

The species in greatest need of further management include, in approximate order of priority, the South Georgian diving petrel, New Zealand fairy tern, Chatham Island taiko, Chatham shag, Chatham petrel, Kermadec storm petrel, black-billed gull, Pitt Island shag, Chatham mollymawk, Westland petrel, Fiordland crested penguin, Kermadec petrel, lesser fulmar prion, yellow-eyed penguin, black-fronted tern, grey-headed mollymawk, Bounty Island shag, , erect-crested penguin, black petrel and rockhopper penguin.
The New Zealand storm petrel is a special case, when and if its status as a distinct endemic species is confirmed it must then become a species of particular concern for conservation management.

Albatrosses

New Zealand can be justifiably called the home of the albatross, with 13 out of 24 taxa of the great albatrosses (*Diomedea*), mollymawks (*Thalassarche)* and sooty albatrosses (*Phoebetria*) breeding here. Nine of these taxa are endemic. The taxonomy of the albatrosses is currently not settled. For most of the 20th century it was accepted that there were 13 species and a number of sub-species. More recently it has been suggested each of the 24 taxa probably constitutes a distinct species.

Almost all New Zealand's albatrosses breed on sub-Antarctic islands or the Chatham group, but there is a small colony of just 20 pairs of Pacific mollymawk on the Three Kings Islands, north of the North Island. Most sub-Antarctic islands support several species of albatross, with Campbell Island having six. The only mainland breeding colony is at Taiaroa Head on Otago Peninsula where the first northern royal albatross was seen in 1914, the first egg was laid in 1920, but disturbance from predators and people meant that not until 1938 did a chick fledge. This success was thanks to ornithologist Lance Richdale's dedicated protection. In 2005-06 there were 17 nests and more than 65 birds. Predator control and visitor facilities now give the birds and the public a good experience. This is one of most accessible albatross colonies in the world for people to visit.

Albatrosses were hunted by Māori and later by sealers and shipwrecked sailors until given complete protection while in the New Zealand realm in 1922. The illegal harvest of small numbers of albatross and mollymawk chicks continues on the Chatham Islands.The majority of New Zealand breeding sites are free, or have recently become free of introduced mammalian predators. Despite this two issues remain: pigs (*Sus scrofa*) are of concern on the main Auckland Island where they take chicks and adult New Zealand wandering albatross and white-capped mollymawks. The Department of Conservation is currently planning to eradicate these pigs but face considerable logistic issues. Mouse (*Mus musculus*) predation has been implicated in the decline of Tristan albatross on Gough Island, but there is no evidence of a similar threat to the Antipodean albatross.

A small number of southern royal albatross on Campbell Island banded in the 1970s suffered injuries from poorly fitting or poorly closed bands. Department of Conservation staff have spent considerable resources in the last few years removing these bands. Band redesign and tighter banding regulation and supervision will prevent this situation occurring in the future.

Currently, all species are recorded as incidental by-catch in various fisheries. Direct evidence of bycatch causing reductions in populations is lacking. However, there is strong circumstantial evidence that bycatch resulted in declines in the population of Campbell mollymawks during the 1980s and recent suggestions that it may be affecting the population of white-capped mollymawk on the Auckland Islands. The effect of fisheries is exacerbated by albatross's propensity to cover vast distances over large areas of ocean in search of food. When breeding, they are more restricted in their choice of feeding area as they have to return to their nest. Even so, breeding albatrosses forage considerable distances, which vary depending upon the stage of the breeding cycle. In recent years research, using satellite telemetry, has illustrated the foraging ranges of some albatross species in New Zealand and complex patterns of food choice have been revealed. For example, four distinct foraging patterns were identified for Buller's mollymawk on The Snares. During incubation, the off-duty parent made trips averaging 12 days, ranging up to 1,500 km over the Tasman Sea or 750 km along the east coast of the South Island. After the eggs had hatched, while the chick was guarded, the adults made daily trips extending about 200 km east of The Snares. When the chick was large enough to be left alone at the nest, the parents alternated between short trips (1–2 days, 200 km) east of The Snares to long trips (5–6 days, 780 km) along the east coast of the South Island. Finally, when the chick was within a few weeks of fledging, female parents switched to feeding off the West Coast of the South Island (trips of 4–5 days and 650 km) and male parents resorted to trips of about 2 days and 300 km around Stewart Island.

After breeding, adults travel even longer distances. For example, Buller's, Salvin's and Chatham mollymawks cross the Pacific Ocean to forage off the coast of Chile and Peru. Southern and northern royal albatrosses travel even further, to feed off the coast of Argentina in the South Atlantic Ocean. Northern royal albatrosses have been tracked using satellite transmitters. After breeding, they disperse east from Taiaroa Head and the Chatham Islands to locations off Chile, and then around Cape Horn to feed off Argentina and Uruguay, where they remain until near the start of the next breeding season. To return

Above: Buller's mollymawk (*Thalassarche bulleri*)
Photo by **Kerry-Jayne Wilson**

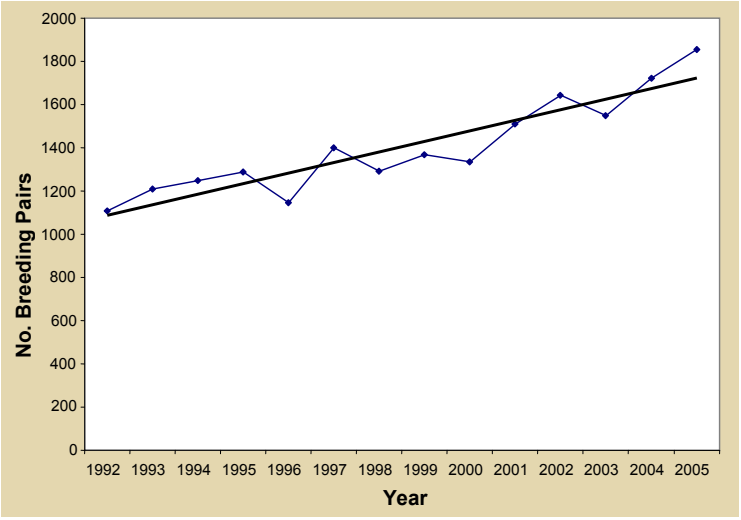
Below: New Zealand white-capped mollymawk (*Thalassarche cauta*) and Salvin's (*Th. salvini*) mollymawks
Photo by **Kerry-Jayne Wilson**

Table 1: New Zealand's breeding albatrosses

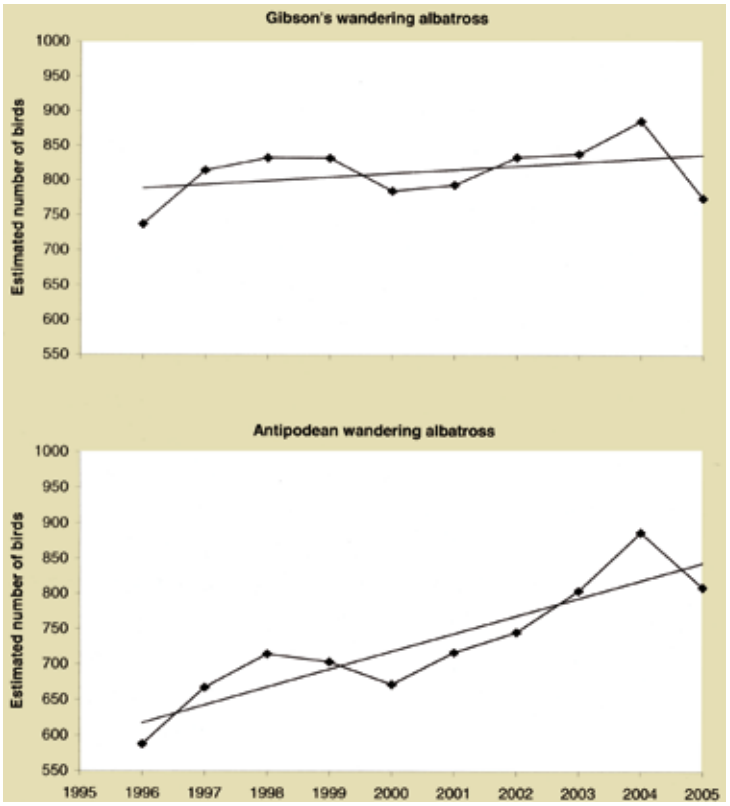
Taxon	Name	Population (breeding pairs)	Status in NZ	In Fisheries Bycatch
Diomedea antipodensis antipodensis	Antipodean albatross	8600	Increasing	Yes
Diomedea antipodensis gibsoni	Gibson's albatross	5,800	Stable	Yes
Diomedea epomophora	Southern royal albatross	8,200-8,600	Stable	Yes
Diomedea sanfordi	Northern royal albatross	6,500-7,000	Declining/ Stable	Yes
Thalassarche chlororhynchos carteri	Eastern yellow-nosed mollymawk	1	Stable	Yes
Thalassarche chrysostoma	Grey-headed mollymawk	6,000-9,000 (p.a)	Declining	Rarely
Thalassarche melanophris	Black-browed mollymawk	140	Increasing	Yes
Thalassarche impavida	Campbell mollymawk	19,000-26,000	Stable/ increasing	Yes
Thalassarche bulleri bulleri	Buller's mollymawk	13625	Increasing	Yes
Thalassarche bulleri n. ssp.	Pacific mollymawk	16,000	Unknown	Yes
Thalassarche cauta steadi	New Zealand white-capped mollymawk	70,000-80,000	Unknown	Yes
Thalassarche eremita	Chatham mollymawk	5500	Stable	Yes
Thalassarche salvini	Salvin's mollymawk	32,000	Stable	Yes
Phoebetria palpebrata	Light-mantled sooty-albatross	7,000 (p.a)	Declining	Rarely

Sources: Primarily Taylor 2000a, 2000b

Annual variation in counts of breeding pairs of Buller's mollymawks on the North Promontory, The Snares, 1992-2005



The number of breeding Antipodean and Gibson's wandering albatrosses alive each year on Antipodes and Adams Island, respectively (estimated by mark-recapture analysis of birds banded in the two study areas on Antipodes and Adams Islands and fitted regression lines of the log of the number of birds against time)



to their breeding grounds in New Zealand, the birds migrate rapidly eastwards below South Africa and Australia, traveling with the prevailing winds and circumnavigating the Southern Hemisphere. These long-distance movements make these populations extremely susceptible to unregulated fisheries on the high seas or traditional inshore fisheries. Less is known about the movements of young birds in the years before they breed.

Grey-headed mollymawks and Light-mantled sooty-albatrosses are rarely encountered in bycatch. A decline in the numbers of both species breeding on Campbell Island recorded since the 1940s appears to be related to movements in the Antarctic Front causing variation in the food supply. The removal of sheep on Campbell Island has significantly reduced the area of suitable breeding habitat but has not yet impacted on the burgeoning population of Southern royal albatross. An increase in marine mammal numbers has been implicated in the loss of breeding habitat, predation and competition for food but this has not been quantified. Plastic ingestion has been implicated in a decline in fecundity in North Pacific albatrosses. Despite the presence of some regurgitated plastic in New Zealand albatross colonies here is currently no evidence of any adverse effects. Disease (which may be a result of global warming or transmission from researchers) has been implicated in the decline of eastern yellow-nosed mollymawk in the Indian Ocean; however, there is no evidence that disease outbreaks have occurred in New Zealand albatross populations. There are no reports of large scale oil spills affecting albatrosses in New Zealand.

Above: Black-browed mollymawk (*Thalassarche melanophris*) and Cape Petrel (*Daption capense*)
Photo by **Kerry-Jayne Wilson**

Below: Antipodean wandering albatross (*Diomedea antipodensis*)
Photo by **Kerry-Jayne Wilson**

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PETRELS

New Zealand has the richest diversity of petrels in the world. Thirty-four species breed from Kermadec Islands in the north (29°) to Campbell Island in the south (52°). The breeding species include two fulmarine petrels (Macronectes and Daption), four large Procellaria petrels, seven shearwaters (*Puffinus spp.*), four prions (*Pachyptila spp.*), 11 gadfly petrels (*Pterodroma spp.*), four storm petrels (*Garrodia*, *Pelagodroma* and two *Fregetta*), and two diving petrels (Pelecanoides). Ten of these species are endemic to New Zealand. The 34 species are further divided into 40 breeding subspecies. Of these subspecies, 17 are endemic. The taxonomic status and affinity of two petrels is still uncertain. Black and white storm petrels seen off northern New Zealand in recent years may be the New Zealand storm petrel (*Pealeornis maoriana*), last observed over a century ago. The population of South Georgian diving petrels (*Pelecanoides georgicus*) breeding on Codfish Island (off Stewart Island) may be an endemic taxon. In addition to the breeding species, a further eight petrel species regularly visit New Zealand seas and another 15 species have been reported as vagrants or beach-cast birds.

All New Zealand petrel species are fully protected under the Wildlife Act 1953. However many species are at risk of extinction. The most significant threat is predation by introduced mammals. Formerly the mainland had a host of breeding species that nested from the coastal slopes to the mountain tops. Today only two petrel species nest only on the New Zealand mainland with

no island refuges. Westland petrels (*Procellaria westlandica*) nest in rain forest near Punakaiki and Hutton's shearwaters (*Puffinus huttoni*) in two sites high up on the Seaward Kaikoura Range. Tiny remnant populations of four other species nest on steep coastal cliffs around the main islands of New Zealand. On the Chatham Islands, several petrels nest on steep coastal cliffs, but one species, the critically endangered Chatham Island taiko (*Pterodroma magentae*) nests only in forested valleys on the main island. All remaining petrel species now breed only on small offshore islands.

The densest petrel populations are found on islands free of introduced predators. Norway rats (*Rattus norvegicus*), feral cats (*Felis catus*), stoats (*Mustela erminea*) and feral pigs (*Sus scrofa*) are the most significant predators. Ship rats (*R. rattus*), kiore (*R. exulans*), ferrets (*M. furo*) and possums (*Trichosurus vulpecula*) all impact on petrels at some sites. Weka (*Gallirallus australis*) severely impact several of the smaller petrel species and this has lead to population declines on offshore islands to which weka were introduced. Introduced browsing mammals damage the petrel's breeding habitat and trample burrows.

Introduced predators and browsers have been eradicated from a number of offshore islands, the largest being Campbell Island (11,300 ha). These eradications have removed some of the most significant threats to breeding seabirds and allowed populations to begin recovery. For example, Pycroft's petrel (*Pterodroma pycrofti*) is now increasing in numbers and range on the Mercury and Chickens Island groups following removal of kiore in the early 1990's. The eradication of rats on Little Barrier and Codfish Islands has allowed Cook's petrels (*P. cookii*) on those islands to breed with greater success and this species is likely to soon be down-listed from its threatened ranking.

Fisheries interactions are another major threat to petrels, especially the larger species. The species most at risk are those that are capable divers and regularly scavenge behind fishing vessels. The *Procellaria* petrels, flesh-footed shearwater (*Puffinus carneipes*) and sooty shearwater (*Puffinus griseus*) are the species most often caught on long-lines or snared during trawl fishing operations. While commercial fishing is the main threat, recreational line fishing is responsible for the deaths of many flesh-footed shearwaters in northern waters. Set-net fishing also impacts on petrels, especially those species that forage close inshore. Hutton's shearwaters, for example, have been reported in set-nets on a number of occasions. Migratory species are exposed to fisheries impacts both during the breeding season and during their non-breeding migratory journeys. For example flesh-footed and sooty shearwaters are taken in salmon gill net fisheries from Alaska south to Oregon.

Other threats include ingestion of plastics and water borne chemicals, and oil spills. These threats are a particular problem for these species that migrate to distant oceans. For example sooty shearwaters have been killed in oil spills off North America and stomach contents of this species reveal plastic residues probably taken during their annual sojourn in the North Pacific. The crowding of petrels onto the few remaining predator free islands is yet another problem. On densely burrowed islands, suitable nesting habitat is scarce and intra- and inter- specific competition for nest sites can be intense. On Rangatira Island in the Chatham Island group, the rare, endemic Chatham petrel (*Pterodroma axillaris*) competes for burrows with the locally abundant broad-billed prion (*Pachyptila vittata*). An intensive management programme involving finding nesting burrows, converting them to artificial wooden nest boxes and use of entrance flaps to prevent prions from entering has stabilised the small population of Chatham petrels. Breeding success has been raised from 10-30% in the early 1990s to around 80%. This has lead to increased recruitment of young birds and a modest population increase (currently about 1000-1100 birds).

Above: Northern giant petrel (*Macronectes halli*)
Photo by **Kerry-Jayne Wilson**

Below: Westland petrel (*Procellaria westlandica*)
Photo by **Kerry-Jayne Wilson**

Habitat loss has primarily resulted from the loss of the mainland nesting sites due to predation by introduced mammals. On some islands, the removal of introduced browsing mammals has created some new problems for petrels. Regeneration of native plants has created dense monocultures of sedges, vines and ferns on some islands. On Macauley Island in the Kermadec group, tall *Hypolepis* fern is smothering breeding areas and may be displacing the near endemic white-naped petrel (*Pterodroma cervicalis*) from its last stronghold. Management of the vegetation may be required until taller forest has re-established. On other islands, introduced weeds have taken over after removal of browsing mammals. For example, on Motunau Island in North Canterbury, boxthorn (*Lycium ferocissimum*) (a thorny shrub capable of snaring petrels) became established and requires active control. To our knowledge no outbreaks of serious viral illnesses have occurred in petrels in New Zealand.

In the near future global climate change may prove to be the major threat to petrels. Sea temperature warming has occurred in the past century and is likely to have caused a decline in ocean productivity. Higher levels of UV light exposure in the southern ocean due to ozone depletion

Table 2: Petrel species of conservation concern in New Zealand

Conservation status	Scientific name	Common name	Population size (NZ)	Population trend (past 10 years)
Nationally critical	*Pterodroma magentae*	Chatham Island taiko	120-150 birds	Slight increase
	Pelagodroma marina albiclunis	Kermadec storm petrel	100+ prs?	Stable?
	Pelecanoides georgicus (Codfish Island)	Codfish Island South Georgian diving petrel	150 birds	Increasing then declining
Nationally endangered	*Pterodroma axillaris*	Chatham petrel	1100 birds	Slight increase
	Pterodroma neglecta	Kermadec petrel	5-10,000 prs	Stable?
	Puffinus huttoni	Hutton's shearwater	150-200,000 prs	Slight decrease?
Gradual decline	*Pachyptila desolata*	Antarctic prion	Tens of thousands prs?	Declining?
	Procellaria cinerea	Grey petrel	50-60,000 prs	Declining?
	Pterodroma cookii	Cook's petrel	50,000+ prs	Declining?
	Puffinus griseus	Sooty shearwater	Several million prs	Declining
	Puffinus carneipes	Flesh-footed shearwater	20,000 prs	Declining?
Range restricted	*Macronectes halli*	Northern giant petrel	2000-3000 prs	Stable
	Pachyptila crassirostris pyramidalis	Chatham Island fulmar prion	1000-5000 prs	Stable?
	Pachyptila crassirostris flemingi	Lesser fulmar prion	1000 prs	Stable?
	Procellaria aequinoctialis	White-chinned petrel	200,000+ prs	Stable?
	Procellaria parkinsoni	Black petrel	5-10,000 birds	Stable?
	Procellaria westlandica	Westland petrel	2000-5000 prs	Stable?
	Pterodroma cervicalis	White-naped petrel	50,000+ prs	Increasing?
	Puffinus bulleri	Buller's shearwater	Several million birds	Stable?

are predicted to impact on chlorophyll A production and decrease productivity at the base of the food chain. Global climate change may interrupt migration patterns for seabirds, reduce food stocks and increase the frequency of storm events. Already severe storms have affected some small islands. For example, on Codfish Island, a storm in 2003 swept out a large section of sand dunes along the beach at Sealers Bay and destroyed 41% of the South Georgian diving petrel nest sites. The same storm also caused the deaths of at least 15% of this tiny population of less than 150 birds.

Since 1990 the development of petrel translocation techniques has provided the opportunity for threatened species to be transferred to new safe sites and for islands cleared of pests to have seabirds returned to begin the process of ecosystem restoration. While the status of some threatened petrel species has begun to improve, there are still several species that will require intensive management to avoid extinction. The Chatham Island taiko, Chatham petrel, the Codfish Island population of South Georgian diving petrels and Kermadec storm petrel are the species at greatest risk. Two significant events in 2006 were the confirmation by Mike Imber and Karen Baird that Kermadec storm petrels breed on the summit of Haszard Island (a tiny stack off Macauley Island), and the first successful breeding by Chatham petrels on Pitt Island in more than a century. The identity of "New Zealand storm petrels" and whether or not they breed in northern New Zealand still needs confirmation.

Of the 40 subspecies of petrels breeding in New Zealand, nearly half are threatened, declining or have restricted breeding ranges (Table 2). The remaining 21 species/subspecies are thought to be stable or increasing in numbers following habitat improvements, and not currently considered at risk. The location and population size of petrel colonies in New Zealand is poorly known. Only a handful of species have had any work done on their population dynamics (survival and recruitment rates) and the population trends for most species has not been studied in a scientifically robust manner. Urgent work is needed on a number of species in view of the potentially significant changes expected in the ocean environment in the next 50 years (only 2-3 petrel generations).

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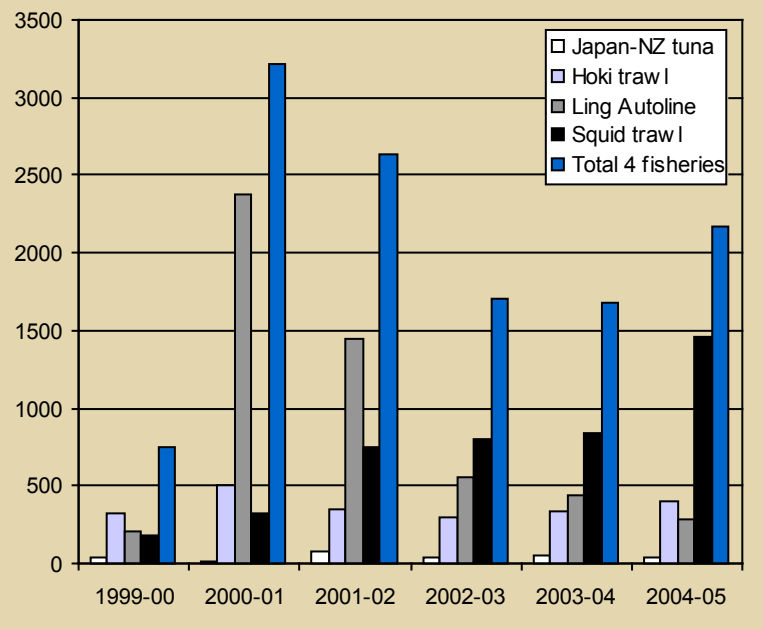
Seabird catch in observed sectors of the fishery (estimated total)



Above: Sooty shearwater (*Puffinus griseus*)
Photo: Graeme Taylor

Below: Flesh-footed shearwater (Puffinus carneipes)
Photo: Graeme Taylor

Bycatch of Albatrosses and Petrels in New Zealand Fisheries

Albatrosses and petrels are attracted to fishing vessels to feed on discarded fish and offal. This leads to incidental seabird captures particularly in trawl and longline fisheries and globally bycatch is recognised as one of the main threats to seabird populations. Around 40 species of seabird are known to have been caught in New Zealand fisheries during the last 10 years. The predominant species caught in New Zealand fisheries are white-chinned petrel (*Procellaria aequinoctialis*), grey petrel (*P. cinerea*), sooty shearwater (*Puffinus griseus*), white-capped mollymawk (*Thalassarche steadi*), Salvin's mollymawk (*T. salvini*), Campbell mollymawk (*T. impavida*) and Buller's mollymawk (*T. bulleri*). The New Zealand breeding populations of these species number in the tens to hundreds of thousands. Rarer species such as Chatham mollymawk (*T. eremita*), Westland petrel (*Procellaria westlandica*) and black petrel (*P. parkinsoni*) are caught in small numbers sporadically. Little is known about seabird capture in coastal setnet fisheries which probably affect penguins, shearwaters and shags. The extent to which these captures affect the population viability of New Zealand breeding seabirds is unknown, but research programmes are in place to address this question over the next five years.

Monitoring of fisheries bycatch has been limited, with coverage of only a small portion of the fisheries potentially interacting with seabirds. There is ongoing monitoring of bird captures in the large-vessel trawl fleets fishing for hoki and squid and in selected parts of the longline fisheries for tunas and ling. This monitoring has shown declines in bycatch rates in the ling autoline fleet following the implementation of line-weighting regimes. There has been success in reducing seabird take in the Japan-New Zealand tuna fleet over a period of several years to the 35-50 birds currently caught each year. Occasional capture of rare species in these longline fisheries is a continuing challenge. The number of mortalities in 2004/05 in the West-Coast hoki and Auckland Islands squid trawl fisheries was around 475 birds. This number does not include those birds which hit trawl wires and fell into the sea.

Review of bycatch statistics both with New Zealand fisheries and internationally shows that for a particular fishery, recognition of the seabird bycatch problem, research and implementation of effective mitigation measures often takes around five years. This requires coordination and cooperation across various government, industry and environmental advocacy sectors. International initiatives to manage seabird bycatch include the International Plan of Action on Seabirds promoted by the Food and Agriculture Organisation. New Zealand is alone in implementing a mainly voluntary regime to manage bycatch through its National Plan of Action on Seabirds.

Ongoing challenges for reducing

seabird bycatch that affects New Zealand breeding species are; the reduction of offal and whole-fish discharge from vessels, and the capture of New Zealand breeding species in foreign fisheries as the birds migrate to other areas around the globe, in particular the waters off South America and South Africa.

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Petrel Translocations

There are two main reasons to translocate petrels: as part of recovery programmes for threatened species, and to restore their role as ecological drivers at sites from which they have been extirpated. Burrowing petrels had profound effects on many New Zealand terrestrial ecosystems, both on islands and on the mainland. Impacts included the importation of vast quantities of marine nutrients (especially nitrates and phosphates), and the creation of a subterranean network of tunnels providing living space and habitat for a diversity of other animals. Eradication of introduced mammals from islands or fenced mainland sites is often a prerequisite for restoration of petrel colonies, but predator eradication alone may be insufficient to guarantee success. Most petrels are highly faithful to their natal colony, and the establishment of a new colony depends on overcoming this strong homing instinct.

The two main techniques used to attract petrels to new or ancestral sites are sound attraction, and translocations of chicks in the last few weeks before fledging. Solar-powered sound systems that automatically switch on at dusk and off at dawn broadcast calls of species that visit their colonies at night, giving the impression of an active breeding colony. These had been installed at ten sites by 2006. Between 1986 and 2006, ten separate attempts were made to translocate chicks of eight petrel species in New Zealand. However, many of these attempts were too recent to yet determine their success, as most petrel species do not return to land until 3-5 years old. Several of the earlier attempts at translocation were specifically to develop seabird translocation techniques, either generic, using fluttering shearwaters (*Puffinus gavia*) and common diving petrels (*Pelecanoides urinatrix*), or as analogues for more threatened species, grey-faced petrel (*Pterodroma macroptera*) for Chatham Island taiko (*P magentae*), and Pycroft's petrel (*P. pycrofti*) for Chatham petrel (*P. axillaris*). Other species translocated to date are black petrel (*Procellaria parkinsoni*), fairy prion (*Pachyptila turtur*), Chatham petrel and Hutton's shearwater (*Puffinus huttoni*).

All translocations involved hand-feeding all or some chicks, though some species become very fat as nestlings and need little food in their last week or so before fledging. Translocations of diving petrels and fairy prions have required daily or twice-daily feeding of all chicks. Earlier translocation attempts used relatively natural food such as fresh or frozen squid, salmon smolt and Antarctic krill – but a diet based on tinned sardines preserved in soya oil has since been used successfully for six species, with fledging rates of up to 100%. Hand-feeding of chicks is labour intensive, and volunteer involvement in caring for the chicks has been a feature of most translocations.

Seven species of petrels have been recovered as adults at their release sites, with five confirmed breeding. However, for five species; few birds (1-4) have yet been recovered at release sites and for at least two of these, a higher proportion of translocated chicks have returned to the source population. To date, only two translocations have resulted in large numbers of birds returning to the release site – 32 fluttering shearwaters on Maud Island, and 20 common diving petrels on Mana Island. While we now know how to get large numbers of chicks to fledge in good condition, we still do not know how to overcome the strong instinct of most individuals to return to their natal colony.

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Chatham Island Taiko

The Chatham Island taiko (*Pterodroma magentae*) was rediscovered in 1978 by David Crockett, solving a puzzle that linked bird bones on the Chatham Islands with a petrel specimen collected at sea in the 1860s. It took nearly ten years to locate the first breeding burrows. In 1987/88, only three taiko breeding burrows were known, at the head of the Tuku River on main Chatham Island, 4-5 km inland in tall, wet forest.

Over the last 20 years, a large team of dedicated workers and volunteers committed to saving this enigmatic species from extinction have contributed to taiko recovery. The work has entailed protection of all known breeding colonies, finding more breeding sites and monitoring all known taiko pairs and their breeding activity.

Department of Conservation workers trap and poison introduced predators and browsers and protect taiko nests. The main target species are feral cats (*Felis catus*) and rats (*Rattus sp.*). Locating new burrows has involved the cooperation of David Crockett and his team of OSNZ volunteers, conservation staff and supportive landowners. Every 2-3 years a radio telemetry project involves spotlighting taiko as they fly inland toward their breeding sites, capturing these birds and attaching tail-mounted radio transmitters. The birds are then tracked to pinpoint promising search areas. Ground teams then head in after dark to locate the birds, hopefully at a new burrow site. In recent years, a specially trained dog and handler have joined the search and have been successful in finding new burrows.

Burrow monitoring, mainly in October each year, has concentrated on capturing birds at the burrows for banding and to determine annual survival. Blood samples have been collected from all birds handled since 1996. These have been used to sex the birds and are currently being analysed to assess genetic relationships within the population. All chicks are captured in April or early May to be banded and measured. Small transmitters are attached to ensure that all chicks make it safely to sea. Every year a few of the fledglings need to be taken out to the coast after crash-landing in the forest.

The species has a precarious hold on its existence. Mark-recapture estimates put the population at 120-150 birds. In 2005/06, the number of known breeding pairs edged up to 15 and a record 11 chicks fledged. Over ten banded chicks have now returned to the scattered colony. The main hope for the species' future lies with the Sweetwater Covenant, a predator proof fenced hilltop about 500m from the coast. The site was gifted by landowners Bruce and Liz Tuanui and funding for the fence was secured by the Chatham Island Taiko Trust. In October 2006 a sound attraction unit with taiko calls was installed and the first taiko chick transfers to this site are planned for 2007.

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Top: Sweetwater exclosure, Alison Davis, Liz and Bruce Tuanui
Photo by **Graeme Taylor**

Black Petrel

The endemic black petrel (*Procellaria parkinsoni*) once bred on coastal and inland ranges of the North and upper South Islands. They are now only found on Little and Great Barrier Islands in the Hauraki Gulf. The Great Barrier Island population is estimated to be 1600 breeding pairs with approximately 100 pairs on Little Barrier Island.

The Great Barrier population is affected by predation by rats (*Rattus sp*), feral cats (*Felis catus*) and occasionally feral pigs (*Sus scrofa*). Little Barrier Island is now predator-free, but once had kiore (*Rattus exulans*) and feral cats which preyed heavily on the petrels. Black petrels scavenge behind fishing vessels and have been recorded in the bycatch of long-line fisheries in New Zealand waters. They

may also be at threat from bycatch in foreign waters during their migration and wintering period in South America. Recent deployment of data loggers has shown that during breeding black petrels forage more widely than expected; around New Zealand visiting Fiordland and the Chatham Rise with some also going to eastern Australia and Fiji.

We have monitored the Great Barrier Island population since the 1995. During this study, population estimates, breeding success, mortality factors and survival rates have been determined. Over 1500 adult birds and 1200 chicks have been banded. Population models suggest that the population is in slight decline, (estimated decline 2.8% per year) and that adult survival is lower than for other petrels. Despite low adult survival, breeding success was high, with chicks fledging from three quarters of eggs laid. Survival of pre-breeders is 92%, which indicates that juveniles are returning to the colony in good numbers.

The black petrel population appears to be fairly stable, but is still at risk from land-based threats such as rats and feral cats on Great Barrier Island and at sea from undetermined fisheries-related mortality.

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Above and Below: Chatham petrel (*Pterodroma axillaris*)
Photos by **Graeme Taylor**

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Pycroft's Petrel

The status of Pycroft's petrel (*Pterodroma pycrofti*) is representative of many New Zealand breeding petrels. They once bred at Norfolk Island and probably at mainland sites in northern New Zealand, as well as many offshore islands. With the introduction of mammalian predators the species became extinct on the mainland and survived only on a few islands that remained free of introduced predators. The species can persist, at least in the medium term, with kiore (*Rattus exulans*). Island surveys in the 1970's and 1980's located some breeding sites and it is likely that they also bred on other poorly surveyed islands. No accurate counts were ever made and few of these islands have been resurveyed. Other than general accounts of the breeding cycle virtually nothing else is known of its biology. The species is threatened but not at immediate risk of extinction. Pycroft's petrel numbers have apparently increased following the eradication of kiore from some islands where the petrels survived. Because Pycroft's petrel is less at risk than other small *Pterodroma* species it has been used to develop translocation methodologies for use with it's rarer congeners. Chick development, meal size and feeding frequencies were studied so that translocated *Pterodroma* chicks could be fed prior to fledging. Pycroft's chicks have been translocated from Red Mercury to Cuvier Island and the species used to develop burrow protection devices for the protection of the critically endangered Chatham petrel (*P. axillaris*). As with most other petrels that are not under immediate threat their status and biology remains little known.

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New Zealand Storm Petrel

Until 2003, the New Zealand storm-petrel (NZSP) was known from only three specimens held in museums in France and England. It was thought to be either a rare colour morph of Wilson's storm-petrel (*Oceanites oceanicus*), or a distinct, but extinct species, *Pealeornis maoriana*.

Then in January 2003 Sav Saville and Brent Stephenson spotted a small black and white storm-petrel, they suggested could be a NZSP, off Whitianga. In November 2003 a small 'flock' of these birds was seen in the Hauraki Gulf and sightings of these birds in northern New Zealand have continued from October to April each year.

Where have these birds suddenly appeared from and are they indeed NZSPs? Perhaps their dramatic rediscovery is an artifact of the recent interest in pelagic bird watching. Although the Hauraki Gulf has been well plied by fisherman and naturalists, birding trips which use chum (fish waste) to attract seabirds close to the observers' boats is a recent development. Alternatively, perhaps their numbers are increasing following recent eradication of rodents from nearby islands. Whichever, it seems likely that the population has persisted unnoticed ever since those specimens were collected in the 19th century.

Confirmation that the birds seen are the same species as the three museum specimens has been slow in coming, mainly because this required the capture of birds. In November 2005 a bird flew into the cabin of a boat anchored off Little Barrier Island. The bird was held overnight and next day Richard Griffiths and Karen Baird were there to band, measure, and photograph it. A further three birds were captured in January 2006. All birds were banded, measured, photographed, and fitted with a small radio-transmitter before release. Unfortunately, only one bird was detected at sea and no signals were received from birds on land. These captures support the assertion that these birds do indeed belong to the same species as those museum specimens, and are a distinct species. The birds' identity is currently being reviewed by the Ornithological Society of New Zealand's Rare Birds Committee.

Now the main priority is to discover their breeding location, to estimate the population size and assess population trends so that protection can be ensured. Molecular work is also underway to compare the four captured birds with the museum specimens and other storm-petrel species. Fieldwork planned for the 2006/07 summer involves the further capture of birds, attachment of transmitters, and survey of islands where they may breed.

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Penguins

Despite being an iconic group and the subject of countless documentaries, New Zealand penguins remain enigmatic with all too much still unknown. Of the six species that breed in the New Zealand region (four of which are endemic), five are in decline.

Mammalian predators including dogs (*Canis familiaris*), cats (*Felis catus*), ferrets (*Mustela furo*) and stoats (*M. erminea*) are the traditional foes of mainland nesting penguins and although advances in trap technology and dog legislation has seen some small reduction in penguin mortality, a solution to mainland predator problems is unlikely in the foreseeable future. Where there is some protection from predators, blue penguins (*Eudyptula minor*) can do well and there are some significant populations on islands and predator controlled sites. Elsewhere, their populations are seeing slow declines and localised extinctions. A growing problem for the blue penguin, and to a limited extent the yellow-eyed penguin (*Megadyptes*

Above: Snares crested penguin (*Eudyptes schlegei*)
Photo by **Dave Houston**

antipodes), is coastal development. Coastal subdivisions and other developments can result in a decrease the amount of suitable nesting habitat, an increase the numbers of domestic dogs and raise the risk of road kills.

Habitat protection alone is not sufficient to ensure the long-term viability of penguin populations, as the state of the yellow-eyed and crested (*Eudyptes sp*) penguins can attest. While the former, at least in its mainland habitat is still subject to the pressures of introduced predators, most crested penguins live on remote sub-Antarctic islands that are largely predator free, yet all but one species are in apparent decline.

The plight of the rockhopper penguin (*Eudyptes chrysocome*) is the most dramatic. Its population on Campbell Island has collapsed from 1.6 million breeding pairs in the 1940's to just over 100,000 pairs in 1985 and there is no evidence to indicate that the decline has halted. A similar decline in rockhoppers has also been noted on the Antipodes Islands and in the erect-crested penguin (*E. sclateri*) population there and at the Bounty Islands.

The reasons for the rockhopper penguin's decline are unclear but are most likely related to changes in food availability, either from reduced marine productivity or shifts in prey distribution. While natural marine and climate cycles may be involved, so may human influence through either global warming or fishing. Our knowledge of the foraging ecology of these species is at best basic and without baseline information, detecting and understanding changes is difficult.

Tourism has the potential to be of benefit to some species, as it has been for blue penguins in Oamaru, who instead of being considered pests and accused of trespass are now a valued asset. Tourism is not always so benign. Viewing yellow-eyed penguins is a must for many of the tourists that visit coastal Otago, but the pressure of tourist numbers at some sites and the overcrowding of facilities is seeing spillover into other breeding sites where, because of their value to the penguin population, viewing has been discouraged and visitor facilities, like hides, do not exist.

While the tourists may get a "natural" experience there is growing evidence that the penguins are suffering, with increased levels of stress hormones and reduced chick fledge weights (and thus lower survival) documented. The behaviour of some visitors undoubtedly contributes to this, as some visitors pursue penguins to get a better photo.

Fiordland crested penguins (*Eudyptes pachyrhynchus*) are even more susceptible to human disturbance and even though the numbers of tourists are a fraction of those viewing yellow-eyeds, most of the Fiordland penguin colonies accessible to the public are in decline. The sensitivity of these birds to disturbance has even seen the monitoring of breeding at some South Westland sites suspended.

The Snares penguin (*E. robustus*) is the one species that is not in decline, the last census in 2000 revealing a similar number of breeding pairs to previous counts. Why they alone should have a stable population is puzzling, but the proximity of The Snares to the nutrient-rich Southland current may be a factor.

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predation by cats (*Felis catus*). However, despite there being no evidence that chicks were still lost to cats, few chicks have fledged in the last three years.

Disease has been an issue for both Stewart Island and Otago Yellow-eyed populations, with the Corynebacterium outbreak of 2004 claiming around 50% of all chicks. A blood parasite, formerly only known from Fiordland crested penguins (*Eudyptes pachyrhynchus*), has also recently been identified in yellow-eyed penguins on Stewart Island. The poor years of the late 1980's and bio-toxin induced mass mortality event of 1989 can be linked to El Nino/southern oscillation events, but other marine factors are having unknown and perhaps immeasurable impacts.

Recent research has confirmed that yellow-eyed penguins forage almost exclusively on the sea floor. Some penguins have been drowned in nets set on the sea bottom even in waters up to100m deep, however information on the frequency of capture is sparse. Evidence is also emerging of yellow-eyed penguins foraging in areas of sea bed disturbed by trawling and dredging. The impacts, if any, of this disturbance to the penguin's marine habitat are unknown.

So if things aren't too good on the mainland, what's going on in the "stronghold" of the species, the Auckland and Campbell Islands? The truth is we don't really know, the last census of these islands was carried out 15 years ago.

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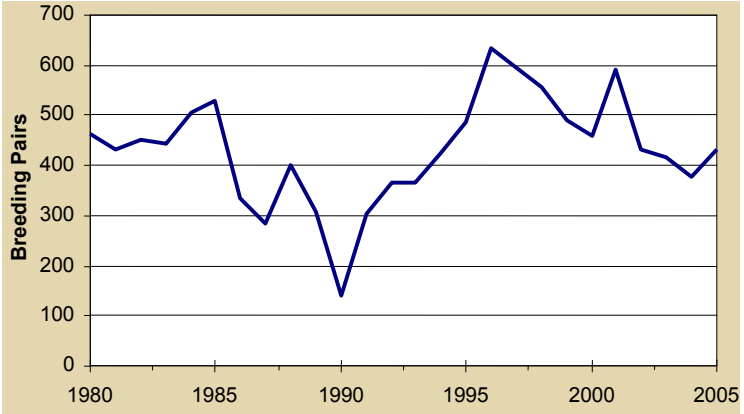
Yellow-Eyed Penguin

Over the last 20 years much effort has been put into the conservation of the yellow-eyed penguin (*Megadyptes antipodes*) in Otago, its principal mainland range. Efforts, lead by the Yellow-eyed Penguin Trust and Department of Conservation, have been focussed on the two problems identified in the early 1980's – predators and breeding habitat. Predator control is ongoing at many sites, significant areas of coastal land have been protected and the slow process of ecological restoration started, but yellow-eyed penguin numbers have not increased significantly.

On Stewart Island the situation is worse. The first census, completed in 2003, revealed a population of just 178 breeding pairs, alarmingly short of the previous estimates of 470-600 pairs. The lack of young and non-breeding birds in what appears to be a population in decline saw research and management efforts focussed on

Population trends for the yellow-eyed penguin in Otago



Shags

New Zealand's shags (cormorants) fall into two distinct groups. Those that predominantly use freshwater or estuarine habitats and those that are primarily, or exclusively marine. The freshwater/estuarine species also occur in Australia and some species in other counties as well. The New Zealand populations of the pied (*Phalacrocorax varius varius*) and little shags (*P. melanoleucos brevirostris*) are sub-species endemic to New Zealand. Within New Zealand, all four species (black (*P. carbo*), pied, little and little black (*P. sulcirostris*) are widespread and moderately common, although the little black shag

breeds only in the North Island. The black shag is one of few native birds that is not totally protected. The most comprehensive population surveys and population and breeding studies are being carried out in the Wellington region where black shag and little shag numbers may have declined. Recent trends elsewhere are unknown. The biology of black and pied shags is moderately well known but little and little black shags have been little studied.

The marine shags are all endemic to New Zealand, all but one have restricted distributions and most are of conservation concern. Three taxa, spotted (*Stictocarbo punctatus*), blue (*S. punctatus steadi*) and Pitt Island (*S. featherstoni*) shags are generally placed in the genus *Stictocarbo* although shag taxonomy is subject to ongoing debate and some taxonomists place all shags in the genus *Phalacrocorax*. The spotted shag has a discontinuous distribution from Auckland to Southland with perhaps two thirds of the population breeding on Banks Peninsula. The blue shag is a closely related subspecies that occurs on the West Coast from Stewart Island to Westport. The Pitt Island shag is endemic to the Chatham Islands. The numbers of spotted shags on Banks Peninsula doubled between 1960 and 1996, the Otago populations appear to fluctuate around 1500 pairs, but there are no reliable estimates of numbers further north. The North Island population may be in decline. No counts have been made at blue shag colonies. The Pitt Island shag is endangered. Most colonies were censused in 1997 and only 669 pairs located. A subsequent count in 2003 suggested a significant decline in numbers. The basic breeding cycle of the spotted shag has been described, but there has been very little other work on that or the other *Stictocarbo* taxa. Population dynamics, foods, foraging ecology and population trends are virtually unknown for all three.

The remaining shags belong to the genus *Leucocarbo*. The taxonomic relationships of these species need revision but on the basis of their disjunct distributions and variations in morphology each is currently treated as a separate species. Recent fossils found in parts of New Zealand not currently occupied by Leucocarbo shags gives credence to the view that the New Zealand king shag (*L. carunculatus*) and the Stewart Island shag (*L. chalconotus*) are in fact variants of the same species and molecular studies being conducted by Martyn Kennedy at the University of Otago, could result in a further reduction in the number of species recognised. The King shag is restricted to the outer regions of the Marlborough Sounds, and the Stewart Island shag occurs in Otago, Southland and Stewart Island. The Chatham (*L. onslowi*), Auckland (*L. colensoi*), Campbell (*L campbelli*) and Bounty (*L. ranfurlyi*) shags are each confined to those respective island groups. The diet, foraging ecology, population dynamics and breeding biology are not adequately known for any New Zealand Leucocarbo species.

The king shag is endangered with a total population of only about 645 birds. However, counts over the last decade suggest the population is stable. The Otago population of the Stewart Island shag increased in both range and numbers during the 1990s but further south trends are confusing. Each with populations of about 2000 pairs, the Stewart Island and Campbell Island shags are the most secure of the New Zealand species in this genus. The Chatham shag appears to have undergone a large decline with counts in 2003 suggesting a population of only a third of that recorded in 1997. The Chatham shag is almost certainly the most threatened of New Zealand's shag species. Counts also suggest a decline in the numbers of Bounty Island shags. However, for both species counts are not strictly comparable and latter counts could reflect poor breeding seasons in the second year counts were done. There is little census data for any of the remaining species but they appear to be small (<1000 pairs) and stable.

Fisheries practices pose some threat to all species that breed around the New Zealand mainland and the Chatham Islands with line-fishing, set-nets and crayfish pots catching an unknown number of shags each year. Set-nets pose the greatest risk. A few shags are still shot in misguided attempts to protect fish, in particular trout and salmon. The black and Pied shags are probably the species most often killed but illegal shooting of spotted, Stewart Island, Chatham and Pitt Island shags has been documented. Persecution was more intense in the past. All species tend to nest in trees, on cliffs or on islands where predation presents a minor threat. The spotted and pied shags are potentially at risk from oil spills as a large proportion of their populations feed near major ports. Shags are sensitive to disturbance by people. This is a particular problem for the king shag whose colonies are in waters where boating activities are popular.

While research on population dynamics, breeding biology and movements on all New Zealand shags is desirable, the need for research is most urgently required for the marine shags. Almost none of the census, survey or research priorities identified for New Zealand shags in 2000 have been addressed. Recent counts are strongly indicative of declines in Chatham, Pitt Island and Bounty Island shags. For all three species the most optimistic counts show populations of c600 pairs. Research to determine the reasons for declines and ways to reverse these declines is urgently required. The New Zealand king shag is the rarest of the New Zealand shags but its population is probably stable. Shags remain a poorly studied group whose conservation needs are inadequately documented. Even easily accessible species, such as the spotted shag, have attracted little attention from researchers. Most shag colonies have not been censused for at least a decade and therefore the population estimates and trends indicated here might be unreliable.

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Above: Pitt island shag (*Stictocarbo featherstoni*) Photo by **Kerry-Jayne Wilson**

Gannets and Boobies

Four species of gannet and booby occur in New Zealand waters. Two of these, the Australasian gannet (*Morus serrator*) and masked booby (*Sula dactylatra*), breed within New Zealand, whilst the Cape gannet (*M. capensis*) and brown booby (*S. leucogaster*) occur in New Zealand only as vagrants (although a male Cape gannet has breed with an Australasian Gannet annually since 1997 and fledged one hybrid offspring).

The Australasian gannet breeds in both New Zealand and Australia. There are currently 27 gannetries in New Zealand, and most (>80%) of the New Zealand population breeds between 34 and 38°S. The location of breeding sites seems related to sea-temperature, which determines the availability of food for these primarily fish eating birds. The predominant prey species of Australasian gannets in New Zealand are inshore pelagic schooling fish and diurnal squid. Differences in diet at different gannetries are evident, and some seasonal variation is also apparent. Gannets also take discards from boats, and will feed on quite large flatfish at the back of trawlers.

National population counts date back to the 1940s and much has been published on their basic biology. Censuses have been conducted in New Zealand in the 1946/47, 1969/70, and 1980/81 breeding seasons, and this has suggested an annual population increase of 2.3%, with the population in 1980/81 estimated at 46,004 breeding pairs in NZ, and 6660 in Australia. A national census was conducted in the 2000/01 breeding season, but the results of this are yet to be published, although results indicate a continued increase, with some gannetries remaining stable. The current population estimate is 55,000 breeding pairs in New Zealand and 20,000 in Australia.

With regards to population changes, three gannetries have been well studied,

with the most famous of these being at Cape Kidnappers (near annual counts since 1947). The detailed study of the development of the Plateau colony at Kidnappers forms one of the most detailed and long-standing seabird monitoring projects anywhere in the World. More recently BM Stephenson conducted a three-year study at Cape Kidnappers investigating inter-annual differences in breeding biology, finding major annual fluctuations in egg and chick survival and overall breeding success. This was attributed to differences in food availability and weather, rather than disturbance, which has in the past been suggested as the cause for breeding failures.

The development of the Farewell Spit gannetries has been closely monitored since breeding there began in 1983. This low-lying, sea-level gannetry has grown rapidly to about 2500 breeding pairs in 2005. The Muriwai gannetry has shown similar increases with the breeding population now extending onto the mainland opposite the islets that the birds have historically nested on.

The increasing population trend of this species suggests little need for active management beyond the current population monitoring and assessment of tourism activities at Cape Kidnappers, Farewell Spit and Muriwai. The species is not of major concern for fisheries bycatch.

Within New Zealand, the masked booby breeds only on the Kermadec Islands. This subspecies also occurs on Lord Howe and Norfolk Islands, and is the rarest of the masked booby subspecies, numbering less than 1200 breeding pairs. It is currently listed as Vulnerable (IUCN). Approximately 240 pairs breed on the Kermadec Islands, most on Macauley and Curtis Islands, with lesser numbers on the Meyer Islands, Herald Islets, and Cheeseman Island. Very little is known about the breeding biology, foraging ecology, and movements of these birds. It appears that there is some movement between Norfolk Island and the Kermadecs, as birds banded on the former have been captured at breeding sites on the Kermadec Islands. With the eradication of introduced mammals from Raoul Island it is expected that birds will colonise Raoul, and the removal of goats and rats from Macauley Island should lead to an increase in numbers there. There is a need to investigate the breeding biology and population trends of this species on the Kermadecs, and to understand dispersal between here and Norfolk and Lord Howe Islands.

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Gulls, Skuas and Terns

New Zealand has three species of gulls, two that are widespread, common and also occur elsewhere and one, the black-billed gull (*Larus bulleri*), that is endemic, endangered and in serious decline. While black-billed gulls are still widely distributed in both North and South Islands, the majority breed on braided rivers in Southland with their only other stronghold in Canterbury. Black-backed gull (*L. dominicanus*) numbers have increased during the last century and the species is considered a pest near airports and where ever food can be scavenged. The species may impact on other native birds but this has not been adequately studied. There is debate whether the New Zealand red-billed gulls comprise a species (*L. scopulinus*) or sub-species (*L. novaehollandiae scopulinus*) that is endemic to New Zealand and even a suggestion that the sub-Antarctic birds may be distinct enough to be considered a separate sub-species. While the species remains very common throughout mainland New Zealand and on the Chatham, Snares, Auckland and Campbell Islands, declines have been noted in the three largest colonies.

The brown skua (*Catharacta lonnbergi*) is an aggressive predator that has suffered persecution by fishers and, on the Chatham Islands where they scavenge lambs, by farmers. The species was probably never especially common and today there are estimated to be 20-30 pairs around Fiordland and Stewart Island, 80-90 pairs at the Chatham Islands and in total about 350 pairs on the sub-Antarctic islands. Numbers on Campbell Island have declined since the 1940's, probably in association with the marked decline in penguins, albatrosses and elephant seals on that island. Penguin numbers have also declined on the Auckland and Antipodes Islands but it is not known if trends in skua numbers mirror that of the penguins. The species has been subject to intensive study by Euan Young, Auckland University.

Ten species of terns breed in the New Zealand region, four of which are widespread tropical species that, in our region, breed only on the Kermadec Islands. Another widespread tropical species, the grey ternlet (*Procelsterna cerulea*) is common on the Kermadec Islands and up to 50 pairs have recently begun breeding on islands in northern New Zealand. The Kermadec species are discussed in a separate section.

Of the remaining five species three are endemic. Once common in both North and eastern South Islands, the New Zealand fairy tern (*Sterna nereis davisae*) is the country's most critically endangered seabird with only 10 breeding pairs confined to beaches in Northland where peak human use coincides with the breeding season of the terns. Other sub-species occur in Australia, and New Caledonia. Wardens patrol the beaches used by the terns, both to protect the birds and to encourage people to behave appropriately in their presence.

Above: Black-billed gull chicks (*Larus bulleri*)
Photo by **Chris Garden**

The black-fronted tern (*S. albostriata*) breeds on the South Island's braided rivers but outside the breeding season most move to the coast of the South Island and lower North Island. As with most other braided river species, numbers have declined markedly during the last 20-30 years and the decline apparently continues. As with the black-billed gull and with other braided river nesting species the threats are many and varied including, introduced predators, weed encroachment, water abstraction, hydroelectric development and disturbance by people.

The white-fronted tern (*S striata*) is by far the most abundant tern in New Zealand. The species is essentially endemic to New Zealand, although since 1979 a few have nested on islands in Bass Strait, Australia. Some authorities consider the sub-Antarctic populations to be distinct sub-species. Many white-fronted terns migrate to Australia for the non-breeding part of the year. Although they remain common and occur around nearly all of the New Zealand mainland plus the Chatham and Auckland Islands, the population is apparently suffering a slow decline. The cause of the decline has not been determined but disturbance of breeding colonies by people is of some concern. The terns frequently feed in association with surface schooling fish such as kahawai and kingfish. The decline in these species may have made it more difficult for the terns to obtain the small fish that are their main prey.

The two remaining tern species are not common in New Zealand but do occur elsewhere so the New Zealand populations are not critical for the species' survival. The Caspian tern (*S. caspia*) has an almost cosmopolitan distribution breeding throughout the temperate regions of the world. The Antarctic tern (*S. vittata*) has a circum-polar distribution breeding on the Antarctic Peninsula and on sub-Antarctic islands in the Atlantic, Indian and Pacific Oceans. There are perhaps 1000 pairs in the New Zealand region breeding on islands around Stewart Island and on the Snares, Campbell, Antipodes and Bounty Islands. Only the Snares populations have been censused. Antarctic terns have recently disappeared from the Auckland Islands. The New Zealand population is secure providing mammalian predators do not reach the islands on which they breed.

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Black-Billed Gull

The black-billed gull (*Larus bulleri*) is considered the world's most threatened gull species, and is listed as endangered by the IUCN. Black-billed gulls nest on bare gravel on inland waterways throughout New Zealand, most migrating to the coast after breeding. National surveys by OSNZ during 1995, 1996 and 1997 found approximately 70-80% of New Zealand's black-billed gulls bred in Southland's riverbeds. Surveys of the region's four main rivers in 1977 found 147,000 breeding birds in 35 colonies. In 2005, preliminary data from the same four rivers indicated only 11,000 breeding birds in 11 colonies; a 90% decline in less than 30 years, and this in the species' stronghold (Figure 5). Declines and range contractions have been reported elsewhere in the South Island though trends are less clear due to a lack of comprehensive surveys.

The species faces an array of threats including introduced predators and weed encroachment on their riverbed breeding habitat. Declines may also be linked to changes in agricultural practices, at least in Southland where gulls take much of their food from surrounding farms.

Current research will assess historic and future population trends in Southland, devise robust monitoring methodology, document the impact of terrestrial predators and weeds, and investigate diet, demography and movements within the Southland region.

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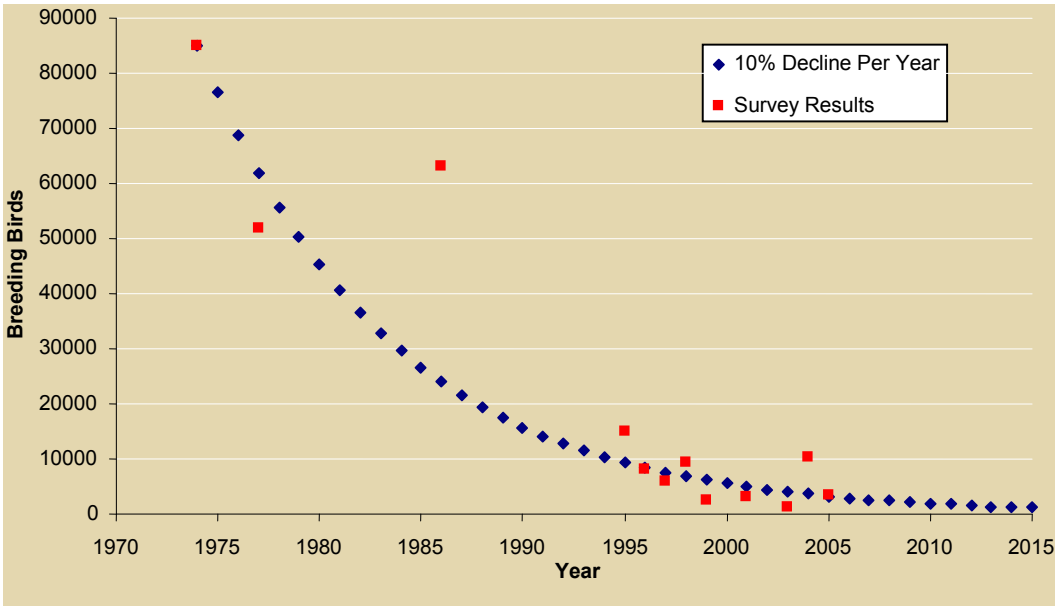
The number of black-billed gulls breeding on the Oreti River, Southland. In the 1990s a quarter to a third of the global population bred there



Black-Fronted Tern

Black-fronted terns (*Sterna albostriata*) over-winter at sea and in coastal areas but are entirely reliant on braided rivers for up to six months of the year. Formerly breeding on both North and South Islands, black-fronted terns now breed only on braided rivers to the east of the South Island's main divide. Predation from introduced mammals, loss of breeding habitat through weed encroachment and loss of feeding and breeding habitat through water abstraction and hydropower development are key factors affecting black-fronted terns while breeding. Nothing is known about factors affecting their survival while away from their breeding grounds.

Research indicates breeding success and survival rates are low, and population modeling shows that under the current conditions, a steady decline is inevitable. Predation is the main contributor to poor survival. There has been no comprehensive population survey and population trends are not clear. Current estimates put the population at under 10,000 individuals.

A range of development proposals for Canterbury and Marlborough rivers, have potential to be detrimental for the black-fronted tern and have highlighted how little is known about the tern populations on these rivers. As a result, several research projects have been implemented in an attempt to understand the efficacy of predator control and increase knowledge about feeding ecology and breeding success across a range of rivers. This information is crucial for understanding how proposed developments will affect the population and to identify the best forms of mitigation.

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New Zealand Fairy Tern

The NZ fairy tern (*Sterna nereis davisae*) is New Zealand's rarest bird, with a population numbering about 35 individuals. This critically endangered species breeds at only four beaches in the north of the North Island, and is threatened by introduced mammalian predators, habitat modification, human disturbance while breeding, increasing pressures from coastal subdivision and natural environmental events. The Wildlife Service initiated management in 1983/84 when the population had declined to three breeding pairs. Intensive management currently includes trapping mammalian predators, fencing of nesting areas to reduce disturbance, the employment of wardens over the breeding season, colour banding of all chicks, and egg and chick manipulations to maximise productivity. Captive incubation facilities are provided by Auckland Zoo for eggs rescued from storms, tidal inundation or abandonment by adults. Eggs are returned to wild nests prior to hatching, as rearing tern chicks in captivity is not yet feasible. Population modelling indicated that management has halted the decline, resulting in an increase in the population of 1.5% per annum and reducing the calculated risk of extinction within 50 years from 52% to 39%. The number of breeding pairs has increased to ten. Recent DNA analysis has shown that the Australian and New Zealand fairy tern populations are genetically distinct. Management needs to be continued. Further research into the fairy tern's population dynamics is required.

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Below: Fairy tern (*Sterna nereis davisae*)
Photo by **Katrina Hansen**

Kermadec Island Seabirds

The Kermadecs are New Zealand's northernmost islands, located between 29°S and 32°S, in subtropical waters. The largest in the group is Raoul Island (2938 ha). Raoul dominates a northern group of islands and laying offshore are the Herald Isles, the Meyer Islands and other small islands. South of Raoul, but part of the Kermadec group are Macauley Island (306ha) and adjacent Haszard Islet (6ha) which lie 108km SSE of Raoul Island. Curtis (52ha) and adjacent Cheeseman Island (7.4ha). L'Esperance Rock (4.8ha), the southern most of the Kermadec Islands lies 230 km south of Raoul Island.

The Kermadec Islands have never been joined to the mainland of New Zealand. They are true oceanic islands, the summits of volcanic cones. They have formed since the Pliocene and Raoul and Curtis have active volcanic calderas. Due to their

geological youth and possibly regular volcanic activity the number of indigenous species is small. Not surprisingly seabirds were a significant component of the indigenous fauna, but severe modification as a result of mammalian introductions has decimated many of these species, particularly on Raoul and Macauley Islands. The islands are Nature Reserves. A Marine Reserve was gazetted in 1990 and covers all waters and the seabed out to 12 nautical miles (22.4 km).

The Kermadec Islands are the only place in New Zealand where a number of tropical and sub-tropical seabirds breed (Table 3). Some of these birds are subspecies endemic to the Kermadecs or subspecies with limited Pacific distributions. The breeding site of the endemic Kermadec Storm Petrel was unknown until a colony was discovered on Haszard Islet in 2006.

Feral goats (*Capra hircus*) were eradicated from the Kermadec Islands by 1985. In 2003, feral cats (*Felis catus*), Norway rats (*Rattus norvegicus*) and kiore (*R. exulans*) were successfully eradicated from Raoul Island. In 2006 kiore were targeted for eradication on Macauley Island and early indications are that this was successful. This would mean that the Kermadec Islands are now free of mammalian pests. The eradication of introduced mammals from Raoul and Macauley Islands will allow the reestablishment of many of the species listed below, from islands and stacks where seabirds have retreated to over the past hundred years.

Seabirds were all but exterminated from Raoul Island, due to the presence of rats and cats but with the predators gone recovery is occurring. In 2006 the first Kermadec petrel chick was found. Sooty terns were nearly wiped out from Raoul Island but populations are now increasing and new colonies becoming established. With kiore probably eradicated from Macauley Island it is hoped that susceptible species, including the Kermadec and white-bellied storm petrels and Kermadec little shearwater, may be able to recolonise.

With pests eradicated there is need for increased vigilance in terms of quarantine measures and contingency plans to enable rapid response should any new mammal introductions occur.

Seabirds of the Kermadec Islands

1. **Wedge-tailed shearwater** (*Puffinus pacificus*). By 2000 the "immense numbers" found breeding on Raoul Island in 1908 were completely gone, and although still present in considerable numbers on Macauley Island they were apparently also declining there. They remained numerous on Curtis and Cheeseman Islands. Active burrows have recently been found on Raoul Island and with cats now eradicated from Raoul these birds should rapidly expand.
2. **Kermadec little shearwater** (*Puffinus assimilis kermadecensis*). Breed on Macauley, Haszard, North Meyer and probably some of the Herald Islets. The largest populations are on Curtis and Cheeseman Islands. On Macauley Island kiore apparently restricted little shearwaters to cliff faces and coastal ledges. With rats now gone they should be able to spread to other areas, as long as competition for space with larger petrels and dense thickets of the *Hypolepis* fern do not restrict them. Both these situations should be monitored. Significant differences between this and other subspecies suggest Kermadec little shearwaters could be considered as a distinct species in future.
3. **Black-winged petrel** (*Pterodroma nigripennis*). Population estimated at 2-3 million on Macauley in 1988, also abundant on Curtis and the Meyer Islands. They were wiped out by rats on Raoul Island but recently active burrows have been found at several locations on Raoul. The population in New Zealand is increasing as new colonies have become established. They may out-compete less aggressive colonisers returning to Raoul Island.
4. **White-naped petrel** (*Pterodroma cervicalis*). On the Kermadecs now known only on Macauley Island where approximately 50,000 pairs estimated in 1988. A few also bred on Phillip Island in the Norfolk group. Eradication of mammalian predators from Raoul and Macauley should see this species expand its population and range; although there are concerns about the impact *Hypolepis* ferns and velcro grass may have on this petrel. It may require assistance to encourage re-establishment on Raoul Island. Re-establishment on other islands is essential with most of the population currently restricted to one island.
5. **Kermadec petrel** (*Pterodroma neglecta*). Formerly common on Raoul Island, but had nearly disappeared by 1970. Two separate breeding populations occur; one breeding in summer, the other in winter. The summer breeding

Table 3: Seabirds of the Kermadec Islands, known breeding locations and conservation status at the Kermadec Islands

Conservation Status	Scientific Name	Common Name	Population size	Islands known to be breeding	Population trend (past 10 years)
Nationally critical	*Pelagodroma marina albiclunis*	Kermadec storm petrel* ++	100+ prs	Haszard Islet	Stable?
Nationally critical	*Gygis alba royana*	White tern *	10 birds	Raoul?	Declined to 0, increasing?
Nationally endangered	*Pterodroma neglecta neglecta*	Kermadec petrel*	5-10,000 prs	Meyer Islets, Meyers, Napier, Nugent, Dayrell, Chanters, Raoul, Macauley, Haszard	Stable or Increasing?
Gradual decline	*Sterna fuscata*	NZ sooty tern* ++	10,000+ prs	Raoul, Meyers, Dayrell, Macauley, Curtis, Cheeseman	Increasing
Range restricted	*Pterodroma cervicalis*	White-naped petrel *	50,000+ prs	Macauley Island	Stable or Increasing?
Range restricted	*Puffinus assimilis kermadecensis*	Kermadec little shearwater * ++	100,000+	Curtis, Macauley, Meyer Islets	Stable?
Not threatened	*Pterodroma nigripennis*	Black-winged petrel	2-3 million prs	Raoul, South Meyer, Napier, Dayrell, Chanters, Macauley, Haszard Curtis, Cheeseman, L'Esperance Rock	Increasing
Range restricted	*Puffinus pacificus*	Wedge-tailed shearwater *	>50,000 prs	Macauley, Curtis, North Meyer Island, Raoul and others	Stable?
Range restricted	*Fregetta grallaria grallaria*	White-bellied storm petrel *	<1000 prs	Curtis, Macauley	Stable?
Range restricted	*Sula dactylatra fullagari*	Masked booby *	155+ prs	Herald Islets, Macauley, Curtis, Cheeseman, L'Esperance	Stable?
Range restricted	*Phaethon rubricauda roseotincta*	Red-tailed tropic bird	Unknown, probably <100 prs	Meyers, Nugent, Dayrell. Chanters, Macauley, Curtis	Increasing?
Range restricted	*Procelsterna albivitta albivitta*	Grey ternlet		Meyers, Napier, Nugent, Dayrell, Chanters, Macauley, Haszard, Curtis, Cheeseman, L'Esperance Rock	
Range restricted	*Anous minutus minutus*	White-capped noddy *	1000+	Meyers, Macauley, Curtis, Cheeseman, L'Esperance	Stable or increasing
Coloniser	*Anous stolidus pileatus*	Common noddy *	25+	Curtis Island	Increasing?

* Species where the Kermadecs is the only breeding location in New Zealand
++Endemic taxa

birds were on Raoul Island. Winter breeding birds occur on the Herald Islets, Macauley and Haszard Islands. A small population of the summer breeding birds occurs on North Meyer and Macauley Islands. The first chick seen on Raoul Island for decades was found in mid-October 2006. There is a need to determine if there are genetic differences between the summer and winter breeding populations.

6. **Kermadec storm petrel** (*Pelagodroma albiclunis*). The first known breeding colony of this species was discovered on Haszard Islet in August 2006 by Mike Imber and Karen Baird. At least 100 pairs breed on this tiny island. Since 2004 birds have also been caught off the Meyer Islands and seen at sea off Raoul Island. It seems likely that they also breed on the Meyer Islands.
7. **White-bellied storm petrel** (*Fregetta grallaria grallaria*). Probably fewer than 1000 pairs of this sub species breed on Macauley and Curtis Islands. Elsewhere, it occurs on small stacks off Lord Howe. Thirty birds were seen at sea near Macauley Island in January 2006. The recent eradication of mammal pests from Macauley and Raoul leaves the way clear for reintroduction to these islands.
8. **Red-tailed tropicbird** (*Phaethon rubricauda roseotincta*). Breed on islets adjacent to Raoul and possibly on Raoul though none were found in 2005/06. Fewer than 100 pairs breed on Macauley. About 1000 pairs of this subspecies are breeding elsewhere in the Tasman Sea and Great Barrier Reef.
9. **Masked booby** (*Sula dactylatra fullagari*). This subspecies breeds in small numbers throughout the Kermadec Islands except for Raoul and L'Esperance, The Kermadec population is less than 250 pairs. Elsewhere they only breed on Norfolk and Lord Howe Islands. The total population of this subspecies is less than 1200 pairs.
10. **New Zealand sooty tern** (*Sterna fuscata*). About 80,000 pairs formerly bred on Raoul Island. After goats were eradicated from Macauley Island their numbers increased from 50 pairs in 1970 to 10,000 in 1988. There were 5,500 pairs on Curtis in 1989. In 2003, the first season after the Raoul island cat and rat eradication, about 2000 pairs bred at Hutchison Bluff and the colony appears to have increased each year since then.
11. **Common noddy** (*Anous stolidus pileatus*). An estimated 25 pairs were nesting on Curtis Island in 1989. This widespread tropical species is not considered threatened.
12. **White-capped noddy** (*Anous minutus minutus*). Probably fewer than 1000 pairs spread over several islands but not known to breed on Raoul Island. Breeds widely in the tropical Pacific.
13. **Grey ternlet** (*Procelsterna cerulea albivitta*). The Kermadec Islands are the stronghold for this subspecies with 10-20,000 on the Herald Islets, Macauley, Curtis, Cheesman and L'Esperance. None nesting on Raoul Island, although they are commonly seen around the coast.
14. **White tern** (*Gygis alba candida*). On Raoul Island these birds formerly bred in coastal forest. None breeding on Raoul Island currently although they have been seen prospecting for nest sites, if not already nesting on steep cliffs, since 2004. Elsewhere the subspecies breeds on Norfolk and Lord Howe Islands.

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State of New Zealand's Seabird Biologists

Given that New Zealand is a centre for seabird diversity and about one tenth of all seabird species are endemic to New Zealand, and that New Zealand has about as many species of threatened or endangered seabirds as we have non-marine bird species, one might expect there to be a large and thriving community of seabird biologists in this country. Unfortunately, this is not the case. New Zealand does have a goodly number of seabird enthusiasts but few of us, who are employed in research or conservation get the opportunities we desire, and the birds require, to devote our time to seabirds.

The group of seabirds whose conservation needs are being best met are the albatrosses with work being undertaken by biologists from the Department of Conservation, Ministry of Fisheries, NIWA, Canterbury Museum, Museum of New Zealand and some universities. Most of the research and management devoted to albatrosses is in direct response to fisheries bycatch of this high profile group and is funded by levies from the fishing industry. The main research involves studies of the birds' movements at sea to determine where in the world our albatrosses are exposed to fisheries interactions and following population trends to quantify the impact bycatch has on the populations. Even within the albatrosses there are major gaps in our knowledge. Fisheries bycatch of other seabirds receives much less attention.

A hopeful sign is the recent funding by MFish of 5-year studies of fisheries impacts on white-chinned petrels (*Procellaria aequinoctialis*) and grey petrels (*Pr. cinerea*) at the Antipodes; Chatham mollymawks (*Thalassarche eremita*), northern Buller's mollymawks (*Th. bulleri* n. ssp.), and northern royal albatrosses (*Diomedea sanfordi*) at the Chathams, and Salvin's albatrosses (*Th. salvini*) at the Bounties and Snares Western Chain.

As a result of recent retirements and resignations the Department of Conservation (DoC) now has less in-house seabird expertise than any time in the history of the Department or its predecessor the Wildlife Service. At the same time redeployment of other seabird staff, coupled with policy decisions that have moved priorities away from seabirds, DoC no longer has a scientist or technical specialist employed solely to work on seabirds. The Department lacks the leadership and direction for seabird conservation that was evident previously. Within the Marine Conservation Unit the work is heavily biased toward albatrosses and fisheries bycatch, with work on other seabirds being largely incidental. The precarious status of the black-fronted tern (*Sterna albostriata*) has seen a new DoC research project on this species, but as the forgoing sections have shown, this is but one of many species desperately needing attention. Graeme Taylor, formerly the technical officer with responsibilities for seabirds now runs the bird banding office. Despite the demands of his job as banding officer, Graeme continues to provide advice on seabird related matters and through his inexhaustible enthusiasm for seabirds continues a variety of projects, mostly on endangered species. Stephanie Rowe is preparing a new seabird strategy; but will this be translated into action that reverses the declines suffered by so many seabird species? The Department produced a thorough Action Plan for Seabird Conservation in 2000, but few of the needs identified in that document have been addressed.

Within the DoC conservancies there are a number of field staff working part time on seabirds. The emphasis is on critically endangered species but allocated resources are rarely adequate for the tasks involved. The successes achieved have been won in large measure due to the dedication of field staff who do much of the work in addition to their 'official' duties. Fairy tern (*Sterna nereis davisae*), black petrel (*Procellaria parkinsoni*), Westland petrel, (*P. westlandica*), Chatham Island taiko (*Pterodroma magentae*), Chatham petrel (*P. axillaris*), yellow-eyed penguin (*Megadyptes antipodes*) and Hutton's shearwater (*Puffinus huttoni*) are the main non-albatross seabirds for which there are conservation measures undertaken within the relevant conservancies. Even for these species there is a high reliance on contractors or temporary staff, resulting in lack of continuity and loss of expertise as skilled temporary staff move on at the end of their term of employment.

There is some degree of monitoring and nest protection for a few other species at selected locations, but most species and most colony sites receive little, if any, attention. In the Wellington conservancy Colin Miskelly has led several translocations of petrels to Mana Island, making use of OSNZ volunteers. These projects are of special note, first for using common species such as fairy prions (*Pachyptila turtur*) to develop translocation techniques for use with endangered species, and second for their aim to restore an ecosystem where seabirds once again play a key role in ecosystem function. Taiaroa Head must be the most intensively managed seabird colony in the country where predator control protects Northern royal albatross (*Diomedea sanfordi*), sooty shearwaters (*Puffinus griseus*), Stewart

Island shags (*Leucocarbo chalconotus*) and blue penguins (*Eudyptula minor*). The Southland conservancy continues to eradicate rats and other introduced mammals from southern islands to the benefit of seabirds and other species.

Despite the dedication of many frontline staff, seabird work needs leadership and direction from a DoC employed seabird specialist. Much of the work is reactive and there are ambulances at the bottom of only some of the many seabird cliffs.

As should be expected, university based research on seabirds tends to be of a more theoretical than practical bent. While universities have, and must continue to make useful contributions to seabird research, university research will not always provide the practical outcomes conservation requires. The most extensive university based seabird project has been the Kia Mau Te Titi Mo Ake Tonu Atu project at Otago University. Over a decade there has been intensive research into the ecology and population dynamics of sooty shearwaters and muttonbirding (the traditional harvest of fledgling shearwaters). Other university projects that have a direct management focus include the work on the endangered Chatham petrel at Lincoln University, work on the black-billed gull (*Larus bulleri*) and yellow-eyed penguin at Otago, research on petrel movements at Auckland, and Chatham Island taiko and fairy tern genetics at Massey University.

While not driven by conservation, several important taxonomic studies carried out within the universities will help those at the frontline of conservation make wise decisions when deploying resources. Studies of the taxonomy of the *Leucocarbo* shags at Otago University, a joint study of *Eudyptula* penguins at Lincoln and Waikato Univerities and albatrosses at Victoria University are of particular note. David Lambert at Massey and Craig Millar at Auckland University continue molecular studies on birds, including seabirds.

Blue penguins must be the most popular species for student projects with thesis work being undertaken at Waikato, Massey, Victoria, Lincoln and Otago Universities. These projects range from strictly applied to strongly theoretical. Bridging the divide between management and theory are projects on Cook's petrel (*Pterodroma cookii*) at Auckland University, foraging ecology of several species of penguins at Otago, shearwater morphology at Victoria and sex allocation in mollymawks at Canterbury. The role of seabirds in terrestrial ecosystems has been investigated in a study of seabird/vegetation dynamics at Lincoln and the ongoing work by Richard Holdaway, Canterbury University, and David Hawke at the Christchurch Polytech. Their work has shown just how important seabirds have been in nutrient transport from sea to shore, and that restoration of mainland seabird colonies has an importance far greater than conserving the species themselves.

Other than research on albatrosses mentioned above, there is little work on seabirds currently under way in other research organizations. The most significant project is Phil Lyver's five year study on grey-faced petrels (*Pterodroma macroptera*). He is studying the foraging ecology and population dynamics of the petrels and assessing the sustainability of the traditional harvest of the petrel chicks. Paul Scofield at Canterbury Museum in conjunction with artist Derek Onley, has a field guide to albatrosses and petrels that will soon be published. At Te Papa (Museum of New Zealand) work continues on the systematics and ecology of New Zealand seabirds and there is a joint New Zealand/U.S.A. study of the distribution, movements and populations of Pacific gadfly (*Pterodroma*) petrels.

Overall, while there is a significant amount of high quality research being conducted in the universities and other organisations much of it is driven by the current interests of staff and students and not by the needs of the birds. Funding constraints, student interest and lack of direction or support from DoC too often force seabird researchers into one off or short-term projects, or directs us away from seabirds to work on better-funded taxa. Otago University's decade-long *titi* project and the ongoing studies of penguins at Otago and Waikato are notable exceptions.

New Zealand has many good researchers, wildlife managers and volunteer workers who can and want to contribute to seabird conservation, but without adequate funding and direction we will not make best use of these people. With leadership at DoC head office many of the problems alluded to in this report could be addressed through partnerships between seabird experts, DoC conservancy staff and the universities.

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