

S37-2 Conservation of rare and endangered seabirds in Australia

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Abstract There is an urgent need for the conservation and management of several rare and endangered seabird species in Australia. The initial problem in attempting to conserve or recover these species is, in most cases, a lack of basic ecological information. We use several case studies to highlight the need for baseline studies to inform the management of seabirds in Australia. Gould's petrel (*Pterodroma leucoptera*), the providence petrel (*P. solandri*), sooty tern (*Sterna fuscata*), little tern (*S. albifrons*) and a threatened population of little penguins (*Eudyptula minor*) have all been the subject of recent research designed to provide information for management and recovery. In most cases, management decisions have been delayed while information on nesting requirements, foraging behavior and the effects of limiting factors and human disturbance is obtained. Because long-term studies of threatened species are rare, such studies of more common species provide important information about environmental changes and population fluctuations that inform management of the issues concerning rarer seabirds.

Key words Threatened species, Conservation research, Adaptive management, Species recovery, Long-term studies, Seabirds

1 Introduction

There are 74 species of seabirds (penguins, albatrosses, petrels, shearwaters, gannets boobies, tropicbirds, frigatebirds, skuas, jaegers, gulls and terns) breeding within Australian territories (Marchant and Higgins, 1990; Higgins and Davies, 1996). Of these, 48 (65%) are currently threatened (Garnett and Crowley, 2000) and face a range of impacts both on land and at sea, almost all of which are human in origin (Ross et al., 1996; Garnett and Crowley, 2000; Baker et al., 2002). There are an additional 59 seabird species that visit Australian waters regularly; 16 of them are of global conservation concern (BirdLife International, 2000).

Each year, tens of thousands of seabirds are killed accidentally by longline fishing when birds, attracted to fishing vessels by discards and baits, ingest baited hooks during line setting, or less commonly, hauling-in of the longlines (Baker et al., 2002). Hooked birds are then pulled underwater by the weight of the line and drown. This global threat, which affects predominantly albatrosses and giant petrels, is being addressed at both the national and international level. Threats to the smaller, less charismatic species have not received the same degree of attention. Consequently, there remains an urgent need for informed conservation and management of several rare and endangered seabird species in Australia.

In attempting to address the management of these

seabirds, we have invariably encountered a lack of basic ecological information, including population size and demographic trends, diet and foraging requirements. Even the most fundamental aspects of the ecology of many common Australian species are poorly known. For example, it is only recently that the short-tailed shearwater (*Puffinus tenuirostris*), of which some 23 million breed in Australia each year, was found to provision chicks with food obtained from waters around Antarctica (Klomp and Schultz, 2000). The implications for management arising from this are profound. Clearly, Australia needs to look and act beyond its territorial waters to ensure that adequate food resources are maintained for the seabirds that breed within its national boundaries.

Here we present several case histories of successful seabird management in Australia. Each of these cases highlights an initial lack of baseline information for developing management strategies and recovery plans. In some instances, management decisions had to be delayed until very basic information on nesting requirements, foraging behavior and threatening processes was obtained. Whereas research has been pivotal to these programs, many of them have also benefited from adaptive management during the research phase. The experimental management actions implemented during the adaptive phase were largely developed from knowledge obtained from studies of common seabird species.

The case histories illustrating the issues are those of

Gould's petrel (*Pterodroma leucoptera leucoptera*), providence petrel (*P. solandri*), little tern (*Sterna albifrons*), sooty tern (*S. fuscata*), and a threatened population of the little penguin (*Eudyptula minor*). Along with conservation outcomes, we present some of the more intriguing findings of recent research. Many of the threats that we have unearthed were predictable, but others have been surprising. We also outline long-term studies of two common seabirds, the short-tailed shearwater and wedge-tailed shearwater (*Puffinus pacificus*), that have provided basic information relevant for the management of rarer species.

2 Case histories

2.1 Gould's petrel

The nominate race of Gould's petrel is endemic to Australia and breeds on two small islands off the east coast of New South Wales (Priddel and Carlile, 1997a). In 1990, only 250 pairs were recorded breeding, and less than 20% of eggs laid produced fledglings (Priddel et al., 1995). In 1992, a recovery program was commenced (Priddel and Carlile, 1997b), and proved successful. Today there are more than 800 breeding pairs, and breeding success generally exceeds 50%.

Research began with baseline studies of population size, breeding ecology and mortality factors. Threats were identified, and their experimental amelioration implemented and evaluated (Priddel and Carlile, 1997b). Once information on diet, meal size delivered to chicks, and feeding frequency had been obtained, techniques for translocation were developed, tried and assessed (Priddel and Carlile, 2001). Subsequently, we successfully completed a translocation of 200 fledglings to another island. This process included the creation of artificial habitat by installing nest boxes that were specifically developed for the purpose (Priddel and Carlile, 1995a). The second colony provides a buffer and safeguard for the species should the main colony on the main island suffer catastrophic loss due to wildfire or the arrival of alien predators such as cats or rats. We also undertook a European rabbit *Oryctolagus cuniculus* eradication program on the main island that included an assessment of the effectiveness of each of the three mortality agents used (Priddel et al., 2000). Monitoring, together with research into recruitment, longevity and the energetics of breeding, continues.

The main threats discovered were plumage entanglement with the sticky fruit of a native shrub, the birdlime tree (*Pisonia umbellifera*), and predation of nesting adults by a native bird, the pied currawong (*Strepera graculina*) (Priddel and Carlile, 1995b). The reason why these native species, which had presumably coexisted harmoniously with Gould's petrel in the past, had now become a threat was perplexing. The key to the riddle was the degradation of vegetation caused by the rabbit since its introduction some 90 years earlier (Priddel and Carlile, 1997b). This degradation had opened up the rainforest to such an extent that

birdlime tree and currawong were now having a significant impact on a habitat where previously their influence had been minimal. Until the rainforest fully regenerates, currawongs will continue to be controlled and emergent seedlings of the birdlime tree removed from within petrel nesting areas (New South Wales National Parks and Wildlife Service, 2001).

2.2 Providence petrel

The providence petrel is endemic to Australian waters. The species was exterminated from Norfolk Island by a colonial settlement that ran short of food after their supply ship was wrecked in the 1790s (Hutton, 1991). At least 84 000 birds, and an unknown number of eggs, were eaten in the first year alone. The species now survives within the Norfolk Island Group in only very small numbers on Philip Island. The stronghold, and only other breeding locality, for this species is Lord Howe Island where there are approximately 40 000 breeding pairs. These nest predominantly on the summits of two mountains: Mount Gower (875 m) and Mount Lidgbird (777 m). As late as 1998, almost nothing was known about the biology of this species. Our recent research has focused on breeding ecology, foraging strategies, the extent of nesting distribution on Lord Howe Island, population size and the identification of threats.

Although several threats have been recognized, breeding success is high and the species appears secure. Inundation of burrows during heavy rain is a major cause of egg loss. Ship rats (*Rattus rattus*) are present but take few eggs. Providence petrels almost certainly benefit from the baiting of rats, conducted to protect endemic mountain flora. This action is motivated by commercial interest rather than for biodiversity conservation, as the endemic plants are a potential export resource for Lord Howe Island. The most surprising threat comes from the endangered Lord Howe woodhen (*Gallirallus sylvestris*). Normally restricted to a diet of invertebrates, in dry times these flightless rails will take petrel chicks up to 800 g in mass. Woodhens capture petrel chicks by repeatedly plunging their bills through the roof of the nesting chamber to create a hole through which they can extricate their prey.

Initial results from satellite-tracking studies of providence petrels have revealed foraging ranges of hundreds of kilometers in all directions from Lord Howe Island, with one bird flying 1 500 kilometers from the colony on a single foraging trip. Providence petrels are known to interact with fishing vessels that operate in the region, but the level of interaction and the implications for their conservation are still unknown.

2.3 Little tern

Within Australia, there are three discrete populations of little terns, one breeding on the east coast, another one along the north of the continent, and a third a palearctic non-breeding migratory population present during the austral summer (Higgins and Davies, 1996). The east coast breeding population is the smallest and most threatened,

primarily because it breeds on estuarine sand-flats and beaches which are subject to all manner of disturbances in a country famed for its beach culture. By the 1980s, the population had declined to just 220 breeding birds (Smith, 1990). Intensive management of breeding colonies since 1990 has seen the population increase to more than a thousand birds. Principal recovery actions included predator control and the erection of temporary fences to deter humans and vehicles from entering nesting colonies.

Sited just above the mean high tide mark, the nests, eggs and chicks of little terns are threatened by spring tides, sunbathers, beach anglers, four-wheel-drive vehicles, hovercraft and other beach-oriented activities. There are a number of native bird species that, given the chance, will prey heavily upon the eggs of colonies. Predation occurs most often when the terns have been disturbed from their nests by humans. Crabs also prey on the eggs by undermining the sand beneath an incubating adult and drawing the egg into the sand below. Inserting a metal sheet into the sand below the nests prevents such losses from occurring. Despite their cryptic nature, little tern chicks are particularly vulnerable to predation from introduced European foxes (*Vulpes vulpes*), feral domestic cats (*Felis catus*) and unrestrained domestic dogs (*Canis familiaris*). Ants also set upon wet, newly hatched chicks. We have been able to protect vulnerable nest sites from ants by spraying the surrounding sand with a liquid pesticide.

2.4 Sooty tern

Sooty terns present some challenging management problems on islands such as Lord Howe Island, where they nest on sand dunes near the airport runway, creating potential for aircraft bird-strike. This has necessitated baseline study of the breeding ecology of the tern there in order to manage the species responsibly.

Our studies have shown that sooty terns on Lord Howe Island, the most southerly colony in the world, have a breeding success that is highly variable between years. In some years, they raise more than twice the young reported for colonies elsewhere. Such success is achieved despite the presence of ship rats, which elsewhere have either caused colonies to decline or to be driven to extinction. In other years, very few chicks survive to fledge. It appears that the extent, timing and success of breeding on Lord Howe Island all fluctuate in response to local availability of food. This information has useful application in the management of the 10 other species of threatened seabirds that breed on Lord Howe Island.

2.5 Little penguin

Little Penguins are relatively common in Australia and its waters. They are one of few seabirds that still breed on the Australian mainland, and a small remnant population survives in Sydney Harbour. In 1995, the State of New South Wales introduced legislation, the *Threatened Species Conservation Act 1995*, to protect such endangered populations of relatively common species.

Only in the last four years has there been a coordinated research effort to catalogue the basic ecological requirements of the Sydney population. It is now known that there are some 70 pairs in this endangered population, many of which nest within the gardens and backyards of a busy suburb. The birds forage in the harbor as well as out to sea. They compete for baitfish with commercial fishers and compete for swimming space with huge numbers of watercraft every day. Marine pollution and debris are also causes for concern, although recent initiatives to improve the water quality in Sydney Harbour have been very successful. Although the size of the population appears to be relatively stable, and breeding success is high for the species, dog and fox attacks have taken 5%–10% of the entire breeding population on at least two occasions in recent years.

Notwithstanding its limited conservation value for the species as a whole, the research on this small endangered population has engendered great community support and publicized the plight of seabirds widely.

3 Discussion

The case histories outlined above highlight instances where research has contributed to the successful management or recovery of threatened seabirds in Australia. These species include surface-nesting seabirds (little and sooty terns), burrow nesters (providence petrel) and cavity nesters (Gould's petrel and little penguin). The case histories demonstrate that it is possible to manage or recover a wide range of seabirds, each with very different breeding strategies. Each species faced a unique suite of threats, and each successful management or recovery program entailed the application of a unique set of management actions. These successes have been achieved despite an initial lack of basic ecological information.

Several of the recovery programs have also involved coordination of adaptive management with research. Many adaptive management decisions have been based on information and knowledge obtained from studies of other, more common, seabird species. Long-term studies of common seabirds can provide important information about environmental changes and population fluctuations which can then be applied to the management of rarer species.

Harvesting of short-tailed shearwaters on the islands of Bass Strait, between Tasmania and the Australian mainland, has provided the impetus for long-term monitoring of this particular species. Comparative studies are also being conducted on wedge-tailed shearwaters breeding on inshore islands along Australia's east coast. Whereas short-tailed shearwaters make regular foraging trips to Antarctica, wedge-taileds feed within a few hundred kilometers of their breeding grounds (Schultz and Klomp, 2000). By comparing two similar sister species with radically different foraging strategies, we are beginning to tease out the effects of change in local and more distant marine environments.

On Montague Island, off the coast of southern New

South Wales, a 30-year study continues to document the effects of short-term climatic events and long-term El Niño cycles on both short-tailed shearwater population size and chick production. Such long-term studies not only provide benchmarks against which fluctuations in the rarer species can be gauged, but also indicate how the shearwaters and other, rarer seabirds are likely to respond to major perturbations in the marine environment. The value of long-term studies of common species, and the applicability of their data to rarer seabird species, should not be underestimated.

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