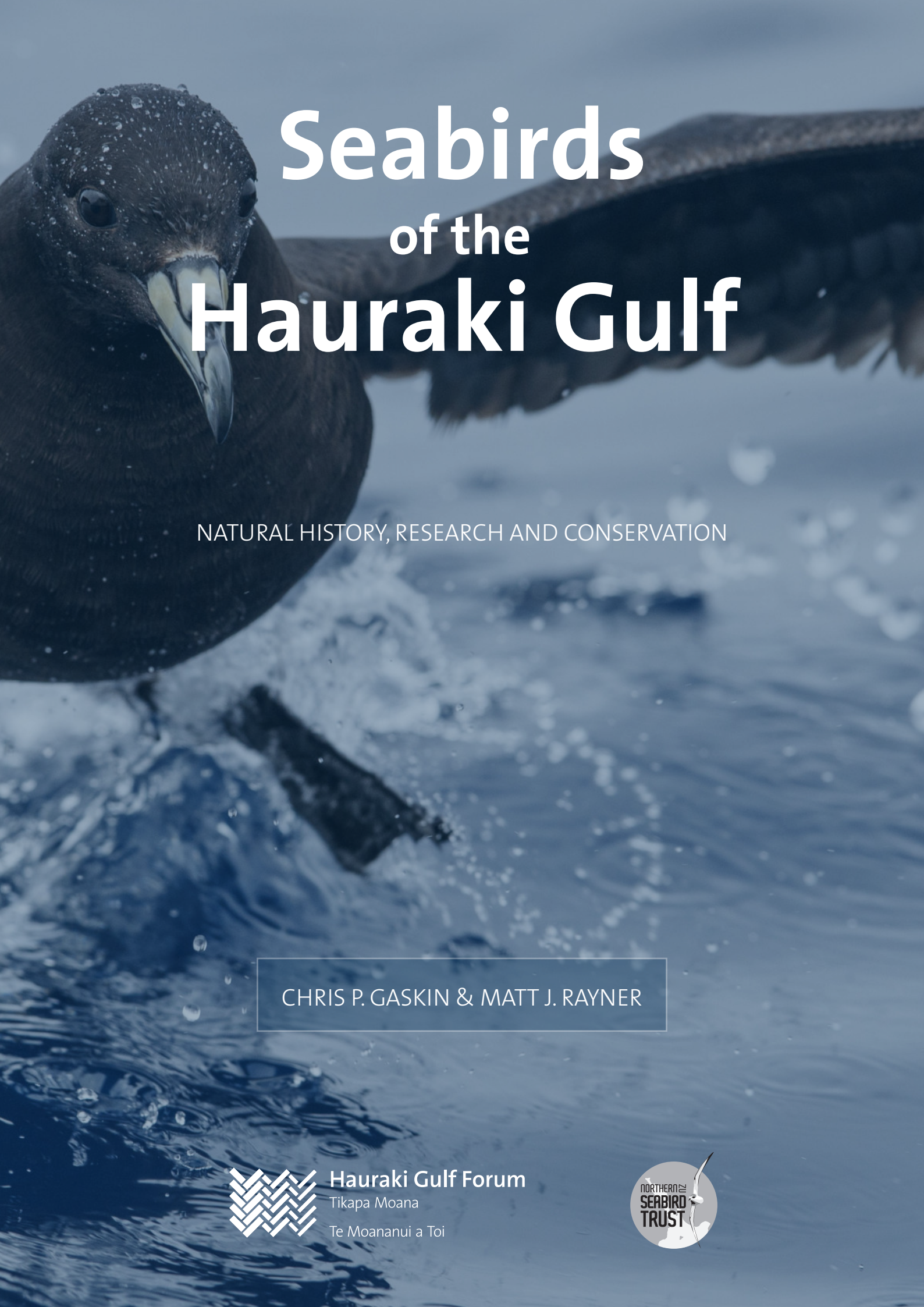

Seabirds of the Hauraki Gulf

NATURAL HISTORY, RESEARCH AND CONSERVATION

CHRIS P. GASKIN & MATT J. RAYNER

Hauraki Gulf Forum
Tikapa Moana
Te Moananui a Toi

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FOREWORD by John Croxall

Chair of BirdLife International's Global Seabird Programme

This is a landmark report about a region of top priority for New Zealand and of outstanding international importance. It is widely appreciated that New Zealand is the seabird capital of the world (which also testifies to the importance of its marine ecosystems generally). However, it is much less recognised that the Hauraki Gulf is one of New Zealand's outstanding areas of seabird and marine biodiversity – right up there with the subantarctic islands and the Kermadec Islands. Moreover, what is unique about the Hauraki Gulf is that it contains a massive Marine Park, itself containing five marine reserves and an exceptional suite of islands, all on the doorstep of the largest metropolis in the South Pacific!

This report is also a tribute to the foresight and vision of those who established the Hauraki Gulf Marine Park (HGMP) and to the Hauraki Gulf Forum for seeking to plan and deliver that vision – whereby recreational, commercial and conservation interests can all be accommodated within the HGMP without detriment to the natural environment on which they all depend.

The special contribution of this report is fourfold: 1) an authoritative brief review of the biology, ecology, status and distribution of the breeding seabirds of the wider Hauraki Gulf; 2) a succinct summary of the role of seabirds on the islands and in the waters of the region – and why we should be concerned about them; 3) a plan for how seabirds could (and should) contribute to the marine spatial planning essential for managing HGMP (and its surrounding seas), notably through developing a comprehensive inventory of breeding sites (linked to monitoring of population status and trends), together with mapping their key foraging (and migration) areas at sea throughout their annual and life-cycles; 4) summarised but detailed priorities for research and conservation of seabirds, in the context of their role and contribution to marine and terrestrial systems and recognising that further research is essential to underpinning and developing most of the management and conservation actions.

All this emphasizes that any effective management system for the HGMP will require: a) even more work on restoring islands, especially through alien predator (and weed) eradication, coupled with stringent biosecurity measures to ensure that all gains are maintained in perpetuity; b) better management and operational practices for commercial and recreational fisheries alike, especially to ensure that accidental by-catch and entanglement of top predators are as low as possible and that the benchmark of sustainable fisheries includes the efforts made to eliminate adverse effects on non-target and dependent species; c) cooperative management (including awareness-raising) of human activity in sensitive mainland coastal areas (as well as islands) to minimise disturbance to seabirds and the deterioration and destruction of their key habitats; d) enhanced research on regional seabirds and marine ecosystems.

Achieving this will be challenging. It will only happen through genuine partnerships and collaboration between all stakeholders, as the report emphasizes throughout. Indeed, at a time when marine habitats worldwide are under intense pressure, compounded by the growing concern that governments, agencies and corporations are reducing commitments to improving (let alone restoring) the natural environment, it is encouraging to see evidence here of new partnerships, ideas and enthusiasm to try to secure the future of one of New Zealand's most iconic areas, the Hauraki Gulf. Nowhere else in New Zealand should so many citizens and visitors be able to see the outcomes of this enterprise; I commend this report, and the vision of which it is a part, to everyone.

Fairy prion over trevally, Hauraki Gulf. *Photo: Richard Robinson (Depth NZ)/DOC/NNZST*

Seabirds of the Hauraki Gulf: Natural History, Research and Conservation

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Abstract : The Wider Hauraki Gulf Region's (WHGR) striking seabird diversity, together with the combination of multiple predator-free breeding sites on islands and (increasingly) on the mainland with productive waters close to colonies, makes the WHGR a globally significant seabird biodiversity hotspot, remarkable given its proximity to the doorstep of the country's largest city. In this strategic plan we present an overview of current knowledge regarding twenty-seven seabird species breeding in the region, including their breeding habitat and provide recommendations to protect seabird species and enhance our understanding of them and their habitats. We stress the need for multi-disciplinary broad-scale long-term studies into ecosystem processes; integration with both spatial planning and threat/risk mapping for the region; advocating for greater awareness of seabirds, their ecology including dispersal post-breeding as well as the multiple threats they face; for greater collaboration between researchers, government agencies, *tangata whenua* and community groups. We provide background to BirdLife International's global Important Bird Area (IBA) Programme. Seabirds are rebounding in the wake of considerable investment in eradications of mammalian predators from islands and mainland sites within the WHGR. These predator-free sites are vitally important to the survival of a suite of threatened species. Seabirds, as a standout biodiversity feature of marine and terrestrial (particularly island) ecosystems within the WHGR, require strategic direction regarding their conservation and research. This plan provides that strategic focus.

Keywords: Seabirds, Hauraki Gulf, strategic planning, research, seabird conservation

1 PURPOSE, SCOPE AND DEFINITIONS

1.1 Purpose

The Hauraki Gulf State of the Environment Report 2011 identified seabirds as key ecosystem components of the Hauraki Gulf Marine Park (HGMP) and stressed the importance of establishing strategic goals for the protection, sustainability and enhancement of these populations. This strategic plan provides an overview of knowledge regarding all seabird species breeding in the region, their breeding habitat and provides recommendations to protect seabird species and enhance our understanding of their biology.

Defined goals include:

1. Provide species/taxon specific profiles for all the region's seabird species detailing species specific knowledge (breeding population locations, size, habitats, biology) and research to date
2. Where possible provide information on seabird utilization of the region's waters (i.e. the HGMP and adjacent waters including Tasman Sea and Pacific Ocean)
3. Provide summarised data on seabird breeding sites throughout the wider Hauraki Gulf region
4. Provide prioritized recommendations for research on seabirds and seabird habitats within the region
5. Provide prioritized recommendations for conservation management of seabirds throughout the region
6. Provide background to BirdLife International's Global Important Bird Area (IBA) programme and recognition of the Hauraki Gulf as an IBA for seabirds
7. Provide crucial information on seabirds for the marine spatial planning process for the HGMP.

1.2 Scope and definitions

For the purposes of this plan:

1. We define seabirds as birds that spend some part of their lifecycle feeding at sea either in inshore or offshore waters. 'Seabirds' include storm petrels, shearwaters, petrels, giant petrels, albatrosses, gannets, boobies, tropicbirds, frigatebirds, shags (or cormorants), skuas, gulls, terns and noddies
2. The scope of our analysis primarily incorporates seabirds and their breeding sites within the HGMP. However, important regional species and/or breeding sites beyond the boundaries of the HGMP are incorporated where they are considered to be important components of the region's ecosystem. Thus, the region covered by our analysis extends from Cape Brett (Bay of Islands) to Ruamaahua/Aldermen Islands (Bay of Plenty) and from Poutu (North Kaipara Head) to the Waikato River mouth and is termed the wider Hauraki Gulf region (WHGR). For the purposes of the report this area (including the land areas between) defines 'the region'. Moreover the land area between Auckland's west coast and the Hauraki Gulf will be referred to as the 'North Auckland seabird flyway' (Fig 2).
3. Seabirds spend most of their lives at sea, but breed on land. Seabird colony sites are island and

mainland sites where one or more species are confirmed breeding. Breeding presence is defined as presence of burrows and burrow activity, actual nests with birds, birds incubating eggs, chicks and fledglings or a combination of other observation sources such as carcasses of deceased birds and acoustic recordings showing persistent presence of birds (i.e. ground and flight calls) during likely breeding periods

4. Although seabird breeding colony boundaries are confined to the land on which the colonies are located, their colony boundaries can, in many cases, be extended to include those parts of the marine environment which are used by the colony for feeding, maintenance behaviours and social interactions (Lascelles 2008)
5. Where data are available, foraging areas within the study area for various taxa are described in general terms.
6. Several species breeding in the region forage in areas well beyond the edge of the continental shelf in pelagic waters, or in shelf-edge habitats at great distances from their breeding colonies. In these cases foraging information will be presented to highlight the region's breeding sites as centres of ecological importance extending well beyond the region's boundaries.

This plan follows the Checklist of the Birds of New Zealand (OSNZ 2010) and the International Union for Conservation of Nature *IUCN Red List of Threatened Species*™ (*www.iucnredlist.org*; viewed 27 March 2011) in respect of bird taxonomy, nomenclature and conservation status.

Figure 1. Fairy prions and shearwater species feeding in association with a school of kahawai northwest of Hauturu/Little Barrier Island, November 2011. *Photo: Frederic Pelsy.*

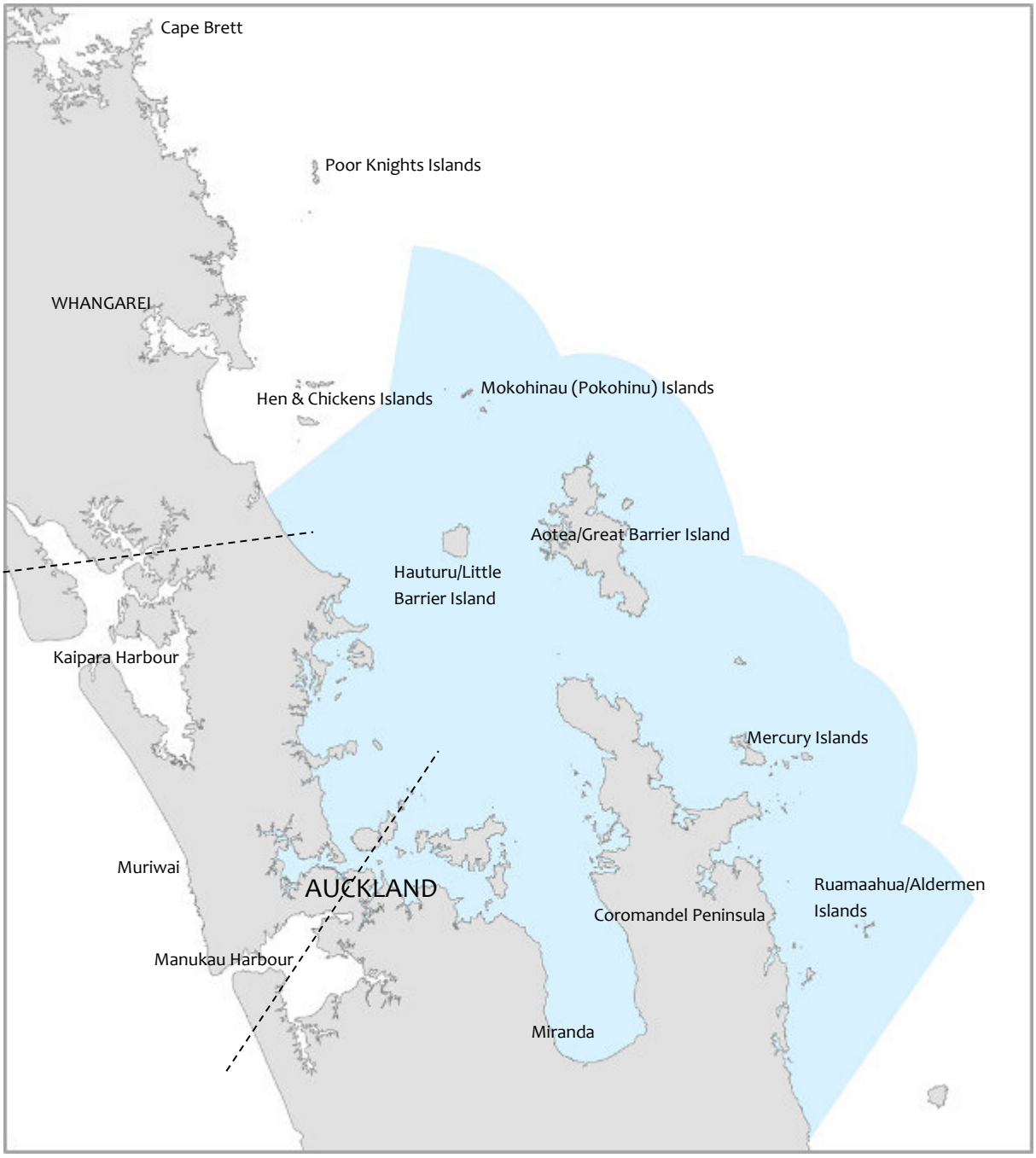


Figure 2. Map of the region covered by this strategic plan. The blue area delineates the Hauraki Gulf Marine Park. The highlighted area between the west coast and the Hauraki Gulf is described as the 'North Auckland Petrel Flyway'.

2 INTRODUCTION

The Hauraki Gulf Marine Park (HGMP) was established under the Hauraki Gulf Marine Park Act (2000) and includes the foreshore and seabed of the Hauraki Gulf, Waitemata Harbour, Firth of Thames, and east coast of the Coromandel Peninsula (Fig 2). This diverse region encompasses marine reserves, five an internationally recognised wetland on the Firth of Thames at Miranda, hundreds of islands ranging in size from Aotea/Great Barrier Island (27 761 ha) down to significant stacks such as Maori Rocks (Mokohinau Islands) (0.24 and 0.18 ha) and all waters out to 12 nm.

Auckland city, with 1.4 million people, dominates the region. It is New Zealand's largest city by far with one third of the country's population. Auckland lies between the Hauraki Gulf to the east, the Hunua Ranges to the south-east, the Manukau Harbour to the southwest, and the Waitakere Ranges and smaller ranges to the west and northwest. The central part of the urban area occupies a narrow isthmus between the Manukau Harbour, connected to the Tasman Sea, and the Waitemata Harbour, linked to the Pacific Ocean. The Kaipara Harbour defines Auckland's north-western boundary. Auckland is one of the few cities in the world to have harbours on two separate major bodies of water and, notably, approximately 70% of the Auckland region consists of coastal waters. The Auckland region has unique character and biodiversity, being home to over one third of New Zealand's native plants and more than half of its native birds. While naturally abundant, the WHGR's coastal and marine ecosystems are susceptible to degradation from inappropriate development.

The WHGR's marine environment is of nationally-significant economic, cultural and ecological importance. The Hauraki Gulf itself, extending from shallow inshore waters to the continental shelf edge, is a gently sloping plain studded with islands and reefs, washed with Pacific Ocean tidal currents. By contrast the region's west coast on the Tasman Sea presents a comparatively regular coastline with few islands and a broad continental shelf. These combined regions, with influences from warm oceanic currents and seasonal variability present a complex marine ecosystem of high diversity and productivity (Fig 3). The region's islands provide a critical lifeboat for many rare endemic fauna previously present on mainland New Zealand, many now occurring nowhere else in the world.

Due to its natural characteristics and thus great economic and cultural value, the region's marine environment and coastlines have undergone profound, predominantly negative, change over last 100-200 years. The Hauraki Gulf State of the Environment Report (2011) highlighted the decline in the Gulf's environment as a result of removal of forest and wetland cover, increasing pastoral land use, intensive sedimentation of shallow coastal areas, destruction of vital marine habitats (e.g. sub-tidal mussel beds) and depletion of fish stocks. Continuing urbanization is enhancing this loss, modification and contamination of the coast.

Increasingly local and national government agencies, researchers and community groups are becoming involved in conserving the natural heritage of marine ecosystems, halting declines in ecological values and maintaining ecological sustainability into the future. Such actions include the conservation and restoration of Gulf islands and reserves and research seeking to understand all the Gulf's ecological components, beyond those with immediate economic value such as fish stocks. Seabirds are a standout biodiversity feature of marine and terrestrial (particularly island) environment of the WHGR and require strategic direction regarding their conservation and research. This plan provides that strategic focus.

Figure 3. Two NIWA poster images:

a) top right, shows how the potent mix of plate boundary earthquakes and volcanoes, powerful storms, and ocean currents, make undersea New Zealand one of Nature's great geological and oceanographic laboratories. The white rectangle defines the area (WHGR) covered by this plan; and b) bottom, shows the submarine topography of the Hauraki Gulf, most but not all of the area covered by the WHGR, the subject for this plan.

2.1 National and Global Seabird Hotspot

There are around 10,400 species of birds worldwide. Remarkably, only 359 of the global total of birds are what we call 'seabirds'. Seabirds breed on islands, but spend most of their lives at sea. They are essentially marine creatures and possess unique physiological and morphological adaptations. They can be highly mobile, and in some cases the whole population of a species can travel from one side of an ocean to another. They come in all shapes and sizes and are highly specialised.

New Zealand is ideally suited to seabirds; surrounded by productive oceans (Fig 3), presenting a multitude of breeding habitats and having been isolated from mammalian predators for millions of years prior to human arrival. It is thus no surprise that the New Zealand archipelago has great seabird diversity with 85 breeding species of which 36 are endemic species (42%) breeding nowhere else in the world. Indeed of 359 seabird species worldwide, approximately one quarter breed in New Zealand and 10% are endemic to New Zealand breeding grounds, making the country a world centre of seabird diversity.

Within New Zealand the WHGR is an area of high seabird diversity. There are 27 seabird taxa known to breed in this region of which of which 16 (59 %) are New Zealand endemics (Table 1). These taxa include include 14 petrels and shearwaters, 1 penguin, 1 gannet, 5 cormorants (shags), 3 gulls and 3 terns. Of these species, Buller's shearwaters (*Puffinus bulleri*) (Fig 4), New Zealand fairy tern (*Sternula nereis davisae*), Pycroft's petrel (*Pterodroma pycrofti*) and black petrel (*Procellaria parkinsoni*) breed nowhere else in New Zealand or the world. The New Zealand storm petrel (*Fregetta maoriana*) was discovered breeding on Hauturu/Little Barrier island in February 2013; the only known breeding site for this species. Over 70 species of seabird, c. 20% of the world's seabird species, have been seen within the region. On a New Zealand scale the seabird diversity of the greater Hauraki Gulf region (26 breeding species, 4 regional endemics) ranks very highly compared to other New Zealand locations that have great international prominence as seabird sites. For example, the Kermadec Islands (a nature reserve of the highest conservation protection) supports only 14 breeding species (2 regional endemics; Gaskin 2011), the Chatham Islands supports 28 breeding species (5 regional endemics; Aikman and Miskelly 2004) and the Snares Islands 17 breeding species (2 regionally endemics; Miskelly et al. 2001).

This striking diversity on a New Zealand scale, together with the combination of multiple predator-free breeding sites on islands and (increasingly) on the mainland with productive waters close to colonies, makes the greater Hauraki Gulf region a globally significant seabird biodiversity hotspot. This diversity is being recognized with Birdlife International, through its New Zealand affiliate Forest and Bird, officially identifying the greater Hauraki Gulf region as an internationally recognized a Important Bird Area (IBA) for seabirds. Remarkably, given its close proximity to the country's largest city.

Figure 4. Buller's shearwater, one of the Hauraki Gulf local endemics. *Photo: Neil Fitzgerald*

3 THE BIOLOGY OF SEABIRDS

Seabirds have biological characteristics that differ dramatically to most land birds. These characteristics reflect the difficulties of making a living from the unpredictable marine environment and the evolution of many species in the absence of mammalian predators (Schreiber and Burger 2002). The life-history characteristics of seabirds are often referred to as extreme including long lifespans (20-60 years), delayed maturity (breeding delayed up to 3-15 years), small clutch sizes (often only one egg) and long chick development periods (Imber 1985; Warham 1990). By comparison, many terrestrial birds such as passerines have shorter lives, lay larger clutches of eggs and have chicks that mature more rapidly.

The feeding habits of seabirds vary. Some species regularly feed over land (gulls) or in freshwater (cormorants), others feed in tidal harbours and inshore waters (gulls, terns, cormorants, gannets) and the rest feed on the continental shelf and beyond in deep oceanic waters (petrels, shearwaters and gannets). However, all seabirds spend some part of their life cycle on the open sea in an environment to which they are supremely adapted. Flight for many species (i.e. petrels, shearwaters, gannets) is extremely efficient and with energy gained via dynamic soaring, where birds take advantage of reduced wind speeds near the ocean's surface to store energy to be used on the next ascent (Pennycuick 1982). Other species such as penguins, cormorants, diving petrels and shearwaters fly underwater using their wings (Fig. 5). Seabirds can find their food over large distances. Excellent vision keeps them alert to the activities of other seabirds, fishes and cetaceans, (Au and Pitman 1986) and a strong sense of smell is enhanced by large olfactory bulbs (Hutchinson and Wenzel 1980). Seabirds have water resistant feathering (from preen gland oils), webbed feet for swimming and bills with hooks, points, serrations and/or filters. These modified bills enable seabirds to exploit prey such as fish, crustaceans (krill) often in association with fish schools, cephalopods (squid), plankton and zooplankton from the surface to depths of 60 metres or more (Brooke 2004; Rayner et al. 2008; Taylor 2008; Rayner et al. 2011b). Unlike terrestrial species, the gut of seabirds is modified to allow birds to store large meals that are converted to a low weight, rich oil, perfect for transporting large amounts of energy over long distances during breeding and migration.

Figure 5. Black petrel underwater, Hauraki Gulf. *Photo: Richard Robinson (Depth NZ)/DOC/NNZST*

Figure 6. Australasian gannet colony, Muriwai. *Photo: Abe Borker.*

Seabirds are the ultimate example of colonial living with a large proportion of species aggregating loosely, or in dense colonies (Fig 6), where they exploit preferred breeding habitats and/or find protection from predators by sheer numbers. Species nest either on the surface or in vegetation (terns, gulls, gannets, cormorants), in rock crevices, or underground in excavated burrows (petrels, shearwaters) (Warham 1990). The breeding schedule of seabirds is generally cyclical although breeding varies between summer and winter periods (Warham 1990). Pairs return to their colony at the beginning of the breeding season to clean out and defend the nesting site and re-establish pair bonds. After copulation, egg formation takes between 10-80 days depending on species. Petrels and shearwaters may spend as long as 60 days at sea during egg formation. When females return, they lay a single egg or small clutch of eggs and share incubation with males over incubation periods of 40-75 days. Chick rearing extends over 50-280 days during which the chick is most often unattended whilst its parents forage at sea (Warham 1990; Brooke 2004) .

4 SEABIRDS: SHOULD WE CARE?

4.1 Top predators and ecosystem indicators

As predators at the top of the food chain seabirds are crucial components of marine ecosystems and possess attributes that make them useful as indicators of change in the marine environment. In particular, changes in lower trophic levels of marine food webs can be brought about by climatic or anthropogenic impacts on marine resources, such as overfishing and/or pollution. Such changes are frequently reflected in seabird populations through shifts in population size, behaviour and/or the chemical signature of individuals tissues (Furness and Camphuysen 1997; Boyd et al 2006; Piatt et al. 2007). Given that there is an increasing demand for relevant indicators for the marine environment, the conservation and study of seabird populations represents an viable and cost effective "canary in the cage" for the long-term assessment of marine ecosystems across broad spatial scales.

Figure 7. Fairy prions feed en masse on krill around a school of kahawai, northwest of Hauturu/Little Barrier Island. *Photo: Jono Irvine.*

4.2 Ecological engineers

Although studies of seabirds at their breeding sites can provide a picture of trends in the marine environment, fluctuations of these populations can have important implications for the ecology of their terrestrial ecosystems in which they are situated. The lifestyles of seabirds operate on strikingly divergent spatial scales with individuals foraging over vast areas yet concentrating breeding efforts to spatially restricted breeding sites that are often reused year after year. Accordingly seabirds play a major role in shaping the ecology of terrestrial communities by acting as links between the land and sea; importing sources of marine-derived nutrient into terrestrial communities (Markwell and Daugherty 2003; Harding et al. 2004; Hawke and Newman 2005; Fukami et al. 2006) (see also Mulder et al. (2011) for comprehensive review). At sites where seabirds are present, soil fertility and thus plant growth can be enhanced through the concentration of minerals (provided by guano and dead adults, chicks and eggs) and in the case of burrowing species through the tilling of the soil and incorporation of leaf litter into the soil through burrow nesting (Anderson and Polis 1999; Mulder and Keall 2001).

Figure 8. Grey-faced petrel burrows with herb associates. Northern headland, Burgess Island, Mokohinau Group. *Photo: Shelley Heiss-Dunlop.*

Figure 9. Egg-laying skink *Oligosoma suteri* feeding close to a seabird carcass. Burgess Island. *Photo: Dylan Van Winkel*

Excessive guano deposition and or disturbance by burrowing birds may also kill vegetation or alter the composition of the plant community through seedling loss and erosion (Mulder and Keall, 2001). Colonies do provide food sources and habitats for a range of invertebrate and small vertebrate fauna (Sanchez-Pinero and Polis 2000; Fukami et al. 2006) and this enhancement of the biodiversity can travel up the food chain enriching the diversity and abundance of species at higher trophic levels (Polis and Hurd 1996; Sanchez-Pinero and Polis 2000; Markwell and Daugherty 2002). In addition, seabird populations may provide a direct food source for larger predators including birds and reptiles that take eggs, chicks and even adult birds (Sandager 1889, Anderson 1992, C. Gaskin and M. Rayner pers. obs.). Given the removal of the mainland seabird fauna from New Zealand, it is likely that terrestrial communities are experiencing very different conditions to those prevailing for much of their evolutionary history (Hawke and Powell 1995).

4.3 Lifeboat for restoration

The value of seabirds as ecosystem engineers is being increasingly recognised by conservationists seeking to re-establish functional native ecosystems by including seabirds in island and mainland restoration projects (Miskelly et al. 2009). Techniques for the translocation of seabird populations are now well established and primarily involve the movement and supplementary feeding of seabird chicks at new (predator proofed) locations prior to fledging (also augmented via acoustic attraction at new colony sites) (Carlile et al. 2003; Miskelly et al. 2009).

Given their high seabird biodiversity value, the islands of the WHGR are a vital source for seabird conservation projects regionally and nationally making protecting and enhancing these lifeboat populations vitally important. Recent examples of seabird translocations from source populations within the region include the movement of Pycroft's petrel from Red Mercury Island to Cuvier Island, 232 chicks moved 2001 – 2003, 13 breeding pairs now established) (Fig 10); northern diving petrel (*Pelecanoides urinatrix urinatrix*) from Little Wooded Island (Tiritiri Matangi) to Motuora Island, 300 chicks moved 2007- 2008, 2 breeding pairs established) and Cook's petrel (*Pterodroma cookii*) from Little Barrier Island to Cape Kidnappers Sanctuary (Hawkes Bay), 150 chicks moved 2010 -2011. The Korapuki Restoration Plan includes conceptual models of food webs with seabirds on islands. Playback systems, broadcasting seabird calls have been installed at several WHGR localities: Cuvier Island (2001), Motuora (2008), Tawharanui Open Sanctuary (2011), and Motuihe (2011). The former two were installed to anchor translocated species, the latter two to attract birds to the sites. At Tawharanui and Motuihe, recordings have been used to match species' target species breeding cycles (Fig 11).

Figure 10. Artificially feeding Pycroft's petrel chicks following translocation, Cuvier Island. *Photo: DOC*

Figure 11. Fluttering shearwater pair attracted to a playback system at Tawharanui Open Sanctuary. *Photo: NNZST*

Figure 12. Grey-faced petrel Oi chick, Burgess Island, Mokohinau Group. *Photo: Chris Gaskin*

4.4 Seabirds as Taonga

The New Zealand government has a relationship with Māori through the Treaty of Waitangi that is enshrined in legislation (e.g. Section 4 of the Conservation Act, 1987). This relationship carries with it opportunities and obligations that are reflected in other goals of the New Zealand Biodiversity Strategy (NZBS) (DOC & MfE 2000): protecting the interests iwi have in indigenous biodiversity, building and strengthening their partnerships with Crown agencies, and conserving and sustainably using indigenous biodiversity (Towns et al. 2012b).

Seabirds are harvested globally for food. In the wider Auckland region Māori have had a special interest. In the WHGR chicks of the grey-faced petrel (*Pterodroma macroptera gouldi* Oi) (Fig 12), a protected species, have been legally harvested subject to conditions set by the Minister of Conservation. Iwi that maintain manawhenua over and sometimes conduct traditional harvests of seabirds are Ngati Rehua at the Mokohinau (Pokohinu) Islands, Ngati Hei on Ohinau and Hauraki at the Ruamaahua Aldermen Islands. It is likely, as evidenced by seabird remains in midden deposits throughout the region, the seabird harvesting was much more extensive historically than today.

4.5 Legal protection of New Zealand seabirds

All seabirds breeding within New Zealand are fully or in a few cases partially protected under the Wildlife Act 1953 and its amendments. Seabirds in the WHGR breed on a large number of island and coastal sites that are administered by Department of Conservation (DOC), regional authorities, private landowners and local iwi. People seeking to visit these sites need to consult with landowners. The inshore and off-shore islands of the Hauraki Gulf and Auckland's west coast are a lifeboat for seabird populations and many are administered by DOC.

These islands (along with mainland sites) have varying protection status under the Wildlife Act 1953 and Reserves Act 1977 including Recreation Reserve (e.g. Burgess Island, Mokohinau Islands), Scenic Reserve (e.g. Rangitoto Island), Wildlife Refuge (e.g. Mangawhai), Scientific Reserve (e.g. Tiritiri Matangi Island) and, the highest protection category, Nature Reserve (e.g. Hauturu/Little Barrier Island). Access to these locations can be dependent upon their protection classification in accordance with the Reserves Act and may require a written landing permit. In general any work with seabirds requires research permission from the regional conservator of DOC, following consultation with *tangata whenua*. Such permission is dependent upon perceived conservation benefit to the species and overall research value.

The purpose of the Fisheries Act 1996 is to provide for the utilisation of fisheries resources while ensuring sustainability. 'Ensuring sustainability' is defined by the Act as maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations, and avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment, which includes seabirds. Further

impetus to manage the impacts of fishing on seabirds is provided through Section 9 of the Fisheries Act, which requires decision-makers to take into account the environmental provisions in the Act, which include: 1) associated or dependent species (which includes seabirds) should be maintained above a level that ensures their long-term viability, and 2) the biological diversity of the aquatic environment should be maintained (DOC 2011).

The National Plan of Action for Seabirds (NPOA-S) is a single-issue plan that is being developed jointly between DOC and the Ministry of Primary Industries (2012). The document will set out a long-term strategic approach to reducing the incidental by-catch of seabirds in New Zealand fisheries zones or by New Zealand flagged vessels in high seas fisheries. The NPOA-S will inform the priorities on issues relating to interactions between fisheries and seabirds. Although this plan does not cover indirect effects of commercial fishing on seabirds (for example, through alteration of habitat and/or food availability), the Draft Conservation Services Programme (CSP) Strategic Statement (2013) sets out indirect effects as a research priority.

The Resource Management Act (1991) (RMA) under Section 6 (Matters of National Importance) requires, for example, recognition and provision for the preservation of the natural character of the coastal environment (including the coastal marine area), the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna, including seabirds and the protection of protected customary rights.

4.6 International migrants, international responsibilities

A key feature of many New Zealand seabirds is migration. Of the 26 seabird species breeding within the region at least 13 are known to migrate at some stage during the year beyond New Zealand waters (Shaffer et al. 2006; Rayner et al. 2011a; Rayner et al. 2011b). These species play important socio-economic and ecological roles in regional ecosystems beyond New Zealand. For example, large populations of Cook's petrel (Fig 15), Buller's shearwater and sooty shearwater (*Puffinus griseus*) that migrate to the coasts of North America during the Northern Hemisphere summer (Shaffer et al. 2006; Rayner et al. 2011a) are, as top predators, key ecosystem components. These species also play major roles in a lucrative marine wildlife tourism industry such as in California.

New Zealand as a signatory of the international Convention on Migratory Species of Wild Animals (CMS) (signed by one hundred and sixteen countries as of 1 July 2011) thus has an international responsibility to protect the breeding grounds for such migrant species, many of which only breed within our region. Seabirds that breed outside the New Zealand EEZ, such as yellow-nosed albatross (*Thalassarche carteri*) (Indian Ocean) (Fig 14), wandering albatross (*Diomedia exulans*) and great shearwater (*Puffinus gravis*) (Atlantic Ocean), short-tailed shearwater (*P. tenuirostris*) and providence petrel (*Pterodroma solandri*) (Australia) and Caledonian petrel (*P. leucoptera caledonica*) (New Caledonia), are also covered by the CMS with obligations to mitigating obstacles to migration and controlling other factors that might endanger them (*http://www.cms.int/about/into.htm* viewed 18 Oct 2011).

New Zealand and nine other countries (known as "Parties to the Agreement") have ratified Agreement on the Conservation of Albatrosses and Petrels Action Plan (ACAP). The objective of ACAP is to achieve and maintain a favorable conservation status for albatrosses and petrels. Parties are expected to take measures, both individually and together, to achieve this objective. The *Priorities* sections in this report (Sections 11.1. and 11.2) will help New Zealand implement ACAP.

Figure 13. White-naped petrel. First reported sighting of this Kermadec breeding species in Hauraki Gulf, March 2007. *Photo: Chris Gaskin*

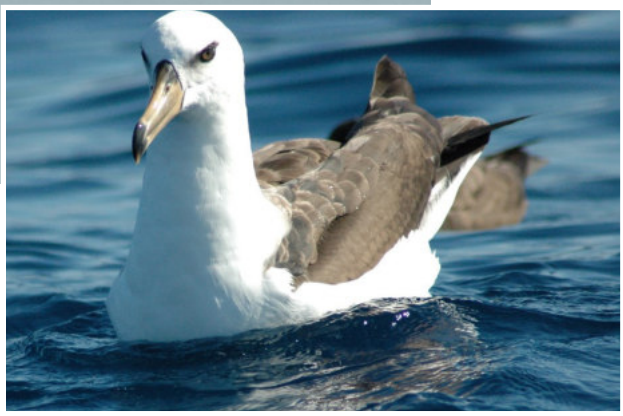
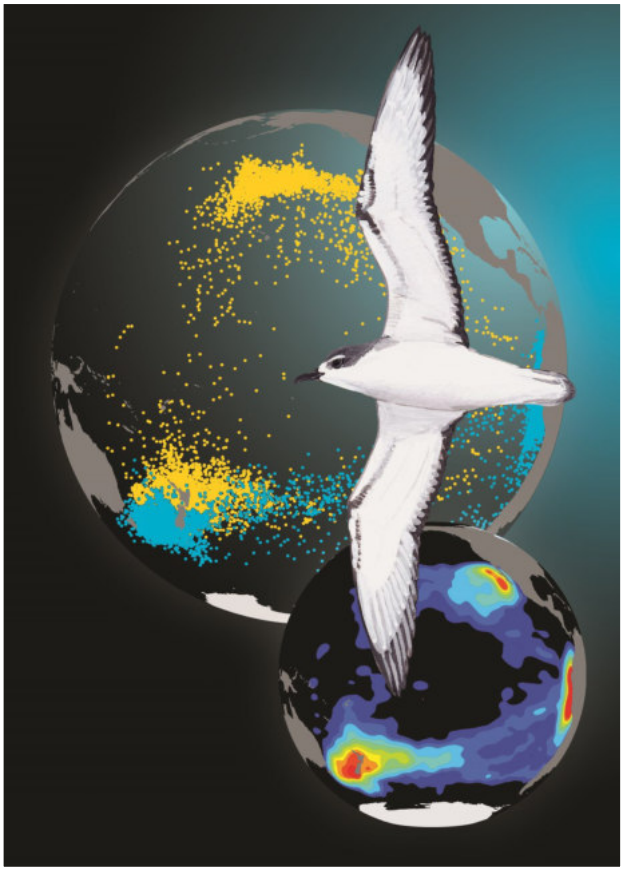


Figure 14. Immature Campbell Island albatross, Hauraki Gulf, December 2006. *Photo: Karen Baird.*



5.1 Introduced predators

Given their low reproductive rates, prolonged chick rearing and ground-nesting tendencies seabirds are poorly adapted to withstand introduced predators, which represent the most significant onshore threat to seabird populations worldwide (Mulder et al. 2011). In the greater Hauraki Gulf region introduced species that can impact seabird populations include cats (*Felis cattus*), rats (*Rattus* spp.), pigs (*Sus scrofa*), mustelids (Mustela spp.) and hedgehogs (*Erinaceus europaeus*).

Cats were introduced to many gulf islands, often in association with lighthouse settlements, and are also present on the mainland as feral populations. Cats have contributed to the decline or loss of seabird populations through the predation of adults (Fig 18) and chicks (i.e. Cook's petrel and black petrel population declines) on islands such as Hauturu/Little Barrier Island (Imber 1987) and Aotea/Great Barrier Island (Bell and Sim 2005).

Norway rats (*Rattus norvegicus*), ship rats, (*R. rattus*) and Pacific rats (kiore) (*R. exulans*) have reached the region's mainland and offshore islands. Given its large size, the Norway rat (150- 500 g) is considered most damaging to seabird populations, predating adults, eggs and chicks (Atkinson 1985) of species such as the white-faced storm petrel on Maria Island (Noises group) (Moors 1985; Towns and Broome 2003). Ship rats (50 - 250 g) are capable of killing the adults of smaller seabirds and predate their eggs and chicks (Atkinson 1985). Although there is no direct evidence of ship rat driving population declines of seabirds on islands of the WHGR, its current or past (prior to eradication) presence on many Gulf islands and this presence (historic or current) is associated with low biodiversity of seabirds and other fauna and flora (Towns et al. 2006). Moreover the role of ship rats as a seabird predator is well established: a classic New Zealand example being the ecological catastrophe that followed the invasion of Big South Cape Island by this ship rats in 1962. This invasion was followed by the large declines in seabird populations, the local extinction of 6 forest birds and one bat and total extinction of one endemic bird and a bat (Towns et al. 2006).

Figure 16. Petrels killed by cats. Photo*: DOC*

The Pacific rat (kiore) (30-150 g) was introduced widely with early Polynesian settlement; given its smaller size, it is primarily a predator seabird egg and chicks. Evidence for the impact of Pacific rat on seabirds comes from observations of direct predation (Booth 1995) and the examination of population changes of birds after eradications (Towns et al. 2006). On Korapuki Island (Mercury Islands), two small colonies of common diving petrels expanded following the eradication of Pacific rats in 1986 (G. Taylor pers. comm.). Pierce (2002) also found that the breeding success of Pycroft's petrels and little shearwaters (*Puffinus assimilis haurakiensis*) on Coppermine and Lady Alice Islands (Hen and Chickens) increased following removal of Pacific rat. On Hauturu/Little Barrier Island the breeding success of Cook's petrel breeding in high altitude habitats average 5% prior to Pacific rat eradication yet rose immediately to approximately 60% following rat eradication in 2004 (Rayner et al. 2007c). Observation of feral pig predation on seabirds within the region are less numerous but the species was observed to be having significant impact on seabirds on Aorangi Island, Poor Knights Islands (Harper 1983), Cook's petrel on Hauturu/Little Barrier Island prior to their eradication (Reischek 1886; Reischek 1887), and continue to predate the eggs and chicks of black petrel on Aotea/Great Barrier Island (Bell and Sim 2005).

In addition to cats, rats and pigs, mustelids and hedgehogs can predate seabirds such as breeding gulls and terns in mainland coastal habitats. New Zealand native species such as the southern black-backed gull, Australasian harrier (*Circus approximans*), pukeko (*Porphyrio porphyrio*) and morepork (*Ninox novaeseelandiae*) (Fig 17) will predate the nests, eggs, chicks and sometimes adult seabirds and awareness of the presence of such species is important when designing seabird translocations or protection programmes. For example, black backed gull (*Larus dominicanus*) have been culled when nesting too close to the breeding sites of the critically endangered New Zealand fairy tern as a result of the danger to nesting terns and their eggs and chicks. A native avian seabird predator introduced to the Gulf region is the weka (*Galliralis australis*). The danger of weka to seabird populations is well documented following their introduction to New Zealand seabird islands such as Codfish Island (Whenau Hou) after which seabird populations were severely depleted or exterminated (Imber et al. 2003b). In the Hauraki Gulf region this species has been introduced to Kawau and Arid Islands where it has likely impacted seabird populations. However control of weka populations should be conducted in the knowledge that North Island weka is itself listed as Vulnerable (IUCN Red List, viewed 23 July 2012) and Nationally Vulnerable (DOC NZ Threat Classification 2008).

Figure 17. Morepork, Burgess Island, Mokohinau Islands. *Photo: Stefanie Ismar*

5.2 *Habitat modification, urban development and disturbance*

Modification of seabird breeding habitats has also impacted populations within the WHGR. Forest clearance through logging and burning destroyed breeding habitats for many species on the mainland and offshore islands including Burgess Island (Mokohinau Islands) (Fig 18), Red Mercury Island and Tiritiri Matangi. On Hauturu/Little Barrier Island the burning and logging of the islands slopes is a major factor in predicting current distribution of Cook's petrel burrows which are found predominately either at higher altitudes in unmodified habitats or at lower altitude in pockets of remnant forest (Rayner et al. 2007b). Moreover the introduction of livestock to mainland and island habitats further modified habitats through grazing, the trampling of nests and burrows and also opening up habitats for weed species such as boxthorn (*Lycium ferocissimum*), which deters seabirds from breeding (Taylor 2000b). On Motuora Island stock damaged the burrows of grey-faced petrel prior to the fencing of coastal forest habitats (Gardner-Gee et al. 2008). Australasian gannets (*Morus serrator*) breeding on Mahuki Island (Broken Islands) have shown an immediate expansion of their colony area following removal of cattle from the island (J. Boow pers. com. & M. Rayner pers. obs.).

The rapid increase in beach and sand-spit subdivisions together with coastal land-use changes have also adversely impacted populations of terns, gulls and cormorants by reducing the availability of breeding habitats for these species. Such land use change, in concert with burgeoning human populations, have resulted in increasing levels of disturbance at remaining coastal breeding sites as people access the coast for recreation (walking, boating, vehicular recreation such as 4X4 off-roading). For islands in the region greater disturbance is manifested as visitation to public access reserves and unauthorised landings on Nature Reserves increase. Associated risks are from invasive species introductions, fire or other damage to habitats. Light pollution from urban areas is also playing a role by disturbing and or disorienting seabirds populations. For example, hundreds of Cook's petrel fledglings are annually rescued by Bird Rescue from the Auckland central business district and east coast settlements between the city and Leigh where they are attracted and disorientated by night time urban lights during the fledging period.

Figure 18. Lighthouse settlement on Burgess Island, Mokohinau Group, c. 1950. *Photo: DOC*

Figure 19. Rena spills oil towards Bay of Plenty coastline. *Photo: Kim Westerskov.*

Figure 20. Oiled Buller's shearwater, shows bare brood patch. This is likely to be a breeding bird. *Photo: Karen Baird.*

5.3 *Marine pollution*

A range of marine pollutants enter the marine environment and have the potential to impact seabirds. These include effluent (sewage), chemical contaminants (pesticides, herbicides, storm-water runoff, heavy metals), plastics and oil and petroleum products. Pollutants can impact birds directly, causing death through ingestion of toxic materials or, in the case of oils, through fouling of plumage resulting in the loss of water proofing properties and a loss of ability to fly, feed and keep warm. Pollutants can also impact birds indirectly, entering the food chain and accumulating in tissues causing reduced fertility, egg shell thickness and or chick rearing capacity. The negative impacts of plastic debris on seabirds (through entanglement and or ingestion) are well recognised globally (Young et al. 2009) but such impacts within the WHGR, where large quantities of plastic debris enter the marine environment, have received limited study (Young and Adams 2010). The WHGR is a major shipping route to and from the ports of Auckland, Marsden Point (Whangarei) and Tauranga, the threat of oil spill following a shipping accident would have significant consequences for seabird populations. The recent oil spill and associated seabird mortality caused by the grounded container ship *Rena* off Tauranga serves to highlight this on-going threat (Figs 19, 20).

5.4 *Interactions with fisheries*

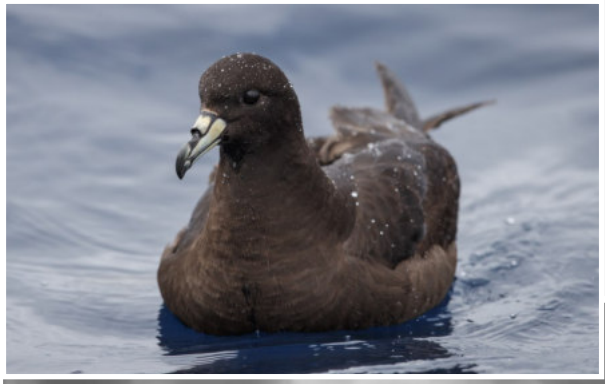
The effects of recreational and commercial fishing within the region continues are poorly understood. Some publicised events and numerous anecdotal reports suggest inshore set nets by recreational and commercial fishers capture and drown significant numbers of penguins, shags and shearwaters. The capture of birds on fishing lines also appears to be a problem of unknown scale and consequence. The by-catch of seabirds by commercial fishing boats is a major threat to seabird populations. A recent research report prepared for the Ministry of Fisheries (Richard et al. 2011) has indicated the bottom long-line and trawl fisheries within the WHGR for bluenose and snapper are resulting in by-catch rates for flesh-footed shearwaters and black petrels are far in excess of what their populations can sustain. Competition with commercial and recreational fisheries for prey and habitat degradation by fishing practices (i.e. bottom trawling) presents a likely but unknown level of threat to seabird populations.

Figure 21. Black petrel aggressively attacking a baited line (during experiments - no hooks used). *Photo:* Richard Robinson/DOC/NNZST.

Figure 22 Crewman of an inshore fishing vessel successfully releases a Cook's petrel found aboard; the bird was most likely attracted by the vessel's lights. Hauraki Gulf.

Figure 23 (left). Black petrel. *Photo: Richard Robinson/DOC/NNZST.* Figure 24 (right). Flesh-footed shearwater. *Photo: Richard Robinson/DOC/NNZST.* Figure 25. Dead black petrel prior to necroposy, fisheries return. *Photo: Karen Baird.*

Figure 26. The map below shows commercial fisheries mortality data from Oct 2008 to Nov 2010 for black petrels and flesh-footed shearwaters (right & below). Events where birds were captured are shown by coloured dots. A number of the events are for multiple deaths, maximum number for a single event was 15 flesh-footed shearwaters in Oct 2010. *Map: Data supplied by Elizabeth Bell.*



6 STATE OF SEABIRD KNOWLEDGE FOR THE WHGR

Knowledge of the WHGR's seabird populations was historically restricted to anecdotal or un-systematic observations made by amateur or professional naturalists and ornithologists. Andreas Rieschek was one of the first European specimen collectors to make notes on the seabirds, and seabird islands in the Hauraki Gulf (Reischek 1886; Reischek 1887). Andras Sandager was 32 years old when appointed the assistant lighthouse keeper on Burgess Island in 1883 and spent six years there, during which he chronicled a remarkable natural history of the local islands and their seabirds, invertebrates and fish. Sandager's bird notes serve as something of a benchmark to seabird study in New Zealand, and have been much referred to over the years since (Sandager 1889).

Subsequent published accounts on the region's seabirds were made by great New Zealand naturalists such a Edgar Stead (Stead 1936a; Stead 1936b), Charles Fleming (Fleming 1950; Fleming and Wodzicki 1952) and other museum staff (Turbott and Sibson 1946; Turbott 1947). Naturalist clubs provided valuable accounts of the regions seabird avifauna beginning in the early 20th century. The Kings College Naturalist Club, founded by the leading New Zealand ornithologist Richard Sibson (Sibson 1947; Sibson 1949; Sibson 1952), and the University of Auckland Field Club made regular field excursions to many of the region's islands - the latter's Journal *Tane* publishing valuable observations on the seabirds and seabird islands from 1948 to the early 1980s (McCallum 1983).

Systematic surveys of the region's seabird populations commenced in the 1970s when the New Zealand Wildlife Service began assessments of islands within the WHGR to quantify biodiversity assets, understand the impacts of introduced predators and identify locations for conservation action (Wildlife Service summary reports). This work was continued following the formation of the New Zealand Department of Conservation (DOC) with the creation of the Northern Offshore Island Register (Taylor 1989) and the survey of smaller islands not previously covered by the Wildlife Service (Cameron and Taylor 1991; Taylor and Tennyson 1999; Tennyson and Taylor 1999). Large DOC Conservancy-funded projects were also conducted to assess biodiversity of island groups such as the Ruamaahua Aldermen and Mercury Islands (G Taylor pers. com.).

After 1980, a so called modern era in the study of WHGR seabirds commenced out of a need to understand the biology of endangered species and or the ecology of seabird islands. Projects include DOC-funded studies of Cook's petrel (Imber 1996; Imber et al. 2003b) and black petrel (Imber 1987; Imber et al. 2003a; Bell and Sim 2005; Bell et al. 2009; Bell et al. 2011) and study of the critically endangered New Zealand fairy tern by Ornithological Society of NZ (OSNZ) members, DOC and Royal Forest and Bird

Figure 27. (above) A.F.S. Sandager.

Figure 28. Survey party on Stanley Island, Mercury Group, 1987. *Photo: Alan Tennyson*

Table 1 (facing page). Seabirds breeding in the Hauraki Gulf region. Threat rankings for NZ birds – refer Townsend (2008), Miskelly et al. (2008) for details and definitions.

	Seabirds breeding in Hauraki Gulf region	NZ Classification	IUCN Rank	Endemism
SPENISCIFORMES	Northern Blue Penguin *Eudyptula minor iredale*	DP EF (DP EF)	LC	NZ endemic subspecies
PROCELLARIIFORMES	Cook's Petrel *Pterodroma cookii*	B (Inc RR)	V	NZ endemic
	Pycroft's Petrel *P. pycrofti*	B (Inc RR)	V	NZ and regional endemic
	Black-winged Petrel *P. nigripennis*	(SO)	LC	NZ native
	Grey-faced Petrel *P. (macroptera) gouldi*	(De Inc	LC	NZ native
	Buller's Shearwater *Puffinus bulleri*	(OL St)	V	NZ and regional endemic
	Flesh-footed Shearwater *P. carneipes*	B(1/1) (RR	NT	NZ native
	Fluttering Shearwater *P. gavia*	B (RR)	LC	NZ endemic
	Little Shearwater *P. assimilis haurakiensis*	B (IE RR)	V	NZ and regional endemic subspecies
	Sooty Shearwater *P. griseus*	B(1/1) (SO)	LC	NZ native
	Black Petrel *Procellaria parkinsoni*	B(1/1) (RR)	V	NZ and regional endemic
	Fairy Prion *Pachyptila turtur*	B (RR SO)	LC	NZ endemic subspecies
	Common Diving Petrel *Pelecanoides urinatrix*	B (Inc RR SO)	LC	NZ and regional endemic subspecies
	White-faced Storm Petrel *Pelagodroma marina maoriana*	B (RR)	LC	NZ endemic subspecies
	New Zealand Storm Petrel *Fregetta maoriana*	(DP)	C	NZ and regional endemic species
PELECANIFORMES	Australasian Gannet *Morus serrator*	(DE Inc	LC	NZ native
	Pied Shag *Phalacrocorax varius*	C (1/1)	V	NZ endemic subspecies
	Little Shag *P. melanoleucos brevirostris*	(Inc)	LC	NZ native
	Black shag *P. carbo novaehollandiae*		LC	NZ native
	Little Black Shag *P. sulcirostris*		LC	NZ native
	Spotted Shag *Stictocarbo punctatus punctatus*		LC	NZ endemic
CHARADRIIFORMES	Southern black-backed Gull *Larus dominicanus*	(SO)	LC	NZ native
	Red-billed Gull *L. scopulinus*	E(1/1)	LC	NZ endemic
	Black-billed Gull *L. bulleri*		En	NZ endemic
	White-fronted Tern *Sterna striata*	B(1/1) (DP)	V	NZ native
	Caspian Tern *Hydroprogne caspia*	B(1/1) (SO)	NT	NZ native
	NZ Fairy Tern *Sternula nereis davisae*	A (CD RR)	C	NZ and regional endemic

Society of NZ (Ismar et al. 2012). Studies of seabird island ecosystems include long-term projects on the Mercury Islands (Towns 2002; Towns et al. 2006) and investigations of the impacts of introduced predators within seabird island ecosystems across the wider Gulf (Pierce 2002; Fukami et al. 2006, Towns et al 2009).

Translocation projects to restore seabird populations have also provided opportunity for the study of species biology (Gangloff and Wilson 2004). In particular in recent years there have been a proliferation of community-based conservation trusts involved in protecting and monitoring seabirds and seabird islands in the region (Gaskin and Heiss-Dunlop 2011; Gaskin 2012). Increasing interest in, and publicity around, the Hauraki Gulf Marine Park has ensured that a new generation of postgraduate researchers continues to add to understanding the seabirds within the WHGR (Young and Adams 2010; Machovsky et al. 2011a; Machovsky et al. 2011b; Dunn 2012; Machovsky-Capuska et al. 2012, Young 2013).

Figure 29. Black petrel transfer on Hauturu/Little Barrier Island. *Photo: Alan Tennyson*

Background: White-faced storm petrel colony and researchers' tent. *Photo: Abe Borker.*

7 INDIVIDUAL SEABIRD PROFILES

This section provides profiles for each seabird species breeding within the WHGR outlining research conducted on each species and their biology and management requirements.

Figure 30. Cook's petrel. *Photo: Abe Borker*

Northern little penguin

Eudyptula minor iredale

Maori name: Karora

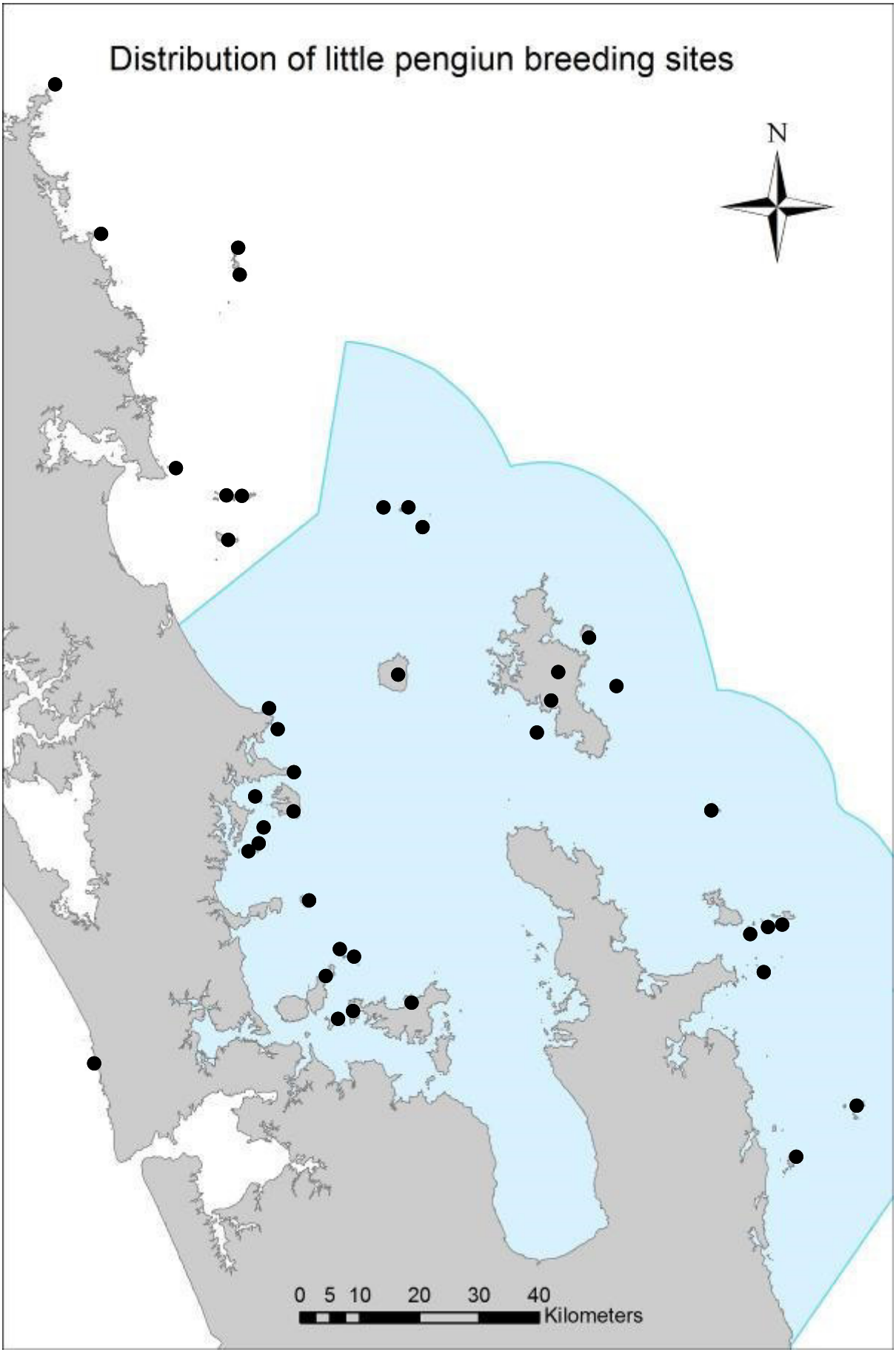
Photo: Adrien Lambrechts

Other names	Blue penguin, little blue penguin
Average length & weight	40 cm, 1100 g
IUCN conservation status	Least Concern
Breeding season	July - Feb, 1-2 eggs laid Aug-Oct, hatching Sept-Nov after c. 36 days, fledging Nov-Jan after c. 54 days
Breeding habitats	Rock and natural crevices, burrows and under thick vegetation
Foraging habitat and movements	Sedentary, coastal waters close to breeding sites

Widespread New Zealand endemic subspecies within the WHGR with populations present on the mainland coast and on most islands that can be accessed from the sea – particularly those lacking mammalian predators. Breeding biology and ecology in the Hauraki Gulf studied at Tiritiri Matangi Island. Studies of breeding biology (Chen 2004; Geurts 2006; Boyer 2010; Van Rensburg 2010) and sporadic mass mortality events caused by prey die off and/or algal blooms (Robertson and Bell 1984) indicate strong linkages between resource availability, breeding success and survival. Studies of foraging ecology and links between resource availability, foraging behaviour and movements are required. Disturbance by people and predation by domestic dogs, feral cats and mustelids are major threats at mainland breeding sites. Management at such locations should focus on pest control and disturbance minimisation. Recent island pest eradications (i.e. Motuihe, Rangitoto and Motutapu Islands) stand to benefit this species through the provision of safe inner-Gulf breeding and roosting sites. Monitoring and or habitat augmentation through provisioning of nest boxes could be considered at these locations.

Photo: Abe Borker

Photo: Adrien Lambrechts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Black petrel

Procellaria parkinsoni

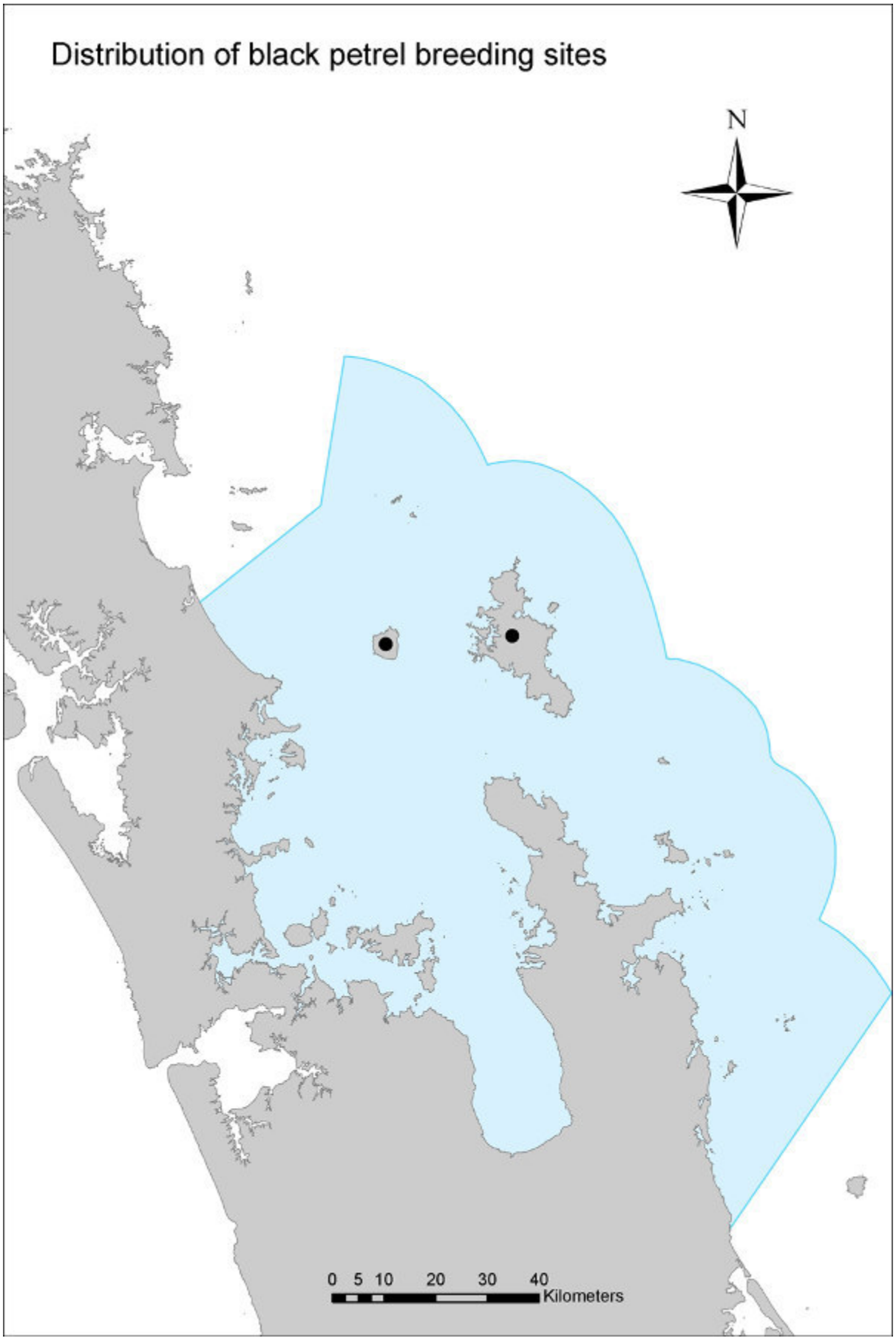
Maori name: Taiko

Photo Richard Robinson/DOC/NNZST

Other names	Parkinson's petrel
Average length & weight	46 cm, 700 g
IUCN conservation status	Vulnerable
Breeding season	October-July, 1 egg laid Nov-Dec, incubation c. 57 days, chicks hatch end Jan-Feb, chicks fledge April-July after c. 107 days
Breeding habitats	Breed colonially in forested habitat, nesting in underground burrows
Foraging habitat and movements	Offshore foraging habitats, shelf break and pelagic waters. Migrates to eastern Pacific off South America during winter non-breeding period

New Zealand and Hauraki Gulf endemic restricted to two breeding population on Aotea/Great Barrier Island (2000 breeding pairs (Bell et al. 2011) and Hauturu/Little Barrier Island (100 breeding pairs) (Imber 1987). Long-term study of the Aotea/Great Barrier Island colony indicates a decline of 1.4% per annum which has been attributed to predation by introduced cats, rats and pigs (Bell et al. in press) and more recently high-levels of by-catch of the species by commercial fishers (Richard et al. 2012). Black petrel were predated by cats on Hauturu/Little Barrier island until their eradication in 1980 (Imber 1987; Imber et al. 2003a) and this population requires further study to provide estimates of population size and dynamics. During breeding, black petrels forage predominantly along the continental shelf break and beyond in deeper oceanic waters (Bell et al. 2009; Freeman et al. 2010). Birds migrate to the eastern Pacific Ocean during the non-breeding season (Bell et al. in prep). An immediate research priority for this species is quantifying and mitigating the by-catch of this species by onshore and deep-water fishing fleets within the New Zealand EEZ. The Aotea/Great Barrier Island colony requires on-going and improved protection from introduced predators.

Photo: Richard Robinson


Distribution of black petrel breeding sites
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Kilometers

Grey-faced petrel

Pterodroma macroptera gouldi

Maori name: Oi

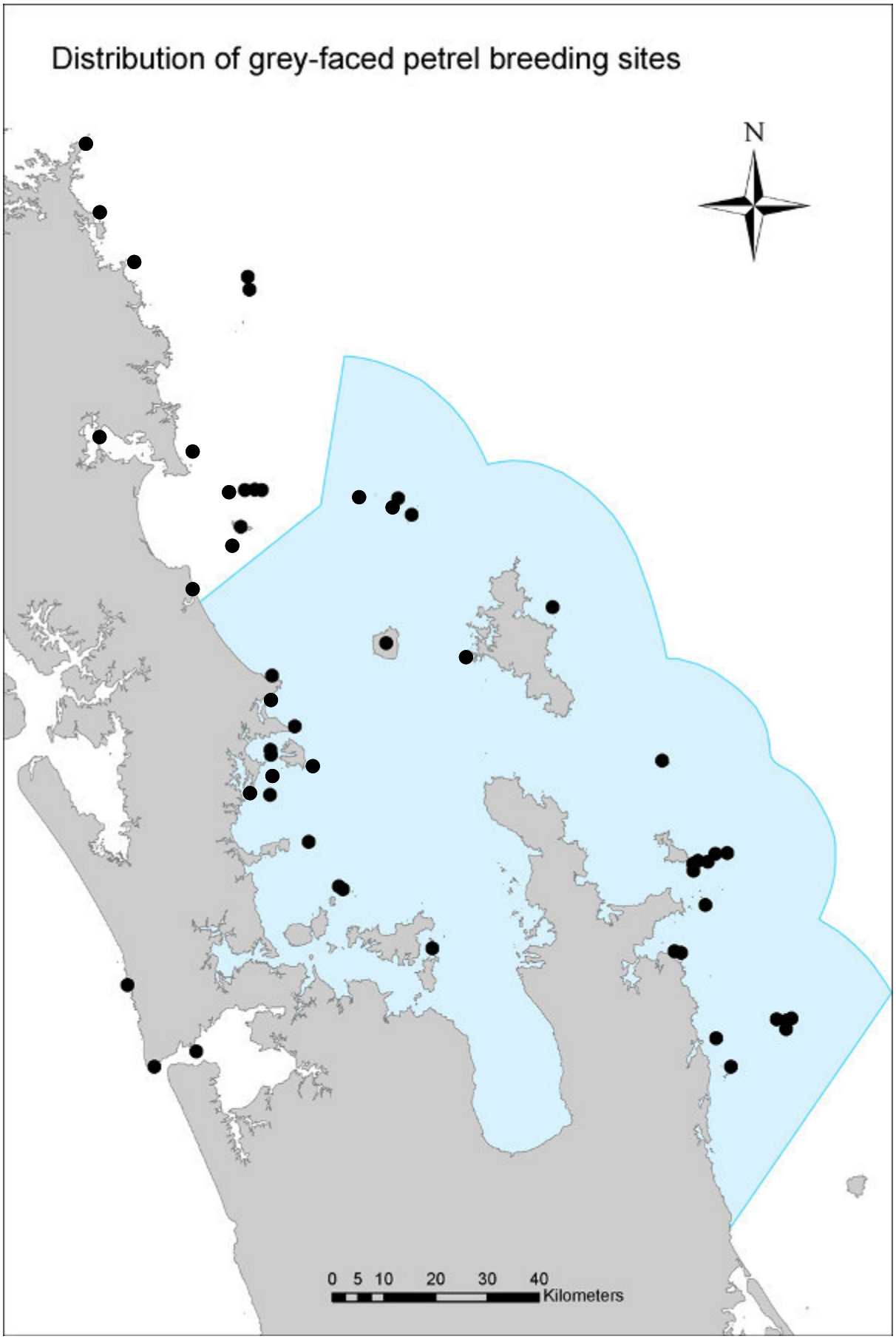
. Photo: Adrien Lambrechts

Other names	Great-winged petrel, northern muttonbird.
Average length & weight	41 cm,, 550 g
IUCN conservation status	Near Threatened
Breeding season	April- December, 1 egg laid June-July, hatching Aug-Sept after c. 55 days, chicks fledge Dec-Jan after c. 118 days.
Breeding habitats	Breed colonially in forested and or scrub habitats on islands, islets and some mainland headland sites, nesting in underground burrows.
Foraging habitat and movements	Offshore in deep sub-tropical and temperate waters of Tasman Sea and Pacific Ocean. Roams widely (Australia to central South Pacific) within subtropical and temperate waters during non-breeding.

New Zealand endemic subspecies breeding widely within the WHGR on islands and at some mainland sites. Largest WHGR population on Hongiora (Ruamaahua Aldermen Islands; 20,000-50 000 pairs; G. Taylor and A. Tennyson unpublished data) though Islands likely to have more than 5000 breeding pairs include Hen, Lady Alice, Whatupuke (Hen and Chickens), Burgess, Fanal (Mokohinau) Red Mercury, Double and Stanley (Mercury Islands) and Ruamahuanui and Ruamahuaiti (Ruamaahua Aldermen Islands) (Imber 1976; G. Taylor 2000b). Breeding biology studied extensively (Imber 1976; Imber et al. 2000; Imber et al. 2003c; G. Taylor unpublished data). Recent investigations suggest significant differences in the timing of breeding, foraging ecology and impacts of oceanic processes on breeding between West Coast and East Coast colonies requiring further investigation. Dietary studies and recent tracking indicate the species to be an obligate deep-water specialist with > 80% of food, predominantly diurnally migrating species, predated or scavenged at night (Imber 1973; G. Taylor and M. Rayner unpublished data).

Photo: Adrien Lambrechts

Photo: Abe Borker


Distribution of grey-faced petrel breeding sites
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Kilometers

Black-winged petrel

Pterodroma nigripennis

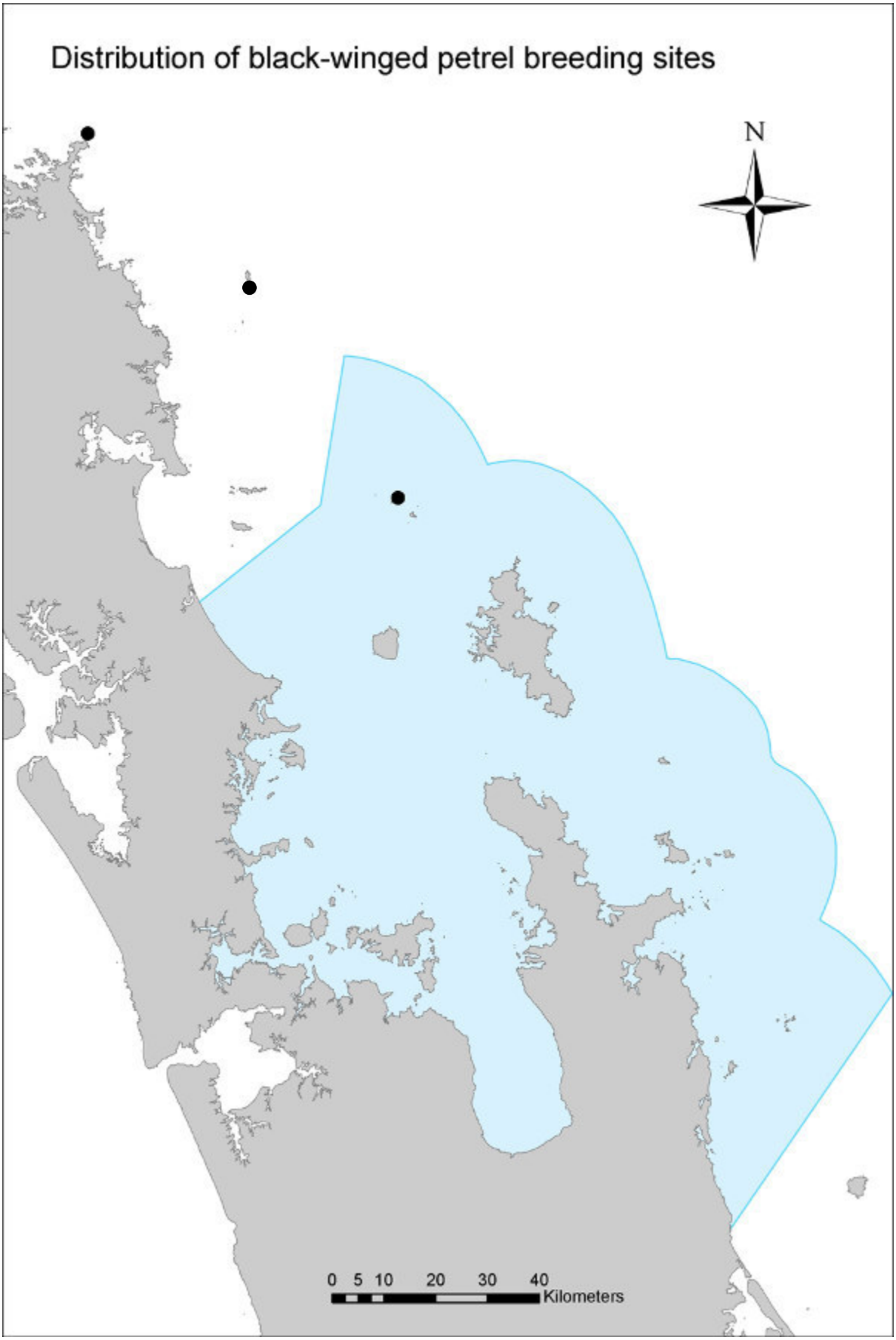
Photo: Abe Borker

Other names	Titi (Raoul)
Average length & weight	30 cm, 175 g
IUCN conservation status	Least Concern
Breeding season	October-May, 1 egg laid Dec-Jan, hatching Feb-Mar and fledging May-June
Breeding habitats	Burrow nesting in scrub or open habitats.
Foraging habitat and movements	Pelagic foraging to in Tasman Sea and South Pacific Ocean during breeding as far south as Subtropical Convergence. Migrates to Equatorial and North Pacific Ocean.

New Zealand native with wide breeding distribution with South-West Pacific and French Polynesia (and isolated population on Round Island in Indian Ocean). New Zealand stronghold for species on Kermadec Islands (2-3 million pairs; Taylor 2000b). Two populations in the WHGR: eight burrows discovered on Motukokako Island (Cape Brett) in 1987 (Taylor and Cameron 1991) and 14 burrows on Burgess (Pokohinau) Island in 2011 (Ismar et al. in press). Also heard calling at Aorangi Island, Poor Knights in 2013 (G. Taylor, pers. com.). Breeding biology and ecology poorly known (see Marchant and Higgins (1990); Tennyson (1991), Hutton and Priddel (2002) for available information) and requires detailed study. Known populations within WHGR require monitoring to confirm persistence and or expansion. Tracking of New Zealand populations (Raoul Island and South East Island) indicates that breeding birds forage in deep oceanic waters from the subtropics to South of the Subtropical Convergence Zone (21°-52° S) and migrate to the Equatorial and North Pacific Ocean (1°-37° N) during the austral winter (M. Rayner and G. Taylor unpublished data). Tracking data to ascertain the distribution, foraging ecology and migratory destinations of WHGR populations is currently being assessed.

Photo: Sylvain Dromzee

Photo: Sylvain Dromzee


Distribution of black-winged petrel breeding sites
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0 5 10 20 30 40
Kilometers

Cook's petrel

Pterodroma cookii

Maori name: Titi

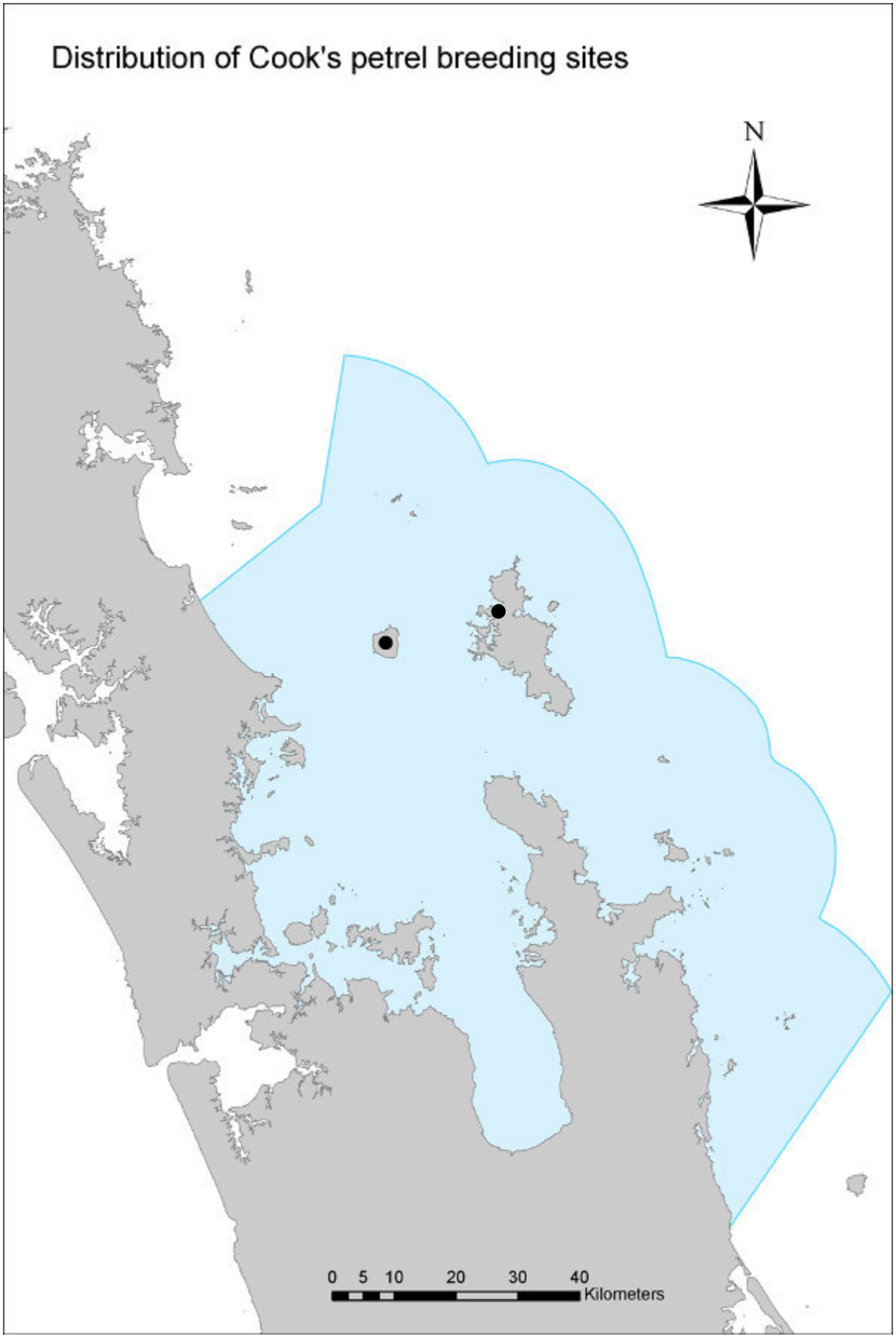
Photos: Matt Rayner

Average length & weight	25-30 cm, c. 190 g
IUCN conservation status	Vulnerable
Breeding season	Sept-April, 1 egg laid mid-November, incubation 46-50 days, chick rearing approximately 87 days (Imber 2003, Rayner 2008)
Breeding habitats	Burrow nesting in forest predominantly between 300 – 700 m on Little Barrier Island.
Foraging habitat and movements	Pelagic foraging in Tasman Sea and Pacific Ocean during breeding. Migrates to North Pacific Ocean during New Zealand winter.

New Zealand endemic with two genetically distinct and reproductively isolated populations breeding on Hauturu/Little Barrier Island and Whenua Hou/Codfish Island off Stewart Island (Rayner et al. 2010a). World's largest population breeds on Hauturu/Little Barrier Island with approximately 300 000 breeding pairs (c. 1 million plus individuals) expanding following the eradication of feral cats (Veitch 2001) and kiore, which predated Cook's petrel, in 1980 and 2004 respectively (Rayner et al. 2007a; Rayner et al. 2007b; Rayner et al. 2007c). Cook's petrel, presumably of Hauturu/Little Barrier Island origin still breed in scattered burrows on Aotea/Great Barrier Island where the species likely bred widely before the introduction of ship rats, cats and pigs. Eradication of pests on Great Barrier would result in the rapid expansion of the species population breeding on this island. Breeding birds forage offshore in deep waters of the Tasman Sea and Pacific Ocean predating predominantly nocturnal prey (Imber 1996; Rayner et al. 2008; Rayner et al. 2010b). Up to one third of population may use the North Auckland seabird flyway during breeding to access the Tasman Sea (M. Rayner unpublished data). Following breeding birds migrate to the North Pacific Ocean Convergence zone frequenting pelagic waters off Baja California and North of Haaii (Rayner et al. 2011a).

Photo: Hadoram Shirihai

Photo: Hadoram Shirihai


Distribution of Cook's petrel breeding sites
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0 5 10 20 30 40
Kilometers

Pycroft's petrel

Pterodroma pycrofti

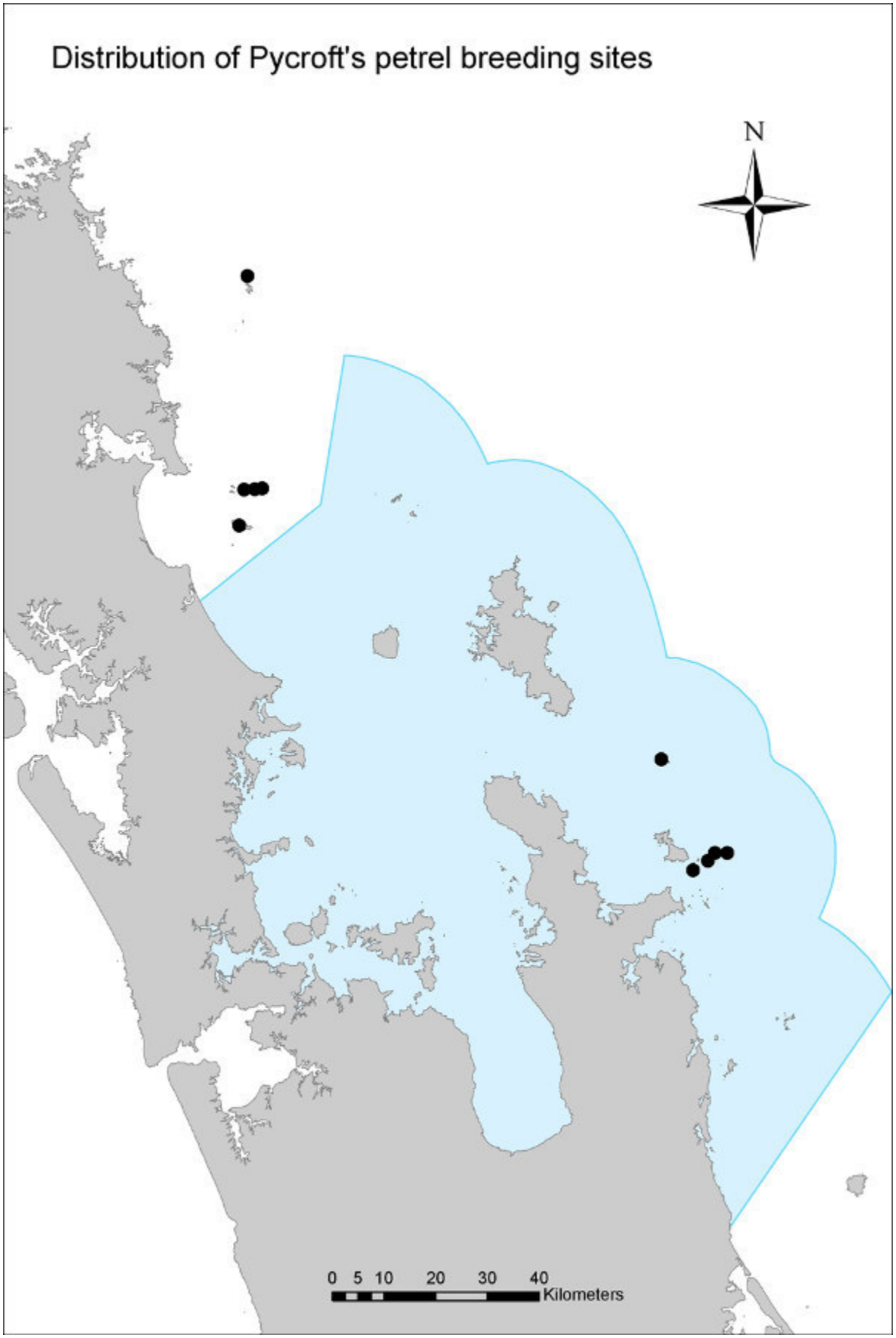
Maori name: Titi

Photo: DOC

Average length & weight	28 cm, 160 g
IUCN conservation status	Vulnerable
Breeding season	October-April, 1 egg laid Nov-Dec, hatching Jan after c. 47 days, fledging March-April after c. 80 days
Breeding habitats	Burrow nesting in forest and or scrub habitats.
Foraging habitat and movements	Pelagic foraging in Pacific Ocean during breeding with concentration off east coast of North Island. Migrates to central tropical Pacific during New Zealand winter.

New Zealand and WHGR endemic breeding on the Poor Knights Islands (Aorangi), Hen and Chicken Islands (Taranga/Hen Island, Lady Alice, Coppermine, Whatupuke, Mauitaha), Cuvier Island and Mercury Islands (Red, Double, Stanley, Korapuki) (Taylor 2000a). Breeding observations made on Hen Island, Lady Alice and Aorangi Islands (Bartle 1968; Dunnet 1985). Detailed study of chick feeding frequency, meal size and growth conducted on Red Mercury Island prior to translocation of the species that provided sound understanding of the species breeding biology (Gangloff and Wilson 2004). Population sizes for Pycroft's petrel at most breeding sites remain anecdotal but are most likely small (100s of pairs) beyond the species stronghold on Red Mercury Island. The population on Red Mercury Island appears to have increased markedly since Pacific rat eradication with an estimated 2500-4000 pairs in 1998 now numbering possibly 10000 + pairs (G. Taylor, M. Rayner unpublished data). A complete revision of the population status of Pycroft's petrel using modern survey techniques is now a key requirement for the species. Between 2001 and 2003, 232 Pycroft's petrel chicks where translocated between Red Mercury Island and Cuvier Island in an attempt to establish an additional secure population (227 were fledged successfully; Miskelly et al. 2009). Translocated chicks have now returned to breed on Cuvier Island with 13 breeding pairs established as of 2010 (G. Taylor unpublished data) and on-going monitoring of this population should be continued. Tracking of Pycroft's petrel from Red Mercury Island indicates that breeding birds forage over oceanic waters from the subtropics to Subtropical Convergence Zone (21° – 52° S) with foraging hotspots east of the North Island over the Hikurangi Trough and Plateau and north of the Chatham Rise. Migrates to the eastern Equatorial and North Pacific Ocean (1° – 37° N) during the austral winter (M. Rayner unpublished data).

Photo: Hadoram Shirihai


Distribution of Pycroft's petrel breeding sites
N
0 5 10 20 30 40
Kilometers

Fairy prion

Pachyptila turtur

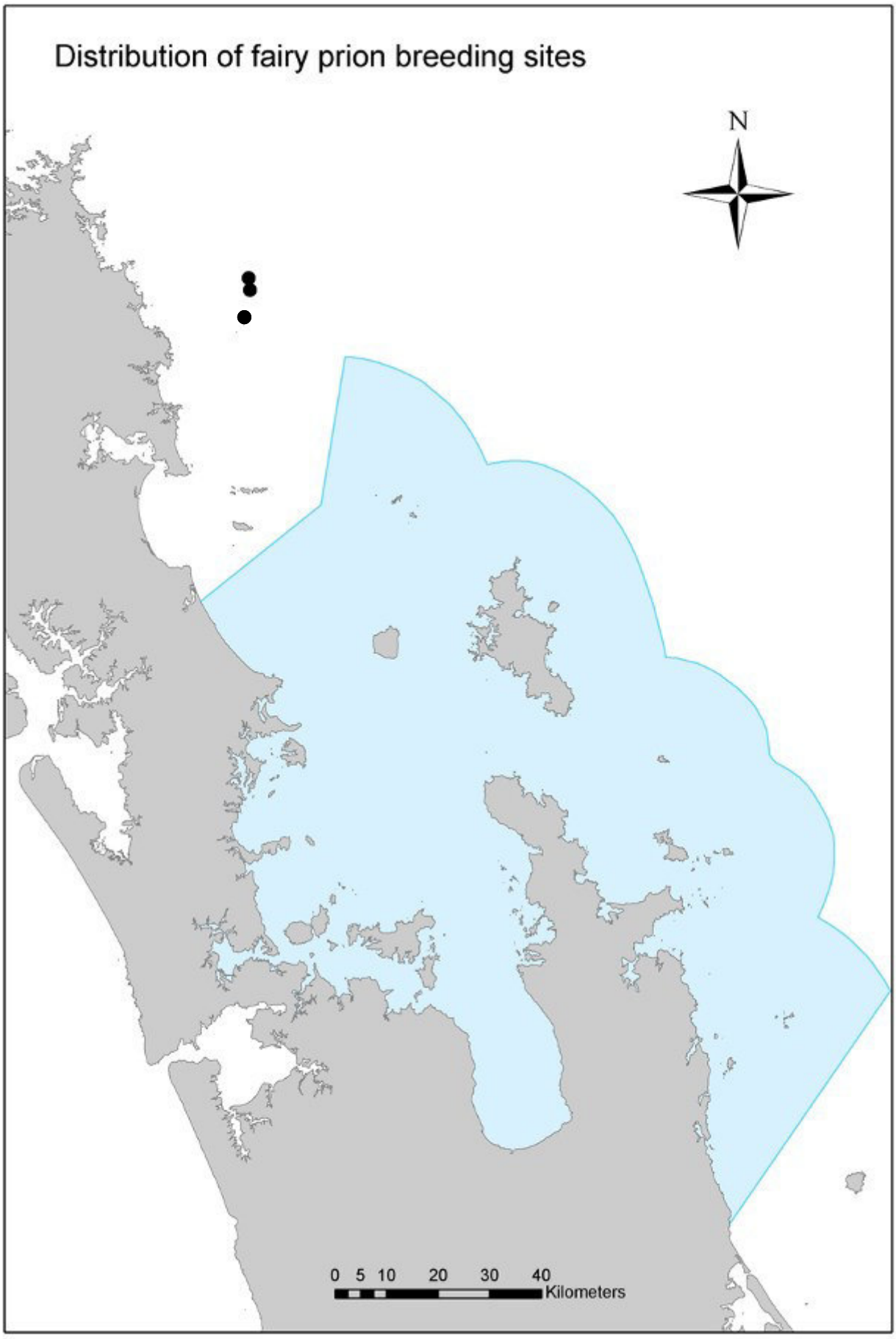
Maori name: Titi wainui

Photo: Johnny Kendrick

Other names	Dove petrel
Average length & weight	25 cm, 125 g
IUCN conservation status	Least Concern
Breeding season	Aug-Jan, 1 egg laid October, chicks fledge in Jan
Breeding habitats	Breed colonially, nesting in underground burrows and rock crevices on offshore islands.
Foraging habitat and movements	Essentially unknown

Abundant New Zealand native with 1 million + pairs breeding nationally. One breeding population in the WHGR of c. 40 000+ breeding pairs on the Poor Knights Islands (Harper 1976). Up to date and reliable population data are lacking and a population survey is a management priority. Potential competition from expanding Buller's shearwater population at this site (S. Bartle pers. com.) also warrants further investigation. At-sea movements are poorly known but large flocks of birds are common in the northern Hauraki Gulf between November and February where they feed on surface aggregations of krill, often in association with schooling fish such as trevally and or kahawai (C. Gaskin pers. obs.). Tracking using geolocation loggers is warranted to establish the inter-seasonal and inter-population distribution of the species.

Photo: Richard Robinson/DOC/NNZST


Distribution of fairy prion breeding sites
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0 5 10 20 30 40
Kilometers

Buller's shearwater

Puffinus bulleri

Maori name: Rako

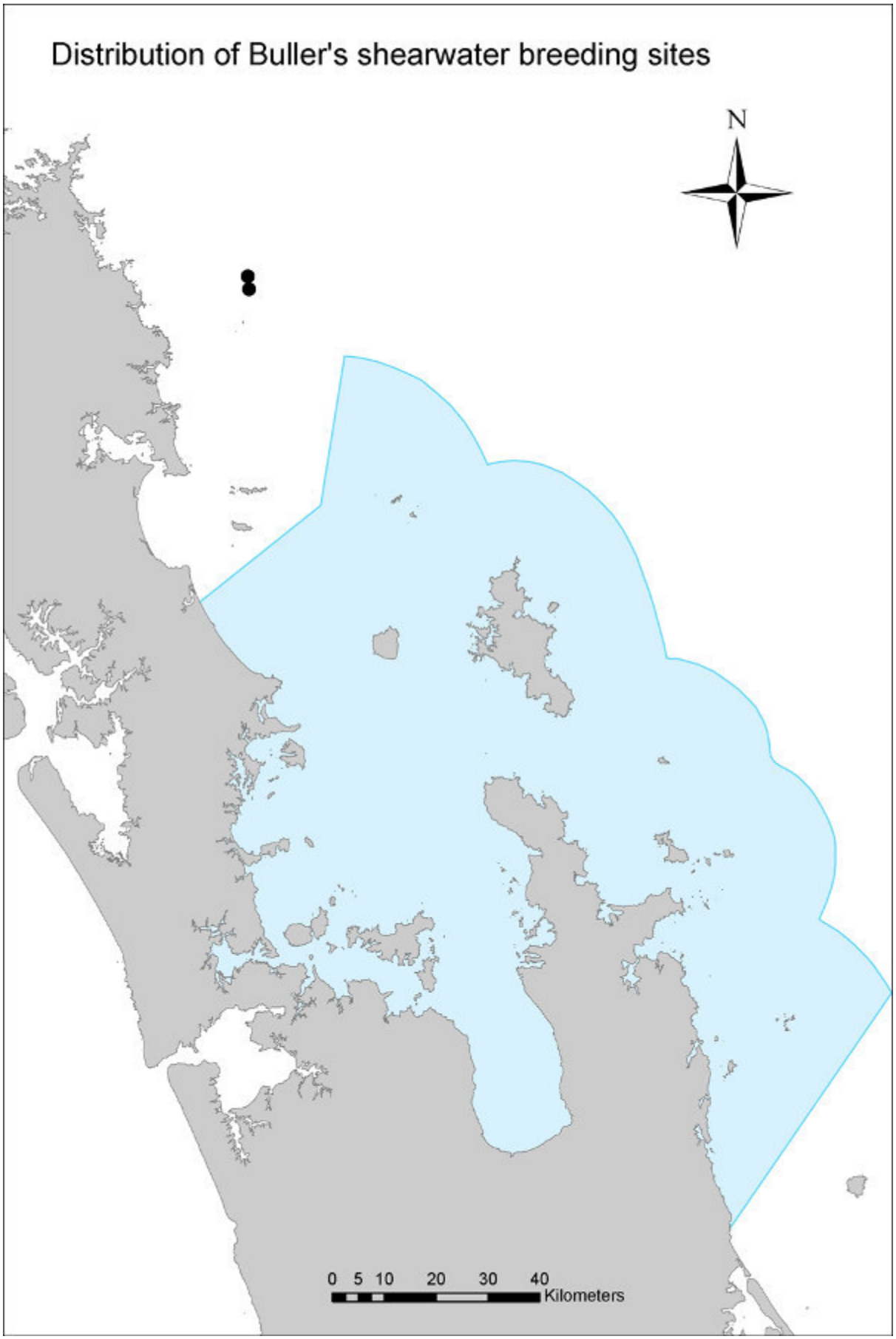
Figure 49. *Stefanie Ismar*

Other names	New Zealand shearwater (USA)
Average length & weight	46 cm, 425 g
IUCN conservation status	Vulnerable
Breeding season	October-May, 1 egg laid Nov-Dec, incubation c. 51 days, chicks fledge in April-May after c. 90 days.
Breeding habitats	Breed colonially in forested habitat, nesting in underground burrows.
Foraging habitat and movements	Offshore foraging habitats, shelf break and pelagic waters. Migrates to eastern Pacific off South America during winter non-breeding period.

New Zealand and Hauraki Gulf endemic restricted to a single breeding population on the Poor Knights islands where studies in the 1980's estimated approximately 2.5 million birds (200 000+ breeding pairs estimated on Aorangi; Harper 1983). One bird found in a burrow with a chick on Simmonds Island (far North) in 1990 (Taylor and Parrish 1990). Poor Knights Islands population recovered from 1000s of birds following feral pig eradication in 1936 (Taylor 2000b). However, there have been no estimates of the size of this population since the 1980's. A population survey of this species on the Poor Knights and also on Simmonds Island is of immediate need. During the breeding season Buller's shearwaters are common within inshore and offshore waters of the WHGR; however range as far as several thousand kilometres east into the Pacific Ocean at approximately latitudes 35-45°S (G. Taylor and M. Rayner unpublished data). Migrates to the North Pacific Ocean during the winter non-breeding period and particularly waters of the Kuroshio Current and North Pacific Convergence Zone (30-36°N) (G. Taylor and M. Rayner unpublished

Photo: Alan Tennyson

Photo: Abe Borker


Distribution of Buller's shearwater breeding sites
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Kilometers

Flesh-footed shearwater

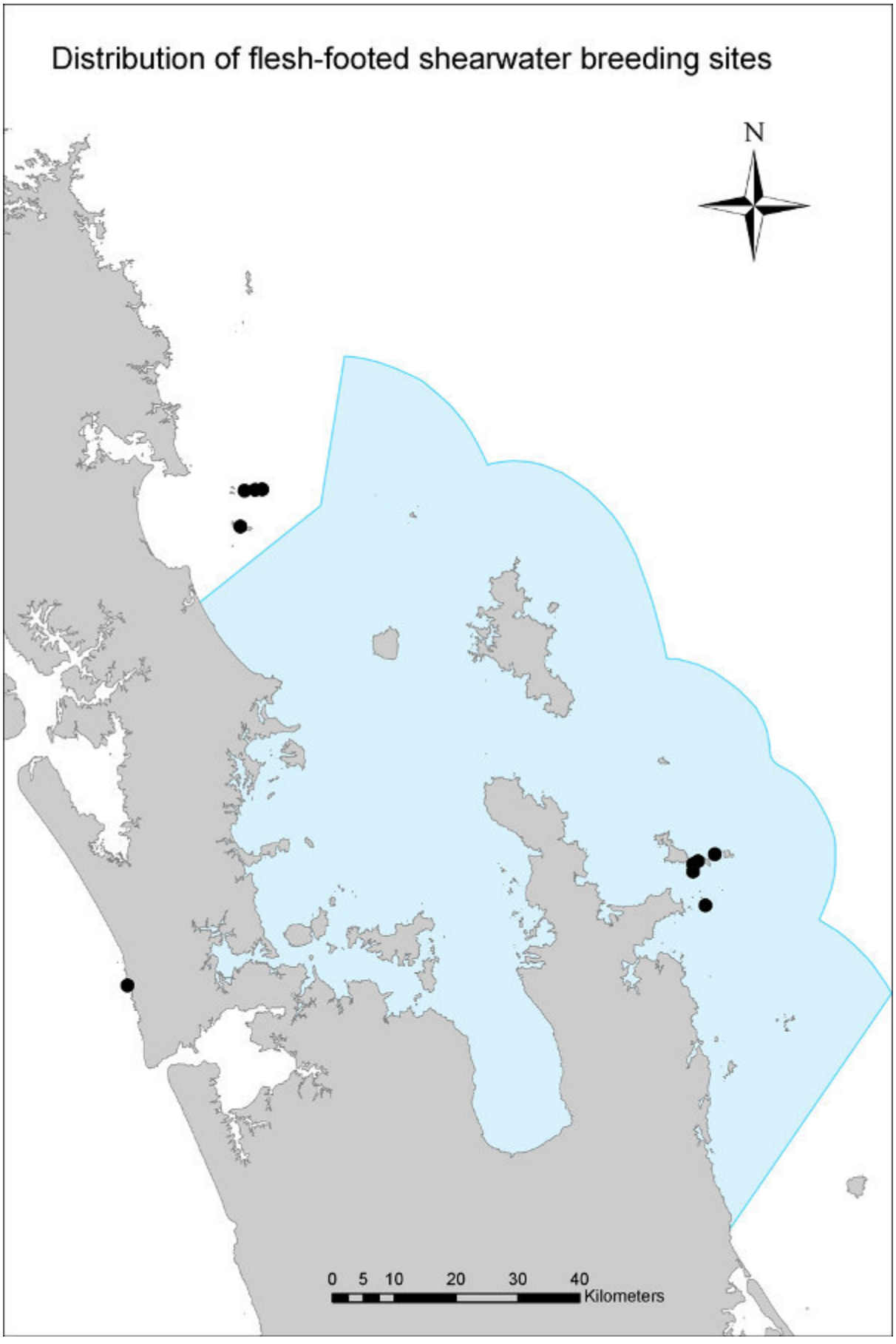
Puffinus carneipes

Maori name: Toanui

Photo: Jono Irvine

Average length & weight	44 cm, 650 g
IUCN conservation status	Least Concern
Breeding season	Sept-May, 1 egg laid Dec, incubation c. 53 days, chicks fledge April-May after c. 92 days.
Breeding habitats	Breed colonially in forested and or open habitats, nesting in underground burrows.
Foraging habitat and movements	Offshore pelagic foraging habitats during breeding season. Migrates to North Pacific Ocean winter non-breeding period.

New Zealand native with WHGR populations breeding on Hen and Chickens Islands (Lady Alice, Whatupuke, Coppermine, Mauitaha, Hen), Mercury Islands (Middle, Green, Korapuki, Stanley, stack north of Stanley, and Double), Ohinau, Ohinauiti, Karewa, Kauwahaia, Motumahanga and Middle Trio. Long-term stability of these populations is uncertain. Previously estimated total of 50 000 – 100 000 pairs (Robertson and Bell 1984), subsequently downgraded to 25 000 – 50 000 pairs (Taylor 2000b). Recent comprehensive surveys of eight breeding islands have indicated a population significantly less than 25 000 – 50 000 breeding pairs (Baker et al. 2010b). Long-term monitoring of this species is required as it is incidentally killed by commercial fishers in northern New Zealand waters. Expansion of observer programme to WHGR inshore snapper and bluenose fisheries indicates greater mortality than previously thought with mortality rates beyond what the regional population can sustain. Further studies of by catch, by-catch mitigation and population demographics are urgently required. Forages in deep pelagic waters of the Tasman Sea and Pacific Ocean (Thalmann et al. 2009; Rayner et al. 2011b; Rayner and Taylor unpublished data) and further tracking studies are required to ascertain distributions and association with fisheries. During the winter non-breeding season the species migrates to North Pacific Ocean (Japan Sea, Kuroshio Current and Sea of Okhotsk; Rayner et al. 2011b).


Distribution of flesh-footed shearwater breeding sites
N
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Kilometers

Sooty shearwater

Puffinus griseus

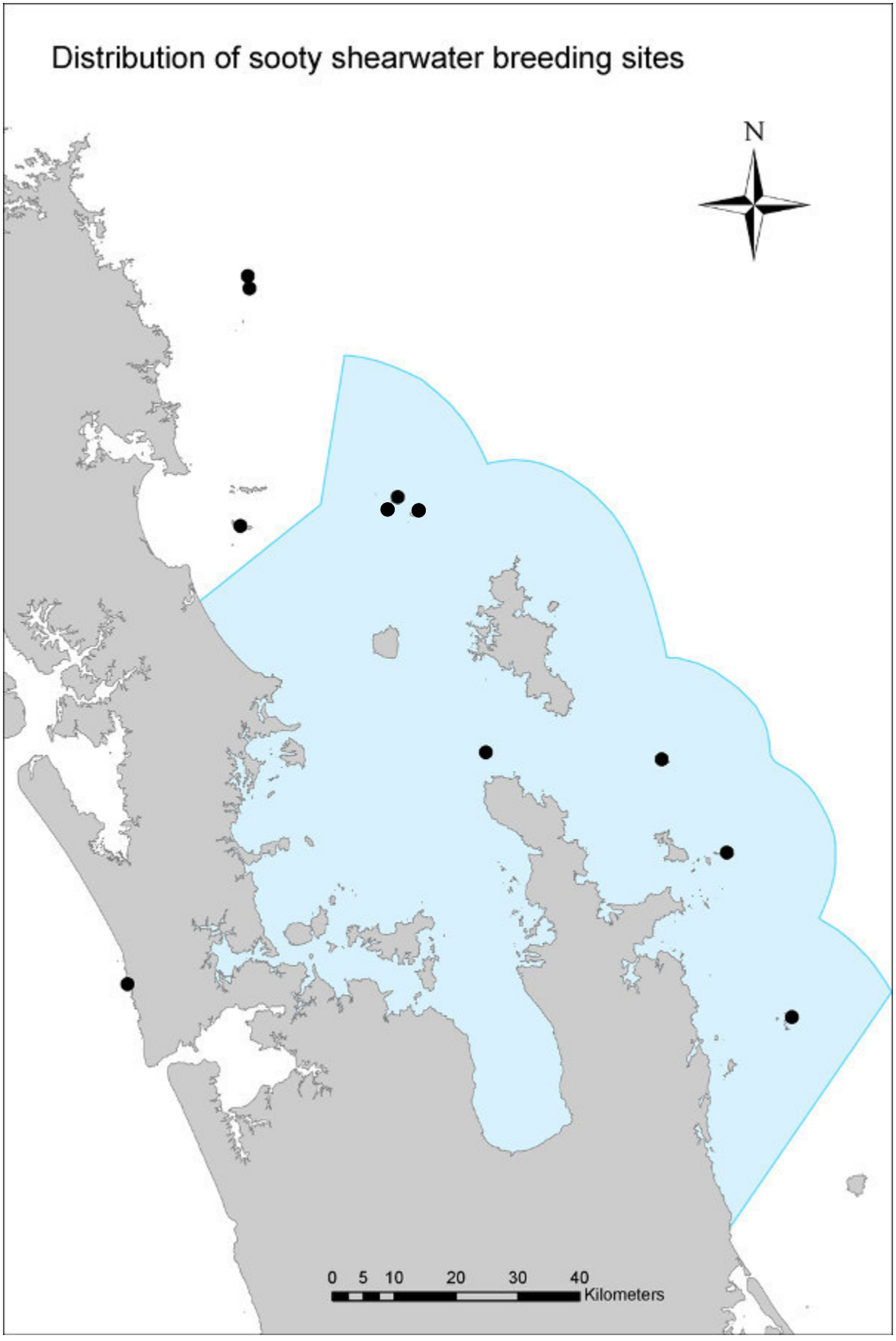
Maori name: Titi, hakoakoa

Photo: Adrien Lambrechts

Other names	Muttonbird
Average length & weight	44 cm, 800 g
IUCN conservation status	Least Concern
Breeding season	Sept-May, 1 egg laid Nov-Dec, eggs hatch Jan after c. 53 days, chicks fledge April-May after c. 97 days.
Breeding habitats	Breed colonially in forested and or scrub or open habitats, nesting in underground burrows.
Foraging habitat and movements	Offshore foraging within region and to Subantarctic waters Migration to North Pacific Ocean during winter non-breeding period.

New Zealand native with WHGR populations (also Three Kings Islands) constituting the northern extent of the species breeding range with huge populations (20 million +) on islands near Stewart Island and New Zealand Subantarctic Islands (Marchant and Higgins 1990) (Newman et al. 2009). Breeds on the Mokohinau Islands (Pokohinu), Mercury Islands (Red Mercury, Stanley, Double) (Hamilton et al. 1997), Alderman Islands (Ruamahuanui) and Kauwahaia Island (Bethell's Beach) (Taylor 2000b) in the WHGR. Beyond a study of the population on Kauwahaia Island (25-50 breeding pairs), population sizes and trajectories are unknown and require evaluation. Feeds over inshore and offshore waters though tracking of WHGR birds suggests, like southern populations (Shaffer et al. 2006; Shaffer et al. 2009), northern birds make extensive foraging movements to feed near the polar front (65°S) (G. Taylor and M. Rayner unpublished data). Energy expenditure involved in such foraging may limit the northern extent of this species by regulating breeding success and or adult condition and warrants further study. Migrates to North Pacific Ocean during winter non-breeding season with core areas in the Kuroshio Current (east of Japan), south of the Aleutians and in coastal waters off Alaska and the western United States (Shaffer et al. 2006; G. Taylor and M. Rayner unpublished data). Potential for population-specific migratory destinations requires investigation.

Photo: Hadoram Shirihai


Distribution of sooty shearwater breeding sites
N
0 5 10 20 30 40
Kilometers

Fluttering shearwater

Puffinus gavia

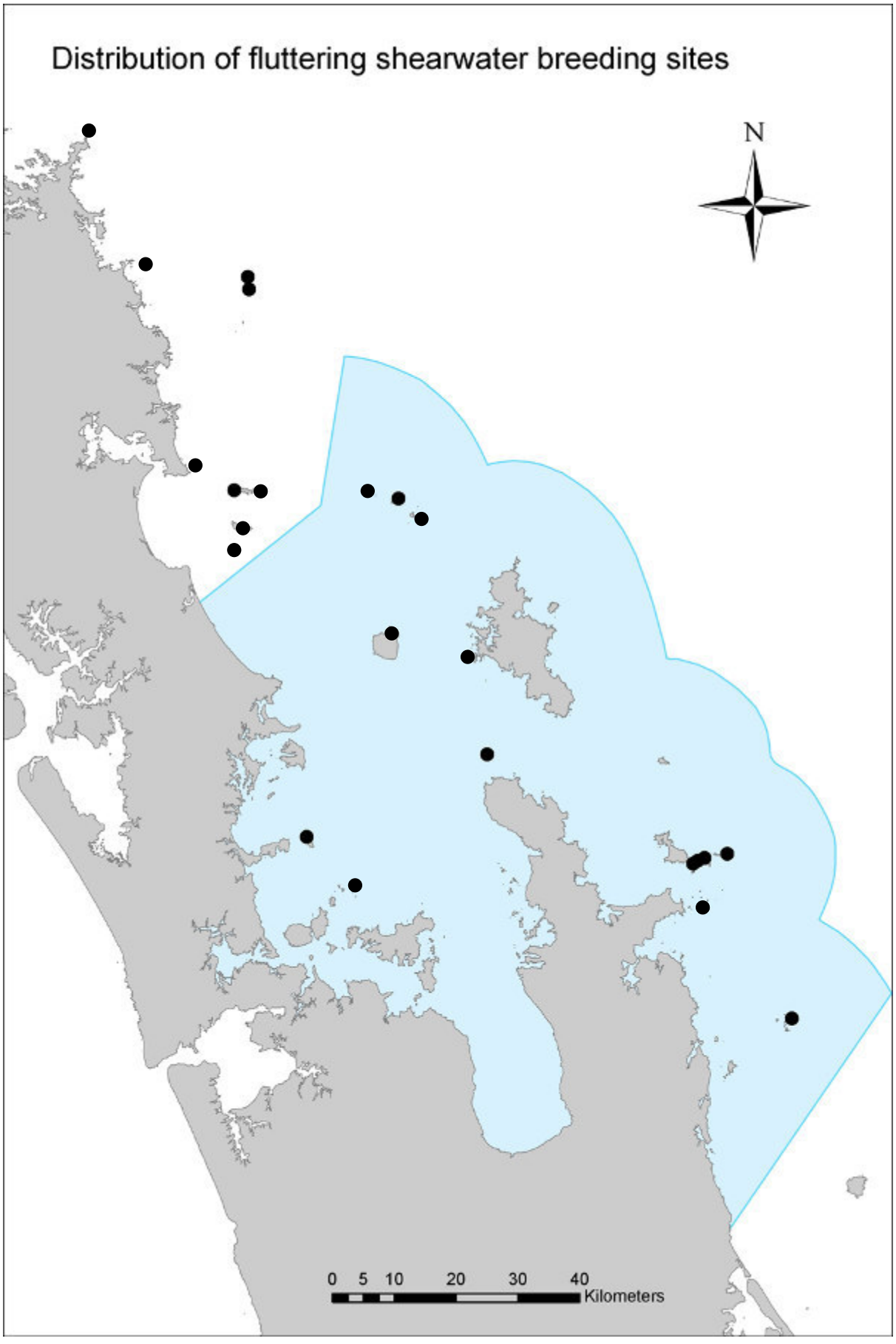
Maori name: Pakaha

Photo: DOC

Other names	Flutterer
Average length & weight	33 cm, 300 g
IUCN conservation status	Least Concern
Breeding season	July-Feb, 1 egg laid Sept-Oct, eggs hatch Oct-Nov and chicks fledge Jan-Feb.
Breeding habitats	Breed colonially in forested and or scrub or open habitats, nesting in underground burrows and under boulders.
Foraging habitat and movements	Common inshore species but also offshore foraging. Post-breeding, most birds remain in local waters. At least partial migration to eastern Australian seabird during winter non-breeding period.

New Zealand endemic with at least ten breeding populations in the WHGR on the Poor Knights Islands, North-west Chickens, Hen Island, Bream Islands, Mokohinau Islands, Wooded Island, Channel Island, Mercury Islands (Middle, Green, stack north of Stanley, Korapuki, Red Mercury) and Aldermen Islands (Ruamahuanui). Other scattered small colonies on offshore islands; recent colonist to Hauturu/Little Barrier Island. Local and regional population sizes unknown and require study. Estimated national population, with little empirical basis, as 100,000+ breeding pairs (Robertson and Bell 1984). Breeding biology poorly known (Marchant and Higgins 1990) and requires study. A ubiquitous Hauraki Gulf seabird species common in large feeding flocks during summer within inshore and harbour waters though distribution across breeding cycle is unknown and requires study. Significant proportion of the population remains in local waters during non-breeding period. Observed to visit colonies during this period. However, likely trans-Tasman migrant as common visitor to eastern and south-eastern Australian waters Feb-August (Marchant and Higgins 1990). Intra and inter-seasonal movements require study using geolocators.

Photo: Richard Robinson


Distribution of fluttering shearwater breeding sites
N
0 5 10 20 30 40
Kilometers

North Island little shearwater

Puffinus assimilis haurakiensis

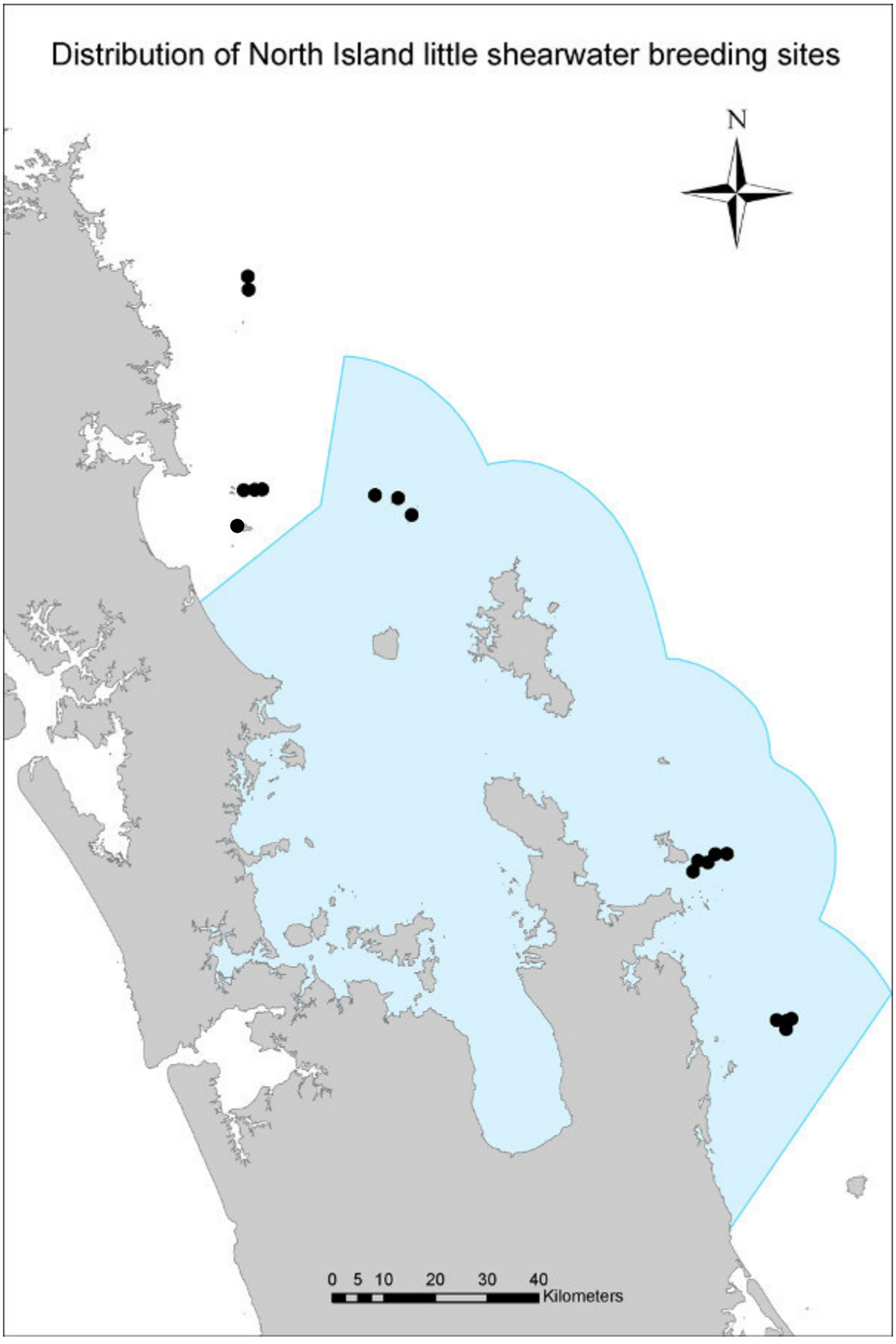
Maori name:

Photo: Adrien Lambrechts

Average length & weight	30 cm, 200 g
IUCN conservation status	Vulnerable
Breeding season	May-Dec, 1 egg laid June-July, incubation 52-58 days, chicks fledge Nov-Dec after 70-75 days.
Breeding habitats	Breed colonially in low scrub to forest habitats, nesting in underground burrows or natural crevices.
Foraging habitat and movements	Offshore foraging but poorly known. Migrates to south-east Pacific Ocean in non-breeding season.

New Zealand and wider Hauraki Gulf endemic subspecies with breeding populations on the Cavalli Islands (Motuharakeke), Poor Knights Islands (Aorangi and Tawhiti Rahi), Taranga/Hen Islands, Chickens Islands (Coppermine, Lady Alice, Whatupuke, Muriwhenua), Mokohinau Islands (most islands and larger in the group), Mercury Islands (Red Mercury (c. 1000 pairs), Stanley, Double, Korapuki and Middle Islands), Aldermen Islands (Ruamahuanui (c. 1200 pairs), Ruamahuaiti (Hongiora (c. 3000 pairs)), Penguin and Rabbit Islands (R. Pierce, T. Greene, G. Taylor & A. Tennyson unpublished data). Possibly 10 000 + pairs in total (Taylor 2000b) however reliable estimates for nearly all populations are lacking and of immediate need. Studies of breeding biology and impacts of Pacific rats conducted (Booth 1995; Booth et al. 1996; Booth et al. 2000). However, study of long-term population dynamics and taxonomic relationships between this subspecies and sister taxa are required. The at-sea distribution of this species is poorly known and the subject of recent study. Offshore foraging occurs during breeding. After breeding the

Photo: Karen Baird


Distribution of North Island little shearwater breeding sites
N
0 5 10 20 30 40
Kilometers

White-faced storm petrel

Pelagodroma marina maoriana

Maori names: Takahikare

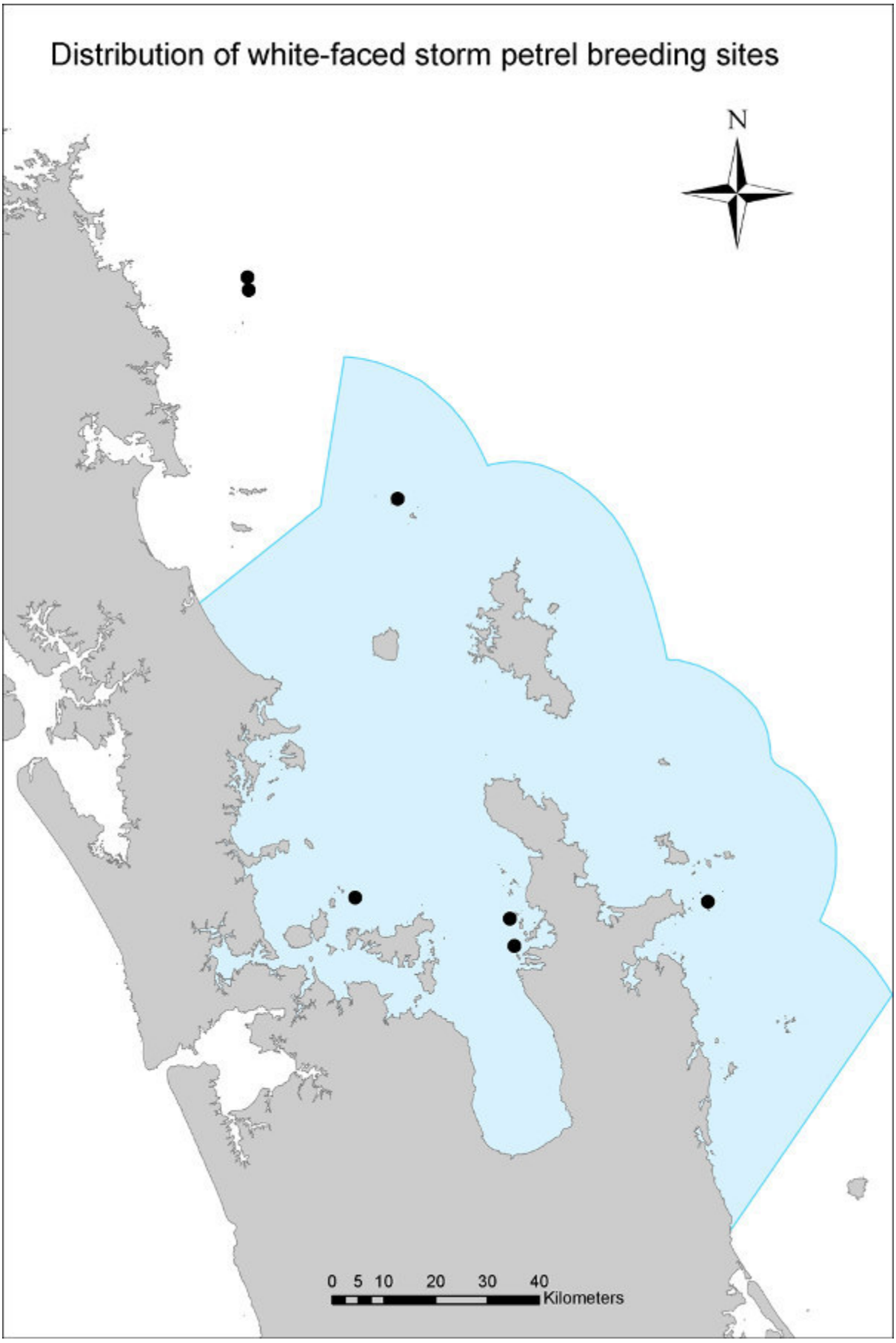
Photo: Adrien Lambrechts

Other names	JC bird, frigate petrel, Mother Carey's chicken
Average length & weight	20 cm, 45 g
IUCN conservation status	Least Concern
Breeding season	Aug - Feb, 1 egg laid October-November, chick fledge Jan-March
Breeding habitats	Breed colonially, nesting in underground burrows, rock crevices and or under dense mats of vegetation.
Foraging habitat and movements	Forages offshore breeding and migrates to eastern tropical Pacific during austral winter. Poorly known.

New Zealand endemic subspecies with 1 million + pairs nationally (Taylor 2000b). At least six confirmed breeding populations in the WHGR on Poor Knights, Mokohinau Islands (Burgess Island), Noises Islands (Maria), Motuokino and Cow, Little Ohinau, Aldermen Islands (Hongiora), although size of populations unknown and requires assessment. Population on Burgess Island has expanded rapidly following rat and livestock removal (C. Gaskin pers. obs.). Breeding biology study (timing, chick growth, provisioning) and translocation experiment conducted on Burgess Island (Young 2013). At sea feeds alone or in large, sometimes scattered flocks on krill, amphipods and other planktonic crustaceans and larval fish. Forages in offshore waters but at-sea distribution poorly described. Migrates to eastern tropical Pacific during non-breeding (Imber 1984).

Photo: Adrien Lambrechts

Photo: Martin Berg


Distribution of white-faced storm petrel breeding sites
N
0 5 10 20 30 40
Kilometers

New Zealand storm petrel

Fregetta maoriana

Maori name:

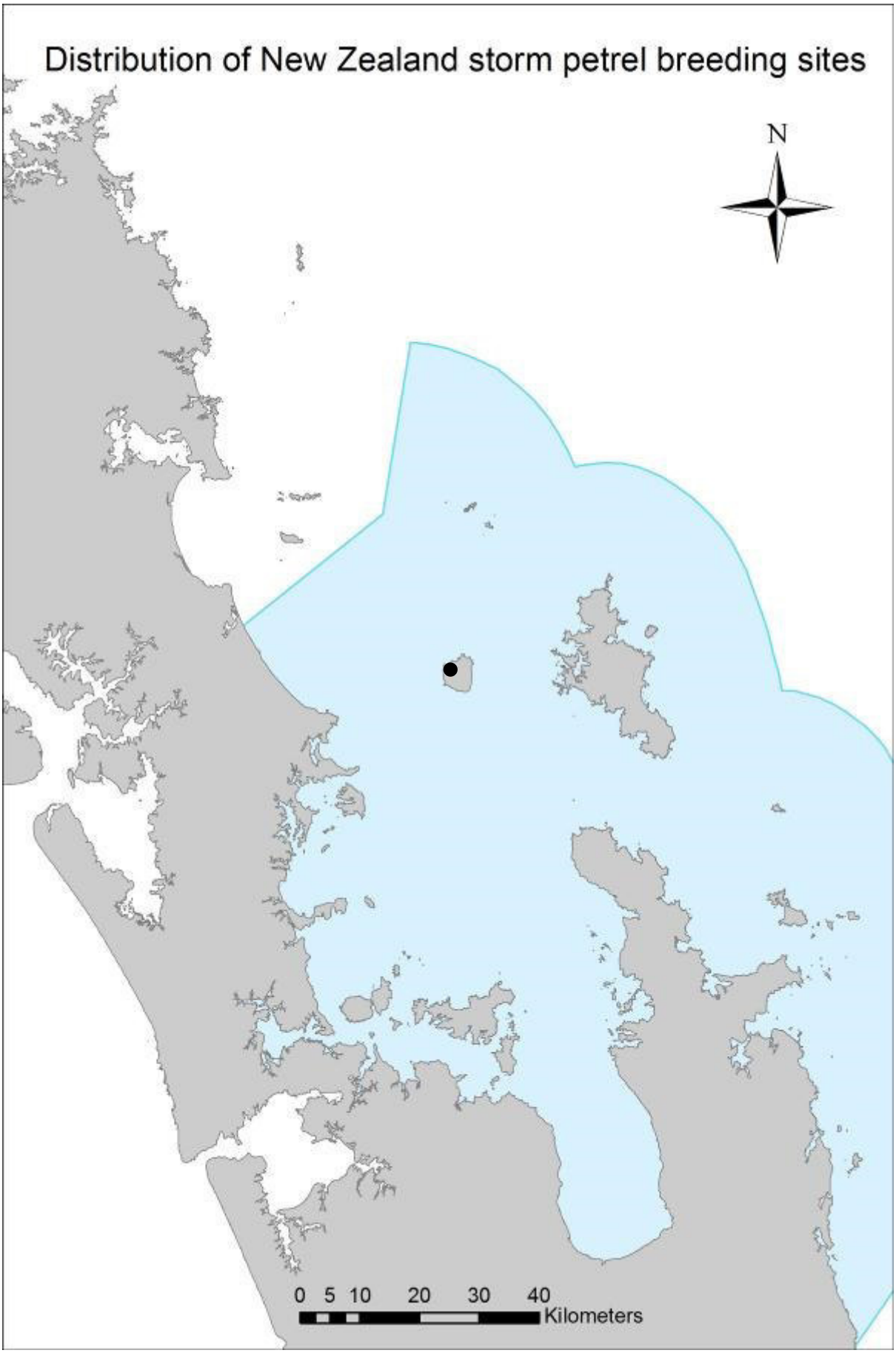
Photo: Richard Robinson

Other names	
Average length & weight	18cm, 35g
IUCN conservation status	Critical
Breeding season	Commencing late Dec-Jan, poorly known
Breeding habitats	Not known
Foraging habitat and movements	Present WHGR from late September to early June on current data; possibly disperses to Coral Sea. Poorly known

Critically endangered species known historically from three museum specimens collected in the 1800s (Stephenson et al. 2008a; Stephenson et al. 2008b; Sikes et al. 2009). Rediscovered in 2003 at sea in the HGMP after 110 years of presumed extinction (Flood 2003; Saville et al. 2003) with subsequent genetic analyses of tissue from captured birds confirming the species identity (Robertson et al. 2011). Recent at-sea captures of birds in breeding condition (bare brood patches) (Rayner et al. in prep), opportunistic observations of birds with vegetation attached to their legs (Gaskin et al. 2011) and at-sea observations of distribution (Gaskin and Baird 2005) suggested breeding in the WHGR. Discovery of a breeding site on Hauturu/Little Barrier Island in February 2013 is crucial for its conservation and facilitates assessment and management of its population and understanding of its biology. Breeding biology and inter-annual movements largely unknown. Observations of birds in moult during winter in Fijian waters and off eastern Australia suggest a subtropical/ tropical non-breeding distribution., although birds are present in northern New Zealand waters for most of the year.

Photo: Steph Borrelle

Photo: Neil Fitzgerald


Distribution of New Zealand storm petrel breeding sites
N
0 5 10 20 30 40
Kilometers

Common diving petrel

Pelecanoides urinatrix urinatrix

Maori name: Kuaka

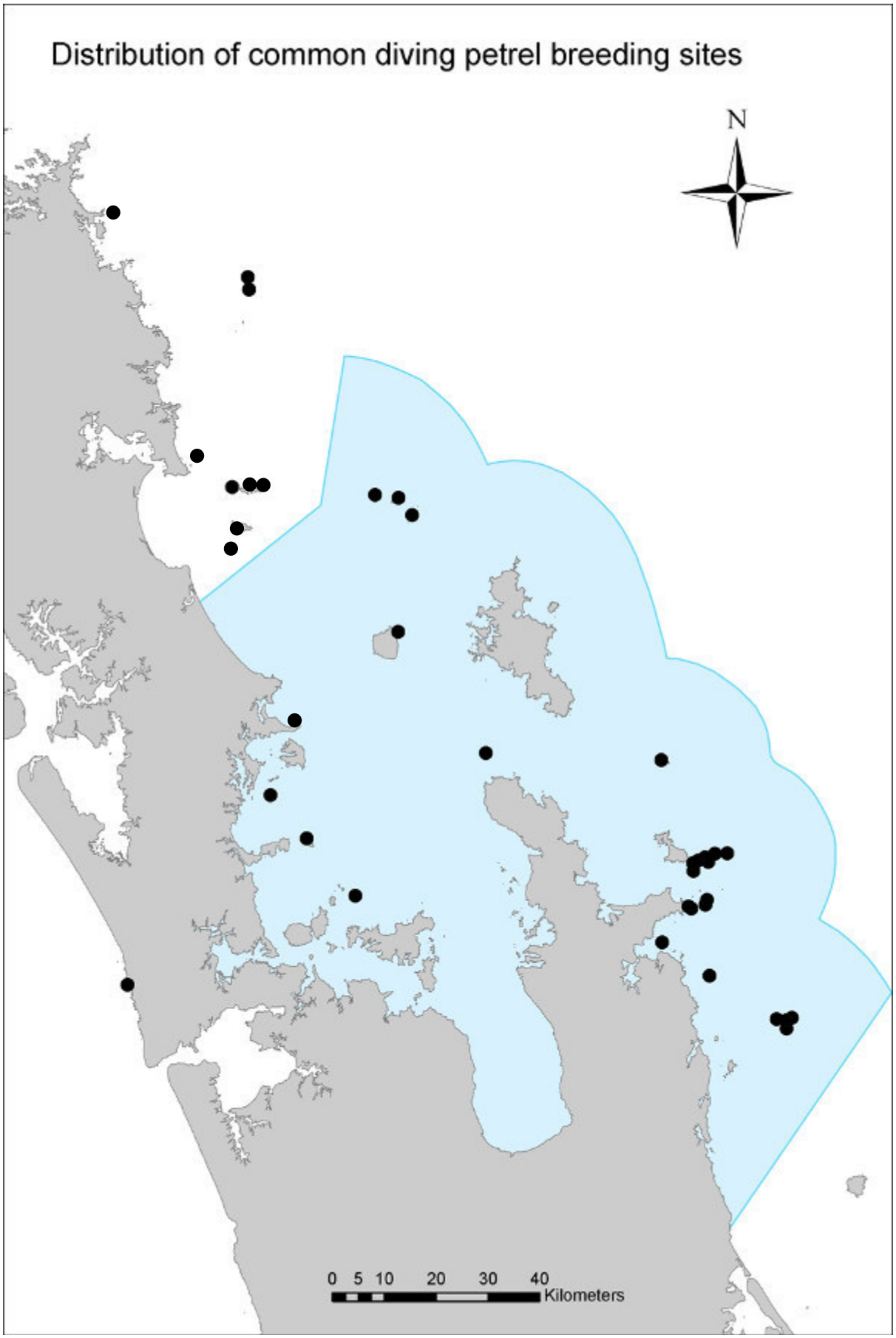
Photo: Adrien Lambrechts

Other names	Diving petrel
Average length & weight	20 cm, 130 g
IUCN conservation status	Least Concern
Breeding season	March -Jan, 1 egg laid Jul-Oct, incubation c. 53 days, chicks fledge Nov-Jan after c. 52 days.
Breeding habitats	Breed colonially, nesting in underground burrows or on surfaces under dense vegetation.
Foraging habitat and movements	Inshore and offshore foraging habitats near breeding colonies. Migrates south during summer non-breeding period.

New Zealand native with 1 million + pairs nationally (Taylor 2000b). Breeding populations on 30 + rat free islands in the WHGR. Near year-round presence at breeding sites (absent only mid-January to mid-March) exacerbates susceptibility to introduced predators. Increasing on some islands following rat removal (C. Gaskin and G. Taylor unpublished data). Forages on krill, copepods and fishes within inshore and offshore waters with prey taken with frequent dives using wings for underwater propulsion (G. Taylor unpublished data). Recent tracking studies suggest populations in WHGR migrate south during the summer non-breeding period to take advantage of foraging opportunities in the Subtropical and Sub-Antarctic Convergence Zones (45 - 55°S) (G. Taylor, M. Rayner, C. Gaskin unpublished data). Further at-sea tracking required.

Photo: Adrien Lambrechts

Photo: Les Feasey


Distribution of common diving petrel breeding sites
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0 5 10 20 30 40
Kilometers

Australasian gannet

Morus serrator

Maori name: Takupu

Photo: Abe Borker

Other names	Takapu
Average length & weight	90 cm
IUCN conservation status	Least Concern
Breeding season	July -April, 1 egg laid August-December, chicks fledge March-April
Breeding habitats	Breed colonially on open rock stacks, islands and coastal headlands building a raised pedestal nest from guano and seaweed.
Foraging habitat and movements	Migratory. Breeding populations feed throughout inshore and offshore waters. Migrates to east coast of Australia during winter.

Australasian gannets breed in six different colonies in the greater Hauraki Gulf region: Muriwai Beach, Horuhoru (Waiheke Island), Mahuki Island (Aotea/Great Barrier Island), Maori Rocks (Mokohinau Islands), Motukaramarama (Western Coromandel) and High Peak Rocks and Sugarloaf (Poor Knights Islands) with early surveys made by Fleming and Wodzicki (1952). During breeding birds forage in a broad range of estuarine, inshore, and offshore habitats feeding on shoals of fish and squid (Robertson 1992; M. Rayner and S. Ismar unpublished data). Highly specialized hunters that plunge dive from heights exceeding 5 m, with dive profiles being V- and U-shaped and prey capture rates of c. 72%, reaching up to 5 fish in a single U-shaped dive (Machovsky et al. 2011b; Machovsky-Capuska et al. 2012). Feeding often takes place in multi -species feeding-associations involving common dolphins (*Delphinus delphis*), Bryde's whales (*Balaeonoptera brydei*) and other seabirds. Fledglings travel to Australia upon fledging and adult birds migrate annually across the Tasman Sea to winter in coastal waters off Australia (Ismar et al. 2011). Although the risk of injury or death due to accidental collisions while plunge diving exists (Machovsky-Capuska et al. 2011a) mortality rates are mainly related to fishing lines from recreational vessels and starvation in young chicks (Machovsky-Capuska unpublished data). Populations of this species appear to be increasing annually at sites monitored and the largest colony in the Hauraki Gulf, on Mahuki Island, has benefitted from an increase in available breeding habitat after the removal of cattle (M. Rayner pers. obs.; J. Boow pers. com.).

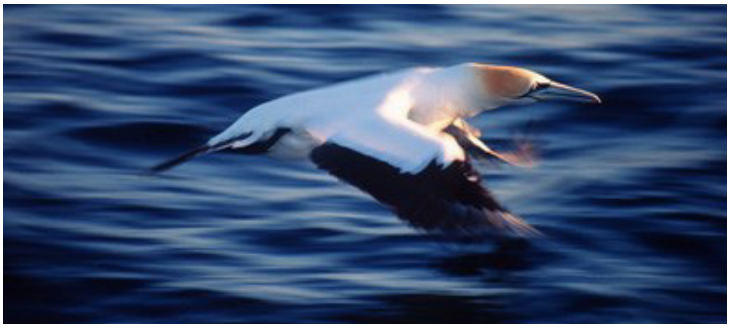
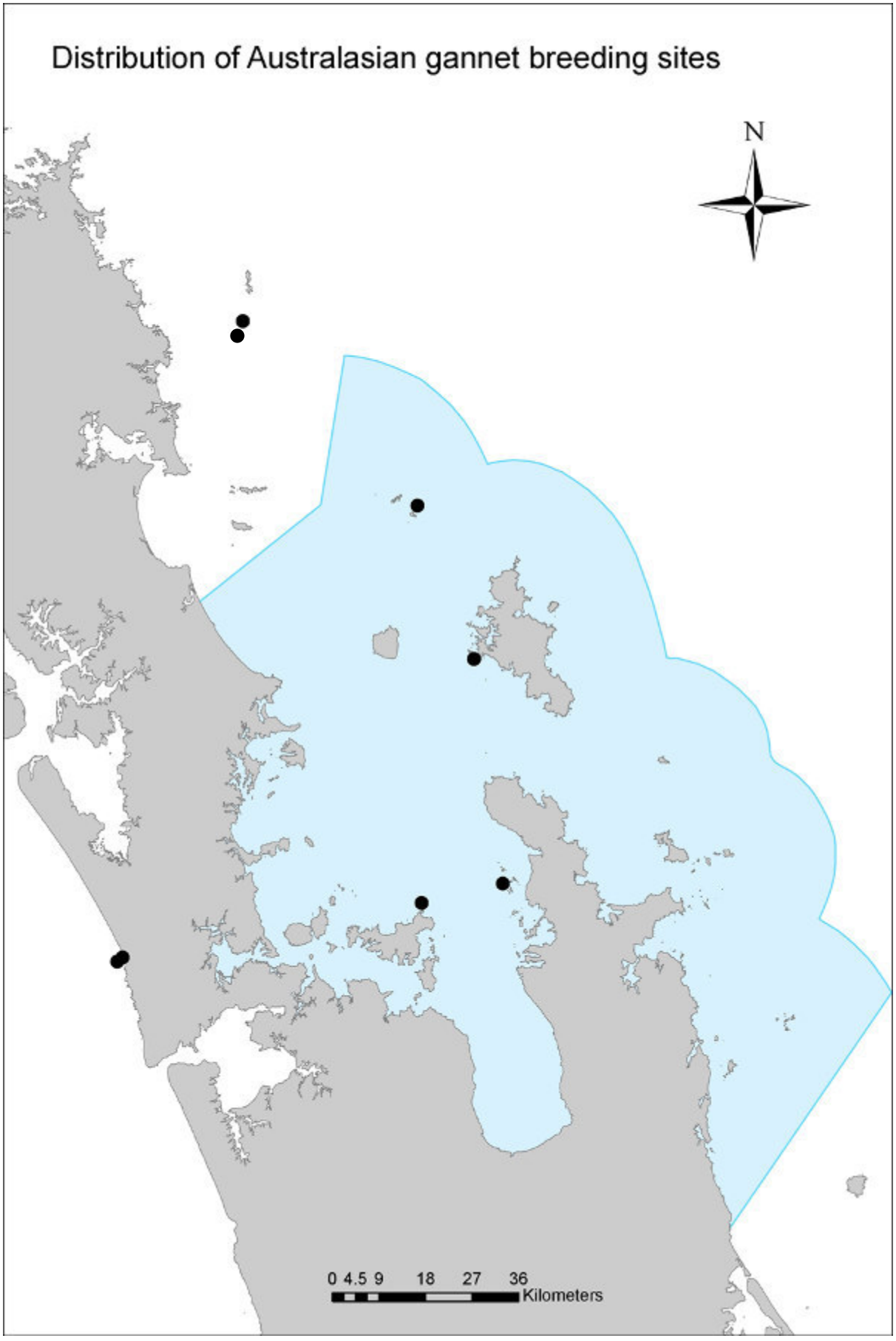


Photo: Kim Westerskov


Distribution of Australasian gannet breeding sites
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0 4.5 9 18 27 36
Kilometers

Pied shag

Phalacrocorax varius varius

Maori name: Karuhiruhi

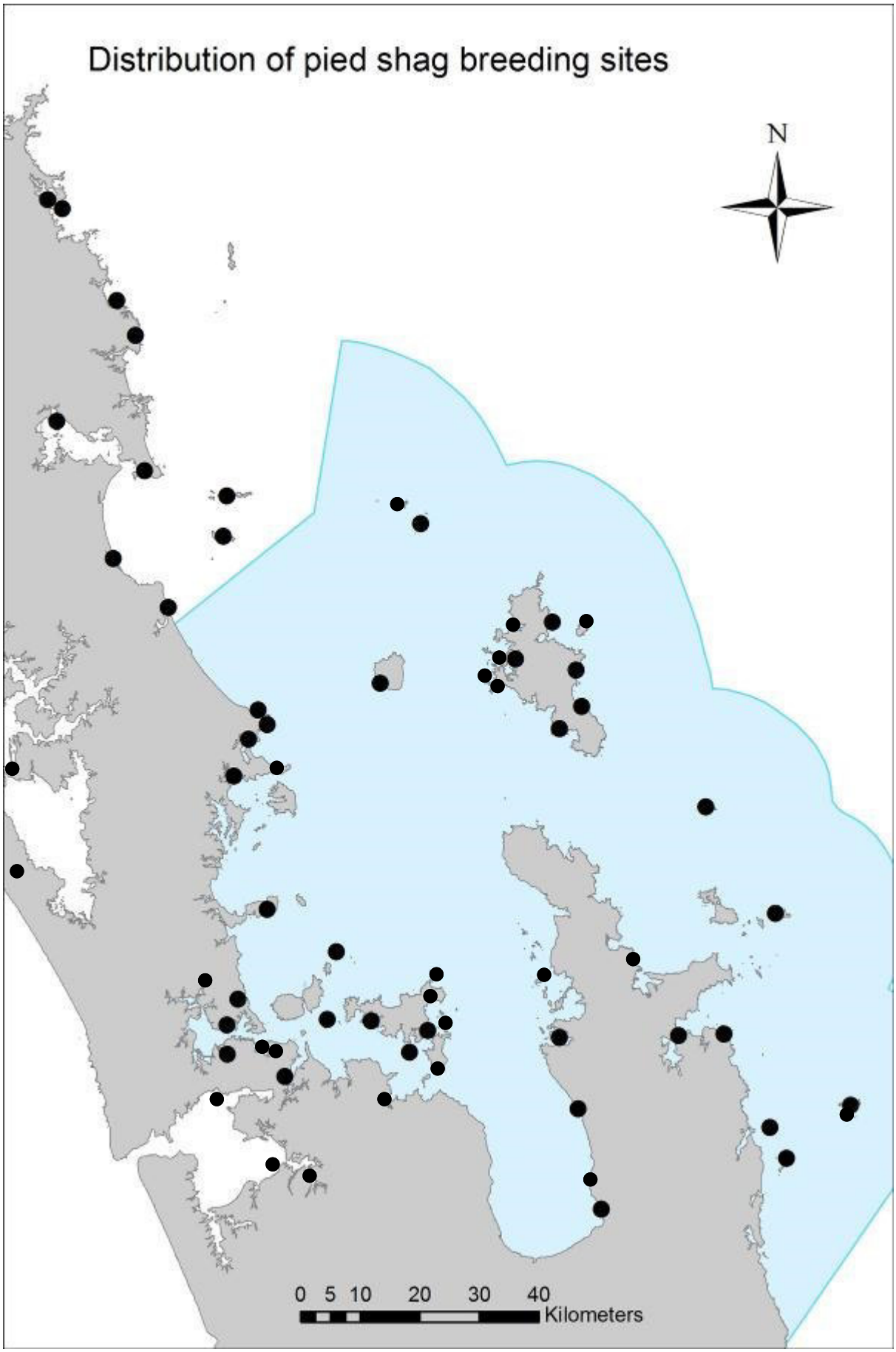
Photo: Martin Sanders

Other names	
Average length & weight	81 cm. 2 kg
IUCN conservation status	Least Concern
Breeding season	Colonies active all year, laying July-Oct and Jan-March, fledging after 43-53-60 days
Breeding habitats	Colonies commonly positioned in trees overhanging sea > 10 m above water. Nest a large platform of sticks and seaweed.
Foraging habitat and movements	Sedentary, inshore waters, solitary but occasionally form feeding flocks when prey abundant.

New Zealand endemic subspecies breeding widely in the WHGR at over 40 sites. Colonial breeding at sheltered sites within coastal harbors and estuaries and also on offshore islands. Breeding biology studied in the WHGR by Millener (1972) and elsewhere in New Zealand by Lalas (1979) and Powlesland et al. (2008). Diet predominantly includes fish and eels taken in water less than 10 m deep. Bell (2012) has shown populations of pied shags within the WHGR are in decline. Populations frequently dependent upon coastal trees for roosting and breeding thus protection of this habitat is a priority. Susceptible to disturbance and recognized breeding sites require monitoring to assess and protect from disturbance. Frequently caught and injured or killed when entangled in set nets or occasionally caught on recreational fishing lines (Taylor 2000a).

Photo: Fredric Pelsy

Photo: Abe Borker


Distribution of pied shag breeding sites
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0 5 10 20 30 40
Kilometers

Spotted shag

Stictocarbo punctatus punctatus

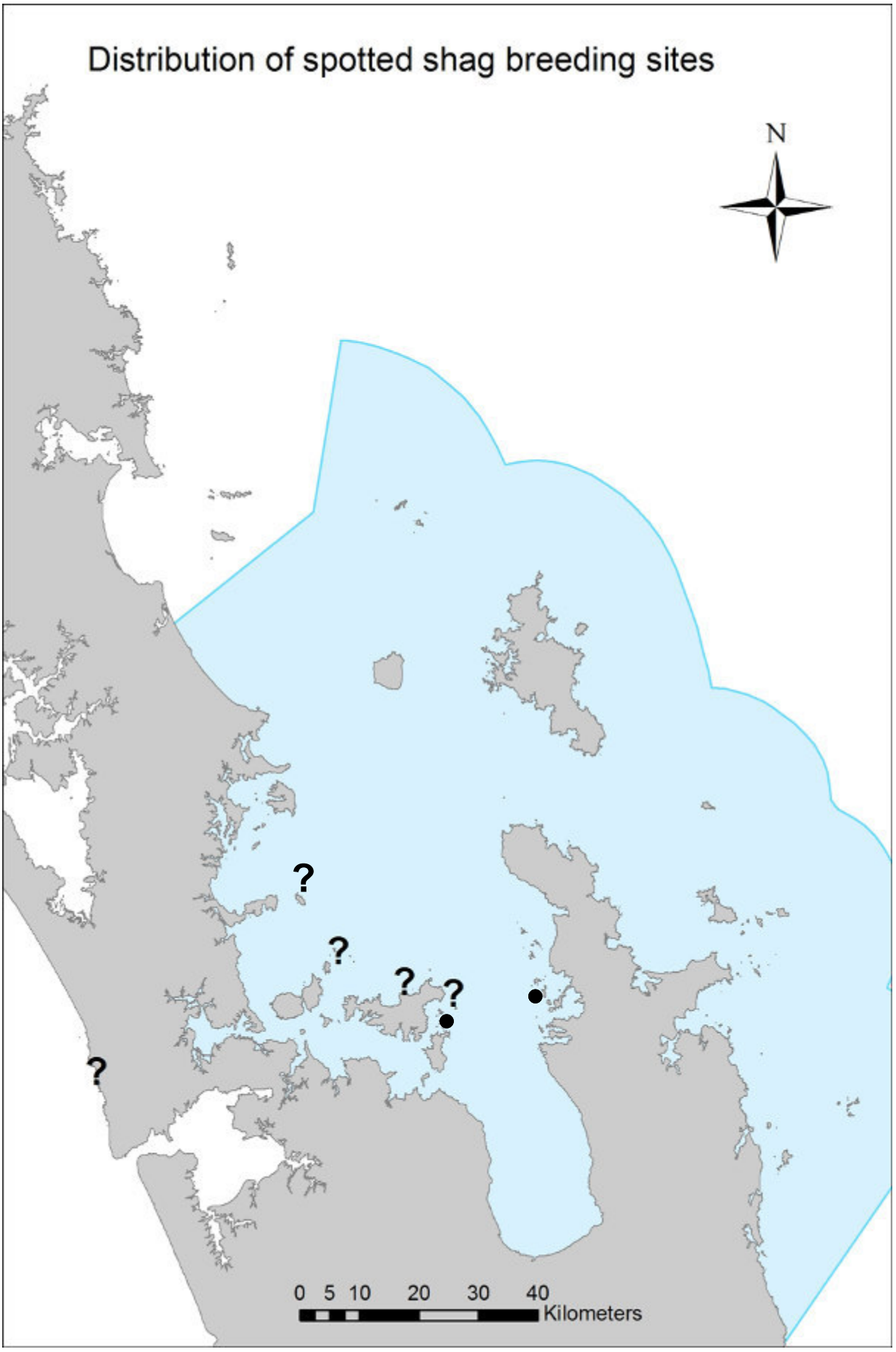
Maori name: Kawau tikitiki

Photo: Fredric Pelsy

Other names	Parekareka
Average length & weight	70 cm, 1200 g
IUCN conservation status	Least Concern
Breeding season	Variable, laying in March, Aug and Dec
Breeding habitats	Rocky coastlines, cliffs and islets near open ocean
Foraging habitat and movements	Mainly deep water up to 15 km from shore.

New Zealand endemic species with small populations breeding in WHGR in the inner Hauraki Gulf (formerly Noises Islands, islands off Waiheke Island, and western Coromandel islands) and the West Coast of Auckland (Cox et al. 1946; Turbott 1956). Populations in the North Island are considered much smaller than the South Island and in the WHGR have continued to decline following early population crashes as a result of unrestricted shooting in the early 1900's (Cox et al. 1946). Spotted shags breed colonially on cliff ledges and islets near open water with Cox et al. (1946) making notes on the breeding biology of the species. Feeding ecology studied in South Island (Lalas 1983) but population biology, diet, movements and behaviour of spotted shag in the WHGR are poorly known and require study. Breeding populations in the WHGR urgently require surveying to assess their status as these populations are most at risk from human disturbance and mortality associated with recreational fishing. Survey methods should be based upon, and consistent with those of Cox et al. (1946) allowing for long-term comparisons. Remaining breeding locations should, where possible, be protected from human disturbance.

Photo: Fredric Pelsy


Distribution of spotted shag breeding sites
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0 5 10 20 30 40
Kilometers

Little shag

Phalocrocorax melanoleucos brevirostris

Maori name: Kawaka paka

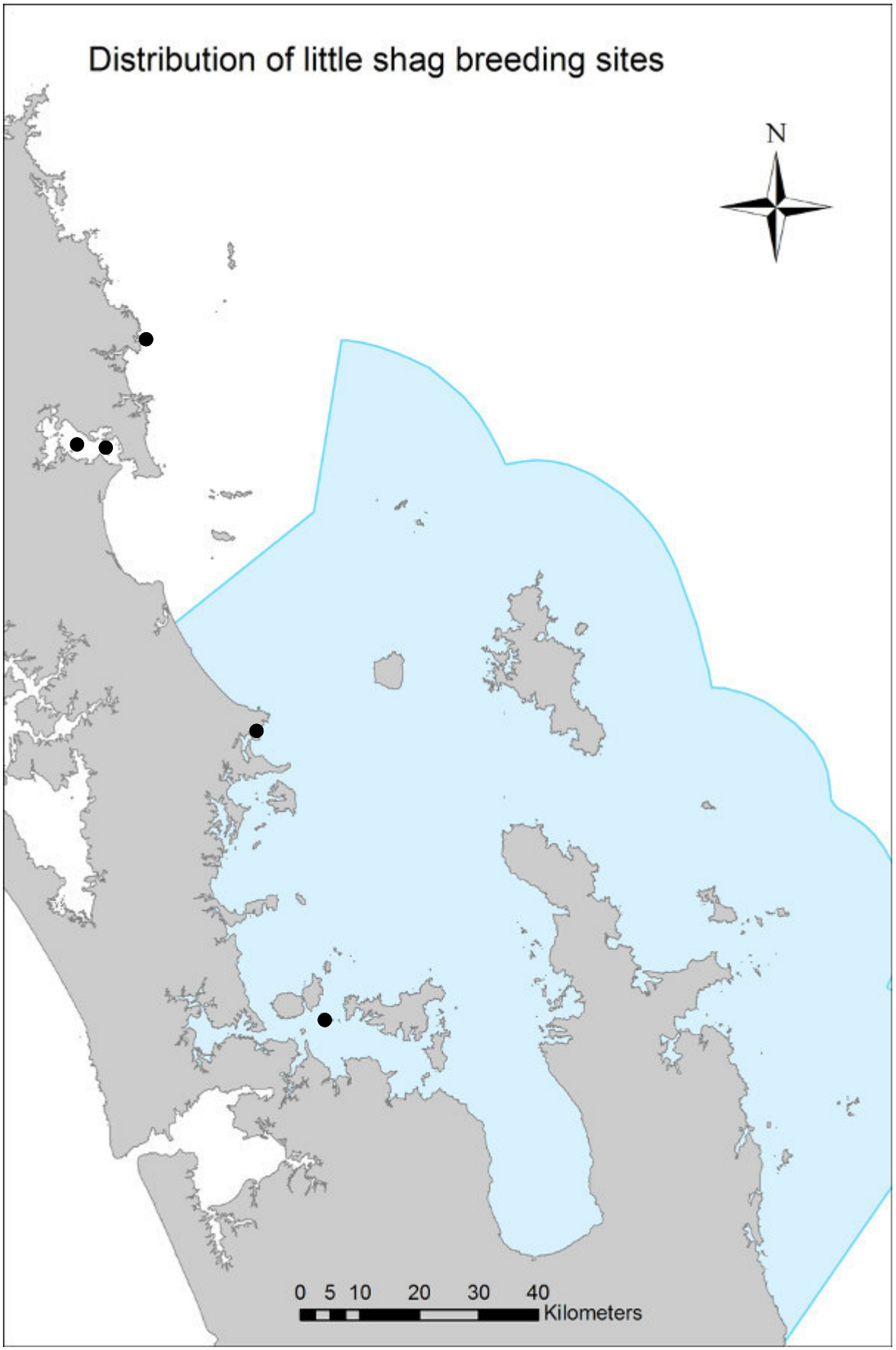
Photo: Fredric Pelsy

Other names	Little pied shag
Average length & weight	56 cm, 700 g
IUCN conservation status	Least Concern
Breeding season	Eggs laid Aug-Feb
Breeding habitats	Trees overhanging freshwater and estuaries, ledges on river gorges or sea cliffs.
Foraging habitat and movements	Sheltered coastal waters, estuaries harbours and rivers and lakes. Disperse widely following breeding.

Endemic New Zealand subspecies, whose population sizes are poorly known both regionally and nationally (Taylor 2000b). Breeds colonially within sheltered coastal harbors and estuaries and in freshwater habitats such as rivers and lakes; in some places in association with pied shags (e.g. Motuihe, Tutukaka). Breeding, foraging and diet studied outside the WHGR (Potts 1977; Taylor 1979; Matthews and Fordham 1986). Genetics studied by Dowding and Taylor (1987). Diet includes freshwater crayfish, frogs and small fresh water fish in inland habitats, and small fishes and flounder in coastal habitat. Prey frequently taken in shallow water < 3m deep. Breeding biology of little shags requires further study including timing of breeding stages. Further research into the taxonomy of little shags is required using DNA techniques (Taylor 2000b). Populations are susceptible to disturbance by humans and recognised breeding locations require protection from disturbance. Little shags are frequently caught and injured or killed when entangled in sets nets or caught on recreational fishing lines. Occasionally shot by fishermen who see them as competitors for fish.

Photo: Phil Battley

Photo: Phil Battley


Distribution of little shag breeding sites
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0 5 10 20 30 40
Kilometers

Black shag

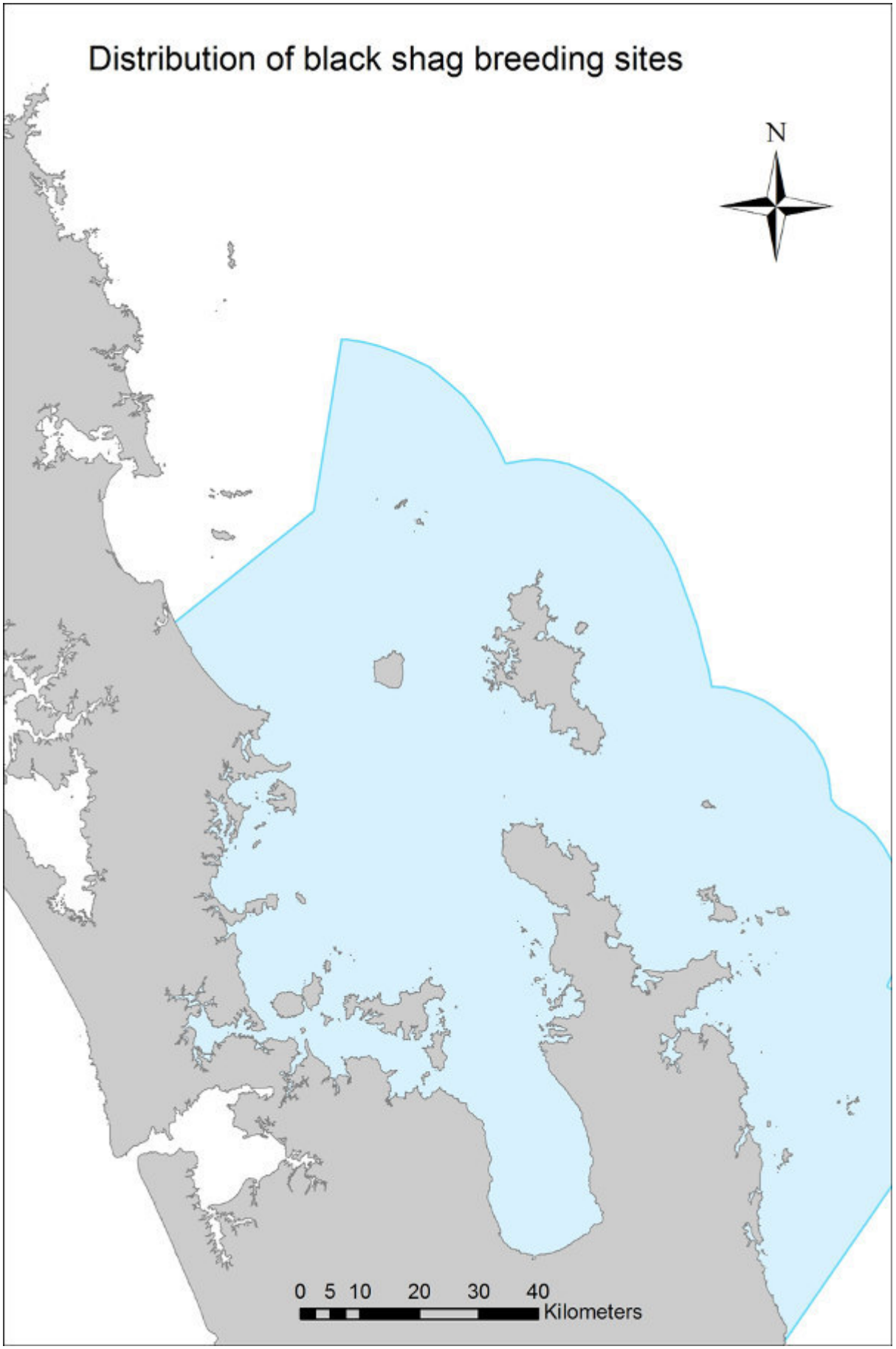
Phalocrocorax carbo novaehollandiae

Maori name: Kawau

Photo: Phil Battley

Other names	Kawaupaka
Average length & weight	88 cm, 2200 g
IUCN conservation status	Least concern
Breeding season	Eggs laid June-October, incubation in 27-31 days and fledging in 7 weeks
Breeding habitats	Trees overhanging fresh and or coastal waters, coastal or river cliffs
Foraging habitat and movements	Sheltered coastal waters, estuaries harbours and rivers and lakes. Disperse widely following breeding.

Native species for whom distributions of colonies within the WHGR and wider New Zealand are poorly known (Taylor 2000a). Breeds colonially within sheltered coastal harbors and estuaries and in freshwater habitats such as rivers and lakes. No studies of WHGR populations though diet, population dynamics and mortality studied nationally (Lalas 1983; Sim and Powlesland 1995; Innes et al. 1999; Powlesland and Reese 1999). Diet includes small and medium sized fish, eels, freshwater crayfish, invertebrates and molluscs. Prey frequently taken in shallow water <3m deep. Colonies susceptible to disturbance (Sim and Powlesland 1995) and set netting presents a threat to species(Lalas 1983; Taylor 2000b). Development of a colony database for the WHGR and at a national level a priority for this species.


Distribution of black shag breeding sites
N
0 5 10 20 30 40
Kilometers

Little black shag

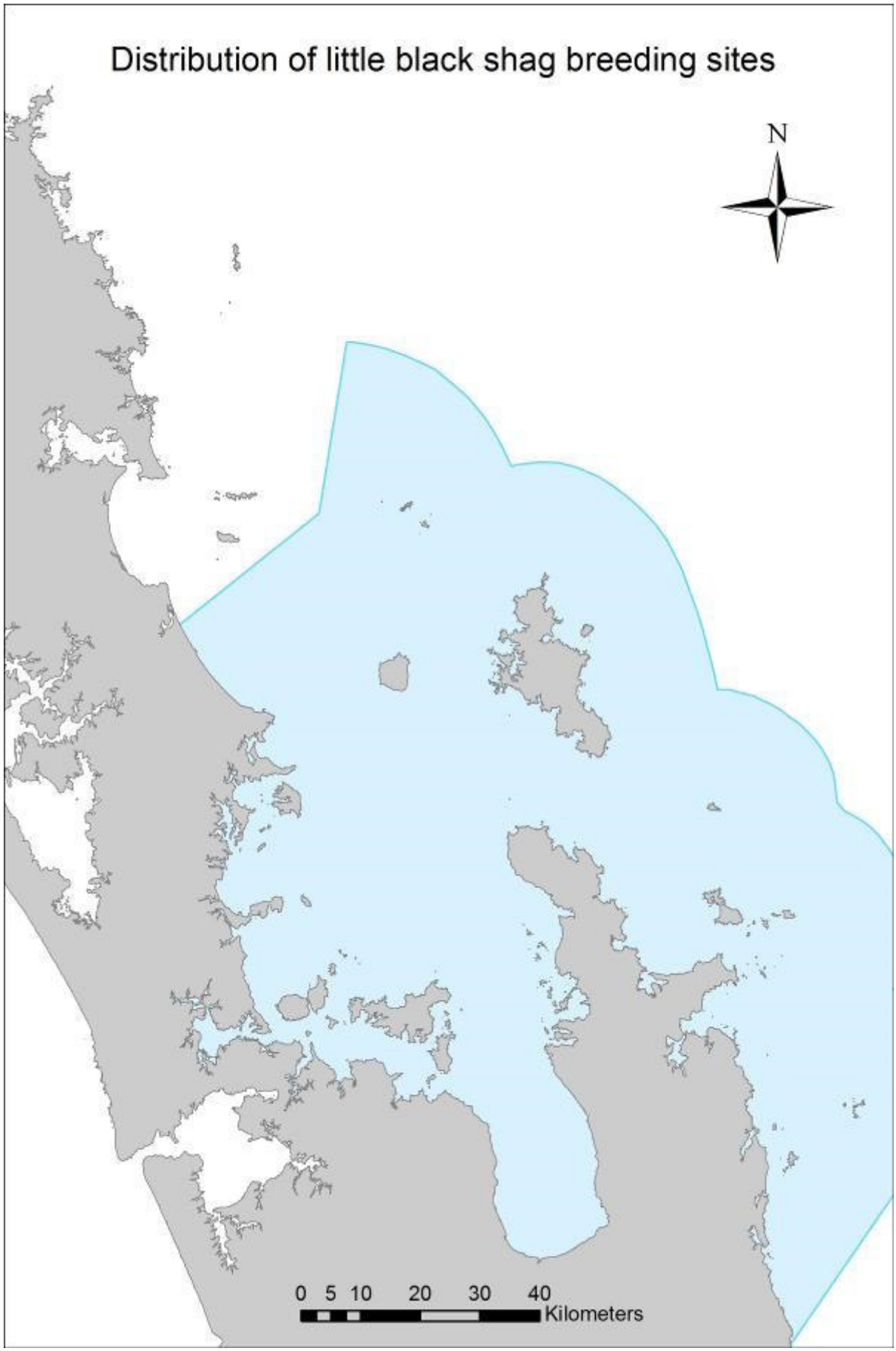
Phalocrocorax sulcirostris

Maori name: Kawau tui

Photo: Phil Battley

Other names	Kawaupaka
Average length & weight	56 cm, 700 g
IUCN conservation status	Least Concern
Breeding season	Eggs laid Aug-Feb
Breeding habitats	Trees overhanging freshwater and estuaries, ledges on river gorges or sea cliffs.
Foraging habitat and movements	Sheltered coastal waters, estuaries harbours and rivers and lakes. Disperse widely following breeding.

Distribution and populations are poorly known both regionally and nationally (Taylor 2000a). Breeds colonially within sheltered coastal harbors and estuaries and in freshwater habitats such as rivers and lakes. Breeding and foraging behaviour in New Zealand studied by Innes and Taylor (1984) . Diet includes freshwater crayfish, frogs and small fresh water fish in inland habitats, and small fishes and flounder in coastal habitat (Innes and Taylor 1984). Prey frequently taken in shallow water < 3m deep. Breeding biology of little black shags requires study including timing of breeding stages. Populations are susceptible to disturbance by humans and recognised breeding locations require protection from disturbance. Little black shags are sometimes caught and injured or killed when entangled in sets nets or caught on recreational fishing lines. Occasionally shot by fishermen who see them as competitors for fish (Taylor 2000b). Development of a colony database for the WHGR and at a national level a priority for this species.


Distribution of little black shag breeding sites
N
0 5 10 20 30 40
Kilometers

Southern black-backed gull

Larus dominicanus dominicanus

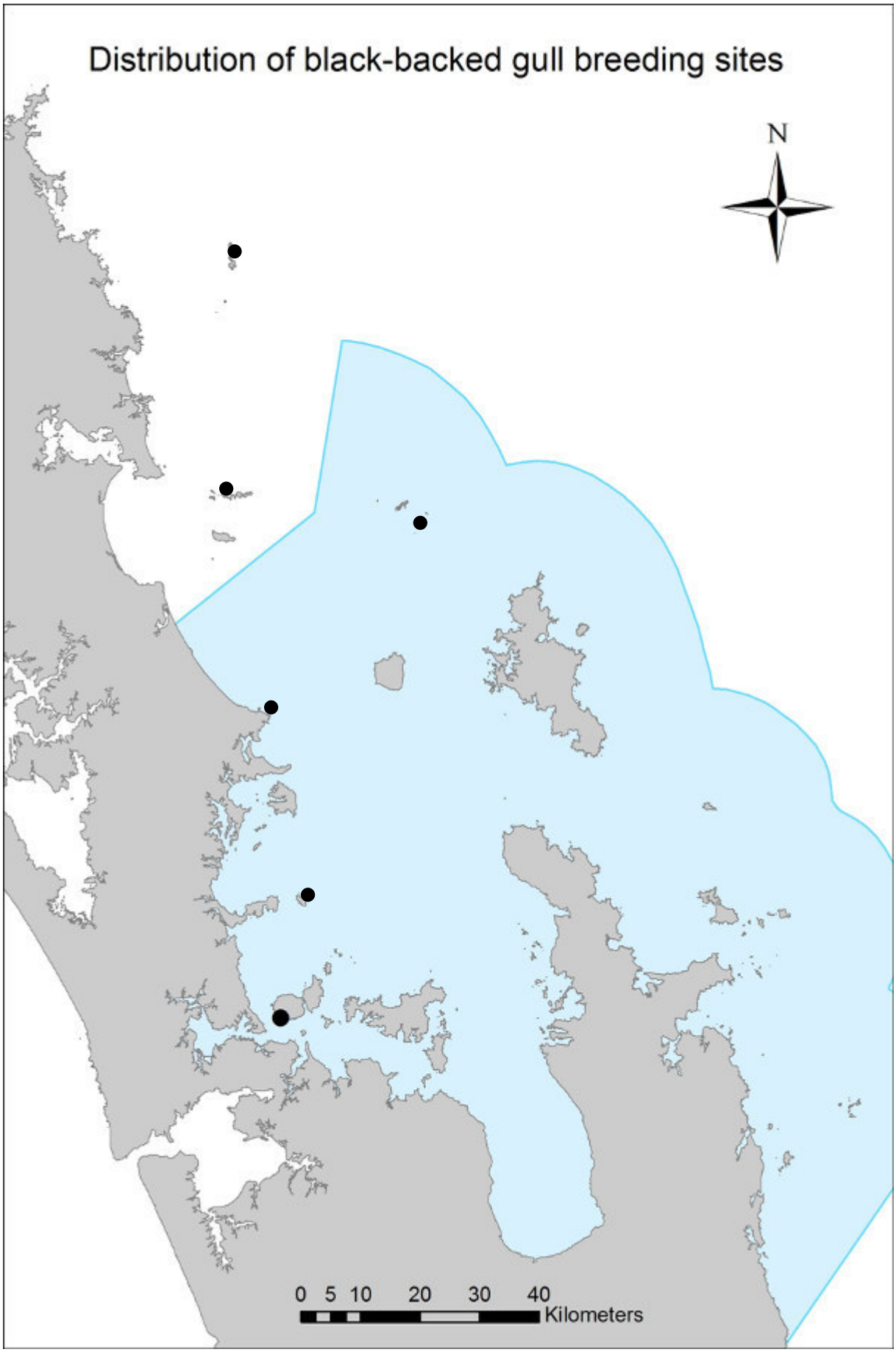
Maori name: Karoro

Photo: Abe Borker

Other names	Kelp gull, Dominican gull
Average length & weight	60 cm, males 1050 g, females 850 g
IUCN Conservation status	Least Concern
Breeding season	September-March, 1 -2-3-5 eggs laid Oct-Nov, incubation 23-27-30 days and fledging at c. 50 days old.
Breeding habitats	Nest in colonies, or as individual pairs, on dunes, sandspits/ shellbanks, boulderbanks, rocky islets and city buildings.
Foraging habitat and movements	Consider sedentary with local movements

New Zealand native breeding widely within the WHGR in a variety of habitats, both on the mainland and on many Gulf islands. Regional colony of note present on Rangitoto Island. Breeding biology and vocal behaviour studied (Fordham 1964a; Fordham 1964b; Oliver 1973; Brunton 1982). However, the size of WHGR and national populations are unknown and a survey, as part of a national effort, is required. Highly opportunistic forager taking a wide variety of food including offal and refuse from rubbish tips and sewer outfalls, marine invertebrates, shell fish and fish as well as frogs, lizards, birds and mammals (Heather and Robertson 1996). Disturbance of breeding sites by humans, introduced pests and summer storms are threats to species breeding success. Movements unknown and require study.

Photo: Karen Baird


Distribution of black-backed gull breeding sites
N
0 5 10 20 30 40
Kilometers

Red-billed gull

Larus scopulinus

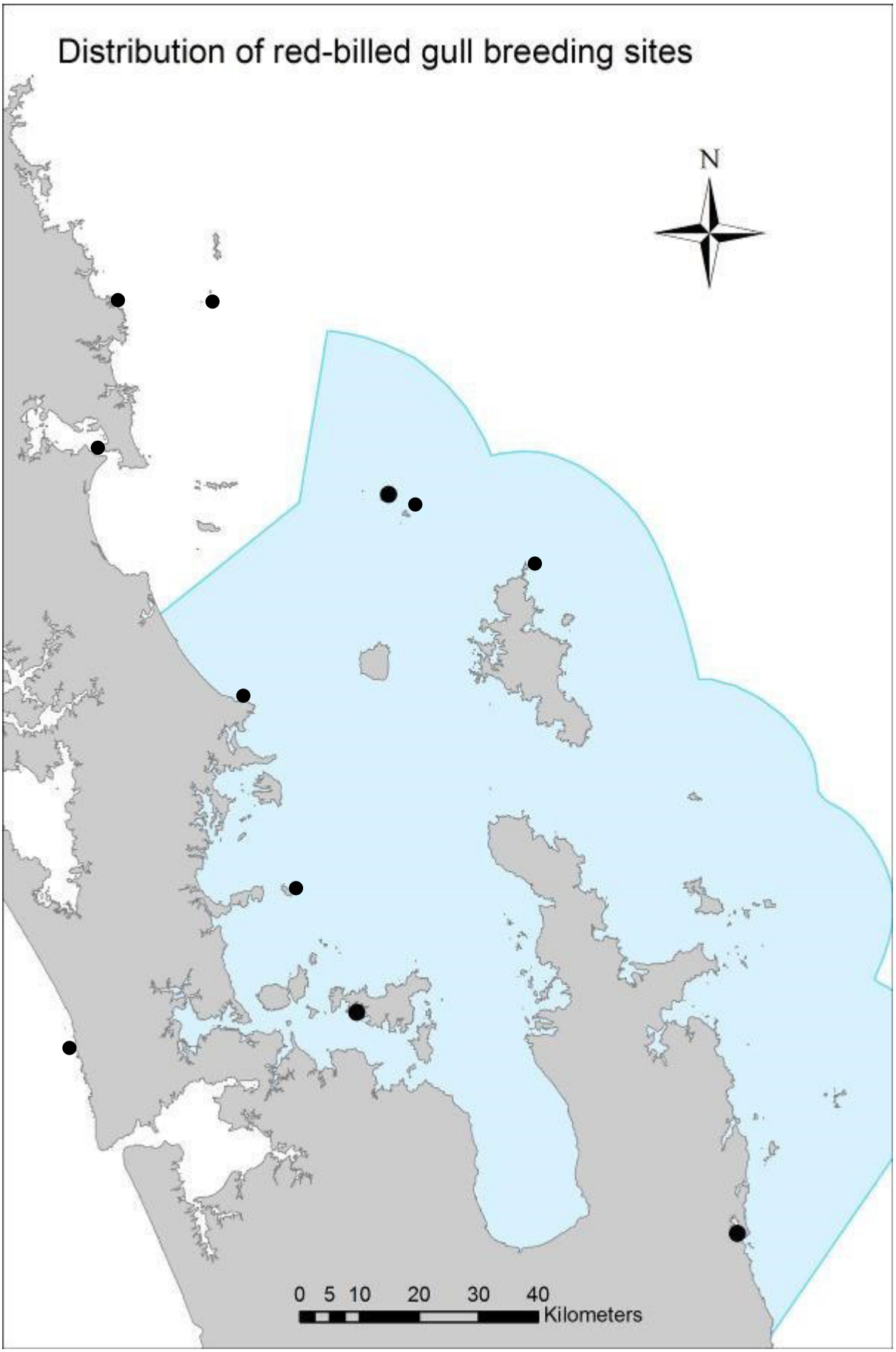
Maori name: Tarapunga

Photo: Abe Borker

Other names	Silver gull
Average length & weight	37 cm, males 300 g, females 260 g
IUCN conservation status	Least Concern
Breeding season	Oct-Feb, 1-2-5 eggs laid Oct-Dec, incubation 24-25-27 days, chick rearing c. 37 days.
Breeding habitats	Sandspits, boulderbanks, shellbanks, gravel beaches, rocky headlands, islets and offshore islands
Foraging habitat and movements	Poorly documented

New Zealand endemic which breeds widely within the WHGR on offshore islands and at mainland sites that offer protection from predators such as mustelids, cats and rats. Breeding sites of note include the Mokohinau Islands, Tiritiri Matangi Island, Koi Islet (Waiheke) (Lee 1999) and the Whangamata marina Breakwater (Whangamata). Population sizes are poorly known, summarised by Gurr and Kinsky (1965), with no subsequent study. Some previously surveyed large populations have declined significantly (particularly at the Mokohinau Islands) but regional (and also national) population census and monitoring is of immediate need. Colonial nesting seabird whose breeding biology was the subject of detailed study in Kaikoura (Mills 1970; Mills 1973; Mills 1979; Mills 1989) but not in northern New Zealand where behaviour may differ. During breeding forages near marine up-wellings in inshore and offshore waters where it specialises in predating planktonic euphausiids (Mills et al. 2008) and also marine invertebrates and schooling small fishes, often in association with larger predatory fishes (Heather and Robertson 1996). Numbers at the Mokohinau and Poor Knights Islands increase during winter months (C. Gaskin pers. obs). Diet can vary greatly at other times of year to offal, refuse and carrion from scavenged food source (i.e. rubbish tips, and other urban refuse). Movements and foraging ecology of WHGR populations unknown and require study.

Photo: Abe Borker


Distribution of red-billed gull breeding sites
N
0 5 10 20 30 40
Kilometers

Black-billed gull

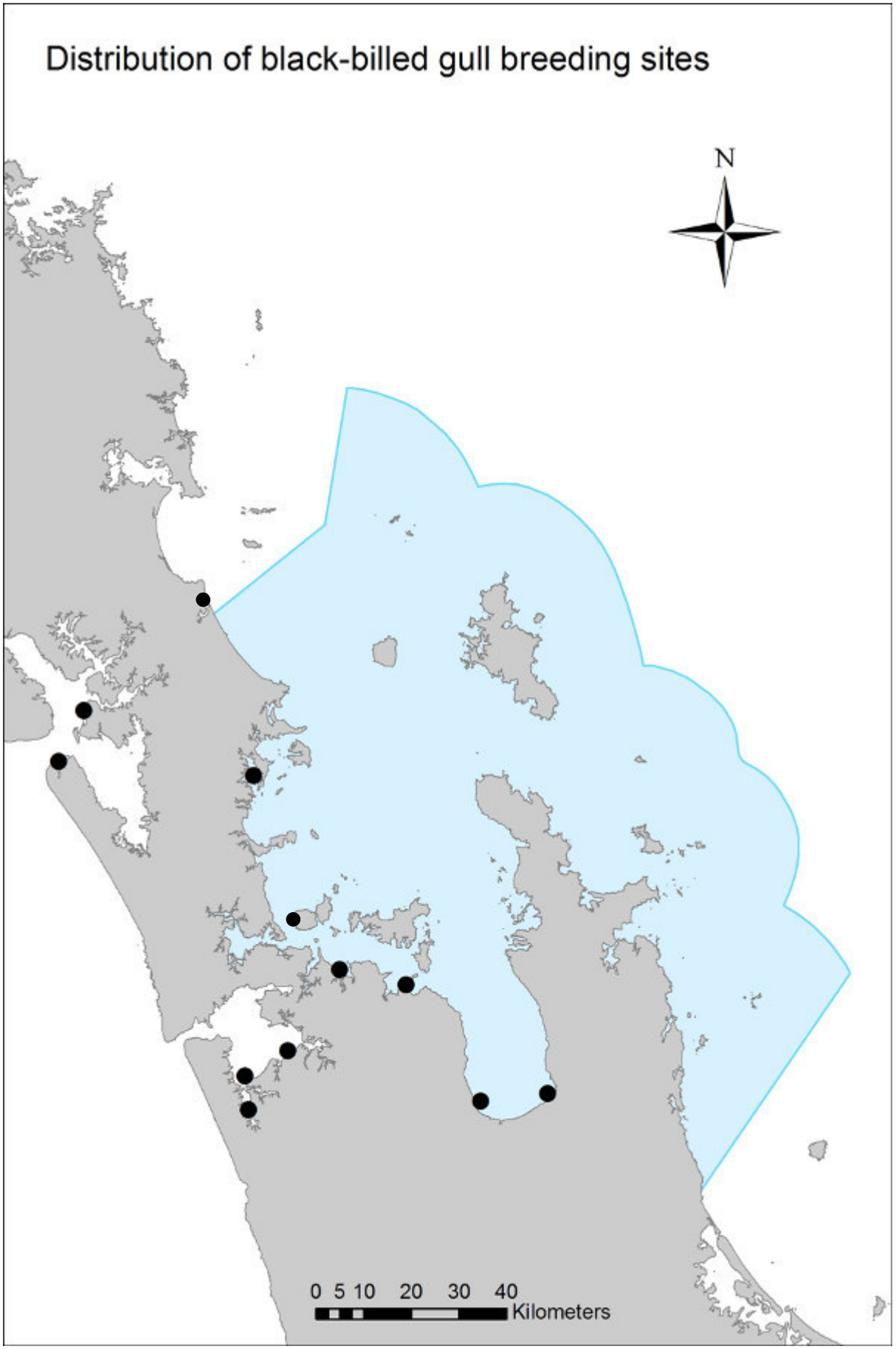
Larus bulleri

Maori name: Tarapuka

Photo: Phil Battley

Other names	
Average length & weight	37 cm, males 300 g, females 250 g
IUCN Conservation status	Endangered
Breeding season	Sept-March, 1-2-4 eggs laid Sept-Dec, incubation 20-24 days and fledging at c. 26 days old.
Breeding habitats	Nest on in colonies on coastal sandspits, boulderbanks or shellbanks
Foraging habitat and movements	Poorly known

Endangered New Zealand endemic gull with major breeding populations on braided riverbeds in the South Island. North Island breeding population has expanded within recent years (Heather and Robertson 1996) countering major declines of southern population since the 1970's which resulted in the 2008 revision of the species to Endangered under IUCN criteria. Recorded breeding within the WHGR at Waionui Inlet, Rat Island and Waikiri Creek in the Kaipara Harbour, Waipipi Creek, Clarks Bay & Te Hihi shellbanks in the South Manukau Harbour, also Mangawhai Harbour, Turanga Creek, Mataitai, Miranda and Waihou River, Thames (A. Habraken unpublished). Nests in colonies on coastal sandspits, boulder banks or shellbanks often in association with white-fronted terns. Surface nest of dry grass, twigs, shells and tide wreck debris (Heather and Robertson 1996; Habraken 1997). Disturbance of breeding sites by humans, introduced pests, Australasian Harrier, high tides and summer storms (A. Habraken, unpublished data) are threats to species breeding success. Breeding biology of South Island populations has had numerous studies (Dawson 1954; Beer 1965; Beer 1966; Evans 1970; Evans 1982a; Evans 1982b), whereas there are comparatively few on-going breeding studies of northern populations (Habraken 1997; Crocker and Habraken 1998). Long-term monitoring (on-going) and protection of breeding sites from disturbance and predation are key management requirements for this species.


Distribution of black-billed gull breeding sites
N
0 5 10 20 30 40
Kilometers

New Zealand fairy tern

Sternula nereis davisae

Maori name: Tara iti

Photo: Brian Chudleigh

Other names	Tara-iti
Average length & weight	25 cm, 70 g
IUCN Conservation status	Critically Endangered
Breeding season	November-February, 1-2 eggs laid mid-November, incubation 23-25 days, chick rearing 22-23 days
Breeding habitats	Nests on low lying sand-spit, beach and dune habitats.
Foraging habitat and movements	Non-migratory with inshore coastal foraging during breeding. Kaipara Harbour an important overwintering habitat, also for non-breeding birds and failed breeders.

The New Zealand fairy tern is a critically endangered endemic subspecies restricted to breeding sites at the Papakanui Spit (South Kaipara Head), Pakiri Beach, Mangawhai and Waipu Estuaries (Taylor 2000a). Total world population is 25-38 individuals with 8-10 breeding pairs (Taylor 2000a). Predation by introduced mammalian predators and native avian predators (southern black-backed gulls, Australasian harrier and oystercatchers (*Haematopus* spp.)) and direct human disturbance are key threats at the species breeding sites. Breeding birds forage over inshore and estuarine waters with the largest breeding population (Mangawhai; 5 pairs) making extensive use of the Mangawhai estuary, particularly mangrove vegetated habitats, where they prey upon gobies and possibly shrimp (S. Ismar and K. Baird unpublished data). Non-breeders (during both the breeding and non-breeding seasons) make extensive use of the eastern river arms and estuaries of the Kaipara Harbour (Ismar et al. in prep-b).

Photo: Fredric Pelsy

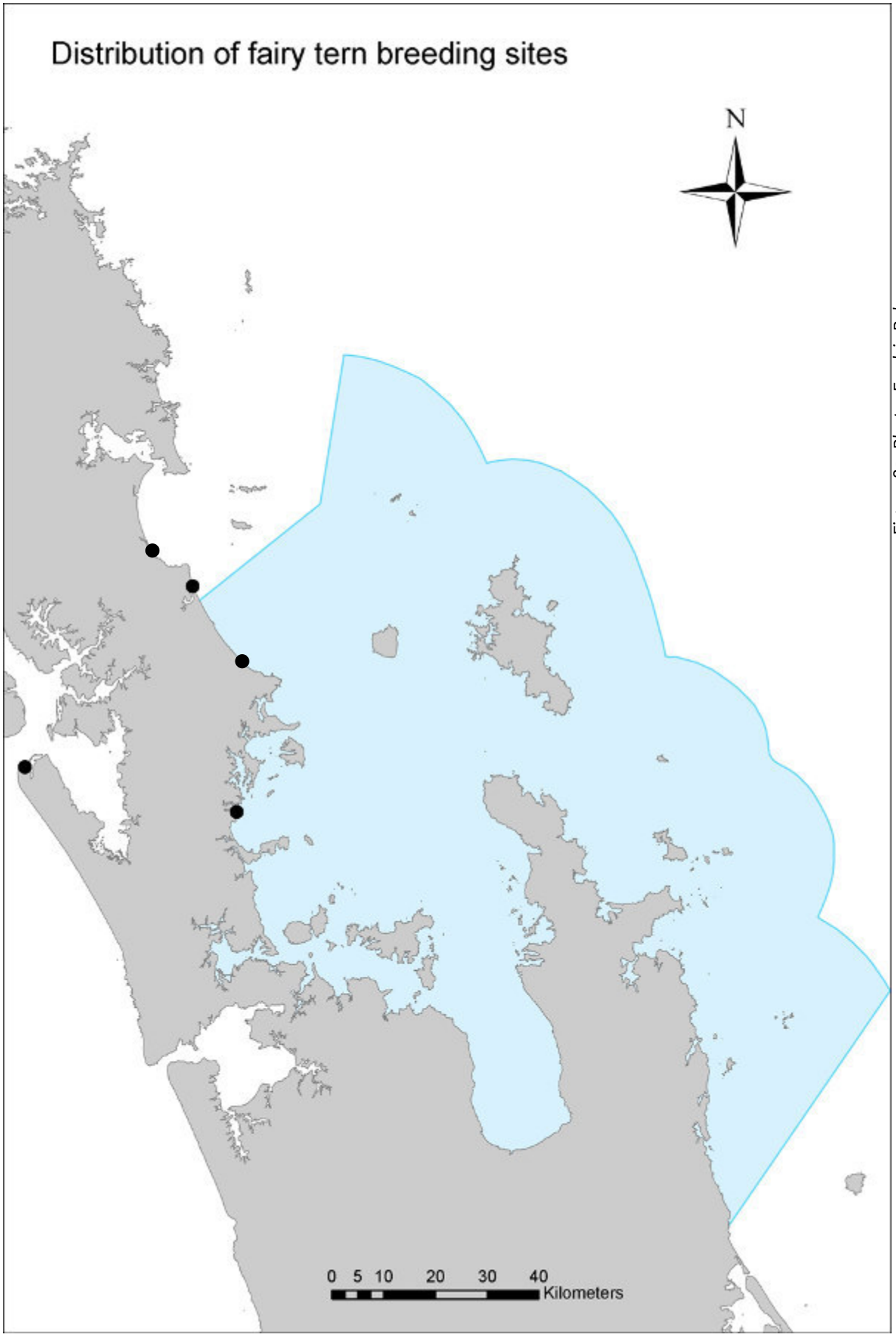


Figure 83. *Photo: Fredric Pelsy*

Caspian tern

Hydroprogne caspia

Maori name: Taranui

Other names	
Average length & weight	51 cm, 700 g
IUCN conservation status	Least Concern
Breeding season	Sept-March, 1-3 eggs laid Sept-Dec, incubation 26-28 days and fledging at 33-38 days old.
Breeding habitats	Nest on low lying sand spit, beach and/or dune habitats, and occasionally on inner Gulf islands.
Foraging habitat and movements	Inshore, estuarine foraging during breeding. Movements focussed within productive harbours during non-breeding period

New Zealand native with world-wide distribution. National census conducted in 1970-75 and 1990-95 (Bell and Bell 2008) with breeding colonies identified in the WHGR at sheltered harbour/estuarine shell banks and sandspits including Mangawhai and the Whangateau Estuary (M. Bell and K. Baird pers. com.). However, known to breed as single pairs in other locations. Disturbance of breeding sites by humans and or introduced pest are key threats to species breeding success. Although some colonies at key shorebird sites are protected, all major colonies within the WHGR should be identified and protected. Breeding biology studied in New Zealand (Pierce 1984; Barlow and Dowding 2002) but further study required of WHGR populations. Predominant inshore, harbour and estuarine foraging and also known to forage freshwater lakes and rivers inland. Feeds primarily on surface feeding fish taken on the wing (Heather and Robertson 1996). Non-breeding movements poorly known but WHGR populations are thought to remain within 100 km of breeding site frequenting productive harbour habitats and shore bird roost sites (Heather and Robertson 1996). Study of movements and ecology required.

Photo: Chris Gaskin


Distribution of Caspian tern breeding sites
N
0 5 10 20 30 40
Kilometers

White-fronted tern

Sterna striata

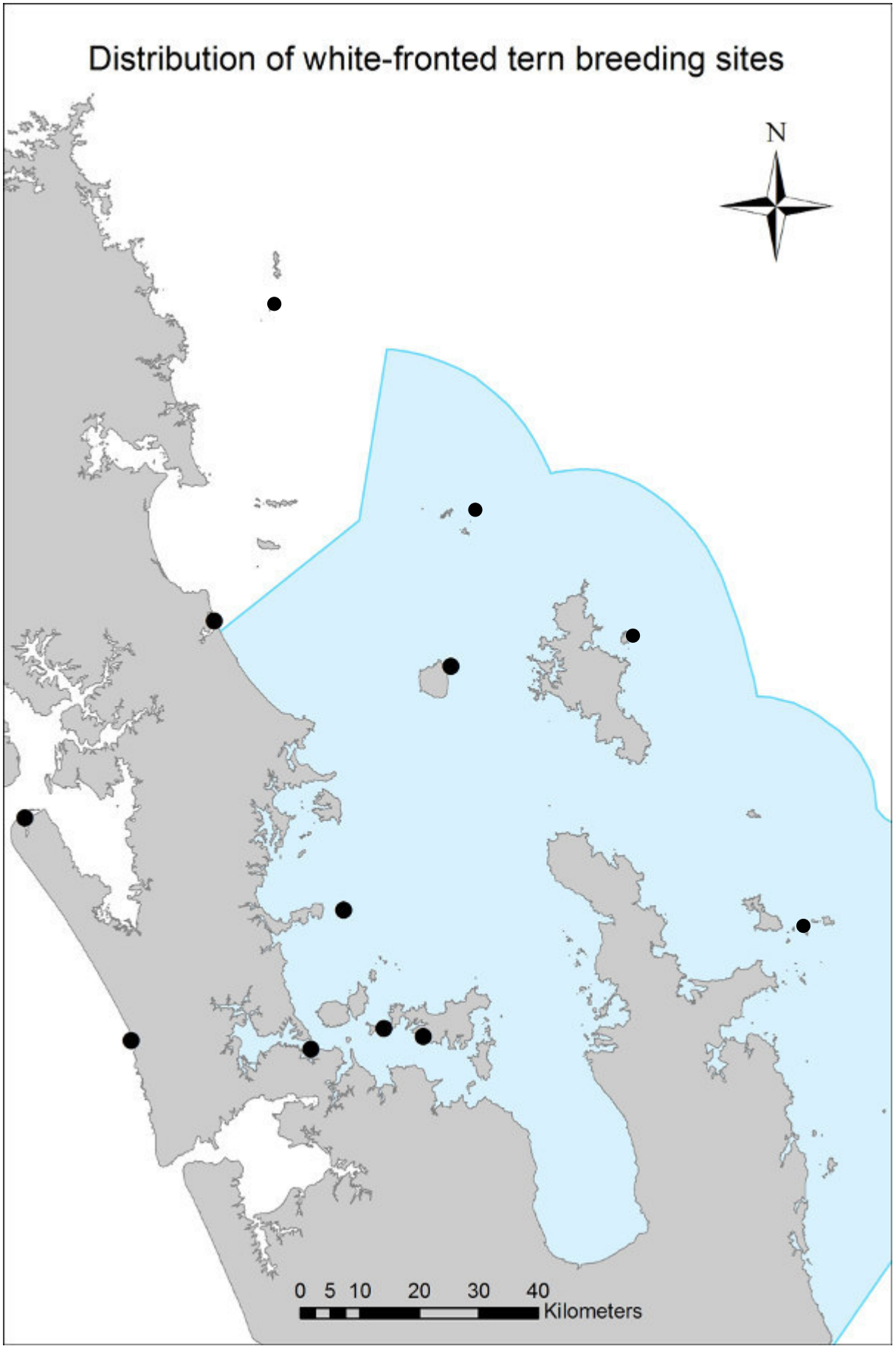
Maori name: Tara

Photo: Karen Baird

Other names	Kahawai bird
Average length & weight	42 cm, 160 g
IUCN conservation status	Vulnerable
Breeding season	Sep-Feb, 1-2 eggs laid mid-Oct-Jan, incubation c. 24 days, chick rearing 29-35 days
Breeding habitats	Nests on low lying sand-spit, beaches, rocky islets, rock stacks and offshore islands.
Foraging habitat and movements	Primarily inshore, harbour and estuarine foraging for surface shoaling fish. Non-breeding movements unknown.

Nationally vulnerable native species with major WHGR breeding colonies (> 250 pairs) at Papakanui Spit (South Kaipara Head) and Miranda (Firth of Thames). WHGR population sizes unknown but evidence suggests white-fronted tern populations are declining with fewer colonies in the 1990's than 1970s (Taylor 2000a). National population considered to be 12,000-15,000 pairs (Taylor 2000a). Breeding biology studied by Mills and Shaw (1980) but further studies of foraging ecology and population biology (particularly population size, stability and demography) are urgently required. Predation by introduced mammal and native avian predators (southern black-backed gulls, Australasian harrier and oystercatchers) and human disturbance are key threats to the species at its breeding colonies. On-going management of these sites is required to protect populations.

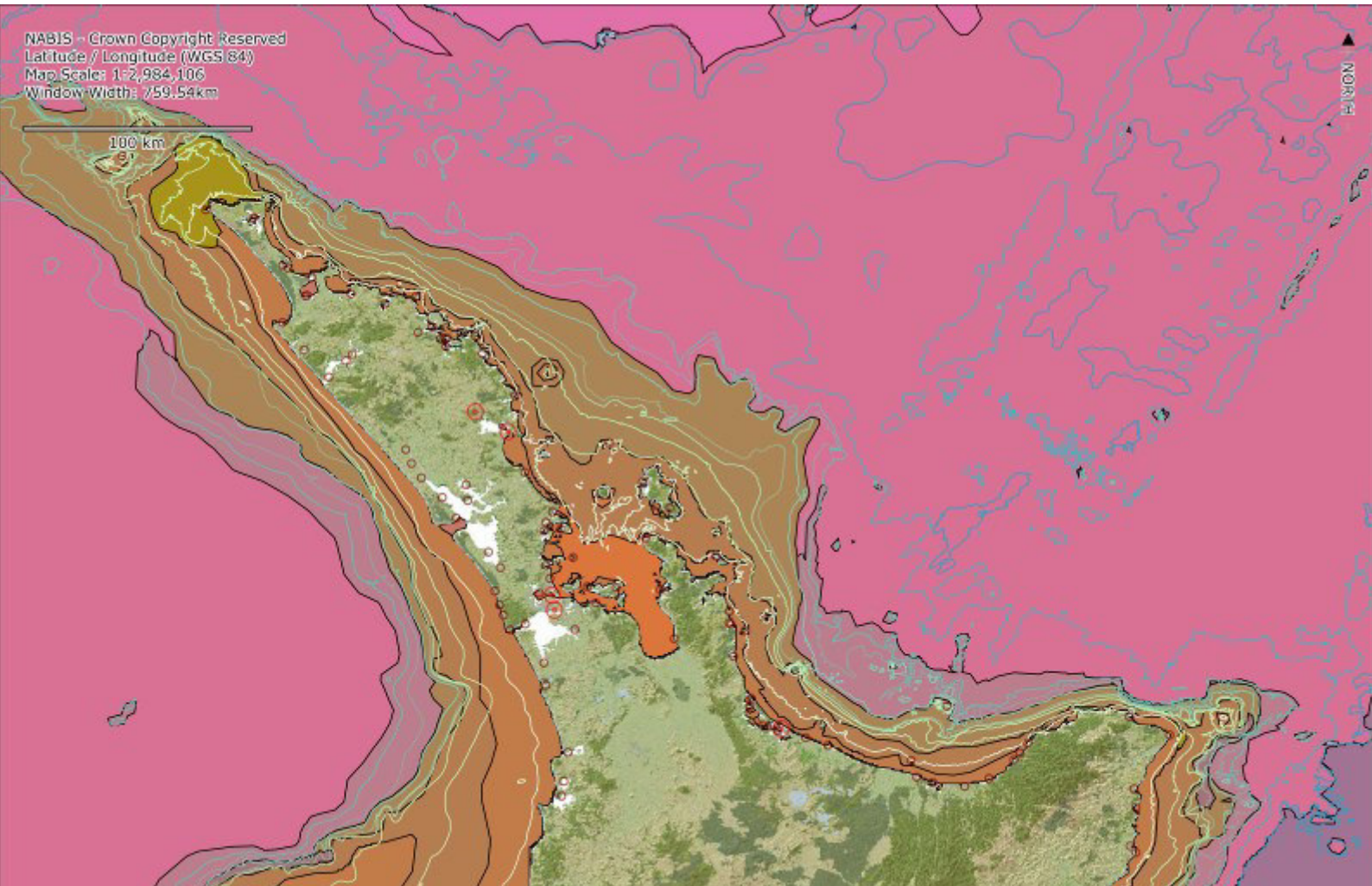
Photo: Fredric Pelsy


Distribution of white-fronted tern breeding sites
N
0 5 10 20 30 40
Kilometers

8 SEABIRD USE OF WHGR WATERS

The previous section outlines the incredible seabird diversity of the WHGR. This diversity is also mirrored by the numerous ways birds utilise the waters of the Gulf for foraging and breeding. Understanding the importance of the waters of the WHGR to seabirds requires knowledge of species diversity across a dynamic marine ecosystem from estuaries and harbours, to coastal waters, deeper shelf waters, to the edge of the continental shelf and deep pelagic waters far from land. Historically this understanding has been gained from boat-based observations of where birds congregate to feed at sea and from collecting colony-based datasets, such as the length of adult foraging trips away from breeding colonies, that can be extrapolated to interpret likely foraging distance. Recently, understanding of bird foraging has been transformed through the use of bird-borne tracking devices. Moreover, using these technologies in combination with other behavioural and molecular methods, such as stable isotopes, is opening broad avenues for understanding seabird biology and ecology in unprecedented detail.

Approximately, 60% of NZ seabird species regularly forage more than 50km offshore while the remaining species feed over inshore waters and only occasionally are found well away from land (Taylor 2000a). Other species such as gulls, terns, shags, penguins and gannets (to some degree) feed close to the shorelines of the mainland and inner and outer Gulf islands where they breed. Of the tube-nosed "procellariiform" seabirds, species such as fluttering, flesh-footed, diving and storm petrels also forage predominantly in shelf waters. Fluttering shearwaters, diving and storm-petrels, and blue penguins are more localised in their foraging during breeding. From regular at-sea observations, little shearwaters appear to forage at a greater distance offshore than fluttering shearwaters. Buller's, flesh-footed and sooty shearwaters, while commonly seen within the Hauraki Gulf during their summertime breeding season, range widely while provisioning chicks. Cook's, Pycroft's, black and grey-faced petrels are all pelagic seabirds which search for prey beyond the continental shelf. For example, though Cook's petrels abound in the Gulf during summer these birds return to their colony on Hauturu/Little Barrier Island and feed over deep Pacific Ocean waters off the East Coast of the North Island and in the Tasman Sea (Rayner



et al. 2008). Grey-faced petrels also breed on the Gulf's many islands yet forage at the Chatham Rise, East Cape, towards the Kermadec Islands and in the Tasman Sea as far as the New South Wales and Tasmanian coasts (G. Taylor, M Rayner, C Gaskin unpublished data). Species-specific foraging habitat selection is reflected in the frequency with which chicks are fed; every one or two days in the case of local foraging species (e.g. diving petrels, white-faced storm petrels), and from several days to up to three weeks in pelagic species such as Cook's petrel, black petrel, grey-faced petrel and sooty shearwater.

The foraging ecology of WHGR seabirds depends on the prey species exploited (e.g. zooplankton such as krill, fish, and cephalopods such as squid) and habitats used (e.g. estuarine/harbour, inshore, continental shelf, shelf edge and pelagic zone). Recent study of the foraging of NZ fairy tern during the summer breeding season has shown that birds favour estuarine habitats near their breeding colonies (e.g. Mangawhai, Waipu) including areas adjacent to mangroves (Ismar et al. in prep-b). During non-breeding periods, or if breeding has failed, NZ fairy terns move away from the Hauraki Gulf and frequent the arms of the Kaipara Harbour to the west (Baird, et al *in prep*) . In contrast, pied shags breed on many of the islands and around estuaries and harbours throughout the WHGR and are commonly seen foraging individually, close to shore or roosting on rocks. Little black shags in contrast can be communal and flocks of up to 20 can be seen in the Kaipara Harbour, or sometimes in the Inner Hauraki Gulf, for example near Orewa (C. Gaskin pers. obs.). The most spectacular feeding activity in the HGMP are boil- or work-ups around fish schools when shearwaters, prions, storm petrels, gannets, gulls and terns are joined by common dolphins and even Bryde's whales. Schools of trevally (*Caranyx georgianus*) and kahawai (*Arripis trutta*) along with marine mammals drive prey such as krill and or small fish closer to the surface in reach of the birds. Trevally can be seen at the surface, their backs clearly visible, mouths open feeding, while the birds mostly feed around the school's fringes (fig 1). Occasionally flesh-footed shearwaters have been observed taking saury (*Scomberesox saurus*) in association with gannets in the outer Hauraki Gulf, also in spectacular fashion when the fish are close to the surface (C. Gaskin pers. obs.).

Little shearwaters tend to forage either individually, or in loose groups, and have a distinctive foraging behaviour, where pursuit of prey underwater is interspersed by little flighted dashes. Strangely the numbers seen within WHGR during breeding are low and contrary to large breeding populations present (e.g. Mokohinau, Hen & Chickens, Poor Knights, and Mercury Islands) and suggest the species has a more pelagic distribution. The little shearwater is one of several local species for which foraging and feeding are poorly understood. Research currently underway has found that the common diving petrels, for example, can spend up to 80% of their time at sea during a single day underwater in pursuit of prey (G. Taylor pers. com.).

Figure 90 (opposite). Map of the northern North Island, showing bathymetry and Marine Environment Classifications. *Map source: NABIS*

Figure 91 (right). Arctic skua forces a white-fronted tern to drop its catch, Kawau Bay. Photo: Martin Sanders.

Large-scale zooplankton occurrences (e.g. euphausiids) also concentrate feeding in a number of seabird species such as Buller's and fluttering shearwaters, prions, common diving petrels and white-faced storm petrels (Fig. 91). At times these patches can extend across several square kilometres. When zooplankton surface accumulations are not so readily seen, especially when the sea is rough, significant concentrations of diving and storm-petrel activity can signal zooplankton presence. Phytoplankton blooms, sometimes in extensive yellow or orange paint-slick-like skeins kilometres long, also feature in northern New Zealand waters. While not directly food for seabirds, this primary productivity can fire a progression through the trophic chain, zooplankton and larval fish through to the top marine predators with seabirds included (see Section 4.1 above).

At the continental shelf edge (from 500m bathymetric contour), which in the WHGR can vary from 12 nm off Cape Brett to 40 nautical miles off Aotea/Great Barrier Island, seabirds that breed elsewhere in New Zealand increasingly appear. Species regularly present in these waters include the Antipodean (*Diomedia antipodensis*), wandering (*D. exulans*), northern royal (*D. sanfordi*), southern royal (*D. epomophora*), Buller's (*Thalassarche bulleri*), white-capped (*T. steadi*) and Salvin's (*T. salvini*) albatrosses (C. Gaskin unpublished data). Moreover, depending on the time of the year, petrels from New Zealand's Chatham and subantarctic Islands such as giant (*Macronetes* spp.), mottled (*Pterodroma inexpectata*), soft-plumaged (*P. mollis*), white-headed (*P. lessonii*), grey (*Procellaria cinerea*) and cape (*Daption capense*) petrels that disperse following their breeding seasons are also present (C. Gaskin unpublished data). Some of these species will make incursions inshore, some possibly forced by adverse or unfavourable weather conditions. However the general rule of thumb is that those species most likely to be observed in inshore gulf waters are those that breed on islands there.

Groups of seabirds resting (rafting) on the surface are a major feature of the WHGR. These "rafts" are likely to include birds gathering together near their breeding islands before their heading ashore after dark, such as the Cook's petrel and Buller's shearwater which breed on Little Barrier and the Poor Knights Islands respectively (C. Gaskin pers. obs). At other times birds will form large resting flocks during lulls between feeding, i.e. at slack tide or when their prey descends out of reach. This is a common sight for Buller's and fluttering shearwaters, for example, around the Maori Rocks at the Mokohinau islands, northwest of Hauturu/Little Barrier Island and, in the case of fluttering shearwaters, in the inner Gulf during winter (Fig 93).

Figure 91. White-faced storm petrels feeding on zooplankton, outer Hauraki Gulf. *Photo: Hadoram Shirihai*

Seasonal migration plays a big part in seabird use of WHGR waters with a number of the local breeding species mostly absent post-breeding. During winter months Cook's, Pycroft's, black, and black-winged petrels, Buller's, flesh-footed and sooty shearwaters, white-faced storm petrel and a large proportion of Australasian gannets are absent from the Gulf on their seasonal migrations that extend across the Tasman Sea (gannets), across the Pacific Ocean to waters off South America (black petrel, white-faced storm petrel) and north across the equator to the Northern Pacific Ocean (Cook's, Pycroft's and black-winged petrels, Buller's, flesh-footed and sooty shearwaters). Conversely, little shearwater and common diving petrel will be absent during summer months when they tend to move south to exploit productivity towards the subtropical convergence zones and polar front, and grey-faced petrels migrate to the east coast of Australia.

Extract from **Lew Ritchie's *Three King's Magic***

Figure 92. 'Meat-ball'. *Photo: Kim Westerskov*

"If you are a sea adventurer the pulse quickens where seabirds and school-fish feed on plankton at the sea surface. These feeding melees can occur anywhere around the Kings but appear to be almost continuous near the eastern end of the Princes Islands and the northern end of South West Island where the current is strong and where there are islets and near surface reefs.

On Wairangi's *echo sounder a huge school of trevally appears like an iceberg with 95% of its mass below the surface. However, unlike an iceberg it changes shape, contorting and twisting like the super organism it is* (Fig. 92). *It touches the sea surface here in a thousand gaping mouths and a rustle of wavelets barely heard above the screaming seabirds, then it touches the surface elsewhere in apparently haphazard fashion. Large patches of blue - blue mao mao, pink - pink mao mao and grey - large sweep, entwine with the twisting grey-green skein of trevally ever changing direction and size as new fronts form to chase the plankton, mainly crustaceans or krIll. Three or more species of petrel lead the seabird attack, the diving petrels with heads down beneath the sea surface nearly as constantly as the surface trevally have their heads above. Continual darting strikes marked by flurries of spray and a babble of cries mark the unceasing attack on krill by other petrels.*

A flurry of red-billed gulls, as much noise as fishing success, accompany the petrels above with smaller numbers of bumbling black-backed gulls which rush clumsily to even less effect. Diving petrels ceaselessly dive and burst out of the sea again amongst the main body of surface fish. White-fronted terns, with a dancing precision that contrasts strongly with the haphazard rabble of gulls and petrels, strike at pockets of fish fry while gannets make their hits on larger fish from well above.

Ripping lines of spray burst through the near surface trevally denoting attacks by larger predators. We see no fins or tails and conclude that these are the electrifying rushes of large kingfish".

Whether the New Zealand storm-petrel is a migrant is uncertain although at-sea observations suggest there is a mid-winter period where the species is present in only low numbers, if at all, and thus likely disperses out of local waters. Post-breeding fluttering shearwaters are both resident and migratory. Some breeding birds and juvenile birds sojourn to Australian waters (Marchant and Higgins 1990), whereas large flocks of this species are also a common sight inshore throughout WHGR during winter months. For resident species, i.e. the gulls, terns and shag species, there is a change both in their behaviour and where they occur between breeding and non-breeding periods. For example, at the Mokohinau Islands the red-billed gull population is no more than 200 pairs, and yet during autumn/winter months the numbers of these gulls can swell into the thousands, to take advantage of the productive waters through that period (C. Gaskin pers. obs.).

The WHGR also enjoys regular visits from some northern hemisphere migrant seabirds, for example, Arctic (*Stercorarius parasiticus*) and pomarine skua (*S. pomarinus*) and little tern (*Sterna albifrons*). Of these, the kleptoparasitic behaviour of Arctic skua harassing white-fronted terns is likely to capture the attention of local fishers and boaties, and possibly some of the commuters to Waiheke and other inner Gulf islands (Fig 91). Seabirds breeding on sub-tropical islands (e.g. Kermadec Islands), such as white-naped (*Pterodroma cervicalis*) and Kermadec petrels (*P. neglecta*), will also visit WHGR waters. Grey ternlets (grey noddies) (*Procelsterna cerulea*) are a common annual visitor from November to April, with roosts on Maori Rocks (Mokohinau Islands) and High Peak and Sugarloaf Rocks (Poor Knights Islands).

Figure 93. Fluttering shearwater rafting en masse post-breeding, Kawau Bay. *Photo: Karen Baird*

Figure 94 (opposite page). 'Petrel weather', NW storm at Mokohinau Islands, view from Burgess Island towards Atihau Island, Mokohinau Islands. *Photo: Abe Borker.*

9 SUMMARISED SEABIRD BREEDING SITES

The many seabird species breeding within the WHGR at sites for individual taxa that are both numerous and usually poorly documented. The following section attempts to summarise existing information. To achieve this goal we divide the WHGR into six 'regions', with the number of seabird species confirmed breeding, within each order, shown in each case. We define breeding as the presence of burrows, burrow activity, nests with birds, birds incubating eggs, chicks and fledglings or a combination of other observation sources such as carcasses of deceased birds and acoustic recordings showing persistent presence of birds (i.e. ground and flight calls) during likely breeding periods. These information sources include published and unpublished empirical data. NB: a number of sites/islands have been listed below for which there is no data, however, are included here for future surveying.

The following seabird orders are recognised in this analysis:

Spenisciformes (= Sph) - penguins

Pelecaniformes (= Pel) - gannets, shags (cormorants)

REGION 1 - Cape Brett (Bay of Islands) to Bream Head (including the Poor Knights)

Site no.	Location	Island/breeding site	Seabird diversity			
			Sph	Proc	Pel	Char
1	Cape Brett					2
2		Motukokako (Piercy Island)	1	2		
3	Northland coast/offshore islands		1	1	1	2
4		Waiwiri Island		1		1
5		Bland Rocks		1	1	1
6		Rimariki Island & stacks	1	1	2	1
7		Otawhanga Island		1		1
8		Little Otawhanga Island		2		2
9		Motutohe	1	1	2	2
10	Bream Islands					
11		Mauitaha Island	1	3		3
12		Guano Island	1	2		1
13	Poor Knights Islands Group					
14		Tawhiti Rahi Island	1	6		
15		Motu Kapiti Island				
16		Unnamed island off Urupa Point				
17		Unnamed stack off Urupa Poiint				
18		Aorangi Island	1	8		
19		Aorangaia Island		4+		
20		Archway Island		4+		
21		High Peak Rocks (The Pinnacles) A (+ Stack A)	1	2+	1	
22		High Peak Rocks (The Pinnacles) B	1			
23		Sugarloaf Rock			1	
24	Whangarei coast			1		
25		Bream Head (Whangarei Heads)			2	
26	Whangarei Harbour islands					
27		Caliope Island				
28		High Island (+ stack)			3	2
29		Motukaroro	1			1
30		Limestone Island		1		1

Figure 95. The Pinnacles, Poor Knights Group.
Photo: Shelley Heiss-Dunlop

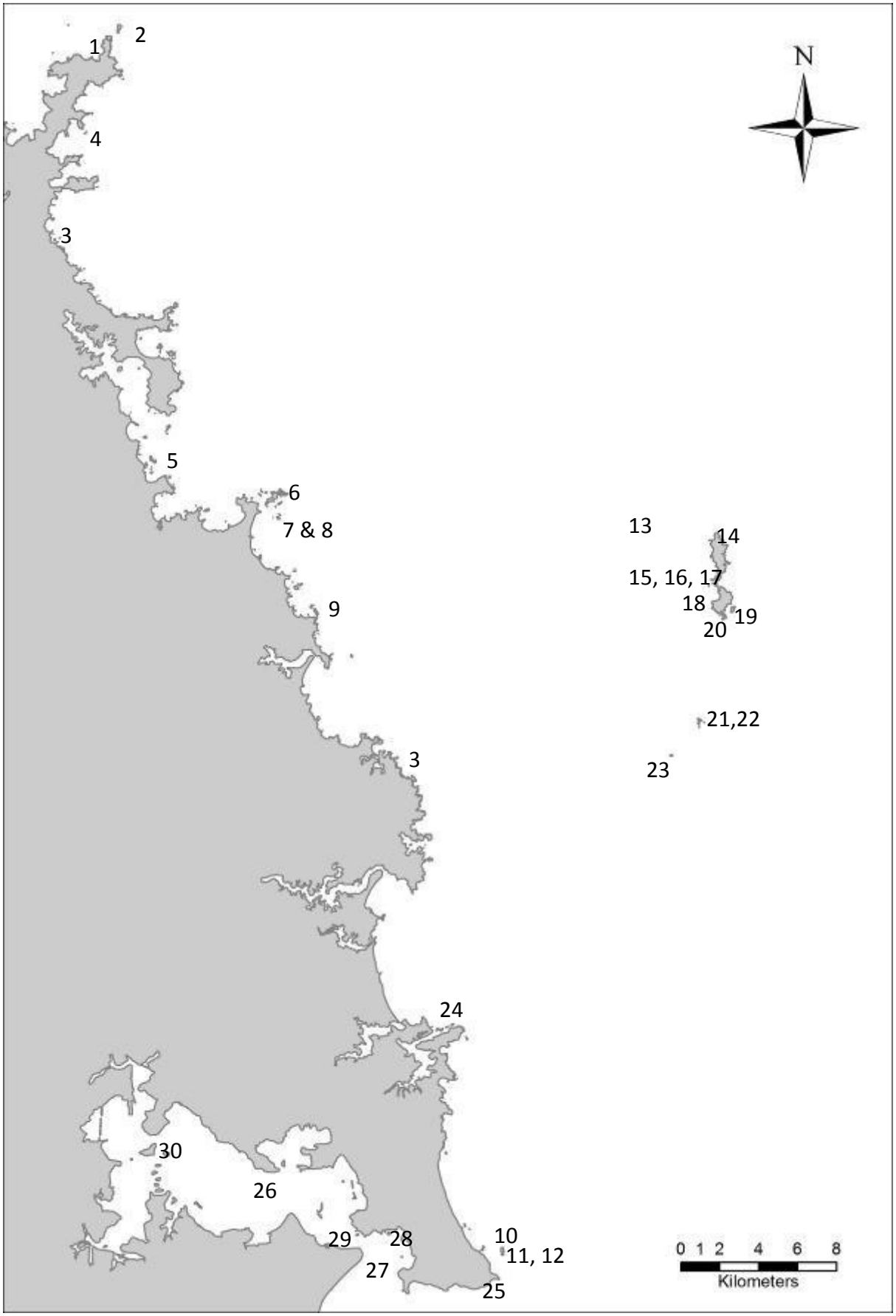

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Figure 96 (top). Crater Bay, Aorangi Island, Poor Knights Group. *Photo: Shelley Heiss-Dunlop.*

Figure 97 (middle left). Poor Knights lily *Xeronema callistemon*, Aorangi Island, Poor Knights Group. *Photo: Shelley Heiss-Dunlop.*

Figure 98 (middle right). Tuatara *Sphenodon punctatus*. *Photo: Glenn McKinlay*

Photo 99 (bottom). Aorangi Island, Poor Knights Group. *Photo: Shelley Heiss-Dunlop.*

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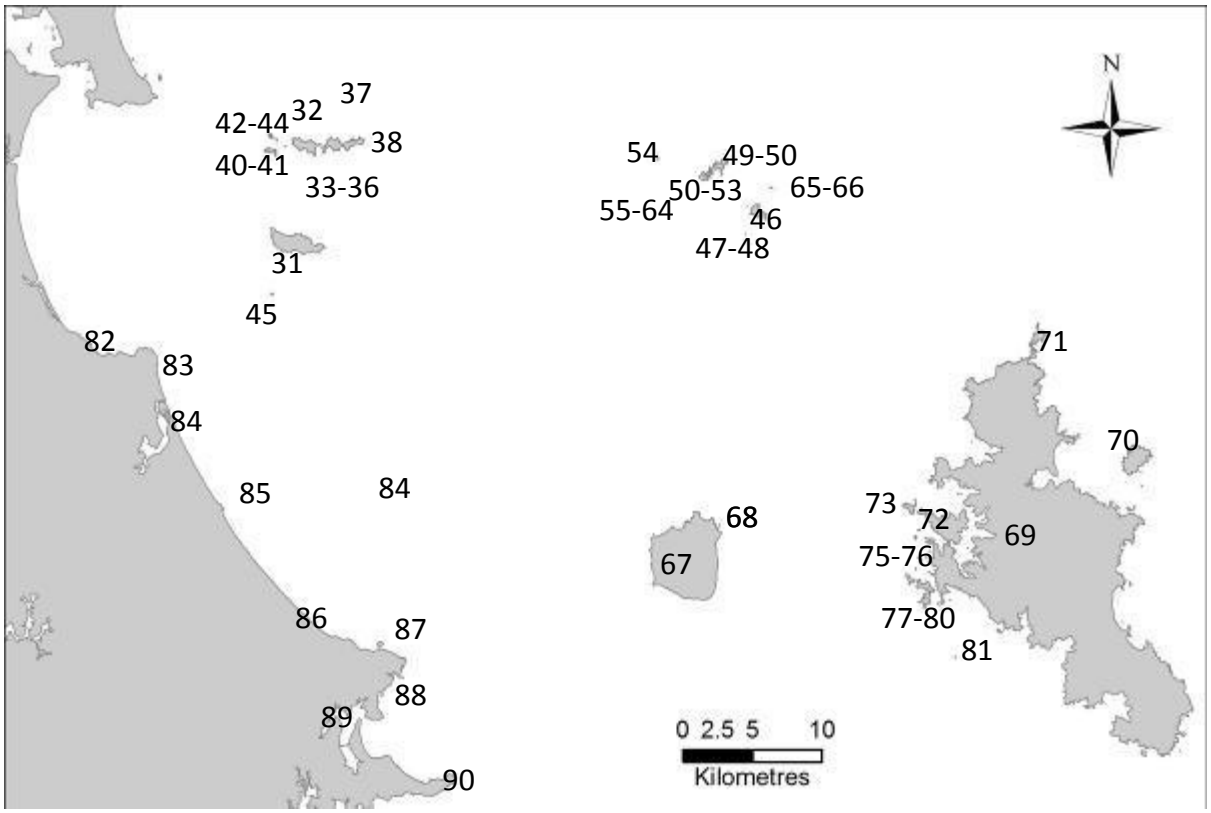
Figure 100. (top). Bream Islands, view of Mauitaha from Guano Island. *Photo: Dylan van Winkel.*

Figure 101 (middle left). Flax weevil *Anagotus fairburni,* Bream Islands. *Photo: Sara Wells.*

Figure 102 (middle right). MacGregor's skink *Oligosoma macgregori*. *Photo: Dylan van Winkel.*

Figure 103 (bottom). Fluttering shearwater. *Photo: Sarah Wells.*

REGION 2 - Outer Hauraki Gulf Islands and Bream Head to Tawharanui Regional Park



Site no.	Location	Island/breeding site	Seabird diversity			
			Sph	Proc	Pel	Char
	Hen & Chickens Islands Group					
31		Taranga (Hen) Island	1	4+	1+	1+
32		Marotiri (Lady Alice) Island	1	5+		1+
33		Keyhole Rock				
34		Rawaru Rock				
35		Moki Rock				
36		Middle Stack				
37		Whatupuke Island	1	4+		
38		Coppermine Island	1	4+		
39		Taura Rock				
40		Mauitaha (West Chicken) Island	1	5		1
41		Araara Island	1	3+		u
	Northwest Chickens					
42		Wareware Island	1	3+		
43		Muriwhenua Island	1	3+		
44		Pupuha Island		3+		
45		Sail Rock	1	4+		

Site no.	Location	Island/breeding site	Seabird diversity			
			Sph	Proc	Pel	Char
	Mokohinau (Pokohinu) Islands Group					
46		Fanal Island	1	5+	1	1
47		(Fanal Is. Stack A)				
48		Gut Rock (Fanal Is. Stack B)		2		
49		Burgess (Pokohinu) Island	1	7		1
50		Flax (Motuharekeke) Isle	1	4		
51		Hokoromea (Maori Bay) Island	1	4+	1	
52		Atihau (Trig) Island	1	3+		
53		Lizard Island	1	4+		
54		Groper Island	1	4+		
55		Arch Rock	1	2		
56		Mokohinau Stack A				
57		Mokohinau Stack B	1	2		
58		Motupapa (Stack C)	1	2		
59		Mokohinau Stack D	1	2		
60		Mokohinau Stacks E-G				
61		Mokohinau Stack H		3		
62		Mokohinau Stack I, J				
63		Sphinx Isles		1		
64		Bird (Elephant) Rock		1		1
65		Maori (Cathedral) Rocks A			1	2
66		Maori (Cathedral) Rocks B			1	2
67	Little Barrier Island		1	6	1	1
68		Lot's Wife		2		
	Great Barrier Island Group					
69		Great Barrier Island (Aotea)	1	2+	1+	1+
70		Rakitu (Arid) Island (incl. Close Island)	1	2+	1+	
71		Aiguilles Island and Needles Point (stacks)				2+
72		Motu Kaikoura (Selwyn Island)	1			
73		Nelson (Peter) Island				
74		Motuhaku Island				
75		Grey Group Islands		1+		
76		Opakau Island				
	Broken Pig Islands					
77		Motutaiko Island	1	4		
78		Papakuri Island				
79		Mahuki (Anvil) Island			1	
80		Little Mahuki Island				

Site no.	Location	Island/breeding site	Seabird diversity			
			Sph	Proc	Pel	Char
	Great Barrier Island Group contd.					
81		Junction Islands				
	Coastal and offshore island sites					
82		Waipu Estuary				2
83		Sentinel Rock (Mangawhai)		1		
84		Mangawhai Harbour & Spit				2
85		Te Arai Point				3
86		Pakiri Beach				2
87		Goat Island	1	1	1	2
88		Matheson's Bay stack		1		
89		Whangateau Harbour			1	1
90		Tawharanui Regional Park	1	1	1	2

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Figure 104 (top). Burgess Island, Mokohinau Group. *Photo: Abe Borker.*

Figure 105 (left). Shore skink *Oligosoma smithi. Photo: Abe Borker*

Figure 106 (right). Common gecko *Woodworthia maculatus. Photo: Abe Borker*

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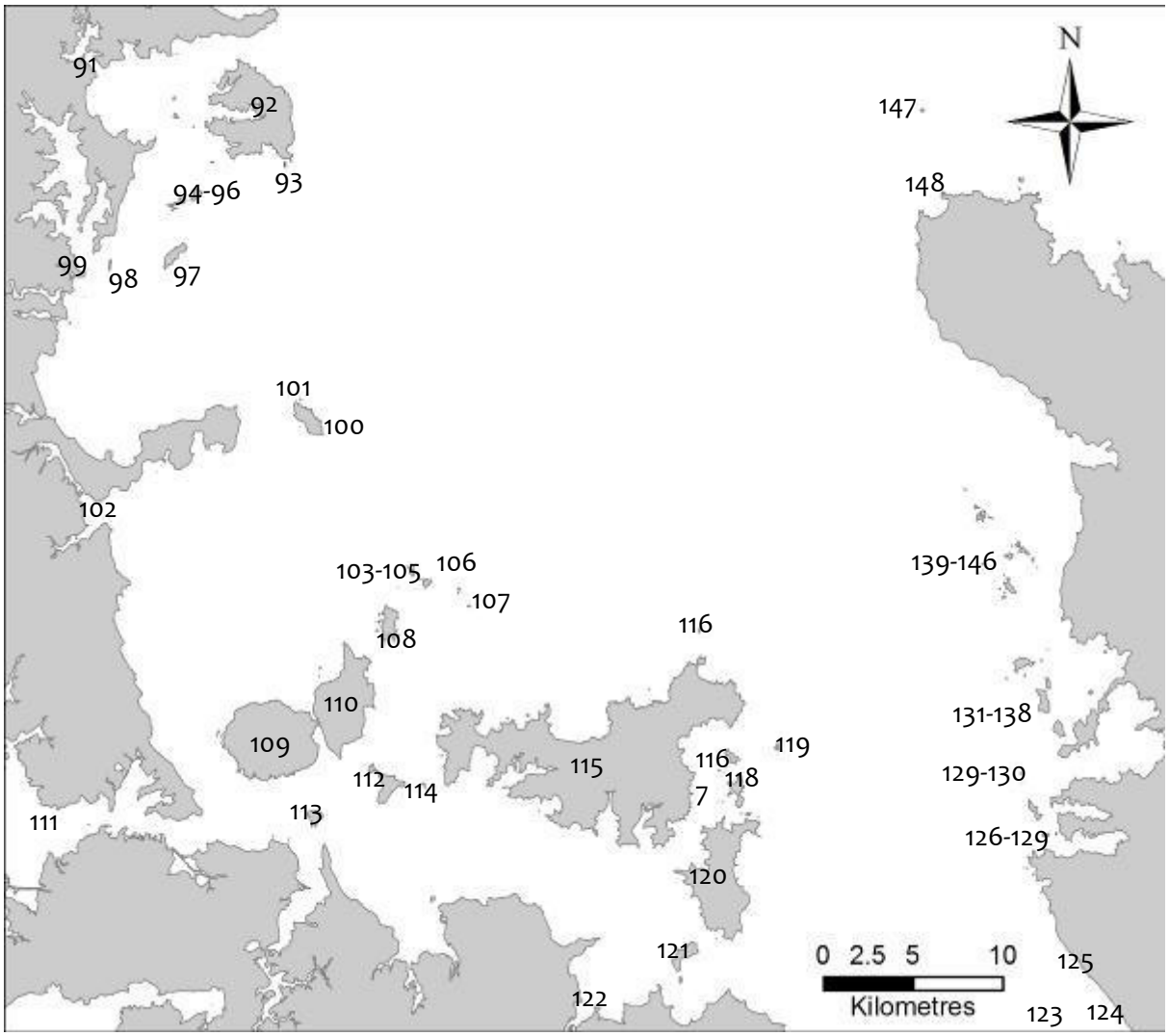
Figure 107 (right). Wareware Island from Muriwhenua Island, Northwest Chickens. *Photo: Chris Gaskin.*

Figure 108 (below). Red-billed gulls, Needles Point, Aotea/Great Barrier island. *Photo: Chris Gaskin.*

Figure 109 (above). Mangawhai Harbour and Spit. *Photo: Stefanie Ismar.*

Figure 110 (left). Taranga/Hen Island. *Photo: Chris Gaskin.*

REGION 3 - Inner Hauraki Gulf, Firth of Thames and western Coromandel



Site no.	Location	Island/breeding site	Seabird diversity			
			Sph	Proc	Pel	Char
91		Sandspit Estuary			1	
92	Kawau Island		1		3	
93		Challenger Island		1		
94		Motuketekete	1			
95		Moturekareka	1	1+		
96		Motutara	1	1+		1+
97	Motuora		1	2		
98		Te Haupa (Saddle) Island	1	2+		
99	Mahurangi Harbour (islands and shoreline)					
100	Tiritiri Matangi Island		1	3	1	3
101		Little Wooded Island	1	3		

Site no.	Location	Island/breeding site	Seabird diversity			
			Sph	Proc	Pel	Char
102		Wade River Estuary				
	The Noises Group					
103		Motuhoropapa Island	1	1+		
104		Orarapa Island (The Haystack)				
105		Otata Island	1	1+		
106		David Rocks (The Four Islands)	1	1+		1+
107		Maria (Ruapuke) Island	1	4		1+
108	Rakino Island		1			1+
109	Rangitoto Island		1			3
110	Motutapu					
111	Waitemata Harbour (islands and shoreline)					
112	Motuihe		1		2	3
113		Motukorea (Browns Island)				2
114		Papakohatu (Crusoe) Island	1		2	2
115	Waiheke Island (incl. Nani, Te Whau, Koi, Passage Rock)		1		3	4
116		Horuhoru (Gannet) Rock		1+	1	1
117	Pakatoa Island (incl. Kahakaha or Frenchman's Cap I.)					2
118	Rotoroa Island		1	1		
119	Tarahiki Island				1	
120	Ponui (Chamberlins) Island				1	
121	Pakihi (Sandspit) & Karamuramu Islands					
122		Wairoa River Estuary				1
123	Miranda					4
124		Waihou River Estuary			2+	
125	Thames to Tapu shoreline (including stacks and rocks)				3	1
126		Matariki Island				
127		Tataweka Island				
128		Wekarua Island		1+		
129		Rangipukea Island				
129		Calf Island		u		
130		Cow Island		u		
131		Whanganui Island				
132		Motukakarikitahi (Rat) Island				
133		Motukopake				
134		Motukaramea (Kaikai Island)				
135		Motuokino (Shag Island)				
136		Motuoruhi (Goat Island)				
137		Motumorirau (Pauls Island)				
138		Motupohukuo (Turkey Island)				
	Motukawao Group					
139		Moturua (Rabbit) Island				
		Ngamotukaraka Islands (Three Kings Islands)				

Site no.	Location	Island/breeding site	Seabird diversity			
			Sph	Proc	Pel	Char
140		Motuwi (Double Island)			1	
141		Motukaramarama (Bush Island)			1	
142		Motutakupu (Gannet Island)			1	
143		Motuwinukenuke (Square Island)				
144		Motukahaua (Happy Jack Island)				
145		Motuwhakakewa Island				
146		Motupotaka (Black Rocks)				
147		Channel Island		2+		
148	Cape Colville					

Figure 111 (left). Noises Islands, view from Otata looking towards Motuhoropapa. *Photo: Chris Gaskin.*

Figure 112 (below). Shorebirds at high tide roost, eastern bar-tailed godwit *Limosa lapponica baueri* and South Island pied oyster-catcher *Haematopus finschi*, Miranda. *Photo: DOC*

Figure 113 (insert). Wrybill *Anarhynchus frontalis*. *Photo: Frederic Pelsy*.

Figure 114. Motuihe. *Photo: Shelley Heiss-Dunlop.*

Figures 115-116. Trail-camera photos of little blue penguins at burrow entrance, Motuihe Island *Photos: John Laurence, Motuihe Island Restoration Trust*

Figure 117. Crusoe Island from Motuihe with Waiheke Island in background. *Photo: Shelley Heiss-Dunlop.*

Figure 118. Channel Island from the air. *Photo: Chris Gaskin.*

REGION 4 - Eastern Coromandel to Whangamata

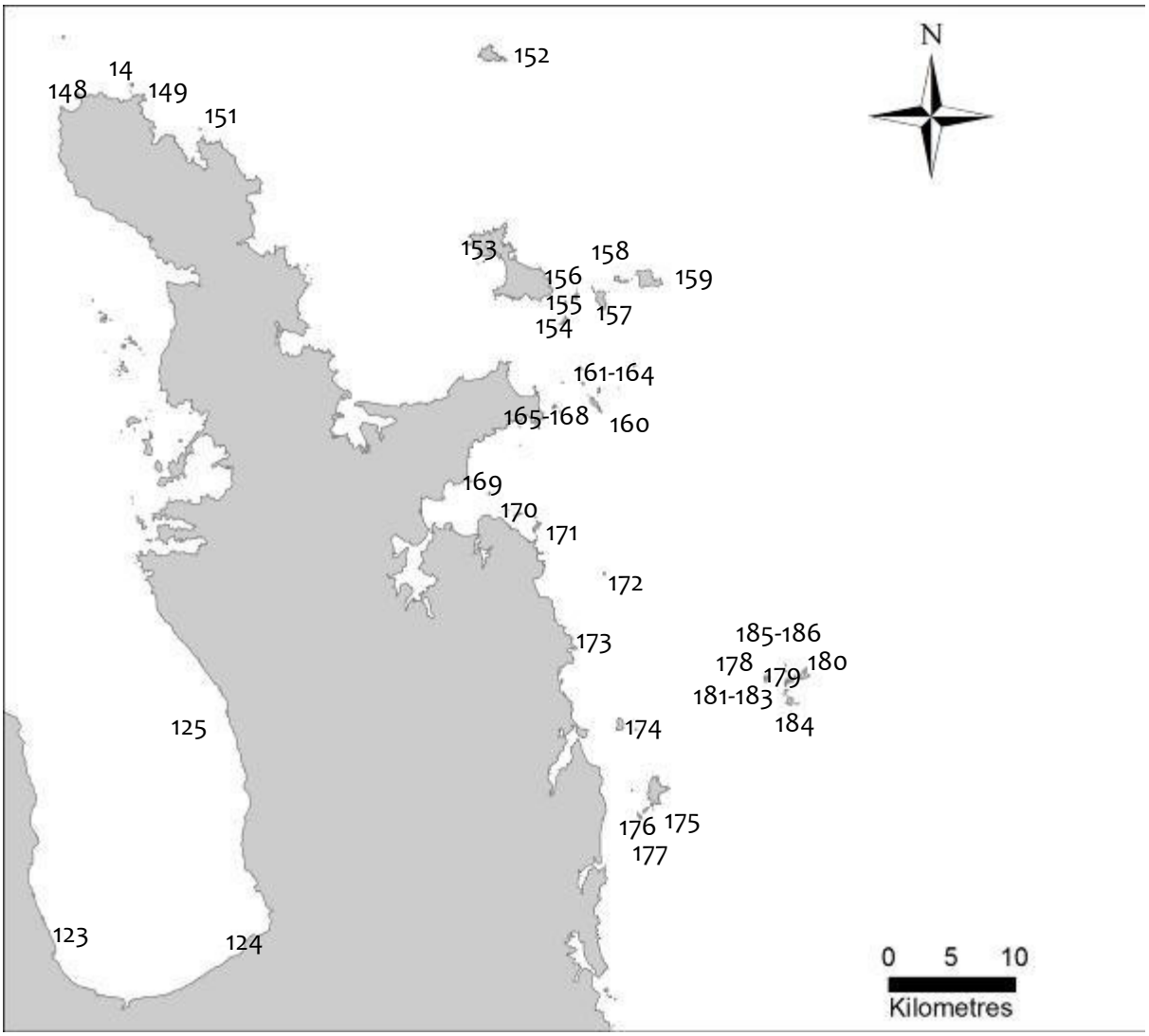


Figure 119. Middle Chain, Ruamaahua (Aldermen) Islands. *Photo: Rob Chappell, DOC*

168	Location	Island/breeding site	Seabird diversity			
169			Sph	Proc	Pel	Char
149		Square Top Island		u	u	u
150		The Pinnacles				
151		Motukokopu				
152	Cuvier (Repanga) Island		1	3+	1	3
	Mercury Islands Group (Iles d'Haussez)					
153		Great Mercury (Ahuahu) Island	1		2	1+
154		Korapuki Island	1	6		1+
155		Green Island	1	6	1	
156		Atiu (Middle) Island				
157		Kawhitu (Stanley) Island	1	4+	1	
158		Moturehu (Double Island)	1	1+		
159		Red Mercury (Whakau) Island	1	6+	1	
	Ohena Islands Group					
160		Ohinau Island	1	3+		
161		Ohinauiti Island	1	3+		
162		Flat Island				
163		Black Rocks				
164		Old Man Rock				
165		Rabbit Island				
166		Motukoruenga & Needle Rock		1+		
167		Needle Rock		3+		
168		Motukoranga				
169	Whitianga Harbour (Mercury Bay) and islands					
170		Motueka				
171		Mahurangi (Goat) Island		1+		
172		Castle Island				
173		Waipapa Island				
174		Shoe Island (Motuhoa)		1+		
175		Slipper (Whakahau) Island		1+		
176		Penguin Island	1	2+		
177		Rabbit Island		1		
	The Aldermen (Ruamaahua) Islands Group					
178		Hongiora (Flat) Island		6		
179		Middle Chain Island		3+	1	
180		Ruamahuanui Island	1	3+		
181		The Spire		1+		
182		Ngahoro (Hernia) Island		1+		
183		Half Island		1+		
184		Ruamahuaiti Island	1	4+		2
185		Big Hump		1+		
186		Little Hump		1+		

Figure 120. Cuvier Island from the air. *Photo: Steve Bolton*

Figure 121. Tuatara *Sphenodon punctatus*. Photo: DOC

Figure 122. Gecko footprints, from tracking tunnel, Cuvier Island. *Photo: Rob Chappell, DOC*

Figure 123. Korapuki Island, Mercury Group. *Photo: Rob Chappell, DOC*

Figure 124. Tuhua/Mayor Island from Penguin island. *Photo: DOC*

Figure 125 (left). Purple crab *Leptograpsus variegatus*, Korapuki Island. *Photo: Iris Broekema, DOC*

Figure 126 (left). Tusked weta *Motuweta isolata*, Cuvier Island following transfer. *Photo: Rob Chappell, DOC*

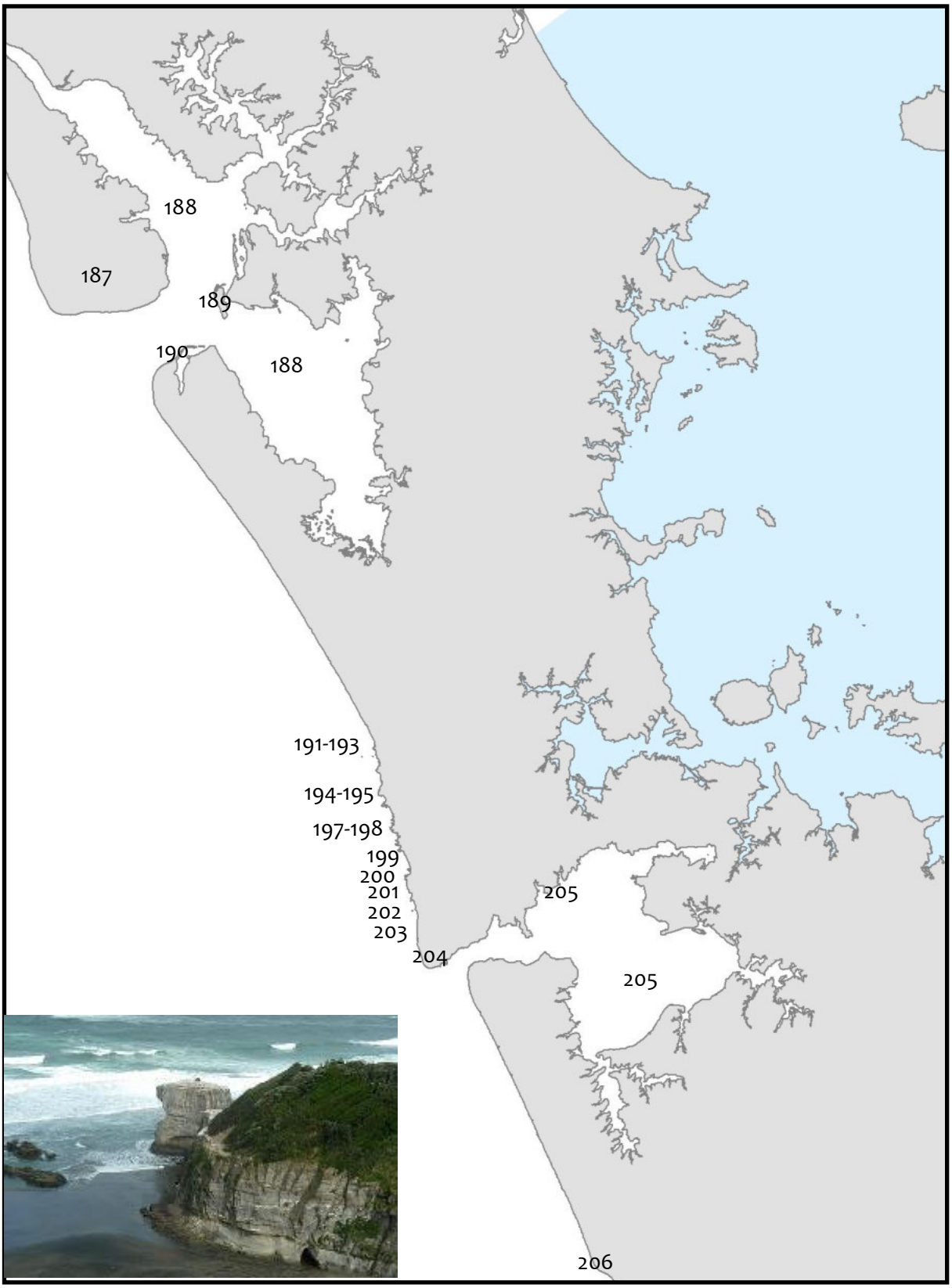
Figure 127 (bottom). Penguin Island seabird survey. *Photo: Derek Cox*

REGION 5 - Auckland's West Coast

Site no.	Location	Island/breeding site	Seabird diversity			
			Sph	Proc	Pel	Char
187		North Kaipara Head				
188	Kaipara Harbour				2+	3+
189		Big Sand (Manukapua) Island				1+
190		Papakanui Spit				4+
	Muriwai					
191		Otakamiro Point	1		1	3
192		Motutara	1	1	1	2+
193		Oaia Island			1	
194		Kauwahaia Island	1	3		
195		Erangi Point (Te Henga/Bethell's Beach)		2+		
196		Ihumoana Island (Te Henga/Bethell's Beach)	1	4		
197		Pukekowhai Point		1+		
198		Kehole Island				
199		Te Waha Point				
200	Piha					
201		Taitomo Island				
202	Karekare					
203		Panatahi Island				1+
204		Paratutae Island				1+
205	Manukau Harbour				2	3+
206	Waikato River Estuary				2+	

Figure 128 (left). Erangi Point, from Ihumoana Island, Bethells Beach. *Photo: Shelley Heiss-Dunlop.*

Figure 128 (opposite). Muriwai, showing Otakamiro Point and Motutara; Australasian gannets are on guano-marked flat areas, white-fronted terns and red-billed gulls breed on ledges on cliffs above beach. *Photo: Reiner Ertel.*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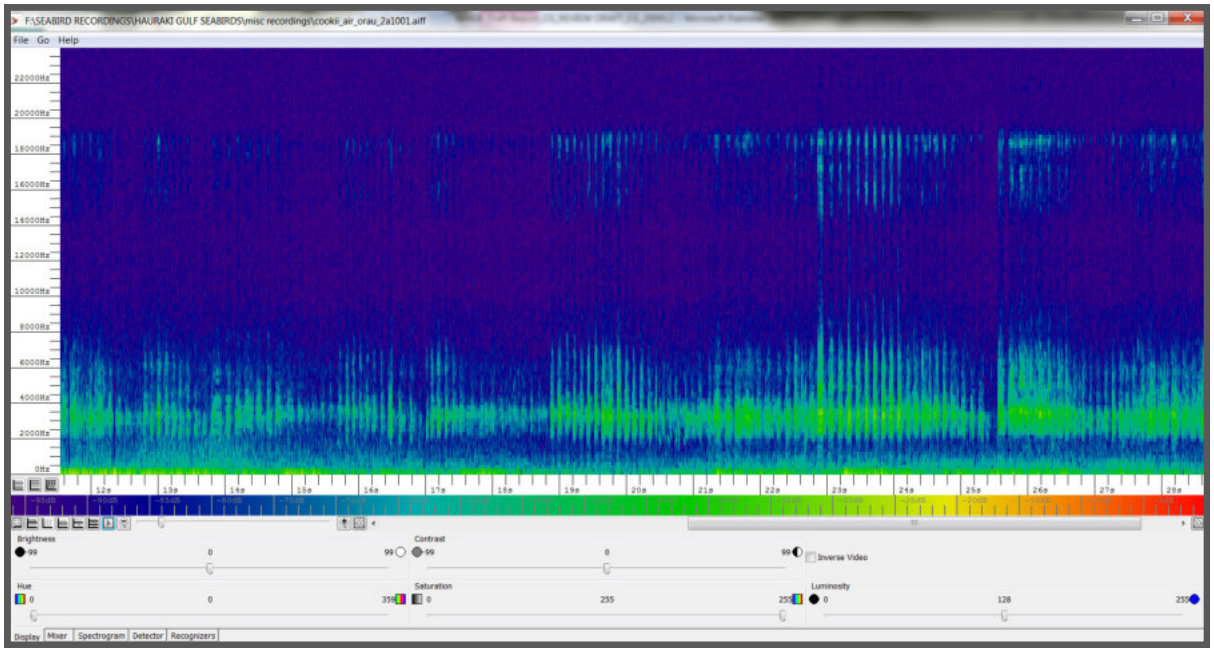
REGION 6 - North Auckland Seabird Flyway

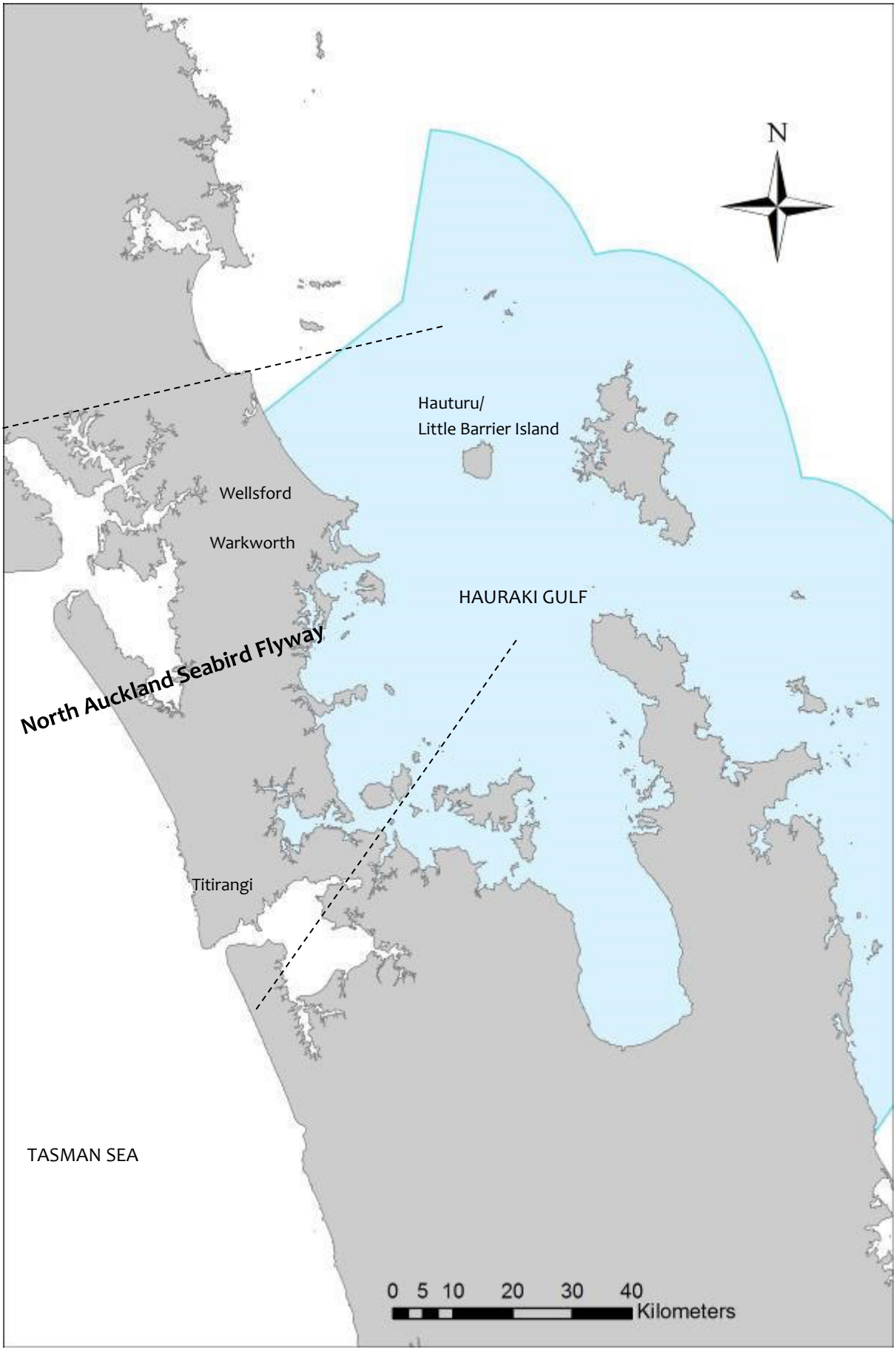
The passage of Cook's petrels across the North Auckland peninsula, moving at night between Tasman Sea foraging grounds and the Hauraki Gulf, is a major mainland seabird feature during the species summer breeding season (Imber et al. 2003b; Rayner et al. 2008).

Birds move over the mainland after dark with anecdotal observations suggesting a key feature of this flyway are the ridge and valley systems running between the Wellsford-Warkworth Area, Mt Auckland and the Kaipara Harbour . However, with the expansion of the Hauturu/Little Barrier Island Cook's petrel colony following the eradication of Pacific rats in 2004, the sound of Cook's petrels calling over other parts of the Auckland Isthmus is becoming increasingly common. Recent evidence from tracking studies suggests that other species (e.g. grey-faced petrel & black petrel) may also use the North Auckland Seabird 'flyway'.

Figure 129. Cook's petrel in flight (enhanced). *Photo: Abe Borker.*

Figure 130. Spectrograph of Cook's petrel flight calls using remote recording device. *Image: Chris Gaskin*

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HAURAKI GULF
North Auckland Seabird Flyway
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Kilometers

10 HAURAKI GULF - IMPORTANT BIRD AREA (IBA) PROGRAMME

BirdLife International's Important Bird Area (IBA) programme has, for more than 30 years, been successful at setting priorities and focusing conservation action on land and has now been adapted and extended to the marine environment. The programme has over 11,000 IBAs identified worldwide. In New Zealand, BirdLife International, through its New Zealand Partner organisation the Royal Forest and Bird Society of NZ (in association with the Ornithological Society of NZ), is identifying IBAs for seabirds. This is the first stage of a programme that will extend to encompass New Zealand's precious land-, shore- and water-birds.

Important Bird Areas for seabirds are those areas recognised as meeting one or more of a standardised set of data-driven criteria and thresholds, ensuring the approach is used consistently worldwide (Table 2). Essentially, most of the Hauraki Gulf is to be identified on this basis. Given the complexity of our marine environment and number of species to consider, Hauraki Gulf and IBAs for New Zealand seabirds elsewhere will be developed using a mosaic of 'layers', with each 'layer' representing breeding colonies and other high use areas, such as those used for regular foraging by a particular or group of species. Thus, candidate IBAs are being identified on the basis of the presence of greater than threshold numbers of one or more seabird species at a given life-history stage. These areas, encompassing a diversity of habitat types, are subject to a wide range of threats, e.g. habitat depletion, shipping traffic and marine/seabed exploration.

As described above, seabird populations are rebounding in the WHGR. Considerable investment in eradications is paying off, and IBA status can reflect significant and growing populations of seabirds. However, IBAs are also designed to put the spotlight on those sites that are vitally important to the survival of threatened species. The Hauraki Gulf, like New Zealand as a whole with its suite of threatened species, registers strongly on that count. The aim is to have IBAs recognised in planning processes, ideally embedded within legislation. They are a conservation tool, and through monitoring and community participation, will provide a measure of how well we are protecting these important sites, and because they are part of a global process, they are a check on how well we're doing internationally.

Table 2. Global criteria by which Important Bird Areas are identified. NB: To date, only A1 and A4 have been applied to seabirds.

A1.		More than threshold numbers of one or more globally threatened species
A2.		Restricted-range species (5% of the species population with a small geographic range)
A3.		Biome-restricted species assemblages
A4.		More than one percent of the world population of one or more congregatory species
	A4i	1% of the biogeographic population of water-birds
	A4ii	1% global population
	A4iii	10,000 pairs seabirds or 20,000 individual water-birds
	A41v	Migration bottleneck sites

Forest & Bird (together with the Department of Conservation and BirdLife International) published for reports on important areas for New Zealand's seabirds.

Download the reports at : **http://www.forestandbird.org.nz/important-bird-areas**

Table 3. Confirmed IBA for breeding sites within the WHGR.

IBA name (breeding sites only)	Criteria	Criteria	Trigger species	IUCN Threat listing	Other bird species (i.e. threatened land-, water - and shore-birds)
	IBA definite	IBA possible - data required			
Poor Knights	A1, A4ii, A4iii		Buller's Shearwater Pycroft's Petrel Fairy Prion Common Diving Petrel	VU VU LC LC	Red-crowned Parakeet (VU)
Sugar loaf/High Peak Rocks (Poor Knights Group)		A4ii	Australasian Gannet Fairy Prion	LC LC	
Chickens Islands/ Marotere	A1, A4ii, A4iii		Pycroft's Petrel Flesh-footed Shearwater Fluttering Shearwater Northern Little Shearwater Common Diving Petrel	VU LC LC LC LC	North Island Saddleback (NT) Red-crowned Parakeet (VU) NZ Pigeon (NT)
Hen Island/Taranga	A1	A4iii	Pycroft's Petrel Grey-faced Petrel Fluttering Shearwater Northern Little Shearwater Common Diving Petrel	VU LC LC LC LC LC	Little Spotted Kiwi (NT) North Island Saddleback (NT) Red-crowned Parakeet (VU) Kaka (EN) NZ Pigeon (NT)
Bream Islands		A4iii	Fluttering Shearwater Common Diving Petrel	LC LC	
Hauturu/Little Barrier Island	A1, A4ii	A4iii	New Zealand Storm Petrel Cook's Petrel (northern) Black Petrel Grey-faced Petrel Fluttering Shearwater Common Diving Petrel Little Penguin	EN VU VU LC LC LC LC	Hihi (stitchbird) (VU) North Island Saddleback (NT) ** Kokako (EN) ** North Island Brown Kiwi (EN) ** Kakapo (CR) ** Kaka (EN) Red-crowned Parakeet (VU) Yellow-crowned Parakeet (NT) NZ Pigeon (NT) Long-tailed Cuckoo (LC)
Mokohinau Island Group	A4iii		Sooty Shearwater Northern Little Shearwater Fluttering Shearwater White-faced Storm Petrel Common Diving Petrel Grey-faced Petrel Little Penguin Black-winged Petrel Pied Shag Red-billed Gull Southern Black-backed Gull Australasian Gannet	NT LC LC LC LC LC LC LC LC LC LC LC	Red-crowned Parakeet (VU)

Aotea/Great Barrier Island (Mt Hobson site)	A1, A4ii		Black Petrel	VU	Kaka (EN)
Mahuki Island (Broken Pig Islands)		A4ii	Australasian Gannet	LC	
North Auckland sea-bird flyway		A4ii	Cook's petrel	VU	
Waipu Estuary		A1, A4ii	NZ Fairy Tern	VU	NZ Dotterel (EN)
Mangawhai Estuary	A1, A4ii		NZ Fairy Tern	VU	NZ Dotterel (EN)
Pakiri Beach	A1, A4ii		NZ Fairy Tern	VU	NZ Dotterel (EN)
Papakanui Spit (South Kaipara Head)	A1, A4ii		NZ Fairy Tern	VU	NZ Dotterel (EN)
Kaipara Harbour (incl Big Sand Island)		A1, A4ii	NZ Fairy Tern		NZ Dotterel (EN)
Gannet Rock (Horuhoru)		A4ii	Australasian Gannet	LC	
Muriwai & Oia Island	A4ii		Australasian Gannet	LC	
Miranda		A1	Black-billed Gull	EN	Wrybill (VU) (non-br)
Cuvier Island		A1	Pycroft's Petrel (introduced)		North Island Saddleback (NT) **
Mercury Islands Group	A1, A4ii, A4iii		Pycroft's Petrel Grey-faced Petrel Flesh-footed Shearwater Northern Little Shearwater Fluttering Shearwater Common Diving Petrel	VU LC LC LC LC LC LC	North Island Saddleback (NT) Red-crowned Parakeet (VU)
Aldermen (Ruamaahua) Islands		A4ii, A4iii	Grey-faced Petrel Northern Little Shearwater Fluttering Shearwater Common Diving Petrel White-faced Storm Petrel	LC LC LC LC LC	

11 STRATEGIC OBJECTIVES FOR SEABIRD RESEARCH & CONSERVATION

The WHGR is vitally important to the economic, social and cultural well-being of people from the greater Auckland region. As outlined seabirds represent a jewel in the biodiversity crown of the WHGR. Understanding and protecting seabirds and their habitats stands to significantly benefit both people and the environment. The following section seeks to provide a framework for understanding key priorities for the research and conservation of seabirds in the WHGR.

Figure 131. Hauturu/Little Barrier island from the northwest. See Table 3 for the full list of both sea- and land-birds which will trigger IBA status for this island. *Photo: Auckland Council.*

Seabird research and management is carried out by a diverse range of individuals and organisations Including DOC, regional councils, universities, Manaaki Whenua Landcare Research Ltd, The National Institute of Water and Atmospheric Research Ltd, museums, private consultancy firms, OSNZ group projects and private individuals. While some long-term research projects have governmental funding (e.g. Marsden Fund) some tend to be undertaken by private individuals. Management of most seabirds breeding sites within the WHGR is the responsibility of DOC, the Auckland Council, through its biodiversity and regional parks programme, and Waikato and Northland Regional Councils. The choice of research projects reflects in part the interest of individuals, but lately has become more focused on conservation priorities (Rowe and Taylor 2006; Joseph et al. 2009, Towns et al. 2012), and particularly those that receive governmental funding. Although many gaps remain in our understanding of seabird populations and ecology in the WHGR, significant progress is being made in some areas (Hauraki Gulf State of the Environment Report 2011). Note that Taylor (2000b) provides a list of seabird projects undertaken between 1980 and 1999.

Most of the seabirds breeding in WHGR are on comparatively remote offshore islands; many of these locations are rugged and demanding places to visit (Section 5). In addition, 15 of the 26 species breeding in the WHGR are nocturnal while moving in and out of colonies, breed in burrows and have lengthy breeding cycles making them very difficult to study in the field. While technology has greatly enhanced our understanding of seabird biology, physical contact with the birds to conduct research is still required. Such research requires major time, effort, financial and volunteer commitments, especially if long-term studies are needed to determine trends and cover inter-annual variation. For researchers who must spend time in the field, practical skills and a general self-reliance are important attributes for this demanding, but ultimately extremely rewarding work.

11.1 Research priorities

Research priorities for New Zealand seabirds were identified by Rowe and Taylor (2006): determining the distribution and abundance of breeding colonies, additional work on basic breeding ecology, understanding taxonomic relationships of species and populations, studies of movements and dispersal of seabirds at sea and between breeding colonies, and more work on foraging ecology and diet. Also, monitoring of population demography (survival rates, breeding success etc.) of representative species of migratory and non-migratory seabirds is needed to assess the impacts of global climate change on seabird populations. Taylor (2000a, b) provides species-specific research priorities, a number of which have been achieved since that landmark publication. Further guidance is presented in Towns et al (2012), a research strategy for biodiversity conservation in New Zealand's offshore islands. In particular, they argue for 1) greater understanding of ecosystem processes and their resilience to long- term environmental change; and 2) defining and better understanding the consequences of direct involvement by the public in management of islands, including partnerships between government agencies, Tangata Whenua (original people of the land - Māori) and non-government organisations such as community groups. The following section lists those priorities arising from a recent surge in seabird research, also closer collaboration between researchers active in the region than probably has been evident earlier.

Table 4. Research priorities listed by species.

	Species	Research req'd	Future research areas			Current	Recent
			Popula-tion/ trends	Breeding biology/ cycles	Foraging ecology		
SPHENISCIFORMES	Northern Little Penguin						
PROCELLARIIFORMES	Cook's Petrel						
	Pycroft's Petrel						
	Black-winged Petrel						
	Grey-faced Petrel						
	Buller's Shearwater						
	Flesh-footed Shearwater						
	Fluttering Shearwater						
	Little Shearwater						
	Sooty Shearwater						
	Black Petrel		LBI				
	Fairy Prion						
	Common Diving Petrel						
	White-faced Storm Petrel						
	New Zealand Storm Petrel						
PELECANIFORMES	Australasian Gannet						
	Pied Shag						
	Little Shag						
	Black Shag						
	Little Black Shag						
	Spotted Shag						
CHARADRIIFORMES	Southern Black-backed Gull						
	Red-billed Gull						
	Black-billed Gull						
	White-fronted Tern						
	Caspian Tern						
	NZ Fairy Tern						

Legend

- High priority WHGR research
- Moderate
- Low
- Research currently underway in WHGR
- Recent research undertaken in WHGR
- Research elsewhere in NZ

11.1.1 Research on the distribution, size and status of seabird populations

Data detailing the distribution of seabird breeding colonies and their size and population trends are essential for sound conservation management of seabirds in the WHGR. Moreover in the wake of many successful eradication programmes on islands and mainland sites within the WHGR it is important to be able to follow the restoration of these sites and the dynamics of colonisation (or otherwise) of seabirds that is likely to vary from site to site. Unfortunately such datasets are currently lacking for nearly all seabird species – see species profiles.

The recommendations for research are:

1. **Development of a regional seabird breeding site database for the WHGR, either as (1) a subset of the New Zealand Seabird Colony Database (see Notes below), or (2) as part of an integrated regional biodiversity database, or (3) both.**
2. **Provide accurate population estimates for high priority species in Table 4 (above) including Buller's shearwater, red-billed gull, white-fronted tern and black petrel.**
3. **Systematic ground surveying of all islands /breeding sites within the WHGR (see Section 5 above) to determine accurate population estimates for all species. Where possible an integrated ecological approach plotting seabird presence against vegetation and other biodiversity factors could be adopted. Acoustic surveying is providing a new and useful tool for identifying seabird diversity on remote offshore islands (G. Taylor, C. Gaskin pers. com.) and could be used for this purpose in the WNGR. Also, many islands of the Aotea/Great Barrier Island group present the last significant opportunity for WHGR conservation initiatives. Surveys are required to determine seabird breeding presence/absence, in preparation to developing island and seabird restoration plans.**
4. **Assess population size and security of the New Zealand storm petrel to enable accurate conservation designation (currently listed at 'data deficient' in DOC Threat Classification 2012) and appropriate management action.**
5. **Liaise with community groups to ensure regular monitoring of selected sites to detect recolonising seabirds, especially those islands where invasive species have been eradicated (e.g. Burgess Island, Tiritiri Matangi Island, Taranga/Hen Island, Tawharanui Open Sanctuary).**
6. **Reassess the legal description of key biodiversity sites. For example Burgess Island in the Mokohinau Islands Group is currently designated as an open access public reserve, despite the presence of 12 seabird species, significant bellbird (*Anthornis melanornis*) and kakariki (*Cyanoramphus novaezelandiae*) populations in addition to large populations of geckos, skinks and endemic invertebrates. Moreover, the fact this open access island lies within a 30 metres water gap to other islands within the group designated as Nature Reserves further threatens islands of the highest conservation status.**

Notes:

(1) Developing a comprehensive, accurate, up-to-date, dedicated seabird colony database (or register) for New Zealand is fundamental to the conservation management of New Zealand seabirds. It was also seen as fundamental to the New Zealand IBA for seabirds project (see Section 9 above) and work began in 2009. Initially data was entered into Birdlife International's World Bird/Biodiversity Database (WBDB), subsequently into regional spreadsheets extracted from the WBDB. This is very much a work in progress and a collaborative, consultative approach is required to ensure the best possible eventual outcome

(2) Buller's shearwater is a WHGR endemic, restricted to predator-free islands in the Poor Knights group with a total population estimate in 1981 of 2.5 million birds with c. 200 000 pairs breeding on Aorangi Island (see species notes) following a rapid population increase following the removal of pigs in 1936. There have been no recent estimates of population size. Overnight visits to Aorangi Island by G. Taylor and others in 2011 and 2012 noted absence of Buller's shearwaters from a number of

areas on the island and poor breeding success for those two years. A detailed population assessment is required, particularly if translocations or use of acoustic attraction to establish additional secure colonies of the species at other islands in the WHGR (e.g. Fanal Island, Cuvier Island, Rakitu (Arid) Island) are to be considered.

(3) While iconic and threatened species like Buller's shearwater take high priority, there is the danger of seeing other endemic or native species, particularly birds perceived to be 'common', slipping quietly away where their decline just doesn't register in the official conservation circles. White-fronted tern and red-billed gull could prove to be such species, at least in northern New Zealand, where declines have been detected but not quantified due to lack of a thorough census.

(4) Flesh-footed shearwater is another such species, however two projects (one completed (Baker et al. 2010a) and one current (2012) through Te Papa/ Museum of New Zealand), contracted by DOC's Conservation Services Programme (CSP) are addressing this issue for this particular species. Apparent conflicting population estimates may have distorted a decline in populations, although the species is acknowledged to be at risk from both local and offshore fisheries.

(5) Acoustic monitoring using remote recorders is a cost-effective low-impact method for surveying for the presence of seabirds at sites of interest. These recorders can be programmed to run through the night when nocturnal burrowing seabirds, by nature species whose presence is very hard to census, are accessing colonies. Nearly all seabird species have distinctive calls which are used for pair formation and territorial defence. The advantage of acoustic census is that recorders can be left in place and run for up to 5 weeks, logging any species that calls within the range of the microphones, so providing evidence for the presence of species. This information can be followed up with ground searches. For example: a recent pilot survey of Hauturu/Little Barrier Island using acoustic recorders confirmed the presence of two species (fluttering shearwater and diving petrel) thought to be absent from the main island (C. Gaskin and M. Rayner unpublished data).

(6) Marine-to-land transfer of nutrients by seabirds is a crucial ecosystem process on many islands (Hawke and Holdaway 2005; Fukami et al. 2006). Changes to the marine environment, such as shifting sea-surface temperatures, loss of seabirds as by-catch from fishing, and historic harvesting of both seabirds and marine mammals, could alter these nutrient subsidies (Towns et al. 2012a).

(7) Burgess Island (Pokohinu) is one of the outermost islands of the WHGR. The island was first inhabited by Maori for seasonal mutton-birding of Oi (grey-faced petrel) and then taken over by the New Zealand Government as a lighthouse station (1882-1990) and for military purposes in World War 2. During this time the Island was heavily grazed and invaded by Pacific rats. In 1990, Burgess Is (c. 56 ha) and its adjacent smaller islands were amongst the first of New Zealand's offshore islands to successfully undergo aerial poisoning targeting Pacific rat. The significance of Burgess Island as a Procellariiform stronghold in the Gulf became clearly evident from 2004 making the island (and its Maritime New Zealand house) an ideal field laboratory to study the dynamics of a naturally regenerating seabird dominated terrestrial ecosystem.

11.1.2 Research on seabird breeding biology

Data on the breeding biology and behaviour of species is fundamental to guiding conservation management actions such as predicting population responses at times of conservation threat, for example predator invasion of an island. Despite the importance of these data, published or unpublished data detailing the breeding and life history traits (i.e. colony attendance, timing of laying, hatching and fledging dates, adult and juvenile survival) of a large number of Gulf seabirds are lacking.

The recommendation for research is

1. **Studies of breeding behaviour and life history for key species such as the New Zealand storm petrel, Buller's shearwater, fluttering shearwater, little shearwater, fairy prion, common diving petrel,**

spotted shag (high priority), and black-winged petrel (moderate priority) (see Table 4 above).

Notes:

(1) Incidental observations made during deployment/retrieval of tracking devices on Burgess Island for little shearwater and fluttering shearwater has shown considerable overlap of their breeding cycle beyond that suggested from available published sources (Marchant and Higgins 1990; Heather and Robertson 1996)(M. Rayner, G. Taylor, C. Gaskin pers. obs.). Determining accurate dates for various stages of breeding for these species is important when considering timing of weed management programmes on Burgess Island (and others) to minimise disturbance or destruction of nesting sites.

(2) Prior to 2000 a number of researchers made visits to islands to study seabirds, and while papers have been published on specific species (e.g. Buller's shearwater, fairy prion, Pycroft's petrel) incidental observations made during those visits remain in notebooks. A suggestion was made to the authors of this report to invite researchers to a workshop to assess how these types of data (including anecdotal reports) could be collated and disseminated as potential seed sources for student projects within the WHGR.

11.1.3 Research on seabird diet, foraging and community ecology

The biology of seabirds is heavily influenced by bottom-up (food related) ecological processes. Accordingly research of the diet, foraging and community ecology of seabirds, in conjunction with assessment of population dynamics, presents a viable and cost effective "canary in the cage" for long term assessment of changes to the WHGR marine ecosystem across broad spatial scales (see Piatt et al. (2007) and other papers within this special theme). Such research is yet to be undertaken.

The recommendations for research are:

1. **Studies of the diet, foraging behaviour, trophic dynamics and habitat use of seabirds and seabird communities within the WHGR. Data collection methodologies would include observation data collected at seabird colonies (chick development and adult attendance and provisioning), tracking data obtained from geolocation (Rayner et al. 2008), GPS (Freeman et al. 2010) and PTT (Peron et al. 2010) sources, dive depth data from capillary tubes and/or time depth recorders (Rayner et al. 2008; Taylor 2008, Shaffer et al. 2009; Rayner et al. 2011b) and dietary and/or physiological analyses utilising stable isotopes (Hobson et al. 1994), fatty acid analyses (Williams and Buck 2010), doubly-labelled water (Shaffer 2011) and direct analyses of sampled regurgitates (Imber 1973, 1996).**

2. **Subsequent identification of suitable indicator species for long-term assessment of ecosystem change. Such taxa would feed into wider ecosystem research and would preferentially include species for which some historic data are already available. These species would most likely include shelf-specialist species including red-billed gull, white-fronted tern, fluttering shearwater, fairy prion, common diving petrel, white-faced storm petrel and Australasian gannet.**

   Notes:

   (1) In 2010 a consortium of researchers who received funding from the Auckland Regional Council now known as the Auckland Council (Coastal Enhancement Fund) in 2010-2011 to investigate the foraging ecology and community of seabirds (grey-faced petrel, little and fluttering shearwaters, common diving petrel, black-winged petrel, and little blue penguin) breeding on Burgess Island, Mokohinau Group. This project set out to complement other projects in the region, notably G. Taylor, M. Rayner (grey-faced petrel, flesh-footed and sooty shearwaters, common diving petrel at Bethell's Beach and Buller's shearwater at Poor Knights Islands), E. Bell (black petrel on Aotea/Great Barrier Island), M. Rayner (Cook's petrel on Hauturu/ Little Barrier Island and Pycroft's petrel at Red Mercury Island), and T. Dennis, M. Rayner, T. Landers (Australasian gannet on Mahuki Island, Broken Pig Islands). By 2012 geolocator (GLS) devices have been used to determine dispersal and migration

patterns for ten species, and GPS-loggers on three of the larger species (grey-faced petrel, black petrel and little blue penguin). Blood and feather sampling has also been conducted for stable isotope analysis of community composition and for the sexing of tracked individuals.

11.1.4 Assessing island biosecurity and at-sea threats

Identifying the most important land- and sea-based issues affecting the long-term viability of seabirds that breed in WHGR are vital to preventing extinctions of indigenous species, ensuring population recovery of threatened taxa, and protecting and restoring seabird breeding sites.

The recommendations for research are:

1. **Provide seabird information on utilisation of WHGR waters and breeding site data to inform a multi -disciplinary and comprehensive approach to threat/ risk mapping for the region.**
2. **Investigate behavioural interactions and associated mortality with inshore long-line, trawl and set-net fisheries within the WHGR. This work builds on current research with black petrels and flesh -footed shearwaters through the DOC's Conservation Services Programme (CSP).**
3. **Investigate seabird interactions with the recreational fishery within the WHGR, in particular with black petrels and flesh-footed shearwaters, and also the extent of set-netting and the threat it poses to fluttering shearwaters, and pied and spotted shags.**
4. **Investigate fishing practises to see whether the overall fish harvest may be competing directly with seabirds for food (i.e. pilchard harvests) or making it harder for seabirds to capture food. In particular purse seine fishing is a threat to seabirds by reducing numbers and size of shoaling fish schools making it harder for seabirds to capture krill and small forage fish brought to the surface by these fish species. Major seabird species of concern are those with limited diving skills (Buller's shearwaters, red-billed gulls, white-fronted terns and fairy prions).**
5. **Use a better understanding of species utilisation of the marine environment and knowledge of where seabirds breed and feed to best inform oil spill response within the WHGR.**
6. **Determine the risks and effects of petrochemical spills on seabird-driven island ecosystems in the WHGR (proposed in Towns et al. (2012a)) .**

Notes:

(1) Abraham et al. (2010) published a survey of the seabirds and marine mammals caught by non-commercial fisheries in New Zealand and highlighted the extent of captures of seabirds in the north eastern region. In this work the authors estimated 11,500 (between 6,600 and 17,200) bird captures occurred a year. Birds were reported as unharmed in 77% of the capture incidents that were recalled during boat ramp surveying. The authors noted that the fate of birds that have been hooked or tangled remained unclear despite the fact fishers may have reported the birds as apparently unharmed. A. Tennyson presented at the OSNZ AGM and conference (2012) a study of the birds recovered dead from beaches during the *Rena* oilspill aftermath, where a significant number of shearwaters found were to be, in fact, unoiled. In these cases mortality appeared to be fisheries-related with actual death in most cases caused by trauma such as broken wings, crushed skulls and stab wounds.

(2) Offshore Islands need protection as they are crucial storehouses for biodiversity and thus represent opportunities for DOC and the community to restore and sustain biological and cultural heritage (NZ Island Strategy, DOC). Mammalian predators pose the greatest threat to the survival of seabirds, and together with human disturbance, dogs and fire, it is vital that the hard-won predator-free status of many of the WHGR's treasured islands is maintained. Despite numerous successful eradications of invasive animals, including at least 60 involving the aerial spread of baits (Bellingham et al. 2010), some direct and indirect effects of the eradication campaigns are poorly understood. A

question often asked by the public and agencies that regulate the use of chemicals is how toxins affect island food webs after eradications, but it is a question that remains largely unanswered (Towns et al 2012).

(3) Risks to seabirds from petrochemical spills are particularly high in NZ, with its extraordinary seabird diversity (Taylor 2000a) and enormous densities of birds nesting in burrows. For example, it is unclear whether the current methods for dispersing spilled oil are appropriate given their potential effects on pelagic seabirds(Butler et al. 1988). The grounding of the *Rena* on Astrolabe Reef off Tauranga in 2011 and subsequent oil spill brought home the impact such a situation can have on local and regional wildlife, especially seabirds. A total of 2000 seabirds was found dead or rescued during the disaster thought the full impact on seabirds is likely much greater, but difficult to determine as the number of seabirds killed at sea (i.e. those not washed ashore and collected on beaches) was not possible to quantify. Moreover the disaster revealed how events such as oil spills have the potential to impact seabirds, with their great mobility, on a much broader geographic scale. For example though species such as common diving petrels and little penguins are most likely to have been local breeding birds (given sizeable colonies nearby), species such as fluttering shearwater (bird banded on East Island (East Cape) was amongst those collected) and Buller's shearwater (breeding only on Poor Knights Islands) were also significantly affected.

11.1.5 Population genetics and taxonomy

Understanding of the gene flow and/or the taxonomy of populations can assist conservation of threatened species (Haig et al. 2011). In particular such information is essential to establish accurate threat classifications which in turn guide the level of conservation effort and critically funding of conservation action (i.e. IUCN Red List, DOC Threat Classification System).

The recommendations for research are:

1. **Comparative studies of the breeding behaviour and life history traits of WHGR populations in comparison with southern populations breeding in markedly different environments and selection pressures. Such data would provide an indication of the behavioural flexibility of populations to withstand long terms environmental changes. Example study taxa would include common diving petrel, sooty shearwater and fairy prion. For example, see Rayner et al. (2008).**
2. **Expanded study of the taxonomy of the New Zealand fairy terns to indicate taxonomic divisions between NZ and overseas populations. This research should include expanded analyses of mitochondrial and nuclear genetic markers and comparisons of morphology and behaviour.**
3. **Identify the taxonomic status and or gene flow between recognised populations of little shearwater including the northern little shearwater of the WHGR?**
4. **Assess the genetic diversity present in New Zealand storm petrel to understand potential of bottleneck impacts and/or assess the effective population size for the species.**

Notes:

(1) Baling and Brunton (2005) contended that the single fairy tern DNA haplotype found in New Zealand did not occur elsewhere (i.e. Australia and New Caledonia), indicating that the continuation of the DOC Recovery Plan for the New Zealand fairy tern to conserve and expand this distinct population was warranted. The New Zealand fairy tern is currently listed as a subspecies (OSNZ Checklist of 2010).

(2) The Subantarctic little shearwater (*Puffinus elegans*) is now considered a separate species (OSNZ Checklist 2010). The Kermadec little shearwater (*P. assimilis kermadensis*) remains a subspecies, likewise the northern little shearwater (*P. a. haurakiensis*) and Norfolk Island little shearwater (*P. a. assimilis*) (OSNZ Checklist 2010).

11.1.6 Standardising seabird census, monitoring and research techniques

Recommendation:

1. **Support the development of an online manual detailing up-to-date surveying, monitoring and research techniques and protocols (including permitting) for all New Zealand's seabirds and relevant habitats.**

   Notes:

   (1) An outline of seabird census, monitoring and research techniques is presented in the Action Plan for Seabird Conservation in New Zealand (Taylor 2000b), also in other publications (Walsh et al. 1995). However, our recommendation here is for an online manual detailing up-to-date surveying, monitoring and research techniques and protocols (including permitting) for all of New Zealand's seabirds and the range of habitats to be created. This manual would greatly assist in standardising procedures.

11.1.7 Broad-scale WHGR ecosystem research

The WHGR is a dynamic marine environment in which tidal movements, cross-shelf intrusions of sub-tropical water from the East Auckland current, spatial and temporal changes in sea temperature, salinity, likely influence the distributions of prey and thus top predators such as seabirds. In addition anthropogenic-related impacts such as increased sediment and nutrient loads and benthic habitat damage from fisheries likely impact the productivity of this dynamic ecological community with the potential for interaction effects on top predators. Consequently, there is a strong need to understand the dynamics of Gulf as an ecosystem in both space and time and across multiple trophic levels in order to better inform management decisions that could affect seabirds.

Recommendations for research are:

1. **Integrated studies of the marine environment through inter-disciplinary collaboration between researchers with expertise from oceanography, benthic and pelagic ecology and top predator biology and spatial ecology. Such research would ideally provide base-line data across all trophic levels and understanding of physical processes driving trophic level interactions in space and time.**
2. **Research could focus on using the presence of top predators (seabirds, marine mammals, sharks) to understand the spatial and temporal dynamics of marine hotspots in the Gulf, see Piatt et al. (2007) and Block et al. (2011). Such research would integrate remote tracking and/or aerial survey of top predators and prey aggregations with remote and location based data on oceanic characteristic such as sea surface temperature, current flow and productivity.**

   Notes:

   (1) Future incorporation of physical dynamics of the WHGR, characterizing primary and secondary production hotspots and modelling primary production (PP) would establish links between feeding locations of the birds and productivity (or more accurately to investigate the disjuncts between aggregations of seabirds observed through tracking data and PP/chlorophyll-a (Chl-a) values. J. Zeldis and M. Gall (NIWA) have been running time series nutrient and production data in the WHGR, with resultant PP modelling papers published (or forthcoming) and M. Pinkerton (NIWA) has produced a trophic model for the region. Nitrogen and Carbon isoscapes currently being developed by NIWA will make a valuable contribution to the interpretations about the movements and diets of some of the WHGR seabirds (S. Bury, NIWA, pers. com.).

   (2) The types of tracking devices (tags) that can be deployed on seabirds can be summarised, as follows: 1) GPS tags provide fine-scale data (location accuracy +/- c. 10m) with a sampling resolution from one fix every few seconds to every day or more. The current lightest weight commercially available GPS tag is just over 5 g, however such devices are extremely expensive and very limited in

battery life. GPS tags weighing between 10-20 g are currently best suited for seabird research in the Gulf. 2) Satellite tags, otherwise known as Platform Terminal Transmitters (PTT's), provide meso-scale data (location accuracy +/- 250 metres, 1500 metres to 25 km depending on the quality of satellite-based position fixes at the time of position acquisition). An advantage of PTT's is battery lifetime, which can be up to 5 years. Solar powered PTT's weighing > 5 g are now commercially available for research purposes. 3) Geolocator tags provide broad-scale data (location accuracy +/- 200km (Phillips et al. 2004) of the locations of tracked animals which are calculated through measurement of day length (latitude) and the time of sunset and sunrise compared to Greenwich meantime (GMT) (longitude). Despite the low accuracy of position fixes from geolocators the devices remain the best and only tool for examining long-term broad-scale movements of small seabirds (< 600g) as a result of their extremely small weight (< 2 g for the latest models). GPS, PTT and geolocation tracking devices all provide the opportunity to answer different questions about behaviour and distribution patterns of Gulf top predators. Technological advances are rapidly reducing the size of these tracking technologies thus expanding the potential of these devices to studies of smaller seabird species

(3) Aerial at-sea surveys have been undertaken elsewhere in New Zealand, principally for Maui dolphin (*Cephalorhynchus hectori maui*) (North Island west coast) and basking shark (*Cetorhinus maximus*) (Canterbury). In Tasman Bay aerial surveys were conducted (2011) to assess marine life prior to oil exploration (R. Schuckard pers. com.) In the WHGR aerial surveys have been conducted solely for marine mammals (i.e. Bryde's whales) (R. Constantine, pers. com.).

11.1.8 Field research facilities, field stations

The WHGR represents an unrivalled natural laboratory for the study of seabird biology and seabirds island ecosystems. Despite these research opportunities (largely missed by academic institutions to date), field research on seabirds and seabird islands remains primarily dependant on researchers living in remote field conditions with poor facilities and challenging health and safety issues. In general supply of field equipment is the responsibility of institutions and/or individual project teams. Accommodation on islands or close to breeding sites is currently by arrangement with DOC (huts or bunkhouses), Maritime NZ (with respect to Burgess Island, Mokohinau Islands), Auckland Council (Tawharanui Open Sanctuary), community groups (e.g. Motuora, Motuihe and Kaikoura Island), iwi (e.g. Mahuki Island) and tent camps. The latter are temporary arrangements for the duration of the research trip only, although on Taranga and Aorangi (Poor Knights Islands) some basic facilities are provided (DOC).

The recommendations are:

1. **Upgrade the Maritime NZ house on Burgess Island, Mokohinau (Pokohinu) Islands to provide a base for research activities on the island, suitable for prolonged stays (up to six weeks at a time).**
2. **Establish a database/inventory of equipment that can be pooled for field research purposes within the region.**

Figure 130. *Schooling fish feeding on euphausiids. Photo: Kim Westerskov.*

Notes:

(1) Seabird researchers have used the house on Burgess Island periodically from 2005 to 2010. More recently research groups have visited the island two or three times each year, and up to six weeks at a time. On-going use of the hut is critical to future research projects. Maritime NZ do some basic work on the house in conjunction with their bi-annual service trips to the island to maintain the lighthouse. Work required to bring the house up to standard as a field station would include: refurbish the hut's interior (cleaning, fixing ceiling panels, painting); purchase and install a VHF radio, small freezer unit; upgrade the water supply (including installation of new tanks); and install some additional fixed furniture and lockable storage.

(2) The success of the NZ storm petrel project in recent years has demonstrated how projects can benefit from better coordination amongst institutions, organisations (including DOC and regional authorities) and individual researchers for skill and equipment sharing. With the latter, particularly items with limited specialised use (e.g. automated telemetry receivers and sound recorders, burrowscopes).

Figure 131. Burgess Island lighthouse. *Photo: Steph Borrelle*

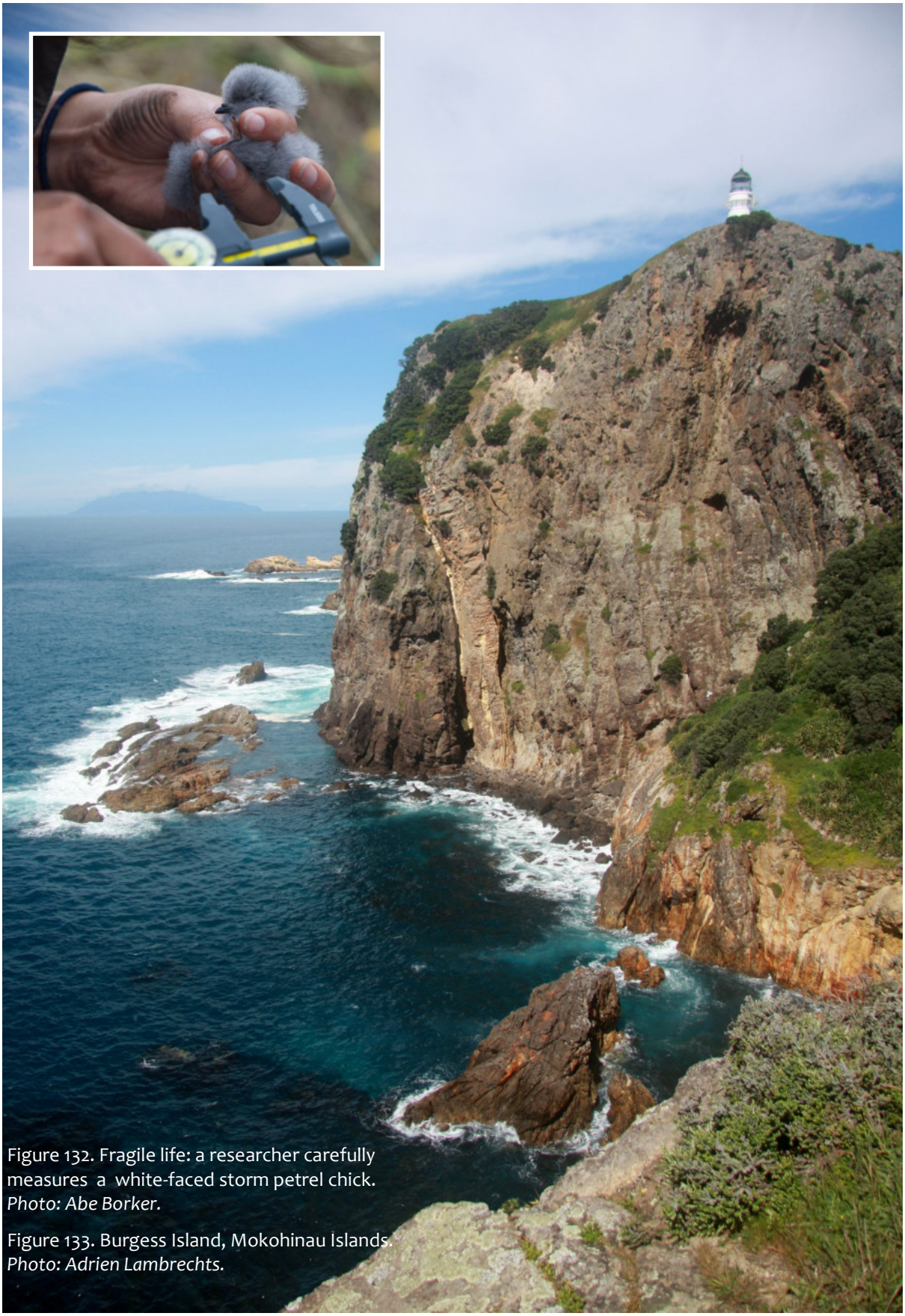

Figure 132. Fragile life: a researcher carefully measures a white-faced storm petrel chick. *Photo: Abe Borker.*

Figure 133. Burgess Island, Mokohinau Islands. *Photo: Adrien Lambrechts.*

11.2 *Priorities for seabird conservation*

In their research strategy for biodiversity conservation in New Zealand's offshore islands Towns et al. (2012) draw attention to a number of conservation management priorities that affect seabirds, in particular, a systematic approach that provides for a range of alternative management strategies on islands urgently needs national application , especially if this also facilitates the protection or restoration of islands outside administration by government agencies.

Rowe and Taylor (2006) outlined a priority outcome statement for New Zealand seabird conservation, that is, to halt the decline of biological and genetic diversity of seabirds that breed in New Zealand or New Zealand's outlying islands through:

- Preventing the extinction of indigenous seabirds in the New Zealand region;
- Ensuring population recovery of all acutely threatened seabird taxa;
- Restoring the role of seabirds in New Zealand's terrestrial ecosystems;
- Ensuring fishing activities within the New Zealand EEZ are not adversely affecting any seabird populations;
- Advocating for the protection of all seabirds throughout their at-sea range;
- Protecting and restoring key seabird breeding sites.

Within the WHGR there are many challenges for seabird conservation management; biosecurity of islands, reducing fisheries-related mortalities, and, that elephant in the room, birds caught and killed by recreational fishers. Threat or risk mapping will be an important exercise for determining seabird and marine conservation priorities. Certainly, the onus is on researchers, conservation and biodiversity staff, and advocates within conservation groups for raising public awareness of seabirds and the threats they face. There is a pressing need to engage the community more and involvement in restoration projects which focus on seabirds can be very useful in this respect.

On-going, long-term studies are vitally important and, together with the research projects outlined above, require a major commitment in terms of funding, either directly through government/local government grants, or through active, official support in applications to donors. Overall a collective approach needs to be adopted if we are to live up to our responsibilities in caring for these remarkable creatures, seabirds. After all, the WHGR, like New Zealand, is a global hotspot, and the world is watching us.

11.2.1 Coordinated regional approach to seabird conservation management

Recommendation for conservation management is:

1. **Map seabird assets showing islands with species ranked according to species conservation status (DOC Threat Classification System 2012/IUCN Red List).**
2. **Overlay with assessment of risk for island biosecurity based upon public access, and recreational and commercial small vessel traffic.**
3. **Map all shipping lanes with speed restrictions, then assess likely threat arising from shipping traffic not adhering to lanes, i.e. short-cut passages between islands, and likely distribution of pollutants if there was a major oil spill.**
4. **Map overland seabird passage routes (i.e. North Auckland Seabird Flyway, Tamaki Isthmus).**
5. **Identify and overlay key hotspots in the WHGR for seabird foraging activity.**
6. **Achieve coordination through spatial planning.**

Notes:

(1) The *Rena* disaster, high rate of fisheries-related mortality of black petrels and flesh-footed shearwaters in WHGR waters, pressure from coastal development on New Zealand fairy tern, incursions by rats on a number of islands in recent years (e.g. Lady Alice Island, Motuora, Rakino), growing aquaculture development, and interest in wind farm development has thrown the spotlight on the vulnerability of the WHGR and its ecosystems.

Furthermore, the *Rena* led to calls to investigate the wreck of the RMS *Niagara* sunk by a mine laid by the German raider HSK *Orion* in 1940. Located approximately midway between the Mokohinau Islands and Poor Knights Islands Marine Reserve, it is regarded by some as a ticking time-bomb that will release heavy oil into the marine environment (ref Keith Gordon book). Quoting author and diver Wade Doak "*In the rest of the Pacific where you have war wrecks, they are not mucking around, they are checking them. But if you asked Maritime New Zealand about the Niagara they will not have a reply. It is one of those can-of-worms they do not want to get into.*" Also, see the Listener article by Wade Doak published on 26 November 2011 (*http://www.listener.co.nz/commentary/the-danger-of-the-rms-niagara/*).

11.2.2 Island biosecurity

Seabirds have few predators on the open seas and it is on land at their breeding sites where they are arguably their most vulnerable. Island biosecurity is thus one of the most important factors in the conservation of seabirds within the WHGR. During breeding and roosting, mammalian predators pose the greatest threat to adult seabirds and chicks and eggs (section 5.1) and many species now only survive on island refuges free from mammalian predators. To ensure the long-term viability of seabird species, it is essential to eradicate mammalian predators from offshore islands and mainland reserves and implement sound plans to maintain their predator-free status.

Recommendations for conservation management are:

1. **Development of a coordinated inter-organisational approach for the eradication of mammalian predators, prevention against reinvasion, and regular monitoring of seabird islands and mainland breeding sites throughout the region. This approach could be guided by threat/risk mapping as outlined in 11.2.1 above.**
2. **Maintaining regular monitoring, pest management, closed areas and warden presence during breeding is critical at New Zealand fairy tern breeding sites.**
3. **Ensure public awareness of island conservation status through publicity campaigns and also review adequacy of signage at key protected biodiversity sites with restricted public access.**
4. **Encourage all commercial vessels (e.g. fishing vessels, charter vessels) that regularly anchor close to nature reserves and/or predator-free island sanctuaries to be checked by DOC staff and have invasive species mitigation measures in place.**

   Notes:

   (1) Currently commercial charter boats moving people and cargo to islands in the HGMP are required by DOC and the Auckland Council to be checked and have invasive species mitigation measures in place – the Pest Free Warrant Programme. This good conservation measure is made futile by the fact that commercial fishing vessels and recreational vessels can anchor overnight within metres of pest free island sanctuaries with no such requirement. Pest-free certification should be made mandatory for commercial vessel operating in such conditions and public awareness campaigns should be conducted to advise the public and recreational boat owners of the necessity of good biosecurity protocols for their vessels.

11.2.3 Fisheries interactions

The mortality of seabirds in association with New Zealand fishing fleets is a major factor contributing to the decline of a number of endemic and native species. The estimated by-catch levels in New Zealand waters are of around 10,000 albatrosses and thousands of other seabirds killed annually (Richard et al. 2011). Within the WHGR breeding seabirds most at risk by commercial fisheries are black petrels and flesh-footed shearwaters (long-line and trawl fisheries), although fluttering shearwaters, pied shags and spotted shags are killed by set nets and recreational line fishers.

Recommendations for conservation management are:

1. **Lobby the Ministry of Primary Industries - Fisheries to increase inshore fisheries observer and/or remote camera coverage to 100% within the WHGR to collate accurate data on the by-catch of WHGR species and to better understand the dynamics of seabird-boat interactions.**
2. **Deployment of mitigation measures to minimise seabird mortality by making them mandatory in these fisheries. Such measures to be improved when new data become available as above.**
3. **Organisation of meeting(s) between selected seabird researchers, seabird advocacy groups, DOC, Ministry of Primary Industries and the fishing industry. This meeting would discuss co-ordinated action to assess and reduce seabird losses associated with fishing practises within the WHGR and ensure long-term sustainability of fisheries within the region in relation to seabirds. Tabled discussion items for an agenda could include: establishing targets for reducing by-catch rates, vessel best-practice to achieve this goal, agreed criteria and results from research that could trigger temporary closures of fisheries.**

Notes:

(1) The Fisheries (Commercial Fishing) Regulations (2001) and subsequent notices detail mitigation measures required for all New Zealand fisheries. However, levels of observer coverage and consequently compliance are very low for inshore fisheries.

(2) One of the Gulf's endemics, the black petrel (see species profile), is currently classified by IUCN as Vulnerable (Nationally Vulnerable by NZ classification) with a threat ranking likely to rise on review of current available data. Long-term research of the black petrel at its strong hold on Great Barrier Island by E. Bell suggests this population (approximately 2000 breeding pairs) is declining by 1.4% per annum with possible extinction within 30 years. The recent expansion of the marine observer programme to shelf fisheries within the WHGR (particularly bottom long-line snapper and bluenose fisheries) has revealed unsustainable by-catch rates of black petrel. Fisheries related threat assessment places black petrel at the top of the list of endemic species at risk of extinction as a result of NZ fisheries by-catch (Richard et al. 2011)

(3) DOC's CSP aims to understand the adverse effects from commercial fishing activities in NZ waters and to develop effective solutions for threat mitigation. Southern Seabird Solutions Trust (SSST) is an alliance including representatives from the New Zealand seafood industry and government, WWF and Te Ohu Kaimoana. SSST takes a cooperative approach to seabird conservation and supports and encourages fishers in southern ocean fleets to adopt responsible fishing practices (*http://www.southernseabirds.org/ss-about_us*). The Global Seabird Programme (GSP) of BirdLife International, works through its partner organisation the Royal Forest and Bird Protection Society of New Zealand. The GSP was established in 1997 in recognition of the fact that seabirds travel widely across oceans facing threats both at their breeding sites and at sea. A major objective of the programme is to reduce seabird by-catch both within New Zealand waters and internationally.

(4) Fishermen are the key to solving the issue of seabird injuries and deaths during fishing. This is the

approach taken by SSST. Promoting good fishing practices by providing publicity and recognition to individuals and companies taking positive action is desirable. However, a wider collaboration between all parties (i.e. seabird researchers, advocacy groups as well as industry and government agencies) could achieve greater reduction in seabird mortality by adopting a more rigorous and effective process.

(5) In New Zealand, participation in recreational fishing is extensive and has impacts on seabirds. It has been estimated that 16.5% of the New Zealand adult population fish annually, with 2.5% of the adult population (81 000 people) fishing at least once a week. In a study of recreational fisheries Abraham et al. (2010) found a seabird capture rate by recreational fishers of 0.22 (95% c.i.: 0.13 to 0.33) birds per 100 hours. A similar rate of 0.36 (95% c.i.: 0.09 to 0.66) birds per 100 fisher hours was obtained from records kept by observers on 57 charter fishing trips. When combined with estimates of fishing effort from trailer boats for the north-eastern coast, the capture rate from the interviews undertaken in the study resulted in an estimated total annual catch of 11 500 (95% c.i.: 6600 to 17 200) seabirds by recreational fishers in this region. The study concluded that there is currently little attention given by New Zealand governmental or non-governmental agencies to reducing the impacts of recreational fishing on seabirds and that, given the apparent scale of the problem, the by-catch of seabirds by recreational seabirds requires increased focus (Abraham et al. 2010).

(6) Under Section 15(5) of the Fisheries Act 1996 the Minister may, by notice in the *Gazette*, prohibit all or any fishing or fishing methods in an area either: (a) under subsection (1)(a), for the purpose of ensuring the maximum allowable fishing-related mortality level set by the relevant population management plan is not exceeded; or (b) under subsection (2), for the purpose of ensuring that any limit on fishing-related mortality is not exceeded. If results of proposed research demonstrate the scale of impacts on seabirds within the WHGR is sufficient to trigger such action, consideration should be given to temporary closure of marine areas to commercial fishers. In the case of black petrel an area would likely include areas adjacent to Aotea/Great Barrier Island and Hauturu/ Little Barrier Island and out to the shelf edge.

11.2.4 Minimising disturbance

Human disturbance of seabirds in New Zealand is generally unintentional due to the general lack of knowledge about seabird behaviour and breeding sites. People disturb nests through recreational use of beaches and riparian zones, during activities such as fishing, walking, horse riding, motorcycling/off-roading, swimming, pet-walking, hunting and picnicking. Human disturbance may cause the deaths of eggs and or chicks through them being dislodged from the nest or may cause birds to abandon nests, placing eggs and chicks at greater risk from predators or human trampling (Rowe and Taylor 2006) . Tourism ventures also have the potential to disturb birds during the breeding season and at roost sites. Scientific research, where it requires manipulation of birds, and close investigation of breeding/roosting sites, also has the potential of adversely affecting birds.

Recommendations for conservation management are:

1. **Review and where necessary improve all publicity campaigns, advocacy material, signage and methods used to convey threats to seabirds, seabird islands and mainland breeding sites.**
2. **Islands open to public access to have well-maintained, clearly defined paths and walking tracks to channel visitor activity, i.e. to direct visitors away from any seabird breeding areas, particularly burrowing seabirds which can be hidden amongst low-growing vegetation close to access ways.**
3. **Visitors to islands where access is by permit only, including DOC staff, maintenance and research parties, to be informed where seabirds are breeding, preferably using maps highlighting sensitive areas.**
4. **All roosting and nesting sites for seabirds on beaches and coastlines should be legally protected as wildlife refuges, or wildlife management areas, to allow for management capacity to reduce impacts on protected species.**

5. **Dog owners need to be informed and educated about the risk dogs impose on ground-nesting seabird colonies.**
6. **Where not already in place, controlled dog areas should be established under the Conservation Act Amendment 1996 in areas where breeding sites of species such as penguins, terns and gulls are vulnerable.**
7. **Notification of restrictions and controls on fires should be reviewed and strictly imposed, particularly on islands with open public access (e.g. Burgess Island, Mokohinau Islands).**
8. **Standards for all wildlife tourism activity on islands and within regional parks should be set through concession conditions by DOC and Auckland Council.**
9. **Risk to seabirds and seabird islands to be given appropriate consideration when investigating an alleged offence such as unauthorised entry to a nature reserve (i.e. disturbing, injuring or killing birds, damaging nesting sites/burrows). Moreover, there should be increased focus on using resolution of such incidents as public advocacy opportunities by which to promote conservation messages to the public through media channels.**

   Notes:

   (1) On Burgess Island, Mokohinau Islands a large proportion of the old lighthouse settlement tracks have been allowed to become overgrown with rank grass, bracken, sweet pea, and in some places pohutukawa (*Metrosideros excelsa*) and *Coprosma macrocarpa* (the latter two as sizeable trees). Visitors will make their own pathways around obstacles, or take short cuts. With the rapid spread of common diving petrels, little shearwaters, white-faced storm petrels, and to a lesser extent grey-faced petrels and little blue penguins, there is a high risk of damage to burrows and birds being trampled (C. Gaskin, M. Rayner pers. obs.).

   (2) Domestic dogs kill seabird adults and chicks, destroy eggs on the nest, dig up burrows and chase seabirds from nesting and roosting sites. Dogs roam into seabird breeding sites from adjacent residential areas and attack birds when taken to beaches or rivers by recreational users. Controlled dog areas can be established under the Conservation Act Amendment 1996 in areas where breeding sites are particularly vulnerable (Rowe and Taylor 2006).

   (3) Evidence of fires having been lit is frequently found on Burgess Island in the Mokohinau group. Most of this island is covered in rank grass and bracken which in summer is tinder-dry. A fire could easily get out of control and would have devastating effect on large breeding seabird populations as well as adversely impact the natural regeneration of the islands forest cover with flow on impacts on terrestrial birds and reptiles (C. Gaskin and M. Rayner pers. obs.).

11.2.5 Enhancing seabird influenced ecosystems

National and international research indicates that when introduced mammals are removed from seabird dominated habitats, ecological communities can recover through four pathways: recolonisation of flora and fauna from outside the island/area; reappearance of species reduced to such low densities they were previously undetected; recovery of species known to be present, but reduced in abundance; and reintroduction of extirpated species which are unlikely to recolonise unaided (Towns et al 2012). Within the past 30 years eradication of introduced species from islands and pest control campaigns within mainland habitats have meant significant conservation gains, particularly for seabirds and seabird-dominated islands. However, many exciting opportunities remain to further enhance the special biological communities with the region.

Recommendations for conservation management are:

1. **A multi-institutional and community focus on the ecological restoration of the islands and islets surrounding Aotea/Great Barrier Island (including DOC, Auckland Council, Ngati Rehua and wider Great Barrier Island community). Management actions would include eradication of mammalian**

predators from Rakitu (Arid) Island and other smaller islands and ecological restoration of these islands through planting, species translocations and or augmentation techniques such as seabird acoustic playback systems.

2. **Work with Aotea/Great Barrier Island community to establish conservation goals for the main island. In particular, funding should be sought for a community led feasibility study of the potential for removal of introduced mammalian pests from Aotea/ Great Barrier Island.**
3. **Encourage private island owners such as Great Mercury Island, Rotoroa and The Noises to engage in or increase the level of ecological restoration for the benefit of seabirds and island ecosystems.**
4. **Inform weed control programme coordinators of seabird presence and timing of breeding to ensure no breeding sites are destroyed or birds disturbed by control measures.**

Notes:

(1) Conservation managers have become increasingly adept at eradicating weeds and pests from islands, including the unprecedented eradication of rats from Campbell Island, cats and rats from Raoul Island, and multi-species eradications from Rangitoto and Motutapu in the inner Hauraki Gulf. These eradications have produced spectacular benefits for native ecological communities with New Zealand seen as international showcase of successful island based conservation (Towns et al. 2009).

(2) Weed control on most sites in the WHGR is undertaken by DOC, local and regional authorities, and community groups. However accurate knowledge of seabird breeding site locations is needed to prevent inadvertent destruction of nesting sites during weed control. For example, where penguins have burrows and are nesting under gorse (e.g. Motuihe), or diving petrels amongst bracken (e.g. Tiritiri Matangi Island) these sites should be made known to DOC staff, volunteer weed teams and/or contractors.

(3) In general seabirds are not discriminatory between native and exotic vegetation; however boxthorn does pose real problems for petrels preventing them reaching their burrows as birds become snared on thorns and die. Seabirds can potentially be vectors for transportation of weeds by carrying seeds, although burrowing seabirds are strongly philopatric and while movement between sites can occur (e.g. grey-faced petrels), weed management around colony sites could minimise any potential spread.

(4) The establishment of new seabird populations through chick translocations is increasingly being used as part of the restoration of islands within the WHGR. Chick-translocation techniques have been used since 1991 allowing the successful introduction of burrow-nesting seabirds to a number predator -free restoration sites around New Zealand and are well documented by Miskelly et al. (2009). An additional seabird restoration technique is the use of acoustic playback systems which broadcast seabird calls and aim to anchor returning translocated individuals or attract immigrants from other colonies. Given the high cost of seabird translocation playbacks are providing a cost- effective, though potentially slower, alternative to translocations for restoring seabirds at mainland and offshore island sites. For example, Sawyer and Fogle (2010) successfully introduced grey-faced petrels and fluttering shearwaters to Young Nicks Head using acoustic attraction combined with artificial burrows from 2005 with first breeding of grey-faced petrel confirmed in 2007. More recently, at Tawharanui Open Sanctuary, diving petrels, fluttering shearwaters and Cook's petrels have been attracted using acoustic playback systems with diving petrels confirmed breeding in November 2012.

11.2.8 Engaging communities, working with iwi on seabird conservation

Within the WHGR there are a number of seabird conservation and restoration projects underway. At these locations iwi, supporter groups, researchers and or conservation managers have recognised the ecological, and cultural benefits of bringing back seabirds and are working together to achieve great

conservation success at sites such as Cuvier island Motuora, Tawharanui Open Sanctuary, Motuihe, Limestone Island (Whangarei Harbour) and at Bethell's Beach. Community-based projects such as these offer excellent opportunities for public advocacy about seabirds and their ecology, as well as hands-on experience with the birds themselves through a variety of workshops, fieldwork and with translocations.

The recommendations are:

1. **Community projects and supporters groups are encouraged to introduce seabird restoration into their project planning.**
2. **Build community support for seabird conservation through involvement of volunteers from iwi, OSNZ, Forest and Bird and other groups, including students from both within New Zealand and overseas.**
3. **Use the BirdLife International IBA for seabirds programme to generate more community support for seabirds and locations within the Gulf.**
4. **Arrange hui within the WHGR between individual iwi, seabird researchers and conservation/ biodiversity staff from within DOC and local authorities, such collaboration refers to the Conservation Act 1987 which states the Crown is required "*to give effect to the principles of the Treaty of Waitangi*"**
5. **Progress one of the suggestions made at first seabird hui (see Notes below) for recording of traditional knowledge relating to the WHGR islands, seabirds, and the harvesting of Oi on northern islands.**
6. **Run regular seminars on Auckland seabirds, similar to the first Auckland Seabird Seminar held in April 2010, hosted by the Centre of Biodiversity and Biosecurity, University of Auckland.**

Notes:

(1) Research within the WHGR is generally conducted by a core group of conservation staff, environmental advocates, researchers (including student projects) and enthusiastic volunteers working individually or in small groups. The NZ storm petrel project is one example of a collaboration that has fostered a widening net of people who are spending time in the field, working with seabirds and seeking to answer seabird related research question.

(2) Confirmation of the Global IBA status for the Hauraki Gulf's marine environment and many of its off-shore islands and seabird breeding sites (see Section 10 above) can be used to stimulate greater awareness of the importance of seabirds in the regional environment, also to the threats that they face.

(3) All seabird research activities are subject to permit requirements which include consultation with Tangata Whenua. Regular contact between researchers and iwi results knowledge sharing and forming trust, and facilitating the consultative process by developing a collaborative relationship. The first seabird hui with Ngati Rehua on Aotea/Great Barrier Island (August 2011) was organised through DOC Warkworth/Great Barrier Island Area Office to discuss seabird research objectives in an open forum. It was seen by participants as highly successful, an important first step towards "sharing knowledge", both scientific and traditional.

(4) Landcare Research has worked under a Cultural Safety Agreement with Hauraki's Ruamaahua Islands Trust (RIT) for the past 7 years. The agreement guides the relationship between the two groups and stipulates the responsibilities each group has to the other. Each person involved in the research signs the agreement and becomes personally accountable for their behaviour and actions. Adherence to the agreement means there are no surprises for each party. In summary, the agreement defines the ownership of data and information and guides its collection and release. For example, scientific data is jointly owned by the two parties, however mātauranga (traditional knowledge) remains the ownership of RIT. Members from the RIT have 2 weeks to review and respond (if required) to material planned for release. No party has the right to veto scientific data and results,

however temporary embargos may be placed over the release of information if either party deems that necessary (this has not been used to date) (P. Lyver pers. com.).

(5) The suggestion of recording of traditional knowledge was made by Ngati Rehua kaumatua with Aotea and Mokohinau Islands in mind, but the suggestion can be extended to all other islands.

(6) Build on the success of the '**Auckland Seabirds: Conservation, Restoration and Research**' Seminar Day held at University of Auckland, Tamaki Campus, 16 April 2010.

11.2.9 Closer collaboration with Iwi

The DOC general policy, as outlined in the New Zealand Island Strategy (2010), indicates that the customary use of traditional materials and indigenous species may be allowed on a case-by-case basis where there is an established tradition of such use; it is consistent with all relevant Acts, regulations, and management plans; the preservation of the species involved is not adversely affected; the effects of use on conservation values are not significant; and Tangata Whenua support the application.

Recommendations for conservation management are:

1. **Determine the abundance of grey-faced petrel (Oi) populations within the WHGR.**
2. **Determine the sustainability of seabird harvests in the WHGR.**
3. **Maintain consistent biosecurity protocols with respect to all entry to nature reserves and other predator-free islands throughout the WHGR.**
4. **Determine the level of illegal harvesting in the WHGR.**

Notes:

(1) Identifying and developing an understanding of the human, biological and physical factors that influence seabird populations and ecosystem processes will assist iwi and relevant Crown agencies to implement effective management of these resources and environments (*www.landcareresearch.co.nz/science/plants-animals-fungi/animals/birds/seabird-ecology*).

Figure 134. A number of the participants of the first seabird hui held at Whakaruruhau Marae, Catherine Bay, Aotea/Great Barrier island 16 August 2011.

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Figure 135. White-faced and NZ storm petrels. *Photo: Martin Berg*