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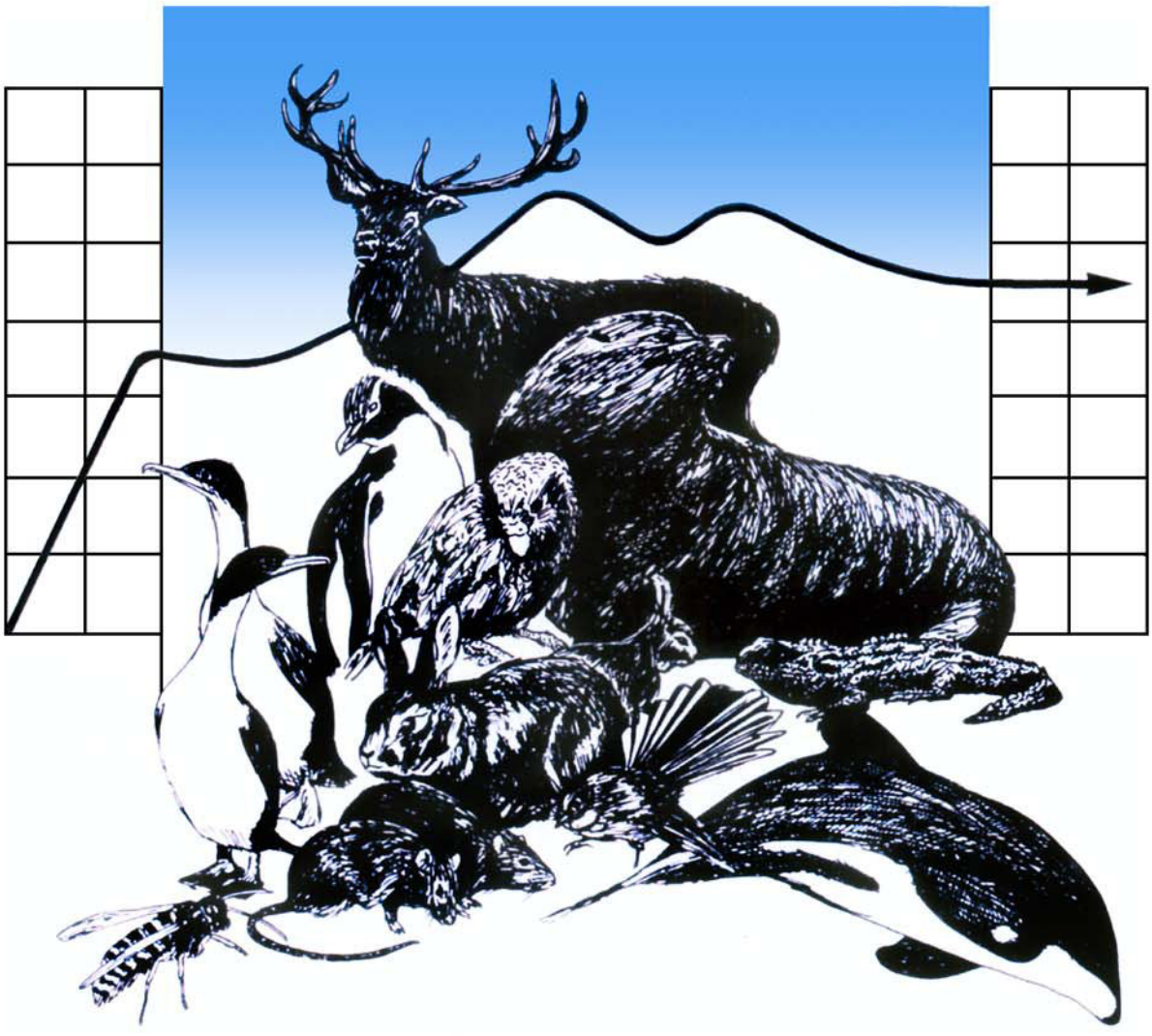
DEPARTMENT OF ZOOLOGY



WILDLIFE MANAGEMENT

Seabird Colonies of Otago:

A review of current status, survey effort and implications for establishment of Important Bird Areas

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Contents

1. Summary

This project aimed to help support the establishment of Important Bird Areas (IBAs) in the Otago region by collating records of seabird breeding areas. To achieve this, records of seabird breeding sites were collated from research or management reports (formal sources) and unpublished or observational sources of information (informal sources). Colonies were classed into different statuses which reflected the confidence in that colony today being an active breeding site based the quantity and quality of information available. These colony statuses were used to support IBA establishment and also served as an indicator of data quality.

In total 2,242 records were gathered and assessed in this project which identified over 330 possible colonies for 20 seabird species. This dataset was examined for any possible gaps in survey effort and colonies and their statuses were compared to the currently proposed IBA network. The main conclusions of this report are:

- There is high spatial survey coverage across coastal Otago.

  Gaps in the distribution of colonies were found but the high correspondence between different survey types and species indicate this is likely due to unsuitable seabird habitat rather than a lack of survey effort. There is an exception here for inland areas for breeding seabirds where survey effort can be sparse and just concentrated in specific locations.

- Survey effort varied significantly between seabird species.

  The species of higher international conservation concern, which can trigger IBA establishment, had a much higher level of survey effort compared to other species. Species which would benefit most from further review include the trigger species sooty shearwater, and regionally significant species white-fronted tern and little penguin.

- Both formal and informal sources were important in confirming the presence of colonies.

  The bulk of data assessed here was from formal sources which provided detailed reports of many of the significant species in Otago. Informal records only composed 14% of the dataset but identified many unique colonies, provided the majority of information on the non-trigger species and were critical in confirming colony statuses by providing updates on older formal surveys.

- The proposed IBA network provides good coverage of the identified trigger species colonies.

  All colonies for the 6 Otago trigger species are currently within IBAs, apart from a small number of sites for sooty shearwater, black-fronted tern and black-billed gull. However, many of these

colonies had a low colony status, indicating further review of these sites will be needed before IBAs could be considered for those sites.

This report therefore provides a base of information to support IBA establishment in Otago and suggests priority sites and species for further review and investigation. Continued long-term monitoring within each IBA to track trends and changes at colonies will be critically to the success of IBAs. Greater integration with local organisations and experts is critical to improve this knowledge base and create long-term support for Otago's IBAs. In this way the IBA network will become an invaluable tool in raising awareness of the many important seabird areas in Otago and aid in their conservation and management.

Keywords: Seabirds, Colony, Otago, IBA, Citizen science, Survey effort.

2. Introduction

2.1 The IBA programme and New Zealand's seabirds

Birdlife International's IBA programme aims to identify sites critical to the long-term survival of avian species, including key roosting, breeding or foraging sites. First initiated in the 1980s, the programme now extends across 200 countries with over 10,000 IBAs established (Birdlife International 2012a). While the installation of an IBA does not have any immediate requirement for conservation or legal protection, many IBAs around the world have seen improvements in both their environment and species' health since their establishment (Birdlife International, 2010a). The recognition of these sites as priority areas for monitoring or conservation therefore often leads to greater awareness, advocacy and consequently protection for these species and their habitat. Yet while IBAs function as a useful conservation tool, no formal IBAs have been established in New Zealand. As a world leader in species diversity and endemism for birds, New Zealand could benefit greatly by integrating into this international conservation network and utilising IBAs to protect its avian fauna.

In order to be a globally applicable tool and measure, IBAs are identified using a set of formal, international criteria. An IBA must fulfil at least one of these criteria:

- A1: Threshold numbers of one or more globally threatened species based on IUCN Red List categories.
- A2: Contain a significant population of a restricted-range species
- A3: Contain a significant population of a biome-restricted species

A4: Contain one percent or more of the world population of a congregatory species for seabirds or 10,000 or more pairs (Birdlife International, 2010b).

At this stage IBA identification for seabird colonies in New Zealand will be assessed primarily under the A1 criteria. Seabird colonies provide an effective starting point for identifying IBAs for seabirds, as they encompass critical lifecycle stages when species are aggregated together, making surveying and protection easier (Birdlife International 2010b). Once terrestrial breeding sites are identified, the addition of marine and flyway IBAs can also be used to provide greater overall protection to these species.

There are six 'trigger' species in Otago which are globally threatened and so would cause an IBA to be established if their colony reaches a threshold number set for that species. These threshold numbers are usually determined based on the species' IUCN red list status although national status of species can also be taken into account. These trigger species are listed in Table 2.1 with their New Zealand and global status and IBA threshold numbers. For many of these species because of their severe conservation status even presence of a single individual is enough to signify that site as being critical to the global conservation of that species.

For the Otago region there are a large number of IBAs proposed for inland and coastal locations. The main IBA sites are illustrated in Figure 2.1. The coastal IBAs are clustered in 3 main areas; North Otago, Otago Peninsula and the Catlins region.

Table 2.1: Status and threshold criteria for IBA 'trigger' species in Otago. Species' New Zealand statuses are sourced from Miskelly et al. (2008) and Global status sourced from the IUCN Red List.

Species	New Zealand status	Global status	New Zealand estimated population size	Global estimated population size	Threshold criteria
Yellow-eyed Penguin	Threatened	Endangered	~6,000 birds (McKinlay 2001)	~6,000 birds (McKinlay 2001)	1 or more individuals
Stewart Island Shag	Threatened	Vulnerable	~8,000 birds (Birdlife International, 2012b)	~8,000 individuals (Birdlife International, 2012b)	30 individuals or 10 pairs
Northern Royal Albatross	At Risk	Endangered	~25,500 birds (Birdlife International, 2012c)	~25,500 birds (Birdlife International, 2012c)	1 or more individuals
Sooty Shearwater	At Risk	Near Threatened	~10 million birds (Marchant and Higgins 1990)	>20 million birds (Brooke 2004)	30 individuals or 10 pairs
Black-billed Gull	Threatened	Endangered	~96,000 birds (Powlesland 1998)	~96,000 birds (Powlesland 1998)	1 or more individuals
Black-fronted Tern	Threatened	Endangered	~8000 birds (O'Donnell and Hoare, 2010)	~8000 birds (O'Donnell and Hoare, 2010)	1 or more individuals

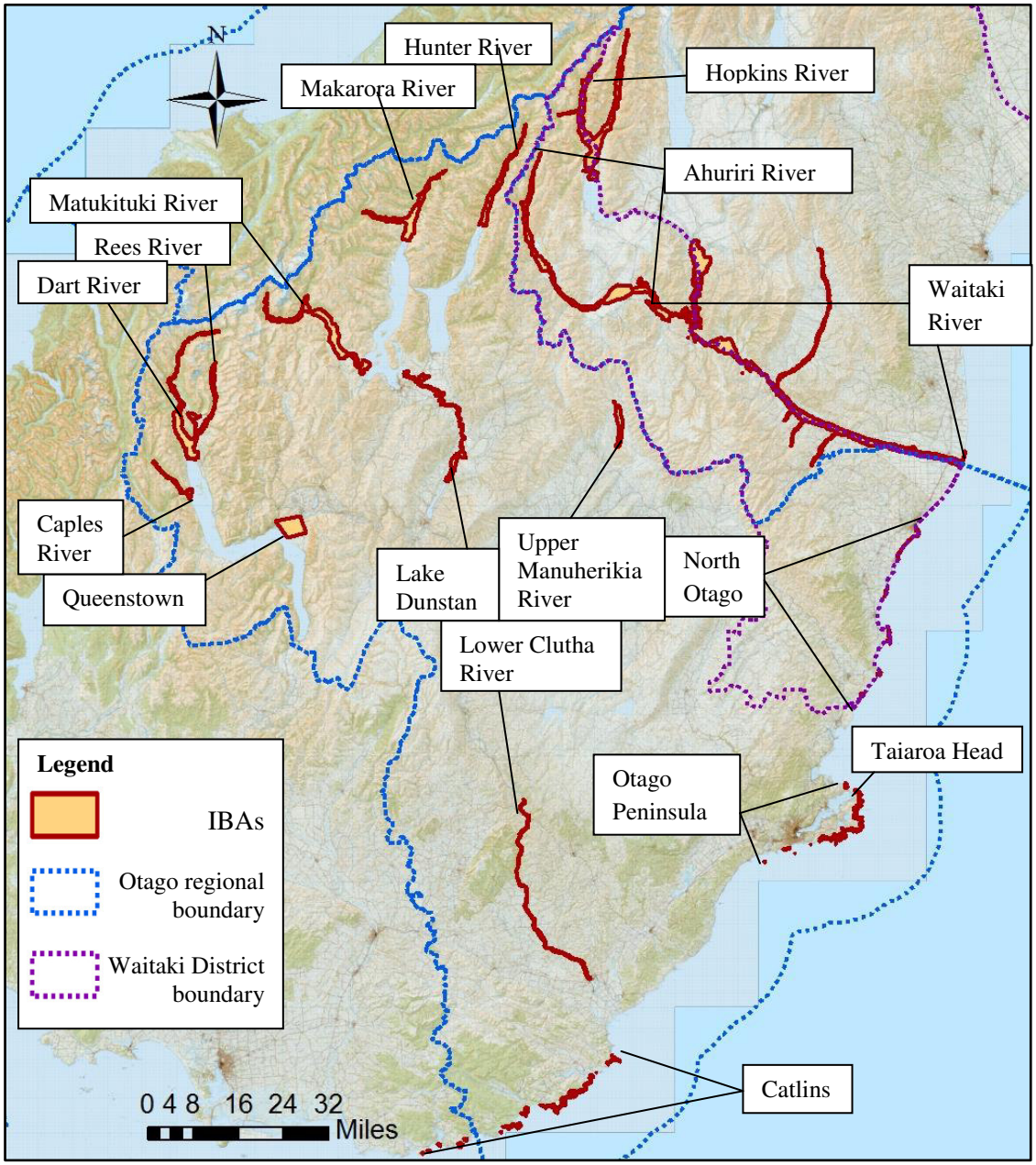


Figure 2.1: Map of the candidate IBAs proposed within Otago with main locations labelled. Each of the individual coastal IBAs are proposed independently. Some of the inland IBAs contain associated rivers which are shown on the map but not labelled. Note here the entire of the Waitaki district which is split between Otago and Canterbury regional councils was used here for continuity. Basemap sourced from Linz data service and Otago, Waitaki boundaries from Statistics New Zealand.

2.2 Seabirds of Otago

New Zealand is one of the top ten countries for number of threatened species, and fifth for endemic threatened species (Birdlife International, 2012d). Many threats exist to New Zealand's seabirds which were previously extirpated from much of the mainland due to mammalian predators (Taylor 2000a). Their future continues to remain under threat from fishery interactions and loss of habitat (Taylor 2000a). The last major review of across seabird species in Otago was in 2000, when the Department of Conservation (DOC) produced a conservation Action Plan for seabirds across New Zealand (Taylor 2000a, b). Further research has been ongoing for particular species at national or regional scales, while some however remain largely un-investigated.

To facilitate effective management and monitoring of seabirds, and to help support establishment of IBAs, a New Zealand database for seabird colonies is currently under construction. National databases for particular species already exist, such as for the yellow-eyed penguin, administered by DOC, and the NABIS database of 180 bird species, administered by the Ministry of Fisheries. The data collated here will also be first incorporated into a New Zealand Seabird Colony Database. This is planned to be an enduring database managed by the Ornithological Society of New Zealand (OSNZ) and Forest&Bird groups. This will form the base information source to utilise for the IBA programme.

As we have seen Otago contains 6 trigger species, of significant threatened status. Sooty shearwater is added to this list although only classed as "near threatened" as is a culturally significant species which is harvested. Most other Otago seabird species are classed as Least Concern on a global analysis. However, in national terms the majority of the species have an At Risk ranking, reflecting the small and sparse populations of many species on the mainland (Miskelly et al. 2008). New Zealand classifications can vary from IUCN as species are classed separately, for instance many species can classed at a subspecies level in New Zealand. Although here national and regional species significance will be taken into account, species will be described and named according to the international system.

Sphenisciformes

Otago is well-known for its two main penguin species, the yellow-eyed penguin (Megadyptes antipodes) and the little, or blue, penguin (Eudyptula minor). The yellow-eyed penguin has long been the focus of concentrated research and community-based conservation effort (McKinlay 2001) and is currently classed as vulnerable by the IUCN. The blue penguin, which occurs further up the North Island and in greater numbers in Australia (Marchant and Higgins 1990), also enjoys localised conservation and tourism conservation efforts. This penguin is listed as least concern by the IUCN, but near threatened under New Zealand's classification system (Miskelly et al. 2008).

Procellariiformes

These include the albatrosses, shearwaters and petrel species. Most notable of this group is the only mainland colony of albatross, the northern royal albatross (Diomeda sanfordi), at Taiaroa Head. The other major topical species is the sooty shearwater (Puffinus griseus), well known for its cultural value (Hamilton et al. 1997). Sporadic colonies of the burrowing fairy prion (Pachyptila turtur) are known to exist around Otago (Marchant and Higgins 1990). However few records exist for broad-billed prion (Pachyptila vittata), and the New Zealand white-faced storm-petrel (Pelagodroma marina maoriana) in Otago and so they are not thought to be resident in Otago (Taylor 2000b). All of these species are listed as least concern as occur in large numbers outside of Otago (Taylor 2000b, Miskelly et al. 2008).

Pelecaniformes

These include five shag (cormorant) species and one gannet. The Stewart Island shag (Phalacrocorax chalconotus) is the most significant in terms of conservation, listed as vulnerable under the IUCN redlist. The large pied (Phalacrocorax varius), little (Phalacrocorax melanoleucos), and spotted cormorant (Phalacrocorax punctatus) are the other coastal shag species normally found in Otago and are of low to moderate conservation concern. The Great or Black cormorant (Phalacrocorax carbo) occupies a different niche to species, being more of a freshwater specialist and so commonly exists and breeds inland (Taylor 2000b). The single gannet species (Morus serrator) is found rarely and in low numbers but nationally is classed as not threatened (Taylor 2000b, Miskelly et al. 2008).

Charadriiformes

This taxonomic group is composed of the smaller gull and tern species. Three gull species exist in Otago; the large and common kelp gull (Larus domincanus); the smaller red-billed gull (Larus scopulinus); and the New Zealand classed “endangered” black-billed gull (Laruss bulleri) (Miskelly et al. 2008). The New Zealand white-fronted tern (Sterna striata) is found in ephemeral colonies throughout Otago and New Zealand (Powlesland 1998) and is classed as vulnerable in New Zealand (Miskelly et al. 2008). Other tern species include the Caspian tern, classed as nationally vulnerable and only rarely seen in Otago (Bell and Bell 2008; Miskelly et al. 2008). Finally, the black-fronted tern (Sterna albostriata) is also a species of concern, under-going a steady decline and now classed as Endangered by the IUCN (O’Donnell and Hoare 2010). The black-fronted tern, black-billed gull and Caspian tern are all inland breeders, typically in braided riverbed habitat. The kelp gull on the other hand will breed across diverse inland and coastal habitats (Marchant and Higgins 1990).

2.3 Citizen science

Birds, being highly visible and charismatic species, have facilitated a long history of amateur research and conservation, making ornithology a leading field in the use of "citizen scientists" (Greenwood 2007). Birding experts and organisation are an important resource of knowledge on bird ecology and behaviour, of great benefit to research and conservation (Greenwood 2007). Volunteers for bird monitoring surveys have been essential in the success of many national monitoring projects such as the Breeding Bird Survey in the US and as well as the Garden Bird Survey here in New Zealand. Citizen science has been found to be valuable in producing long time-series and landscape level information, documenting rare or disappearing species and data gathering from inaccessible locations (Lepczyk 2005; Dickinson et al. 2010).

The OSNZ in particular have been an invaluable resource for New Zealand with a long history of researching birds across the country. They have twice produced a national atlas of species distribution across the nation and assessed broad-scale changes (Robertson et al. 2007). In 2008 ornithological monitoring went online with eBird, a tool allowing pin-pointing of bird sightings. The use of this information has recently been reviewed by Scofield and colleagues (2012). As such for this project, such organisations and individuals will be a valuable possible source of information for this project.

However, without the rigorous protocols and assessment set by researchers there are risks that data can be collected variably which introduces issues for analysis and interpretation (Dickinson et al. 2010). This particular occurs for biases from variable survey effort and differences between observers (Dickinson et al. 2010). OSNZ does utilise data quality protocols for its organised surveys and eBird entries are filtered and regulated by experts (Scofield et al. 2012). Additionally one of the challenges of citizen science is identifying, accessing and incorporating all this information into regional or national datasets so specific information and trends can be set in context (Dickinson et al. 2010). This will be a key challenge this project will tackle by collecting already existing citizen science data. This differs from most citizen science studies which typically design and assess their own surveys (Lepczyk 2005). As such this project does not review the differences in survey design between formal surveys and opportunistic surveys and the biases these involve (Irwin 1995). Nevertheless it is important to remember that these biases may exist in the data collated for this project.

With limited funding for biodiversity surveys, community driven research and management is expected to expand. The IBA programme provides a focus for future community led monitoring programmes (Greenwood 2007). Here, the relative availability of citizen records of seabirds around Otago (informal sources) will be assessed against more formal survey for the purposes of identifying

and managing IBAs. Combining both sources of information should maximise the number of colonies identified as well as improve the level of detail for each site (Lepzyck 2005).

2.4 Aims

This project had the following aims to help assist in the identification of potential IBA sites for seabirds in the Otago region:

1. To collate all possible records of seabird breeding locations in Otago.

2. To analyse the quality of the produced dataset in terms how it effects ability to identify colonies and IBAs through assessing:
   i) the distribution of survey effort across Otago and species,
   ii) how useful each data collection method and data type was for identifying colonies and IBAs.

3. To review management implications for designation and future management of IBAs, including prioritising further survey work.

3. Methods

3.1 Data Collation

This project focused on identification of breeding colonies of seabirds only for Otago. Data was collected using a range of approaches, representative of the diversity of data types targeted. Formal data constituted reports and surveys which utilised a scientific approach to data collection and reporting. These included literature review of scientific articles, DOC reports and articles in the OSNZ's journal "Notornis".

In contrast, informal sources of data include any records taken outside of a deliberate survey, including opportunistic observations or records in birding notebooks. To collate these more informal records, "calls for data" were made via the Otago branches of OSNZ, Forest&Bird organisations and DOC. A newsbrief which contained information on the IBA programme and this aims of this project was sent out to request any information on seabird breeding colonies. This was followed up with a colony questionnaire which provided information on the base knowledge of seabird colonies in Otago already collated from published surveys. This contained maps illustrating these sites to provide a base for contributors to work from and to allow discussion of sites. These were presented at an OSNZ meeting and also sent out to local wildlife tourism operators for their comments.

Case study species and eBird

Three species were selected to represent a cross-section of survey effort. Yellow-eyed penguins were chosen as the highest surveyed species. The white-fronted tern was chosen as a low level of survey effort species while still being common in Otago. The black-billed gull was chosen as a moderate effort species, with surveys in specific areas at multi-year intervals. These species were also used to compare the effectiveness of eBird as a method to identify possible colony areas. All eBird sightings that referred to a specific location for that species were included and formatted in the same way as former data collation. The distribution was mapped and compared to the reported colonies from informal and formal records.

3.2 Data Analysis

Information on colonies was simplified as one record per site per breeding season per source to allow comparison between colonies and across years. All reported sites are discussed as colonies here but it is important to note that some may be just sightings of that species and not an actual breeding colony. Data analysis occurred at both the single record level and the colony level, with information summarised across records for that colony.

Multiple records within a year from the same source were simplified as the average count for that site. Counts that reflected breeding were preferentially used, so for instance the number of nests was preferred over the number of individuals. Zero counts were included in the dataset as were found to be useful in assessing the state of colonies. Their presence however likely adds a bias towards formal survey effort which appeared more likely to present zero counts.

Some sites were aggregated together to ease presentation. This is particularly the case for rivers, due to the common method of surveying which often did not identify explicit colony locations. Further such riverbed nesting sites of seabirds are often transitory, and so for identification of important breeding areas identification of the riverbed system of that river is suitable. If no specific locations for colonies were provided for in reports, then coordinates for the nearest feature were used, which could lead to some level of inaccuracy depending on the area.

Colonies were assigned a status representing the probability of that colony actually being present and breeding. A minimum number of counts were needed to confirm presence, as many seabird colonies can be transitory and abandoned temporarily or permanently (Taylor 2000a, Lalas and Perriman 2009; Perriman and Lalas 2012). Therefore a record within the past decade was considered important to signify colonies were still present. As reported colonies could be just aggregations or roosting sites rather than breeding sites, specific evidence of breeding such as nests or chicks was needed to confirm breeding was occurring. Therefore as the quantity and value of each colony's records are assessed in this way, the colony status is also used here as an indicator of data quality. The specific criteria for each colony status are provided in Table 2.1.

Data was mapped using ArcGIS v10 with spatial analyst extension and basemaps of New Zealand sourced from LINZ. Spatial hotspots of survey effort were investigated using kernel density estimation in ArcGIS. This was applied to distribution of individual records using a range of 5km to illustrate local-scale variations in survey effort.

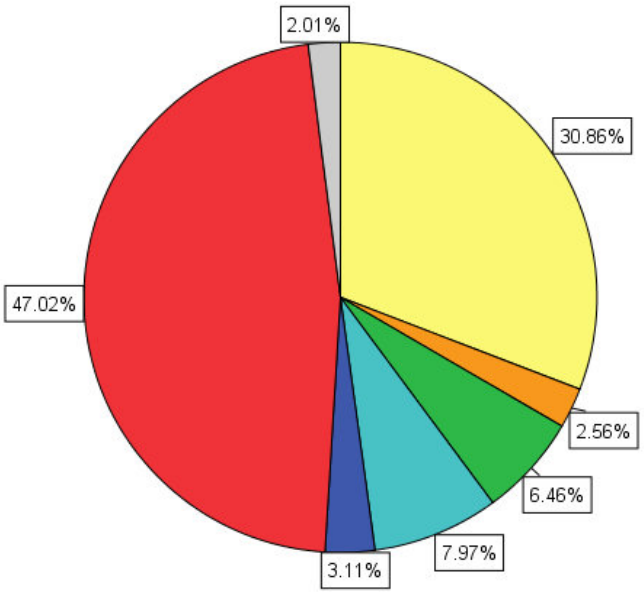
4. Results

4.1 Data collation methods and sources

A total of 2,242 records were collated in this project. The contribution of each data-gathering method to this total is listed in Table 4.1. The method of gaining access to data through meetings and recommendations from organisations and seabird experts yielded access to the greatest number of records, largely by facilitating access to unpublished survey work and the vast majority of information on yellow-eyed penguins. Following from this, the large body of research and conservation literature available for the Otago region provided the second highest contribution of records. Additionally targeted emails and OSNZ and Forest&Bird news articles led to many records being submitted from the fringes of Otago and less well covered regions, such as central Otago. In contrast the colony questionnaire, being only passed around the local OSNZ group identified colonies close to the Dunedin area.

The relative contribution of records from formal and informal was assessed. The vast majority of records were defined as formal, numbering 1837 or 86% of the total. The greatest sources of formal data were from DOC surveys and scientific papers, although many of these themselves relied on local knowledge of experts. Across all species, nearly half of all colonies were only identified by formal sources and 29% from informal only. The spread of each data type across Otago was generally even. The only differentiation found was a slight dominance of formal records around the Otago peninsula and an absence of formal records for central Otago. This suggests that formal surveys are focused on the major biodiversity and conservation areas such as Otago Peninsula and braided rivers inland.

Table 4.1. The number of records yielded from each data collation method and their proportional contribution to the total number of records collected.

Method	Number of records	Proportion of total
Literature search - online	671	
Literature search – paper	24	
News article responses	141	
Targeted email	172	
Colony questionnaire	68	
Meetings and recommendations	1046	
Previously entered data in dataset	44	

4.2 Distribution and quality information on seabirds

Spatial distribution of records

Over 2,000 individual records were mapped to display the full spatial extent of survey effort in Otago. This is shown in Figure 4.1 where, as would be expected for seabird colonies, the majority of records are found along the coastline. Here they were clustered at 3 main areas; South Otago/Catlins region, the greater Otago Peninsula area and North Otago around Moeraki and Oamaru. This map shows most species are distributed fairly evenly across these three areas, and that there is a high overlap of species at the same site.

Kernel density analysis was used to identify the concentrations of survey effort across Otago and species. This indicates a clear main over Otago Peninsula, which had itself over 50% of the total number of records. High species diversity, presence of charismatic northern royal albatrosses and yellow-eyed penguin, as well as being close to a city and university likely funded this high survey effort. The well-known seabird spot of Taiaroa Head in itself had the second highest number of records for a single site (119), with Nugget Point in the Catlins the highest with 130 records.

In comparison, central Otago has a much lower density of records of seabirds. Figure 4.1 shows the inland breeding sites of black-fronted terns, black-billed gulls, kelp gulls and great cormorants are concentrated in typically braided river catchments and so their distributions trace the outline of some of the major rivers through Otago. Again there was found to be a high overlap between species, particularly black-fronted terns and black-billed gulls. Caspian terns also begin to appear on the northern border with Canterbury, where this species is much more prevalent (Bell and Bell, 2008).

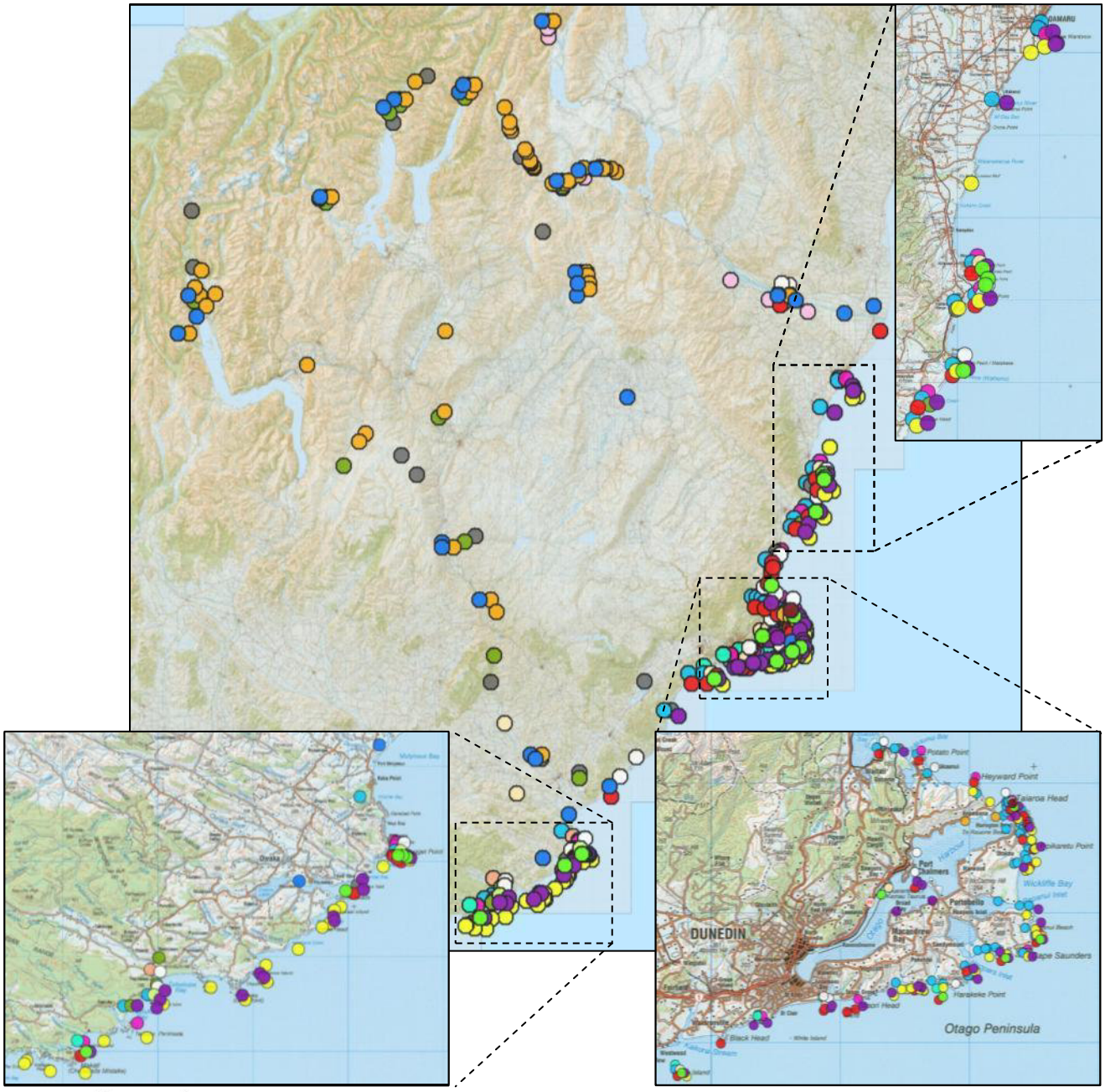


Figure 4.1: Spatial distribution of all records collated for each species, with insets for the 3 main clusters of colonies. The exact location of for each species may be slightly displaced to allow overlapping points to be viewed.

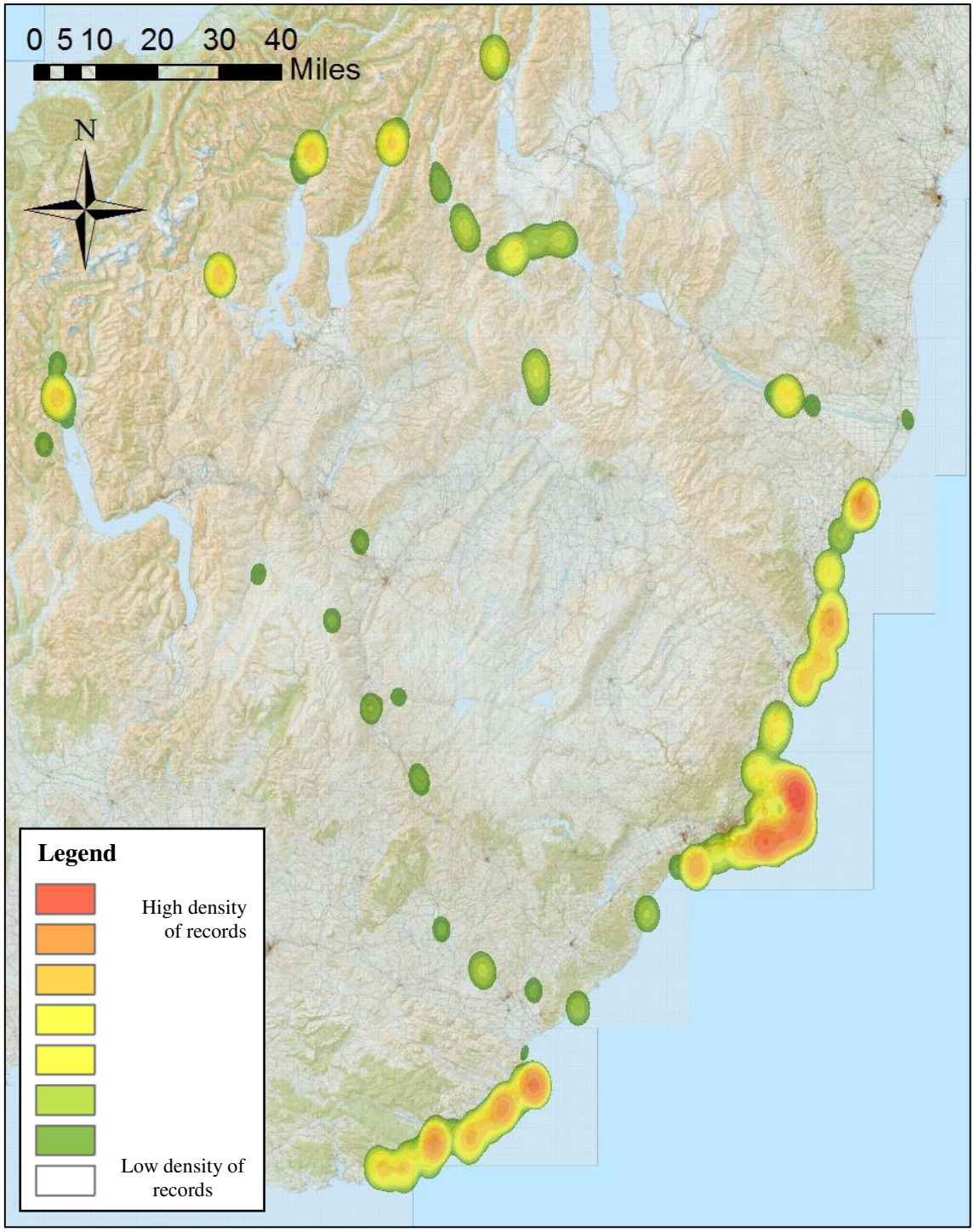


Figure 4.2: Kernel density map of the distribution of records across Otago for all species.

Survey effort between species

The number of records across species was found to be clustered into four neat groups, which are visible in figure 4.3. Yellow-eyed penguins had by far the greatest survey coverage, with nearly five times the number of records to the next highest ranked species. The following grouping of species had between 100 and 300 records each, and contained the little penguin, red-billed gull, Stewart Island shag and sooty shearwater. These are all at least regionally significant species and have been subject to Otago wide-surveys. The moderate set of species, between 50 and 100 records each, contained species that have either been subject to some form of regular, but intermittent survey, such as the black-fronted tern, or are highly common species, such as the kelp gull. Finally species that had less than 50 records were all typically uncommon species in Otago (Marchant and Higgins 1990, Loh 2000, Lalas 1993, Bell and Bell 2008).

Possible breeding colonies were identified for each species and a summary of information is provided in Table 4.2, (further detail for each colony individually is provided in the appendix). This table indicates species with a formal or informal data bias and also the percentage of their colonies which reached a confirmed status, discussed further below.

Table 4.2: Summary records and colonies for each species, with information on assigned colony status and total number of colonies present in Otago. Information on the total number of records, the source of data, whether any colonies were identified from one source type only. Additionally the main method of data collation used for that species is listed. Species are ordered by the percentage of colonies confirmed.

Species	Total number of records (% of total)	Number of sources	Percentage of records from formal source	No. of colonies present (No. absent)	Percentage of colonies confirmed
Common Diving Petrel	1 (0.05%)	1	100%	0 (1)	100%
Northern Royal Albatross	14 (0.7%)	6	100%	1	100%
Yellow Eyed Penguin	1030 (48.0%)	9	97%	38 (9)	90%
Stewart Island Shag	141 (6.6%)	11	89%	11 (3)	57%
Australasian Gannet	18 (0.8%)	3	16%	2	50%
Red-billed Gull	197 (9.2%)	14	89%	29 (8)	50%
Black-billed Gull	59 (2.7%)	21	86%	12	42%
Black-fronted tern	67 (3.1%)	23	80.6%	15	33%
Fairy Prion	12 (0.6%)	5	75%	5	20%
Spotted Shag	52 (2.4%)	14	40%	17	18%
White-fronted tern	53 (2.5%)	16	26%	17	18%
Little Penguin	204 (9.5%)	18	83%	40 (13)	16%
Little Cormorant	12 (0.6%)	8	55%	7	12%
Kelp Gull	84 (3.9%)	24	59%	33	9%
Great cormorant	48 (2.3%)	13	80%	15	7%
Sooty Shearwater	132 (6.2%)	13	67%	31 (16)	7%
Broad-billed prion	1 (0.05%)	1	0%	5	0%
Caspian Tern	10 (0.5%)	5	100%	3	0%
Large Pied Cormorant	9 (0.4%)	2	0%	2	0%
White-faced Storm Petrel	1 (0.05%)	1	0%	1	0%

Data Quality

Each colony was assigned a colony status reflecting how likely it is that the site is currently an active breeding colony. As this was based on the quantity of records and information provided within records, the colony statuses are also an indicator of data quality.

Nearly a third of all identified colonies could be confirmed as being either present or absent. This varied significantly between species, with the main trigger species having much higher percentages of confirmed colonies. All of these species have been subject to in-depth Otago-wide surveys, indicating the value of these formal surveys in understanding the current dynamics of these species. The variation in number of records and proportion of colony status for each species is shown in Figure 4.3. This displays the additional positive relationship between total number of records and higher colony confirmation status, with the exception of species such as the common-diving petrel which only had one record and could be confirmed because the recorded suggested abandonment (Taylor 2000b).

For the non-trigger species, whose colonies were mainly of Likely or Possible status, this was due to lower effort, but also simply because many of these species are less prevalent in Otago. For instance the large pied cormorant and Caspian tern are both listed as nationally vulnerable for New Zealand (Miskelly et al. 2008), but both had a low record and colony status due to there being very few, or any colonies present in Otago for these species (Bell and Bell 2008, Lalas 1993). Alternatively, the kelp gull is a species of no conservation concern, had a moderate number of records but never any formal surveys, and had a low proportion of confirmed colonies.

Species that had lower than expected proportion of confirmed colonies were the sooty shearwater and little penguin. Both of these species have been subject to large surveys in the 1990s and early 2000s (Dann 1994, Hamilton 1997, Jones 2000, Perriman 1997, Perriman and Steen 2000). However, since that time theses colonies have not been formally re-surveyed, apart from specific locations, leading them to fall out of the 10 year date needed to be confirmed.

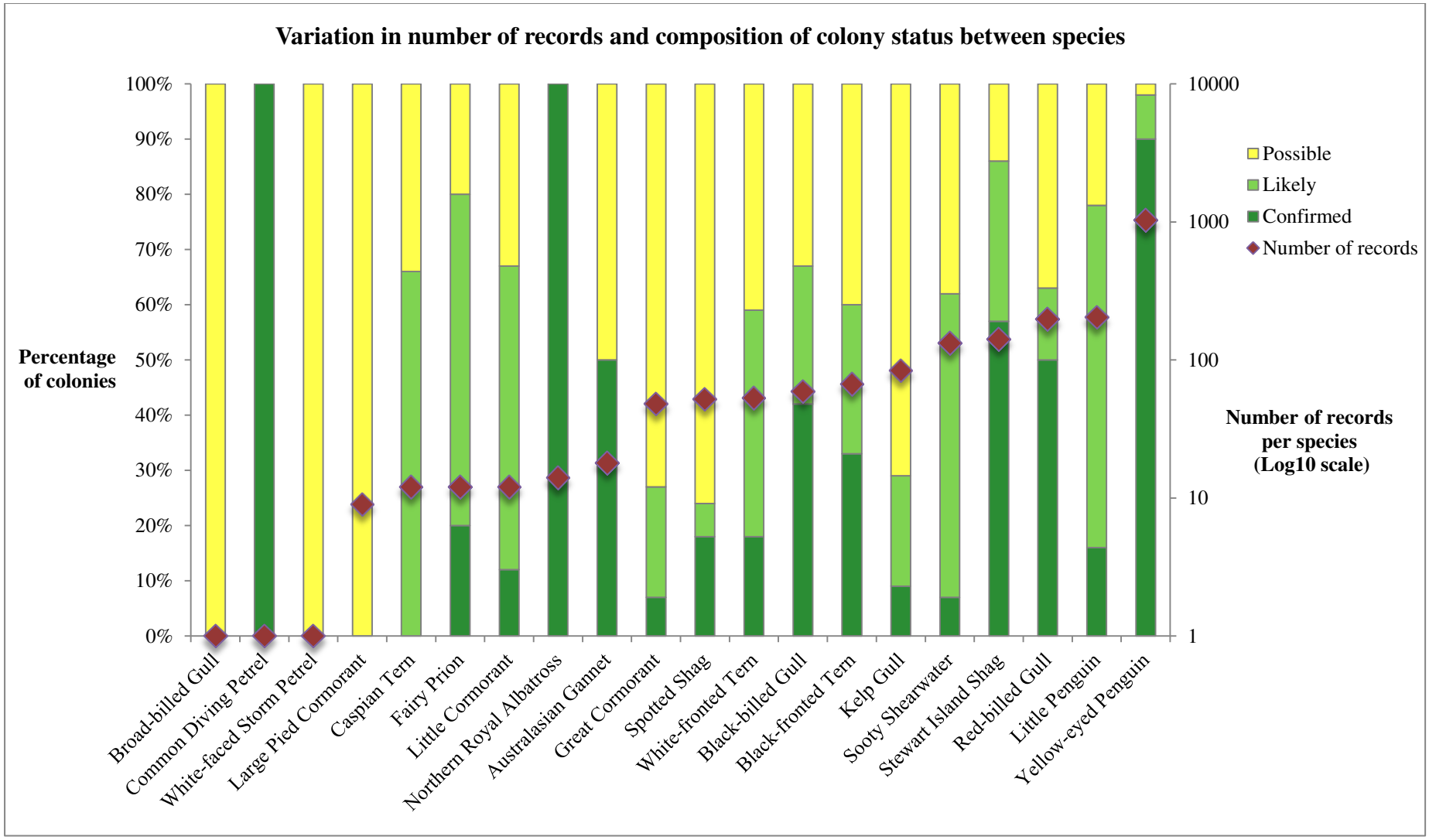


Figure 4.3: Number of records per species and the percentage of colonies of each status type. Colony status includes both present and absent sites.

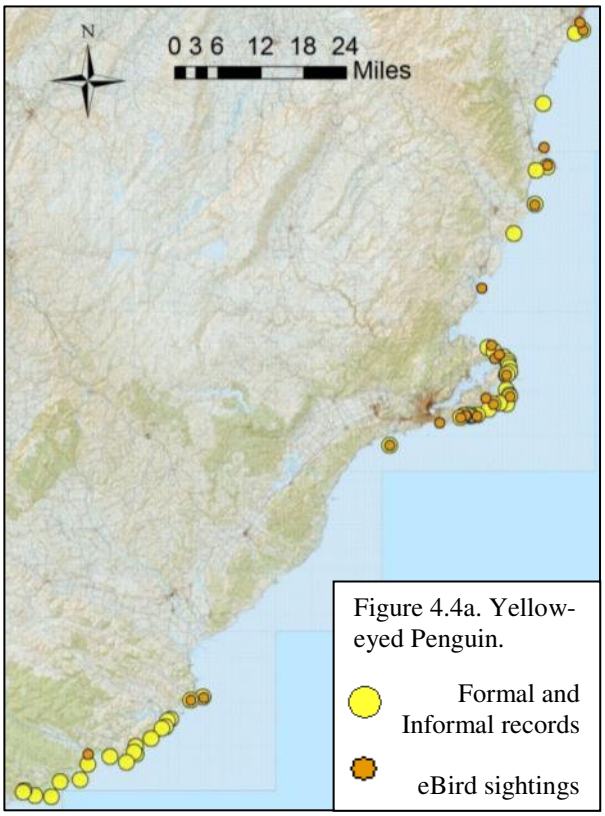
Case study species

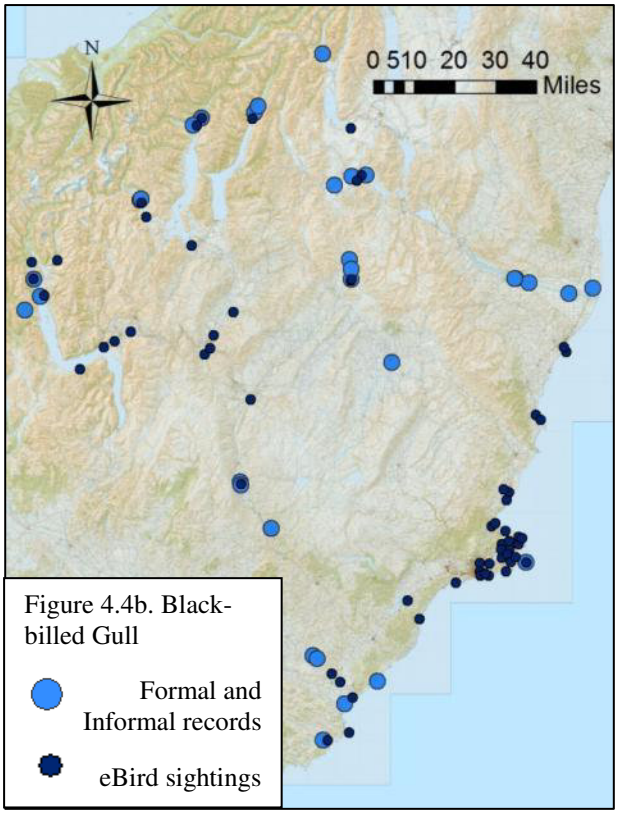
Three species were selected to represent a cross-section of survey effort; the yellow-eyed penguin, black-billed gull and white-fronted tern. The distribution of formal, informal records and eBird sightings are shown in Figure 4.4 for each species. The eBird sightings generally correspond to the distribution of survey records, indicating that the major spatial gaps are likely unsuitable seabird habitat.

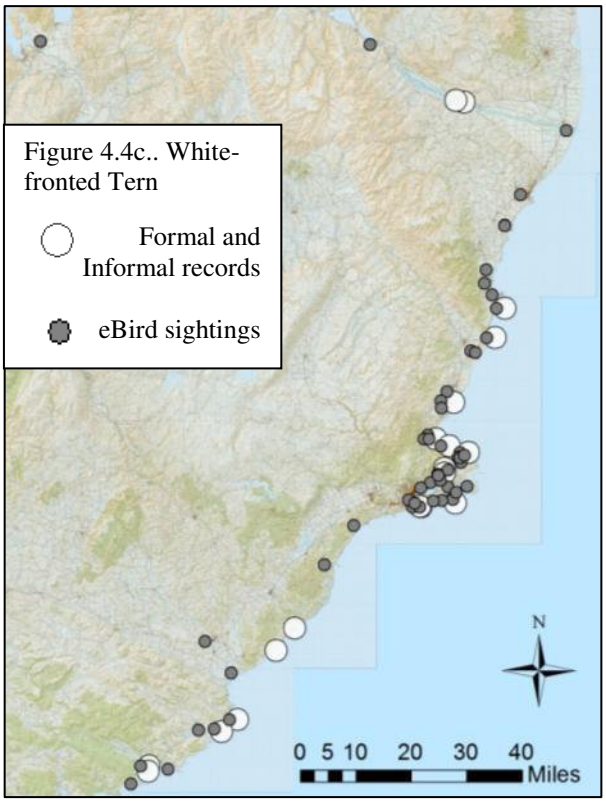
The highest survey-effort species, yellow-eyed penguins, also had the greatest number of colonies identified, despite being one of the most endangered seabirds in Otago (Miskelly et al. 2008). The species also had the greatest data quality allowing 97% of possible colonies to be confirmed. Interestingly, despite yellow-eyed penguins being a highly recognised and well-known species, it had very few informal and eBird sightings. This species had only32 informal records and only 25 eBird sightings. Additionally, only roughly half of the eBird sightings coincided with the reported colony locations.

Black-billed gulls had much fewer records than the yellow-eyed penguin, but a similar high percentage were from formal sources. However, this main formal source was DOC river surveys, which do not always explicitly locate nesting sites but instead count individuals seen, this prevented evidence of breeding at these sites to be confirmed. As such only a third of black-billed gull colonies could be confirmed. The black-billed gull had the highest number of eBird sightings of the case study species, of 62. However, the majority of sightings were on the coastline and therefore most likely to be birds feeding and not breeding colonies. Nevertheless, the inland eBird records did correspond well to identified colonies from both formal and informal sources.

The white-fronted tern had a similar number of records as the black-billed gull, but only a quarter were from formal surveys. Here, informal sources provided the bulk of information for this species, identifying 3 times as many colonies as the only formal survey which took place in 1998. However, as informal surveys are much sparser in details on dates of observation, evidence of breeding and explicit counts, only 26% of colonies could be confirmed. Most of the colonies that were confirmed included a formal record as well, in order to reach the required 3 records per colony needed. The white-fronted however did have a high number of eBird records, 55, which many overlapped with recorded colony locations. However, this is in part likely due to the same contributors of informal records also recorded this information on eBird.







Figures 4.4 a, b and c depict all records (formal and informal combined, with eBird sightings) for the 3 case study species; yellow-eyed penguin, black-billed gull and white-fronted tern respectively. Here we can see the variation in number of colonies identified from the high survey effort species (fig. a) and the low effort species (fig. c). The eBird records for all species have a hotspot around Otago Peninsula. There are also a higher number of eBird sightings separate from the possible colony sites identified from formal and informal records.

4.3 IBA identification

Finally, the distribution of seabird colonies was assessed against the candidate IBA areas. As Figure 4.5 indicates, the candidate IBAs enclose the majority of identified colonies of trigger species. With these species being well-studied there is sufficient evidence for their current presence and breeding at these sites. All sites for present colonies of yellow-eyed penguin and Stewart Island shag have been proposed as an IBA, although here a number of possible sites were indicated for sooty shearwaters, which are not covered. For most of these sites the records are out-dated and were not picked up in more recent surveys such as by Hamilton (1997) and Jones (2000), suggesting they may no longer be present.

For the inland breeding species, black-fronted terns and black-billed gulls, only sporadic colonies in the more remote locations are not covered by an IBA. All of these sites except for black-fronted terns at the Nevis River were classified as possible sites and so require further investigation before further assessment of the use of IBAs for these sites.

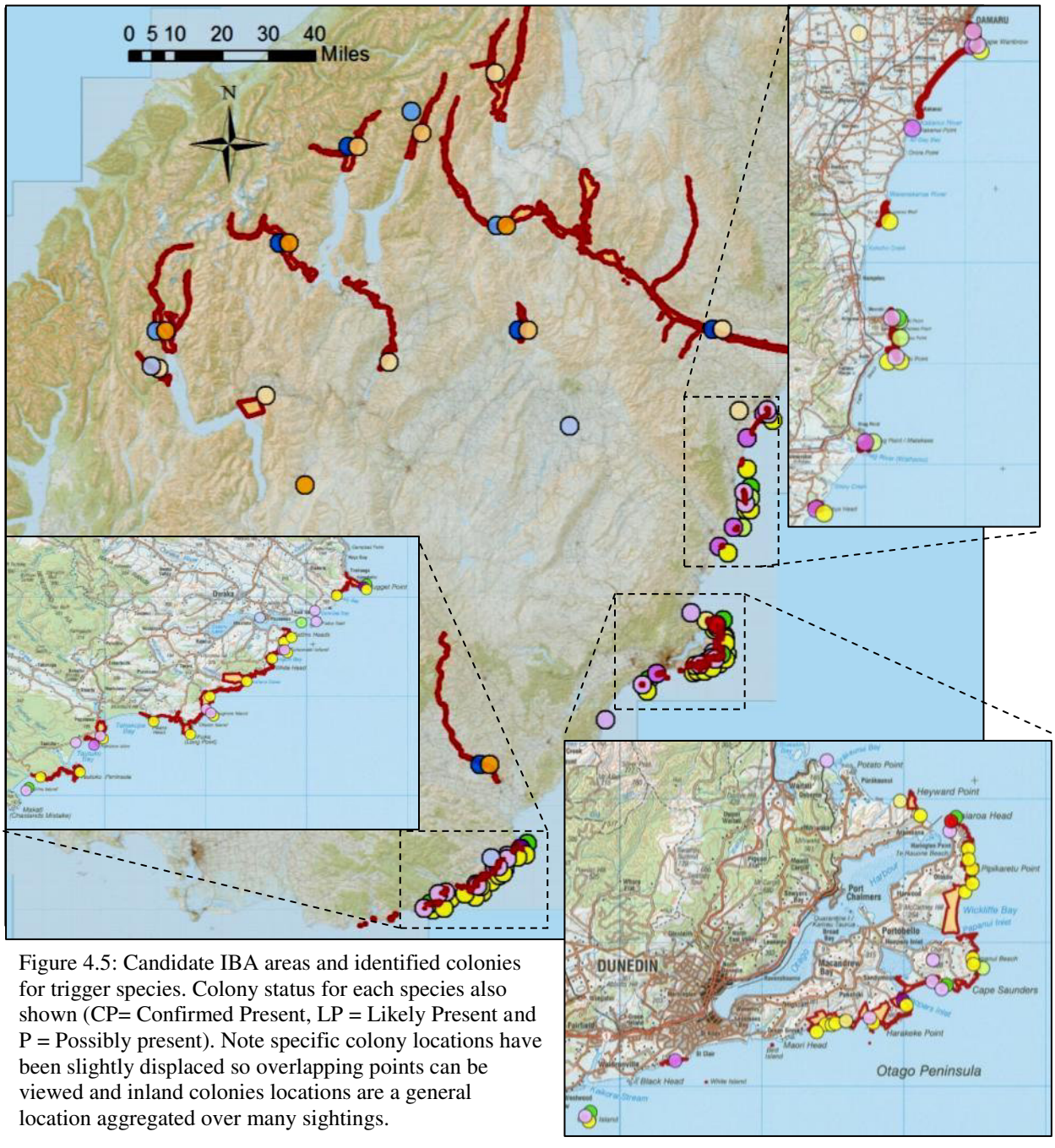


Figure 4.5: Candidate IBA areas and identified colonies for trigger species. Colony status for each species also shown (CP= Confirmed Present, LP = Likely Present and P = Possibly present). Note specific colony locations have been slightly displaced so overlapping points can be viewed and inland colonies locations are a general location aggregated over many sightings.

Legend

IBAs

Species and colony status:

- Black-billed Gull, CP
- Black-billed Gull, LP
- Black-billed Gull, P
- Black-fronted Tern, CP
- Black-fronted Tern, LP
- Black-fronted Tern, P
- N. Royal Albatross, CP
- Stewart Island Shag CP
- Stewart Island Shag, LP
- Stewart Island Shag, P
- Sooty Shearwater, CP
- Sooty Shearwater, LP
- Sooty Shearwater, P
- Yellow-eyed Penguin, CP
- Yellow-eyed Penguin, LP
- Yellow-eyed Penguin, P

5. Discussion

5.1 Data collation methods and limitations

Review of methods and data types

Over 2,000 records were collated from over 70 sources in this project. The vast majority of this data was gathered through in-person meetings and recommendations of other sources of information allowing access to a large trove of unpublished data for this region. Following this, the next major source of data was from the extensive and historic body of published literature available for particular species and areas, such as Taiaroa Head and the Otago Peninsula. Both of these methods focused on formal data types, leading to the dominance of formal over informal records to be gathered. Formal records overall were found to be most valuable in providing long time-series of data, as well as providing accurate counts and more often evidence of breeding. However, if not repeated this information quickly falls out of date.

Informal surveys provided a vital role of filling in and updating gaps left from the formal surveys. Many sites could not have been considered to be still active if any informal records had not confirmed their presence. Further despite only composing 14% of the total number of records, informal records solely identified 29% of all colonies. These included new species at known colony sites and completely new locations such as many of those for inland areas. Here the colony questionnaire was a useful method to collate information, by providing a base for discussion of colonies and encouraged abandoned colonies to also be recorded. However, as this method already listed some colonies this decreased the number of sites that could be potentially identified by participants. The newsbrief, while gathered information from further afield had a relatively low number of responses, likely due to the generality of the appeal for information. Only 20% of colonies were shared between both informal and formal sources. This is lower than has been found in similar studies (50%; Lepczyk 2005), which is likely due to the different methods and lower data collection effort for informal records applied here.

The online bird sighting recording scheme, eBird, was found to have highly variable data between species. Unexpectedly, there was very little data on the more notable charismatic species and more on the less notable, though more common species which were less surveyed by formal sources. The main drawback of eBird is the sightings recorded are not specific to breeding colonies, but rather could be any sighting of a bird feeding or flying. Because of this ambiguity around eBird sightings they cannot themselves be used as records for colonies. However, there are a number of uses for eBird which do not rely on this association. First, as was seen with the black-billed gull and white-fronted tern, there was a high correlation between eBird sightings and identified colonies. This therefore suggests that eBird sightings could be used as an indicator of possible colony locations. For these species the

unique sightings reported through eBird could be investigated to check for further colonies missed from the lower survey effort of these species. Additionally, and perhaps most significantly, the quantity of records for these species indicates that there are available sources and knowledge about these species in that area. As such eBird could be a tool to identify possible sources, which could be used to confirm if sightings are associated with a colony or not.

Limitations of study

Despite the mix of methods used, this review is by no means a full account of seabirds breeding in Otago. The main limitation in this project to gaining further and more accurate records of seabird colonies was a lack of greater integration with local groups. Informal records only composed a very small number of the total dataset, but identified many new colonies in new locations. The existence of these and further unique sites suggested by eBird sightings indicates there is further knowledge and colonies in existence. This is particularly true of areas outside of Dunedin, where there was lower data collation effort. Additionally, greater review of the current knowledge on seabird colonies would likely allow many colony' statuses to be updated and reach a confirmed status. The information gathered here and the proposal of the IBAs provides a good starting point for further discussion and interaction with local organisations and groups.

Specific improvements to data gathering methods included refining the call for data newsbrief that was one of the opening data collation tools. Here it was found that the generality of the newsbrief, asking for information on any colony for any species anywhere wasn't helpful to potential sources in deciding whether information they held was relevant. For instance the value of informal observations was not made clear, with some sources indicating they were not sure if their records were appropriate. As such a clearer guide of species and types of information would have been useful. In this respect, sending out the colony summary was useful as a guide for what information existed and could be updated.

For data analysis, the main limitations surrounded the categorisation of data types and colony status. One issue in data analysis that arose was many of the formal surveys that were used, sourced in turn many of their counts from informal sources. However, here these were still counted as formal data type, creating a bias towards formal over informal survey effort. Additionally the correlation between colony status and data quality is not always true. For some species, such as the red-billed gull, there was a high degree of survey coverage over time at sites. However, because the species can be transient at sites, the zero counts lowered the colony status, although data quality itself remained high. Additionally, all personal communicated data, without a specific date of survey given, was recorded for 2012, which may for some entries be untrue.

There were few issues with the use of data with most contacts happy to provide information without restrictions on use. The only problem encountered was over concerns of that the release of specific site information could endanger species through increasing visits to disturbance sensitive species like yellow-eyed penguin and sooty shearwater. Further, concerns over use of the data once released to the national seabird database as without explicit plans for control of use and access to information being established. As the national seabird colony database is still in planning stages, with management recently agreed between OSNZ and Forest&Bird organisations and as such protocols for data use have not been yet defined. While data was agreed to be presented in a regional format to prevent specific site identification, the lack of specific data use protocol prevented data from being accessed. The establishment of such protocol, with limits on access or presentation of data for all or particular species could allow this data to be added. Such restrictions could be that all uses of data must be checked to the source before it is allowed to be used.

5.2 Distribution of Survey Effort

Total survey effort was distributed fairly evenly across Otago between informal and formal records. The greater Otago Peninsula area held the vast majority of record, which is likely due to it both having a high diversity of seabird species as well as its being the area most familiar to the sources from Dunedin that were targeted. Key sites which stood out as having high survey effort (Taiaroa Head, Nugget Point and Oamaru) were all well-known tourist and wildlife destinations holding charismatic species like the little penguin and northern royal albatross attracting both formal and informal surveys.

The areas with the least survey effort were the inland sites, partly because only few seabirds use this area and only at specific sites like river-bed habitat. However, as data collection did focus more on coastal colonies this may be an under-representation of inland survey effort. The major spatial gaps along the coast, also seen in the eBird data, indicate these sites are likely more due to unsuitable habitat then lack of surveys. There were specific areas where low numbers of records indicated that there might be possible other colonies, such as for many sites in central Otago and the Karitane area.

There was a clear variation in survey effort between species, but this was found to be largely proportional to the management needs of that species. Those most endangered species which would trigger IBAs had the highest survey effort. The main limitation in understanding the state of these species is that the formal records can quickly become out of date. This is the reason why many of the sooty shearwater colonies, which were last formally surveyed in 1997/98 (Jones 2000), do not have a confirmed status.

Species which had a low survey effort were either uncommon in Otago, such as the large pied cormorant and Australasian gannet (Marchant and Higgins 1990; Lalas 1993), or have very little conservation needs such as the kelp gull (Miskelly et al. 2008). For these species, many colonies were only known at sites with high visitation rates for other species or uses, such as Nugget Point. This indicates other colonies may exist in more remote locations.

Interestingly, informal surveys provided much more information on these less common species than formal surveys which focused on the most conservation significant species. In fact very few records of yellow-eyed penguin were provided from informal surveys and none for the northern royal albatross. Likely because these species already have such a good monitoring programme in place that sources did not feel the need to discuss these colonies, and further many of these sites were already included on the colony summary that was distributed. . Other species, such as kelp gull, white-fronted tern, large pied cormorant and Australasian gannet, were recorded more from informal sources than formal. For the white-fronted tern these informal records proved to be critical in providing the majority of information on these species.

The relative value of formal and informal species was emphasised through the case study example. There is a clear benefit of formal surveys in producing accurate and reliable information on species, shown by the yellow-eyed penguin and black-billed gull, which had high proportions of formal survey effort (97 and 86% respectively), had much higher percentages of confirmed colonies (90 and 40%) that the white-fronted tern (18%), with only 12% of records of a formal data. This nevertheless illustrates the importance of informal surveys, in filling the gaps and species which cannot all be covered with formal surveys. With greater work with local groups and further surveys the information on white-fronted terns and other regionally significant but under-surveyed species can be greatly improved. For these species eBird also may be a potential resource to identify possible locations and sources.

5.3 Management Implications

IBA establishment

The high survey effort for the trigger species led to overall a high confidence in the presence of colonies. For these species 47% of colonies could be confirmed as being present or absent. These records supported the current proposed network of IBAs in Otago with the vast majority of trigger species colonies protected by an IBA. Most colonies not covered by an IBA here have a low colony status, indicating that further investigation of the site would be needed before any review of IBAs could be made.

The sooty shearwater had the largest number of colonies (7) outside of an IBA. The last major review for this species lay outside of the last 10 year bracket required for a colony to be confirmed, leading to the relatively low number of confirmed colonies (9%). The black-fronted tern and the black-billed gull were the other trigger species to have colonies not covered by an IBA, but had also had a lower level of colony status, largely due to few records at these often more remote locations. The main exception here is for black-fronted terns at the Nevis River which has both historic and recent (1967-2012) records of nesting (C Wilson pers comm. 2012, J Douglas pers comm. 2012, Child.1975). For many of these low colony status sites, the lower data quality was due to lack of evidence of breeding at sites. With most of the sites recorded for these species sited within their typical breeding habitat braided rivers (O'Donnell 2004, O'Donnell and Hoare 2010), it is largely safe to assume breeding colonies are present, although colonies have been found in atypical habitat (Child, 1986). However, further confirmation of breeding and nesting areas could help ensure IBAs are appropriately drawn to protect these fragile habitats.

Further surveys

Outside of the trigger species, birds that could be considered comparatively under-surveyed are the white-fronted tern, spotted shag, kelp gull and great cormorant. These species had a high number of colonies classified as possible only and many colonies were identified from informal sources only. Additionally the little penguin, although had many more records than these species, can still be considered to be under-surveyed as many of the colony records are now out of date. While the white-faced storm petrel, large pied cormorant and broad-billed prion had the lowest percentage of confirmed colonies, as few or no colonies at all exist in Otago further survey effort for these species would not be worthwhile.

Of greatest significance for further research is the white-fronted tern and little penguin, which are both classed as At Risk (Declining) for New Zealand (Miskelly et al. 2008). The white-fronted tern has only been subject to one survey in the 1990s (Powlesland 1998), putting a high reliance for this current review on informal observations. As many of the records for this species occurs at shared sites with other species, there should be simple for the possible sites to be re-checked and confirmed. However many sources made note that there are probably many more colonies along the Otago coastline, which is also suggested by the eBird records. Comparatively the little penguin had a high degree of survey effort in the 1990s (Dann 1994, Mckinlay 1995, Perriman and McKinlay 1997, Perriman and Steen 2000), but now many of these colonies need to be updated before colonies could be confirmed.

Once IBAs are established, a key aim of the IBA programme is to ensure sites are monitored. This will improve knowledge at the state and trends of species as well as help information management

actions. Birdlife International provides a monitoring framework for all IBAs, which focuses on measuring three key indicators; pressure, state and response (Birdlife International, 2006). Pressure monitoring identifies and measures the main threats to the key populations within IBAs. Monitoring of state involves the health of the bird population as well as habitat, while response indicators involve tracking management and conservation actions taken at the site.

For Otago, the knowledge here provides a starting point for measuring the state of IBAs. Further work will be needed to set the base for pressure and response indicators, as well as fill in the gaps for sites and species states. The identification of IBAs in Otago will help prioritise the monitoring of these sites at this scale, while the gaps identified here could help focus early surveys to fill gaps. This can be achieved through the creation of local conservation groups, which can be specific to each IBA, or perhaps cover numerous as may be needed for the inland IBAs. Linking this monitoring back into the national seabird colony database will help support conservation of seabirds nationally, and further should be integrated into the birdlife world database.

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8. Appendix

Species colony summaries

List of all colonies identified for each species with information on data source and colony status. Colony status designated based on Table 10.1 below. Locations are to the closest named feature and some neighbouring sites have been aggregating together. The number of sources is given and whether these are from a Formal (F) or Informal (In) source. Species are listed in taxonomic orders and then alphabetically by latin names. All locations are listed north to south.

The most recent counts are also provided, the year is provided in brackets if not from the most recent count. Units for counts are:
i = individuals
n = nests
bp = breeding pairs
NR = present, but numbers not recorded.

Table 8: Classification of colonies was based on what was considered necessary quality of information to be confident in defining presence and breeding for establishment of IBAs.

Classification	Criteria
Colony confirmed present	3-4 records, with at least one providing evidence of breeding and one within past 10 years
Colony confirmed absent	>3 records present and most recent 3 or more records indicating absence.
Colony likely present	>2 records, with or without breeding evidence
Colony likely absent	1-3 records present with then 1-3 records recording absence, notes on abandonment (e.g. habitat lost) taken into account
Possible colony	1 record of presence, with or without breeding evidence
Unlikely breeding colony	1 record from unsuitable site or possibly a non-colony record, such as birds flying

Sphenisciformes

Little Penguin
Eudyptula minor

IUCN classification: Not Threatened

New Zealand classification: D. At Risk, D.1. Declining
(Southern Little Penguin, Eudyptula minor minor)

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Confirmed Present	Oamaru Creek	19	1985-2011	149bp	1F	Yes	Oamaru Blue Penguin Trust
	Oamaru Blue Penguin managed colony	21	1985-2011	145bp	2F	Yes	Oamaru Blue Penguin Trust
	Harington Point	4	1970-2012	40n	2F 1In	Yes	Perriman and Steen (2000). L Perriman pers comm., Dann (1994)
	Taiaroa Head	24	1970-2012	325bp	3F 1In	Yes	L Perriman pers comm, Dann (1994), Perriman and McKinlay 1995, Perriman (1997), Perriman and Steen (2000).
	Pilots Beach	8	1992-2012	150i	3F 2In	Yes	Perriman and McKinlay (1995), Perriman (1997), Johannesen et al (2002), KJ Wilson pers comm, Pukekaru Blue Penguin Trust.
	Okia	7	1970-2012	23n (1997)	1F 2In	Yes	Dann (1994), Perriman and Steen (2000), H Lubke pers comm
	Allans Beach	7	1971-2012	8n (1997)	2F 1In	Yes	Dann (1994), Perriman and Steen (2000),

							H Lubke pers comm
	Sandfly Bay	8	1994-2012	6n (1997)	2F 1In	Yes	Dann (1994), Perriman and Steen (2000), H Lubke pers comm
Likely Present	Long Beach	2	1991, 2012	NR	1F 1In	Yes	Dann (1994), D Onley pers comm
	Mapoutahi	2	1991, 2012	6n	1F 1In	Yes	Dann (1994), D Onley pers comm.
	Te pari o Te Mataahua	2	1970, 1990s	NR	1F	Yes	Perriman and Steen (2000).
	Onekapua Point	2	1970-1997	26n	1F	Yes	Perriman and Steen (2000)
	Rerewahine Point	4	1970-1996	59n	1F	Yes	Perriman and Steen (2000)
	Penguin Beach	6	1970-1997	152n	2F	Yes	Dann (1994), Perriman and Steen (2000), H Lubke pers comm
	Otekiho Beach	6	1970-1990s	17n (1994)	2F	Yes	Perriman and McKinlay (1995), Perriman (1997), Perriman and Steen (2000)
	Reids Beach	4	1970-2012	NR	2F 1In	None	Zero counts in 1991 and 1992. Dann (1994), Perriman and Steen (2000), H Lubke pers comm
	Pipikaretu Beach	8	1970-1997	5n (1997)	2F 1In	Yes	Perriman and Steen (2000)
	Ryans Beach	6	1970-1997	5n	2F	Yes	Dann (1994), Perriman and Steen (2000)
	Dicks Bush	2	1970-1990s	NR	1F	Yes	Perriman and Steen (2000).
	Cape Saunders	2	1970, 1990s	NR	1F	Yes	Perriman and Steen (2000).
	Alfred and Cecily Beaches	3	1970-2012	NR	2F 1In	Yes	Perriman and Steen (2000), S Heseltine pers comm.
	Hoopers Inlet	5	1990-1997	5n	1F	Yes	Not continuously

							occupied. Perriman and Steen (2000).
	Sandymount seacave	5	1970-1997	22n	2F	Yes	Dann (1994), Perriman and Steen (2000)
	Harakeke Point (NW Bay)	3	1995-1997	24n	1F	Yes	Perriman and Steen (2000)
	Green Island	3	1985-1992	223 (1991)	2F	Yes	Dann (1994), Hamilton et al. (1997)' (1500 in 1984 by Lalas, BM)
	Taieri Island	3	1991, 1992	NR	2F 1In	Yes	Dann (1994), Hamilton et al (1997), B McKinlay pers comm.
	Nugget Point	2	1985, 1991	8bp	1F	Yes	Dann (1994)
	Mahaka Point	2	1990, 1995	NR	1In	None	F Sutherland pers comm.
Likely Absent	Kakanui	2	1991, 2012	0n	1F 1In	None	Recorded as being wiped out by dogs (J Fyfe pers comm.), Dann (1994)
	Hampden Beach	2	1985, 1991	0	1F	Yes	Dann (1994)
	Katiki Beach	2	1977, 1991	0	1F	None	Dann (1994)
	Shag Point	2	1989, 1991	0	1F	Yes	Dann (1994)
	Stony Creek	2	1981, 1991	0	1F	Yes	Dann (1994)
	Bobbys Head	2	1985, 1991	0	1F	Yes	Dann (1994)
	Onekapua Point (North)	2	1970, 1990s	0	1F	None	Perriman and Steen (2000)
	Te Rauone Beach	2	1970, 1990s	0n	1F	Yes	Perriman and Steen (2000)
	Te Whakarekaiwi	2	1970, 1990s	0	1F	None	Perriman and Steen (2000)
	Papanui Beach	2	1970, 1993	NR	1F	None	Perriman and Steen (2000)
	Papanui Inside spit	2	1970, 1993	0	1F	None	Perriman and Steen (2000)
	Titikoraki	2	1970, 1990s	0	1F	None	Perriman and Steen (2000)
	Boulder Beach	2	1970, 1993	NR	1F	Yes	Perriman and Steen (2000)
Possible	Maukiekie	1	1991	3bp	1F	Yes	Dann (1994)

	Island						
	Kaik, Moeraki	1	1991	13bp	1F	Yes	Dann (1994)
	Katiki Point	1	NR	NR	1In	None	C Lalals pers comm
	Karitane Beach	1	2012	10n	1In	None	D Onley pers comm
	Doctor's Point	1	2012	5n	1In	Yes	D Onley pers comm.
	Potato Point	1	2012	NR	1In	None	J Fyfe pers comm.
	Aramoana (Spit) Beach	1	1991	2bp	1F	Yes	Dann (1994)
	The Chasm	1	2012	NR	1In	None	G Loh pers comm.
	Brighton	1	2012	NR	1In	None	J Fyfe pers comm.
	Wilsher Bay	1	1990	NR	1In	None	F Sutherland pers comm.
	Tautuku Beach	1	1990	NR	1In	None	F Sutherland pers comm.

Yellow-eyed Penguin
Megadyptes antipodes

IUCN classification: Endangered

New Zealand classification: B. Threatened, B.3. Nationally Vulnerable

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Confirmed Present	Bushy Beach	21	1992-2011	5bp	2F	Yes	Jones (2000), YEP Data Summaries*
	Waianakarua Bluff	21	1992-2011	2bp	1F	Yes	YEP Data Summaries
	Katiki Point	21	1992-2012	18bp	1F 1In	Yes	YEP Data Summaries, C Lalas pers comm.
	Katiki Beach	20	1992-2011	2bp	1F	Yes	YEP Data Summaries
	Bobbys Head	20	1992-2011	2bp	1F	Yes	YEP Data Summaries
	Aramoana Beach	20	1992-2011	2bp	1F	Yes	YEP Data Summaries
	Kumo kumo whero (Penguin Beach)	41	1938-2011	10bp	2F	Yes	Moore (2001), YEP Data Summaries
	Reids Beach	30	1936-	4bp	2F	Yes	Moore (2001),

		2011				YEP Data Summaries
Pipikaretu Beach	30	1936-2011	10bp	1F	Yes	Moore (2001), YEP Data Summaries
Ryans Beach	26	1975-2011	4bp	2F	Yes	Moore (2001), YEP Data Summaries
Okia	32	1936-2011	13bp	2F	Yes	Moore (2001), YEP Data Summaries
Fuchsia Gully	20	1992-2011	11bp	1F	Yes	YEP Data Summaries
Papanui Beach	39	1936-2011	16bp	4F	Yes	Moore 2001, Efford et al (1996), McKay et al. (1999), YEP Data Summaries
Alfred and Cecily Beaches	26	1962-2011	20bp	2F	Yes	Moore (2001), YEP Data Summaries
Sandymount	30	1940-2011	6bp	2F	Yes	Moore (2001), YEP Data Summaries
Mid-section	48	1936-2011	15bp	3F	Yes	Efford et al. (1996), YEP Data Summaries
Sandfly Bay	32	1956-2011	9bp	3F	Yes	Efford et al. (1996), Moore (2001), YEP Data Summaries
Boulder Beach (a1)	40	1936-2011	10bp	2F	Yes	Edgar (CSN 1972), Efford et al. (1996), Moore (2001), YEP Data Summaries
Double Bay	33	1982-2011	11bp	2F	Yes	Efford et al. (1996), YEP Data Summaries
Highcliff	29	1962-2011	17bp	3F	Yes	Efford et al. (1996), Moore (2001), YEP Data Summaries
Green Island	20	1992-2011	21bp	1F	Yes	YEP Data Summaries
Nugget Point	39	1940-2012	20bp (2011)	3F 2In	Yes	Efford et al. (1996), Moore (2001), YEP

							Data Summaries, R Schofield pers comm, F Sutherland Pers comm.
	Sandy Bay	20	1992-2011	13bp	1F	Yes	YEP Data Summaries
	Owaka Heads	24	1988-2011	7bp	2F	Yes	Efford et al. (1996), YEP Data Summaries
	Jacks Bay	18	1940-2011	7bp	2F 1In	Yes	Edgar (CSN 1972), Moore (2001), YEP Data Summaries
	Tunnel Rocks	20	1992-2011	2bp	1F	Yes	YEP Data Summaries
	Penguin Bay (Catlins)	24	1939-2011	20bp	2F	Yes	Moore (2001), YEP Data Summaries
	Hinahina Cove	23	1939-2011	14bp	2F	Yes	Moore (2001), YEP Data Summaries
	Purakaunui Bay	5	2007-2011	6bp	1F	Yes	YEP Data Summaries
	Cosgrove Creek	17	1995-2011	12bp	1F	Yes	Efford et al. (1996), YEP Data Summaries
	Pillans Head	5	2007-2011	2bp	1F	Yes	YEP Data Summaries
	Long Point	24	1990-2011	48bp	2F 1In	Yes	Efford et al. (1996), KJ Wilson pers comm, YEP Data Summaries, R Schofield pers comm.
	Mahaka Point	38	1990-2011	6bp	1F 1In	Yes	YEP Data Summaries, F Sutherland pers comm.
	Tautuku Peninsula	15	1997-2011	17bp	1F	Yes	YEP Data Summaries
	Flaxy	5	2007-2011	3bp	1F	Yes	YEP Data Summaries
Confirmed Absent	Otekiho Beach	19	1995-2012	0	IF 1In	None	All records zero counts, YEP Data Summaries
	Dick's Bush	27	1937-	0	2F	Yes	Zero counts

			2011				since 2004, YEP Data Summaries
	Allans Beach	20	1992-2011	0	1F	Yes	Zero counts since 2005, YEP Data Summaries
	Waiparau Head	20	1992-2011	0	1F	None	Counts of zero since 2007, YEP Data Summaries
	Wallace Head	15	1997-2011	0	1F	None	All records zero counts, YEP Data Summaries
	Chaslands Mistake	15	1997-2011	0	1F	None	All records zero counts, YEP Data Summaries
Likely Present	Kaikai Beach	21	1992-2012	0	1F 1In	Yes	Absent for most of 1990s, YEP Data Summaries, H Lubke pers comm.
	Waterfall Bay	18	1993-2011	1bp	1F	Yes	Many zero counts in past decade, YEP Data Summaries
Likely Absent	Beach Road	20	1992-2011	0	1F	Yes	Recent zero counts in 2010 and 2011, YEP Data Summaries
	Shag Point	21	1966-2011	0	1F 1In	Yes	YEP Data Summaries, Edgar (CSN 1972)
	Cape Saunders	5	1937-2012	0	1F 1In	Yes	Moore (2001), D McFarlane pers comm.
	Teflers Bay/ Harakeke Bay	7	1940-2012	0	1F 11n	Yes	Moore (2001), L; Perriman pers comm, B McKinlay pers comm.

* YEP data summaries maintained by DOC on behalf of volunteers, researchers, Penguin Place, the YEP Trust, Katiki Point Penguin Trust and the Departmental staff who have collected the data.

Procellariiformes

Northern Royal Albatross
Diomedea sanfordi

IUCN classification: Endangered

New Zealand classification: D. At Risk, D.4.Naturally Uncommon
(Diomedea epomophora sanfordi)

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Confirmed Present	Taiaroa Head	15	1937-2012	50bp	14F 1In	Yes	Richdale (1942), Robertson (1991), Robertson (1993), Gales (1997), Thomas et al. (2010), L Perriman pers comm.

Fairy Prion
Pachyptila turtur

IUCN classification: Least Concern

New Zealand classification: D. At Risk, D.3. Relict

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Confirmed Present	St Clair Cliffs	6	1990-2012	Present	1In	Yes	Collection of 3 individual sites, Loh (2000).
Likely Present	Wharekakahu Island	2	1989, 2007	NR	1F 1In	Yes	Ward and Munro (1989), G Loh pers comm.
	Green Island	2	1989, 2012	NR	1F 1In	None	Ward and Munro (1989), P Schweigman pers comm.
	Kinakina Island	2	1991, 1996	NR	2In	Yes	J Fyfe pers comm, G Loh pers comm.
Possible Colony	Gull Rocks	1	2000	NR	1F	None	G Loh pers comm.

Broad-billed Prion
Pachyptila vittata

IUCN classification: Least Concern

New Zealand classification: D. At Risk, D.3. Relict

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Possible Colony	Katiki Point	1	NR	NR	1In	None	C Lalas pers comm.

White-faced Storm Petrel
Pelagodroma marina

IUCN classification: Least Concern

New Zealand classification: D. At Risk, D.3. Relict
(New Zealand White-faced Storm Petrel, Pelagodroma marina maoriana)

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Possible Colony Present	Katiki Point	1	NR	NR	1In	None	C Lalas pers comm.

Common Diving Petrel
Pelecanoids urinatrix

IUCN classification: Least Concern

New Zealand classification: D. At Risk, D.3. Relict
(Southern Diving Petrel, Pelecanoids urinatrix chathamensis)

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Possible Colony	Wharekakahu Island	1	1990	NR	1In	None	Evidence of burrows and feathers only, Taylor (2000).

Sooty Shearwater
Puffinus griseus

IUCN classification: Near Threatened

New Zealand classification: D. At Risk, D.1.Declining

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Confirmed Present	Taiaroa Head	15	1992-2012	1200bp	1F 2In	Yes	Clucas et al. (2008), L Perriman pers comm.
	Sandymount	4	1992-2007	18n	2F 1In	Yes	Hamilton et al. (1997), Jones (2000), G Loh pers comm.
	Nugget Point	15	1980-2007	35i	3F 3 1n	Yes	Hamilton et al. (1997), Jones et al (2000), Lyver et al. (2000), F Sutherland pers comm, G Loh pers comm.
	Long Point	5	1997, 2012	40n	2F 3In	Yes	Hamilton et al. (1997), Jones (2000), D McFarlane pers comm, B McKinlay pers comm, R Schofield pers comm.
Likely Present	Oamaru Harbour	2	1997	33n	2F	Yes	Hamilton et al. (1997), Jones (2000)
	Kakanui	3	1994, 1997	18n	3F	Yes	Hamilton et al. (1997), Jones (2000), Lyver et al. (2000).
	Shag Point	3	1980-1997	11n	2F	Yes	Hamilton et al. (1997), Jones (2000)
	Bobbys Head	3	1997, 2012	12n (1997)	2F 1In	Yes	Hamilton et al. (1997), Jones (2000), D McFarlane pers comm.
	Taieri Island	2	1943,198	100n	1F	None	Hamilton et

			0				al. (1997)
	Jacks Island	3	1985, 1992	1162n	2F	Yes	Hamilton et al. (1997), Jones (2000)
	Cosgrove Island	2	1984, 1990	NR	1F, 1In	Yes	Hamilton et al. (1997), F Sutherland pers comm.
	Rainbow Islands	4	1944-1997	NR	1F 1In	None	Hamilton et al. (1997), F Sutherland pers comm.
	Stony Creek	2	1982, 1997	0	1F	None	Jones (2000)
Likely Absent	Bushy Beach	3	1992-2012	143n	2F	Yes	Hamilton et al. (1997), Jones (2000) B McKinaly – major cover removal
	Penguin Beach	2	1950, 1997	0	2F	None	Hamilton et al. (1997), Jones (2000)
	Pipikaretu Point	12	1997	0	2F	None	Hamilton et al. (1997), Jones (2000)
	Okia	2	1950, 2012	0	2F	None	Hamilton et al. (1997), Lyver et al. (2000)
	Goat Island (Rakiriri)	3	1940-2012	0	1F 1In	None	Hamilton et al. (1997), S Heseltine pers comm.
	Quarantine Island	4	1940-2012	0	1F 2In	None	Hamilton et al. (1997), S Broni pers comm, S Heseltine pers comm.
	Pudding Island	3	1940-2012	0	1F 1In	None	Hamilton et al. (1997), S Heseltine pers comm
	Grassy Point	2	1950, 1997	0	2F	None	Hamilton et al. (1997), Jones (2000)
	Titikoraki	2	1950, 1997	0	2F	None	Hamilton et al. (1997), Jones (2000)
	Ohinepuha	2	1950, 1997	0	2F	None	Hamilton et al. (1997), Jones (2000)
	Cape	2	1950,	0	2F	None	Hamilton et

	Saunders		1997				al. (1997), Jones (2000)
	The Chasm	2	1950, 1997	62n	2F	Yes	Hamilton et al. (1997), Jones (2000)
	Double Bay	2	1950, 1997	0	2F	None	Hamilton et al. (1997), Jones (2000)
	Highcliff	2	1950, 1997	0	2F	None	Hamilton et al. (1997), Jones (2000)
	Maori Head	2	1950, 1997	0	2F	None	Hamilton et al. (1997), Jones (2000)
	Lawyers Head	2	1950, 1997	0	2F	None	Hamilton et al. (1997), Jones (2000)
	St Clair Cliffs	2	1997	0	2F	None	Hamilton et al. (1997), Jones (2000)
Possible	Maukiekie Island	2	1944, 1980s	NR	1F	None	Hamilton et al. (1997)
	Katiki Point	1	1997	17n	1F	Yes	Jones (2000)
	Mapoutahi	1	2012	5n	1In	Yes	D Onley pers comm.
	Otekiho Beach	1	2010	46n	1In	None	L Perriman persc omm.
	Mt Charles	1	1950	NR	1F		Hamilton et al. (1997)
	Alfred and Cecilly Beach (adjacent ridge)	1	2012	34n	1In	None	D McFarlane pers comm.
	Wharekakahu Island	1	1985	NR	1F	Yes	Hamilton et al. (1997)
	Sandfly Bay	1	2012	NR	1In	None	H Lubke pers comm.
	Green Island	1	1983	150n	1F	None	Hamilton et al. (1997)
	Cannibal Bay	1	1997	NR	1F	None	Hamilton et al. (1997)
	False Islet	1	1990	NR	1In	None	F Sutherland pers comm.
	Jacks Blowhole/ Tunnel Rocks	1	1992	105n	1F	None	Hamilton et al. (1997)
	Mahaka Point	13	1991-2003	NR	1In	None	Possibly just counts of flying birds, F Sutherland pers comm.
	Wilkie Falls	1	1997	NR	1In	None	Hamilton et

							al. (1997).
	Kinakina Island	1	1996	10n	1In	Yes	Hamilton et al. (1997), G Loh pers comm.

Pelecaniformes

Australasian Gannet
Morus serrator

IUCN classification: Least Concern

NZ classification: E. Not Threatened

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Likely Present	Nugget Point	12	1946-2012	1 bp	1F 2In	Yes	Recent counts have been sporadic, Wodzicki et al (1984), H Lubke pers comm, F Sutherland pers comm.
Possible Colony	Mahaka Point	6	1990-1998	NR	1In	None	F Sutherland pers comm.

Great Cormorant
Phalacrocorax carbo

IUCN classification: Least Concern

New Zealand classification: D. At Risk, D.4.Naturally Uncommon
(Black Shag, Phalacrocorax carbo novaehollandiae)

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Confirmed Present	Dart River	8	1967-2007	3i	1F	Yes	DOC River Survey
Likely Present	Hunter River	7	1969-2010	3i	1F	None	DOC River Survey
	Makarora River	9	1966-2009	2i	1F	None	DOC River Survey
	Matukituki River	8	1971-2011	13i	1F	None	DOC River Survey

	Papatowai	4	1990-1993	NR	4In	None	F Sutherland pers comm.
Possible Colony	Ahuriri River	1	1982	27bp	1F	Yes	Robertson et al. (1983).
	Lake Dunstan	1	2012	NR	1In	None	J Douglas pers comm.
	Nevis River	1	2012	NR	1In	Yes	J Douglas pers comm.
	Stony Creek	1	1978-1983	4n	IF	Yes	Site was abandoned at time due to disturbance, Lalas (1993).
	Teviot River	1	2012	NR	1In	None	C Wilson pers comm.
	Clutha River	1	1985	NR	1F	Yes	Hughey et al. 1986.
	Lake Tuakikoto	1	2012	30i	1In	None	M Thompson (OSNZ Newsletter 2012).
	Maclennan River	1	1991	6i	1In	None	F Sutherland pers comm.
	Lake Wilkie	1	1991	NR	1In	None	F Sutherland pers comm.

Stewart Island Shag
Phalacrocorax chalconotus

IUCN classification: Vulnerable

New Zealand classification: B. Threatened, B.3.Nationally Vulnerable
(Stewart Island Shag, Leucocarbo chalconotus)

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Confirmed Present	Maukiekie Island	18	1962-2012	597n	3F 2In	Yes	Watt (1975), C Lalas (OSNZ News 1985), Lalas and Perriman (2009), Lalas and Perriman (In press), P Schweigmann pers comm, KJ Wilson pers comm.
	Taiaroa Head	42	1957-2012	350bp	2F 1In	Yes	Lalas and Perriman (2009), Lalas and Perriman

							(In press).
	Wharekakau Island	12	1978-2011	120n	1F 1In	Yes	Lalas and Perriman (2009), Lalas and Perriman (In Press), G Loh pers comm.
	Green Island	23	1957-2011	179n	2F	Yes	Watt (1975), Lalas and Perriman (2009), Lalas and Perriman (In press)..
	Kinakina Island	5	1994-2011	58n	1F 2In	Yes	Lalas and Perriman (2009), Lalas and Perriman (In press)., G Loh pers comm, F Sutherland pers comm.
	Nugget Point	6	1992-2012	50bp	1F 2In	Yes	Breeding only began recently - Lalas and Perriman (In press)., F Sutherland pers comm, R Schofield pers comm.
Confirmed Absent	Blanket Bay Beacon	3	1980-1982	3n	1F	Yes	Beacon has been removed - Lalas and Perriman (2009).
	Gull Rocks	7	1966-2007	0n	1F	Yes	Counts made since 1983 recorded zero nests, Lalas and Perriman (2009)
Likely Present	Okahau Point	2	2002-2003	20n	1F	Yes	Lalas and Perriman (2009)
	Triplets	2	2011, 2012	12n (2011)	1F 1In	Yes	Breeding only began recently, Lalas and

							Perriman (In press).
Likely Absent	Seacliff	2	1980, 2011	1n (1980)	1F	Yes	Zero count in 2011 - Lalas and Perriman (In press).
Possible Colony	Shag Point	1	2012	NR	1In	None	H Lubke pers comm. Currently roosting site only – Lalas and Perriman (In press)..
	Otehata	1	2012	NR	1In	None	B Templeton pers comm.

Little Cormorant
Phalacrocorax melanoleucos

IUCN classification: Least Concern

New Zealand classification: D. At Risk, D.4. Naturally Uncommon
(Little Shag, Phalacrocorax melanoleucos brevirostris)

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Confirmed Present	Quarantine Island	3	1992-2012	100n	1F 2In	Yes	Lalas 1993, S Heseltine pers comm, J Fyfe pers comm.
Likely Present	Maukiekie Island	2	1985, 1993	20n	1F	Yes	C Lalas (OSNZ News, 1985), Lalas (1993).
	Taiaroa Head	2	1992, 2012	40bp	1F 1In	Yes	Lalas (1993), L Perriman pers comm.
	Clutha River	2	1992	32n	1F	Yes	Hughey et al (1986), Lalas (1993).
Possible Colony	Kilgours Point	1	2012	NR	1In	None	S Heseltine pers comm.
	Lawyers Head	1	1999	1i	1In	None	G Loh pers comm.
	Green Island	1	1993	10n	1F	None	Lalas (1993)

Spotted Shag
Phalacrocorax punctatus

IUCN classification: Least Concern

New Zealand classification: E. Not Threatened
(Spotted shag, Strictocarbo punctatus punctatus)

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Confirmed Present	Heyward Point	4	1982-1997	90n	1F	Yes	Lalas (1993)
	Taiaroa Head (incl. Harington Point)	9	1977-2012	400bp	1F 2In	Yes	Lalas (1993), KJ Wilson pers comm, L Perriman pers comm.
	Nugget Point	14	1982-2012	100n	1F 1In	Yes	Lalas (1993),R Schofield pers comm, F Sutherland pers comm.
Likely Present	Stony Creek	5	1965-1992	450n	1F 1In	Yes	Edgar (CSN 1972), Lalas (1993)
	Maukiekie Island	2	1996	5n	1F 1In	Yes	C Lalas (OSNZ News 1985), KJ Wilson pers comm.
Possible	Bushy Beach	1	2012	NR	1In	None	H Lubke pers comm
	Katiki Point	1	2012	NR	1In	None	C Lalas pers comm.
	Cornish Head	1	2012	40n	1In	Yes	D Onley pers comm.
	Huriwa reserve	1	2012	6n	1In	Yes	D Onley pers comm.
	Brinns Point	1	2012	10n	1In	Yes	D Onley pers comm.
	Potato Point	1	2012	NR	1In	None	J Fyfe pers comm.
	Kumo Kumo Whero	1	2012	NR	1In	None	H Lubke pers comm.
	Cape Saunders	1	1971	NR	1In	None	KJ Wilson pers comm.
	Maori Head	1	1999	22n	1In	Yes	R Schofield pers comm.
	St Clair Cliffs	1	2007	6n	1In	Yes	G Loh pers comm.
	Tautuku Peninsula	1	1972	NR	1In	None	KJ Wilson pers comm.

	Kinakina Island	1	1996	NR	1In	None	G Loh pers comm.

Large Pied Cormorant
Phalacrocorax varius

IUCN classification: Least Concern

New Zealand classification: B. Threatened, B.3. Nationally Vulnerable
Pied Shag (Phalacrocorax varius varius)

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Possible Colony	Nugget Point	4	1990-1993	0	1In	Yes	F Sutherland pers comm.
	Papatowai	4	1990-1993	NR	1In	None	F Sutherland pers comm.
Unlikely	Sawyer's Bay	1	1982	36bp	1F	None	Marchant and Higgins (1990). Likely misidentification, Lalas (1993).

Charadriiformes

Black-billed Gull
Larus bulleri

IUCN classification: Endangered

New Zealand classification: B. Threatened, B.2.Nationally Endangered

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Confirmed Present	Makarora River	9	1966-2009	303i	1F	Yes	DOC Wanaka River Survey
	Matukituki River	10	1971-2011	142i	2F	Yes	DOC Wanaka River Survey
	Manuherikia River	3	1967-2010	200i	2F 1In	Yes	Child (1975), Schweigman (1991), DOC Wanaka River survey, D Onley pers comm.

	Waitaki River	8	1974-2000	568i	5F	Yes	Robertson et al. (1984), Powlesland (1998), Maloney (1999), P Schweigman pers comm. Perriman and Lalas (2012).
	Clutha River	8	1985-2012	150i (2000)	2F 2In	Yes	Hughey et al. (1986), Powlesland (1998), L Gowans (OSNZ newsletter 2012), J Douglas pers comm.
Likely Present	Hunter River	8	1982-2010	88i	1F 1In	None	DOC Wanaka river survey, J Douglas pers comm.
	Ahuriri River	5	1960-1990	231i	2F	Yes	Robertson et al. (1983), Maloney (1999)
	Dart River	8	1967-2007	90i	1F	None	DOC Wakatipu river survey
Possible Colony	Ranfurly	1	2000	150i	1In	Yes	J Wilson (CSN, 2000)
	Caples River	1	1995	NR	1F	None	P Cromarty, in Cromarty and Smith (1995).
	Otehata	1	2012	NR	1In	None	B Templeton pers comm.
	Pounawea	1	2008	260i	1F	None	R Schofield pers comm.

Red-billed Gull
Larus scopulinus

IUCN classification: Least Concern

New Zealand classification: B. Threatened, B.3. Nationally Vulnerable
Red-billed Gull, Larus novaehollandiae scopulinus

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources

Confirmed Present	Waitaki River	3	1983-2011	2221n	2F	Yes	Robertson et al. (1984), Perriman and Lalas (2012).
	Katiki Point	8	1992-2011	317n	7F 1In	Yes	Perriman and Lalas (2012), C Lalas pers comm.
	Karitane Beach Islets	6	2007-2011	114n	1F	Yes	Perriman and Lalas (2012)
	Karitane Peninsula	6	2001-2011	152n	1F	Yes	Counts of zero from 2008-2010, Perriman and Lalas (2012)
	Doctors Point	9	2001-2012	20n	1F 4In	Yes	Absent from 2007-2009. OSNZ Newsletter (2010), C&C Weston (OSNZ Newsletter, 2012), Perriman and Lalas (2012), D Onley pers comm, B McKinlay pers comm.
	Taiaroa Head	9	1963-2012	2000bp	2F 1In	Yes	Gurr and Kinsky (1965), Perriman and Lalas (2012), L Perriman pers comm.
	Reids Beach	6	1992-2007	153n	1F	Yes	Perriman and Lalas (2012)
	Wharekakahu Island	8	1962-2012	50n (2011)	2F 2In		Gurr and Kinsky (1965), Perriman and Lalas (2012), G Loh pers comm, H Lubke pers comm.
	Gull Rocks	5	1992-2011	50n	1F	Yes	Perriman and Lalas (2012)
	Lawyers Head	8	1999-2012	Present (70n 2011)	1F 3In	Yes	Perriman and Lalas (2012), G Loh pers comm, B

							McKinlay pers comm, C&C Weston (OSNZ Newsletter 2012),
	Bird Island	8	1992-2011	15n	1F 1In	Yes	Perriman and Lalas (2012)
	Nugget Point	11	1965-2012	587bp	2F 2In	Yes	Gurr and Kinsky (1965), Perriman and Lalas (2012), R Schofield pers comm, F Sutherland pers comm.
Confirmed Absent	Heyward Point Islet	7	1992-2011	0n	1F	Yes	Absent since 2007, Perriman and Lalas (2012)
	Onekapua Point	9	1950-2011	0n	3F	Yes	Gurr and Kinsky (1965), Mills (1973), Perriman and Lalas (2012)
	Rerewahine Point	11	1959-2011	0n	2F	Yes	Zero counts since 2007, Gurr and Kinsky (1965), Perriman and Lalas (2012).
	Pipikaretu Point	7	1992-2011	0n	1F	Yes	Presence of breeding colony only recorded in 2001, Perriman and Lalas (2012).
	Te Whakarekaiwi	7	1992-2011	0n	1F	Yes	Presence only recorded in 2001, Perriman and Lalas (2012).
	Quarantine Island	8	1992-2011	0n	1F	Yes	Only record of breeding colony present in 2001, Perriman and Lalas (2012).
	Maori Head	6	2001-2011	0n	1F	Yes	Zero counts from 2009-

							2011, Perriman and Lalas (2012).
	Green Island	6	1992-2011	0n	1F	Yes	Absent from 2009, Perriman and Lalas (2012).
Likely Present	Maukiekie Island	4	1992-2011	49n	1F	Yes	Zero counts in 1992 and 2001, Perriman and Lalas (2012).
Likely Absent	Anderson's Lagoon	4	1992-2011	0n	1F	Yes	Presence only recorded in 2001, Perriman and Lalas (2012).
	Otehata	5	1992-2011	0n	1F	Yes	Zero counts in 2010 and 2011, D Onley pers comm.
	Sandymount	6	1962-2011	0n	1F	Yes	Colony presence only recorded in 1962 and 2007, Gurr and Kinsky (1965), Perriman and Lalas (2012).
Possible Colony	Hopkins River	1	1984	100n	1F	Yes	Pierce (1984).
	Shag Point	8	1992-2012	274n (2011)	1F 1In	Yes	Six zero counts from 1992 to 2010, Perriman and Lalas (2012), D Onley pers comm.
	Hawksbury Lagoon	1	2012	25n	1In	Yes	D Onley pers comm.
	Huriwa Reserve	1	2012	10n	1In	Yes	D Onley pers comm.
	Green Point	1	1950	NR	1F	Yes	Mills (1973)
	Potato Point (Purakanui)	1	1963	80bp	1In	None	Gurr and Kinsky (1965)
	Sandfly Bay	1	1950	NR	1F	None	Gurr and Kinsky (1965)
	Teflers Bay	1	1962	NR	1F	None	Gurr and Kinsky (1965)
	St Clair Cliffs	7	1992-2011	120n	1F	Yes	Presence only recorded in 2011, Perriman and

							Lalas (2012).
	Black Head	4	1992-2011	280n	1F	Yes	Presence only recorded in 2011, Perriman and Lalas (2012).
	Brighton	1	2012	NR	1In	None	D Onley pers comm.
	False Islet	1	2012	NR	1In	None	R Schofield pers comm.
	Kinakina Island	1	1996	NR	1In	None	G Loh pers comm.

Kelp Gull
Larus dominicanus

IUCN classification: Least Concern

New Zealand classification: E. Not Threatened
(Southern Black-backed Gull, Larus dominicanus dominicanus)

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Confirmed Present	Matukituki River	8	1971-2011	543i	1F	Yes	DOC Wanaka river survey.
	Hunter River	7	1969-2010	767i	1F	None	DOC Wanaka river survey
	Nugget Point	8	1984-2012	27i	3In	Yes	R Schofield pers comm, F Sutherland pers comm, KJ Wilson pers comm,
Likely Present	Waitaki River	12	1974-2000	392i	2F	None	Maloney (1999), P Schweigman pers comm
	Makarora River	10	1966-2009	199i	2F	None	Child (1981), DOC Wanaka river survey.
	Ahuriri River	4	1960-1990	507i	2F	Yes	Robertson et al.(1983), Maloney (1999).
	Dart River	8	1967-2007	90i	1F	None	DOC Wakatipu river survey.
	Manuherikia River	2	1991, 2010	50bp	1F 1In	None	Schweigman (1991), DOC Wanaka, D Onley pers comm.

	Old Man Range	2	1967, 2012	NR	1F 1In	None	Child (1975), C Wilson pers comm.
	Shag Point	2	2012	NR	2In	None	H Lubke pers comm, D Onley pers comm.
Possible Colony	Hidden Lake	1	2012	NR	1In	Yes	J Douglas pers comm.
	Fraser River	1	2012	NR	1In	None	J Douglas pers comm.
	Katiki Point	1	2012	NR	1In	None	C Lalas pers comm.
	Tarapuke Creek	1	1984	NR	1In	Yes	KJ Wilson pers comm.
	Teviot River	1	2012	NR	1In	Yes	J Douglas pers comm.
	Hawksbury Lagoon	1	2012	5n	1In	Yes	D Onley pers comm.
	Merton arm (Waikouaiti River)	1	2012	200n	1In	Yes	D Onley pers comm.
	Huriwa Reserve	1	2012	2n	1In	Yes	D Onley pers comm.
	Blueskin Bay	1	2012	60n	1In	Yes	D Onley pers comm.
	Mapoutahi	1	2012	2n	1In	Yes	D Onley pers comm.
	Doctors Point	1	2012	3n	1In	Yes	D Onley pers comm.
	Taiaroa Head	1	2012	50bp	1In	Yes	L Perriman pers comm.
	Pilots Beach	1	2012	NR	1In	None	H Lubke pers comm.
	Quarantine Island	1	2012	50bp	1In	None	S Heseltine pers comm.
	Cape Saunders	1	1971	20i	1In	None	KJ Wilson pers comm.
	The Chasm	1	2012	NR	1In	None	G Loh pers comm.
	St Clair cliffs	1	2000	NR	1F	None	Loh (2000).
	Green Island	1	2012	NR	1In	None	B McKinlay pers comm.
	Lake Waipori	1	1995	NR	1F	None	J Steven, in Cromarty and Scott (1995).
	Taieri Island	1	2012	NR	1In	None	B McKinlay pers comm.
	Clutha River	1	1985	NR	1F	Yes	Hughey et al. (1986).

	Lake Tuakikoto	1	2012	NR	1In	None	M Thompson (OSNZ Newsletter 2012)
	False Islet	1	2012	NR	1In	None	R Schofield pers comm.
	Mahaka Point	1	1994	NR	1In	None	F Sutherland pers comm.

Black-fronted Tern
Sterna albostriatus

IUCN classification: Endangered

New Zealand classification: B. Threatened, B.2. Nationally Endangered (Black-fronted Tern, Chlidonias albostriatus)

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Confirmed Present	Matukituki River	8	1971-2011	73i	1F	Yes	DOC Wanaka river survey
	Dart River	9	1967-2010	27n	1F	Yes	DOC Wakatipy river survey
	Nevis River	3	1967, 2012	NR	1F 2In	Yes	Child (1995 – in O'Donnell and Hoare (2010)), J Douglas pers comm, C Wilson pers comm.
	Waitaki River	7	1960-2005	633i	6In	Yes	Robertson et al (1983, 1984), OSNZ survey (1974, 2000), Maloney (1999), Boffa Miskell (2006 – in O'Donnell and Hoare (2010)).
	Clutha River	4	1985-2012	12i (1995)	1F 2In	Yes	Hughey et al. (1986), J Douglas pers comm, C Wilson pers comm.
Likely Present	Hopkins River	2	1962, 1994	21i	2F	None	Data from O'Donnell and Hoare (2010).
	Ahuriri	4	1960-	520i	2F	None	Lalas (1979),

	River		1990		1In		Robertson et al. (1983), Maloney (1999)
	Hunter River	9	1969-2010	127i	1F 2In	None	DOC Wanaka river survey (2010), J Douglas pers comm, C Wilson pers comm.
	Makarora River	9	1966-2009	108i	1F	None	DOC Wanaka river survey (2009).
	Manuherikia River	12	1967-2012	0	3F 2In	Yes	Child (1975), Schweigman (1991), DOC Wanaka river survey (2011), D Onley pers comm, C Wilson pers comm.
	Lake Dunstan	2	2000, 2012	NR	2In	None	G Chance (CSN 2000), J Douglas pers comm.
Possible Colony Present	Caples River	1	2000	8i	1F	None	P Cromarty in, Cromarty and Scott (1995)
	Lower Shotover River	1	1996	NR	1F	None	DOC Wakatipu river survey (1996)
	Kakanui River	1	1983	68i	1F	None	Robertson et al. (1984).
	Colour Burn, Pisa Range	1	1986	50i	1F	Yes	Child (1986)

Caspian Tern
Sterna caspia

IUCN classification: Least Concern

New Zealand classification: B. Threatened, B.3.Nationally Vulnerable (Caspian Tern, Hydropogne caspia)

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Likely Present	Ahuriri River	4	1982-1990	6i	4F	Yes	Robertson et al. (1983), Pierce (1984), Maloney (1999)

	Waitaki River	5	1960-2000	2bp	4F 1In	Yes	Robertson et al (1984), Pierce (1984), Maloney (1999), OSNZ (CSN 2001).
Possible Colony	Hopkins River	1	1984	1n	1F	Yes	Pierce (1984).

White-fronted Tern
Sterna striata

IUCN classification: Least Concern

New Zealand classification: D. At Risk, D.1. Declining
White-fronted Tern (Sterna striata striata)

Colony Status	Location	Number of records	Record span	Latest count	Number of sources	Evidence of breeding	Notes/Sources
Confirmed Present	Kaitiki Point	4	1995-2012	120n (1997)	1F 1In	Yes	Zero counts in 1995 and 1996, Powlesland (1998), C Lalas pers comm.
	Doctors Point	5	1996-2012	10n	1F 4In	Yes	Powlesland (1998), OSNZ (Newsletter Nov 2010), C&C Weston (OSNZ Newsletter Feb 2012), H Lubke pers comm, B McKinlay pers comm.
	Lawyers Head	6	1995-2012	19i (1999)	1F 4In	Yes	Powlesland (1998), C&C Weston (OSNZ Newsletter Feb 2012), G Loh pers comm, H Lubke pers comm, B McKinlay pers comm.
Likely Present	Waitaki River	6	1983-2000	182i	3F	Yes	OSNZ (1974, 2000), Robertson et al. (1984), Powlesland (1998).

	Long Beach	2	1995-1996	32n	1F	Yes	Powlesland (1998).
	Aramoana Mole	4	2012	1000i	4In	Yes	Conflicting records, both presence and absence recorded in 2012. Gowans (OSNZ Newsletter 2012), S Heseltine pers comm, H Lubke pers comm, B McKinlay pers comm.
	Port Chalmers	2	2012	300n	2In	None	S Heseltine pers comm, D Onley pers comm.
	Nugget Point	7	1990-2012	50i	1In	None	F Sutherland pers comm.
	Papatowai	4	1990-1993	NR	1In	None	F Sutherland pers comm.
	Mahaka Point	5	1990-1995	NR	1In	None	F Sutherland pers comm.
Possible	Shag Point	1	2012	NR	1In	None	J Fyfe pers comm
	Huriwa Reserve	1	2012	10n	1In	Yes	D Onley pers comm.
	Goat Island	1	2012	NR	1In	None	H Lubke pers comm.
	Haraheke Point	1	2007	90i	1In	None	G Loh pers comm.
	St Kilda rocks	1	2010	15bp	1In	Yes	P Sorrell pers comm.
	Tokomariro River	1	2012	NR	1In	None	D Onley pers comm.
	False Islet	1	1990	NR	1In	None	F Sutherland pers comm.