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| **IN THE MATTER** | of the Resource Management Act 1991 ("RMA") |
| **AND** | |
| **IN THE MATTER** | of Coastal Permit Application No:2010.198 by Port Otago Limited |
| **AND** | |
| **IN THE MATTER** | of a submission of the Royal Forest and Bird Protection Society Inc (**Forest and Bird**) Dunedin Branch |

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Evidence of Derek James Onley: Ornithologist on behalf of Forest and Bird, Dunedin Branch dated 11 April 2011

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1. I am Derek James Onley, ornithologist and illustrator. I studied Geography at Cambridge University, then after a short spell at the British Trust for Ornithology, I worked at the Edward Grey Institute at Oxford where my main task was to look after long term studies of passerines in Wytham Wood and seabirds on Skokholm Island. I came to New Zealand in the 1970s where I have done a wide range of jobs from farming and fishing to ornithological work both in the field and museum. Studies of Albatrosses, Petrels and forest birds have taken me to many parts of New Zealand including Campbell and Poor Knights Islands and the Chathams. I am a member of the Ornithological Society of New Zealand and have been a member of their council and various committees.

2. I have been living in the coastal Otago area for nearly 25 years. Over the past 15 years I have illustrated guides and handbooks to New Zealand and Australian birds and illustrated and co-authored works on seabird bi-catch and the Albatrosses, Petrels and Shearwaters of the world for publishers and organisations in Europe and North America as well as Australasia. More recently I have advised on bird interactions with wind turbines and water management in Otago and Southland and am involved in several conservation related projects on birds and habitats both locally and in Paraguay.

3. I have been engaged by the Dunedin Branch of the Royal Forest and Bird Protection Society to present evidence on the seabirds found at A0 and their

ecological and conservation status and the potential impact of the consent application 2011:198 on seabird populations.

4. I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Consolidated Practice Note 2006 and I agree to comply with it.

5. There are two main points that I will make:

1) The sea off the Otago coast in and adjacent to the disposal site A0 is important to a wide range of internationally significant seabirds.

2) Data on the these birds' ecology and habitat is inadequate to make informed projections on the effect of disposal of dredge material at A0.

**Marine species**

6. There has been no consistent, systematic sampling of seabirds at sea in New Zealand. The following list for the coastal region from the Otago Peninsula north to Karitane (table 1) has been compiled from a wide range of sources including at sea and land based observations carried out by both amateur and professional biologists and ornithologists. These are listed in appendix 1.

7. Thirty four species of seabirds have been recorded at sea in or adjacent to disposal site A0; 22 Procellariformes (Albatrosses, petrels and shearwaters), 2 penguins, 2 shags, 2 skuas, 3 gulls, 2 terns and the gannet. See table 1. Note that Wandering Albatross and Cape Pigeon have two possible assessments because the records do not distinguish between similar species and subspecies with differing status.

## 8. Table 1 Species recorded at sea in or adjacent to disposal site A0.

| Common name | Scientific name | Status | Threat Rank |
|---|---|---|---|
| Wandering Albatross | Diomedea sp | Endemic or Migrant | At Risk Naturally Uncommon or Threatened overseas |
| Royal Albatross | Diomedea sp | Endemic | At Risk Naturally Uncommon |
| Southern Royal Albatross | Diomedea epomophora | Endemic | At Risk Naturally Uncommon |
| Northern Royal Albatross | Diomedea sanfordi | Endemic | At Risk Naturally Uncommon |
| Shy Mollymawk | Thalassarche cauta | Endemic | At Risk Declining |
| Salvin's Albatross | Thalassarche salvini | Endemic | Nationally Vulnerable |
| Black-browed Mollymawk | Thalassarche melanophris | Native | Coloniser |
| Campbell Mollymawk | Thalassarche impavida | Endemic | At Risk Naturally Uncommon |
| Buller's Mollymawk | Thalassarche bulleri | Endemic | At Risk Naturally Uncommon |
| Southern Giant Petrel | Macronectes giganteus | Native | Secure overseas |
| Northern Giant Petrel | Macronectes halli | Native | At Risk Naturally Uncommon |
| Cape Pigeon | Daption capense | Native | At Risk Naturally Uncommon or Secure overseas |
| White-chinned Petrel | Procellaria aequinoctialis | Native | At Risk Declining |
| Grey Petrel | Procellaria cinerea | Native | At Risk Declining |
| Fairy Prion | Pachyptila turtur | Native | At Risk Relict |
| Broad-billed Prion | Pachyptila vittata | Native | At Risk Relict |
| Sooty Shearwater | Puffinus griseus | Native | At Risk Declining |
| Hutton's Shearwater | Puffinus huttoni | Endemic | At Risk Declining |
| Fluttering Shearwater | Puffinus gavia | Endemic | At Risk Relict |
| Buller's Shearwater | Puffinus bulleri | Endemic | At Risk Naturally Uncommon |
| Short-tailed Shearwater | Puffinus tenuirostris | Migrant | Secure overseas |
| Great Shearwater | Puffinus gravis | Migrant | Secure overseas |
| Diving Petrel | Pelecanoides urinatrix | Native | Not Threatened |
| Little Blue Penguin | Eudyptula minor | Native | At Risk Declining |
| Yellow-eyed Penguin | Megadyptes antipodes | Endemic | Nationally Vulnerable |
| Australasian Gannet | Morus serrator | Native | Not Threatened |
| Stewart Island Shag | Leucocarbo chalconotus | Endemic | Nationally Vulnerable |
| Spotted Shag | Stictocarbo punctatus | Endemic | Not Threatened |
| Brown Skua | Catharacta skua | Native | At Risk Naturally Uncommon |
| Arctic Skua | Stercorarius parasiticus | Migrant | Secure overseas |
| Black-backed Gull | Larus dominicus | Native | Not Threatened |
| Red-billed Gull | Larus novaehollandiae | Native | Nationally Vulnerable |
| Black-billed Gull | Chroicocephalus bulleri | Endemic | Nationally Endangered |
| Black-fronted Tern | Chlidonias albostriatus | Endemic | Nationally Endangered |
| White-fronted Tern | Sterna striata | Endemic | At Risk Declining |

9. This list differs considerably from that presented by the applicant (Affidavit of Paul Sagar18.2, table 1) Sagar identified 14 coastal species with "special conservation status". Common to both our records are 11 species; Black-fronted tern, Black-billed Gull, White-fronted tern, Red-billed Gull, Yellow-eyed Penguin, Stewart Island Shag, Hutton's Shearwater, Sooty Shearwater, Southern (little) Blue Penguin, NZ Black-browed Mollymawk (Campbell Mollymawk) and Northern Royal Albatross.

10. Of the species with "special conservation status", 3 more, Grey-headed Mollymawk, Flesh-footed Shearwater and Erect-crested Penguin are included in their list and not mine and 12 or 13 species present in my list are absent from theirs: Buller's Shearwater, Fluttering Shearwater, Fairy & Broad-billed Prions, Grey Petrel, White-chinned Petrel, Northern Giant Petrel, Buller's Mollymawk, Salvin's Mollymawk, Shy Mollymawk, Southern Royal Albatross and Wandering Albatross (unidentified to species, both the NZ Wandering Albatross, D. antipodensis from Auckland or Antipodes Islands and the circumpolar Snowy Albatross, D exulans are possible).

11. How did this considerable difference come about? Could my dozen extra species, almost twice the Sagar total, be attributed perhaps to local contacts and more recent work? All the species missing from the applicant's list are mentioned in the published references, ebird and the local OSNZ newsletter, the first accessible to any one familiar with the various ways of academic publishing and the latter two being freely available on the OSNZ website.

One can only conclude that the applicant's research was far from rigorous and lacked local knowledge of the site.

12. I could not find the Grey-headed Mollymawk and Flesh-footed Shearwater records, though both are possible; Grey-headed is circumpolar in sub-antarctic waters and breeds on NZ sub-antarctic Islands and has been found ashore in a less than healthy state in Southland on several occasions. Flesh-footed is a northern NZ breeder that moves south like Buller's Shearwater especially in the autumn. The discrepancy shows the importance of providing references for source data.

13. The other record of Erect-crested Penguin illustrates that it is of little value to compile a list of all the birds seen in an area, look at their status and highlight those that are rare or of some conservation value. An Erect-crested Penguin in Otago is well outside its usual range and occurs just once or twice a year at most. Although it is of considerable conservation concern in its range, it hardly warrants a mention when trying to assess the importance of this area. We could have included Fiordland & Snares Crested and even the Royal Penguin that was standing around at the harbour entrance last week (and which my Oxford twitcher friend dipped out on – see below) but have not done so because they can easily draw attention away from the important issues. Similarly in my list I would not place much emphasis on the few records of Buller's shearwater and single records of Short-tailed and Great shearwaters, though would caution that with all pelagic species (Albatrosses, Petrels and shearwaters etc) the data is sparse and regular monitoring may reveal considerably more. It is interesting to note in this respect the

observation of yet more Great Shearwaters, an Atlantic species, in the past month or so off the coasts of Australia and New Zealand. Something unusual appears to be happening with this species, illustrating the changeable nature of bird distribution and the importance of regular, systematic monitoring.

14. Gathering and assessing baseline data is important and should be done rigorously. There is evidence that the applicant has not done so.

**Which species are important?**

15. I was out at the end of the Aramoana Mole last Tuesday morning in a keen sou-wester, with an equally keen ornithologist from Canada. With our Leica binoculars and telescopes we could see many kilometres out to sea and the view was filled with a constant, wheeling passage of titi (sooty shearwaters), albatrosses, mollymawks, terns, gulls & shags. He went away, back to a winter in the Great Lakes where a single seagull is about as much ornithological excitement you can expect, immensely impressed by the spectacle, the richness and productiveness of the sea. And very pleased that he could tick off 6 New Zealand species that he could see no where else in the world. He thought every species out there was important and well worth looking after.

16. The Department of Conservation and Birdlife International are somewhat less easily impressed and they have developed criteria to assess the conservation status of each species and the importance of any area that they inhabit.

17. The latest criteria and species assessments for New Zealand are set out in Miskelly et al 2008 and Hitchmough 2007. The conservation status of the species recorded in and around A0 are given in Table 1. Table 2 ranks the species based upon their status in NZ (endemic, native etc) their threat state and their occurrence in the coastal seas – the species of most concern at the top. Note that Wandering Albatross and Cape Pigeon have two possible assessments because the records do not distinguish between similar species and subspecies with differing status.

**Table 2 The species ranked by threat status and sightings at sea at and adjacent to A0**

| Common name | Status | Threat Rank | Records | max birds | Peak month |
|---|---|---|---|---|---|
| Black-billed Gull | Endemic | Nationally Endangered | 20 | 5000 | 2 |
| Black-fronted Tern | Endemic | Nationally Endangered | 19 | 312 | 4 |
| Red-billed Gull | Native | Nationally Vulnerable | 2 | 3326 | 3 |
| Stewart Island Shag | Endemic | Nationally Vulnerable | 3 | 322 | 3 |
| Salvin's Albatross | Endemic | Nationally Vulnerable | 19 | 40 | |
| Yellow-eyed Penguin | Endemic | Nationally Vulnerable | 2 | 18 | 3 |
| Sooty Shearwater | Native | At Risk Declining | 36 | 6000 | 10 |
| White-fronted Tern | Endemic | At Risk Declining | 21 | 4000 | 3 |
| Hutton's Shearwater | Endemic | At Risk Declining | 14 | 278 | 2 |
| Shy Mollymawk | Endemic | At Risk Declining | 34 | 245 | 3 |
| White-chinned Petrel | Native | At Risk Declining | 8 | 15 | 1 |
| Little Blue Penguin | Native | At Risk Declining | 3 | 6 | 3 |
| Grey Petrel | Native | At Risk Declining | 1 | 1 | 10 |
| Fairy Prion | Native | At Risk Relict | 11 | 1000 | 10 |
| Broad-billed Prion | Native | At Risk Relict | 1 | 1000 | 10 |
| Fluttering Shearwater | Endemic | At Risk Relict | 4 | 30 | 10 |
| Cape Pigeon | Native or Migrant | At Risk Naturally Uncommon or Secure overseas | 9 | 143 | 3 |
| Buller's Albatross | Endemic | At Risk Naturally Uncommon | 33 | 105 | |
| Southern Royal Albatross | Endemic | At Risk Naturally Uncommon | 4 | 20 | 10 |
| Northern Giant Petrel | Native | At Risk Naturally Uncommon | 23 | 10 | 10 |
| Northern Royal Albatross | Endemic | At Risk Naturally Uncommon | 3 | 6 | 3 |
| Wandering Albatross | Endemic or Migrant | At Risk Naturally Uncommon or Threatened overseas | 5 | 4 | 1 |
| Buller's Shearwater | Endemic | At Risk Naturally Uncommon | 2 | 3 | 5 |
| Brown Skua | Native | At Risk Naturally Uncommon | 1 | 1 | 10 |
| Campbell Mollymawk | Endemic | At Risk Naturally Uncommon | 1 | 0 | 10 |
| Spotted Shag | Endemic | Not Threatened | 3 | 2000 | 3 |
| Black-backed Gull | Native | Not Threatened | 3 | 1933 | 3 |
| Australasian Gannet | Native | Not Threatened | 29 | 59 | 1 |
| Diving Petrel | Native | Not Threatened | 3 | 1 | 3 |
| Black-browed Mollymawk | Native | Coloniser | 4 | 2 | 10 |
| Arctic Skua | Migrant | Secure Overseas | 12 | 27 | 1 |
| Southern Giant Petrel | Migrant | Secure Overseas | 6 | 2 | 10 |
| Short-tailed Shearwater | Migrant | Secure Overseas | 1 | 1 | 10 |
| Great Shearwater | Migrant | Secure Overseas | 1 | 1 | 10 |

18. On the basis of the threat ranking, the long wavering lines of Spotted Shags that I saw off the Aramoana Mole last Tuesday with my friend barely rate a mention, while the constant stream of titi (sooty shearwater) rate better than the shags but not as well as the 30 or so endemic Black-fronted terns returning from out at sea, beating against the rising westerly.

**Observation Problems**

19. Observations at sea are difficult. Seasickness, or the fear of it, is an under-reported limitation to the gathering of good data on seabird distribution. Also birds vary in their visual prominence. It is pretty obvious that 1 record of a penguin does not contribute the same to our understanding of penguin biology as the sighting of 1 albatross – you have to be virtually swimming with a penguin to be aware of it while you can see an albatross miles away. The conspicuousness of other species range between these extremes and one must be extremely wary of comparative assessments between species. That count of fifty Shy Mollymawk, twenty Stewart Island Shags and one Yellow-eyed Penguin means little without interpretation.

20. In addition one has to be aware that many species may move through an area on migration. For example black-billed gulls and black-fronted tern move from inland to the Otago coast in January and February but may then disperse further northwards. Those 30 young terns at Aramoana in the third week in January may not be the same ones as those in February. Assessing the importance of an area to a species as a simple extrapolation from survey counts may not come up with an accurate measure of the proportion of the

population that use the site. Without some form of marking or tracking we are unlikely to be able to identify individuals or use recapture/sighting methods to come to a satisfactory estimate.

**The Importance of the Seas off Dunedin**

21. The criteria to assess the importance of an area (determine Important Bird Areas (IBAs)) are set out in Marine Important Bird Areas for New Zealand, a report for the Royal Forest and Bird Protection Society by Waugh et al., in press. and Bennun et al 2006.

22. Criteria that are relevant to this report are :

i) The site regularly holds significant numbers of a globally threatened species, or other species of global conservation concern.

ii) The site is known or thought to hold, on a regular basis, 1% of a bio-geographic population of a congregatory waterbird species.

iii) The site is known or thought to hold, on a regular basis, 1% of the global population of a congregatory seabird or terrestrial species.

iv) The site is known or thought to hold, on a regular basis, 20,000 waterbirds or 10,000 pairs of seabird of one or more species.

23. The Waugh et al assessment of the importance of the Otago Coast is "high" and they recommend it be part of a Marine IBA extending around much of the coast of New Zealand and all its offshore islands. Their conclusions included reference to most of the species of conservation concern that my compilation of local observations found in and around the disposal area A0 and make

particular reference to the colonies of Stewart Island shags and yellow-eyed penguins.

24. For example, using the records I compiled (table 1) the area could be designated an IBA on several counts. In late summer an autumn it can hold up to 20% of the endangered endemic Black-billed gull as the 5000 roosting and feeding out at sea from Karitane in February 2008 and 1500-2000+ in April 2009 & 2010 indicate.

**Figure 1 Part of the flock of 5000 Black-billed Gulls at Karitane, February 2008.**

25. Even titi, with an estimated NZ population of more than 20 million are considered significant as over 400/min have been observed passing along the coast. That is 24,000 visible birds an hour, not an unusual occurrence in both spring and autumn.

**The Sea as Seen by Birds – Food Sources and Choice.**

26. Seabirds are very mobile; penguins somewhat less than titi. This mobility is often used to claim that disturbance, be it dogs, dune buggies, jet skis, polders, barrages, dredging and dumping of spoil at sea, is unimportant because birds can always simply fly off elsewhere. Even Sagar claims that a wide foraging range enables birds to easily move and by inference, feed as

effectively elsewhere, outside an area of disturbance. Nowadays it is accepted that this is rarely the case with specialist wetland birds or those that need tall native forest (bittern and mohua). However, generally speaking, New Zealand is considered to be an empty greenish place devoid of sprawling suburbs, habitat a-plenty for displaced birds; the sea even more so than the land.

27. But to a bird the sea is far from a large dish of food that you can dip, plunge, dive or swim about in at any point and come up with breakfast. On a large scale there are up-wellings, currents and fronts that provide relatively reliable feeding sites, the equivalent of the pubs, restaurants and cafes in the Octagon in Dunedin.

28. There are several submissions to this hearing that illustrate this aspect of the sea off Dunedin. The following from O'Driscoll et al. 1998 illustrates the complexity:

29. *The continental shelf off Otago is narrow (~15 km) and there are a wide range of physical gradients close to the coast (Jillett 1969). There are three main water masses which may be identified by their temperature and salinity characteristics (Jillett 1969): neritic water, with low salinity (< 34.6 PSU) and variable temperature, occurs over the inner to midshelf; Southland Current water of subtropical origin (salinity > 34.6 PSU), flows north-east parallel to the coast over the outer shelf (Heath 1975); and offshore, Subantarctic surface water (salinity < 34.6 PSU) meets the Southland Current at the*

*Southland Front, which is part of the subtropical convergence (Heath 1985). There is considerable small-scale variation in salinity and flow within the neritic water mass. A surface band of lower salinity water, originating from rivers to the south, is sometimes present (Hawke 1992; O'Driscoll & McClatchie in press), and this may form an eddy in Blueskin Bay (Murdoch et al. 1990). Surface fronts occur where the lower salinity band meets more well-mixed coastal waters (O'Driscoll & McClatchie in press). The coastal circulation of the neritic water mass appears to play an important role in the advection and retention of zooplankton (Murdoch 1989), including krill (O'Driscoll & McClatchie in press).*

30. And just as on a more local scale there are fast food joints scattered around the suburbs, there are ephemeral, less predictable concentrations of food above shoals of large fish, short lived tidal eddies in certain weather conditions, algal blooms, swarms of krill. On some days out from Aramoana there may be almost nothing happening (Fig 2), on others it is chaos (Fig 3). In the autumn of 2008, Blueskin Bay held thousands of titi (Fig 4), white-fronted terns, red & black-billed gulls and spotted shags, hundreds of black-backed gulls and Hutton's Shearwaters, upto 80 Gannets, dozens of Shy and Buller's Mollymawks and a scatter of skuas, penguins and Stewart Island Shags. (pers obs & pers com, OSNZ files) This autumn you would be lucky to see more than twenty white-fronted terns and a dozen or so gulls (Fig 5).

Figure 2. Almost nothing happening. Aramoana March 2008

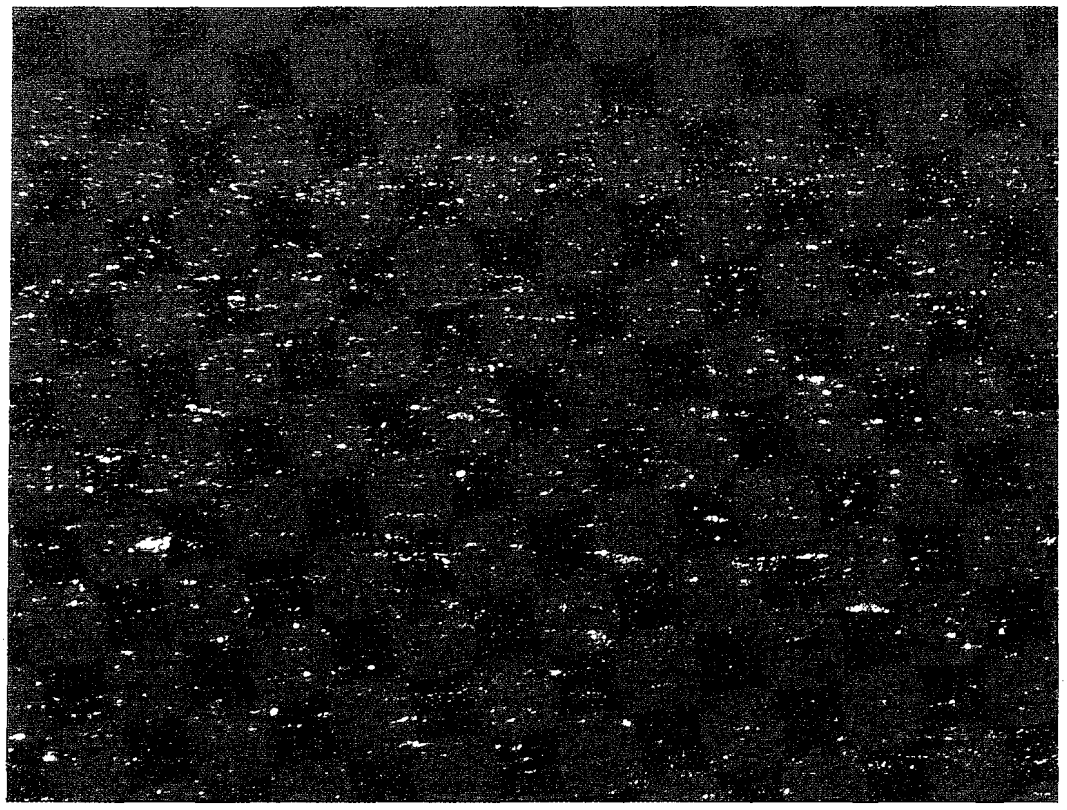

Figure 3 Chaos. Off Aramoana March 2006

Figure 4 Thousands of titi. Blueskin Bay February 2008.

Figure 5 You would be lucky to see a dozen or so gulls. Blueskin Bay 2011.

31. O'Driscoll 1998 attempted to analyse observations made over 12 transects off the Otago coast and assess bird distribution in relation to krill sampling, shoals of predatory fish and saline gradients. He found little close correlation between the distribution of birds (mainly gulls and sooty shearwaters) and these other measures. He attributed some of this to the scale of sampling but it is probable that his use of data from "sitting" rather than feeding birds would be less likely to show any correlation. Those who have observed aggregations of feeding seabirds know that it is a mobile feast and birds that have yet to feed or are satiated drift in and out of the feeding flock.

32. Tracking systems developed during the last 20 years are beginning to build up a picture of birds travelling many miles to preferred feeding sites. (e.g. Walker & Elliot et al 1995 & 2007). For example Mattern et al 2007 say of Yellow-eyed Penguins:

33. *Consecutive foraging trips of individuals revealed remarkably consistent foraging routes. Birds travelled along similar—at times congruent—paths, markedly changed course at distinct locations, and revisited certain locations on separate trips, indicating skilful navigation.*

34. So yes birds are mobile but they use this mobility to get to specific known feeding locations, both predictable and ephemeral, just as we might jump in the car or leap on a horse to go to the local pub or to rush off to the latest street market or new cafe. This mobility does indeed mean that they are often able to avoid disturbance or move out of areas as they become unsuitable

but it does not follow that they can simply fly off and find other suitable feeding sites or habitat any more than we could easily shoot off to another pub in central Otago after arriving at our favourite one to find it engulfed in a mudslide.

35. It is a complex, changeable environment out there. There is very little data on bird distribution and feeding off the Dunedin coast on which to base informed projections about the effects on birds of the disposal and dispersion of dredged material at A0.

**Predicting the Effects of Disposal at A0**

36. Way back in the 1960s, well before the advent of data loggers, excel and statistical programs and binoculars of the Leitz persuasion, Euan Dunn spent several springs on the Farne Islands off the Northumbrian Coast watching feeding terns.(Doctorate thesis, University of Durham) His main conclusion was that the ability of terns, which dive for small fish from twenty or so feet above the sea varies considerably with the state of the sea surface and clarity of the water. Optimal conditions for foraging occur when there is a slight ripple on the surface of otherwise clear water. The tern needs to see the fish but prefers the fish not to be able to see it too well. Not only does foraging success drop off in rough conditions but the breeding season can be poor if there are not enough good days. Life is pretty marginal for adult terns and even more so for young ones. It takes them many months to learn to hunt successfully and young birds could be seen tagging along after adults, whinging constantly and begging for food even well into the following year,

even on migration. Just like White-fronted terns and Caspian terns in New Zealand.

37. There are a couple of conclusions relevant to this application that one can draw from this study., the most obvious being that small changes in sea conditions are known to adversely affect the survival of a species that forages by sight. Secondly, and more important to my approach to this application, is that you need to look in some detail and depth at the ecology of a species before you are in a position to predict consequences.

38. No such in depth data is available for the species that forage in the spoil disposal area and the adjacent seas.

**Birds of the sea and intertidal habitat in the Harbour.**

39. The Ornithological Society has conducted surveys of birds within the harbour over many years and in addition has over 20 years of counts of waders (godwits, oystercatchers, plovers etc.) based upon the convenient habit of these species to roost over high tide in concentrated flocks in traditional locations. I believe this data is going to be presented in more detail by another submitter but I would like to raise a couple of points) Firstly, contrary to the assertion in "The Report to the Hearings Panel" (7.1.2.1/318 Disturbance) that the mobility of the birds would defeat monitoring, I believe given this base data, it would be relatively easy to monitor bird numbers and location throughout the dredging operation and assess whether the data indicated any deviation from known trends.

40. Secondly, Figure 6 is an analysis of the OSNZ bi-annual counts of two important waders, the endemic Pied Oystercatcher and the migratory Bar-tailed Godwit. Both occur in the Harbour feeding at low tide on the mudflats at Aramoana and along the shoreline as well as the large bank in the centre of the harbour beyond the main shipping channel out from Carey's Bay. Both Pied Oystercatcher and Godwit appear to be declining in numbers in the harbour compared with the Peninsula sites (note the log scale so we are talking declines of the order of 50%/500 birds for oystercatchers in June over 20 years). I have included these because they illustrate

1) The value of long term monitoring – something totally lacking at sea.
2) The value of control areas or areas surveyed in the same way available for comparison
3) The fact that both godwit and oystercatcher are declining in the Harbour and we have no idea why

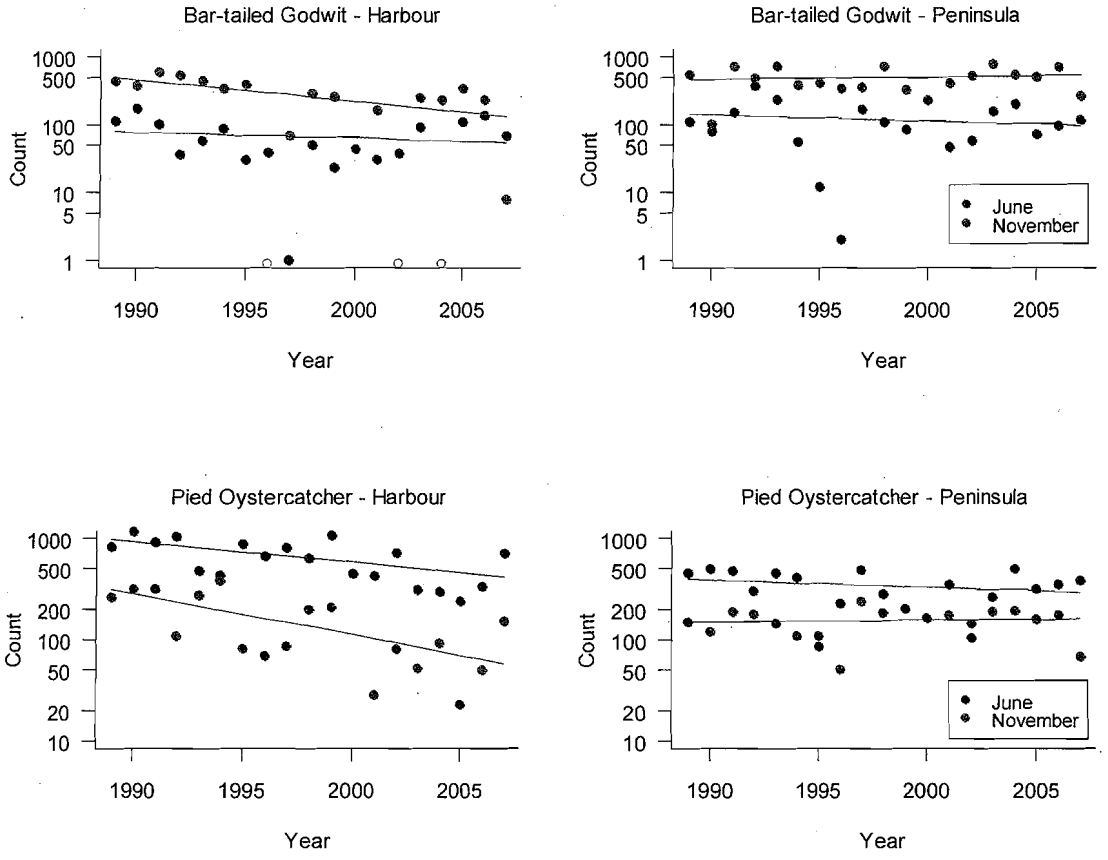


Fig. 6. Trend in wader counts by OSNZ at Otago Harbour and Otago Peninsula 1989–2007 (2000 omitted). Note log scale on y-axis. Open symbols indicate zero counts for BTGW (cannot show log of zero). Trend is significantly negative for Harbour SIPO in both June and November (quasi-Poisson regression in R; $P < 0.002$).

41. It is also worth comparing the large amount of data on the ecology of similar oystercatchers and godwits available in Europe with the comparative dearth from New Zealand. (See references in Schmechel's assessment of the effects of mechanical shellfish harvesting in Golden Bay, Nelson). Long term and detailed studies of waders in the Netherlands and the Wash in eastern England have worked out; the amount of disturbance a species can tolerate before detrimental effects on condition are observed (Goss-Custard et al 2005), the high degree of fidelity of wintering birds to small feeding patches (Verhulst et al 2004), and detailed data on feeding rates, food requirements and foraging techniques of oystercatchers feeding on cockles.(Goss-Custard et al 2003).

42. These studies are used extensively to assess conservation priorities and are considered an essential part of the environmental impact assessments of projects as disparate as the Thames Barrage and un-mechanised cockle harvesting in Scotland. Few such detailed studies are available in New Zealand and it is disturbing to see opinions being expressed on the impact of projects such as this application without good basic data being available. So my conclusion would be:

43. 4) Given the lack of basic data on feeding regimes and preferences I would suggest we are in no position to predict the consequences of dredging the harbour.

**Conclusions**

44. Data on bird distribution over the proposed disposal site and adjacent seas, despite being gathered in an unsystematic way, is good enough to identify the area as important to a wide range of species of conservation concern. It backs up the conclusion of Waugh et al that the Otago coastal seas should be designated an IBA.

45. The data presented by the applicant on bird distribution and use of the proposed disposal site and adjacent seas omits many readily available sources of information, and leads to a far less convincing and consequently misleading assessment of the importance of the area.

46. The existing data on the effects of the disposal and dispersion of spoil on the higher food chain is inadequate to assess the effects on food supplies for birds.

47. There is no doubt that the suspended solids/clouding of the water due to disposal will adversely affect the ability of birds to find food as most species hunt by sight.

48. The data on the finer points of bird distribution, seasonal patterns and feeding sites and regimes is inadequate to present a clear, concise picture of their use of the area that can be precisely related to the disposal and dispersion site.

49. Given these unknowns I consider there is no basis to conclude that the effects on birdlife will be minor – or catastrophic. In fact I suggest the data on all fronts is inadequate to predict anything.

50. Concise, detailed, systematic baseline data should be gathered at sea of the birds use of the area adjacent to the proposed disposal site, stretching from the Otago Peninsula northwards to well beyond the projected dispersal zone at Moeraki and a control area be identified.

51. A report should be compiled on the effects of disruption of the planktonic and seabed communities on the higher food chain, especially those species that are important parts of the local birds diet.

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**Appendix 1: Sources of information on the seabirds off the coast of Dunedin in and adjacent to A0.**


1. McClatchie, S.; Hutchinson, D.; Nordin, K. 1989: Aggregation of avian predators and zooplankton prey in Otago shelf waters, New Zealand. Journal of plankton research 11: 361-374.

2. Hawke, D. J. 1991: Seabirds in neritic water along the South Island south coast in October 1988. Notornis 38: 342-344.

3. O'Driscoll, R.L.; Renner, M.; Austin, F.J.; Spencer, H.G. 1998: Distribution of seabirds in coastal waters off Otago, New Zealand, New Zealand Journal of Marine and Freshwater Research, 1998, Vol. 32: 203-213

4. ebirdNz – an online database for ornithological observations run by the Ornithological Society of New Zealand in conjunction with Cornell Lab (full name) and based upon the successful US version. The individuals contributing the bulk of the relevant records to this scheme were Bruce McKinlay, Russell Cannings, Derek Onley and Graeme Loh.

5. The Ornithological Society of New Zealand, Otago newsletter.

6. The Ornithological Society of New Zealand local records maintained by Peter Schweigman, including the long term surveys of the harbour and the wading

birds of Aramoana and other sites within the harbour, summarised in less detail as part of Sagar et al 1999.

7. Observations by Lyndon Perriman from the Monarch cruises around Taiaroa Head 1995-99

8. Further records were supplied by Graeme Loh, Hamish Spencer, Derek Onley and Alan Anderson. Surveys were conducted by members of the Ornithological Society and their friends.

9. Derek Onley 10 April 2011