Powerpoint presentation by Penguin Rescue Trust to The South-Eastern MPA Forum Science Workshop
Held Friday 17th April 2015 at Marine Science Department, University of Otago, Dunedin.

Otago seabirds

Hiltrun Ratz & Chris Lalas
Penguin Rescue, Moeraki

Photographs by Hiltrun Ratz
Drawings by Chris Gaskin

The Penguin Rescue Trust is based at the lighthouse at Katiki Point on the Moeraki Peninsula. Hiltrun Ratz and Chris Lalas are both trustees and scientists working for Penguin Rescue.

Contents

- 3 special seabirds of Otago (2 flagship species)
- 5 foraging styles and zones
- 2 key breeding locations
- 3 suggestions for protection

Special seabirds of Otago - 1
Northern royal albatross

- Breeds at Taiaroa Head – only mainland albatross breeding site
- Increasing population at Taiaroa Head (3% pa) ≈200 birds
- IUCN status: endangered
- Public attitude - it's an albatross - majestic

Special seabirds of Otago - 2
Yellow-eyed penguin

- Decreasing South Island population now ≈900 birds
- IUCN status: endangered
- Public attitude - it's a penguin – sacrosanct

Special seabirds of Otago - 3

Otago shag

- Formally northern population of Stewart Island shag
- The only seabird endemic to Otago
- Fluctuating population 2000 - 6000 birds
- IUCN status: vulnerable
- Public attitude - it's a shag – demonic

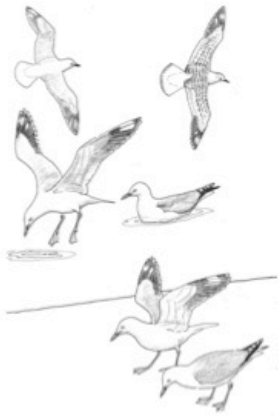
Stewart Island shags in Otago have been re-named Otago Shags because they were found to be closer related to the shags living on Chatham Islands than those living on Stewart Island.

Reference:

Rawlence, N. J., Till, C. E., Scofield, R. P. Tennyson, A. J. D., Collins, C. J., Lalas, C. Loh, G., Matisoo-Smith, E., Waters, J. M., Spencer, H. G. and Kennedy, M. 2014. Strong phylogeographic structure in a sedentary seabird, the Stewart Island Shag (*Leucocarbo chalconotus*). PloS One: e90769. DOI 10.1371/journal.pone.0090769

Foraging styles and zones - 1
sea surface and foreshore - gulls

Black-backed gull
Prey: invertebrates, scavenging
Zone: foreshore out to 10 nm



Red-billed gull
Prey: zooplankton (krill)
Zone: foreshore out to 5 nm

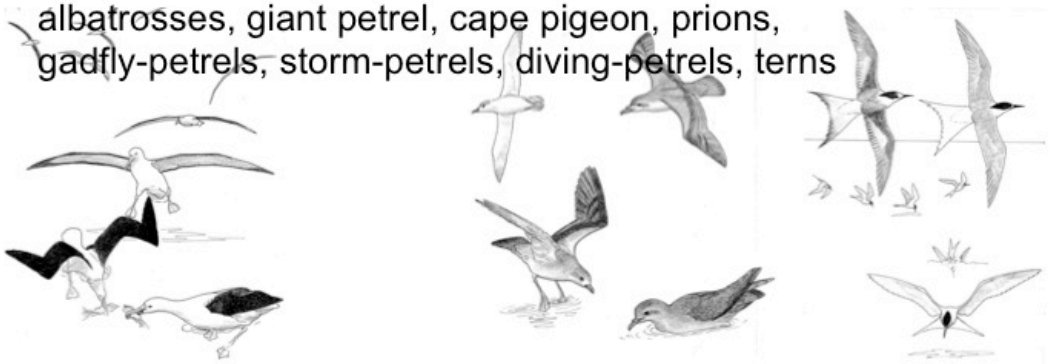
Red-billed gull eat two species of krill: euphausiid *Nyctiphanes* & lobster krill *Munida.* The red-billed gulls have very high breeding success when *Nyctiphanes* are abundant, and a low breeding success when *Nyctiphanes* are scarce.

References:

Mills, J. A, Yarrall, J. W., Bradford-Grieve, J. M., Udderstrom, M. J., Renwick, J. A. and Merilä, J. 2008. The impact of climate fluctuation on food availability and reproductive performance of the planktivorous red-billed gull *Larus novaehollandiae scopulinus*. Journal of Animal Ecology 77: 1129-1142.

Foraging styles and zones - 2
sea surface continental shelf

albatrosses, giant petrel, cape pigeon, prions, gadfly-petrels, storm-petrels, diving-petrels, terns



Albatrosses
Prey: squid, scavenging
Shelf - Buller's
White-capped
Salvin's
Shelf edge – 2 spp. Royal

Prions, storm-petrels, diving petrels
Prey: zooplankton

White-fronted terns
Zone: foreshore out to 10 nm
Prey: zooplankton, fish ≤10 cm

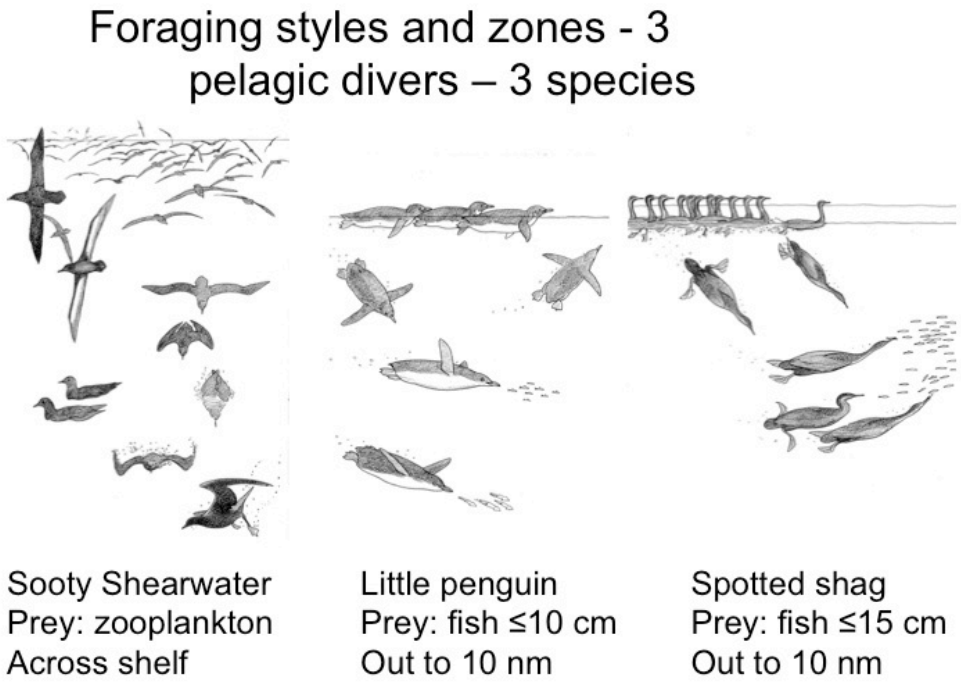
Southern Buller's Albatross breed on Snares Islands.
White Capped Albatross breed on Auckland Islands.
Salvin's Albatross breed on Bounty Islands.
Northern Royal Albatross breed on Chatham Islands and Taiaroa Head.
Southern Royal Albatross breed on Auckland and Campbell Islands.

References:

Imber, M. J. 1999. Diet and feeding ecology of the Royal Albatross *Diomedea epomophora* – king of the shelf break and inner slope. Emu 99: 200-211.

Baker, G. B., Double, M. C., Gales, R., Tuck, G. N., Abbott, C. L., Ryan, P. G., Petersen, S. L., Robertson, C. J. R. and Alderman, R. 2007. A global assessment of the impact of fisheries-related mortality on shy and white-capped albatrosses: conservation implications. Biological Conservation 137: 319-333.

James, G. D. and Stahl, J.-C. 2000. Diet of southern Buller's albatross (*Diomedea bulleri bulleri*) and the importance of fishery discards during chick rearing. New Zealand Journal of Marine and Freshwater Research 34: 435-454.



Sooty Shearwater are seasonally abundant off Otago with about 1 million birds from October to December.
Little Penguins population in Otago is about 1000.
Spotted Shag population in Otago fluctuates between 2000 and 10 000.
All three species are pursuit divers that target small pelagic prey; competition with fisheries unlikely.
Sooty Shearwater – euthausiid krill (Nyctiphanes), arrow squid and sprat.
Little Penguin – mainly sprat.

Spotted Shag – mainly ahuru, also sprat and arrow squid.

References:

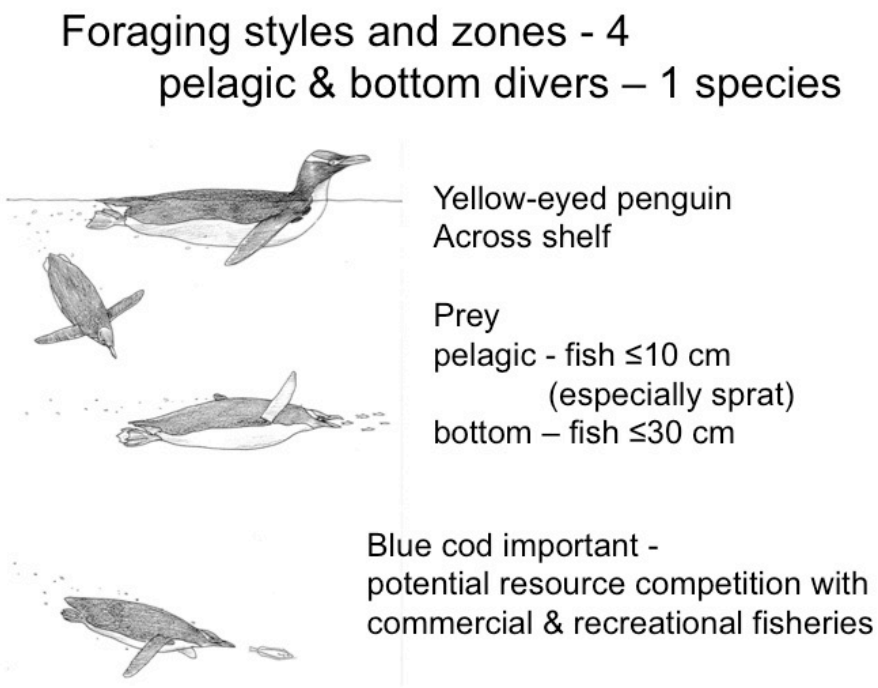
Kitson, J. C., Cruz, J. B., Lalas, C., Jillett, J. B., Newman, J. and Lyver, P. O'B. 2000. Interannual variations in the diet of breeding sooty shearwaters (*Puffinus griseus*). New Zealand Journal of Zoology 27: 347-355.

Cruz, J. B., Lalas, C., Jillett, J. B., Kitson, J. C., Lyver, P. O'B., Imber, M., Newman, J. E. and Moller, H. 2001. Prey spectrum of breeding sooty shearwaters (*Puffinus griseus*) in New Zealand. New Zealand Journal of Marine and Freshwater Research 35: 817-829.

Fraser, M. M. and Lalas, C. 2004. Seasonal variation in the diet of blue penguins (*Eudyptula minor*) at Oamaru, New Zealand. Notornis 51: 7-15.

Flemming, S. A., Lalas, C. and van Heezik, Y. 2013. Little penguin (*Eudyptula minor*) diet at three breeding colonies in New Zealand. New Zealand Journal of Ecology 37: 199-205.

Lalas, C. 1983. Comparative feeding ecology of New Zealand marine shags (Phalacrocoracidae). PhD thesis, University of Otago, Dunedin, New Zealand.



Yellow-eyed penguin population in Otago is about 900.

Main prey – blue cod, opalfish, sprat, arrow squid, red cod.

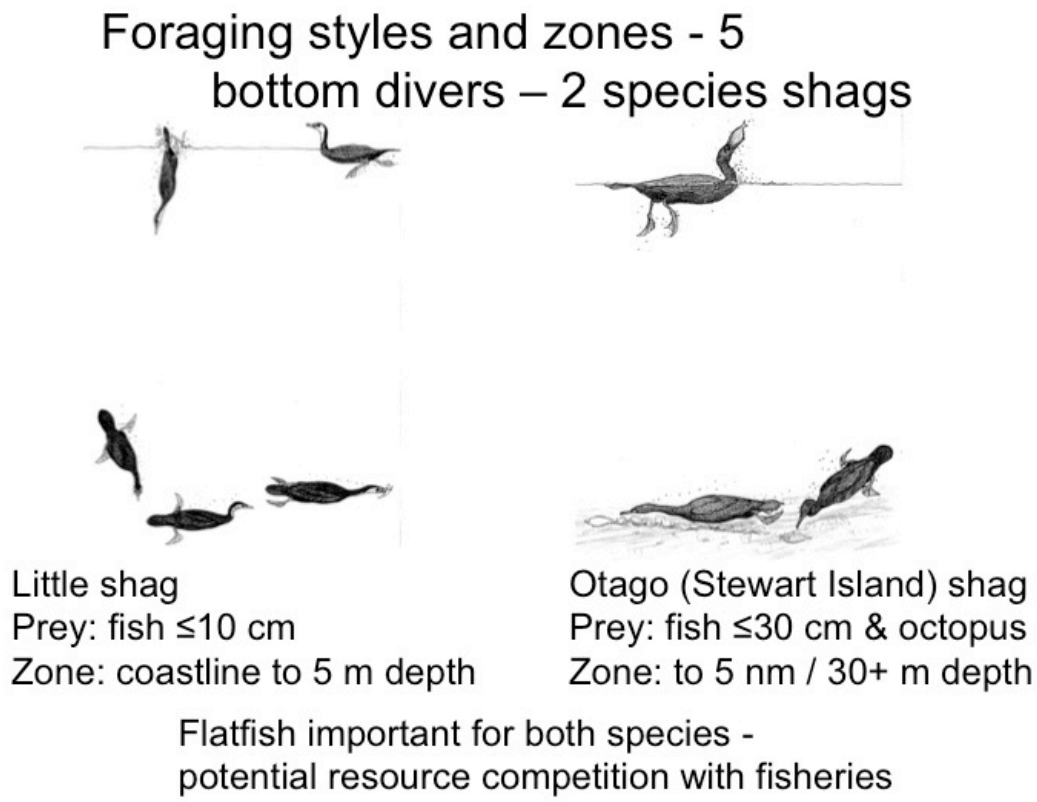
References:

Van Heezik, Y. 1990. Seasonal, geographical, and age-related variations in the diet of the yellow-eyed penguin (*Megadyptes antipodes*). New Zealand Journal of Zoology 17: 201-212.

Moore, P. J. and Wakelin, M. D. 1997. Diet of the Yellow-eyed Penguin *Megadyptes antipodes*, South Island, New Zealand, 1991-1993. Marine Ornithology 25: 17-29.

Moore, P. J. 1999. Foraging range of the Yellow-eyed Penguin *Megadyptes antipodes*. Marine Ornithology 27: 49-58.

Mattern, T., Ellenberg, U., Houston, D. M. and Davis, L. S. 2007. Consistent foraging routes and benthic foraging behaviour in yellow-eyed penguins. Marine Ecology Progress Series 343: 295-306.



Little Shag population in Otago is about 1000-2000 and they are freshwater and marine.
Otago Shag population in Otago is 2000 – 6000.

References:

Lalas, C. 1983. Comparative feeding ecology of New Zealand marine shags (Phalacrocoracidae). PhD thesis, University of Otago, Dunedin, New Zealand.

2 key seabird breeding locations at Otago

Species	Taiaroa Head	Katiki Point
Yellow-eyed Penguin		+
Little penguin	+	+
Northern royal albatross	++	
Sooty shearwater	+	+
Broad-billed prion		++
White-faced storm petrel		++
Common diving petrel		++
Little shag	+	+
Otago (Stewart I.) shag	+	
Spotted shag	+	+
Black-backed gull	+	+
Red-billed gull	+	+
White-fronted tern	+	+
Total species	9	11

++ only mainland breeding location. Only 1 other species at Otago: fairy prion

Taiaroa Head is at the northern tip of Otago Peninsula and Katiki Point is at the southern tip of Moeraki peninsula.
Taiaroa Head is considered the jewel in the wildlife crown and has 9 species of breeding seabirds. Katiki Point has a total of 11 species of breeding.

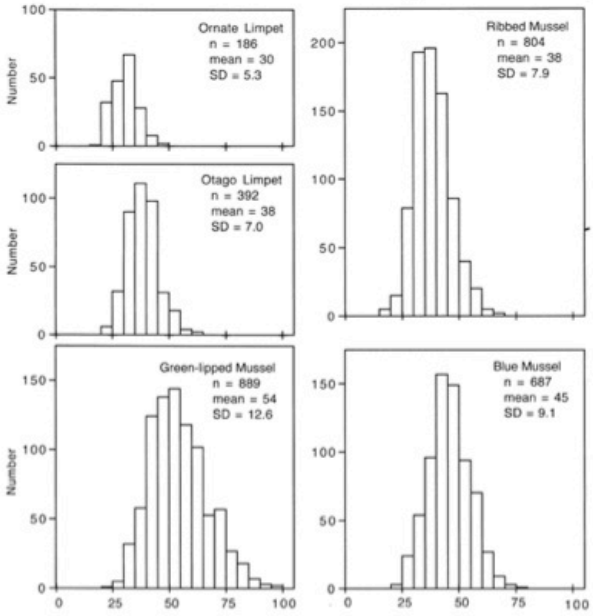
The two species present at Taiaroa Head that are not found at Katiki Point are Royal Albatross and Otago Shags.
Katiki Point has three species of breeding seabirds that don't breed anywhere else on the New Zealand mainland:
Broad-billed prion, White-faced storm petrel and Common diving petrel; and it has an increasing population of Yellow-eyed penguins, an endangered species.

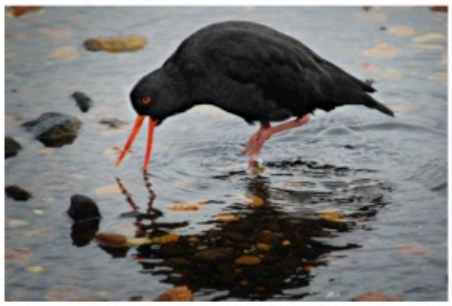
The combination of Taiaroa Head and Katiki Point include 13 of the 14 species of seabirds that breed at Otago. The only exception is the Fairy prion that breeds on islands and at St. Clair.

Before 1990 Spotted shag and Black-backed gull were the only seabirds breeding at Katiki Point. The management of the volunteers of what is now Penguin Rescue Trust has resulted in this impressive list of breeding seabirds. Eight of the nine new seabird species now breeding at Katiki Point colonised naturally. The exception was Yellow-eyed penguins that started breeding following the translocation of rehabilitated birds.

Protective measures – 1

Protect of rocky shore prey and biodiversity





Prey size of variable oystercatchers on Otago rocky shores

This data shows the length-frequency distribution of main prey of the oystercatcher on rocky shores to illustrate the biodiversity of the rocky foreshore.

Protective measures – 1
Protect of rocky shore prey and biodiversity

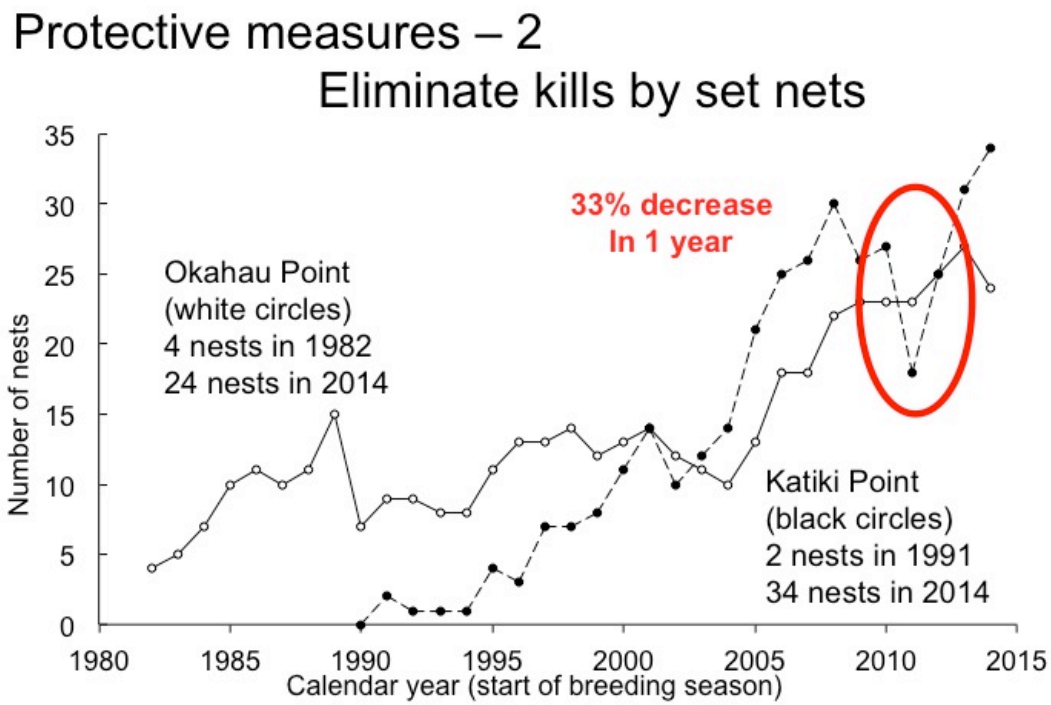
Affects 2 bird species

- Variable oystercatchers – mussels, limpets & chitons
- Black-backed gulls – common cat's eye & Cook's turban

Consider changes to
Southern Recreational Fisheries Regulations?

- Size restriction on mussels – e.g. minimum 70 mm
- Delete the 'All others (combined)' category to ensure retention of gastropods

Fisheries Regulations can be applied to ensure that the foreshore is not stripped bare of molluscs that would result in the disappearance of Variable oystercatchers.



The graph shows an increase in number of nests at two locations: Okahau Point is 1km north of Katiki Point and also managed by the Penguin Rescue Trust. It's nest numbers trend upwards from 1982 to 2014.
Katiki Point Yellow-eyed penguin colony started in 1990 and has also trended upwards since then to 34 nests in 2014.

Between 2010 and 2011 season an unexplained 33% decrease in nest numbers was recorded. This occurred after the implementation of the 4 nm set net ban in October 2008. We conclude that this distance was not enough to keep the penguins safe. This decline in nest numbers was due to deaths of resident breeding Yellow-eyed penguins and not because of birds skipping a season. These adults were never sighted again.

Protective measures – 2
Eliminate kills by set nets

- Extend set net ban to 12 nm
- Change regulations for recreational set nets in harbours
  designate as truly ‘recreational’ –
  mandatory continuous attendance

Protective measures - 3
Protect foreshore access for penguins

Movement of yellow-eyed penguins between land and sea is disrupted by

- Unrestricted public access to foreshore
- Shoreline rod fishers and spear fishers

Yellow-eyed penguins need protection both on land and at sea. They need unobstructed access to travel between the sea and their breeding. That means unrestricted public access to the foreshore is incompatible with their needs. Protecting the shoreshore affects rod fishers and spear fishers and would benefit the penguins as well as New Zealand fur seal breeding colonies.

For any questions or additional information, please contact:

Chris Lalas, PhD
Trustee and scientist for Penguin Rescue Trust

e-mail: ithaki@xtra.co.nz
home phone: (03) 4780249 (answer machine)
office phone: (03) 4781149

Attitudes to and feeding habits of some marine mammals and a penguin:

New Zealand fur seals:

Feed over the edge of the continental shelf and continental slope
Feed on arrow squid, octopus and pelagic fish, e.g. barracouta, , lanternfish
Considered direct competitors by all fishers, evil and to be culled.

New Zealand sea lions:

Feed across the continental shelf
Feed Pelagic: barracouta and jack mackerel
Benthic: octopus, red cod, blue cod, paddle crab
Adult males: fur seals
Also take salmon in Otago Harbour
Considered direct competitors by all fishers, evil and to be culled.

Dolphins:

Hector's dolphin – feeds inshore, primarily on pelagic and benthic fish up to 30cm; flatfish important.
Diets of the other three species are not well known.
Dusky dolphin – feeds over the edge of the continental shelf and continental slope on small pelagic squid and lanternfish.
Common dolphin – feeds over the continental slope on small pelagic squid and lanternfish.
Bottlenosed dolphin – feeds across the continental shelf on pelagic and benthic squid up to 40cm. Also takes salmon in Otago Harbour.
Viewed benevolently by fishers

References:

Harcourt, R. G., Schulman, A. M., Davis, L. S. and Trillmich, F. 1995. Summer foraging by lactating female New Zealand fur seals (*Arctocephalus forsteri*) off Otago Peninsula, New Zealand. Canadian Journal of Zoology 73: 678-690.

Harcourt, R. and Davis, L. 1997. The use of satellite telemetry to determine fur seal foraging areas. Pages 137-142 *In* Marine mammal research in the southern hemisphere Volume 1: Status, ecology and medicine. Ed. Hindell, M. and Kemper, C. Surrey Beatty & Sons, Chipping Norton.

Fea, N. I., Harcourt, R. and Lalas, C. 1999. Seasonal variation in the diet of New Zealand fur seals (*Arctocephalus forsteri*) at Otago Peninsula, New Zealand. Wildlife Research 26: 147-160.

Harcourt, R. G., Bradshaw, C. J. A. and Davis, L. S. 2001. Summer foraging behaviour of a generalist predator, the New Zealand fur seal (*Arctocephalus forsteri*). Wildlife Research 28: 599-606.

Harcourt, R. G., Bradshaw, C. J. A., Dickson, K. and Davis, L. S. 2002. Foraging ecology of a generalist predators, the female New Zealand fur seal. Marine Ecology Progress Series 227: 11-24.

Lalas, C. 1997. Prey of Hooker's Sea Lions *Phocarctos hookeri* based at Otago Peninsula New Zealand. Pages 130-136 *In* Marine mammal research in

the southern hemisphere Volume 1: Status, ecology and medicine. Ed. Hindell, M. and Kemper, C. Surrey Beatty & Sons, Chipping Norton.

Bradshaw, C. J. A., Lalas, C., and McConkey, S. 1998. New Zealand sea lion predation on New Zealand fur seals. New Zealand Journal of Marine and Freshwater Research 32: 101-104.

Lalas, C., Ratz, H., McEwan, K. and McConkey, S. D. 2007. Predation by New Zealand sea lions (*Phocarctos hookeri*) as a threat to the viability of yellow-eyed penguins (*Megadyptes antipodes*) at Otago Peninsula, New Zealand. Biological Conservation 135: 235-246.

Augé, A. A., Lalas, C., Davis, L. S. and Chilvers, B. L. 2012. Autumn diet of recolonising female New Zealand sea lions based at Otago Peninsula, South Island, New Zealand. New Zealand Journal of Marine and Freshwater Research 46: 97-110

Augé, A. A., Chilvers, B. L., Moore, A. B. and Davis, L. S. 2011. Foraging behaviour indicates marginal marine habitat for New Zealand sea lions: remnant versus recolonising populations. Marine Ecology Progress Series 432: 247-256.

Augé, A. A., Chilvers, B. L. and Moore, A. B. and Davis, L. S. 2014. Importance of studying foraging site fidelity for spatial conservation measures in a mobile predator. Animal Conservation 17: 61-71.

Leung, E. S., Augé, A. A., Chilvers, B. L., Moore, A. B. and Robertson, B. C. 2013. Foraging behaviour of juvenile female New Zealand sea lions (*Phocarctos hookeri*) in contrasting environements. PLos One 8: e62728. doi:10.1371/journal.pone.0062728.

Miller, E., Lalas, C., Dawson, S., Ratz, H. and Slooten, E. 2013. Hector's dolphin diet: the species, sizes and relative importance of prey eaten by *Cephalorhynchus hectori*, investigated using stomach content analysis. Marine Mammal Science 29: 606-628.