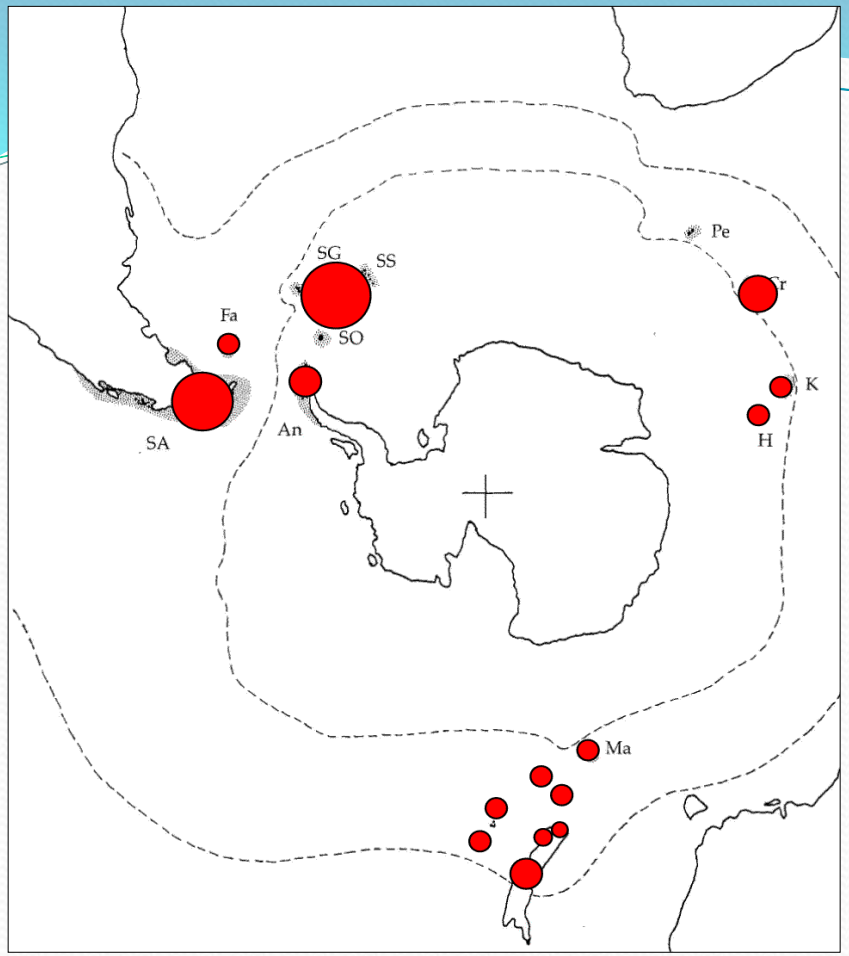

M.van Eerden

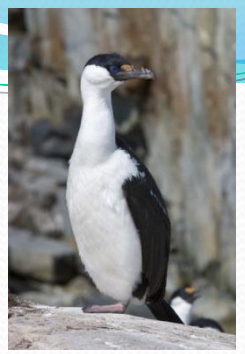
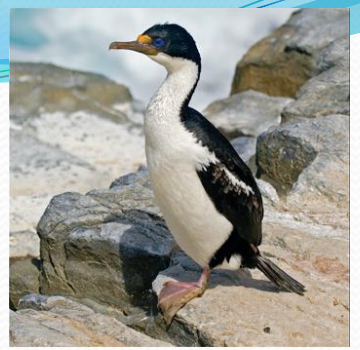
Proposed relocation of salmon farms in the Marlborough Sounds and its potential effect on King Shag.

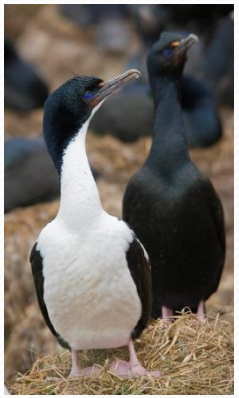
Evidence for Friends of Nelson Haven and Tasman Bay Inc.

And

Kenepuru & Central Sounds Residents Association Inc.




- **Of the 40 cormorant taxa in the world, 16 belong to the genus Leucocarbo or Blue-eyed Shags.**
- **The latter include……..**

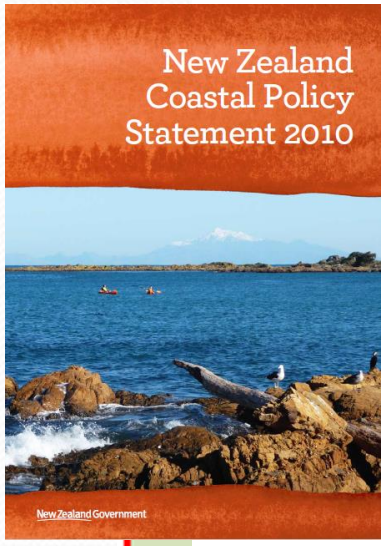
New Zealand King Shag

…endemic NZ bird species, only occurring in the Marlborough Sounds

As part of the King Shag Management Plan, the total population was assessed to be

839 birds (2015)

187 breeding pairs (45% of population)



Policy 11 **Indigenous biological diversity (biodiversity)**

To protect indigenous biological diversity in the coastal environment:

(a) avoid adverse effects of activities on:

(i) indigenous taxa[4] that are listed as threatened[5] or at risk in the New Zealand Threat Classification System lists;

(ii) taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened;

(iii) indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare[6];

(iv) habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare;

(v) areas containing nationally significant examples of indigenous community types; and

(vi) areas set aside for full or partial protection of indigenous biological diversity under other legislation; and

(b) avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on:

(i) areas of predominantly indigenous vegetation in the coastal environment;

(ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species;

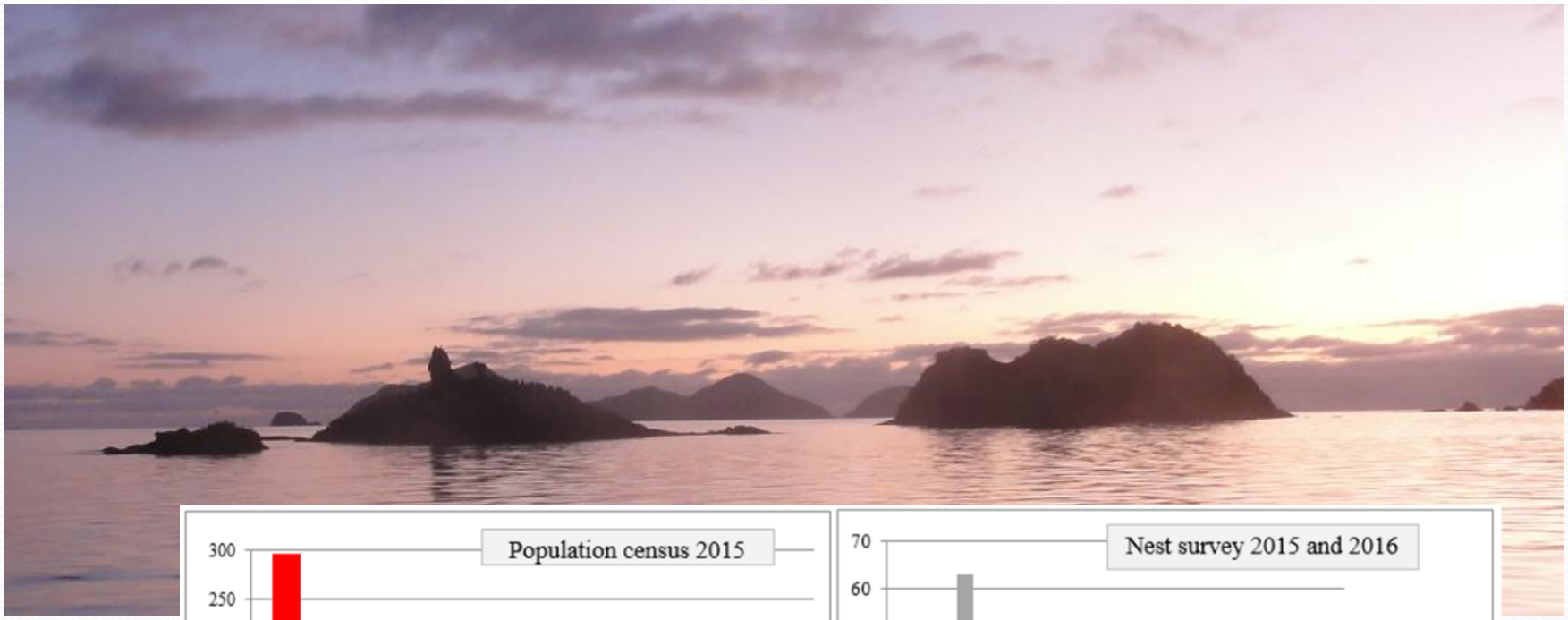
(iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh;

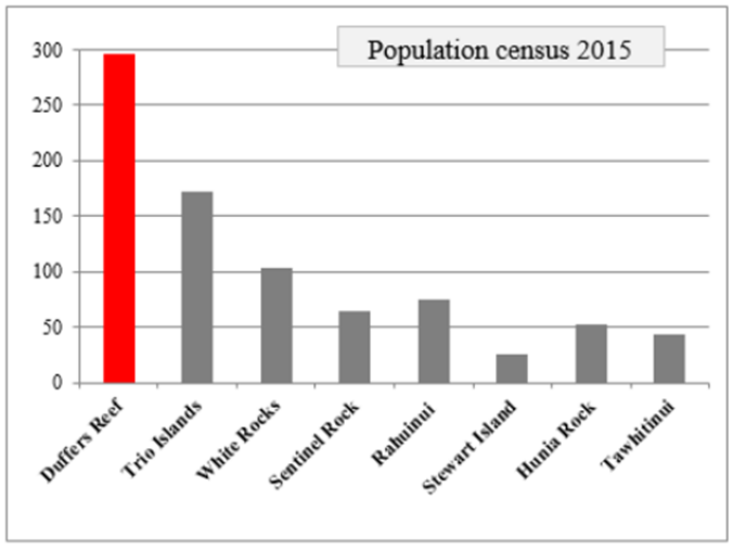
(iv) habitats of indigenous species in the coastal environment that are important for recreational, commercial, traditional or cultural purposes;

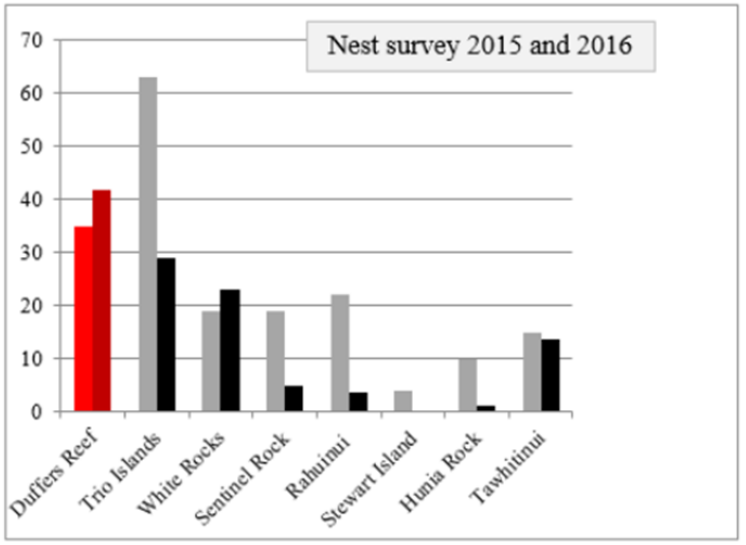
(v) habitats, including areas and routes, important to migratory species; and

(vi) ecological corridors, and areas important for linking or maintaining biological values identified under this policy.

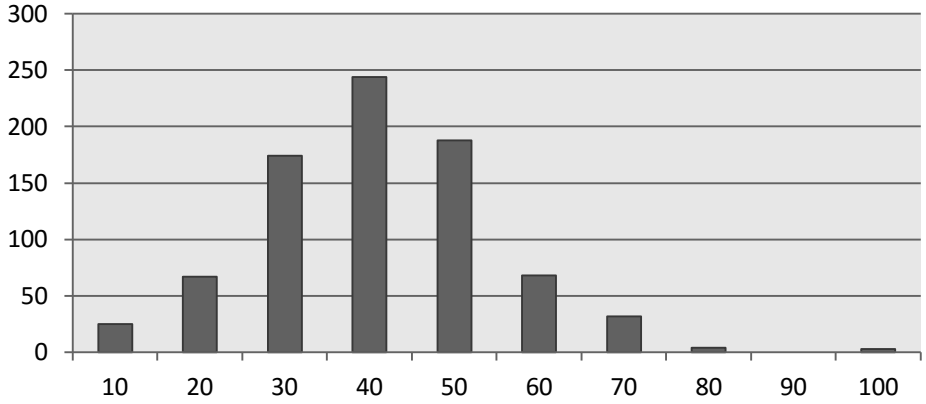
…with 35% of all birds the biggest colony of King Shags. Both North Trio Island and Duffers Reef host up to 61% of all nests of the species.



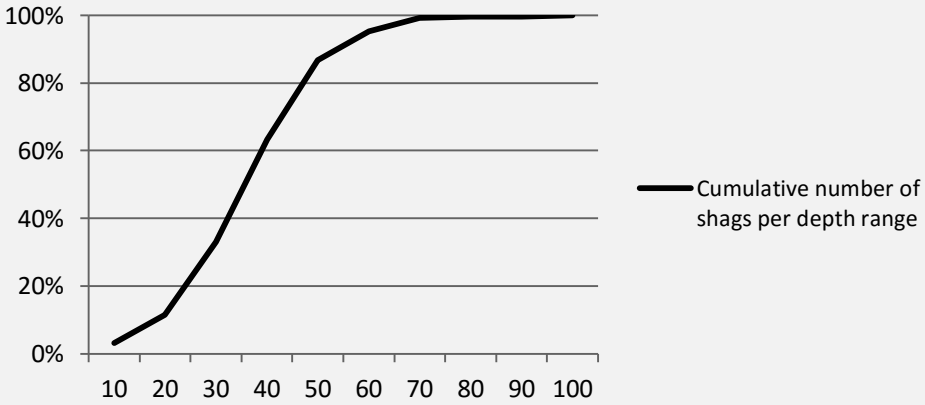




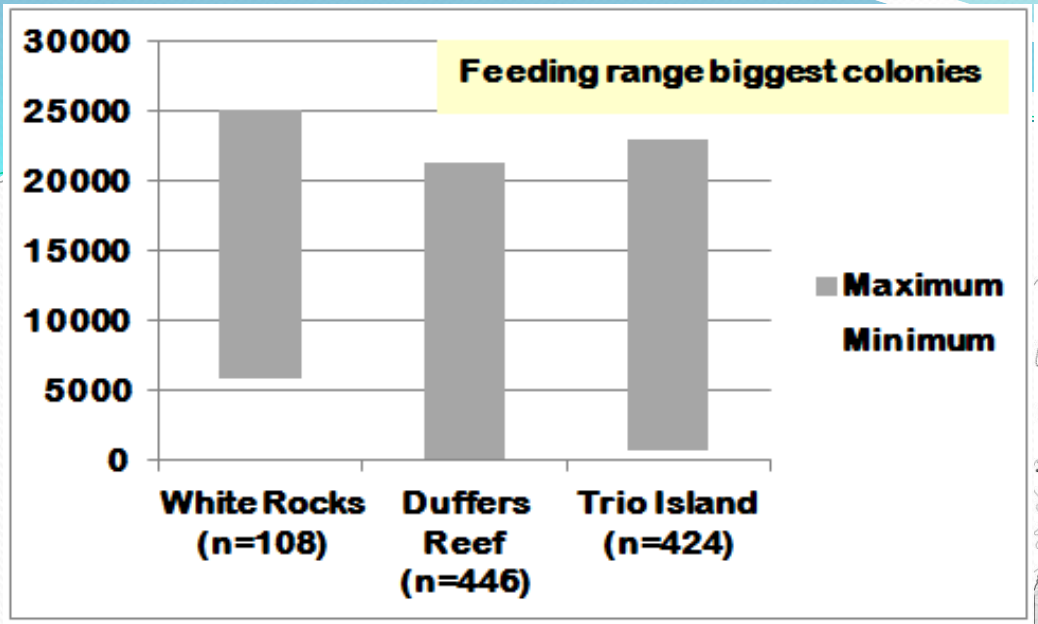
Feeding King Shags per depth series (n=805)

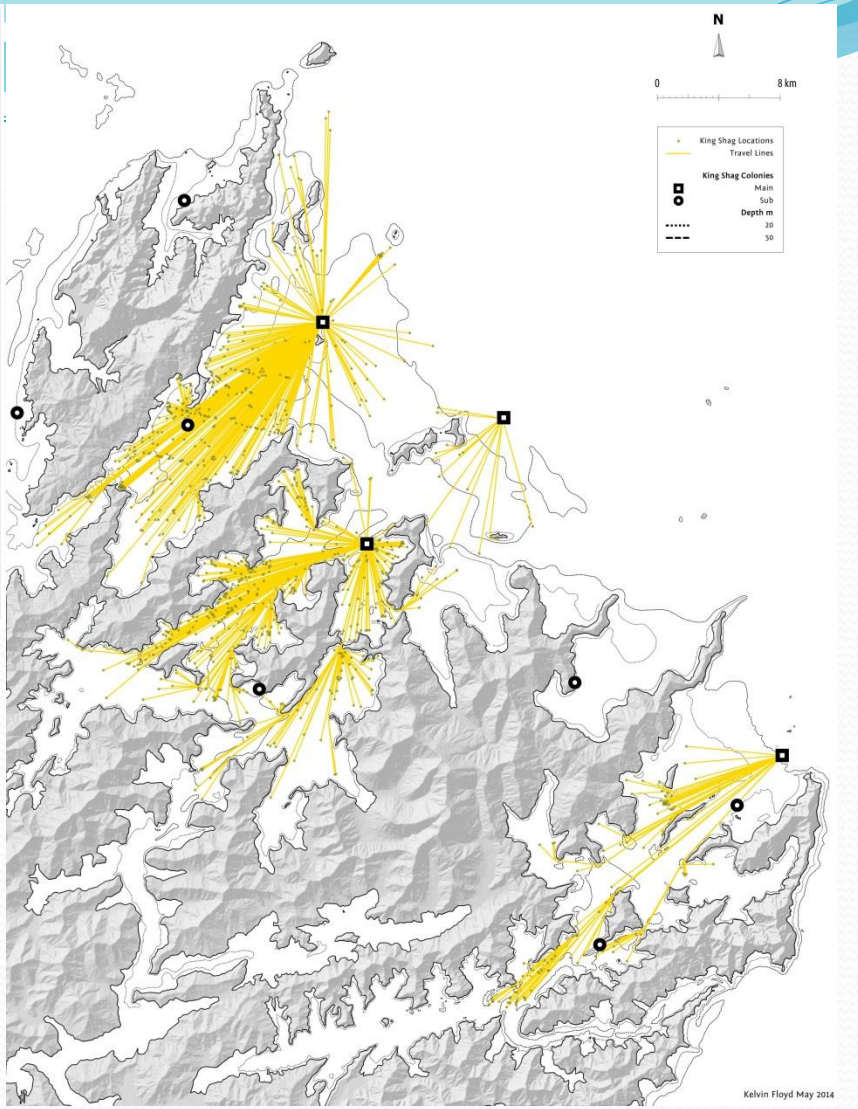


Cumulative number of shags per depth range



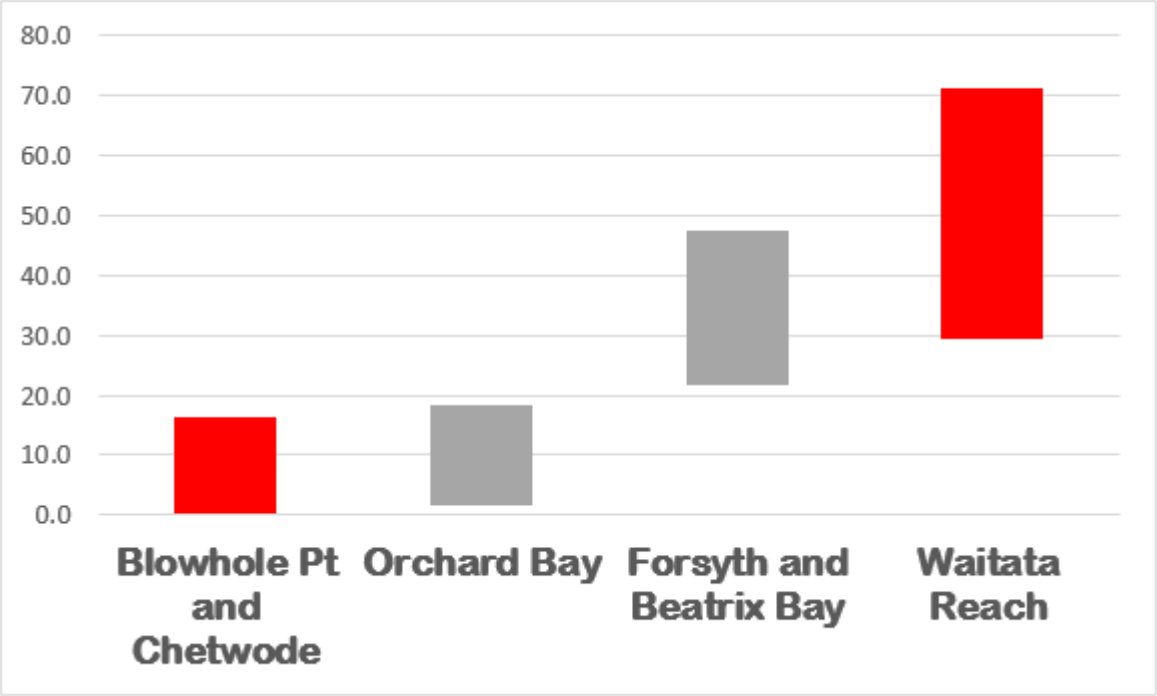
90% of all feeding shags are in waters up to 50m deep.





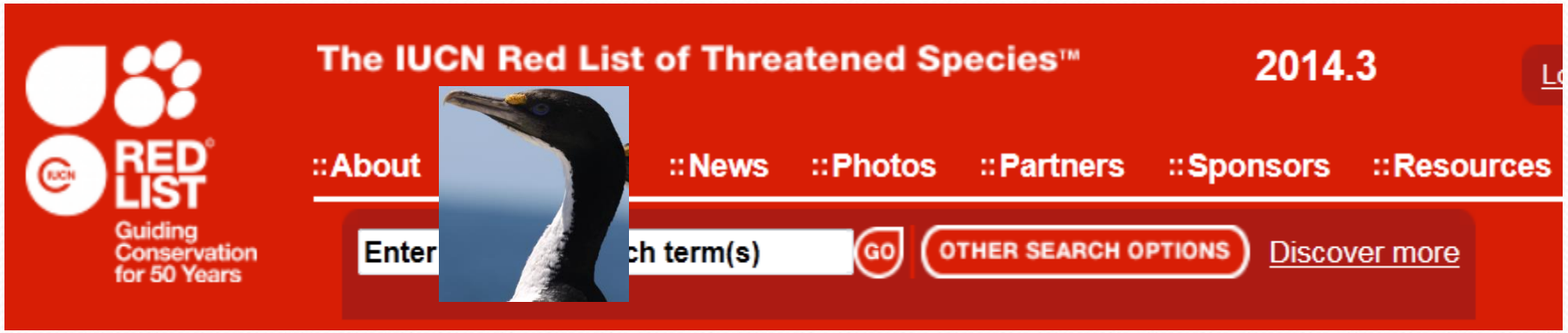
King Shag feed as far as 25km from the colony.

Most King Shags feed up to 12km from the colony.



Departure directions from Duffer's Reef between 2002 and 2015 (leaving birds as percentage of total departures: n=8 surveys).

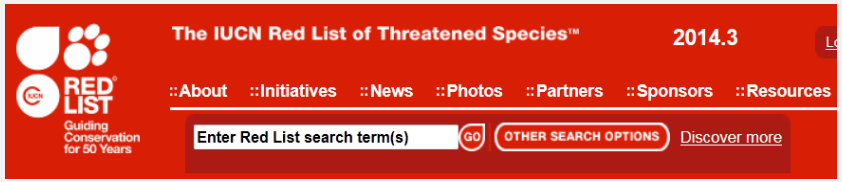
Red are directions of 5 proposed salmon farm sites

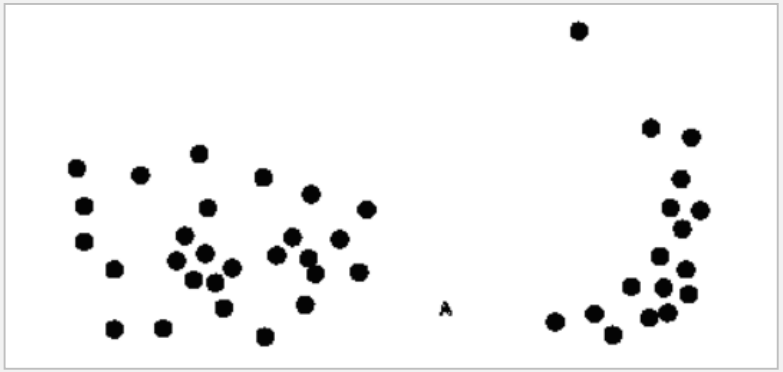


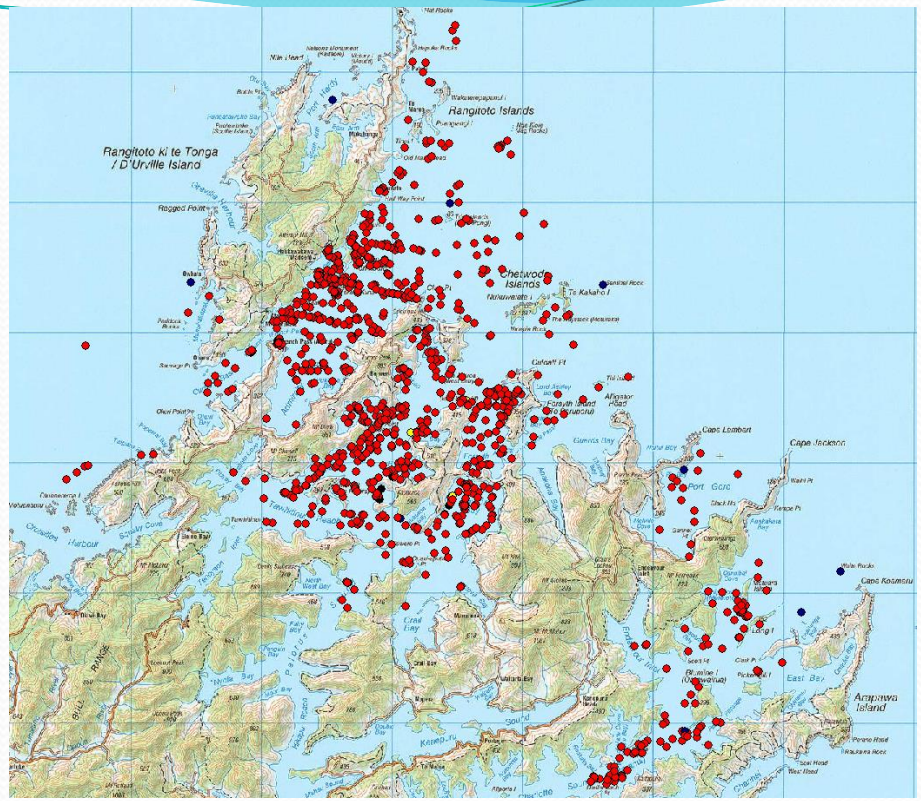
The International Union for the Conservation of Nature has a clear protocol on how to identify feeding areas……

9. Extent of Occurrence (A)

.....is the spatial distribution of known, inferred or projected sites of occurrence.



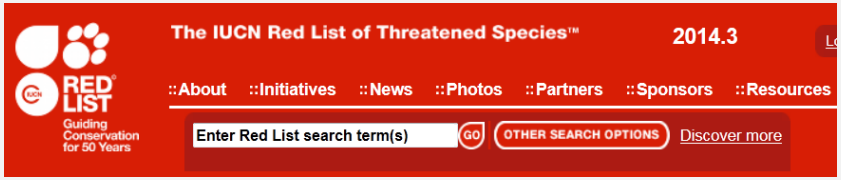


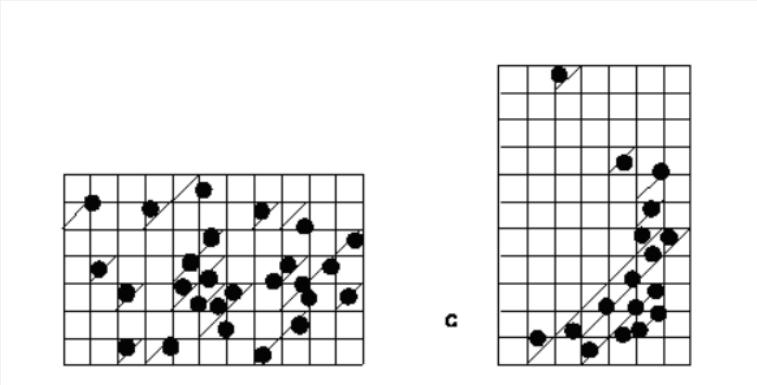


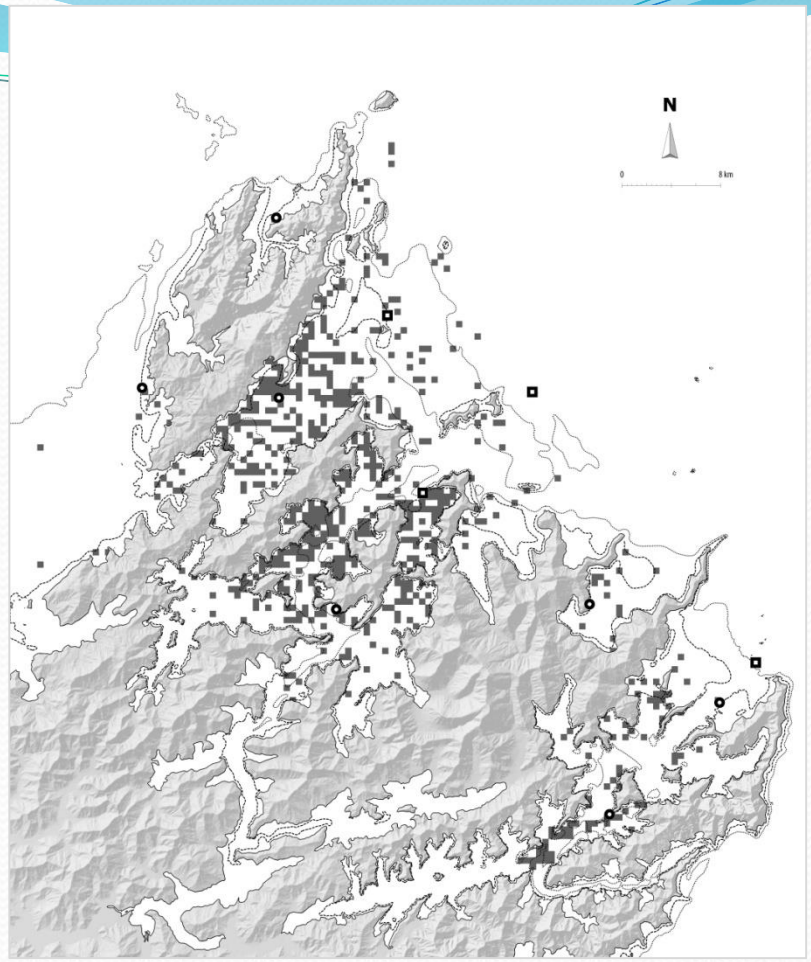
More than 1000 waypoints of feeding shags provide '*sites of occurence*'.

Area of Occupancy (C)

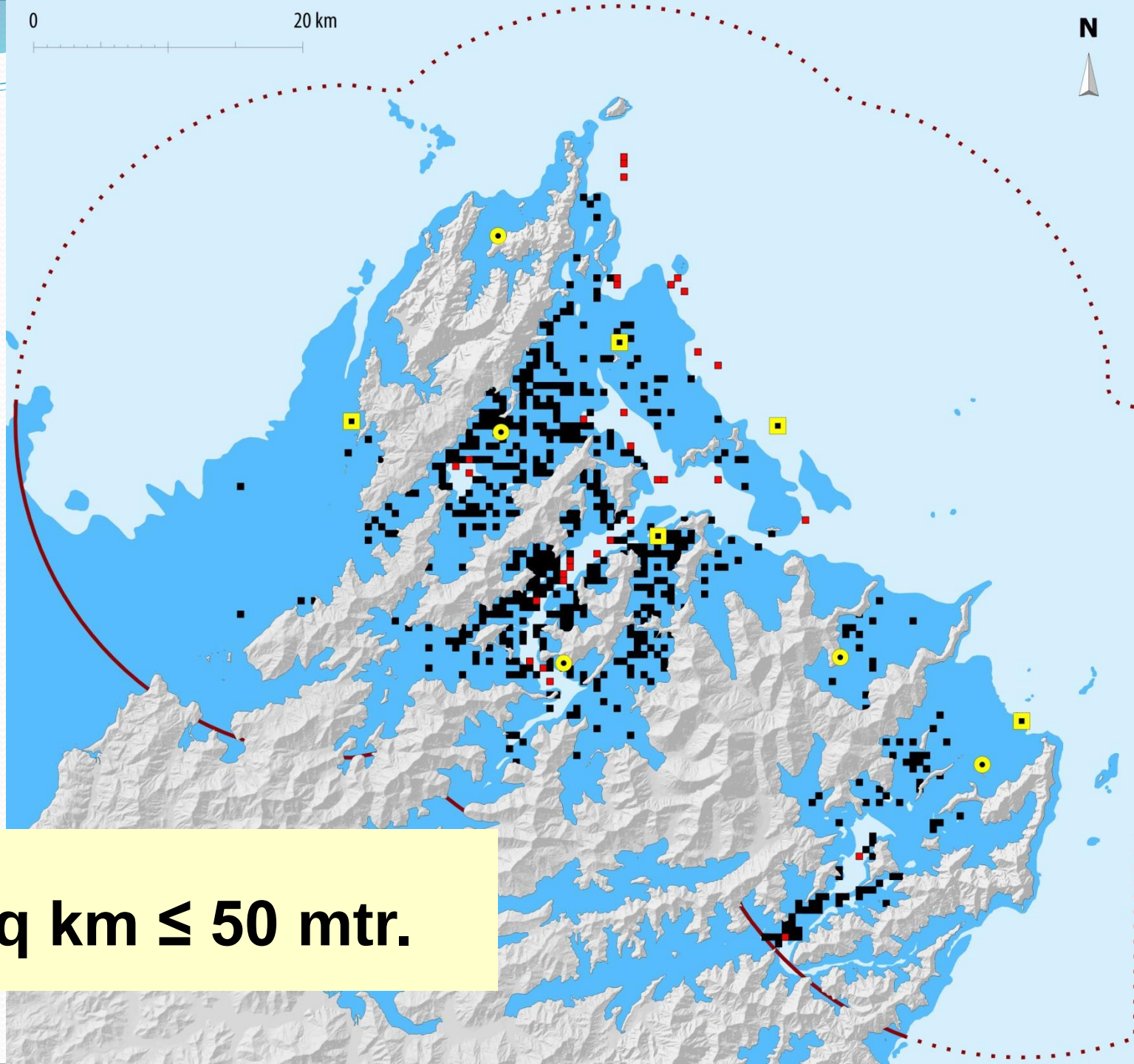
……shows one measure of area of occupancy which can be measured by the sum of the occupied grid squares.







607 (500m) grids with feeding King Shags.



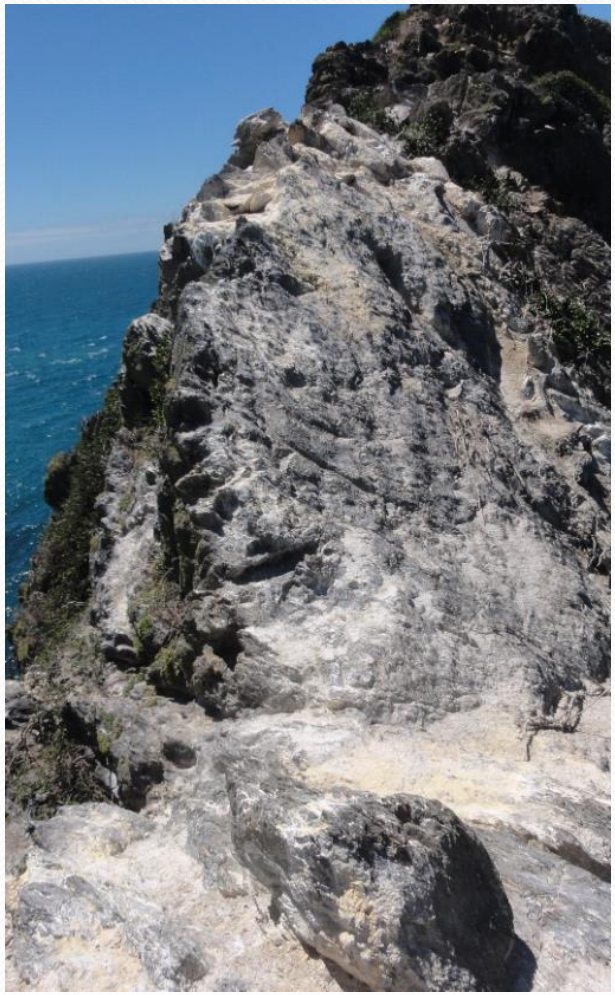
1300 sq km ≤ 50 mtr.

King Shag prey species

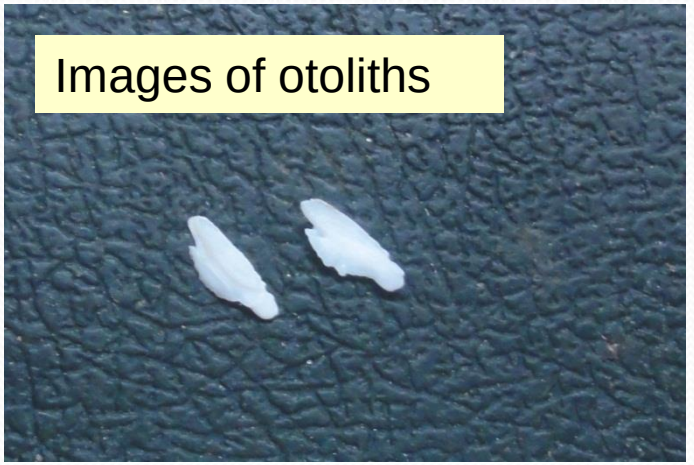
B.Loyd

With funding from:
- Friends of Nelson Haven and Tasman Bay Inc.
- Department of Conservation.

Regurgitations from all main colonies were collected in 2011 and analysed.

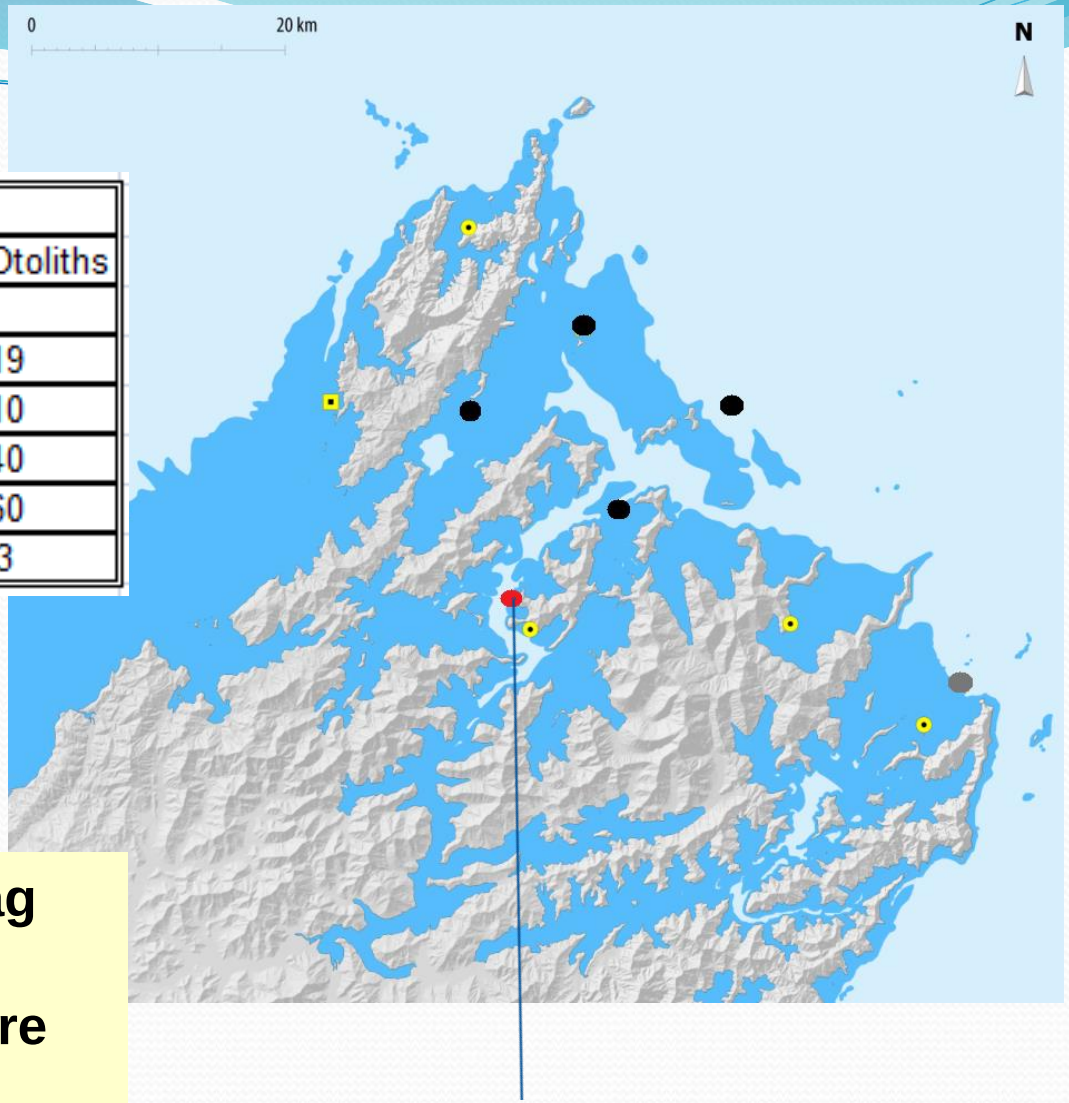


Pellets (regurgitations) from King Shag.



Images of otoliths

	Total Sample	With Otoliths
Trio Island	22	19
Stewart Island	10	10
Duffers Reef	41	40
Sentinel Rock	64	60
White Rocks	4	3



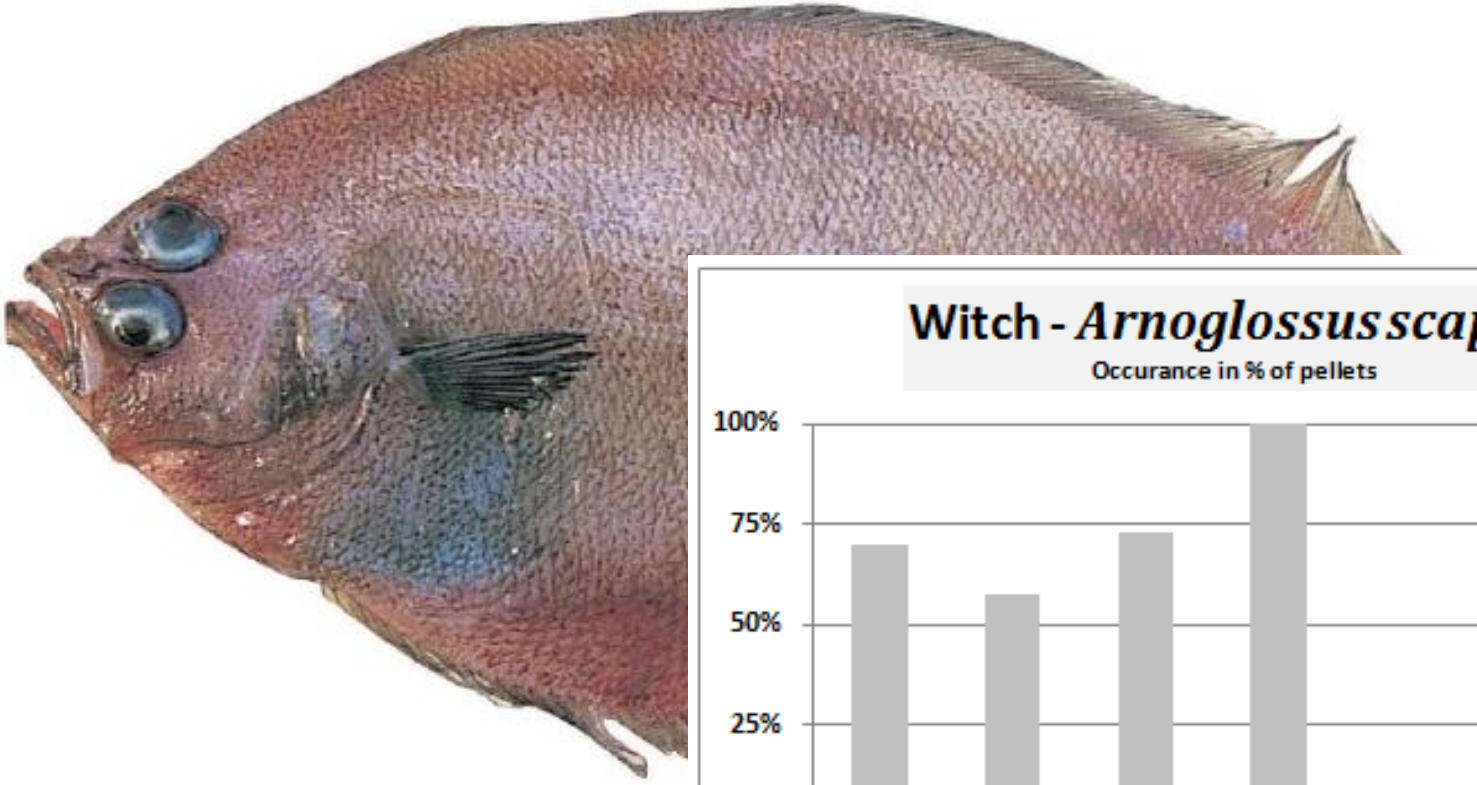
Recent (2011) King Shag prey items from four colonies (●) is much more diverse compared to study of Lalas and Brown (1998) (●) .

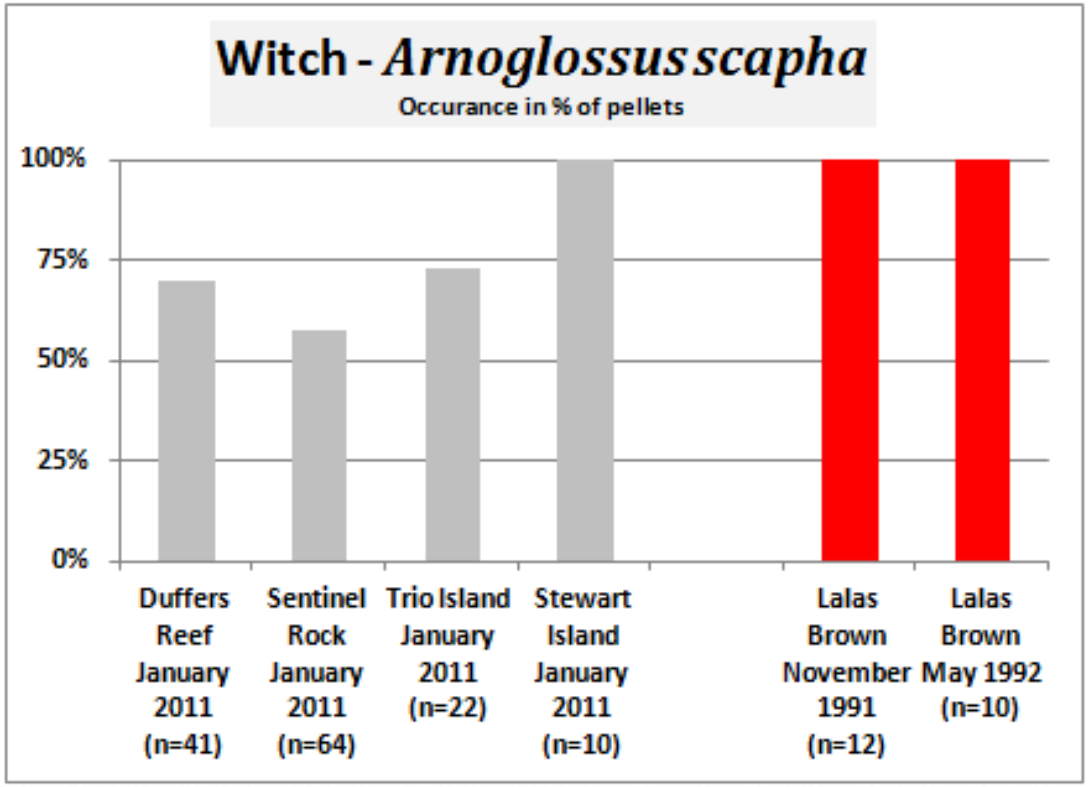
Sampling site Lalas and Brown: Te Kaiangapipi

Common name	Latin name
Witch	*Arnoglossus scapha*
Lemon Sole	*Pelotretis flavilatus*
Opalfish	*Percophidae*
Silver Conger	*Gnathophis habenatus*
Ling	*Genypterus blacodes*
Roughy	*Trachichthyidae*
Spotty	*Notolabrus celidotus.*
sea perch/jock stewart	*Helicolenus percoides*
True Sole	*Peltorhamphus novaezelandiae*
Triplefin	*Tripterygiidae*
Butterfly Perch	*Caesioperca lepidoptera*
Stargazer	*Uranscopidae*
Stargazer	*Leptoscopidae*
Gurnard	*Chelidonichthys kumu*
Sandfish	*Gonorhynchus gonhorhynchus*
Red Cod	*Pseudophycis bachus*
Javelinfish	*Lepidorhynchus denticulatus*

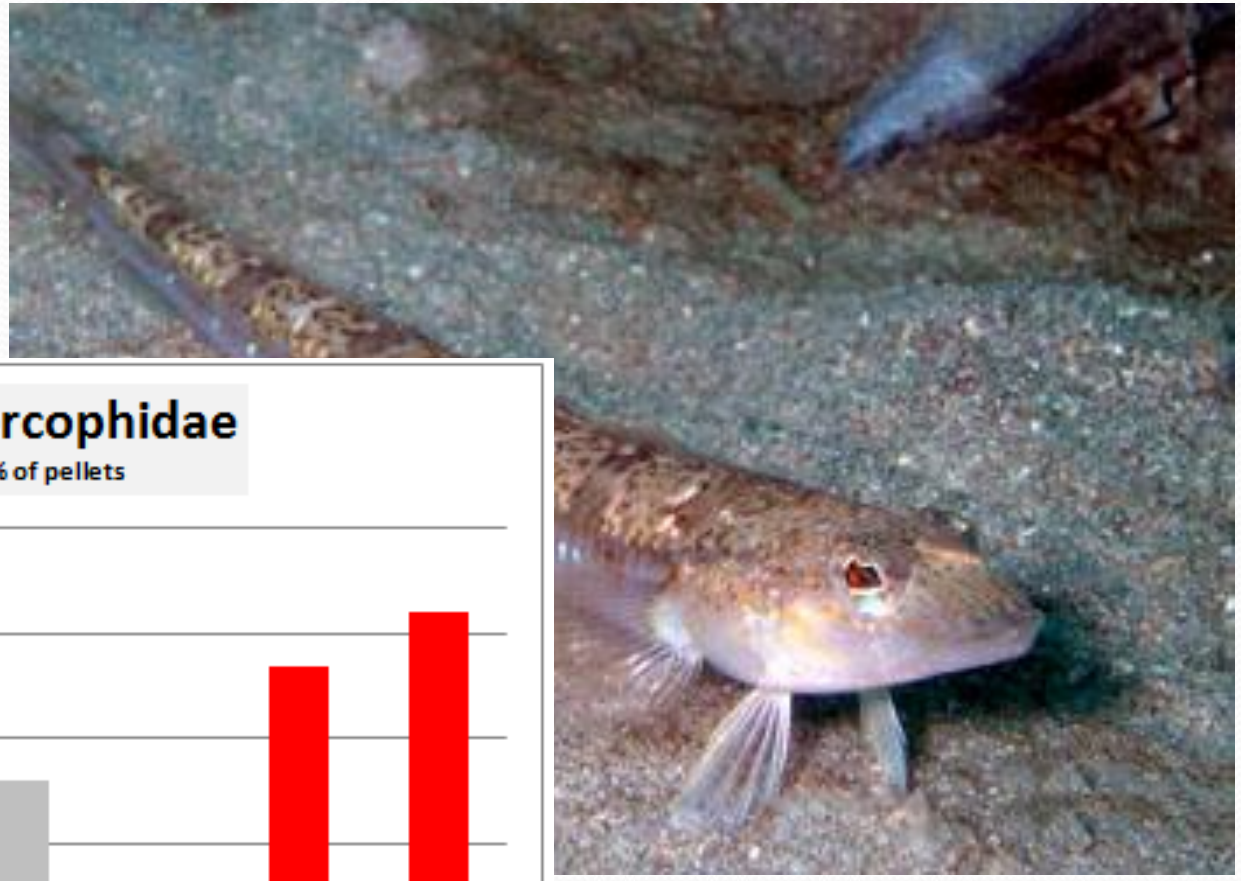
A total of 17 fish species, all bottom dwelling, were identified……..

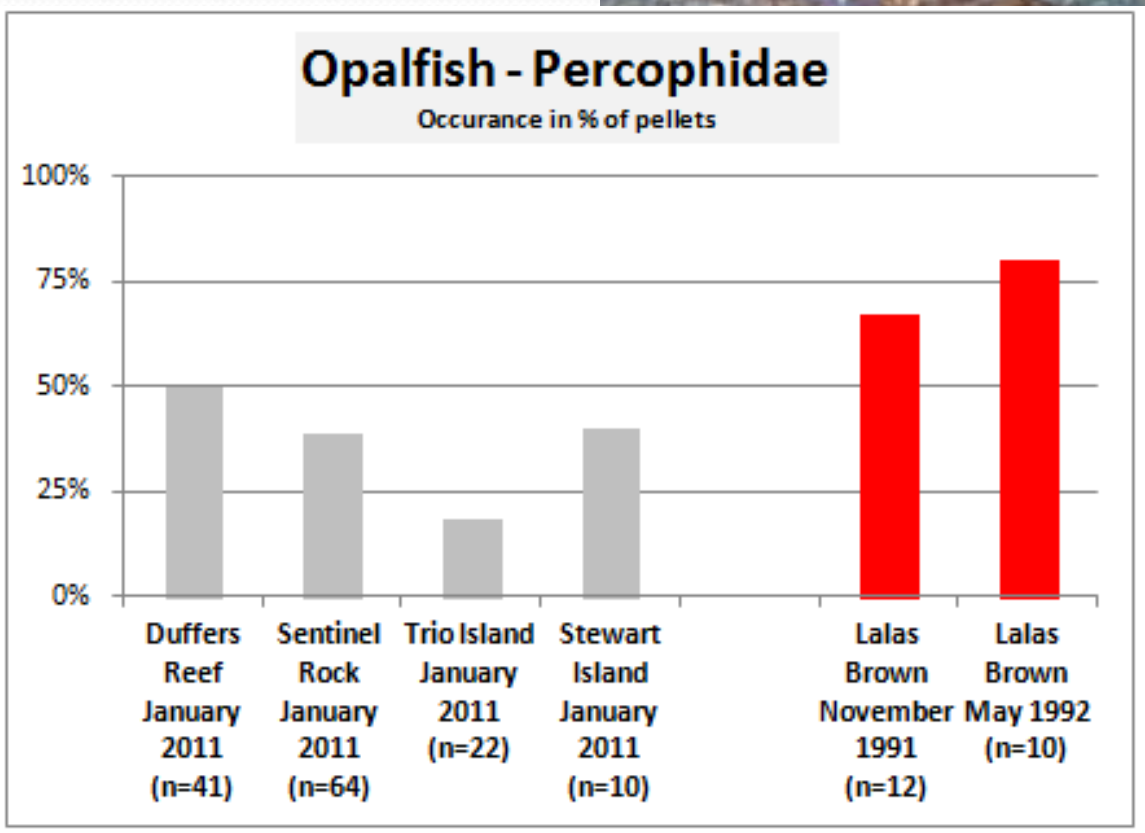
Witch - *Arnoglossus scapha*



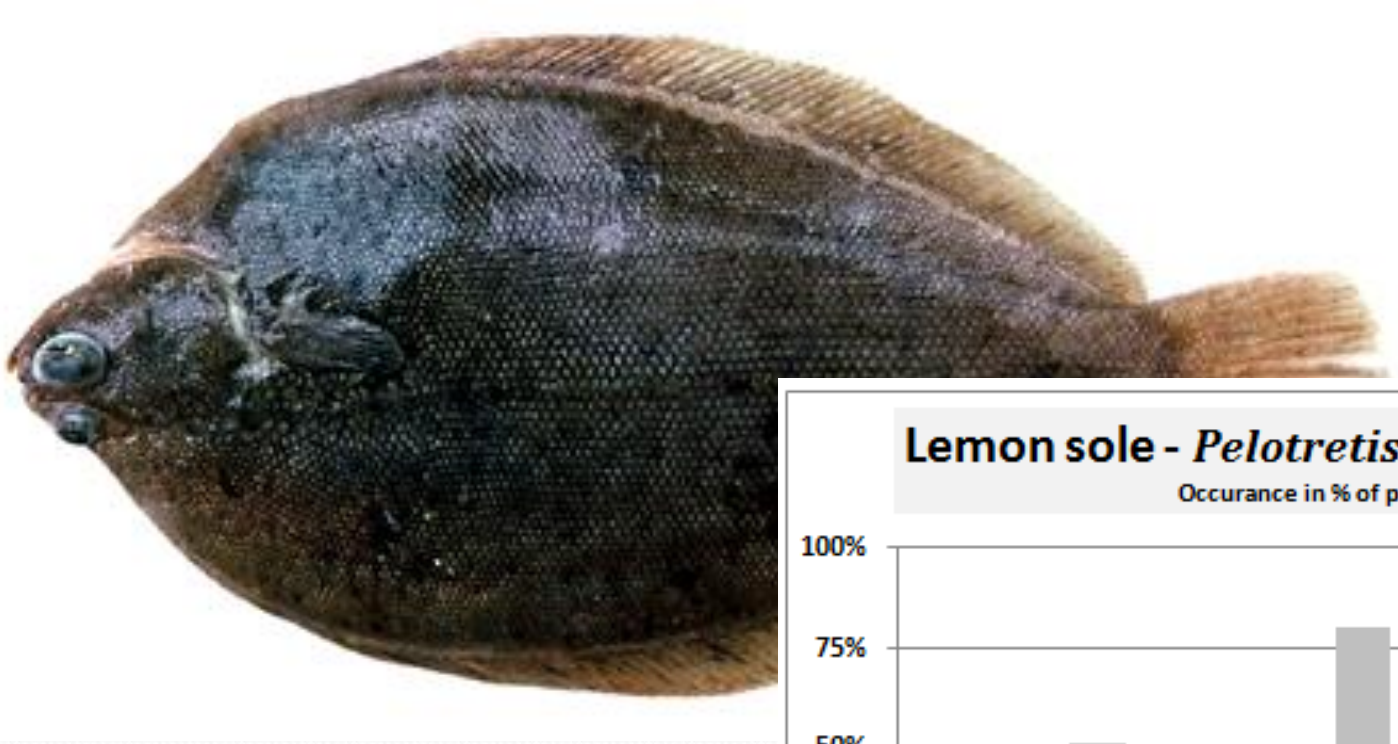


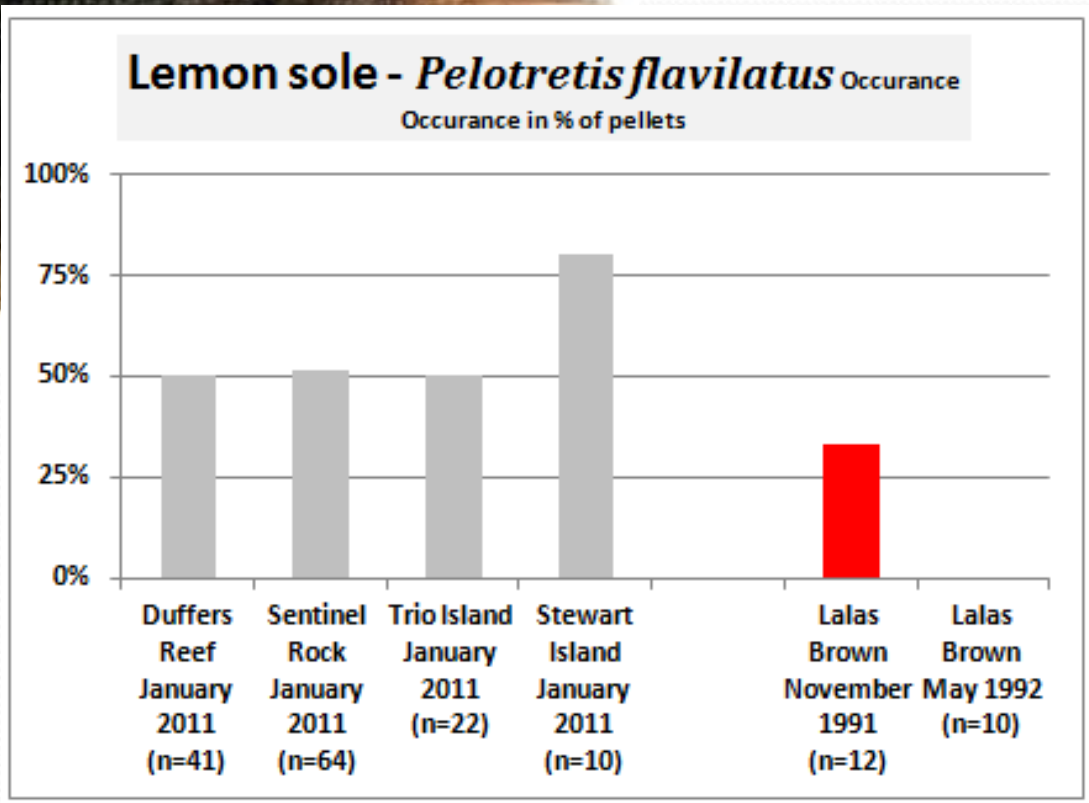
Opalfish - *Hemerocoetes monopterygius*



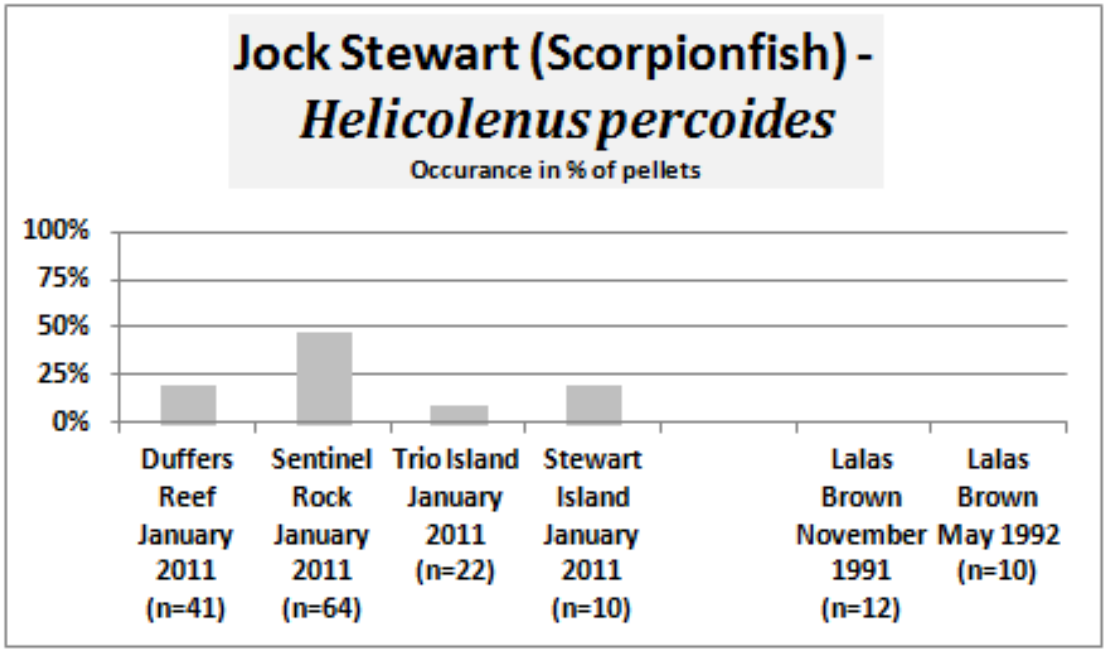


Lemon Sole - *Pelotretis flavialatus*

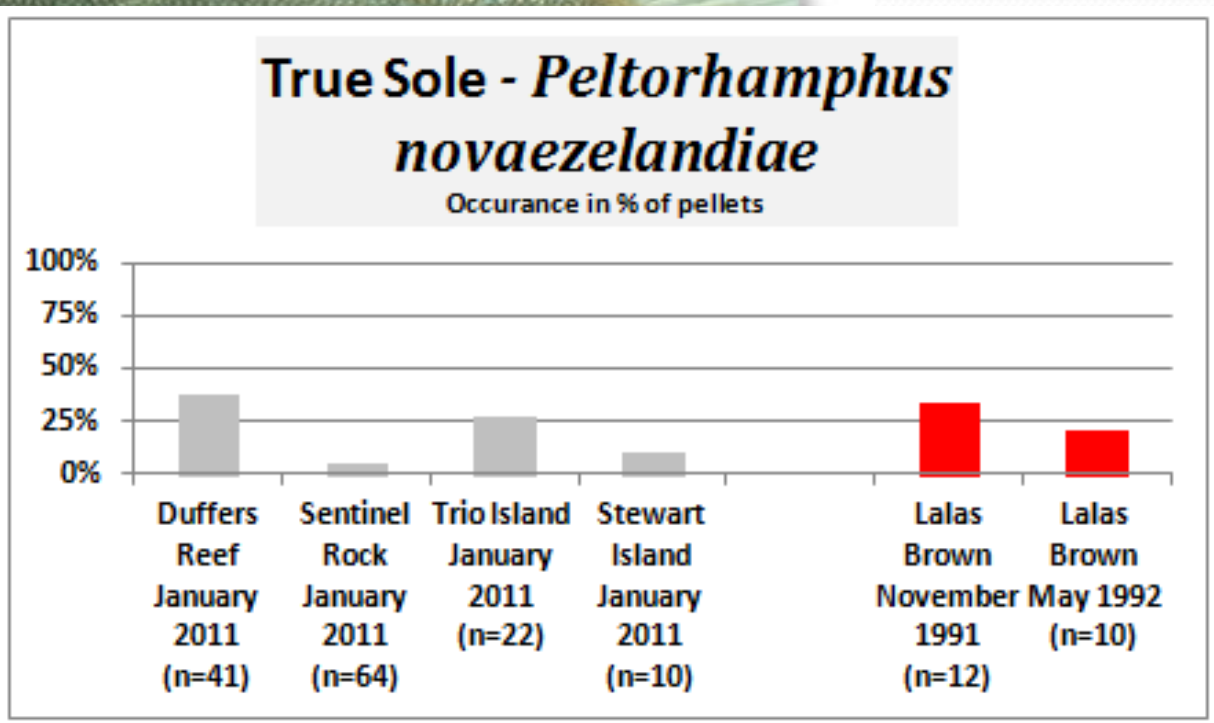




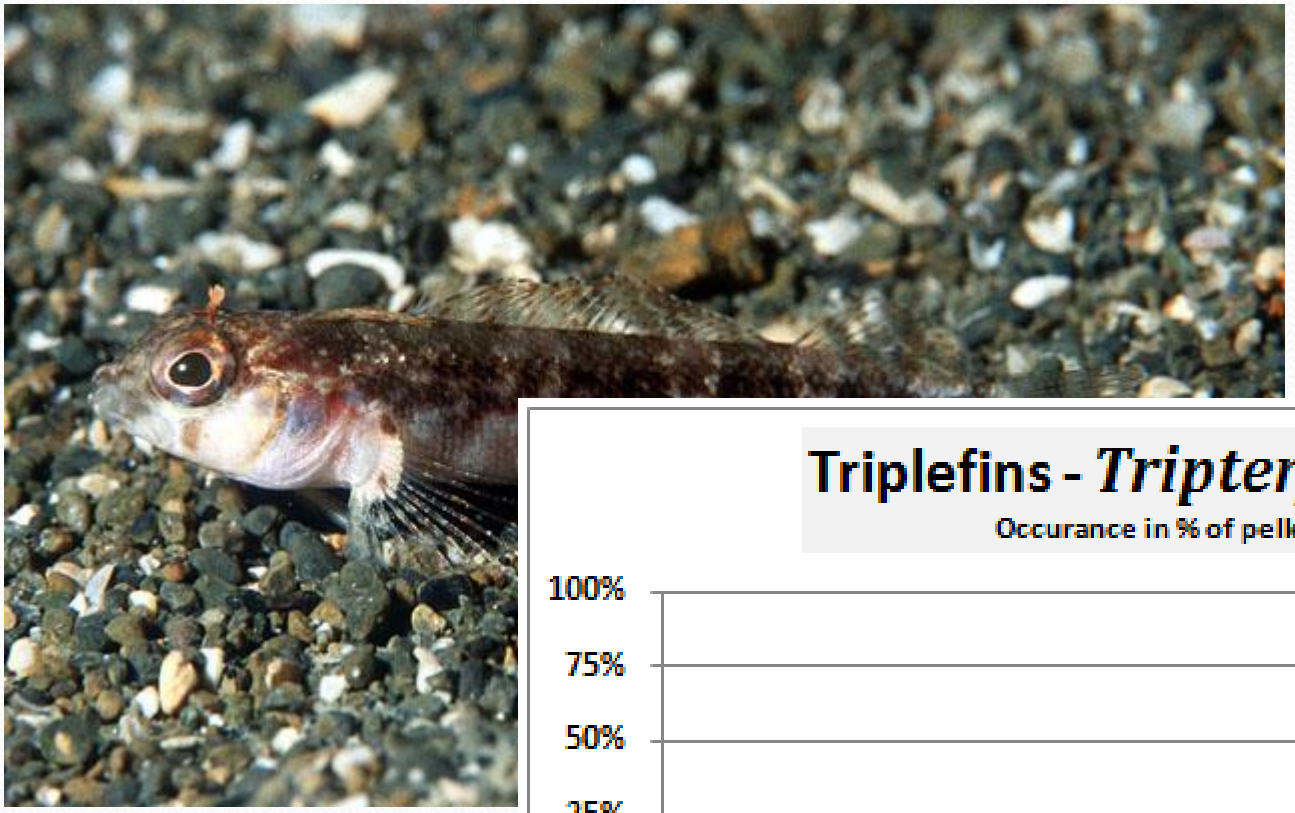
Jock Stewart - *Helicolenus percoides*

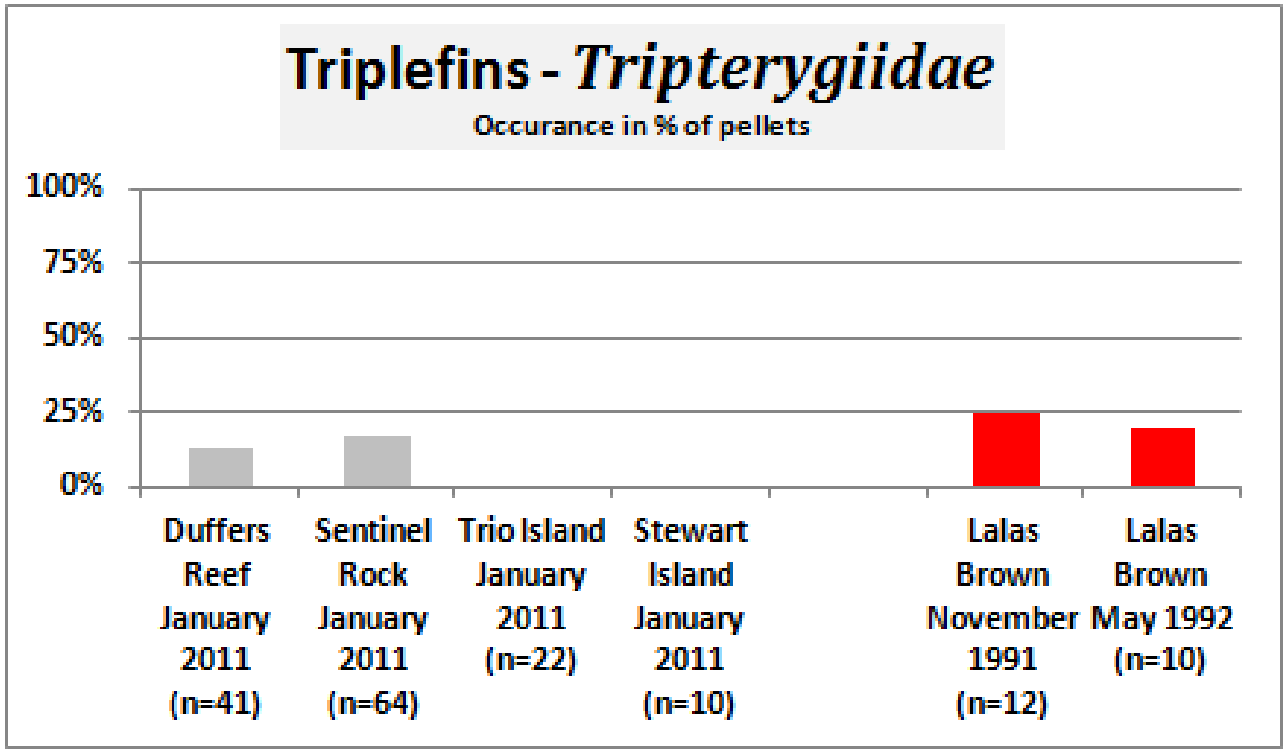


New Zealand Sole - *Peltorhamphus novaezeelandiae*

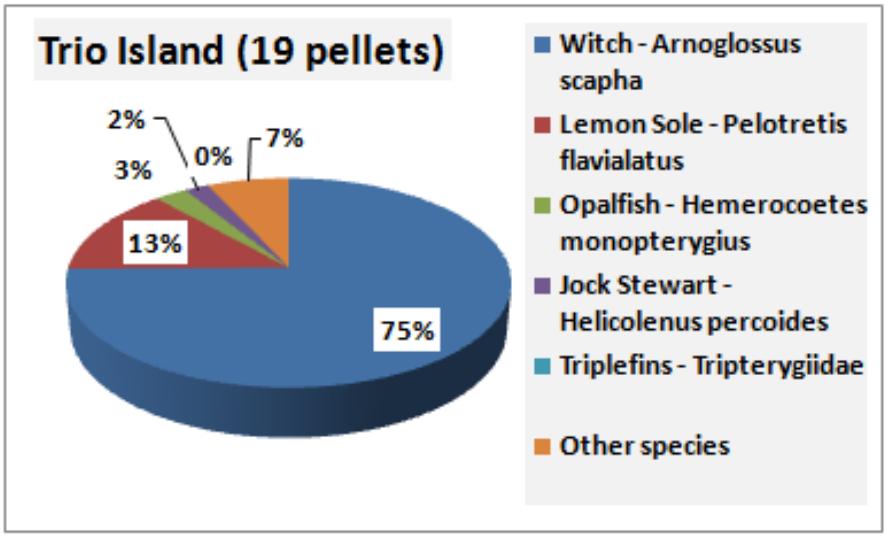


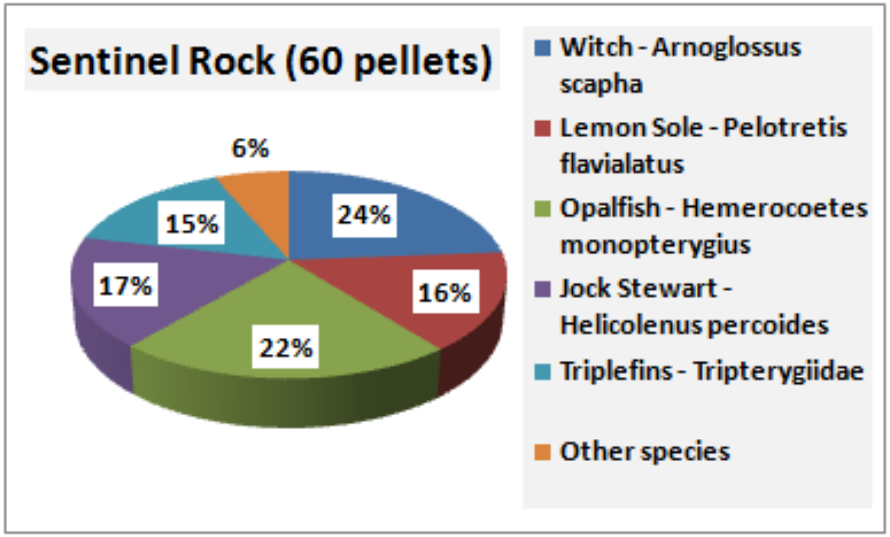
Triplefins - *Tripterygiidae*

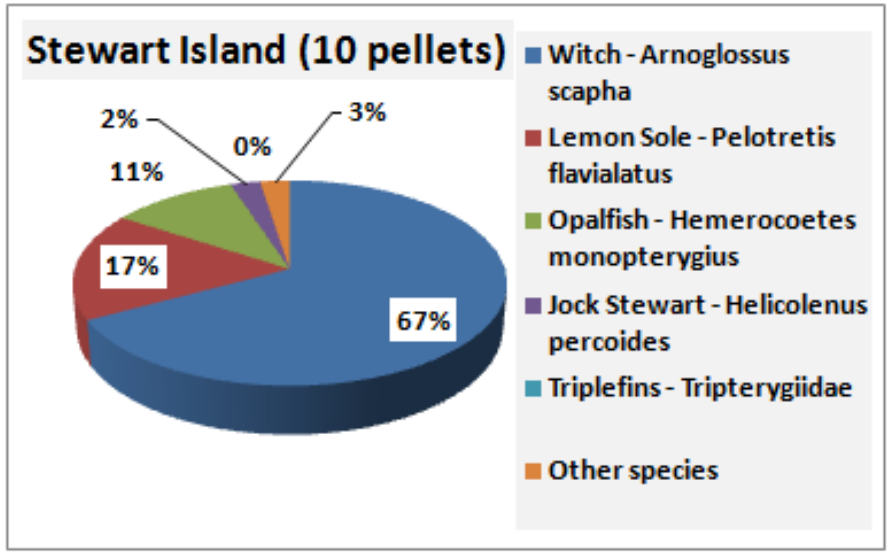


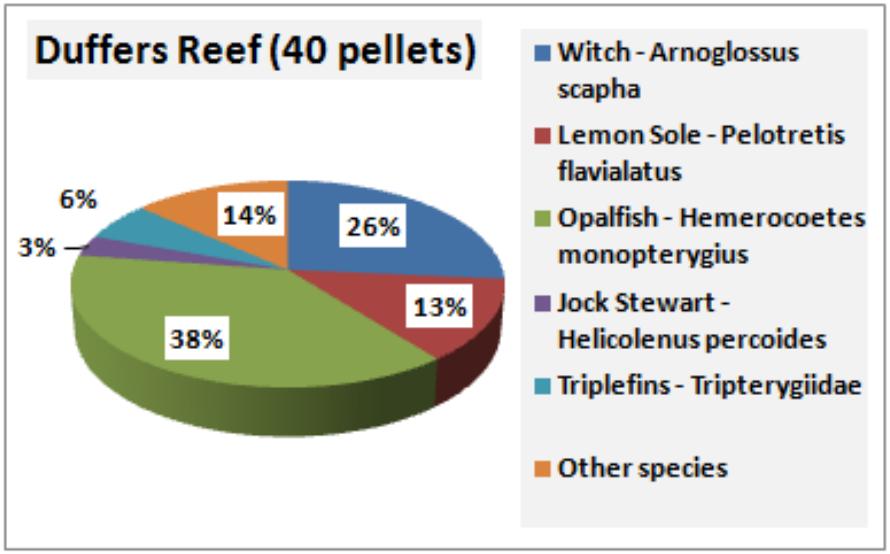


Potential difference in prey selection between different feeding areas.

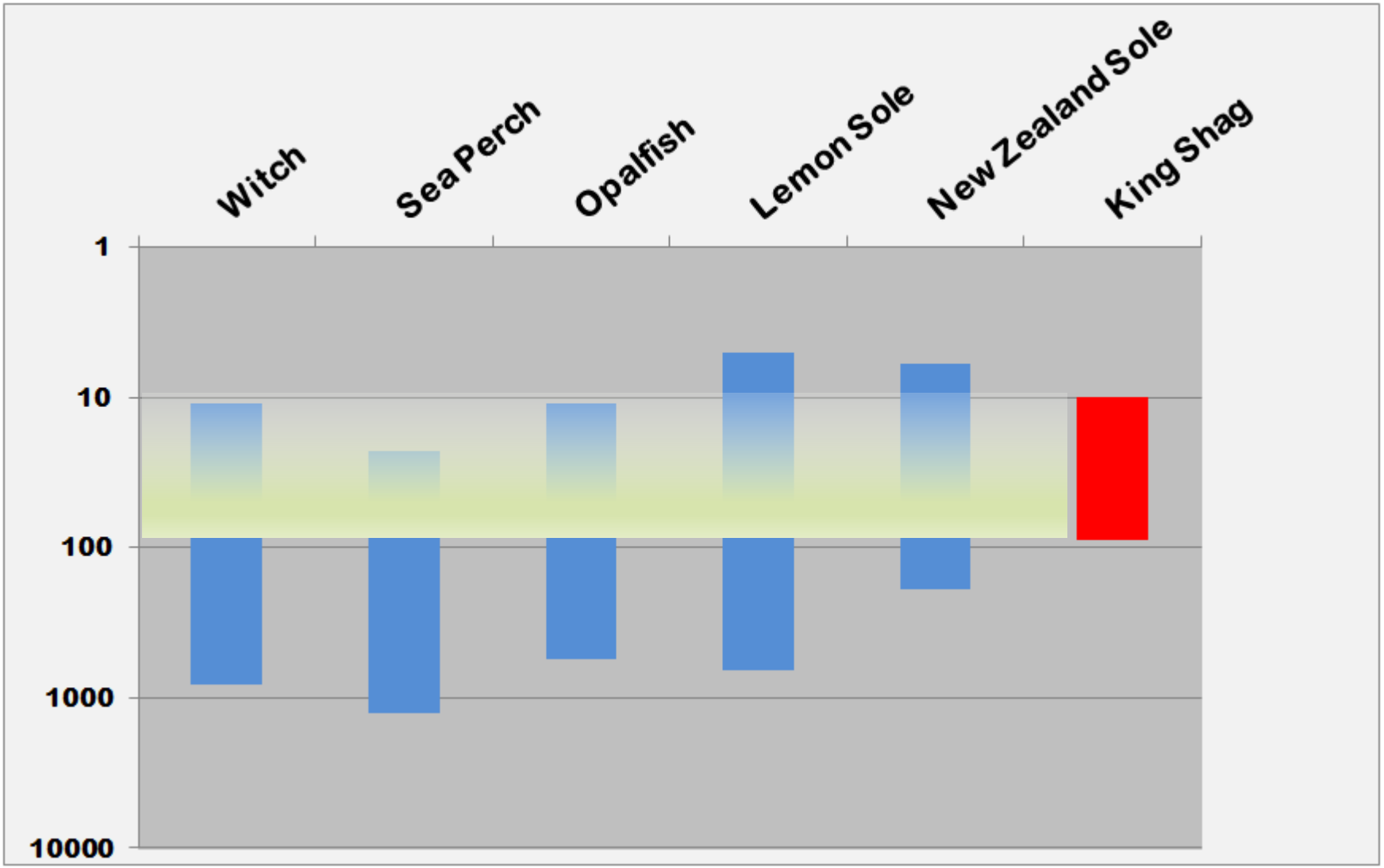








Prey species are caught by King Shag in upper limit of their depth distribution.



1999
Deepest
dive 0.5 Lux

Vol. 188: 219–224, 1999 | MARINE ECOLOGY PROGRESS SERIES
Mar Ecol Prog Ser | Published November 3

Effect of the diel light cycle on the diving behaviour of two bottom feeding marine birds: the blue-eyed shag *Phalacrocorax atriceps* and the European shag *P. aristotelis*

Sarah Wanless[1,*], Suzanne K. Finney[1], Michael P. Harris[1], Dominic J. McCafferty[2]

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[2]British Antarctic Survey, Natural Environment Research Council, High Cross, Madingley Road, Cambridge CB3 0ET, United Kingdom

2017 Deepest
dive 0.3 lux

PLOS ONE

RESEARCH ARTICLE

Selfies of Imperial Cormorants (*Phalacrocorax atriceps*): What Is Happening Underwater?

Agustina Gómez-Laich[1]*, Ken Yoda[2], Carlos Zavalaga[2,3], Flavio Quintana[1,4]

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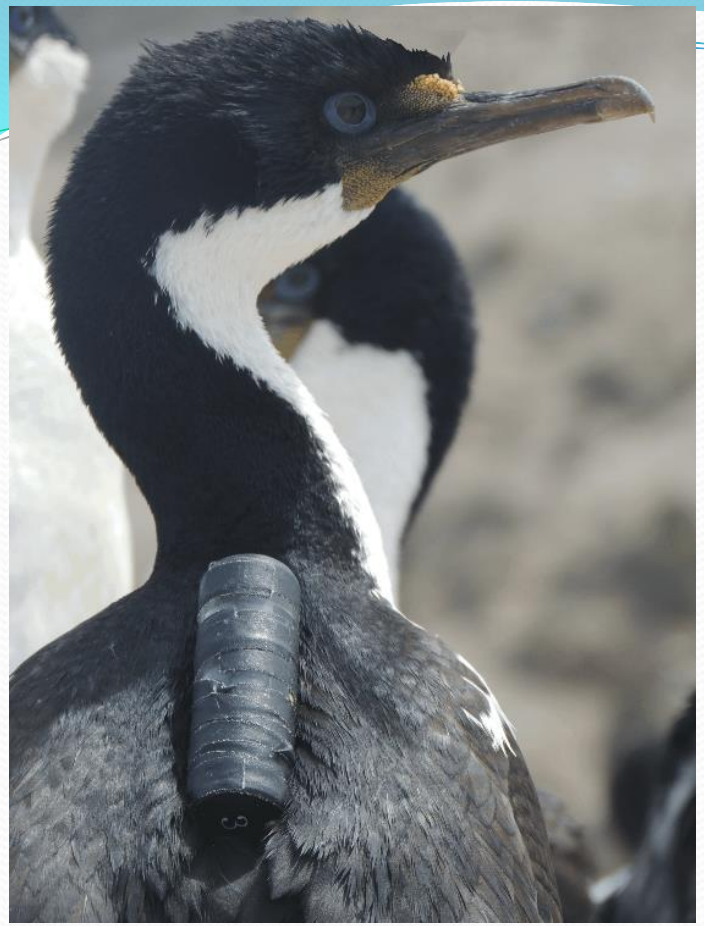
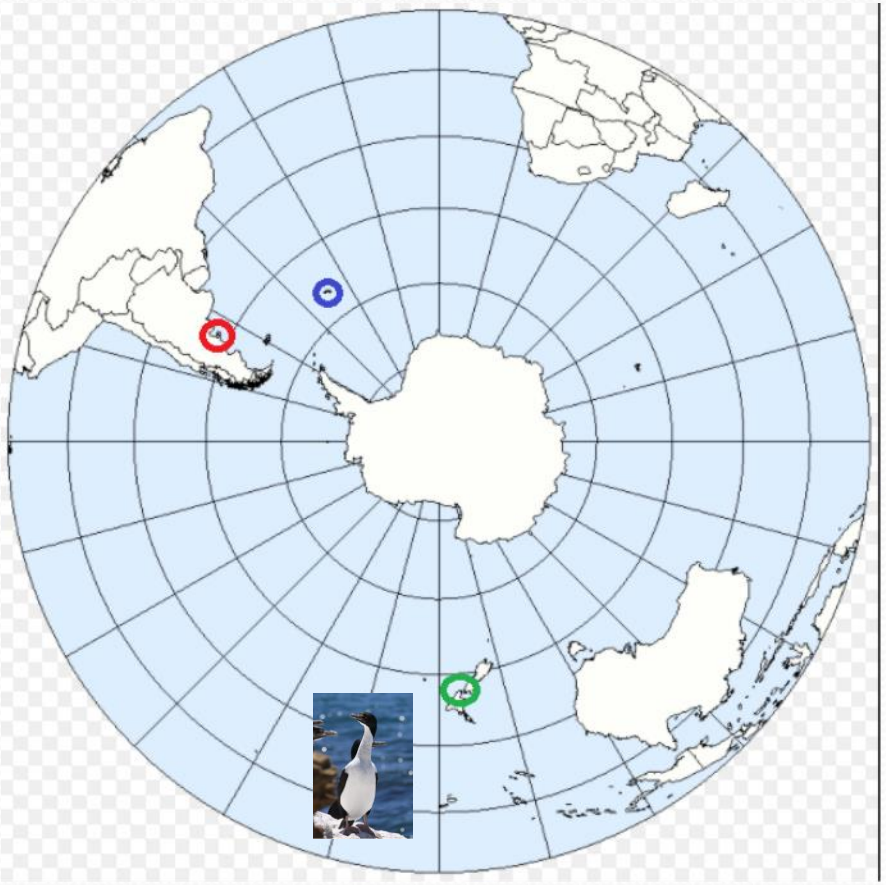
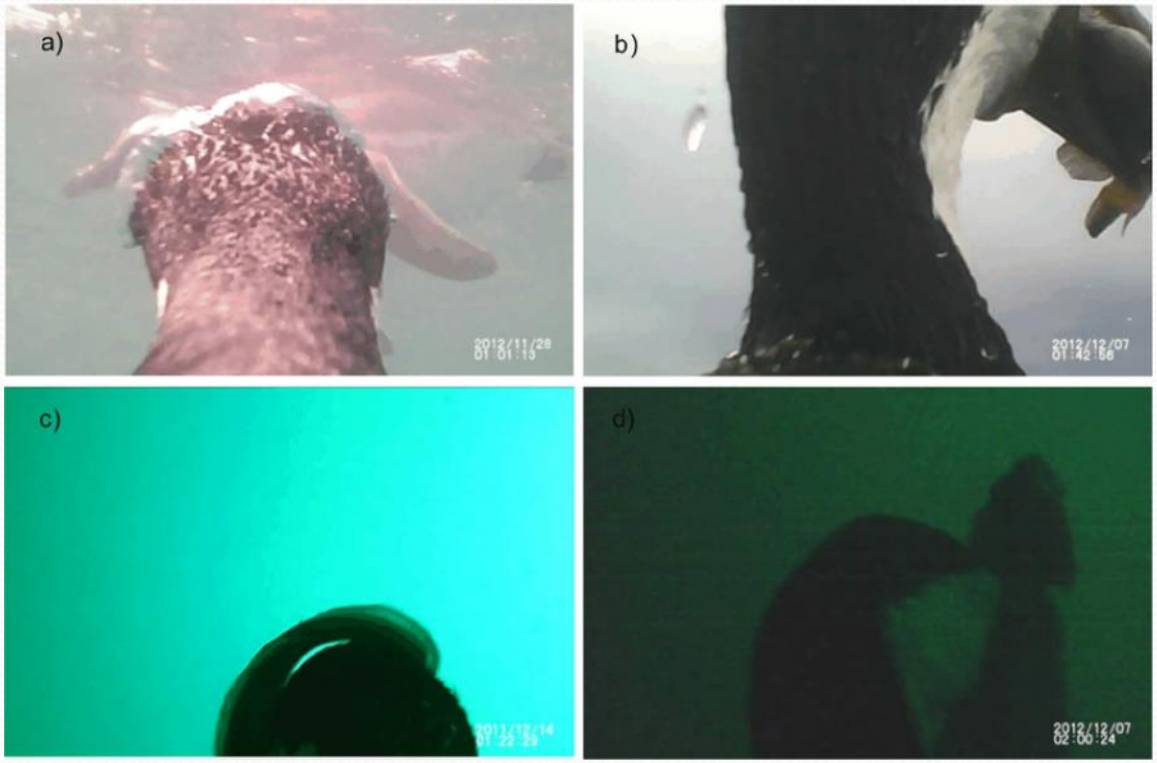




Depth range 0.5 lux (Imperial Shag Phalacrocorax atriceps, South Georgia (54" 00' S, 38" 02' W))

Depth range 0.3 lux (Imperial Shag Phalacrocorax atriceps, Punta León Argentina (43°040S; 64°290W))

Scientists from the Argentinian study, communicated that the shags rarely visit environments where the light level is below 0.3 lux.



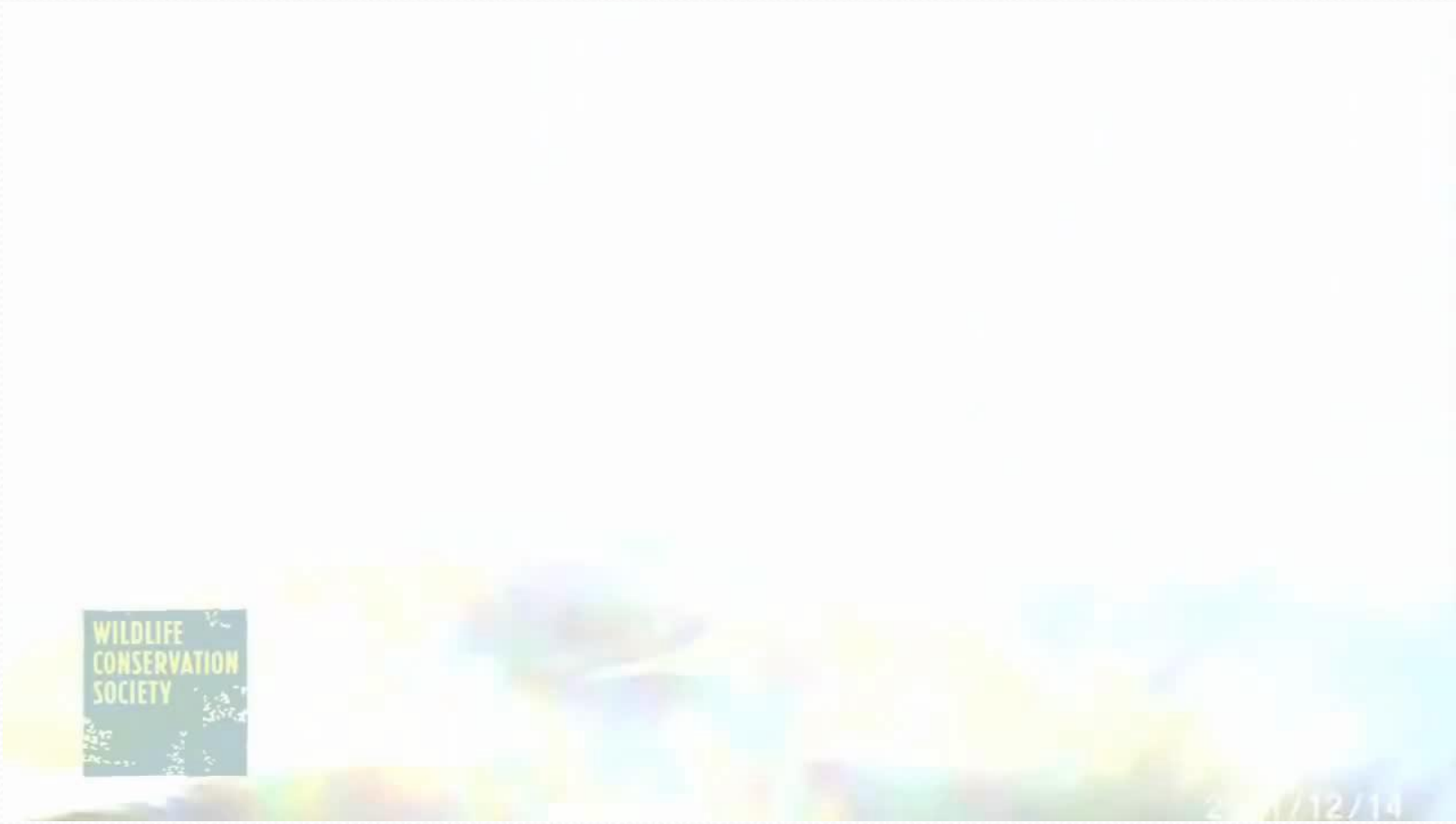
Information kindly supplied by
Agustina Gómez Laich
and
Flavio Quintana

(Top Predators Marine Lab (LEPTOMAR), IBIOMAR-CONICET, Argentina)

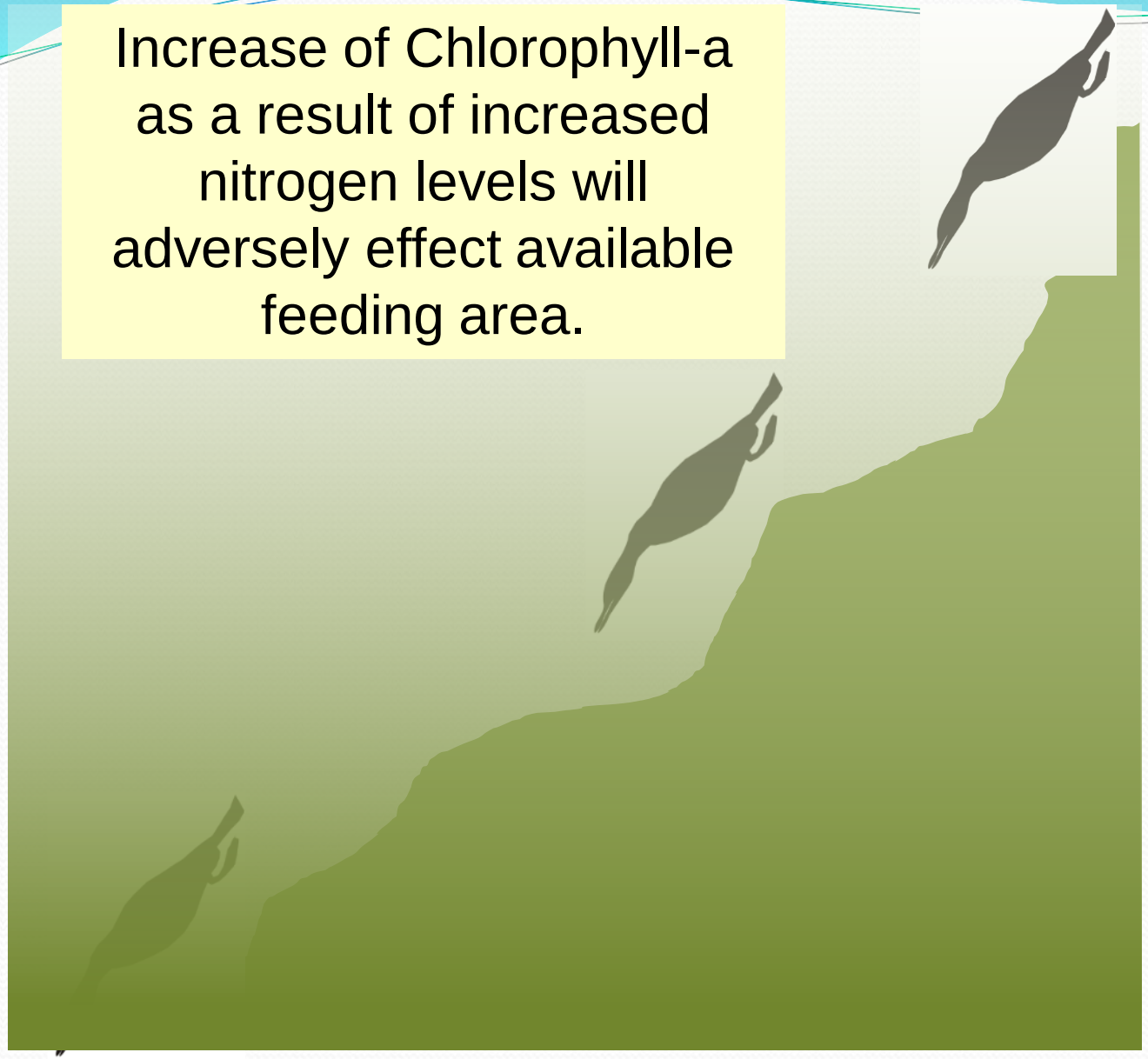
They forage between 100 lux (Like a very dark overcast day).

and …0.27–1.0 lux (Like a full moon on a clear night).

…..scientists have now been able to observe the feeding techniques of the Imperial Shag.



Increase of Chlorophyll-a as a result of increased nitrogen levels will adversely effect available feeding area.



…40 seconds to dive to seafloor at 50 m

80 seconds to hunt for fish

40 seconds to reach the surface.

To establish and operate a marine farm and undertake marine farming of King Salmon Conditions include:

Environmental Quality Standards (EQS) – Water Column

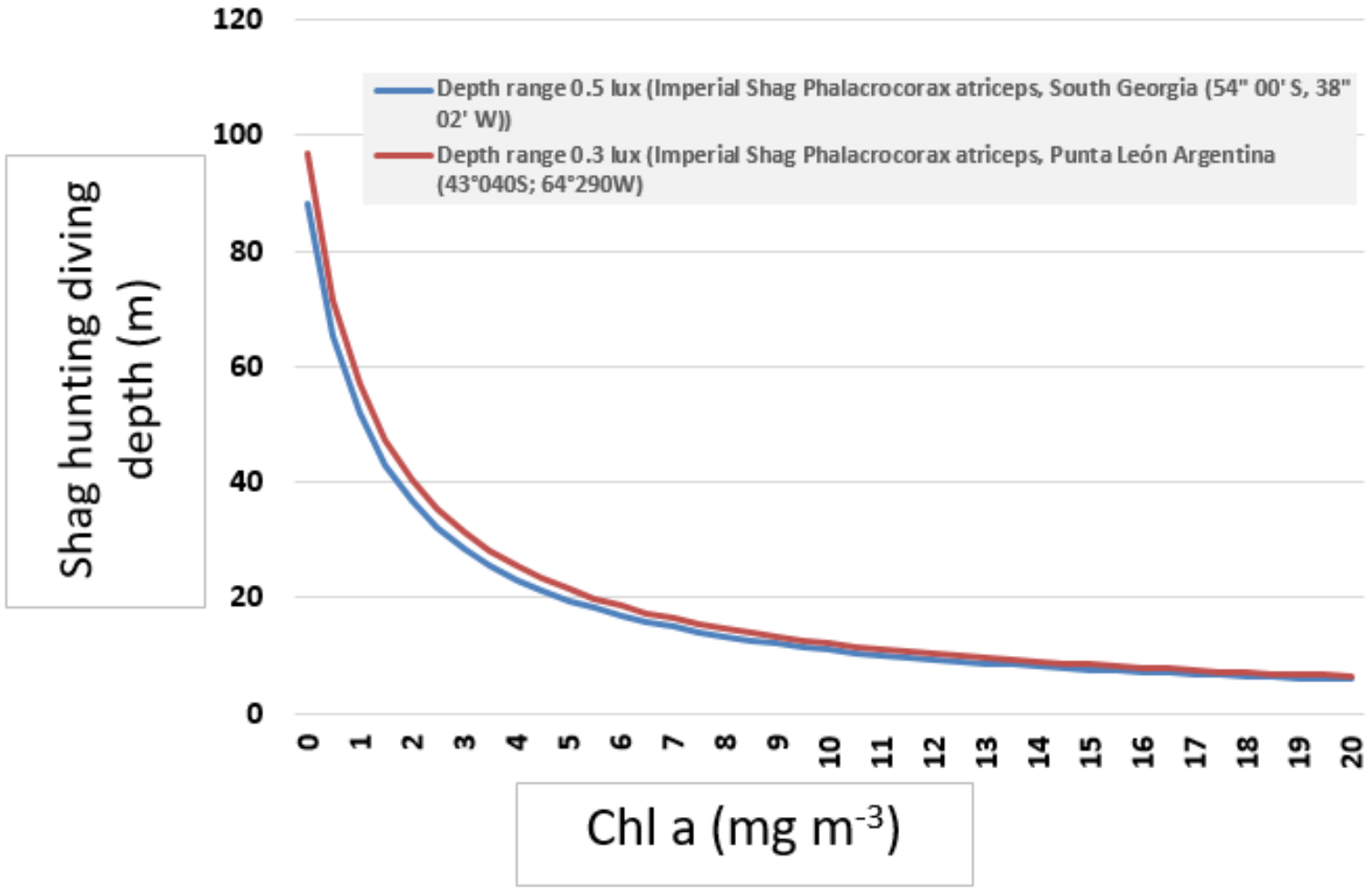
43. The marine farm shall be operated at all times in such a way as to achieve the following Water Quality Objectives in the water column:

a To not cause an increase in the frequency, intensity or

Adapted by New Zealand King Salmon Ltd. and Marlborough District Council to increased surveillance when Chlorophyll-a is more than 3.5 mg m^{-3} in 3 sequential months.

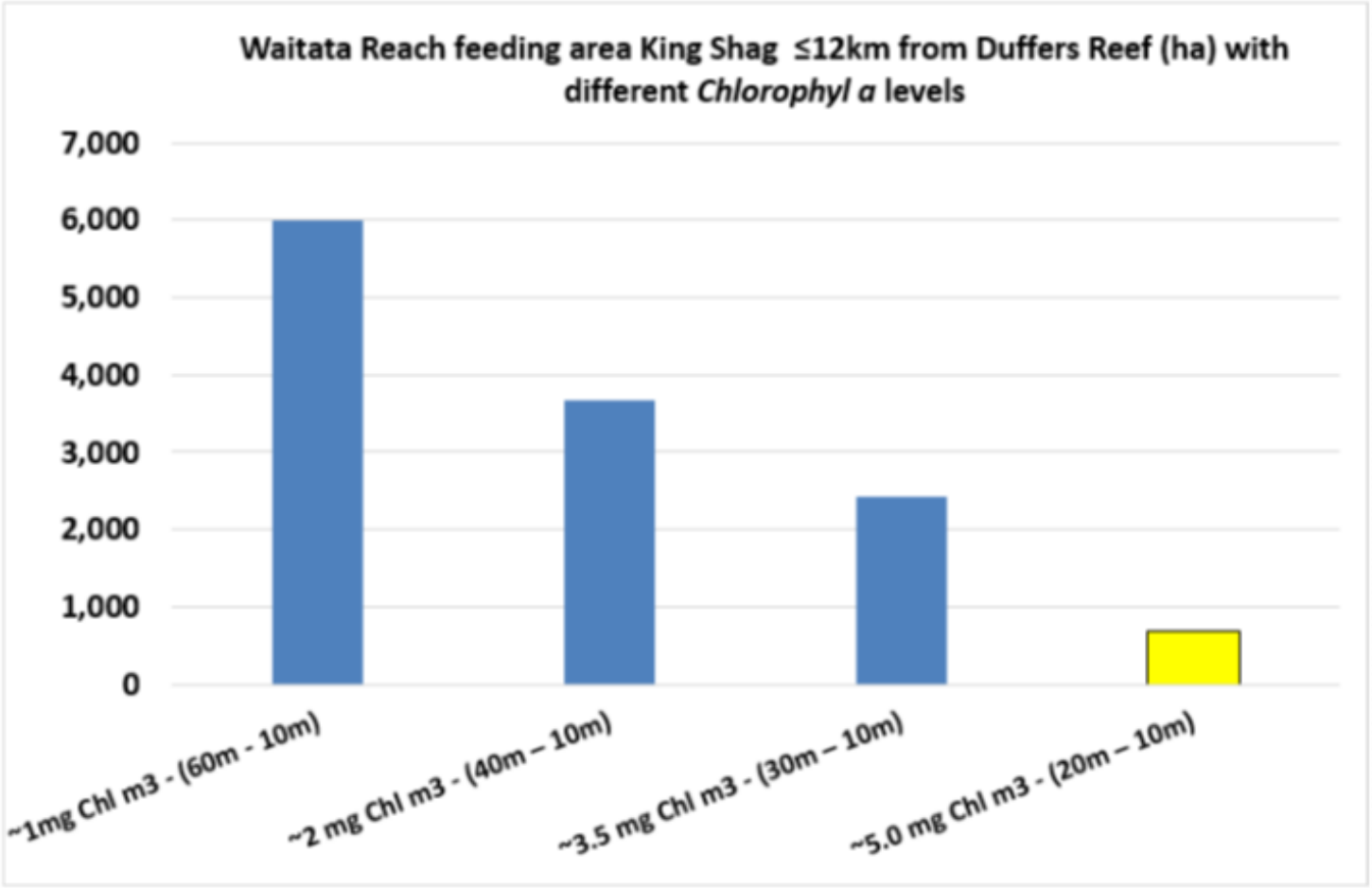
[Note: water clarity as affected by chlorophyll a concentrations is addressed by this objective];

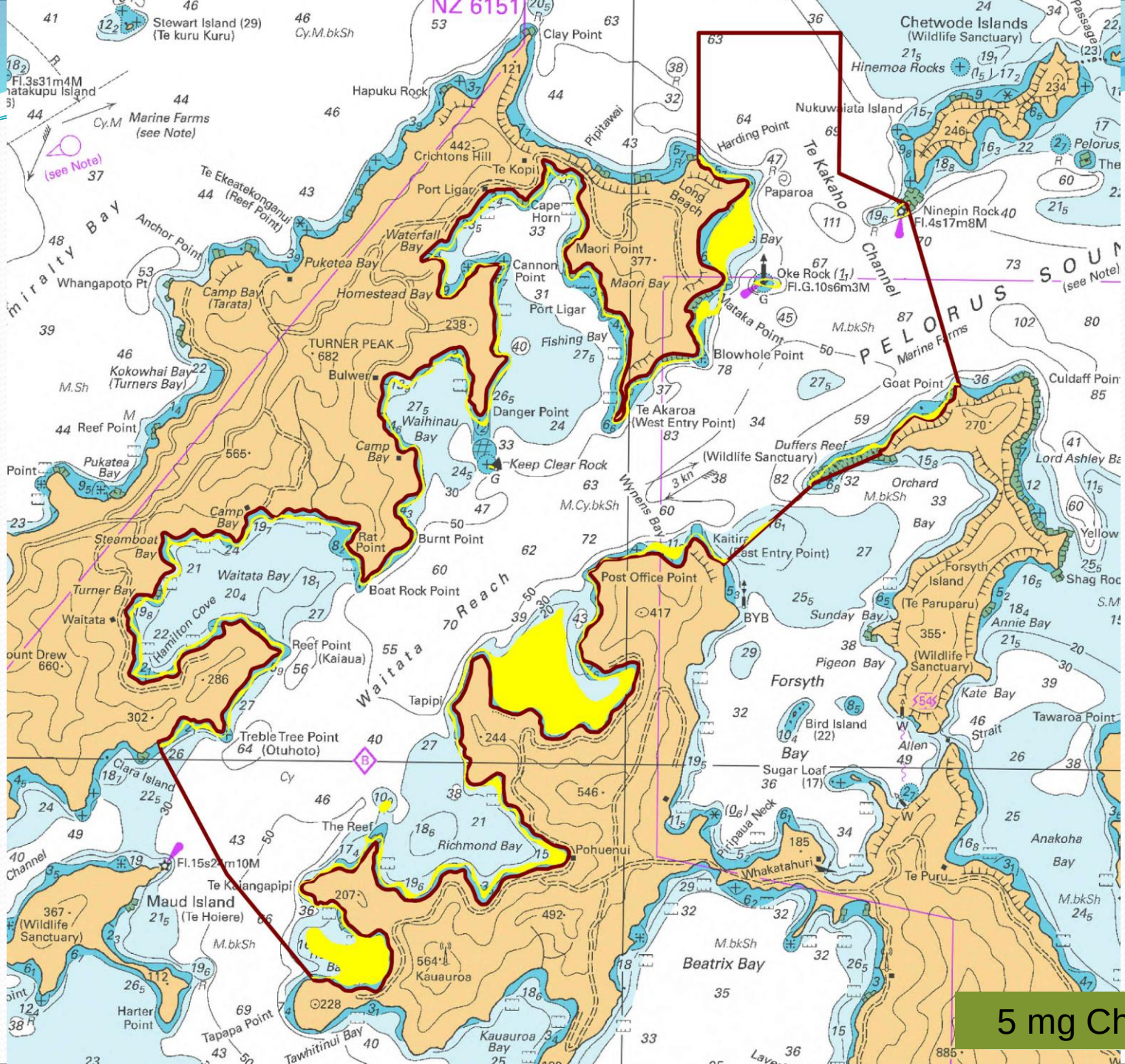
Upper light level 100 lux, lower light level 0.3 and 0.5 lux



Existing Chlorophyll-a concentrations in outer sounds are around 1 mg m^{-3} .....

……and vary between 0.9 – 1.9 mg m^{-3} through the year.


Waitata Reach feeding area King Shag ≤12km from Duffers Reef (ha) with different *Chlorophyl a* levels
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
~1mg Chl m3 - (60m - 10m)
~2 mg Chl m3 - (40m – 10m)
~3.5 mg Chl m3 - (30m – 10m)
~5.0 mg Chl m3 - (20m – 10m)


NZ 6151
Stewart Island (29)
(Te kuru Kuru)
Clay Point
Chetwode Islands
(Wildlife Sanctuary)
Hinemoa Rocks
Hapuku Rock
Marine Farms
(see Note)
Crichtons Hill
Te Kopi
Port Ligar
Cape Horn
Pipitawai
Harding Point
Paparoa
Te Kakaho Channel
Ninepin Rock
Fl.4s17m8M
Anchor Point
Waterfall Bay
Puketea Bay
Maori Point
Maori Bay
Cannon Point
Oke Rock (1)
Fl.G.10s6m3M
Whangapoto Pt
Camp Bay (Tarata)
Homestead Bay
Port Ligar
Matataka Point
Blowhole Point
PELORUS SOUND
Marine Farms
TURNER PEAK
682
Bulwer
Fishing Bay
Kokowhai Bay
(Turners Bay)
Danger Point
Te Akaroa
(West Entry Point)
Goat Point
Culdaff Point
Reef Point
Waihinau Bay
Keep Clear Rock
Duffers Reef
(Wildlife Sanctuary)
Pukatea Bay
Camp Bay
Wyners Bay
Orchard
Steamboat Bay
Rat Point
Burnt Point
Waitata Bay
Turner Bay
Boat Rock Point
Post Office Point
Kaitira
(East Entry Point)
Forsyth Island
(Te Paruparu)
Sunday Bay
Annie Bay
Hamilton Cove
Waitata
Reef Point
(Kaiaua)
Pigeon Bay
Forsyth
Kate Bay
Tapipi
Bird Island
(22)
Tawaroa Point
Strait
Treble Tree Point
64 (Otuhoto)
Sugar Loaf
(17)
Clara Island
The Reef
Richmond Bay
Pohuenui
Pripaua Neck
Whakatahuri
Te Puru
Anakoha Bay
Fl.15s24m10M
Te Kaiangapipi
Maud Island
(Te Hoiere)
(Wildlife Sanctuary)
Beatrix Bay
Kauauroa
Harter Point
Tapapa Point
Tawhitinui Bay
Kauauroa Bay

5 mg Chl a m^{-3}

COMMISSIONER BEAUMONT: So can you address the issue of the risk.

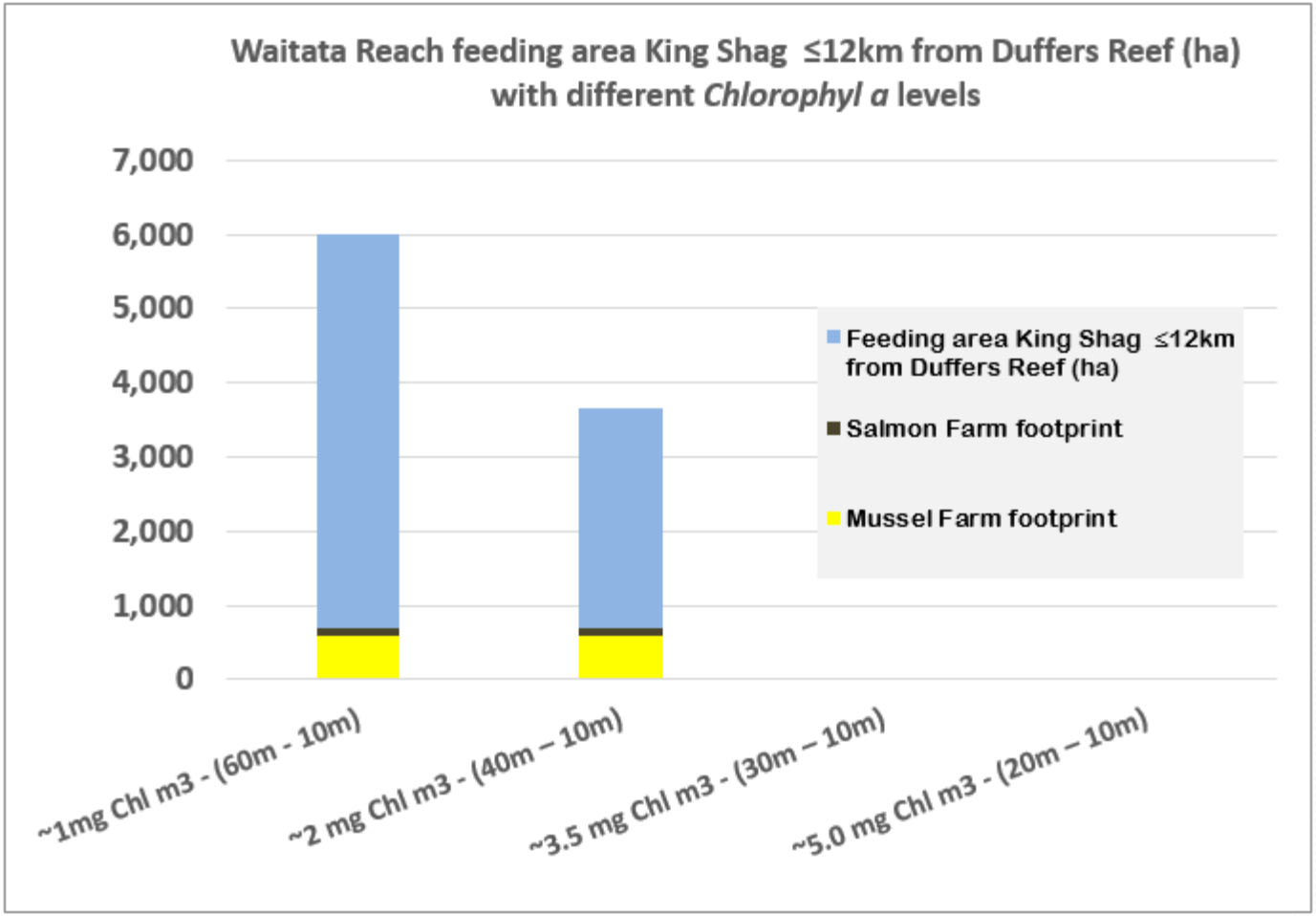
MR SAGAR: Of the risk?

COMMISSIONER BEAUMONT: The risk following a loss of habitat.

MR SAGAR: Well, again it depends upon the extent of the loss before I could consider the risk. I would consider **a loss of up to 5 percent as being no risk** and then increasing risk as the percentage of habitat lost goes up.

The existing environment of Waitata Reach is not pristine,

.....already 705 ha of King Shag feeding area (12%) is covered by mussel farm and salmon farm deposits.



(Simpson, 2017)

(Solley, 2017)

?

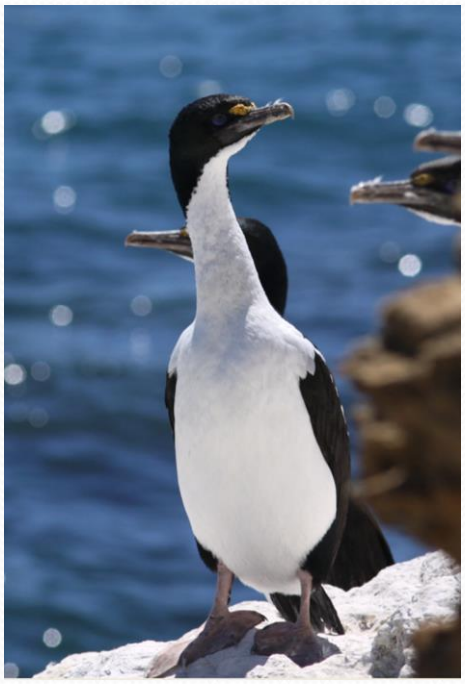
Policy 11 New Zealand Coastal Policy Statement 2010

To protect indigenous biological diversity in the coastal environment:

(a) avoid adverse effects of activities on:

(i) indigenous taxa[4] that are listed as threatened[5] or at risk in the New Zealand Threat Classification System lists;

(ii) taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened;



The proposed relocation of salmon farms in the Marlborough Sounds has an unacceptable adverse effect on the well-being of the threatened King Shag.