

Diving & foraging behaviour of petrels & shearwaters-

Interactions with baits



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Seabirds at risk



**Vulnerable (IUCN Red List)
Nationally Vulnerable
(NZTCS)**



Black petrel

Seabirds at risk



Flesh-footed shearwaters

Least Concern (IUCN Red List)

Nationally Vulnerable (NZTCS)

Foraging behaviour of seabirds - Sensory

Smell

broad-scale foraging
burrow, mate location



Vision

locating prey underwater flattened
cone cells, low refraction, bill
position



Foraging behaviour of seabirds - Diving

Flesh-footed shearwaters: Non-breeding= 2.35 m; breeding=4.81 m (Rayner et al. 2011)

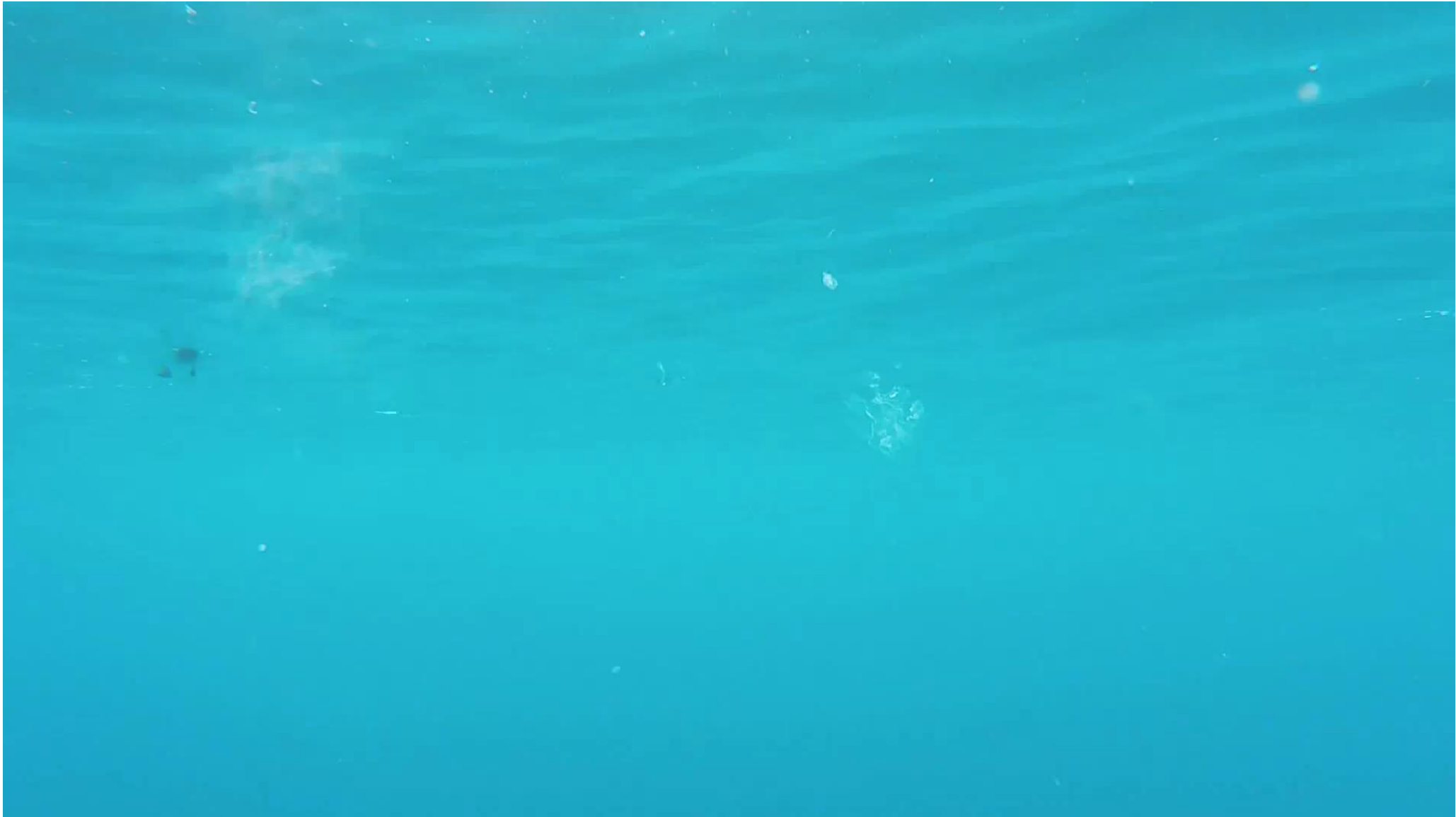
Black petrels: 80% of dives shallow (Bell et al. 2013)

Diving Threshold?

Wedge-tailed shearwaters & sooty shearwaters = 66-69m



Foraging behaviour of seabirds - Diving





Foraging behaviours remain a mystery

Question

1) Are seabird species more attracted to certain types of bait?



Question

A close-up photograph of a dark seabird, possibly a booby, catching a squid in the water. The bird's head is in the center, with its beak open and the squid's tentacles visible. Water splashes around the bird, creating many bubbles. The background is a blurred blue sea.

- 1) Are seabird species more attracted to certain types of bait?
- 2) Do seabird species have different tendencies to obtain prey at different depths?

Methods



Bait

Depth



2m

5m

10m

Cast



2m

5m

10m

Cast

Control

2m

Control

5m

Control

10m

Control

Cast

Methods



Bait

Depth



2m

5m

10m

Cast



2m

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Methods

Date	Date of trial
Site	Site name
Exp. #	Number of experiments at the site
Bait Type	Pilchard or squid
Depth	2 m or 5m or 10 m
Species	Seabird species 4 letter code
Dive behaviour	Flying dive, surface seizure, surface sighting, duck dive, short dive, prolonged dive, other
Success	Prey captured (if obvious)

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Results - Species

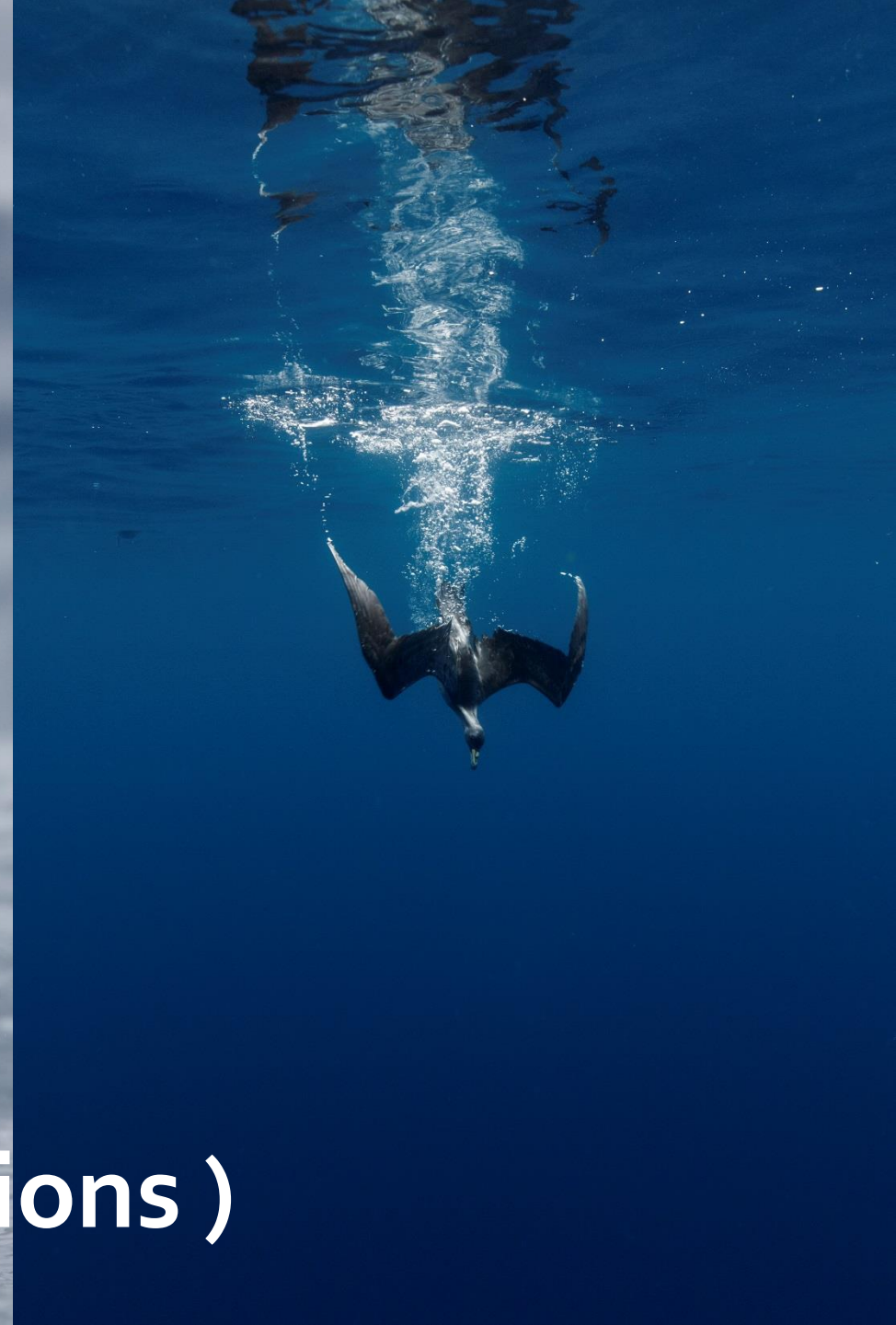


Flesh-footed shearwater (N= 297 interactions)

Results - Species



Black petrel (N= 159 interactions)



Results - Species



Buller's shearwater (N= 9 interactions)

Results - Species



Fluttering shearwater

Results - Species



Short-tailed shearwater

Results - Species



Fairy prion

Results - Species



Sooty shearwater

Image: Sonja Ross

Results - Species



Other species attracted to berley

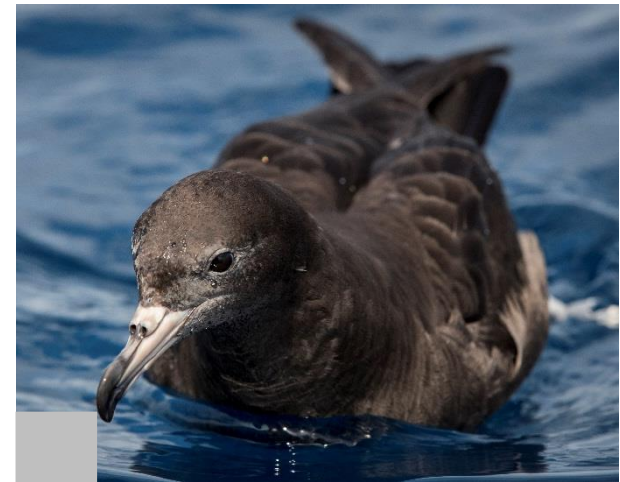
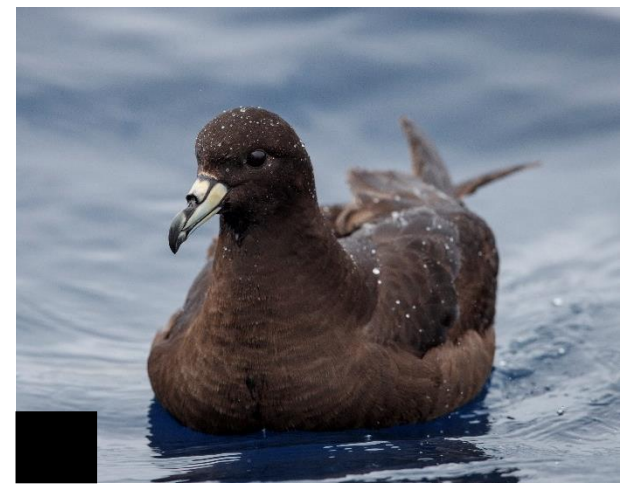
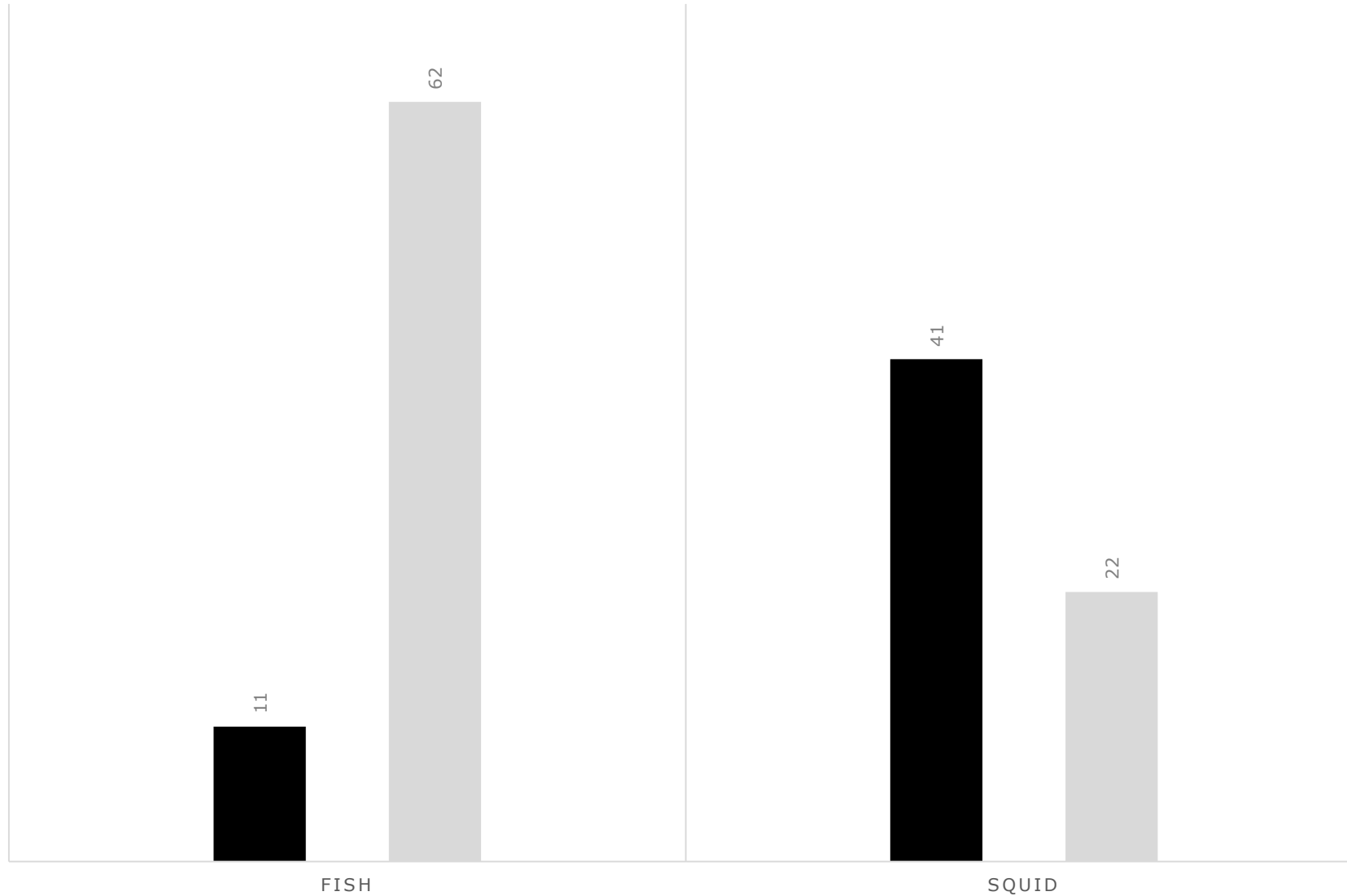


Results – Species- specific distinctions

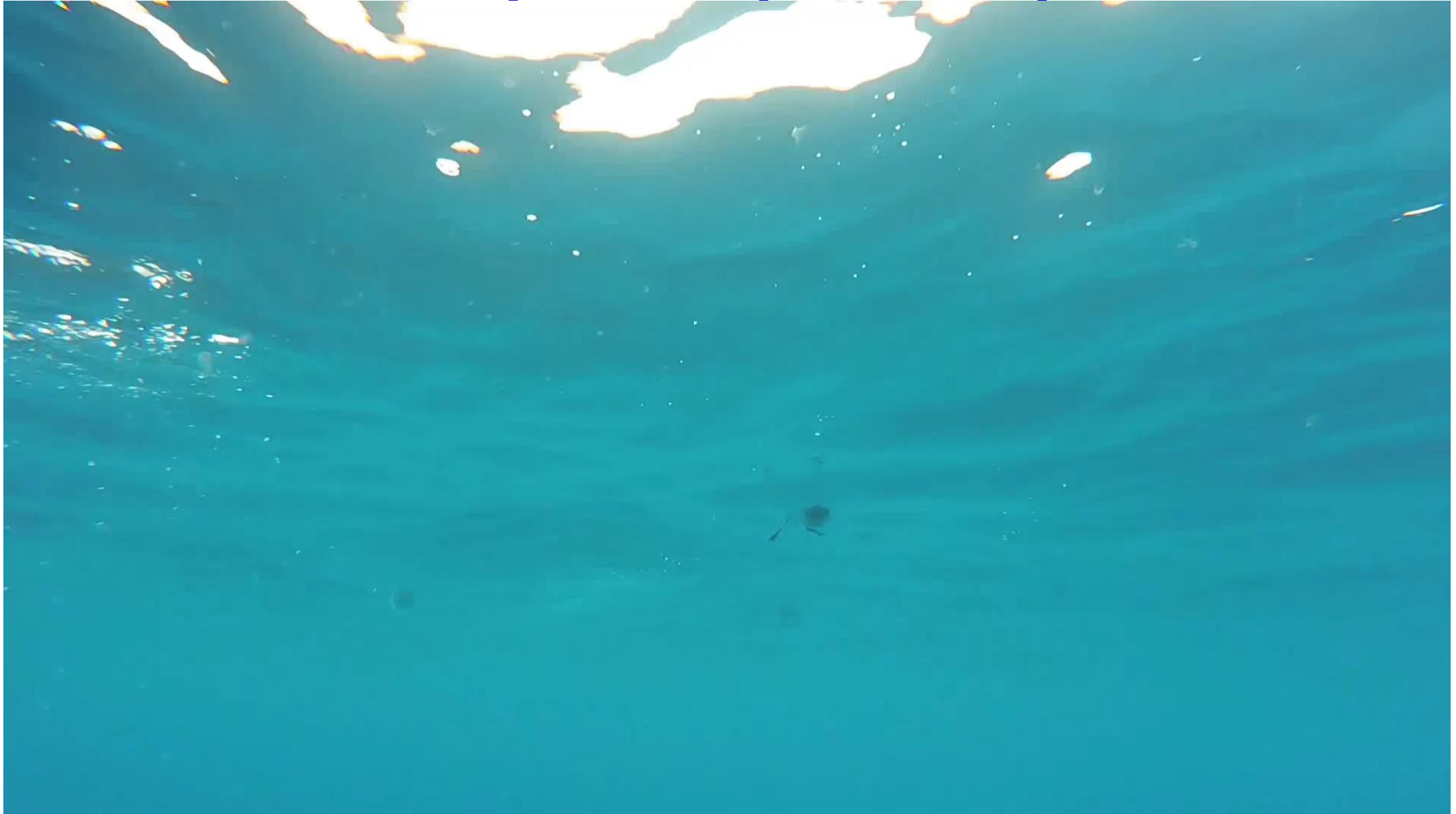
Attribute	N parm	DF	ChiSquare	Prob>Chisq
Bait Type	3	3	34.25	<0.001
Depth	3	3	1.43	0.698
Behaviour	6	6	26.6	<0.001



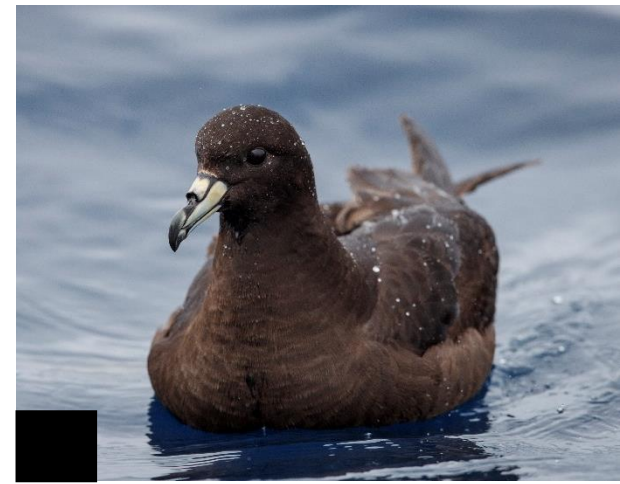
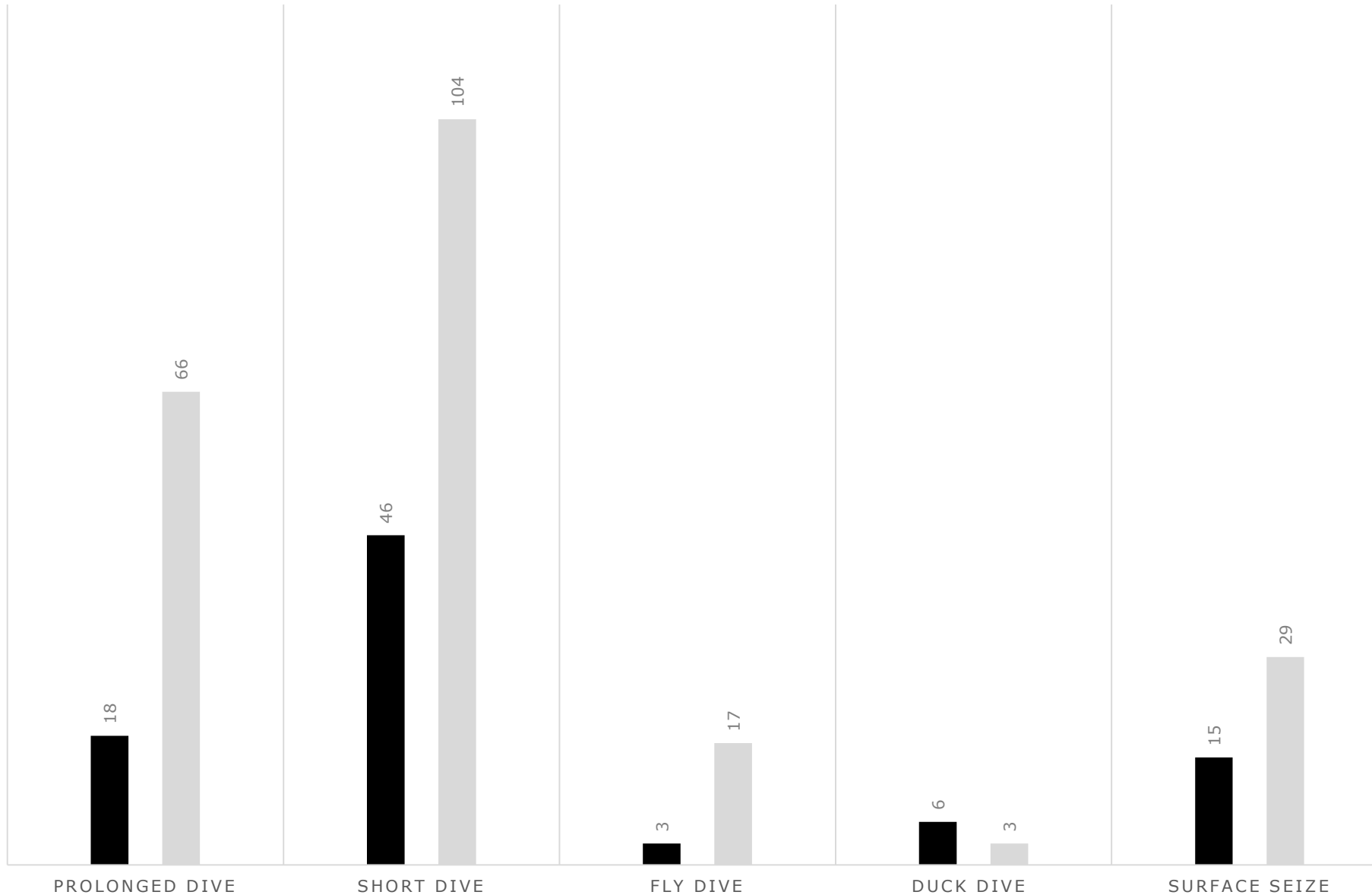
Results – Bait captures by species



Results – Black petrels prefer squid



Results – Behaviour by species



Results - Behaviours

Short Dive



Results - Behaviours



Short Dive

Results - Behaviours

Prolonged Dive



Results - Behaviours



Prolonged Dive

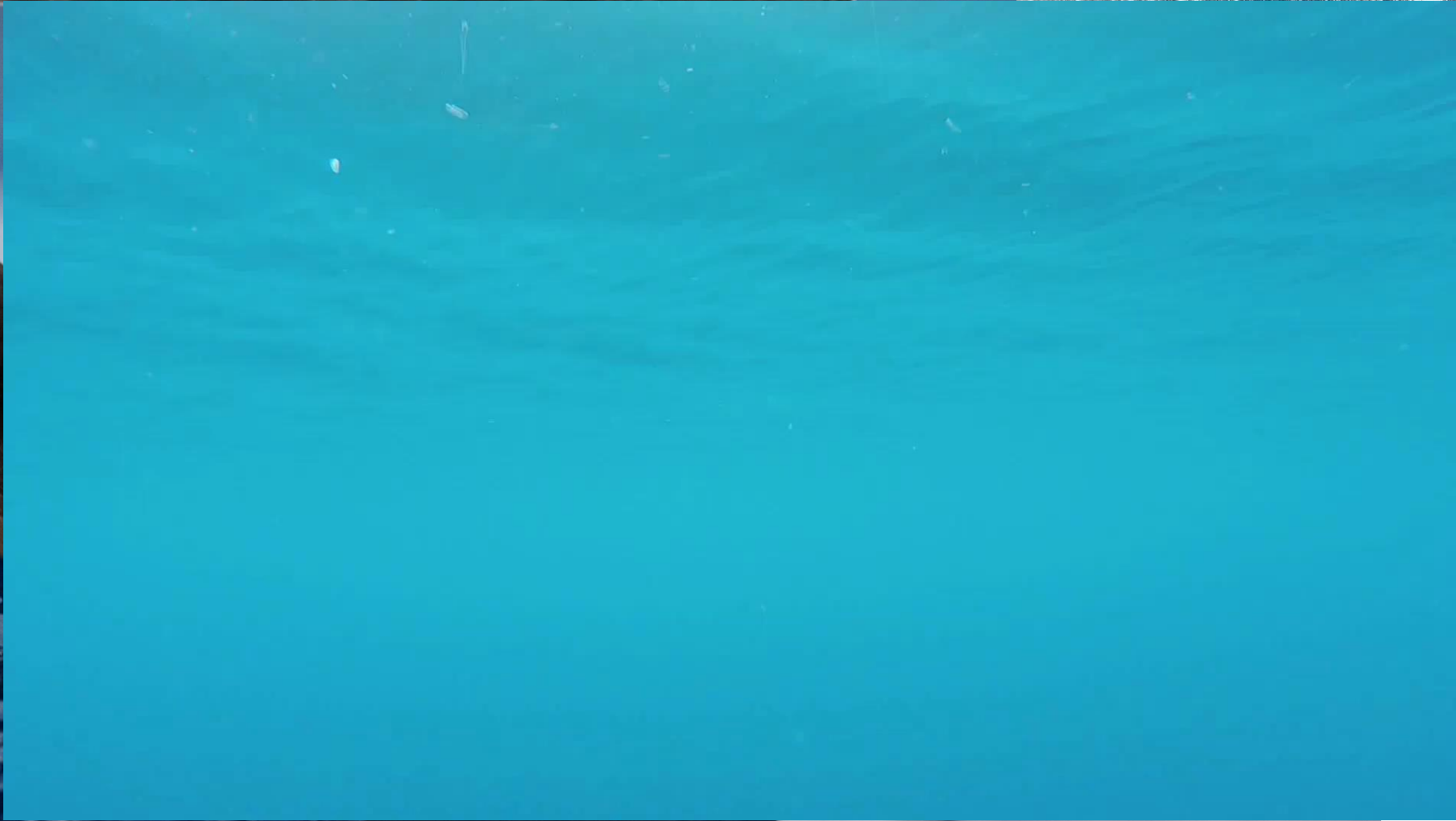
Results - Behaviours



Surface Sighting



Results - Behaviours



Surface Seize



Results - Behaviours

Competition



Results - Behaviours



Competition

Results - Behaviours

Propulsion



Applications for fisheries



Sensory acuity and fishing apparatus (vision, odour):

1. Bait visualization
2. Boat and line sight
3. Line visibility
4. Bait scent

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Applications for fisheries- Future Questions

A close-up photograph of a dark brown seabird, possibly a booby, swimming in deep blue water. The bird's head is turned to the left, and its beak is slightly open. Water droplets are visible on its head and neck. The background shows the texture of the water and the dark feathers of the bird's body.

Experiment with commercial fishing vessels (particularly long line) for:

bait type preferences

drop rate and location

and species behaviours

5 Conservation Recommendations

1. Baits should be weighted.
2. Baits should be lowered into the water close to the boat.
3. Baits should never be cast when seabirds are in the vicinity even with weights.
4. In deep water, baits should be rapidly lowered to at least 10 meters in depth prior to allowing them to drift.
5. Black petrels exhibit a marked preference for squid and it is possible that using other baits when black petrels are present will help avoid interactions



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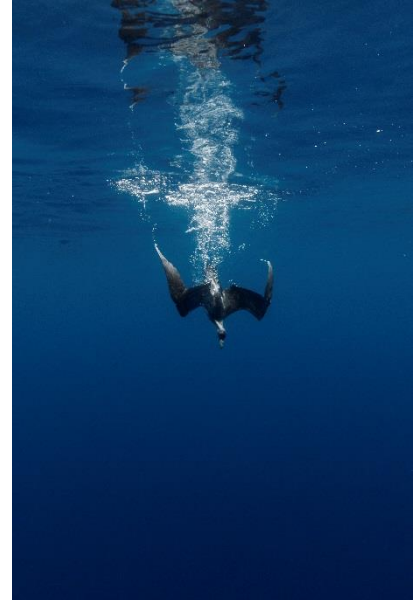
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All photos by Richard Robinson unless otherwise specified

