

# POP2017-06 Indirect effects on seabirds in north-east North Island region

Milestones 2 & 3

Chris Gaskin





# Milestone 2



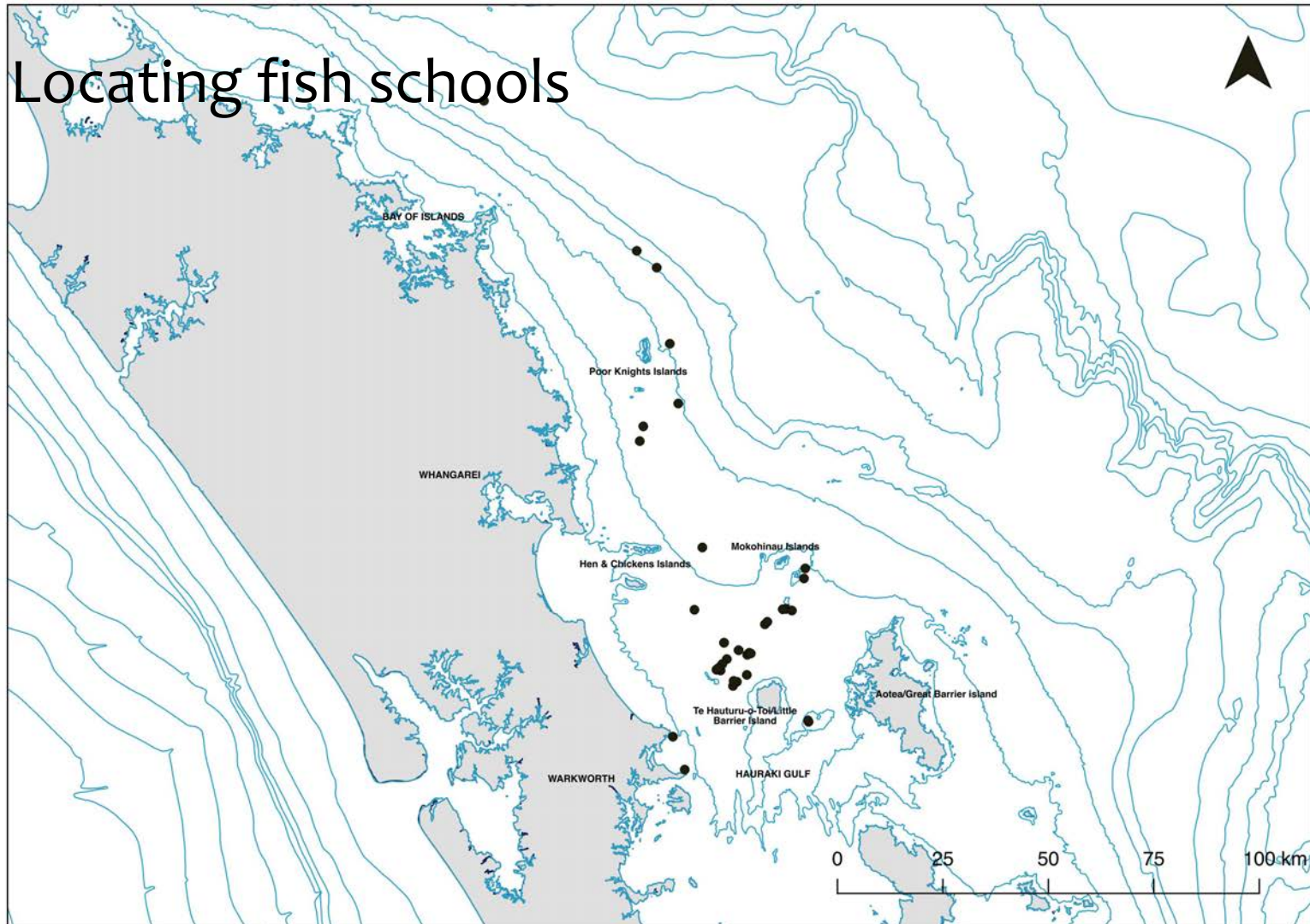
## Summary of activities carried out to collect samples from fish shoals 2017-2018

- Characterise fish work-ups by identifying and estimating abundance of the suite of predator species and record observations of their feeding behaviour, and
- Quantify the composition of the mesozooplankton community associated with fish work-ups.



# Methods

## Locating fish schools





# Methods

## Plankton sampling

- Surface trawls
- 30m vertical hauls
- Contents washed into a 250 $\mu$ m sieve
- Then into a sample jar with ethanol added and sealed





# Methods



Observations & field photography





# Methods



## Underwater videography



Screenshot from video: NNZST



# Methods

Underwater videography = topside photography



Photo: Edin Whitehead



# Methods

## Sampling from fish stomachs

- Catch fish in fish schools where seabirds have been observed feeding,
- Sample from commercially caught fish species that seabirds frequently associate with.





# Results

- Fish school types and seabird feeding activity
- Other feeding associations – cetaceans
- Samples collected – plankton trawls
  - 41 locations – 60 samples
- Samples collected – fish stomachs
  - 3 collected opportunistically

Outlined in the draft report





# Results

Archiving, sorting & identification of samples





# Results

Preservation of soft-bodied organisms

Also algae

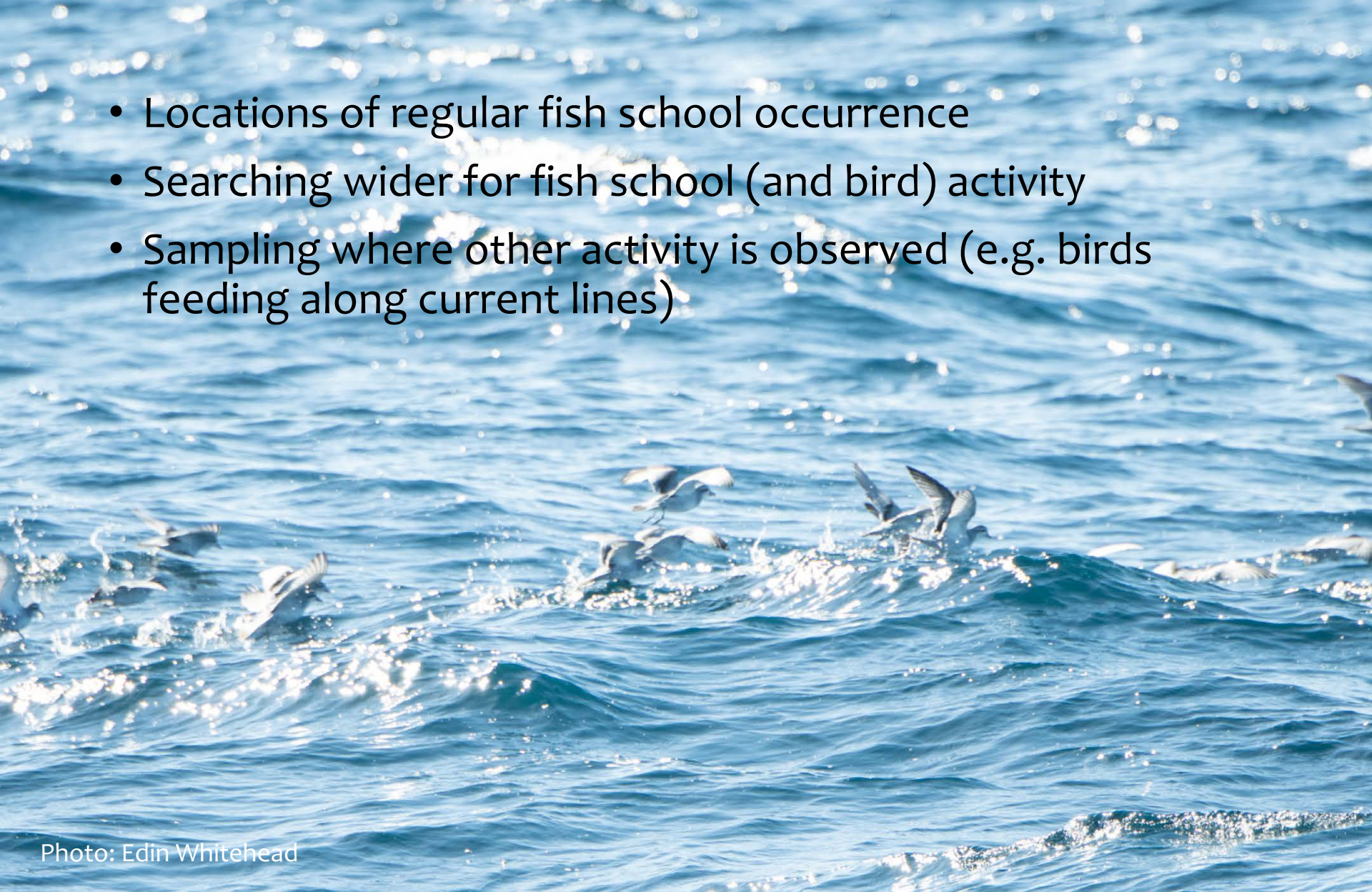




# Unpredictable distribution



- Locations of regular fish school occurrence
- Searching wider for fish school (and bird) activity
- Sampling where other activity is observed (e.g. birds feeding along current lines)





# Fish school types



Screenshot from video: NNZST



# Fish school types



Gannets and shearwaters. Photo: Clinton Duffy



# Skipjack tuna – key association?



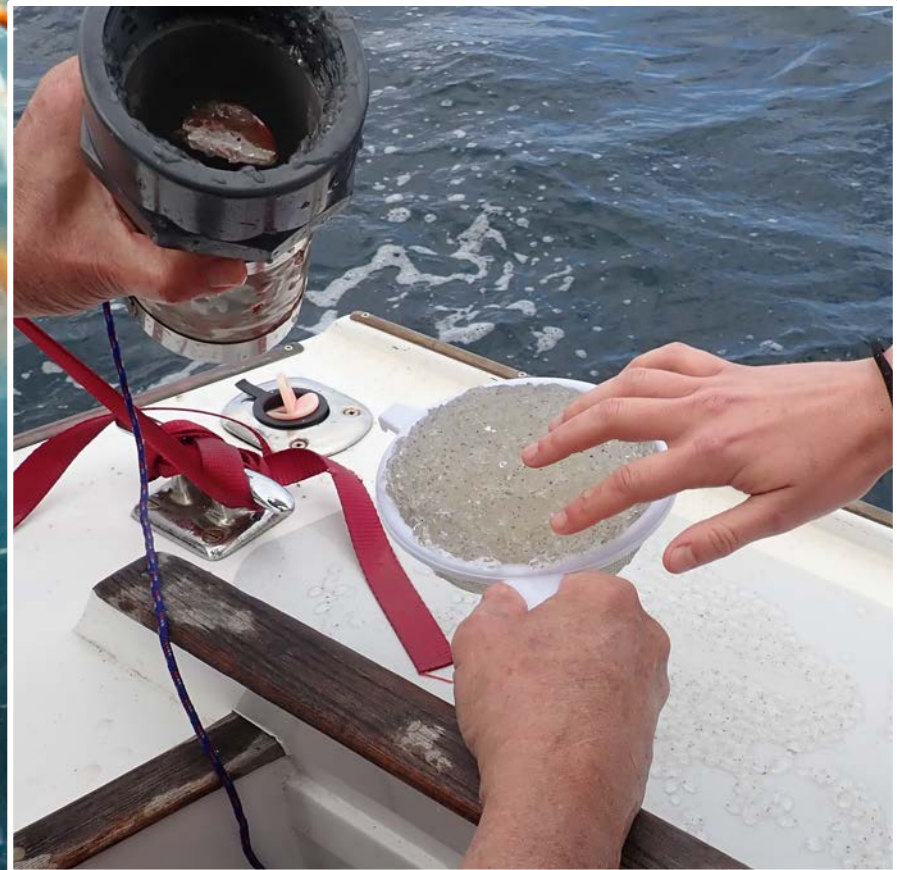
Buller's shearwater – January > May

Photo: Edin Whitehead



# Salps & soft-bodied organisms

- How important to seabirds?





# Scavenging

- Feeding in association with cetaceans
- Feeding on discards and baits - fisheries





# Scavenging



False killer whales and black petrels. Photo: Richard Robinson (Depth NZ)



# Scavenging



False killer whales, flesh-footed shearwaters and black petrels. Photo: Jochen Zaeschmar



# Scavenging





# Recommendations for 2018-2019



Our sampling programme for 2018-2019 will be as follows:

1. Regular monthly voyages from Whangateau Harbour, also Bay of Islands as opportunities arise in conjunction with cetacean surveying. Departure from Whangarei Harbour to be used depending on boat availability.
2. Fixed sampling sites to be determined, although some flexibility will be required during each voyage to ensure we encounter fish shoals.
3. Methodology for plankton sampling to be tightened with an even balance between deep 30m drops and surface tows.
4. Catch fish from fish schools where seabirds are observed actively feeding to obtain stomach samples.
5. Obtain stomach samples from commercially caught fish (i.e. purse seine fishery) through fisheries observer programme.
6. Underwater videography to be undertaken simultaneously with plankton sampling.
7. Topside photography to be undertaken simultaneously with plankton sampling.
8. Soft-bodied organisms to be preserved in formalin on board provided health and safety requirements can be met.
9. Continue to record other seabird feeding activity.



# Milestone 3



Summary of activities carried out to collect samples from seabirds 2017-2018



Photo: Kylie Connell





# Australasian gannet



Nigel Adams

NB: The research study outlined here was conducted jointly by Unitec Institute of Technology and Auckland Council. Due to the overlap of goals results are being made available to this project's (POP2017-06) reporting.

Photo: Derek Tearne





# Australasian gannet



## Methods

- Birds captured using modified shepherd's hook.
- Samples collected and chilled at study site
- Frozen for later analysis.
- Following regurgitation birds held briefly in a crate to collect faecal samples.
- Faecal samples also collected opportunistically



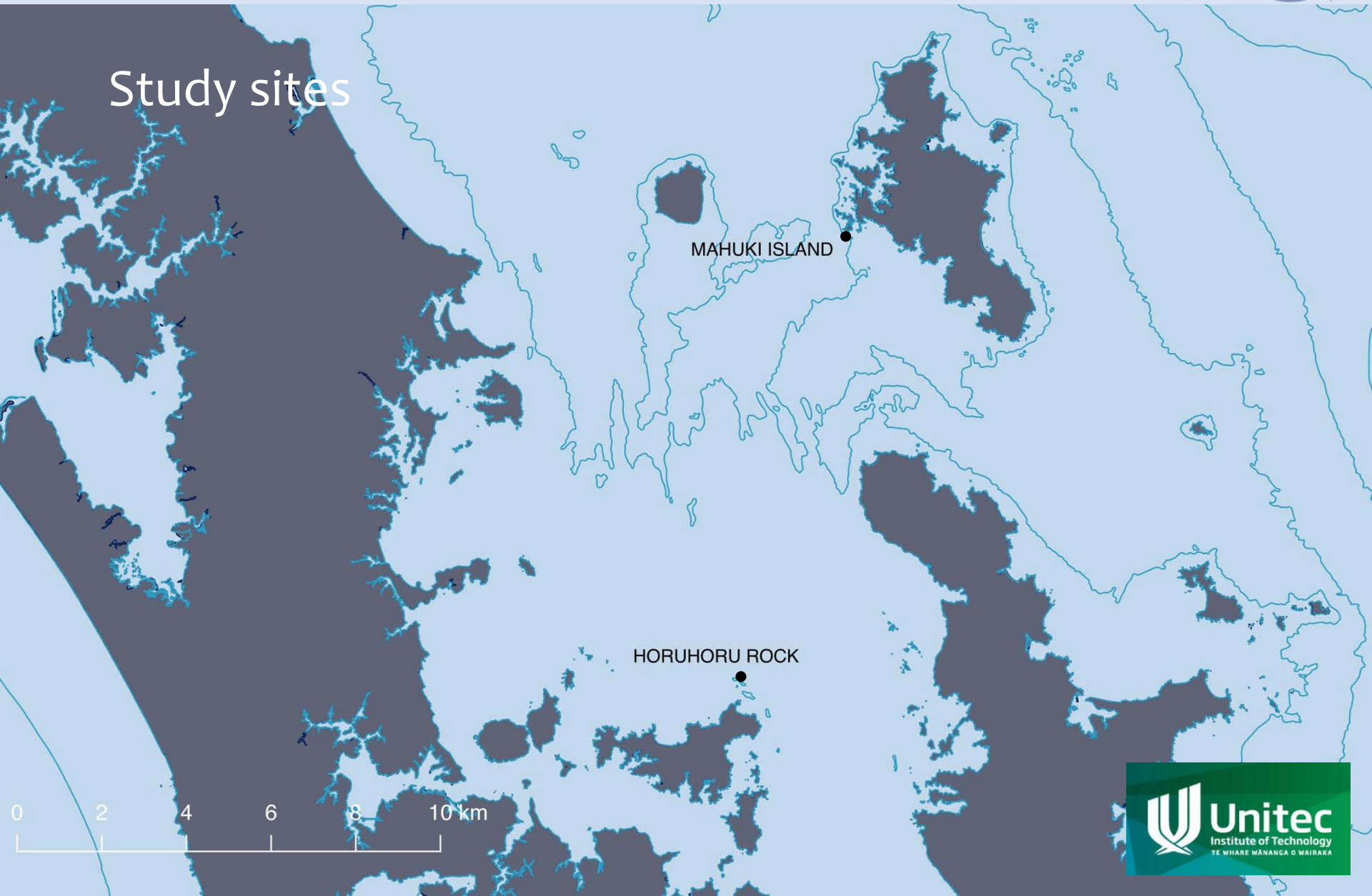
Photo: Nigel Adams



# Australasian gannet



Study sites





# Australasian gannet

## Results

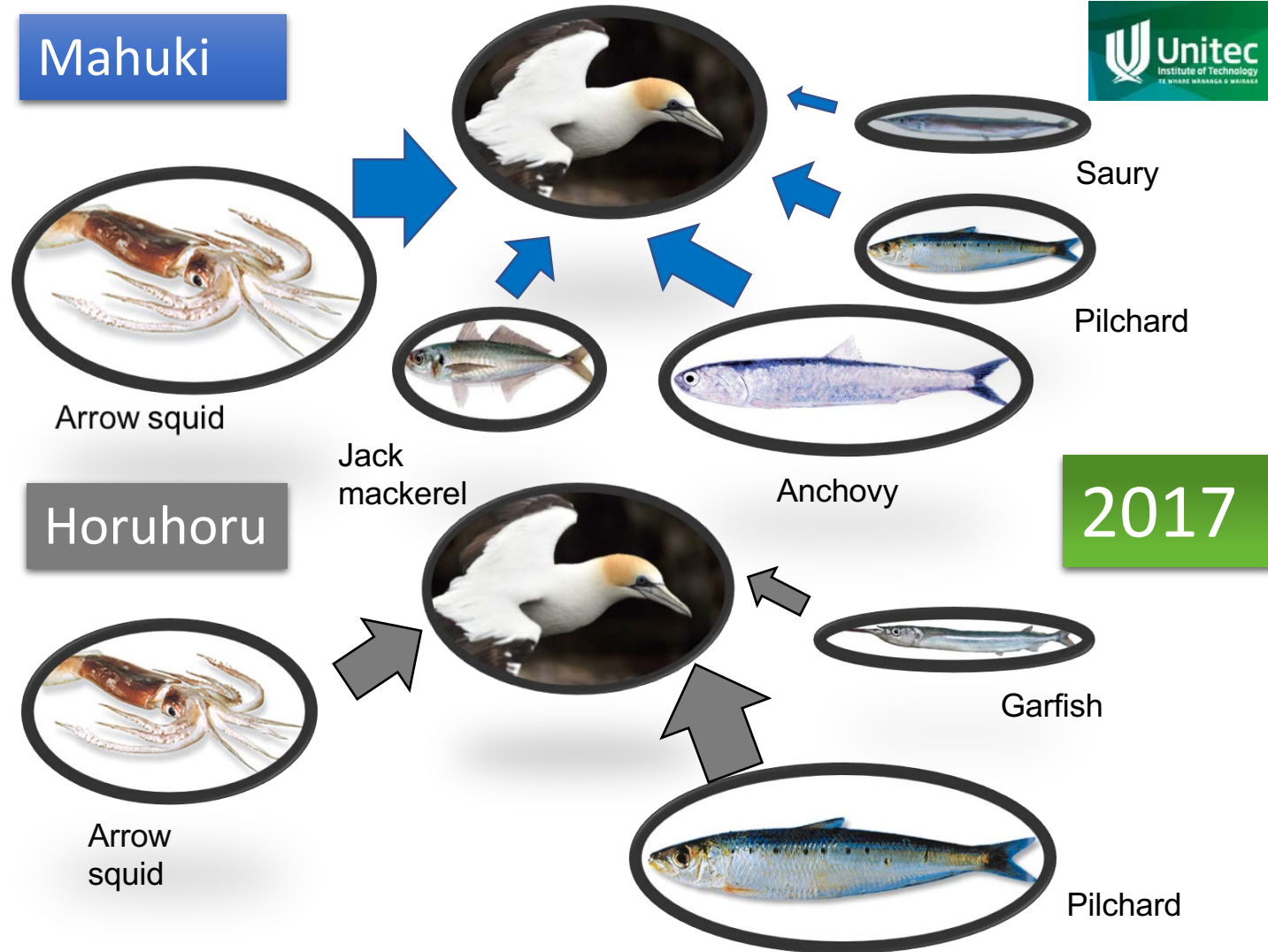
- Regurgitations include largely intact fish and squid.
- Stomachs of ingested fish dissected and contents analysed separately from primary prey.
- 53 birds in 2017 breeding season
- 64 birds in 2018





# Australasian gannet

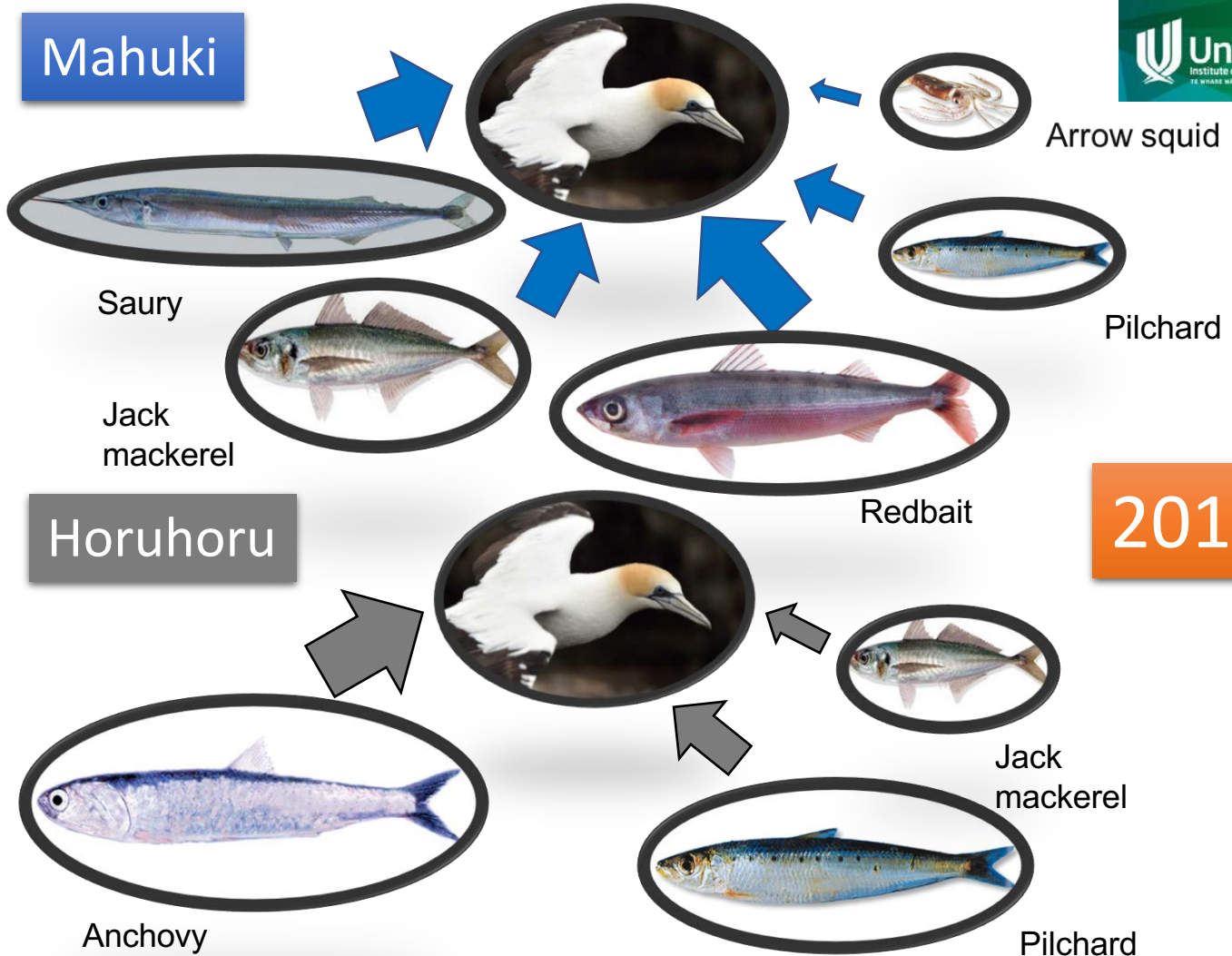
## Results





# Australasian gannet

## Results





# Australasian gannet



## Identification of prey

Fresh prey items identified used standard guides, etc.

## Molecular analysis

Prey identification from samples has involved the extraction, amplification and purification of remnant DNA from fish and squid (prey) tissue, stomach contents of fish and squid recovered from gannets and gannet faecal samples.

The approach adopted here will likely be applied to other species in this study i.e. Buller's and fluttering shearwater, fairy prion, red-billed gull and white-fronted tern.



# Buller's shearwater



Collection of samples (regurgitation and faecal) was undertaken during the Buller's shearwater survey on Aorangi and Tawhiti Rahi, Poor Knights Islands 24 March to 3 April 2018.





# Buller's shearwater

## Methods & results

- We conducted a trial as Buller's shearwaters had been reported reluctant 'regurgitators' (previous season – M. Friesen, C. Mitchell).
- 6 samples were obtained using 'flushing' technique
- 2 samples opportunistically
- 6 faecal samples were collected.



Photos: Karen Baird and Edin Whitehead



# Buller's shearwater



## Molecular analysis

- Regurgitation and faecal samples collected have been sent to Unitec to see whether DNA can be extracted.
- If successful, then further tests can be run.
- These results will guide next season's work on the Poor Knights Islands.



# Other species

- Fluttering shearwater
- Fairy prion

- Red-billed gull
- White-fronted tern



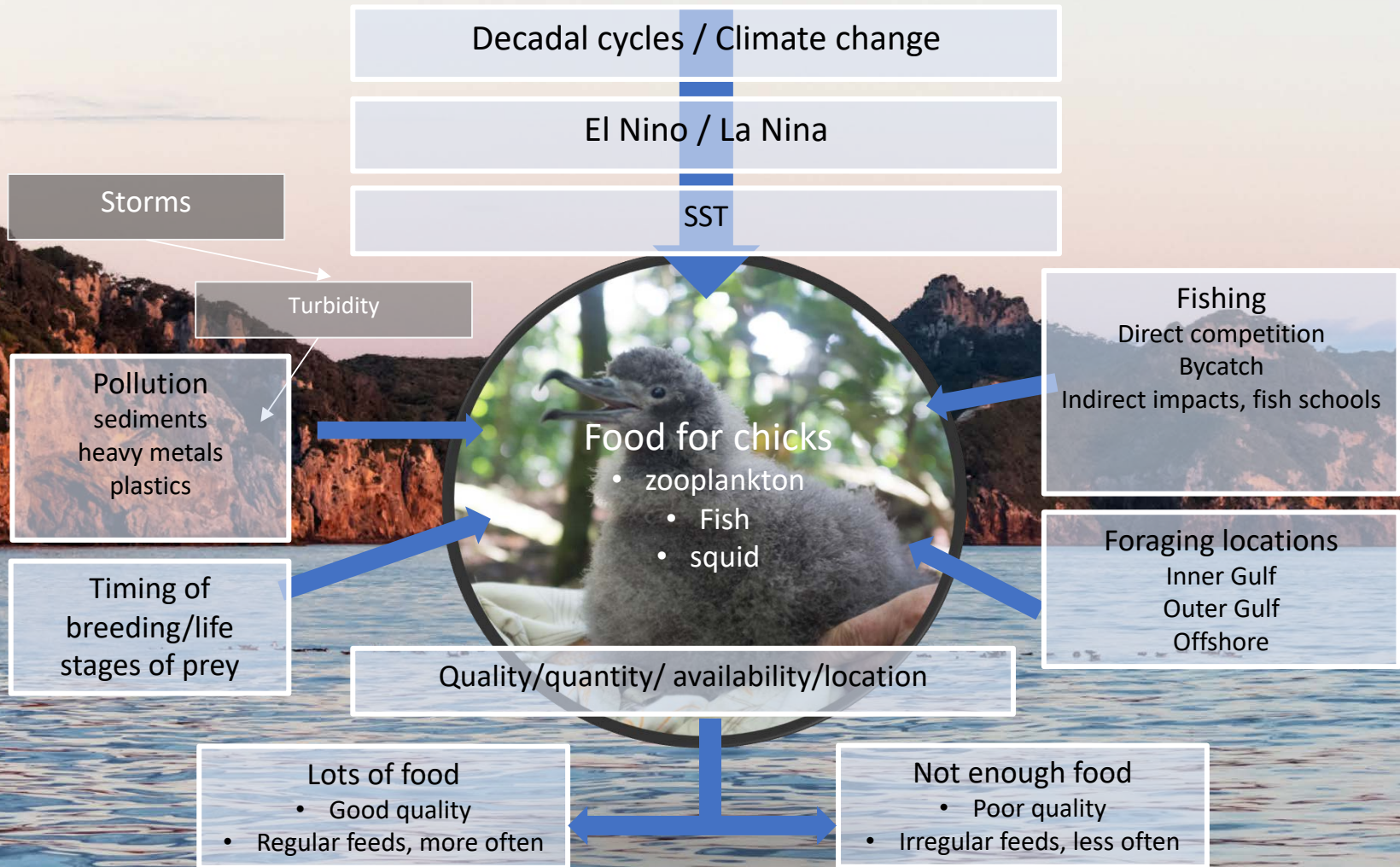
# Recommendations for 2018-2019



- Instruction from Massey University with respect to ‘flushing’ technique.
- Fluttering shearwater – collection of regurgitations and faecal samples from three sites: visits from September.
- Red-billed gull – collection of regurgitations and faecal samples from three sites.
- White-fronted tern – collection of regurgitations and faecal samples from two sites; visits in October, November, December.
- Fairy prion – collection of regurgitations and faecal samples from Aorangi, Poor Knights Islands; visits in October and December.
- Buller’s shearwater – collection of regurgitations and faecal samples from Aorangi Island; visits in December, February and April.
- Australasian gannet – collection of regurgitations and faecal samples will be conducted in conjunction with the tracking studies, from three sites; visits in December and January.
- Molecular analysis through Unitec for DNA and Sanger sequencing; then Genomics Auckland University of Auckland if sequencing extraction is successful.



# Underlying causes



# Concluding

- How dependent is this suite of seabirds on fish work-up associations during breeding?
  - What are they feeding their chicks?
  - Breeding success – healthy chicks?
- We need to understand the drivers of the ecosystems which fuel these associations,
- And assemble a better food chain story for northern waters,
- As we come to grips with the indirect effects on seabirds.





# Acknowledgements



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