

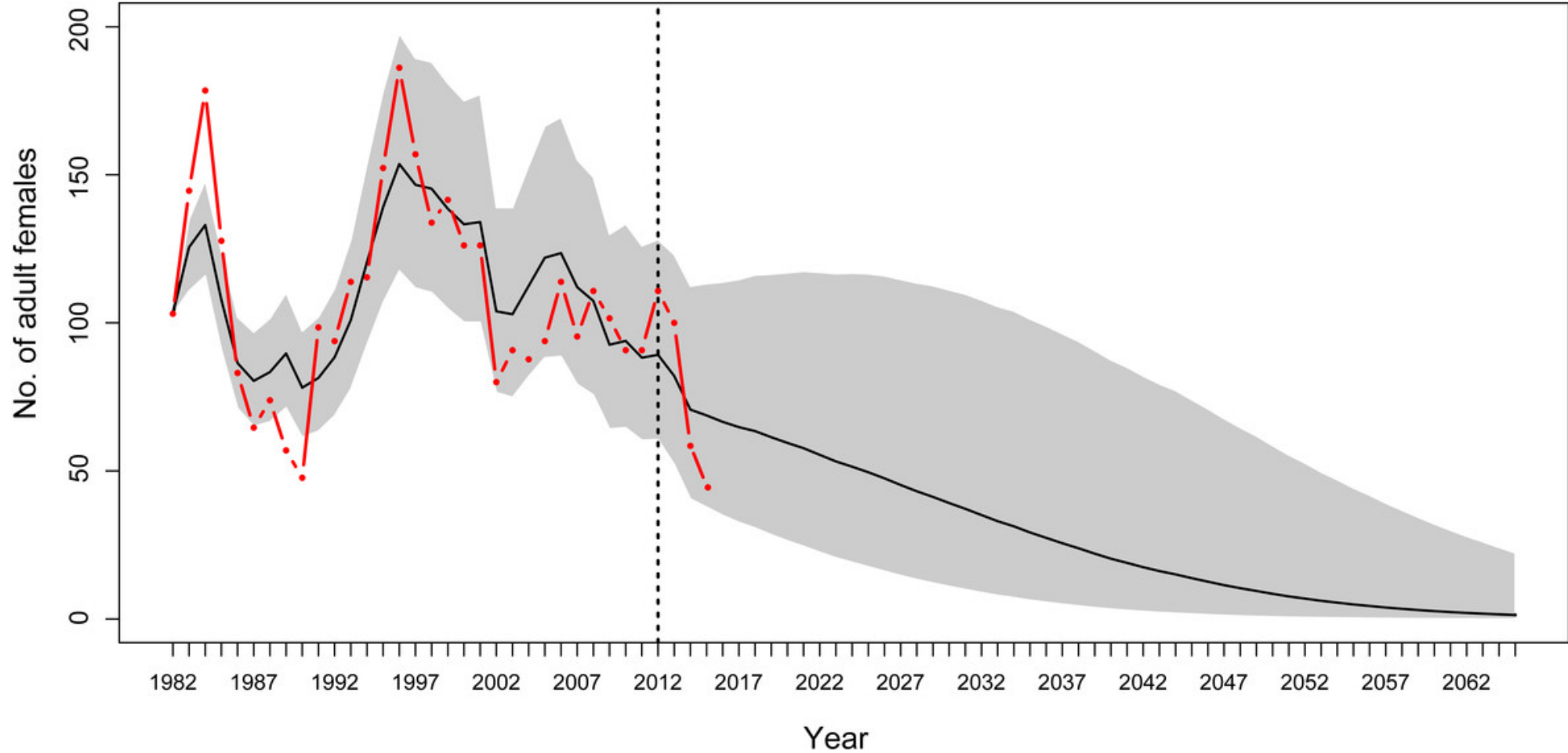
Hoiho at sea

Utilization of the marine habitat by Yellow-eyed penguins
across their mainland distributional range

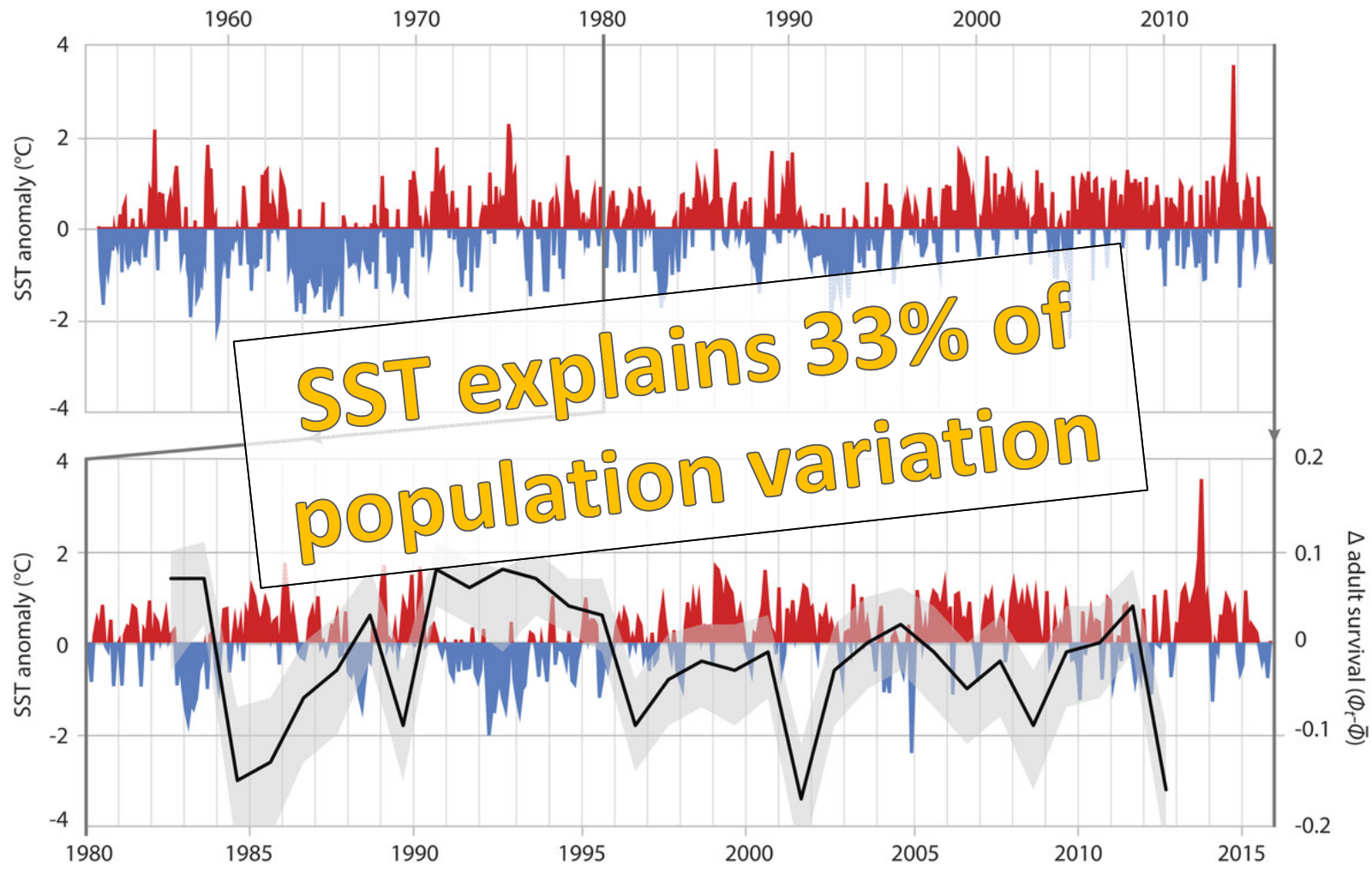
POP2018-02

Thomas Mattern & Ursula Ellenberg

Population projections for hoiho at Boulder Beach



Adult survival and SST anomalies



<https://doi.org/10.7717/peerj.3272>

Other factors impacting hoiho population



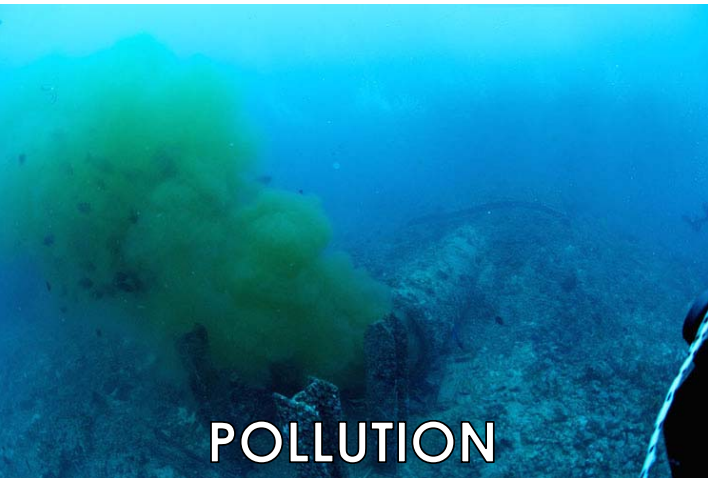
HUMAN DISTURBANCE



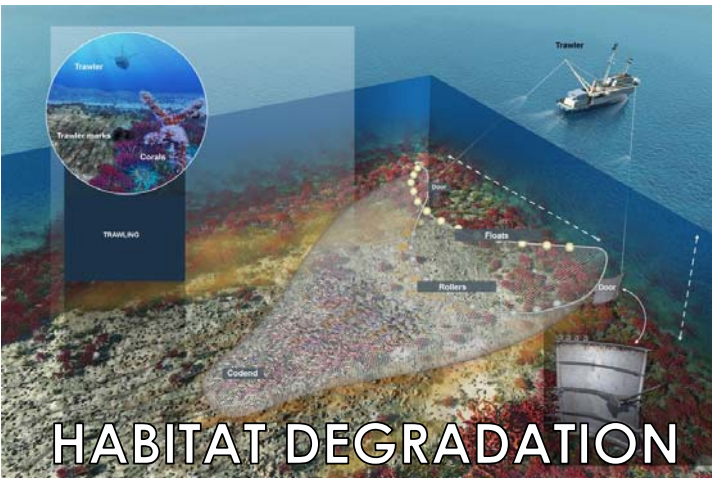
EXOTIC PREDATORS



DISEASE



POLLUTION

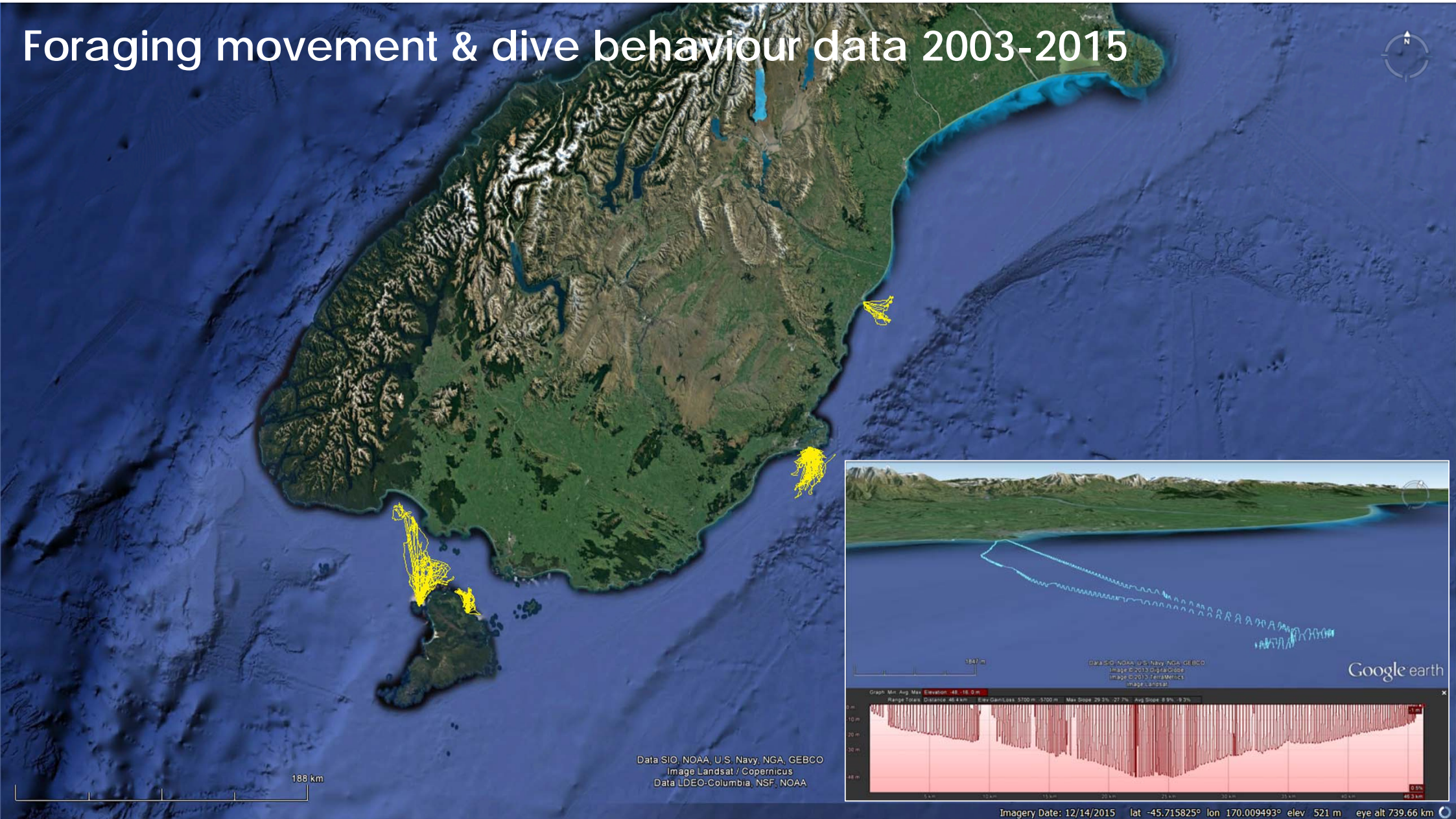


HABITAT DEGRADATION



SET NET BYCATCH

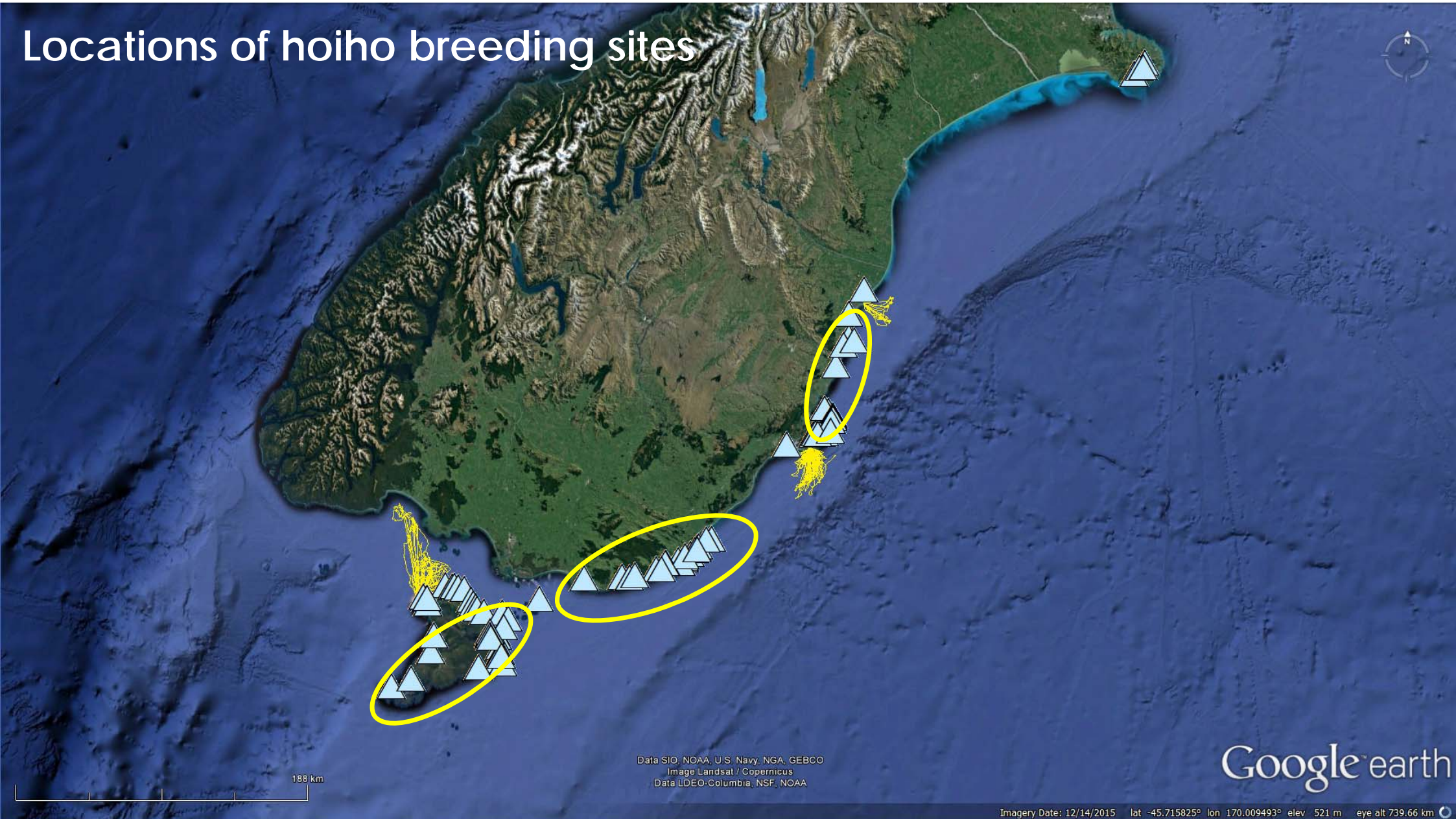
Foraging movement & dive behaviour data 2003-2015



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Data LDEO-Columbia, NSF, NOAA

Google earth

Locations of hoiho breeding sites

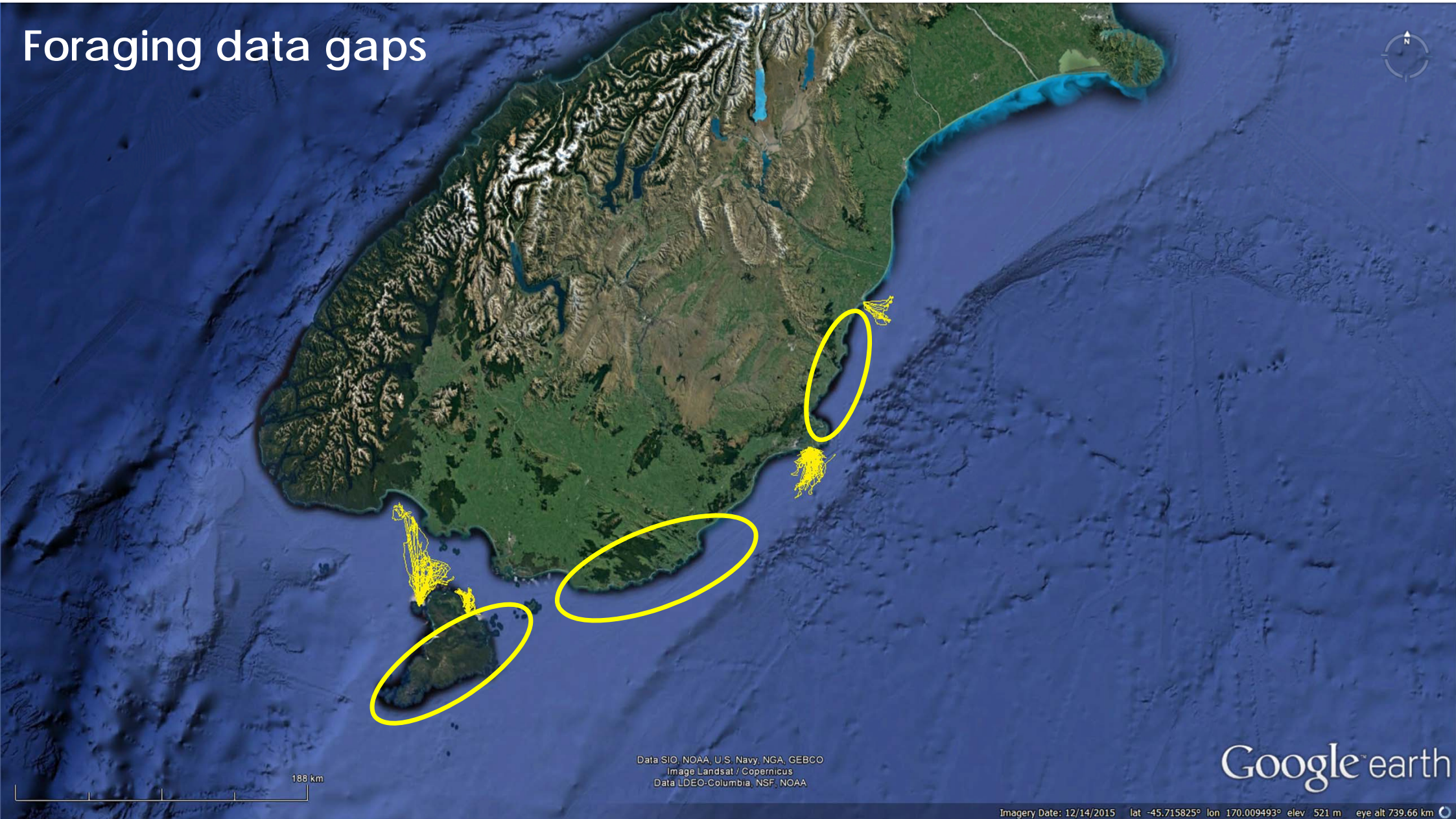


Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Data LDEO-Columbia, NSF, NOAA

Google earth

Imagery Date: 12/14/2015 lat -45.715825° lon 170.009493° elev 521 m eye alt 739.66 km

Foraging data gaps



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Data LDEO-Columbia, NSF, NOAA

Google earth

Imagery Date: 12/14/2015 lat -45.715825° lon 170.009493° elev 521 m eye alt 739.66 km



BRAVO GROUP

6 birds
30.11.-16.12.2019

TE RERE

5 birds
16.12.2018-10.05.2019

HAYWARDS PT

2 birds
19.02.-29.02.2020

LONG PT

8 deployments, 4 birds
22.11.2019-27.06.2019

MAHAKA

1 bird
07-14.12.2019

NUGGET PT

8 birds
13.12.2018-21.05.2019

BOBBY'S HEAD

8 deployments, 4 birds
16.01.-29.05.2020

ARAMOANA

10 deployments, 7 birds
19.02.-29.02.2020

PENGUIN BAY

5 birds
21.12.2018-26.11.2019

BUSHY BEACH

2 birds
17.01.-03.03.2020

PAPANUI BEACH

14 deployments, 10 birds
16.01.-29.05.2020

CICELY BEACH

2 birds
11.-22.02.2019



13 Dec 2018 – 15 Aug 2020

>3,000 field-hours

73 deployments





57 penguins

370 foraging trips

33,290 at-sea locations

118,698 dive events



Marine Reserve



Type-2 MPA



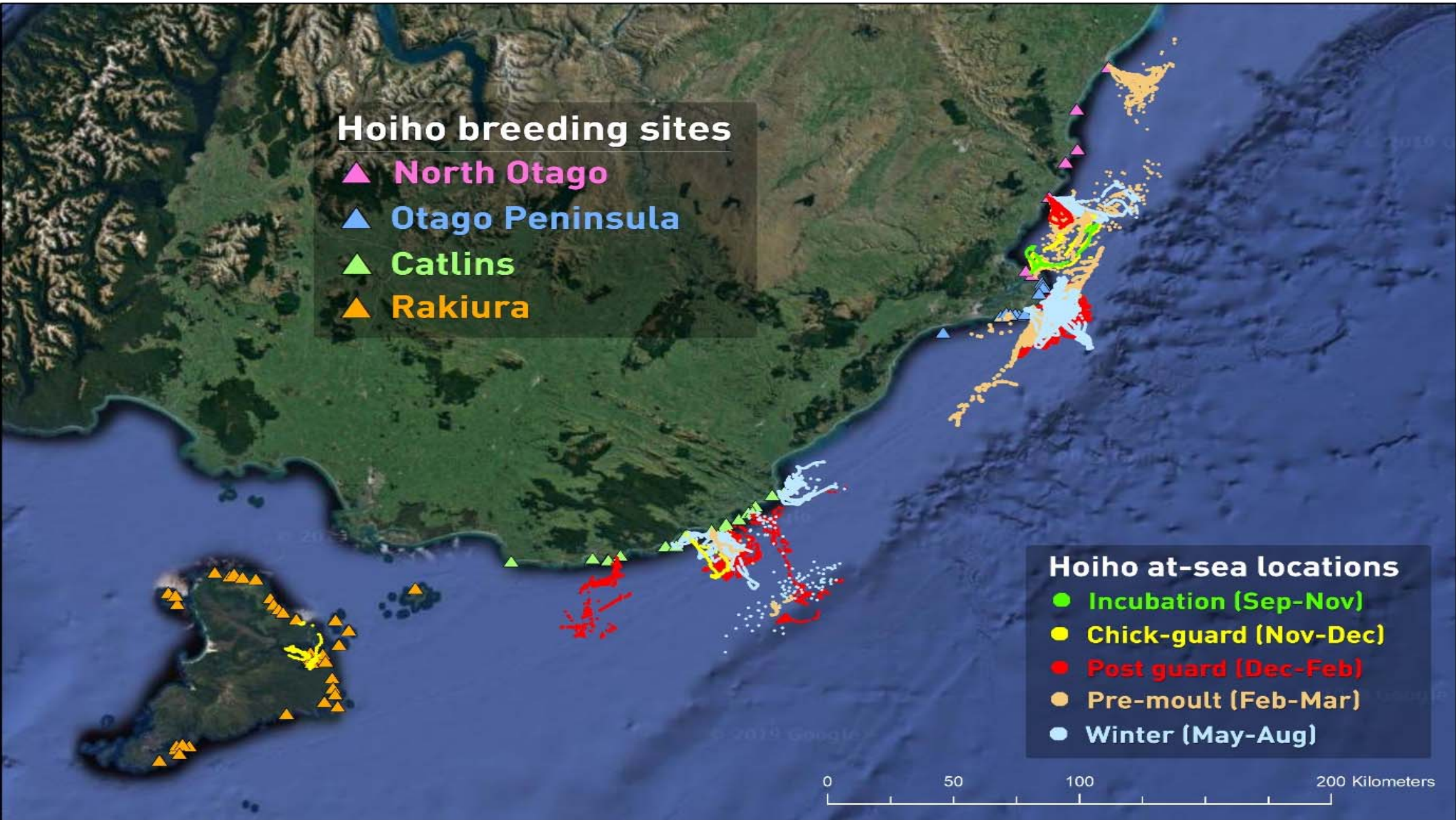
Hoiho breeding sites

- ▲ North Otago
- ▲ Otago Peninsula
- ▲ Catlins
- ▲ Rakiura

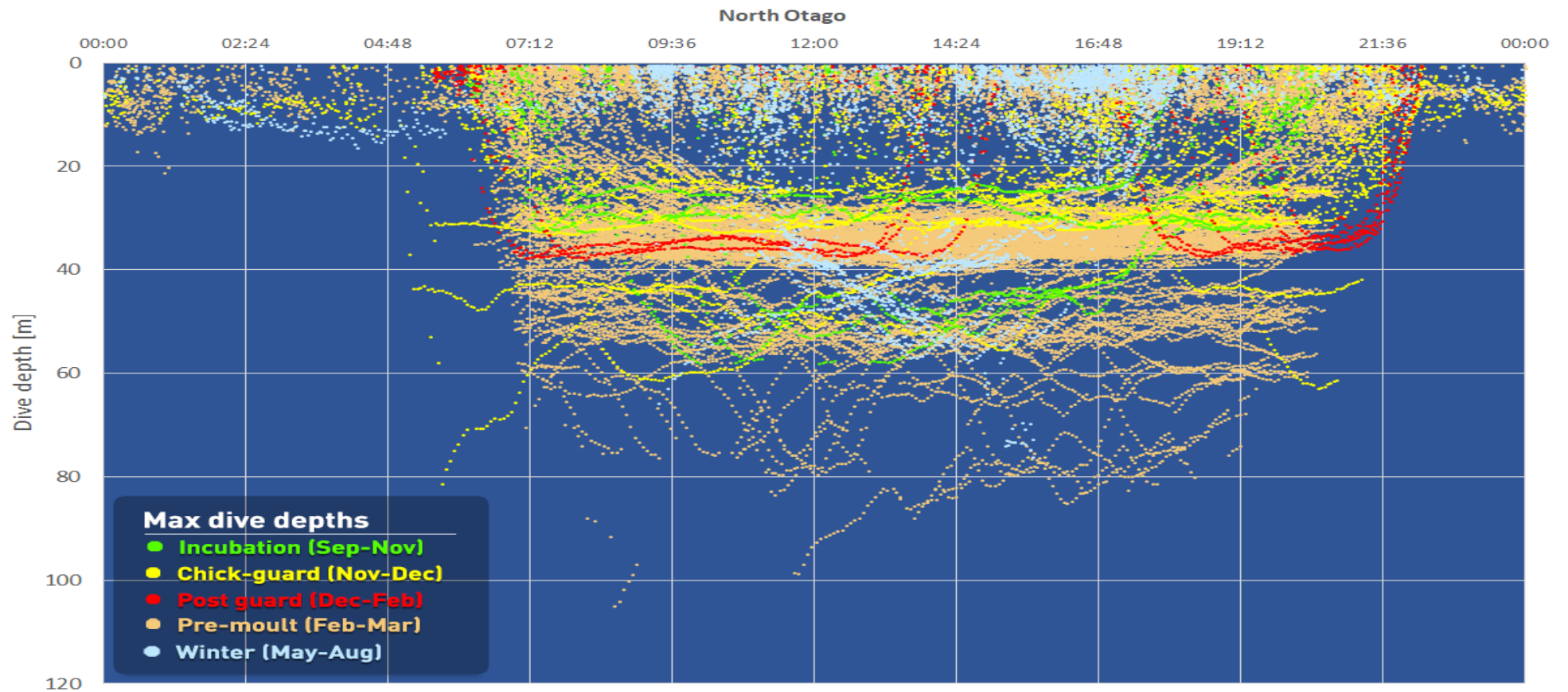
Hoiho at-sea locations

- Incubation (Sep-Nov)
- Chick-guard (Nov-Dec)
- Post guard (Dec-Feb)
- Pre-moult (Feb-Mar)
- Winter (May-Aug)

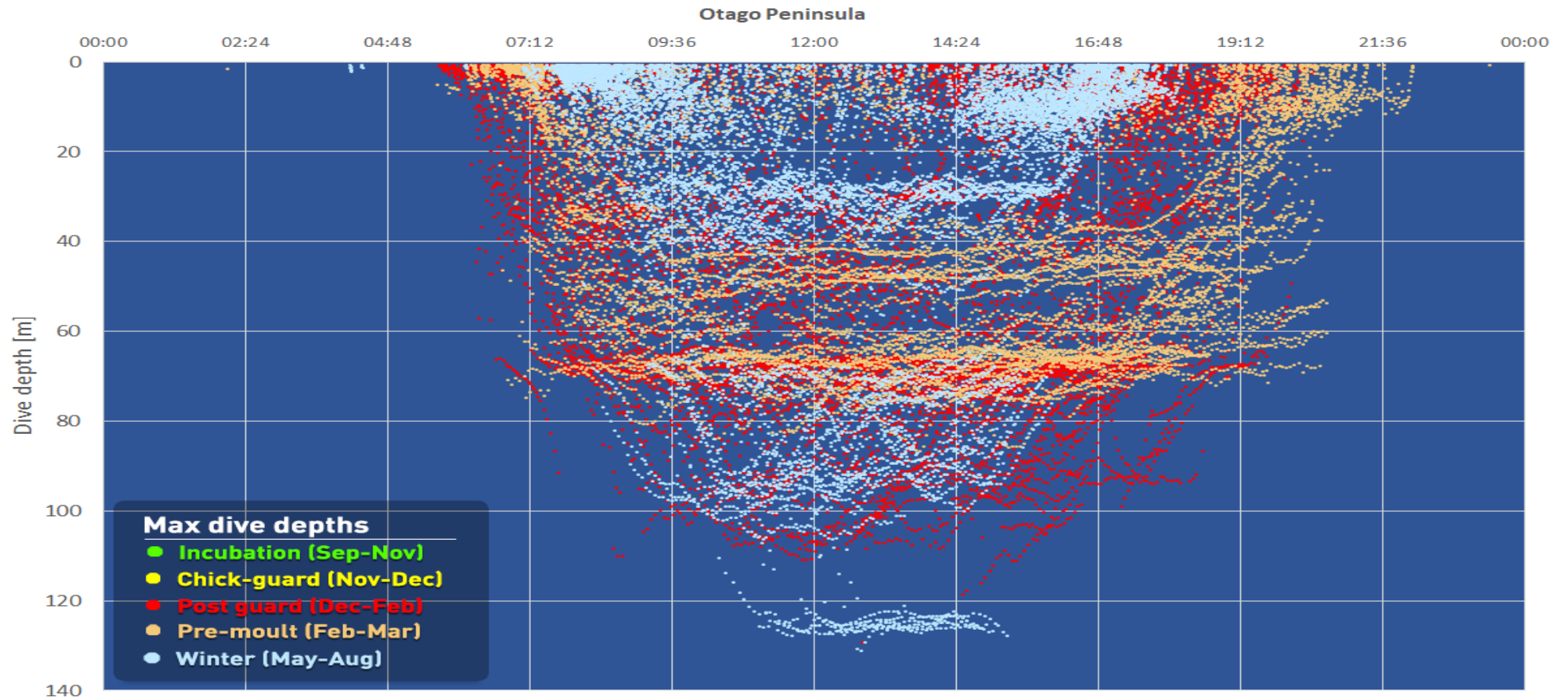
0 50 100 200 Kilometers



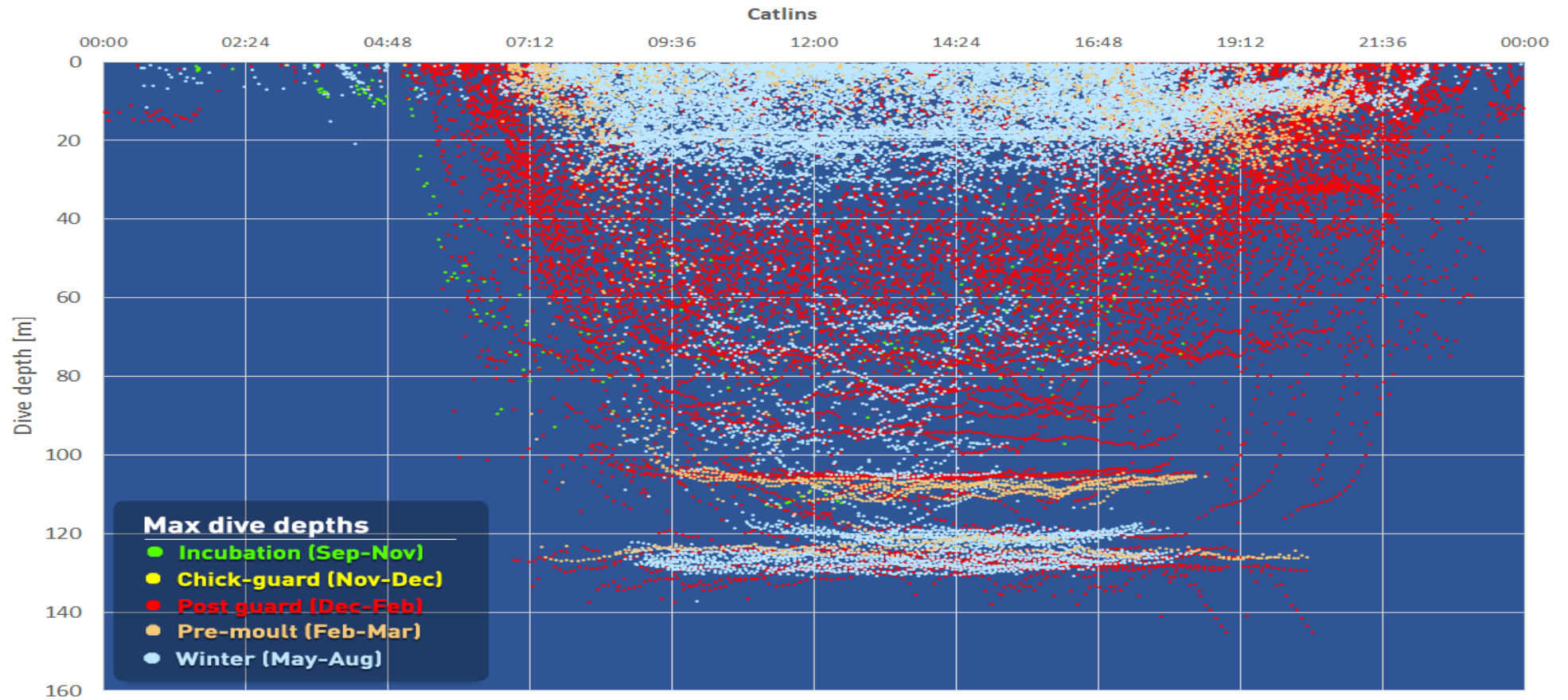
Maximum dive depths North Otago



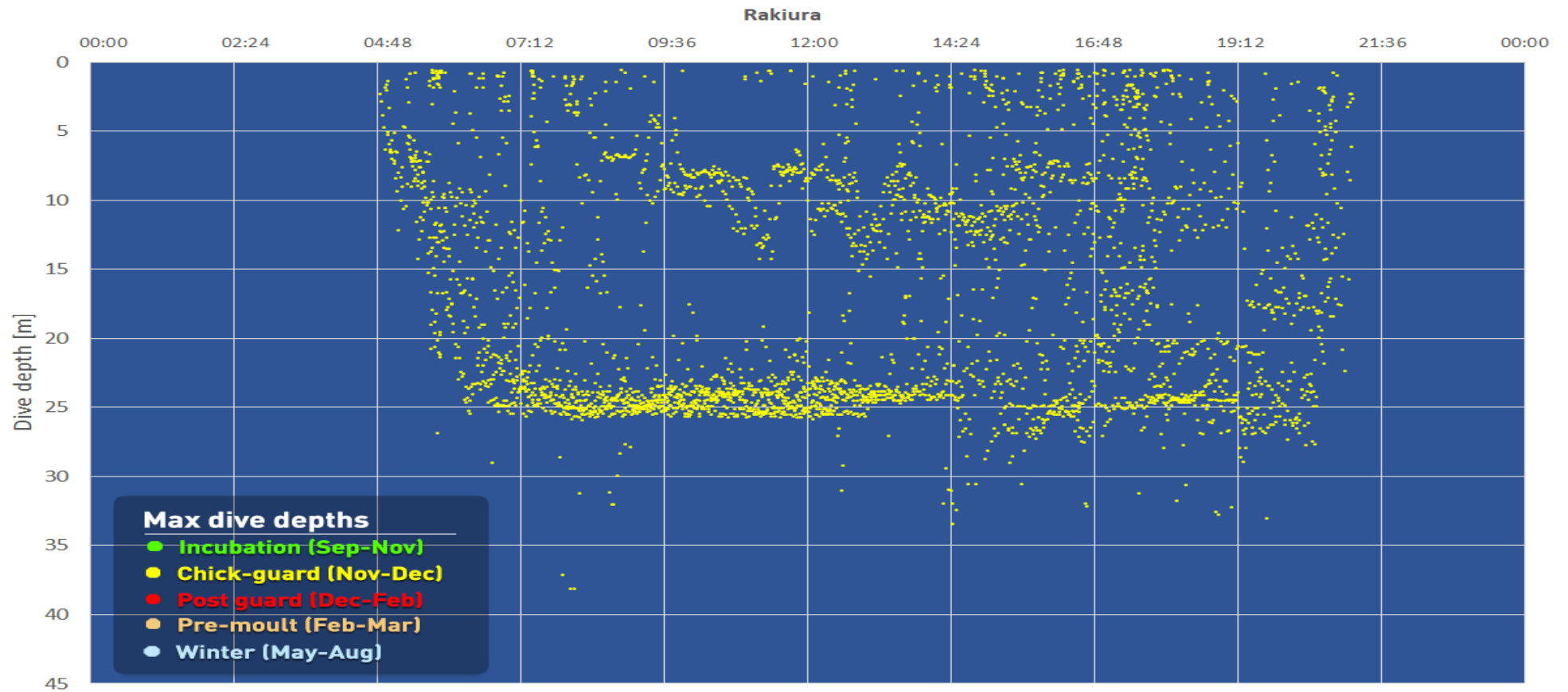
Maximum dive depths Otago Peninsula



Maximum dive depths Catlins



Maximum dive depths Rakiura



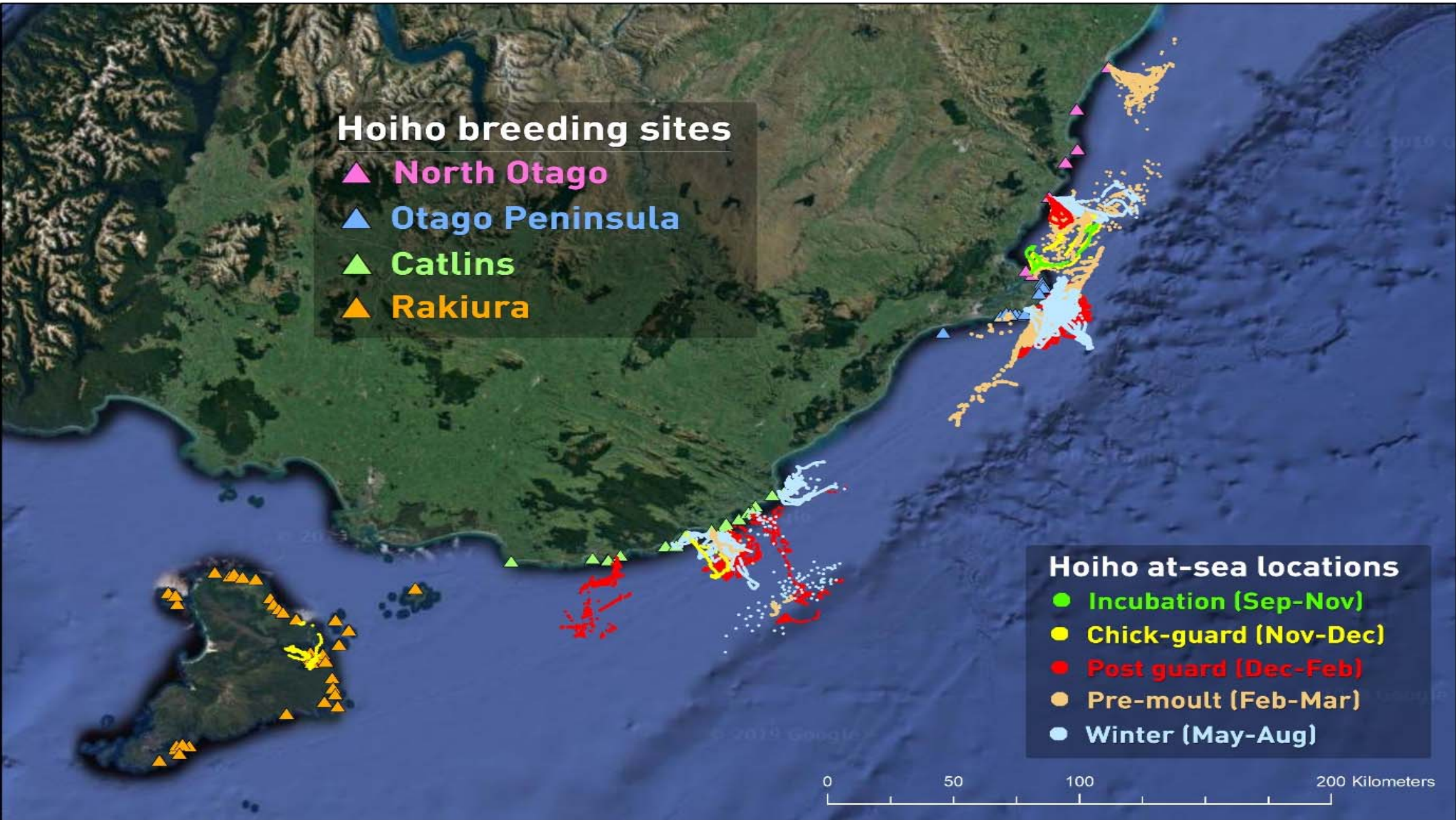
Hoiho breeding sites

- ▲ North Otago
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Hoiho at-sea locations

- Incubation (Sep-Nov)
- Chick-guard (Nov-Dec)
- Post guard (Dec-Feb)
- Pre-moult (Feb-Mar)
- Winter (May-Aug)

0 50 100 200 Kilometers



NORTH OTAGO

Hoiho at-sea locations

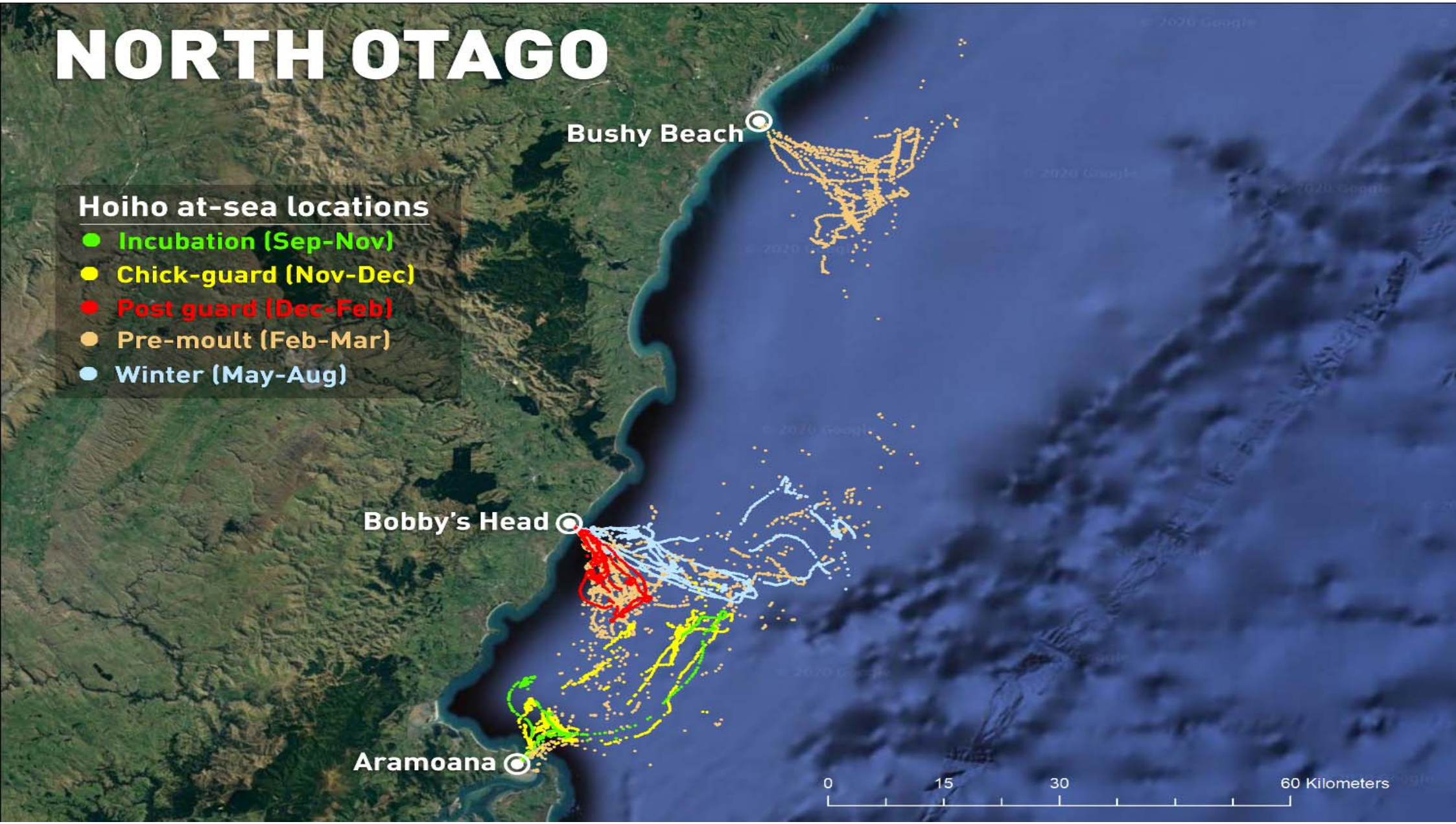
- Incubation (Sep-Nov)
- Chick-guard (Nov-Dec)
- Post guard (Dec-Feb)
- Pre-moult (Feb-Mar)
- Winter (May-Aug)

Bushy Beach

Bobby's Head

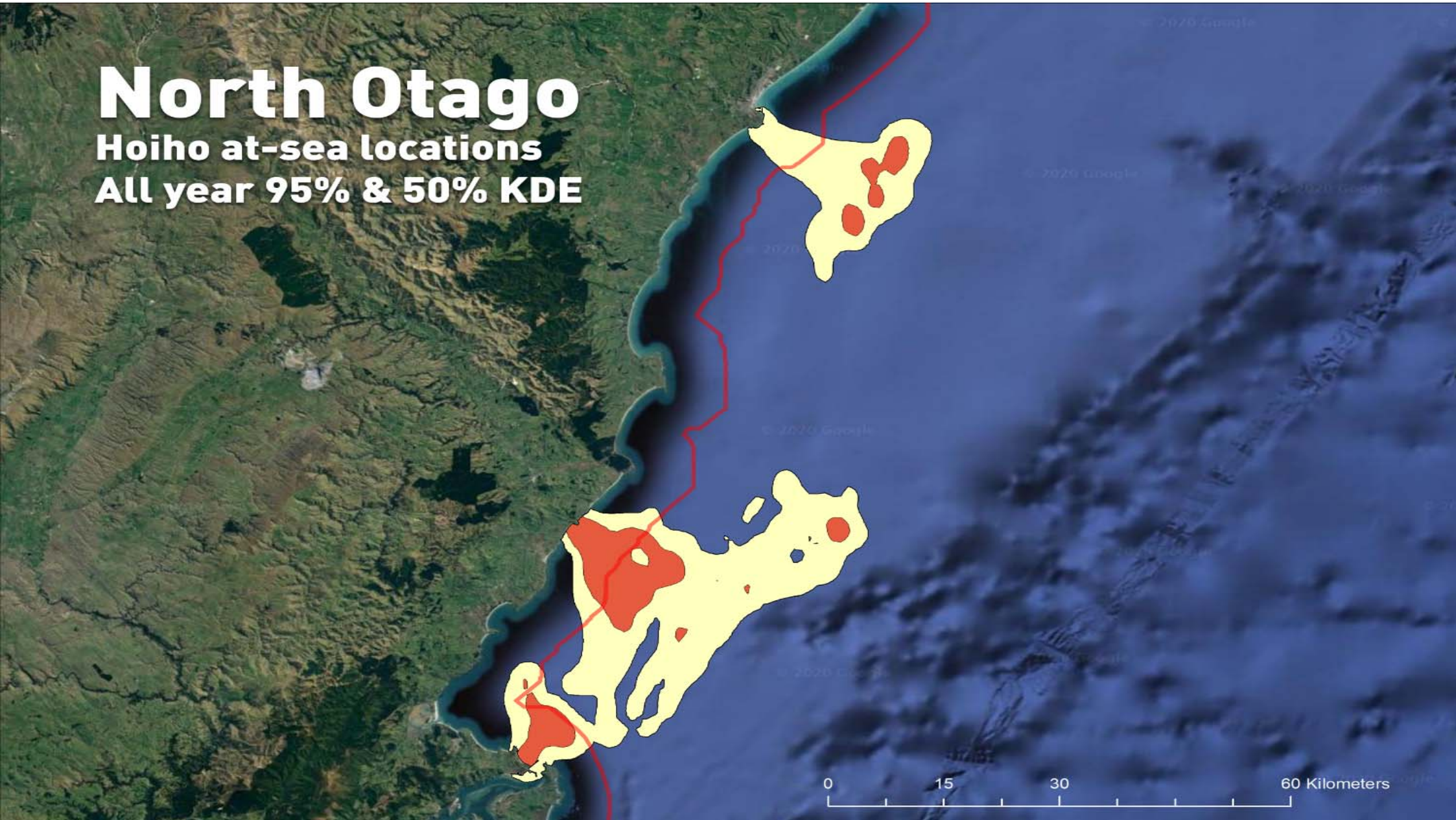
Aramoana

0 15 30 60 Kilometers



North Otago

Hoiho at-sea locations
All year 95% & 50% KDE



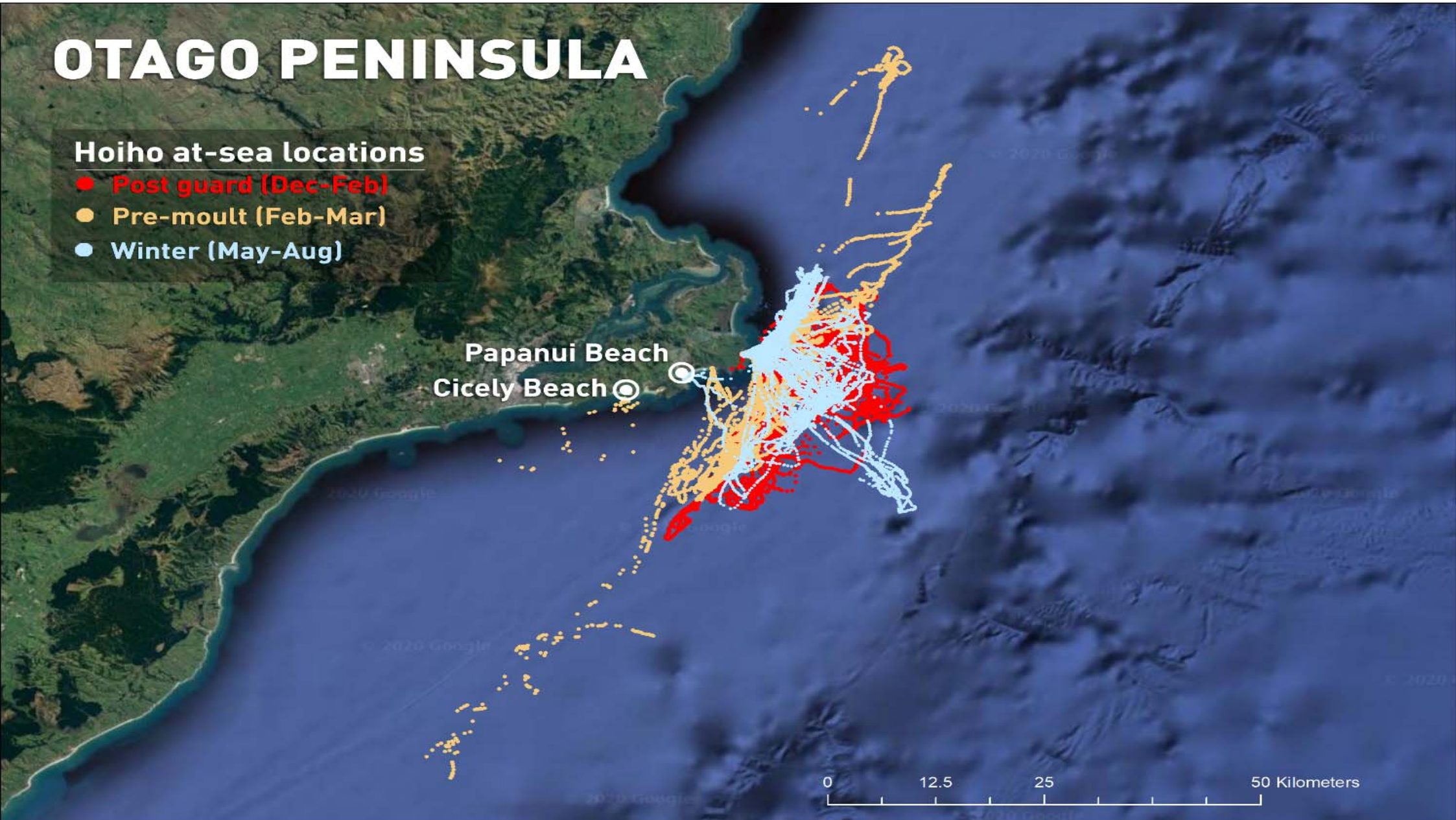
OTAGO PENINSULA

Hoiho at-sea locations

- Post guard (Dec-Feb)
- Pre-moult (Feb-Mar)
- Winter (May-Aug)

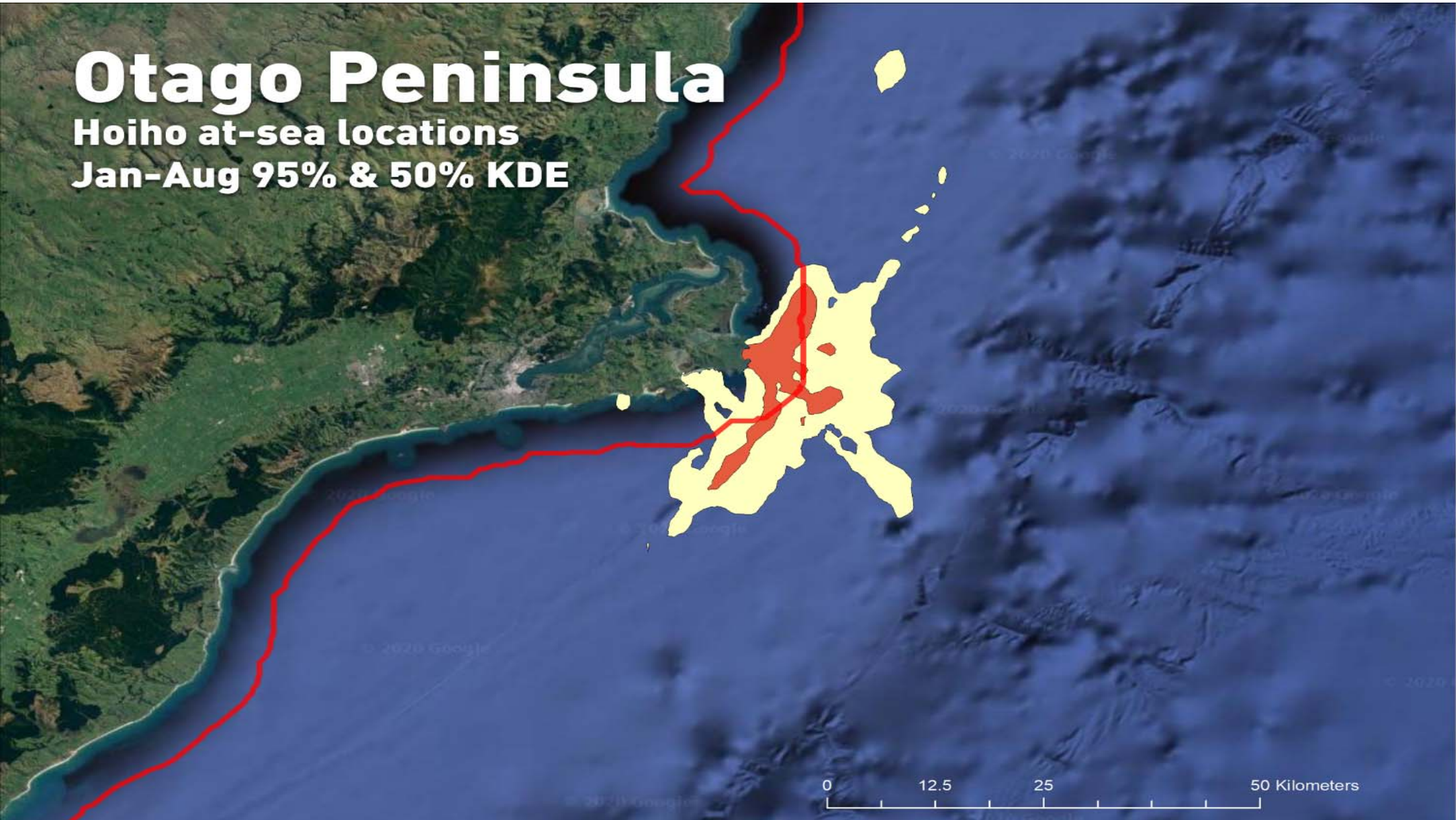
Papanui Beach
Cicely Beach

0 12.5 25 50 Kilometers



Otago Peninsula

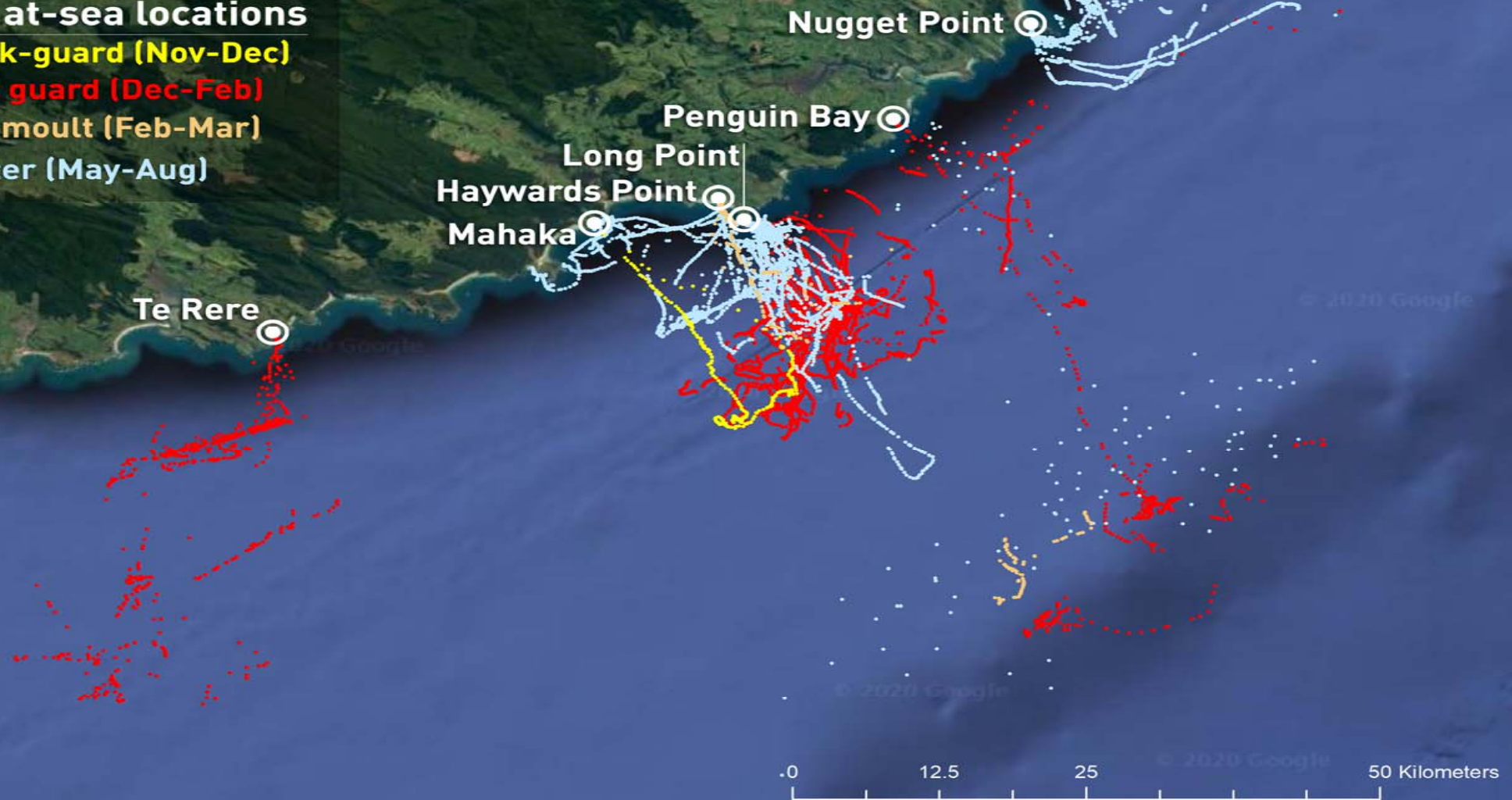
Hoiho at-sea locations
Jan-Aug 95% & 50% KDE



Catlins

Hoiho at-sea locations

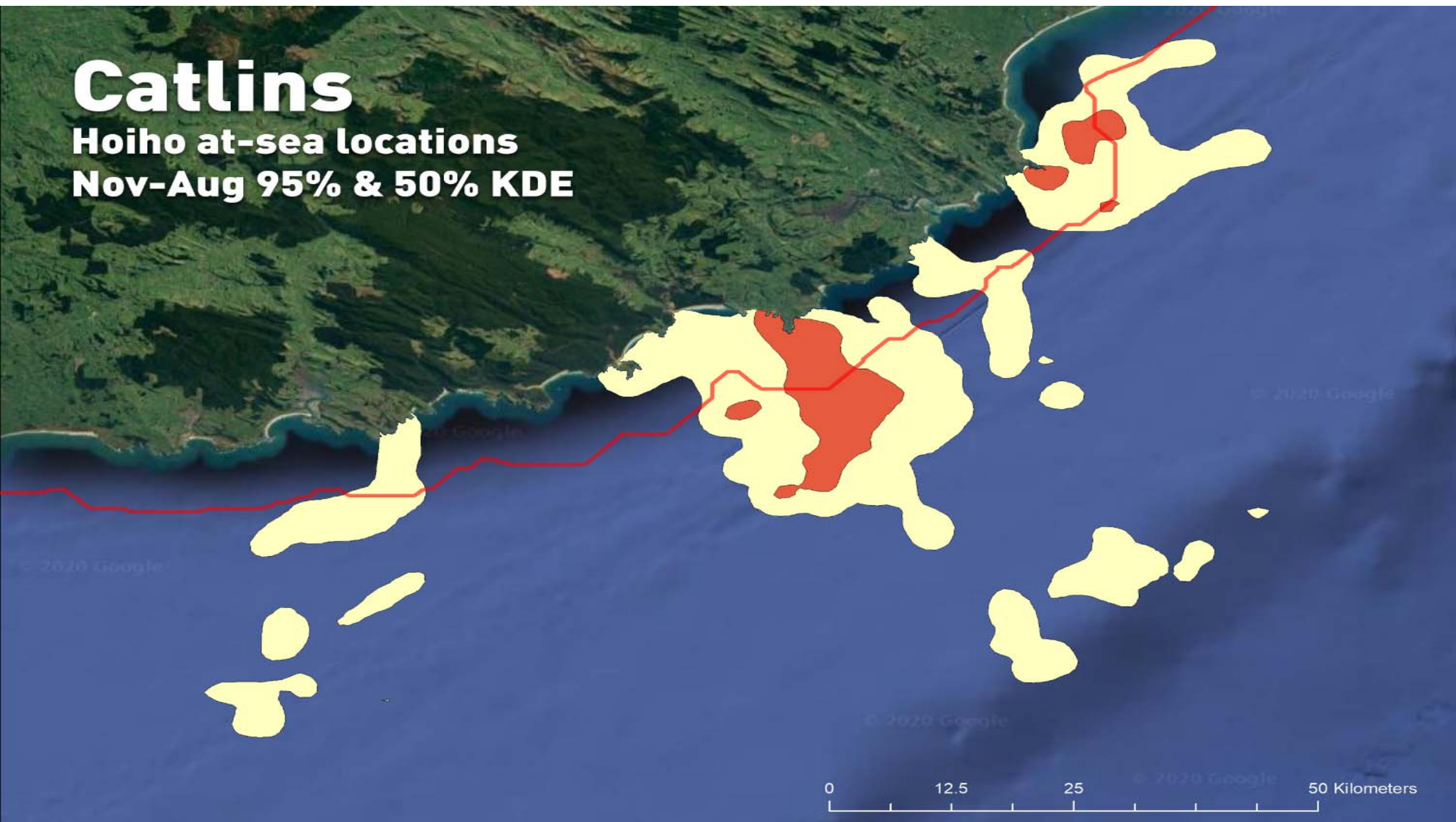
- Chick-guard (Nov-Dec)
- Post guard (Dec-Feb)
- Pre-moult (Feb-Mar)
- Winter (May-Aug)



Catlins

Hoiho at-sea locations

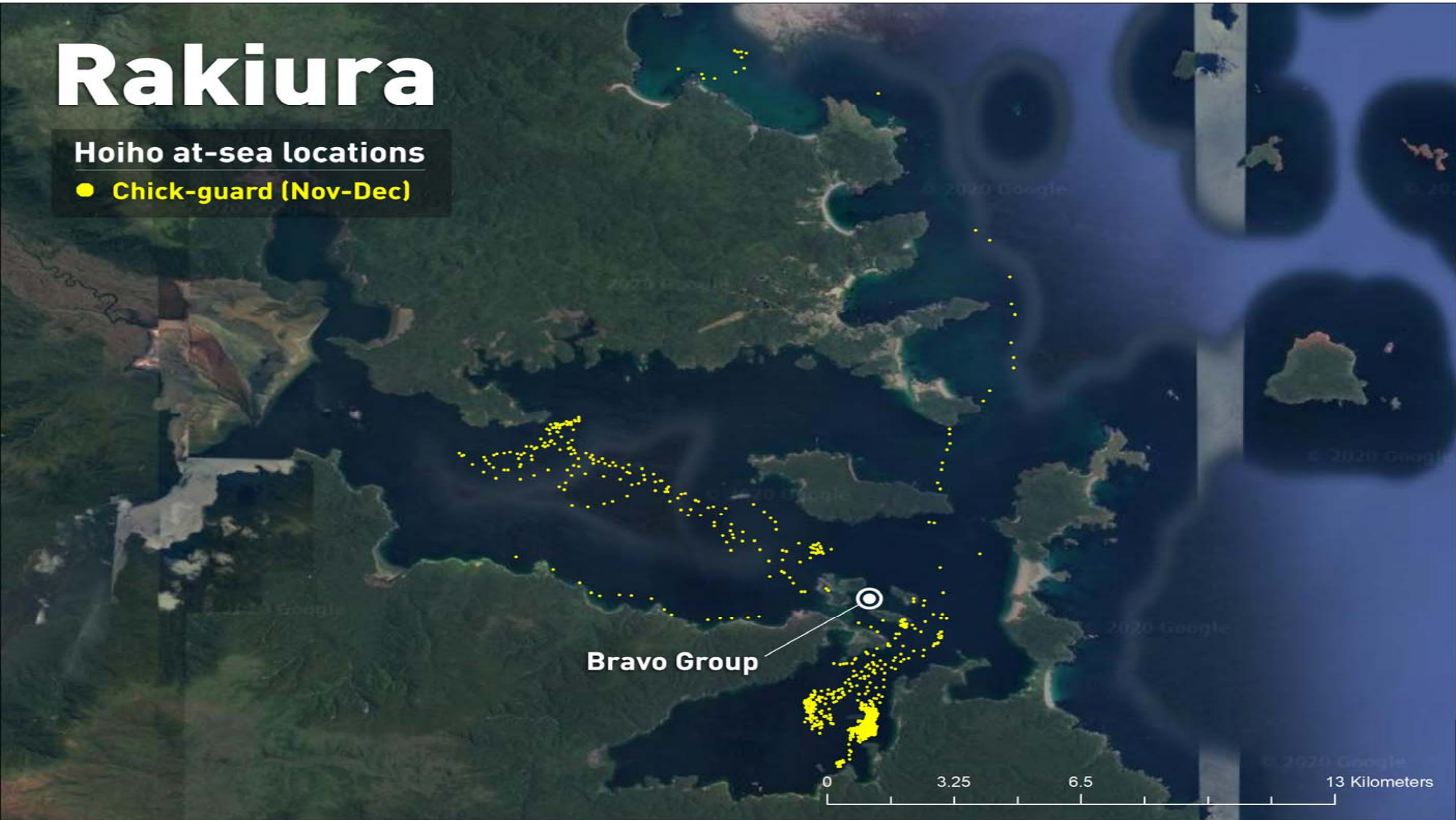
Nov-Aug 95% & 50% KDE

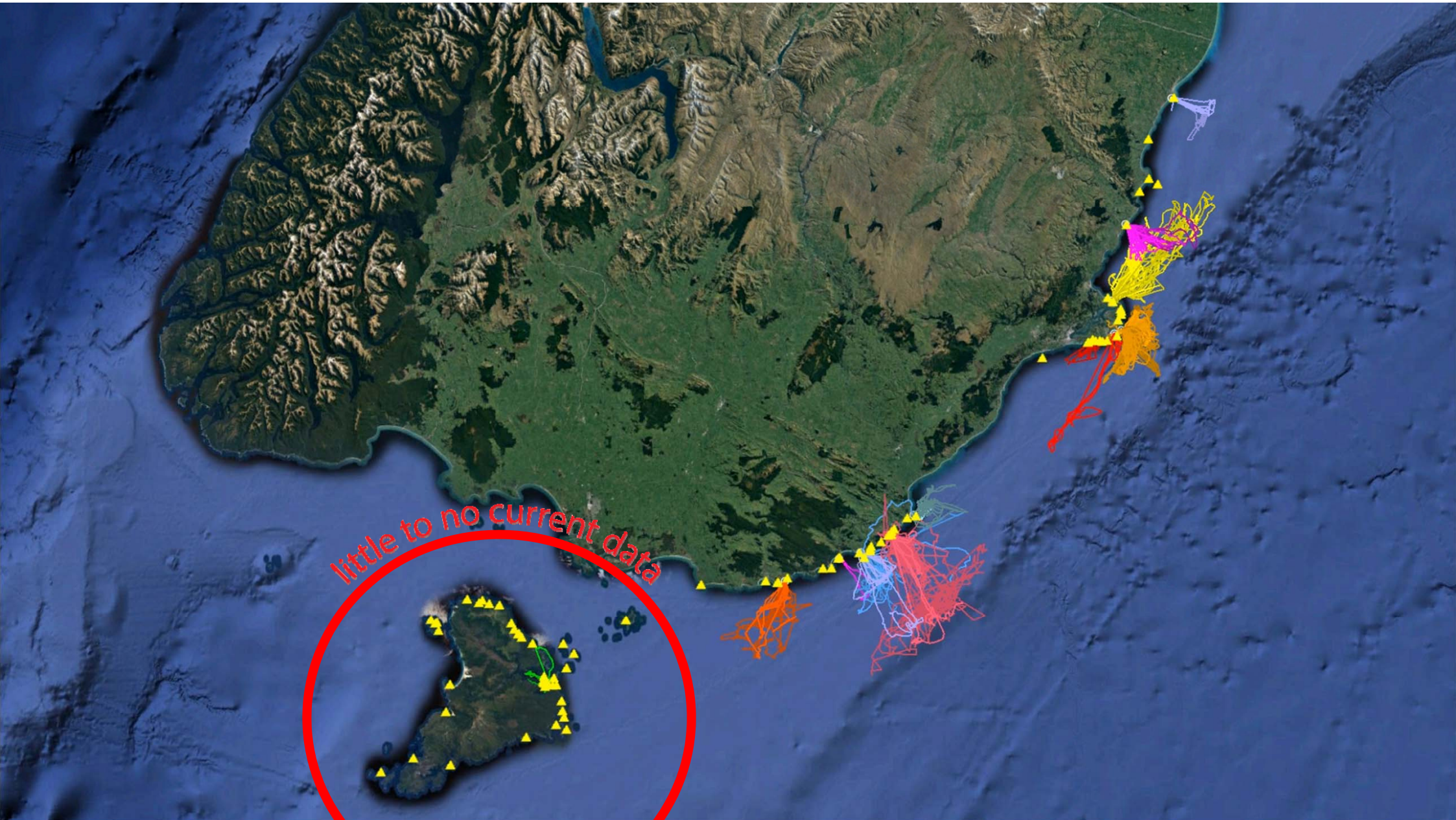


Rakiura

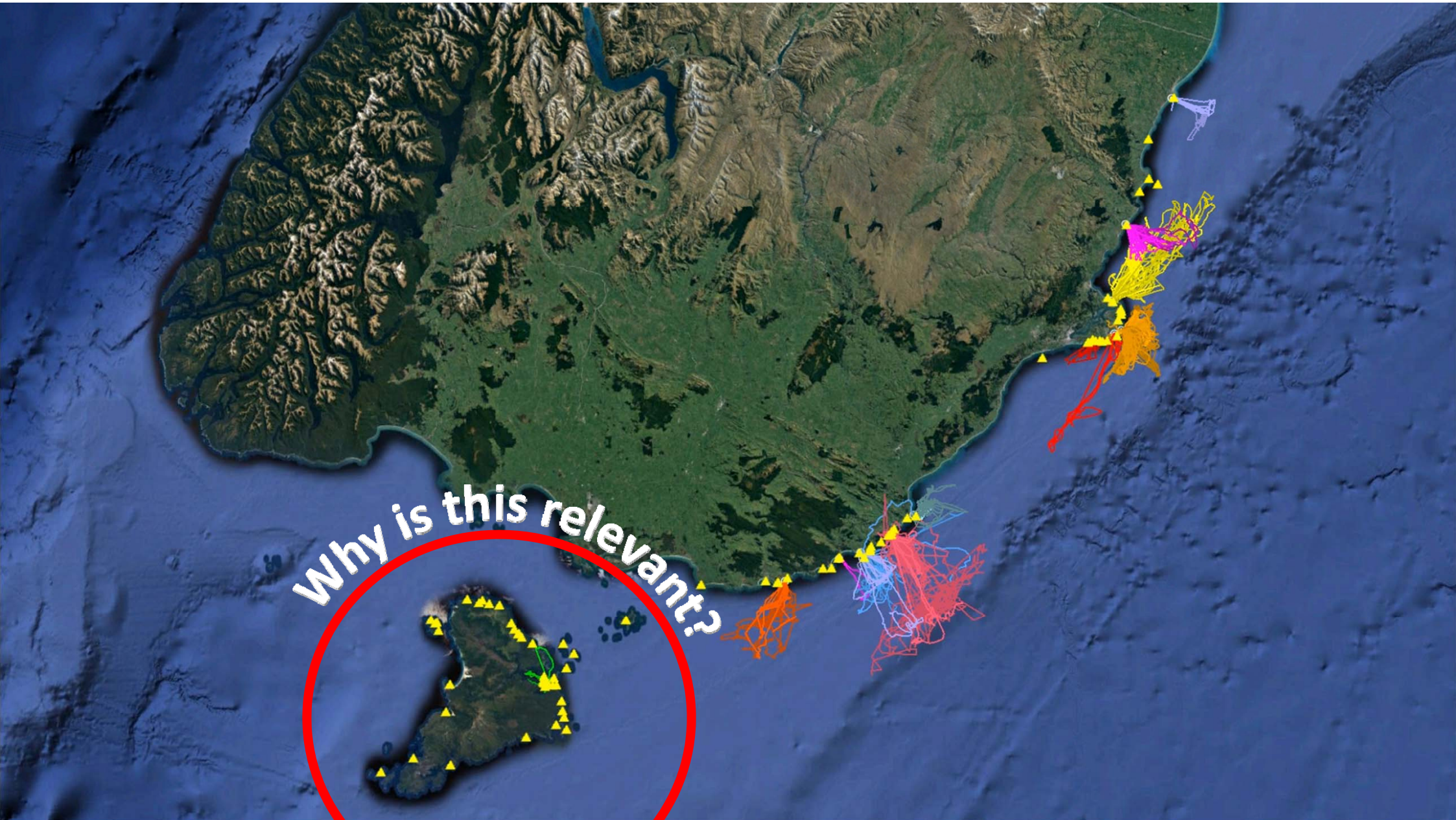
Hoiho at-sea locations

● Chick-guard (Nov-Dec)





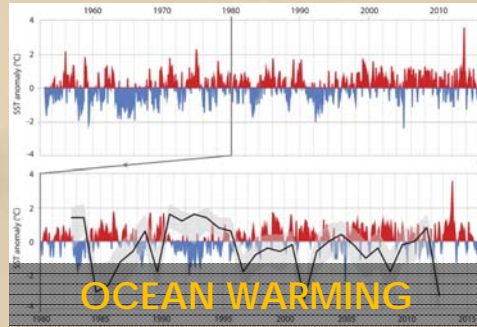
little to no current data



Why is this relevant?



HUMAN DISTURBANCE



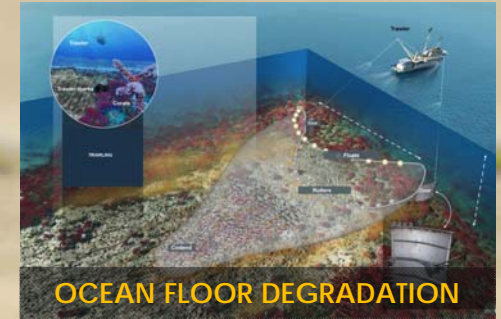
OCEAN WARMING



POLLUTION



DISEASE



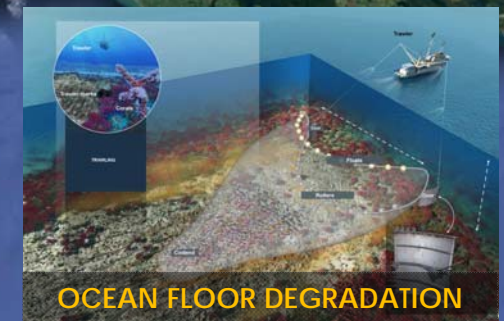
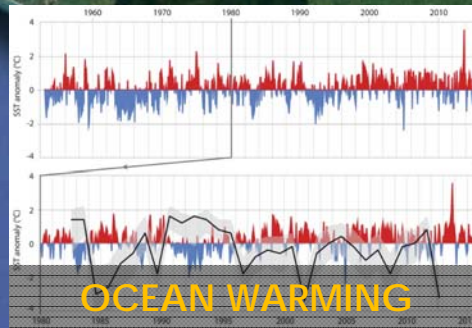
OCEAN FLOOR DEGRADATION



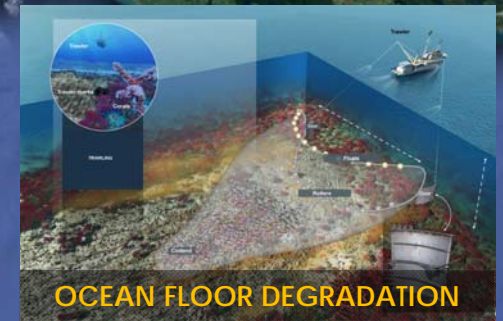
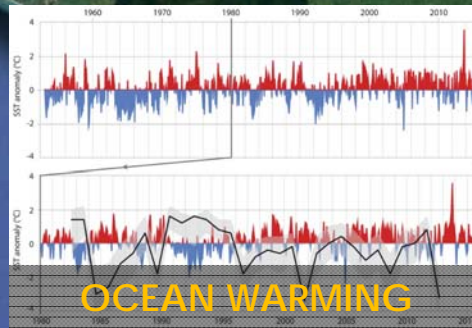
INTRODUCED PREDATORS



SET NET ENTANGLEMENT



Ramp up
population
monitoring



Investigate
at-sea behaviour



A huge thank you to our field helpers:

Mel Young, Rachel Hickcox, Julia Reid, Whitney Steidly, Tama Taita, Meg Houseman, Shannon Ritter, Abby Clarke, Hannah Mattern, Sarah Irvine, Bryony Alden, Tereza Chudobova, Molly Baptista, Hannah Ravn, Alicia Dimovski, Nikki Hartley, Lauren Jordaan, Philippa Agnew, Janine Baker, Lauren Tworkowsky, Thor Elley, Scott Melchert, Fergus Sutherland

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Yellow-eyed Penguin Trust
Forest & Bird