Seabird distribution, population trends, and underlying drivers

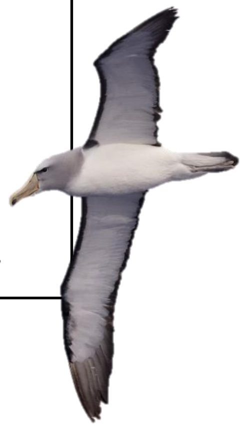


07 May 2024

WCPFC19 noted a global decline in specific ACAP seabird population trends, which are vulnerable to threats posed by longline fisheries in the WCPO

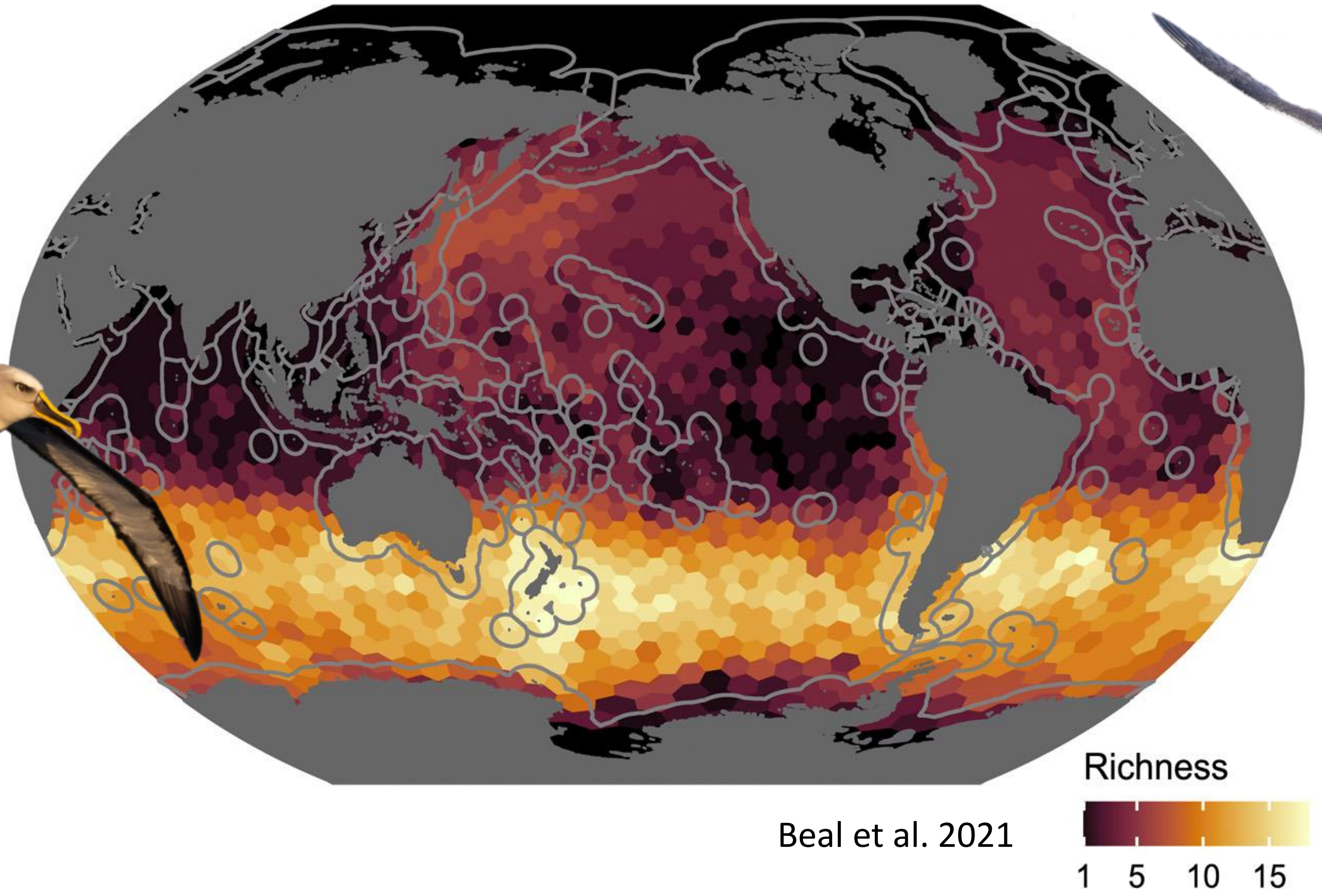
Species	IUCN status	Breeds in WCPO	Forages in WCPO	$N_{breeding\ pairs}$	Trend
Southern Royal Albatross	(CR)	✓	✓	6,347	↓
Antipodean Albatross	EN	✓	✓	8,654	↓
Northern Royal Albatross	EN	✓	✓	4,261	↔
Indian Yellow-nosed Albatross	EN		✓	33,988	↓
Grey-headed Albatross	EN	✓	✓	80,633	↓
Westland Petrel	EN	✓	✓	6,223	↔
Wandering Albatross	VU	✓	✓	10,072	↓
Short-tailed Albatross	VU	✓	✓	889	↑
Salvin's Albatross	VU	✓	✓	58,563	↓
White-chinned Petrel	VU	✓	✓	1,317,278	↓
Black Petrel	VU	✓	✓	5,456	↔

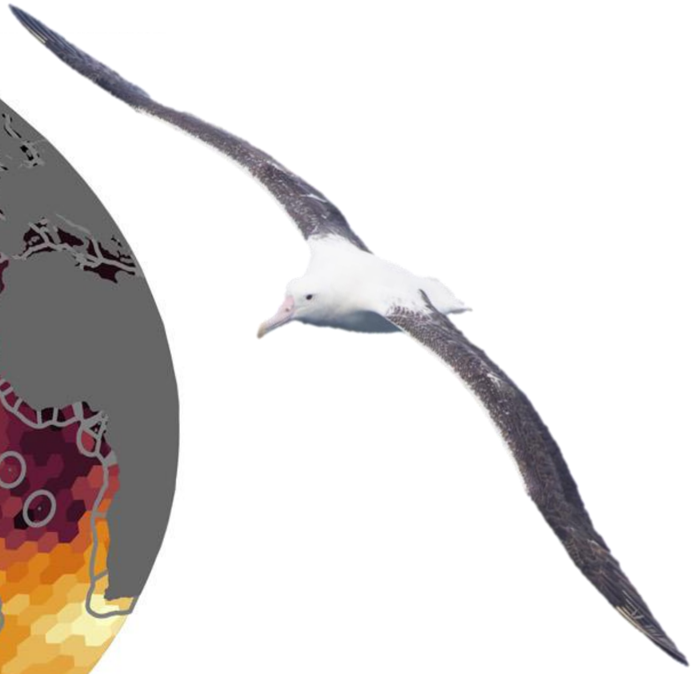
Updated extract of SC18-EB-WP-03



This ultimately led to the review of CMM 2018-03

The WCPO - particularly the Southern Ocean around NZ - is a seabird hotspot





For instance, 77% (17/22) albatross species depend on the WCPO

New Zealand is the World's seabird capital

Due to this responsibility, New Zealand has a large-scale monitoring scheme, which includes:

1. Multi-decade, colony monitoring across the EEZ
2. Deployment of hundreds of (satellite) trackers

These data enable:

- Robust insights into year-round distributions
- Insights into long-term trends
- Advanced population models
- Fisheries overlap analyses & risk assessments

Providing an overview of SH seabird data

To provide overall seabird insights for the CMM-2018 review, we:

1. Generated year-round maps for key SH species*, which:
   A. Account for tag accuracy,

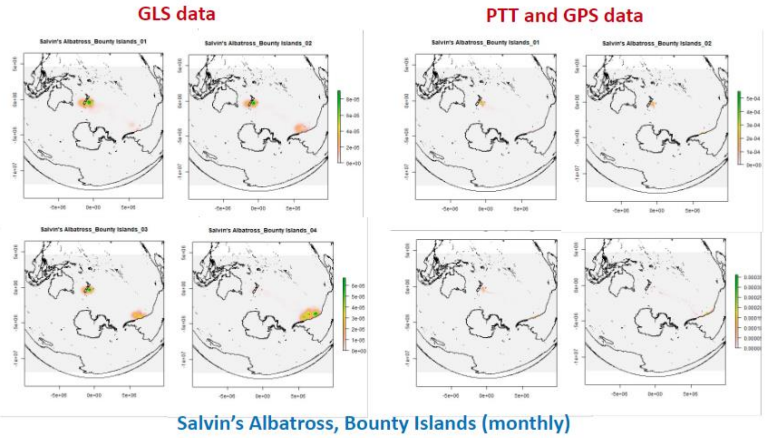
Step 1. Data cleaning and standardisation

Step 2. Utilization distributions (UDs) created for data group* each combination – **Kernel analysis**

Fixed smoothing parameter (*h*):

GLS data
200 km

PTT and GPS data
50 km



*Data group: all data for each combination of species, island group, device type, month

*SH species were selected based on NZ's responsibility for them, known risk (e.g., through Edwards et al. 2023 a,b), and available tracking (*N* >30) & population data

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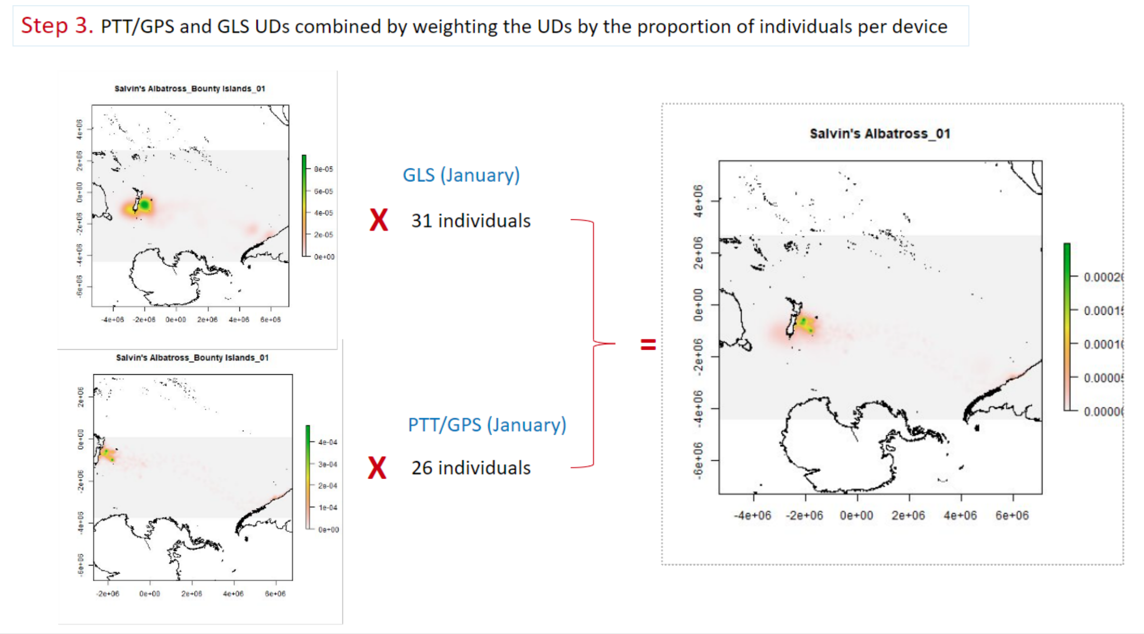

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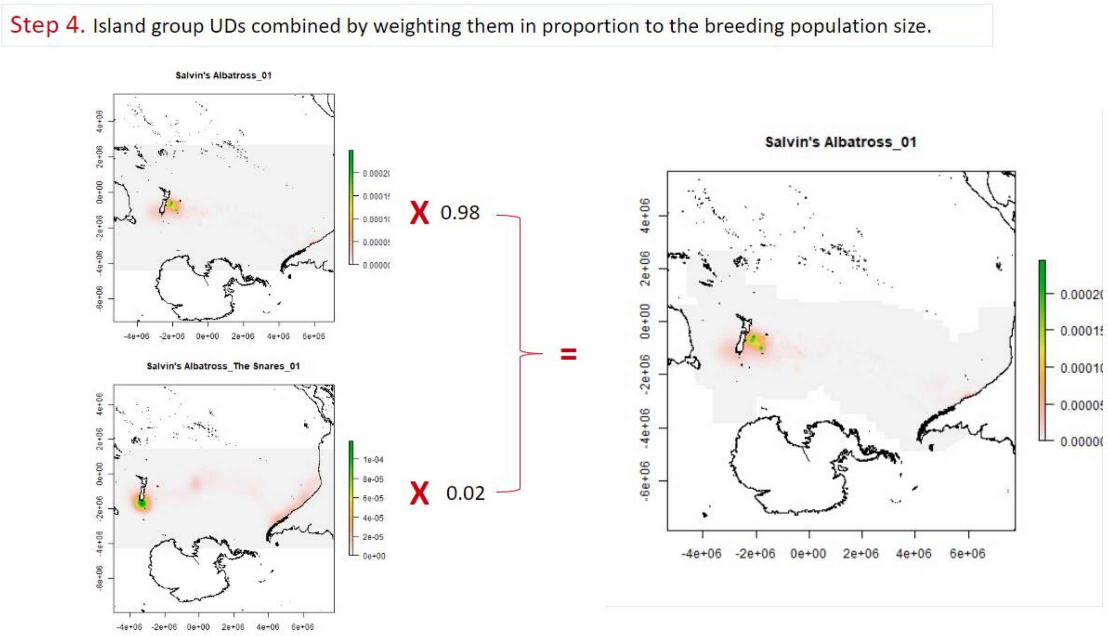

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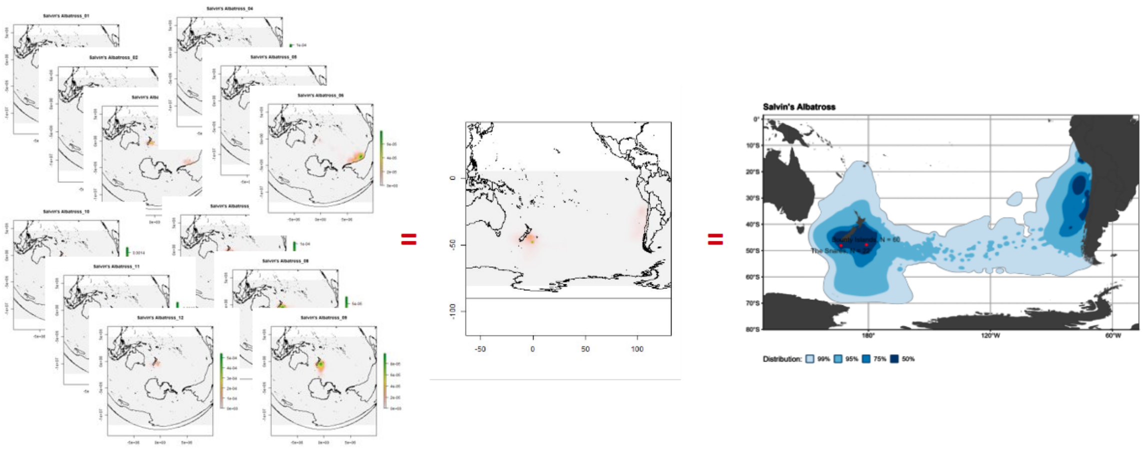
   B. Account for sample size,
   C. Are weighted by population size,
   D. Account for tag loss over time,
   E. Do not extrapolate (i.e., no SDM outputs).

   These maps consequently represent balanced outputs of kernel utilisation distribution analyses

Step 5. Sum monthly UDs to generate annual distribution

Step 6. From the UDs, 50, 75, 95, 99% isopleths calculated to categorise different levels of intensity in use



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Providing an overview of SH seabird data

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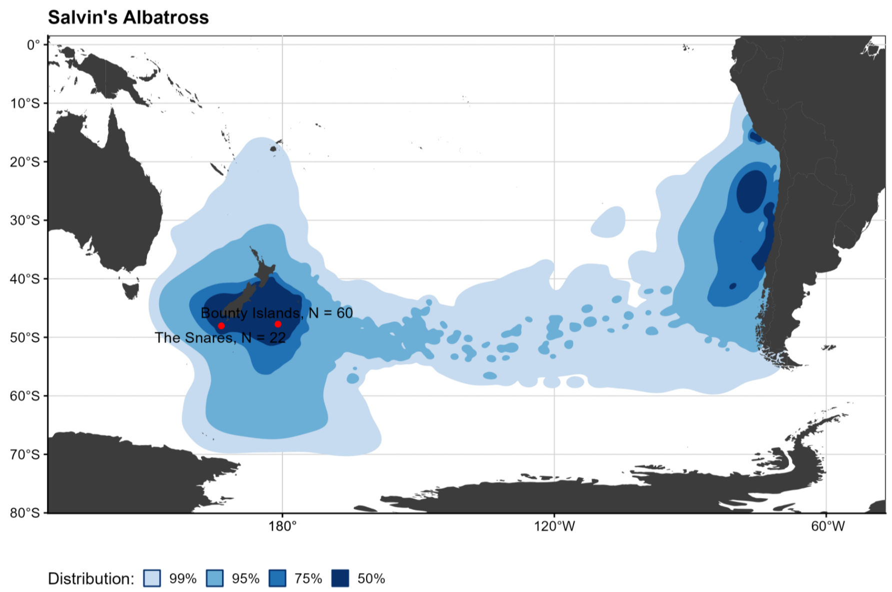
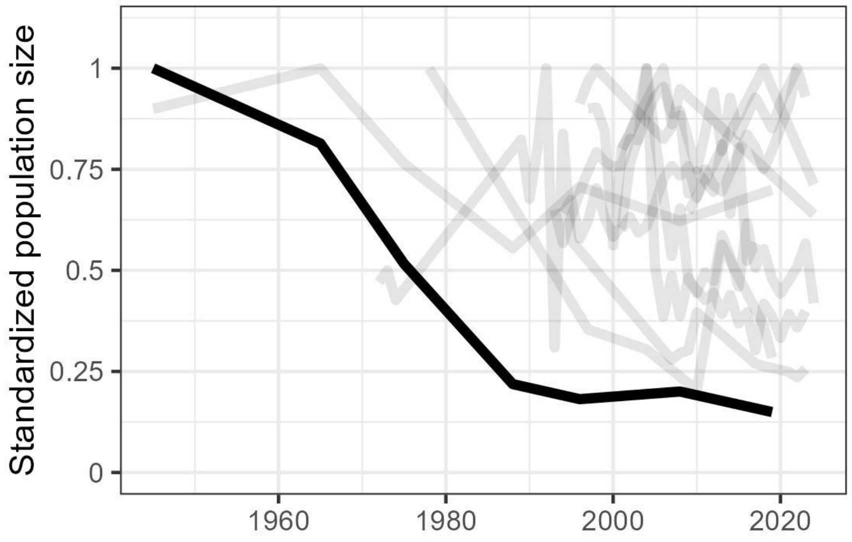
2. Generated standardized population trajectories (i.e., $N_{max} = 1$) for these species from study sites for the monitoring period available.





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Providing an overview of SH seabird data

To provide overall seabird insights for the CMM-2018 review, we:

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   - A. Account for tag accuracy,
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   - C. Are weighted by population size,
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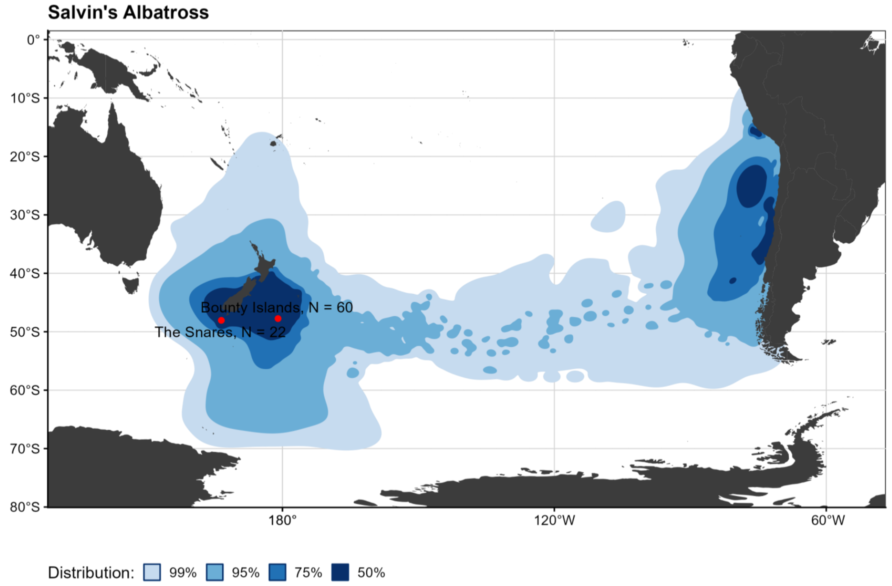
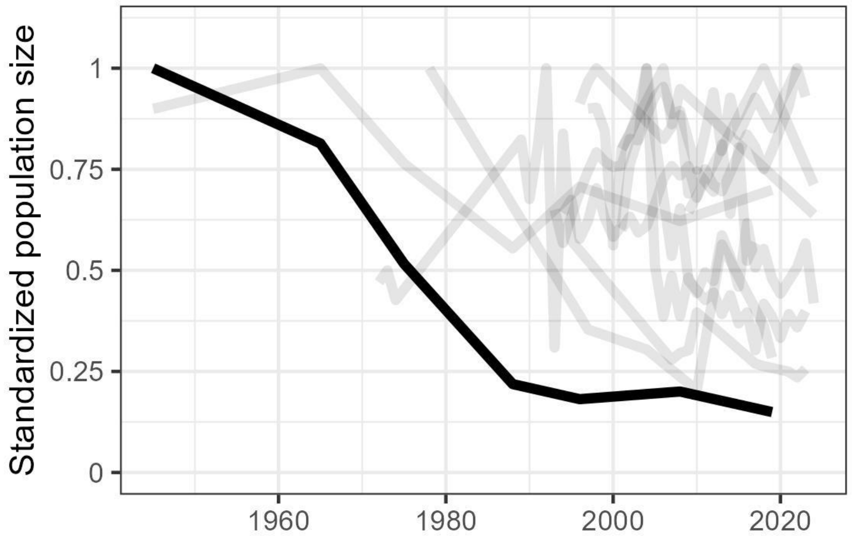
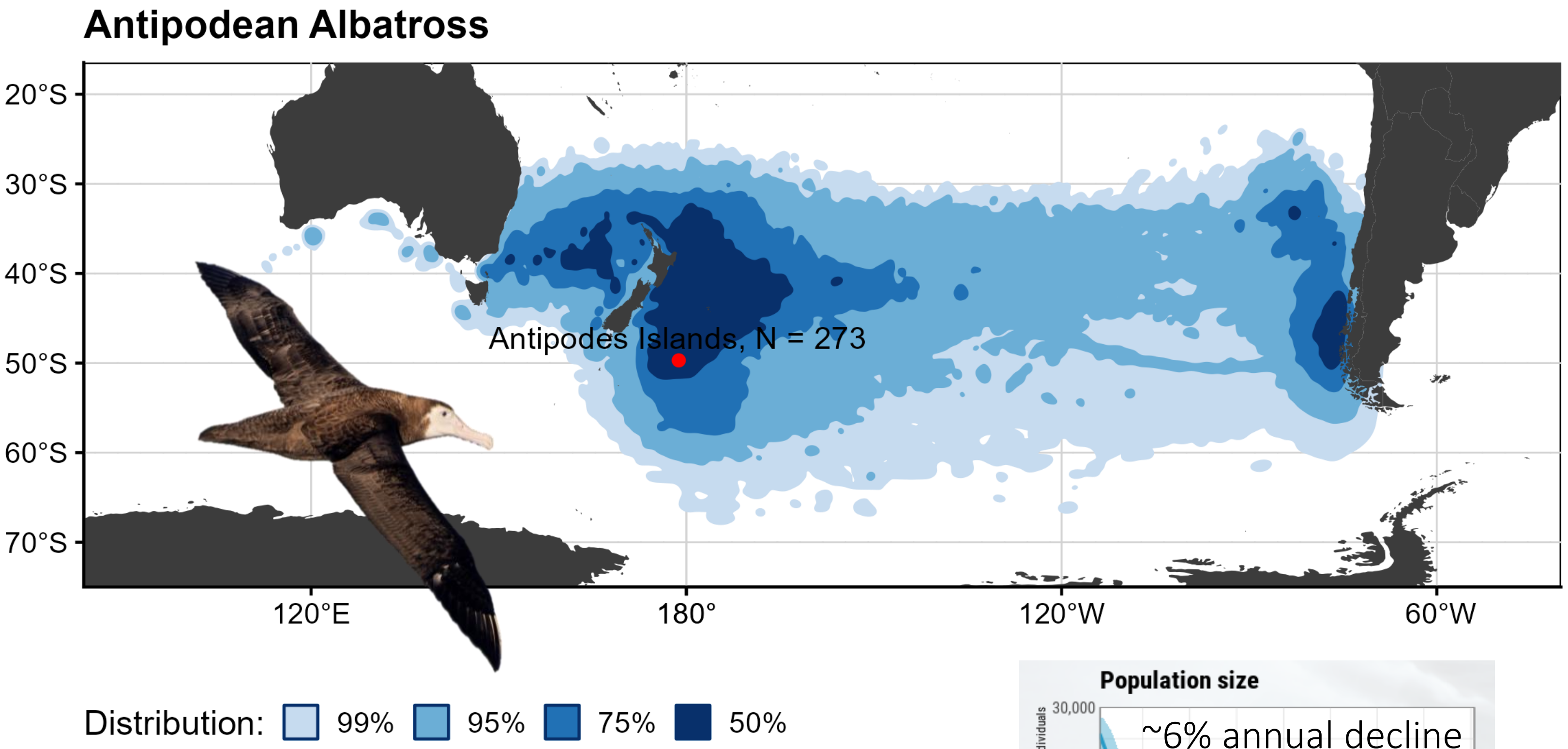
   These maps consequently represent balanced outputs of kernel utilisation distribution analyses
2. Generated standardized population trajectories (i.e., N_{max} = 1) for these species from study sites for the monitoring period available.
3. Combined maps into overall distribution maps
4. Assessed overall seabird community trends

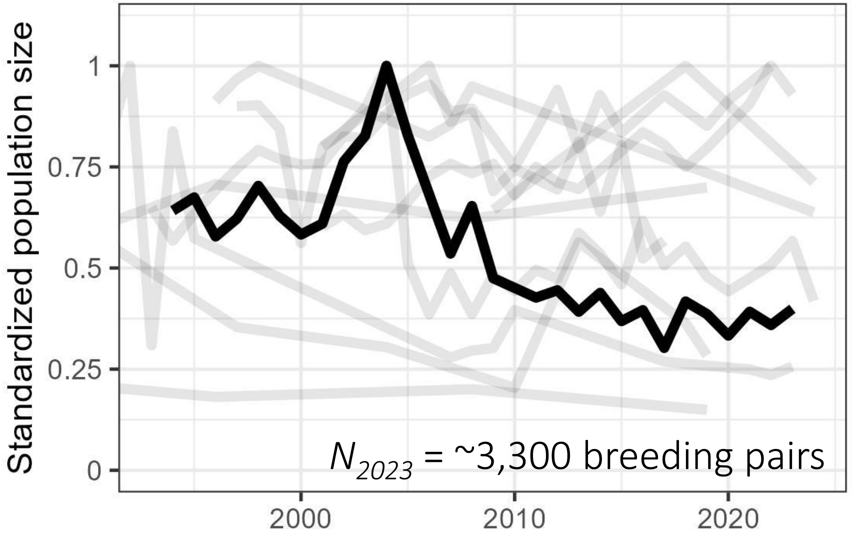
*SH species were selected based on NZ's responsibility for them, known risk (e.g., through Edwards et al. 2023 a,b), and available tracking (*N* >30) & population data





SH seabird overview: Antipodean Albatross



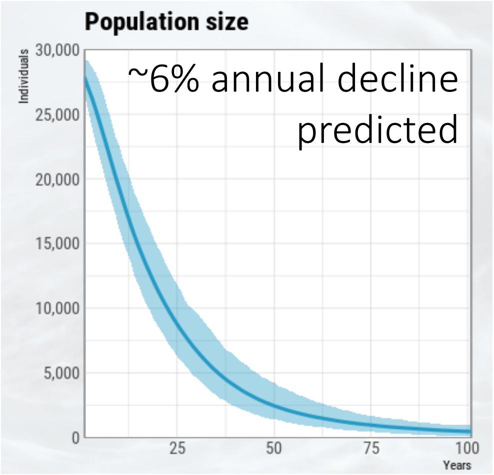


Population insights:

- ~63% decline since 2004
- λ_{colony} = ~0.953 (-4.7% annual decline observed at colony)
- Worse trend projected
- ACAP trend assessment: ↓
- More detailed analyses covered later in presentation

Breeding status:

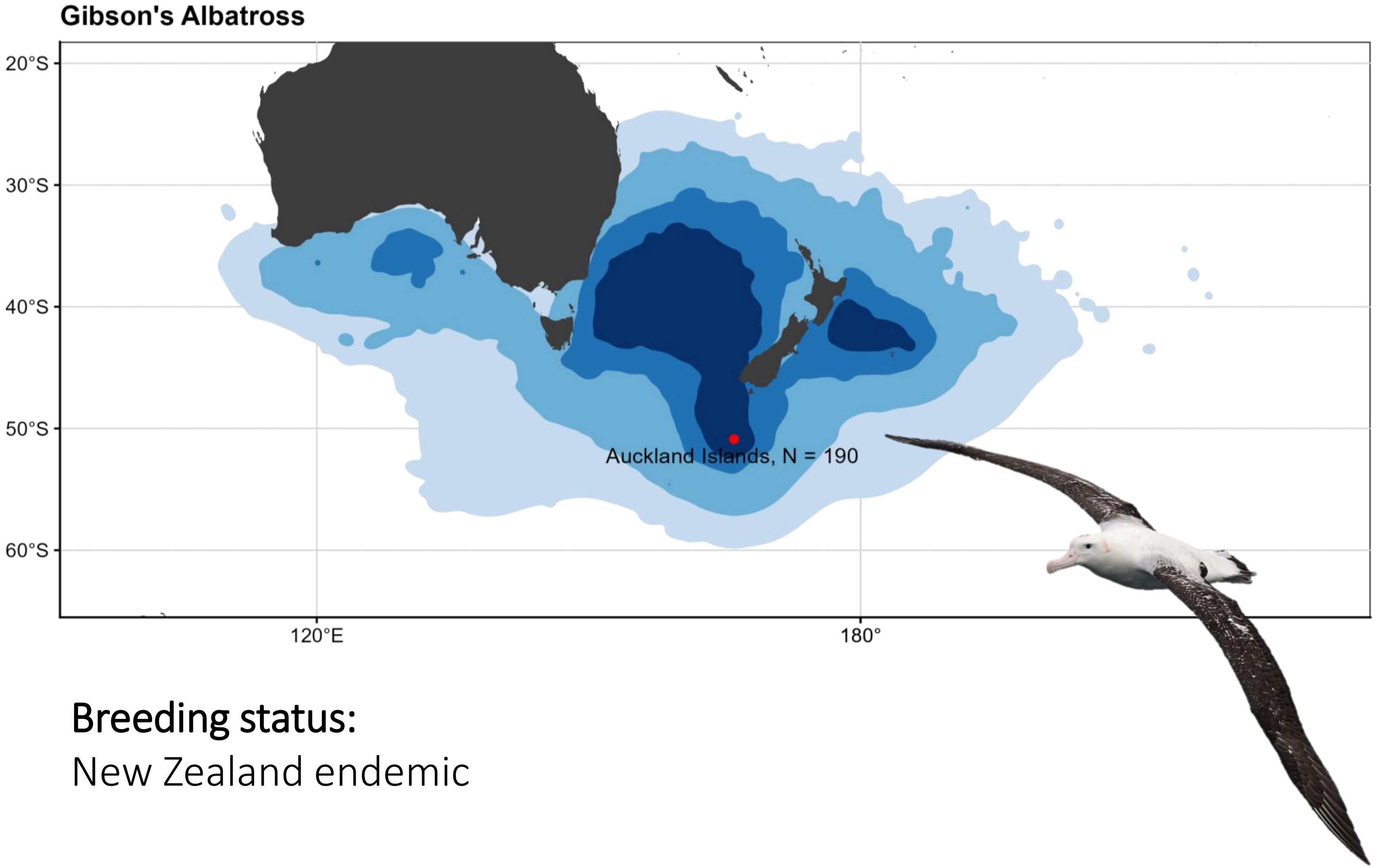
New Zealand endemic

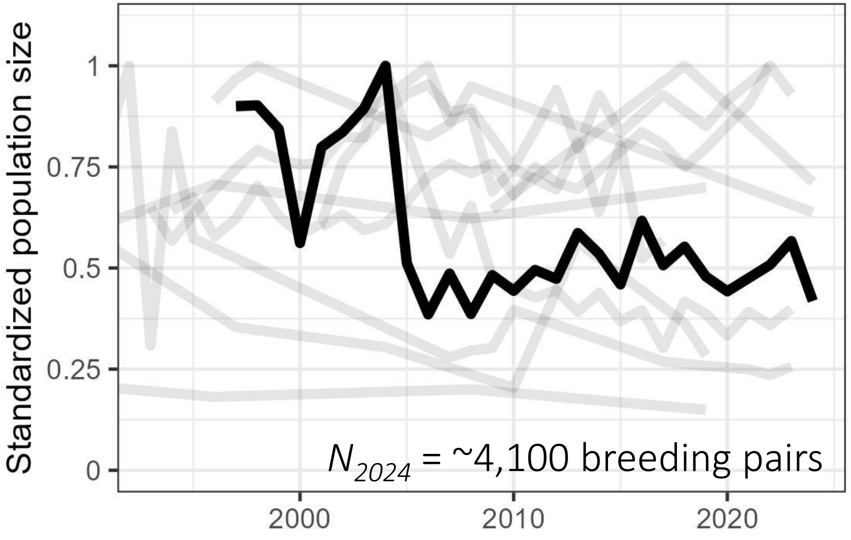


References:

Richard 2021, Parker et al. 2023, ACAP 2024

SH seabird overview: Gibson's Albatross





Breeding status:

New Zealand endemic

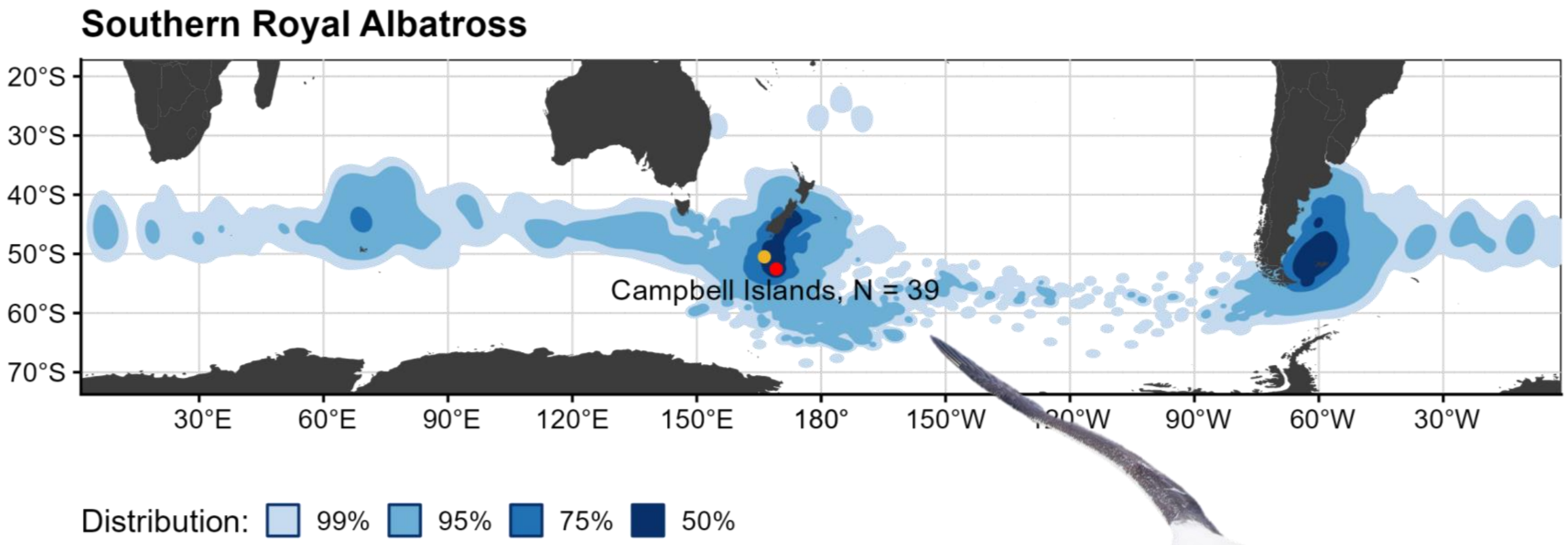
Population insights:

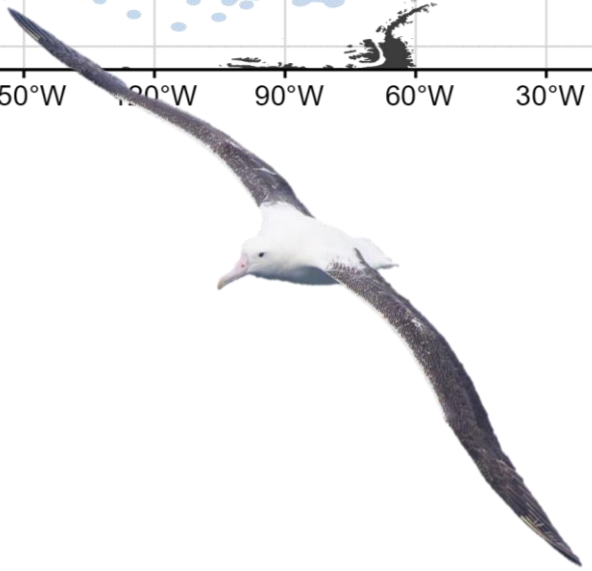
- ~52% decline since 2004
- λ_{colony} = ~0.957 (-4.3% annual decline observed at colony)
- ACAP trend assessment: ↓
- More detailed analyses covered later in presentation

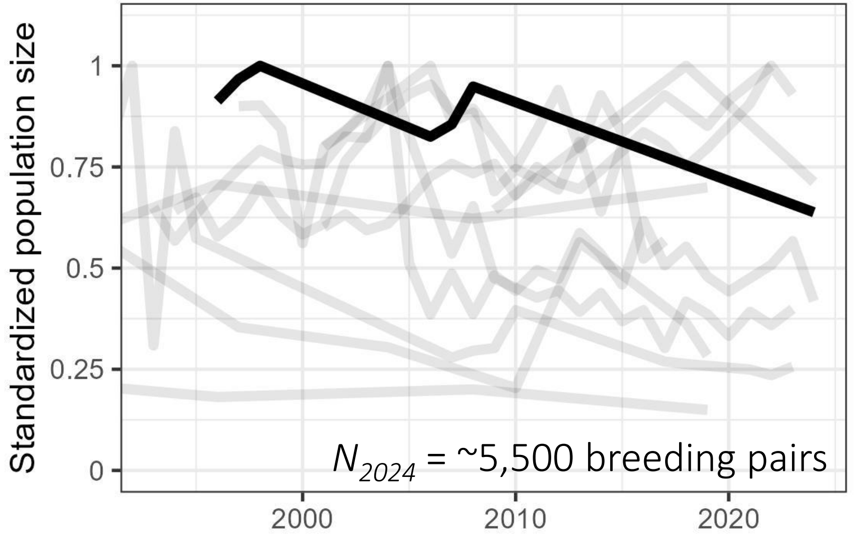
References:

Walker et al. 2023, ACAP 2024, Walker in prep., Waipoua et al. in prep

SH seabird overview:
Southern Royal Albatross







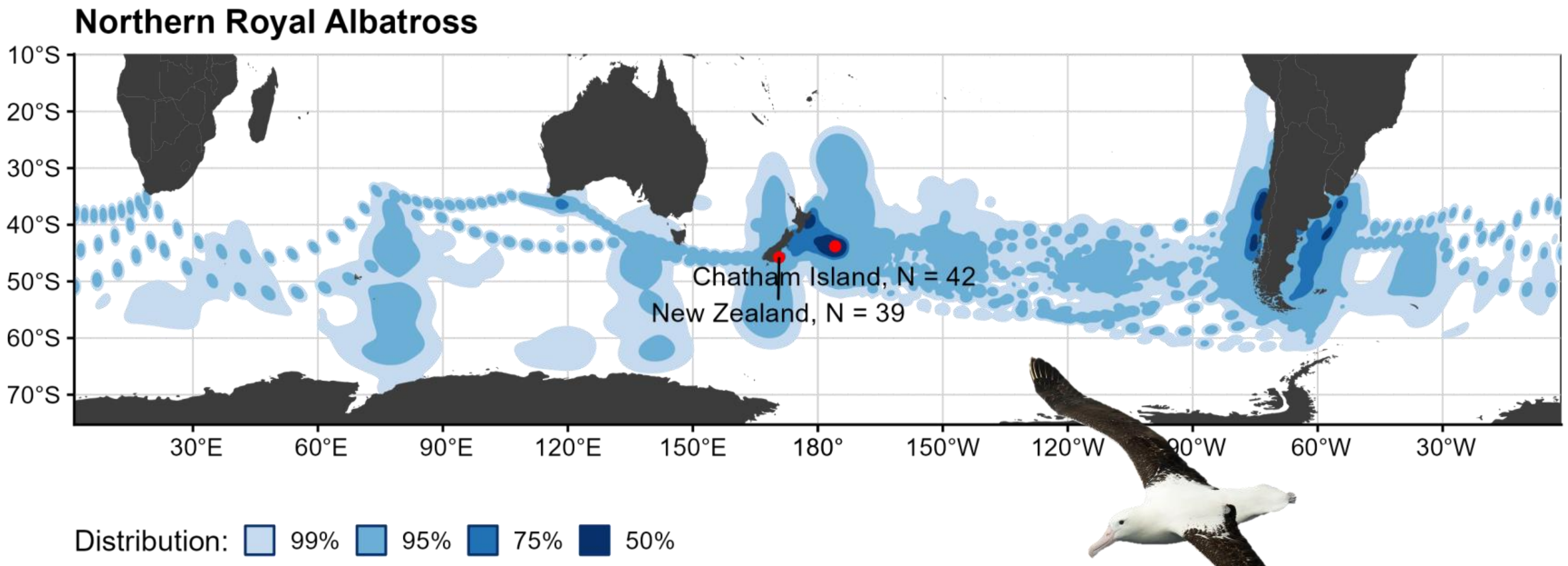
Breeding status:
New Zealand endemic

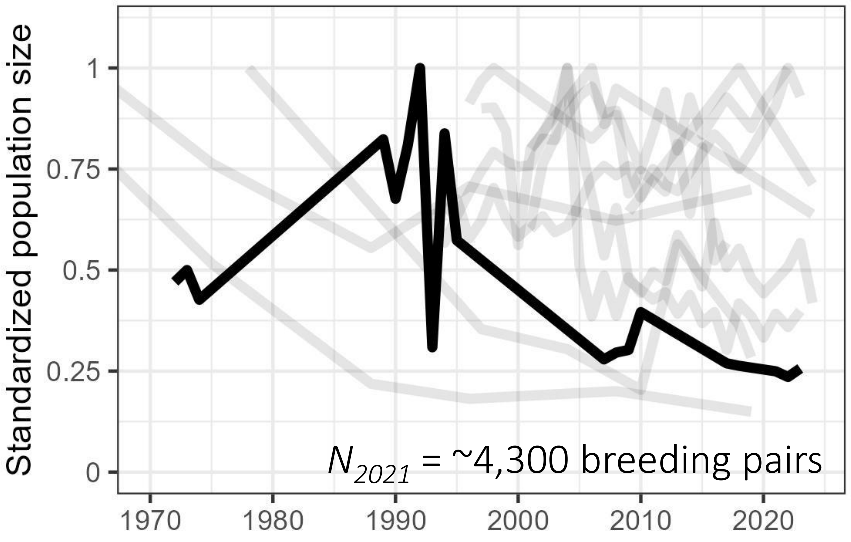
References:
Mischler & Wickes 2023, ACAP 2024, Mischler et al. in prep.

Population insights:

- ~36% decline since 1998
- λ_{colony} = ~0.983 (-2.7% annual decline observed at colony)
- ACAP trend assessment: ↓
- Requires uplisting on IUCN Red List

SH seabird overview: Northern Royal Albatross





Population insights:

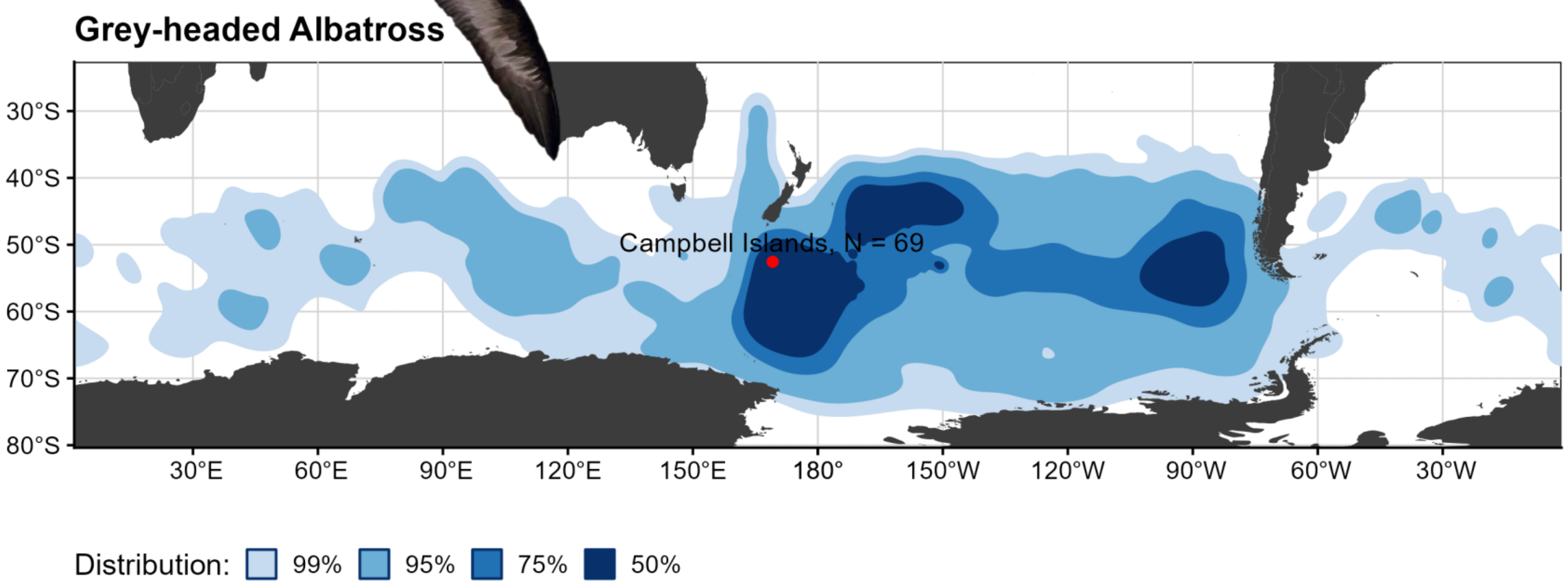
- ~75% decline since 1990s
- λ_{colony} = ~0.957 (-4.3% annual decline observed at colony)
- ACAP trend assessment: ↔
- Challenging to monitor

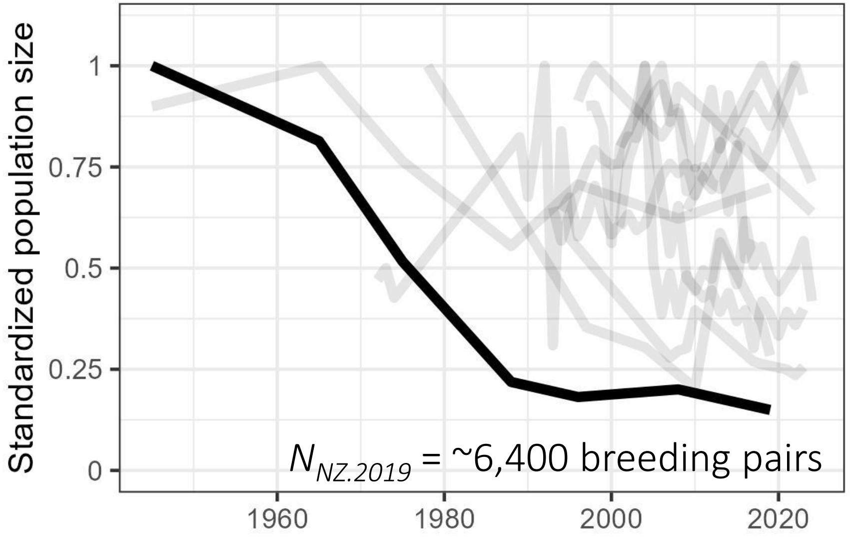
Breeding status:

New Zealand endemic

References: Frost 2021, ACAP 2024

SH seabird overview: Grey-headed Albatross





Population insights:

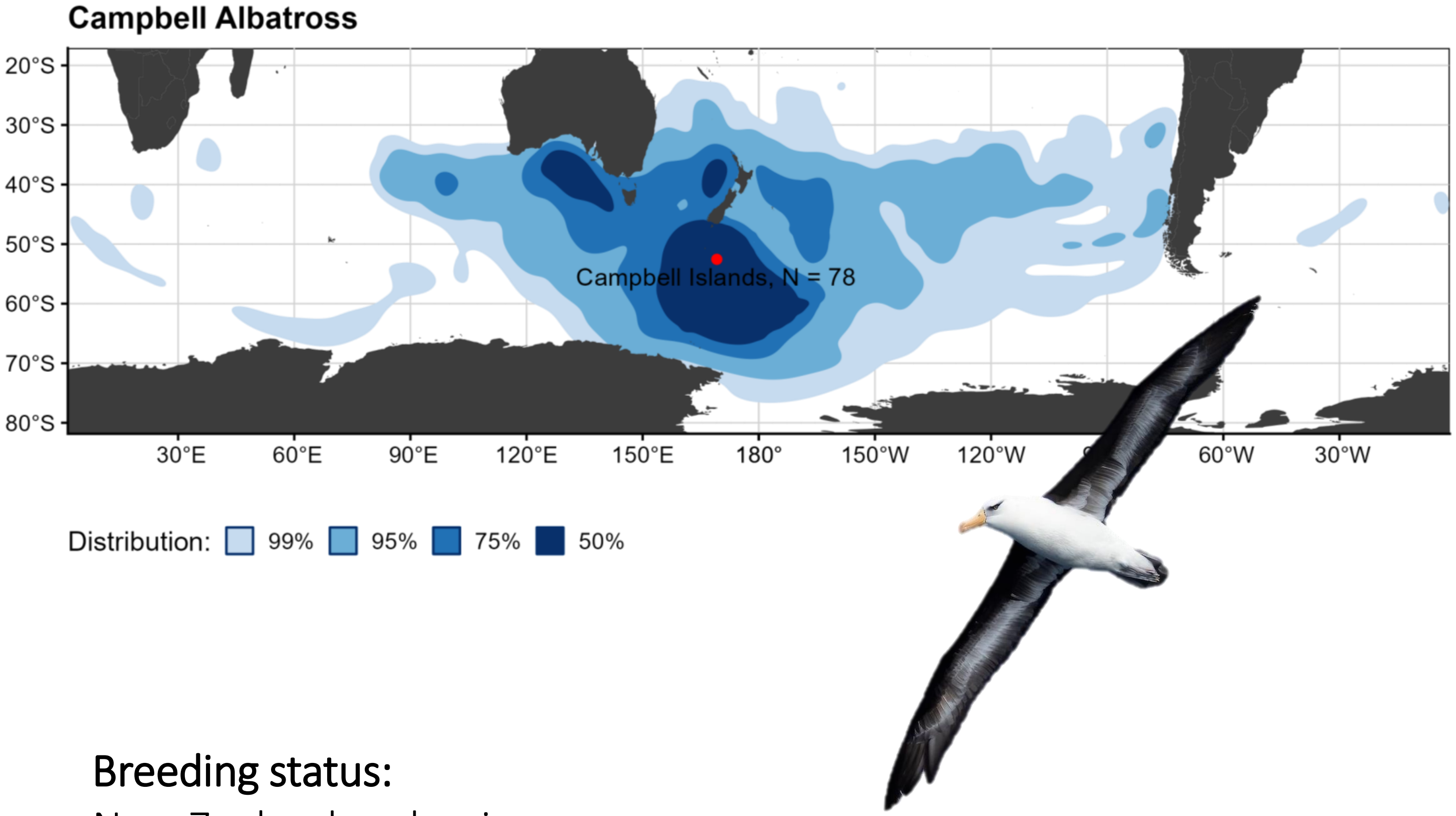
- ~85% decline since 1945
- λ_{colony} = ~0.975 (-2.5% annual decline observed at colony)
- ACAP trend assessment: ↓

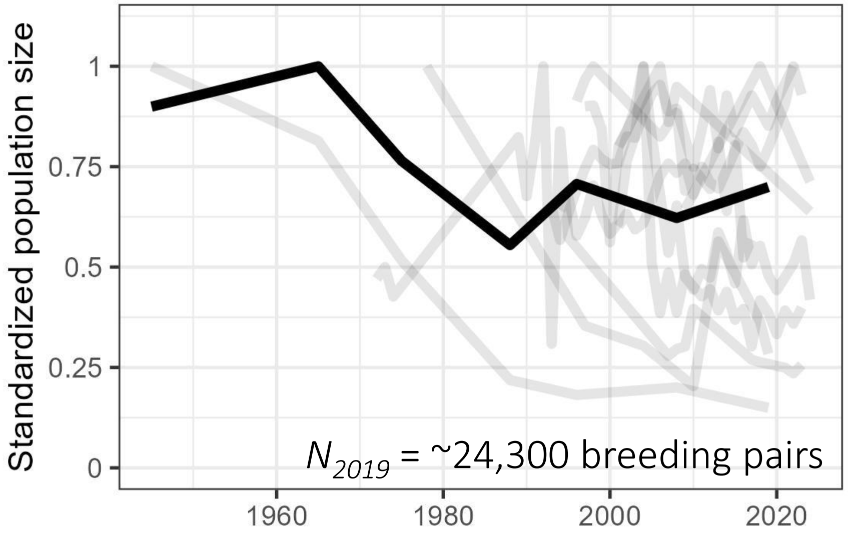
Breeding status:

circumpolar

References: Frost 2019, Goetz et al. 2022, ACAP 2024

SH seabird overview: Campbell Albatross



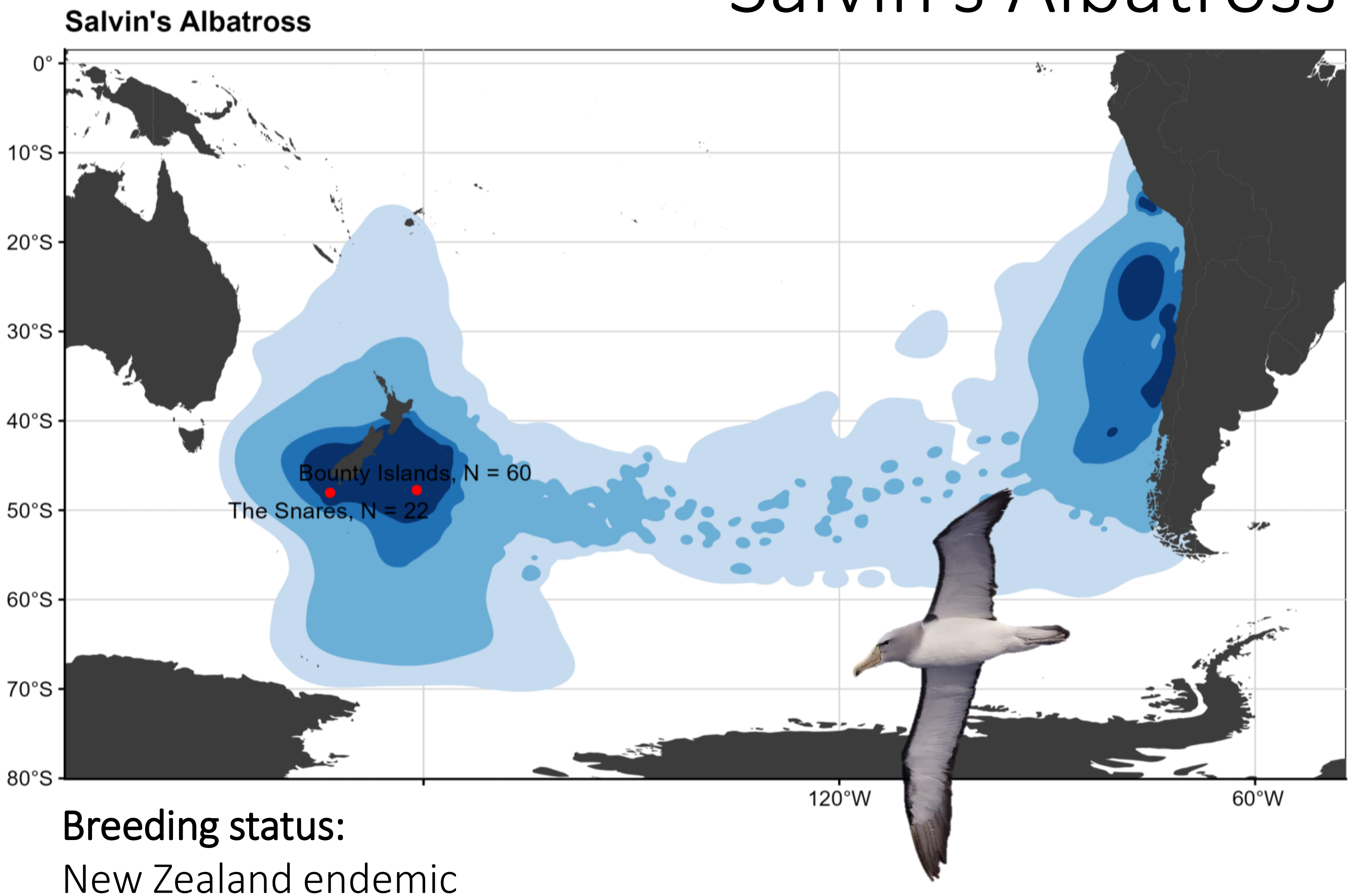


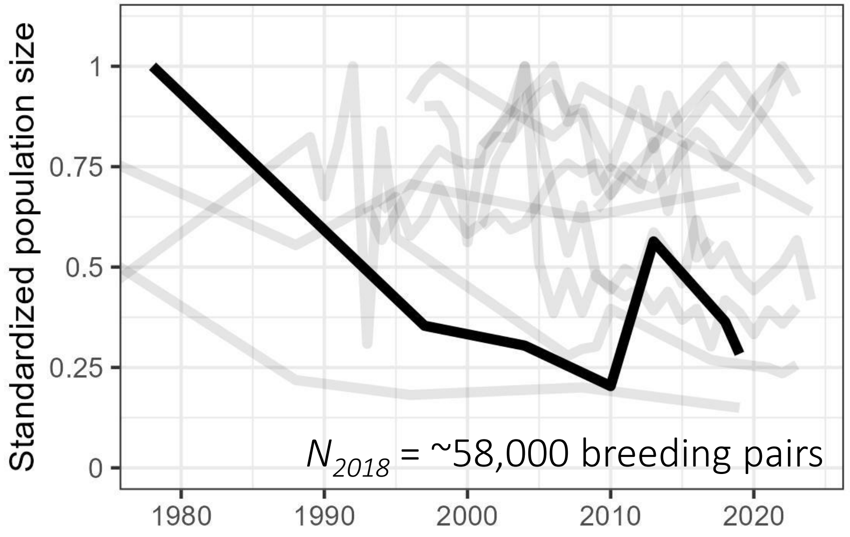
Breeding status:
New Zealand endemic

Population insights:
- ~33% decline since 1965
- λ_{colony} = ~0.993 (-0.7% annual decline observed at colony)
- ACAP trend assessment: ↔

References: Frost 2019, Goetz et al. 2022, ACAP 2024

SH seabird overview: Salvin's Albatross





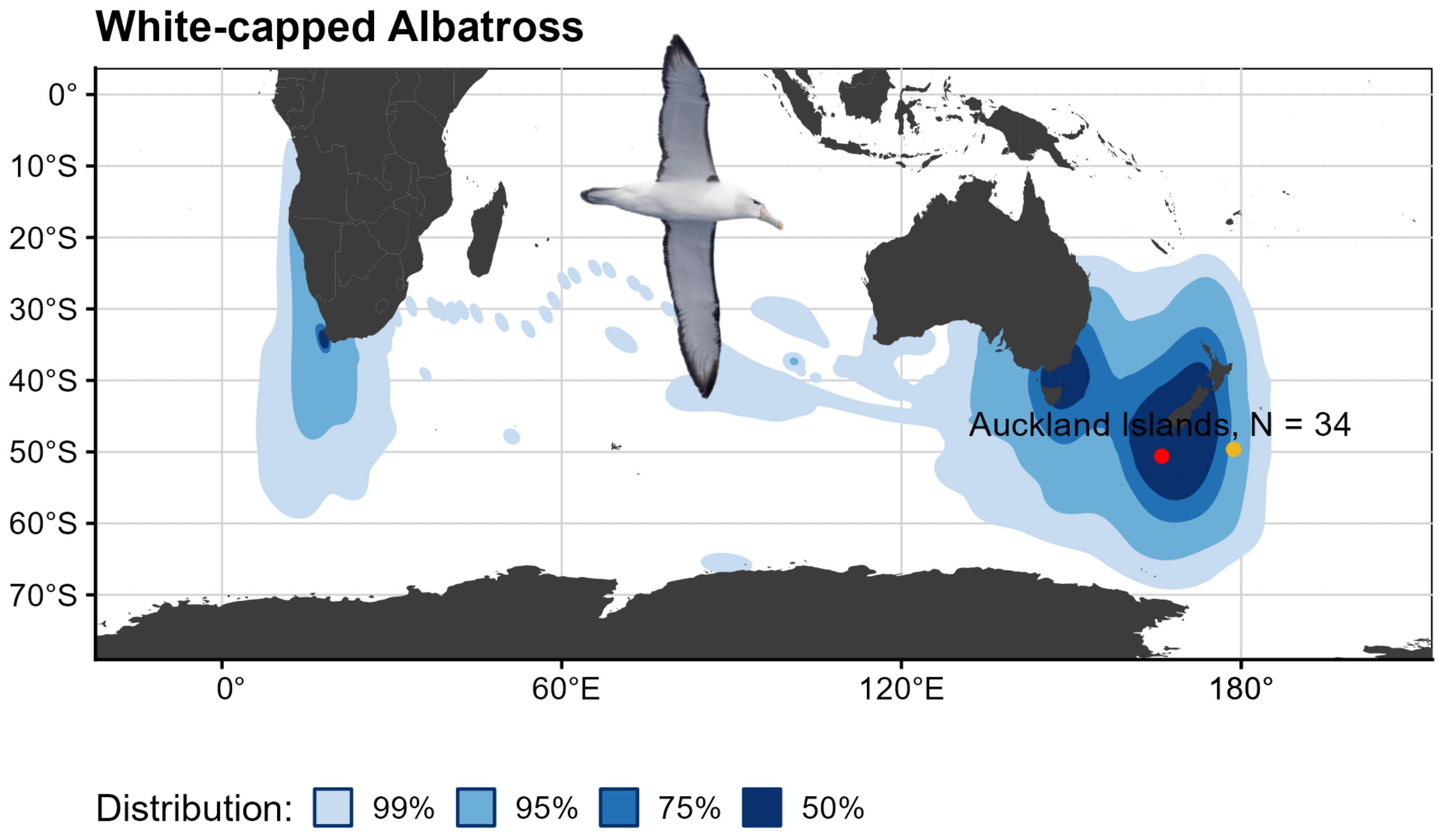
Breeding status:
New Zealand endemic

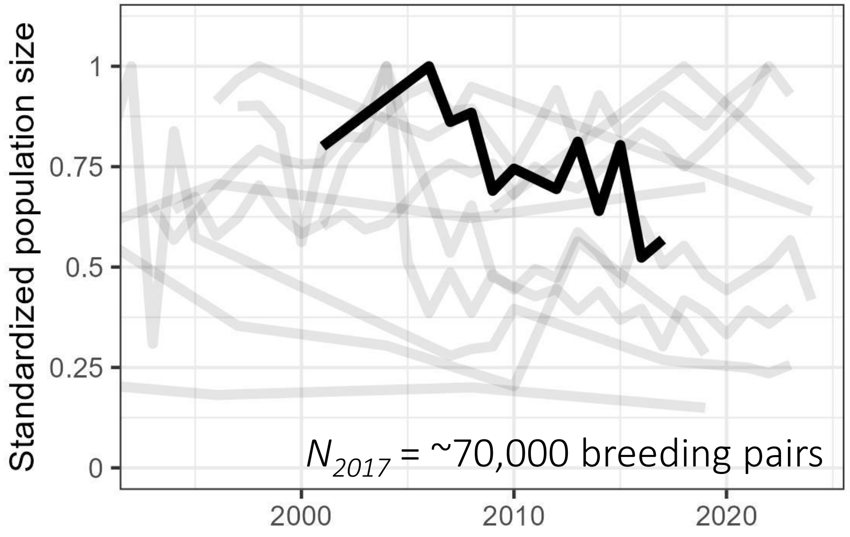
Population insights:

- ~70% decline since 1978
- λ_{colony} = ~0.970 (-3.0% annual decline observed at colony)
- ACAP trend assessment: ↓
- Challenging to monitor

References:
Parker & Rexer-Huber 2020, Thompson et al. 2020, Fischer et al. 2023a, ACAP 2024

SH seabird overview: White-capped Albatross





Breeding status:

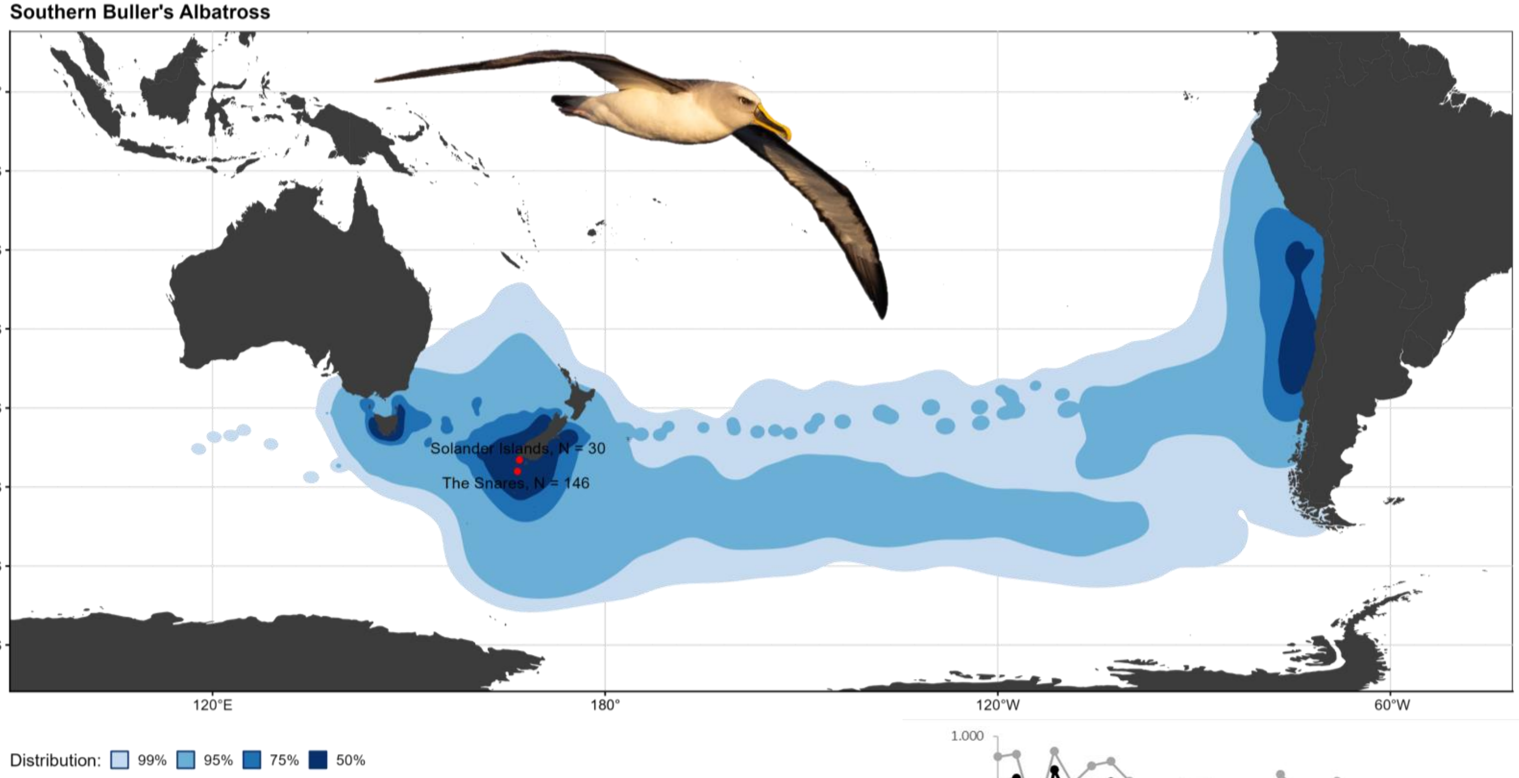
New Zealand endemic

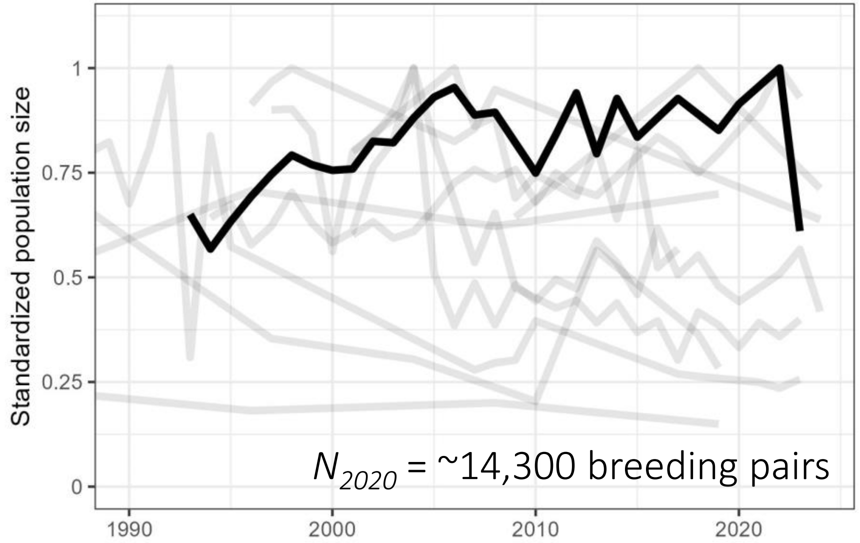
References: Walker et al. 2021, Baker et al. 2023, ACAP 2024

Population insights:

- ~45% decline since 2006
- λ_{colony} = ~0.950 (-5.0% annual decline observed at colony)
- Controversial (another estimate: -1.06%)
- ACAP trend assessment: **?**
- Challenging to monitor

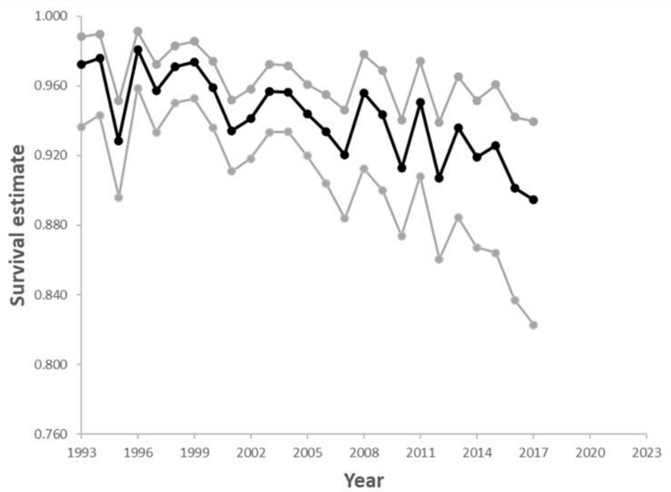
SH seabird overview: Southern Buller's Albatross





Breeding status:
New Zealand endemic

References: Edwards et al. 2023a,
Fischer et al. 2023b, Thompson & Sagar 2023

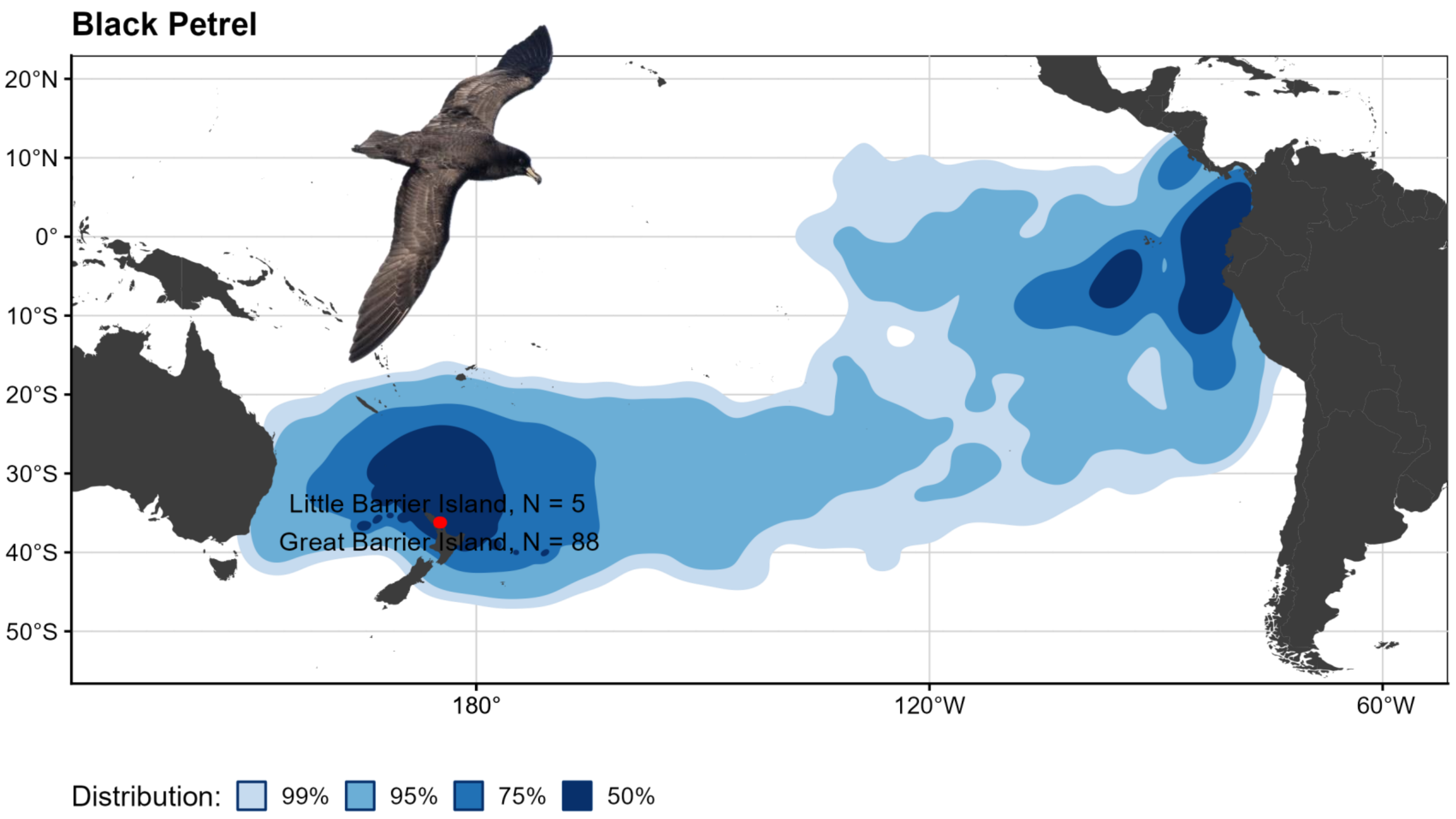


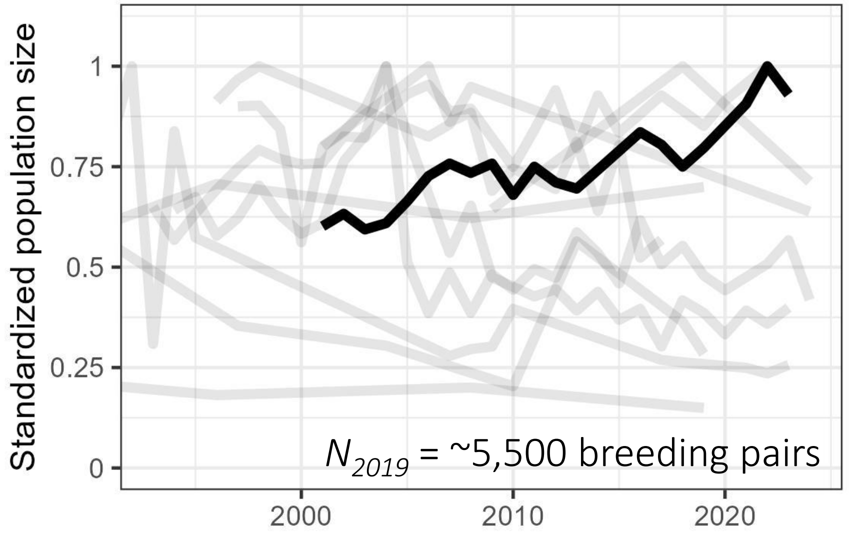
Population insights:

- ~35% increase since 1993
- λ_{colony} = ~1.015 (+1.5% annual increase at colony, until 2023)
- Adult survival is declining, potent. causing 2024 decline
- #1 at-risk species from NZ domestic fisheries
- ACAP trend assessment: ↔

SH seabird overview: Black Petrel

VU



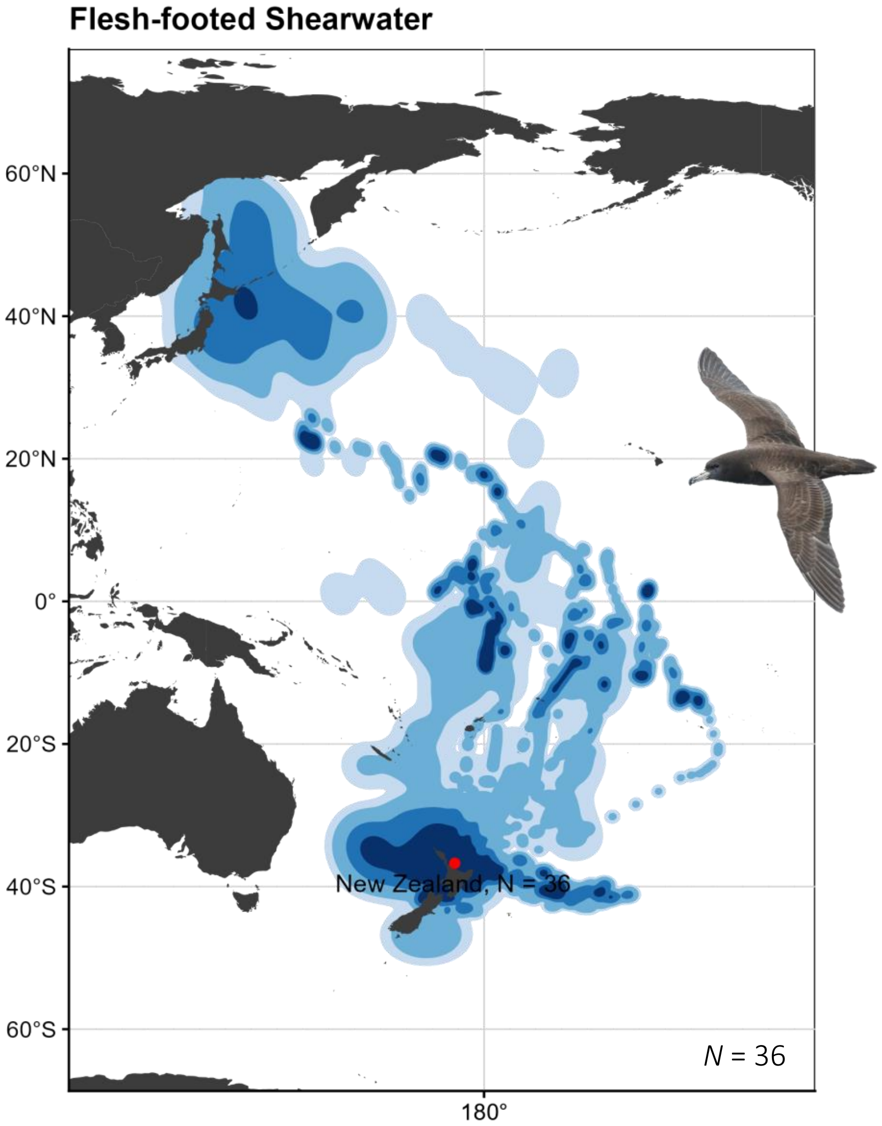


Breeding status:
New Zealand endemic

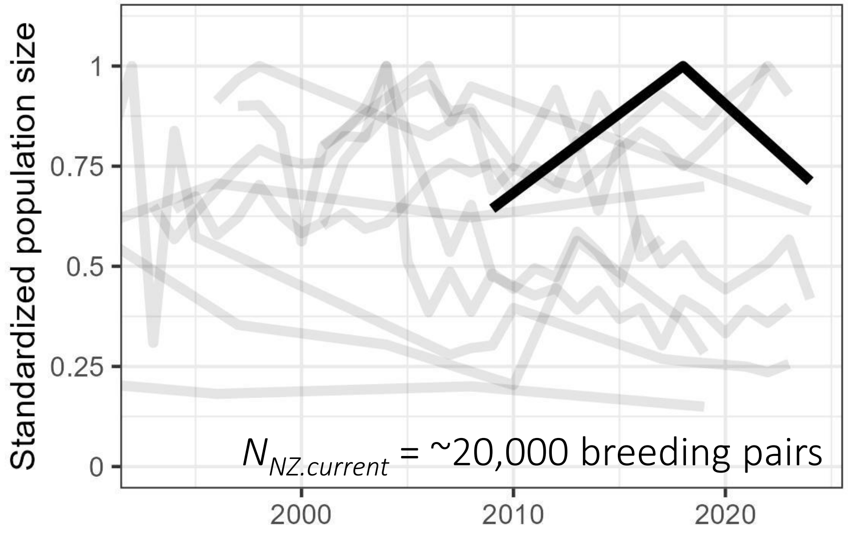
References: Bell et al. 2022, ACAP 2024

Population insights:
- ~40% increase since 2000
- λ_{colony} = ~1.020 (+2.0% annual increase observed at colony)
- Within colony movements prove challenging
- ACAP trend assessment: ↔

SH seabird overview: Flesh-footed Shearwater



Breeding status:
New Zealand & Australian endemic

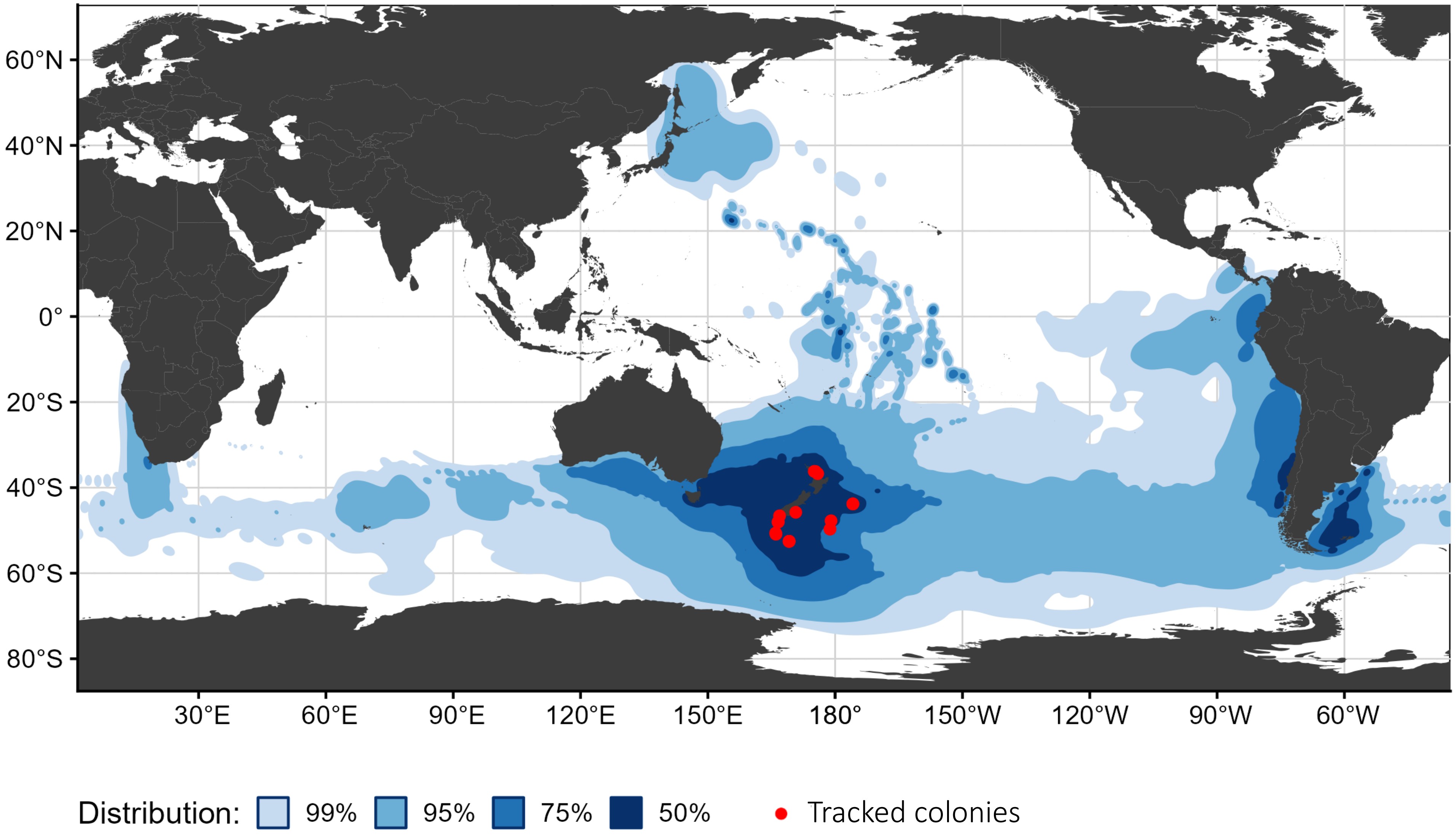


Population insights:

- Population trend unknown
- Some colonies appear in decline
- Very challenging to monitor due to number of colonies
- Candidate ACAP species

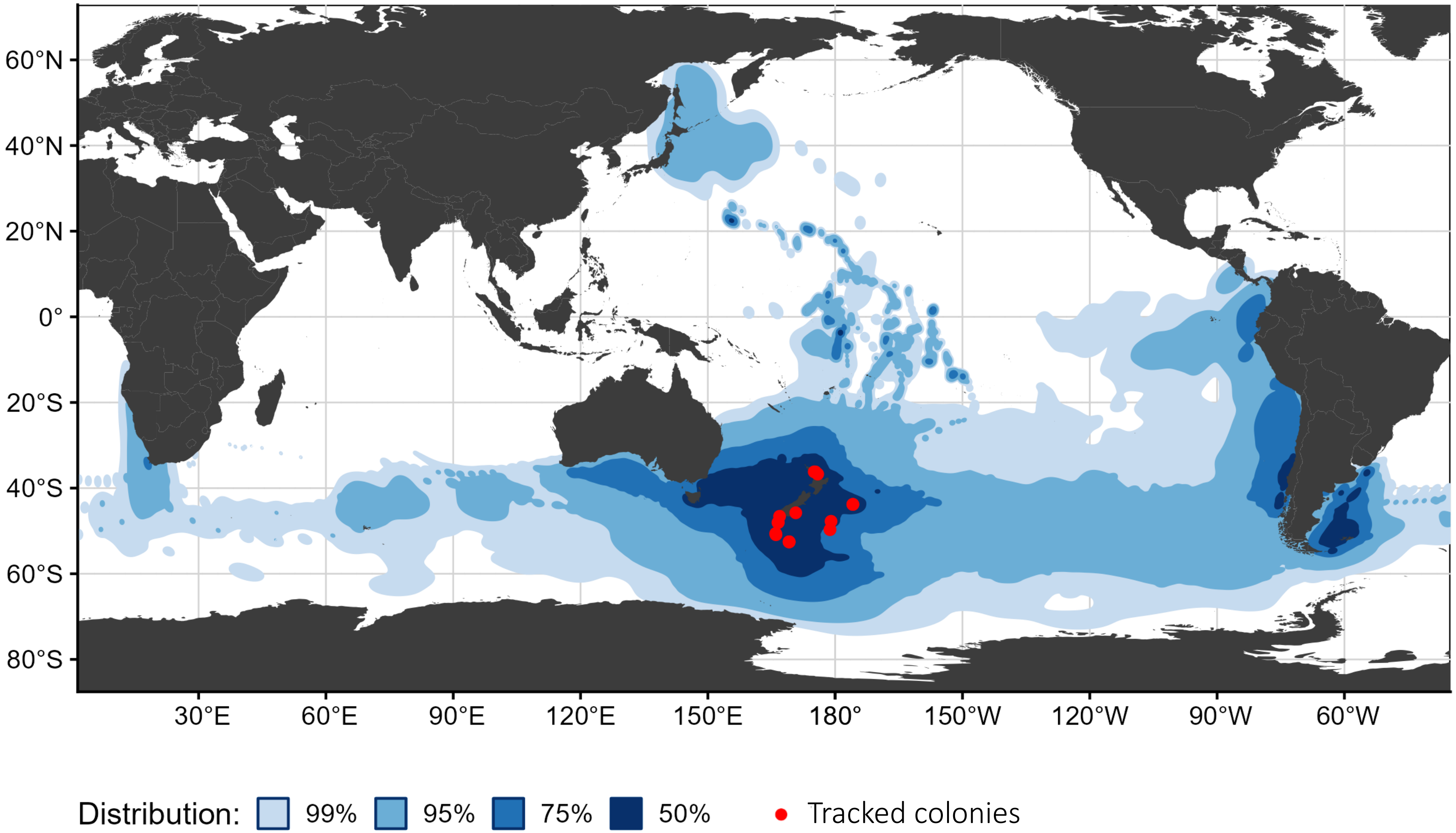
References: Waugh et al. 2013, Burgin & Ray 2022, Fischer et al. 2023b, Ray in prep.

Overall SH seabird distribution



This overall map represents an output of a kernel utilisation distribution analysis of N_{tracks} = 1,151 individuals of 11 species, i.e., where these seabirds occur

Overall SH seabird distribution

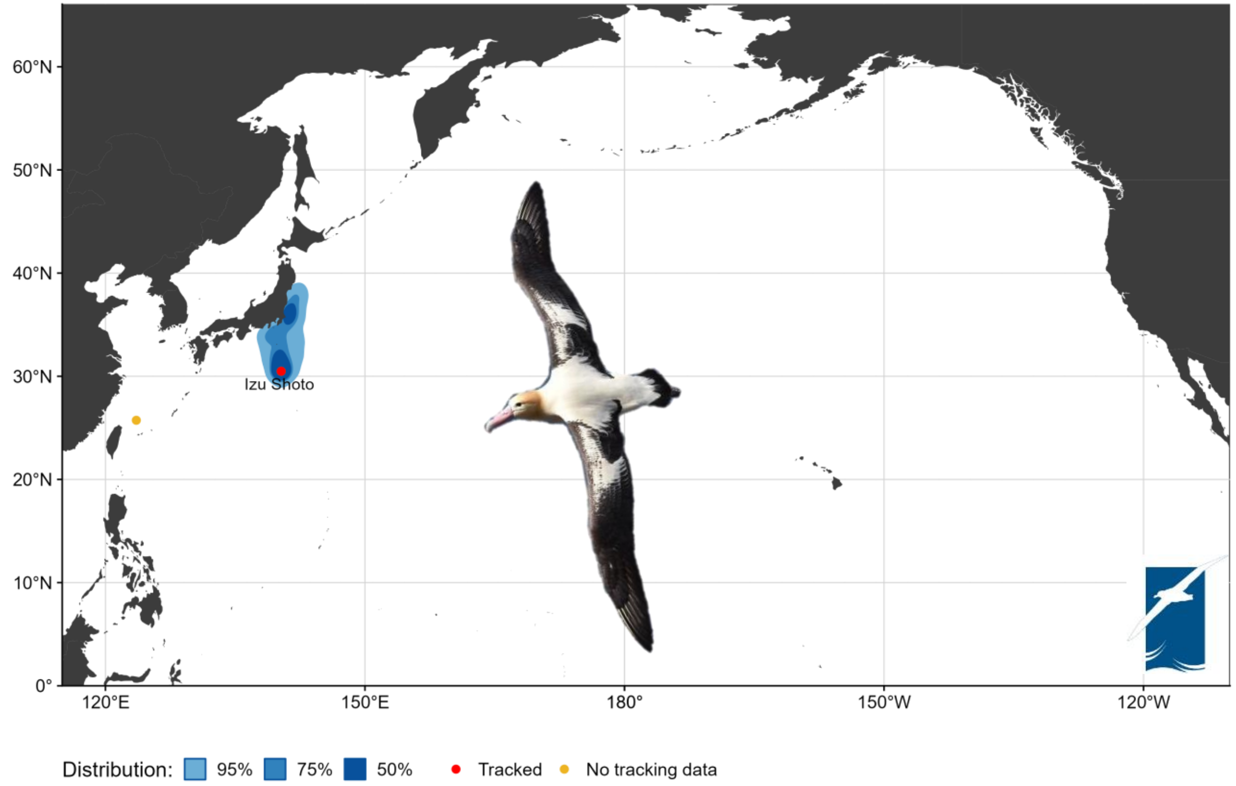


Discussion prompts Is there any other scientific evidence on the distribution of SH seabird species?

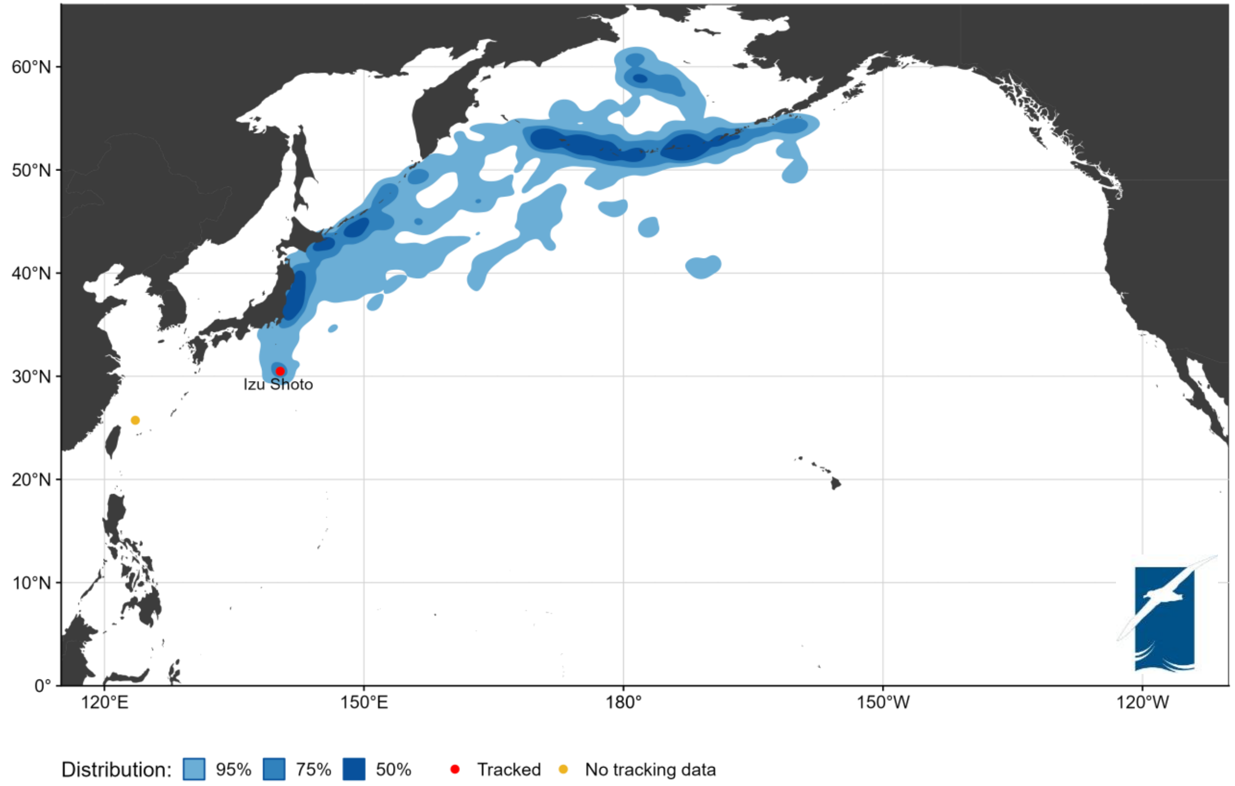
New Zealand isn’t the only seabird hotspot: Short-tailed Albatross in NH

N_{2017} = ~900 breeding pairs

ACAP trend assessment: ↑



Breeding period distribution
(GPS/PTT)



Non-breeding period distribution
(GPS/PTT)

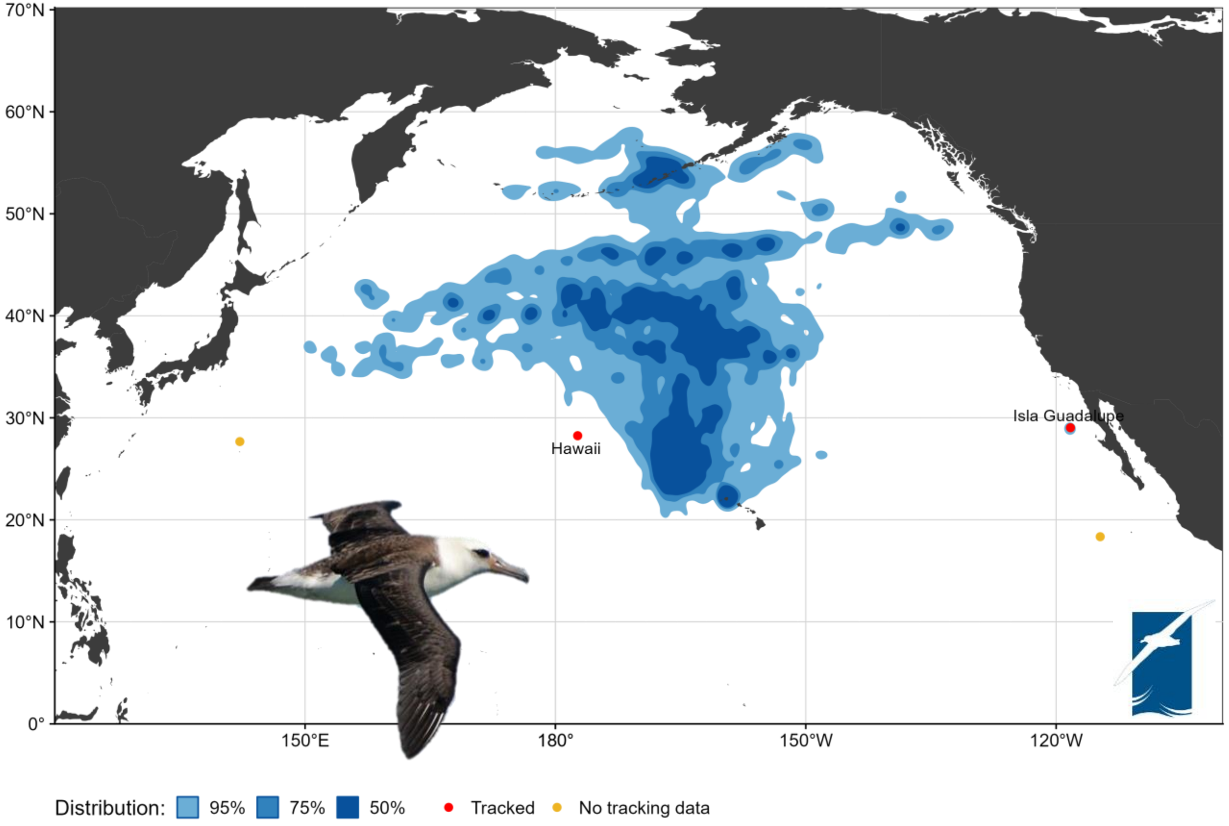
References: ACAP 2022

New Zealand isn’t the only seabird hotspot: Laysan Albatross in NH

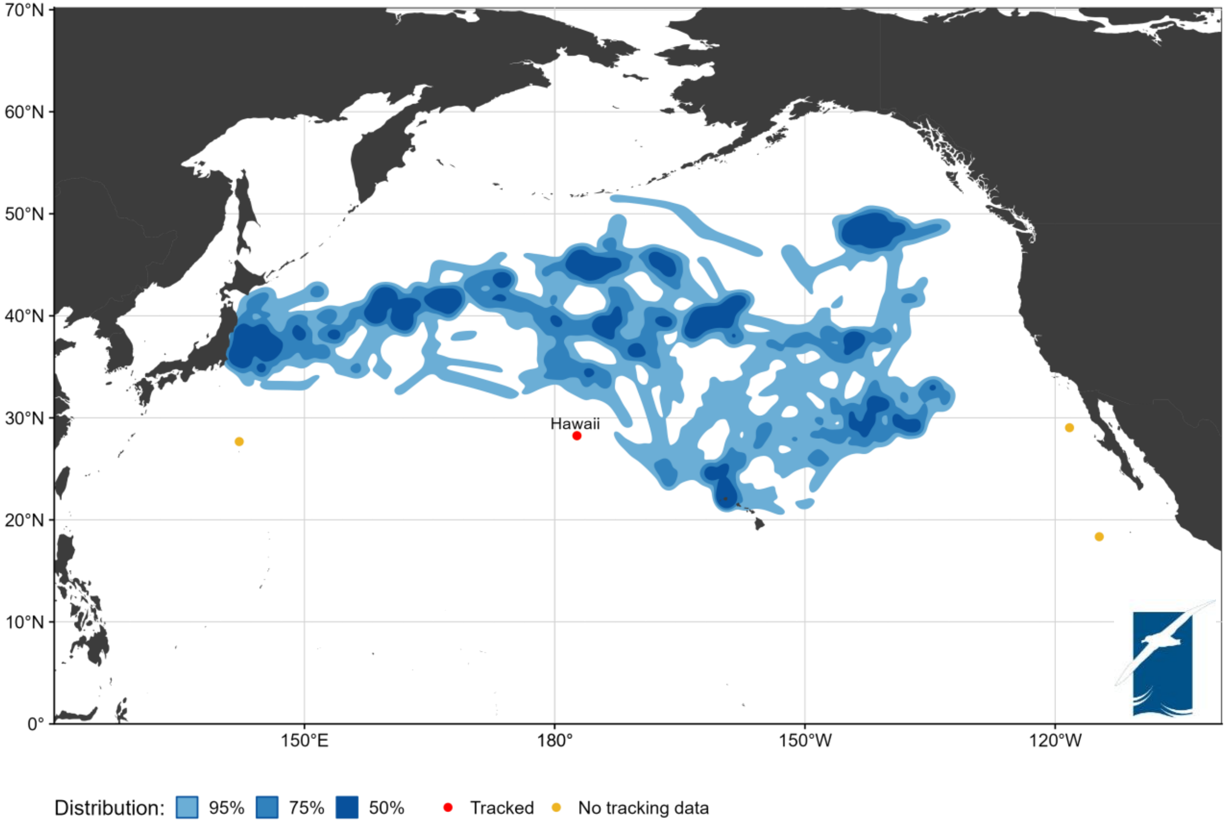
NT

N_{2019} = ~800,000 breeding pairs

ACAP trend assessment: ↔



Breeding period distribution
(GPS/PTT)



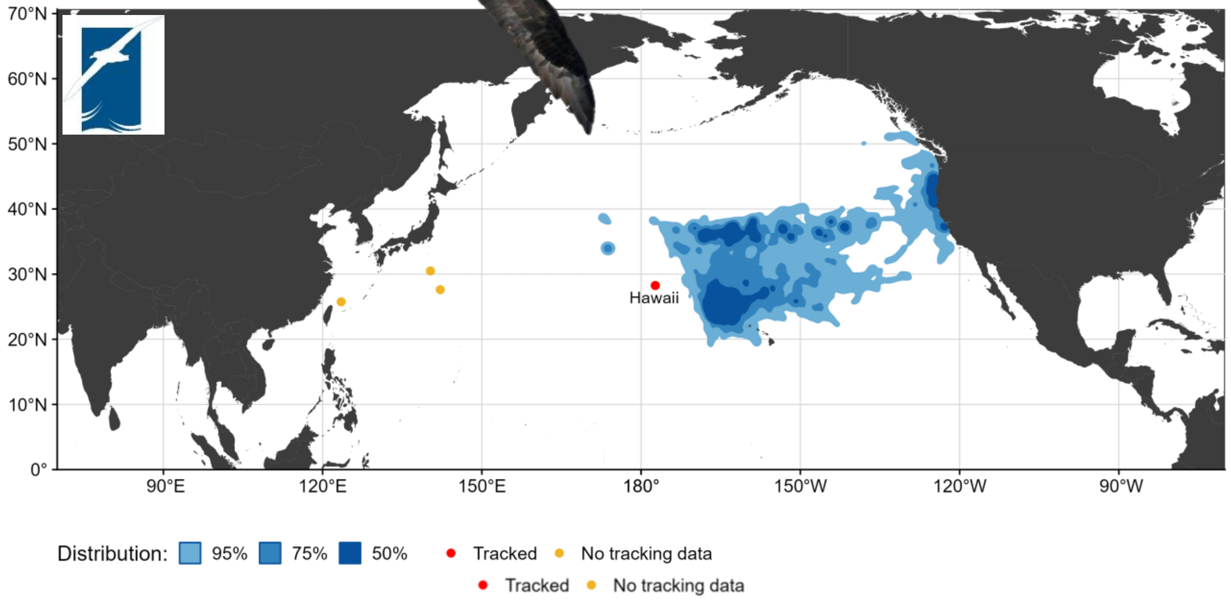
Non-breeding period distribution
(GPS/PTT)

References: ACAP 2022

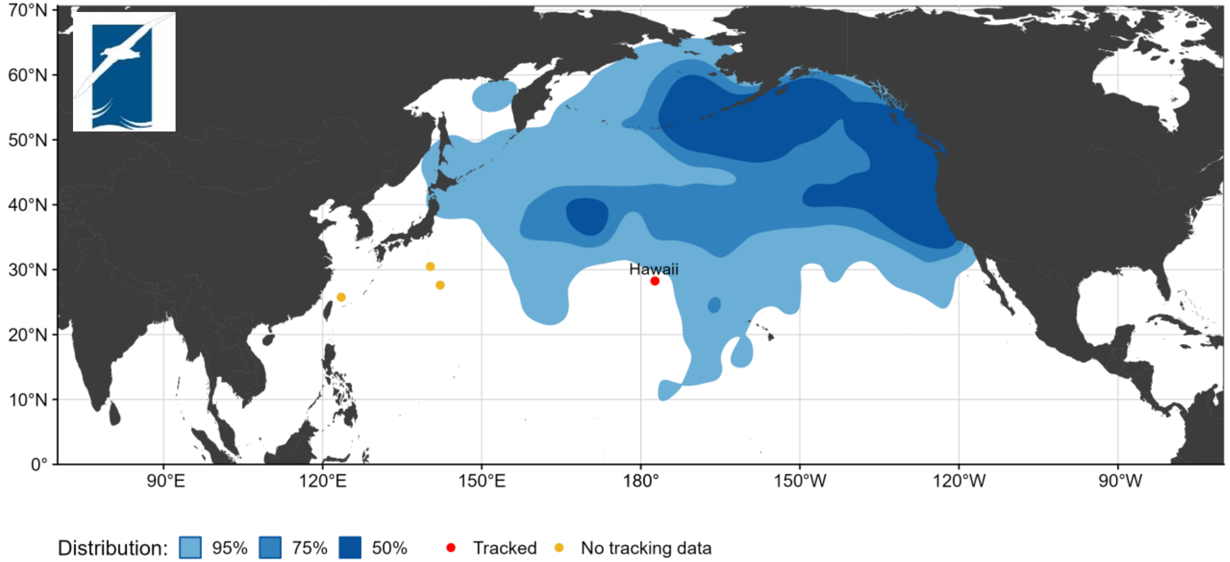
New Zealand isn't the only seabird hotspot: Black-footed Albatross in NH

N_{2017} = ~70,000 breeding pairs

ACAP trend assessment: ↑



Breeding period distribution
(GPS/PTT)



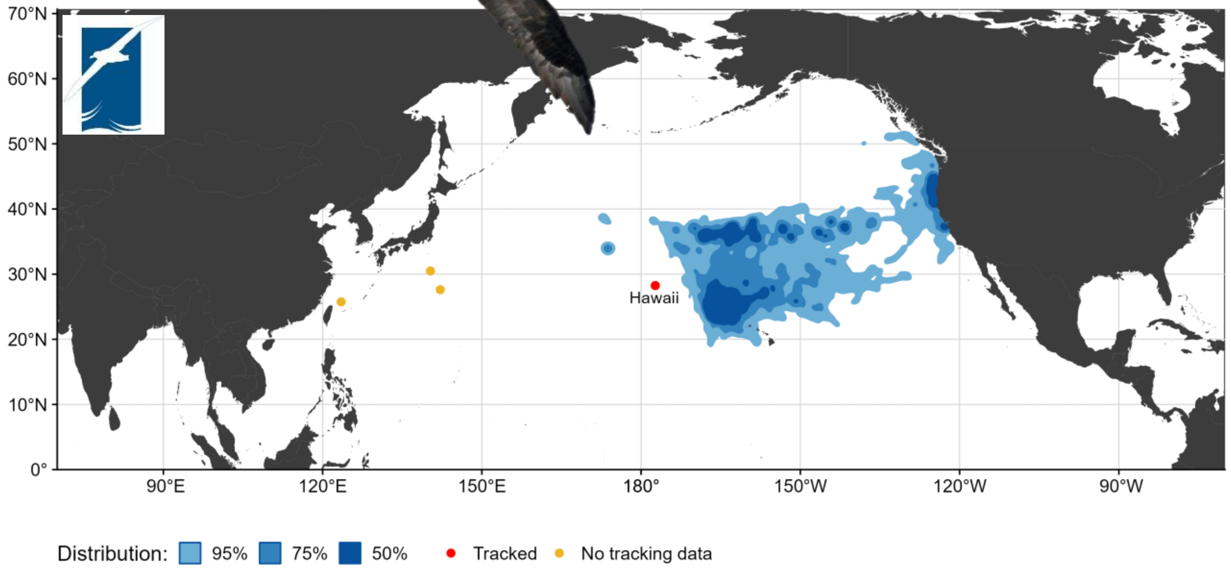
Non-breeding period distribution
(GLS)

References: ACAP 2022

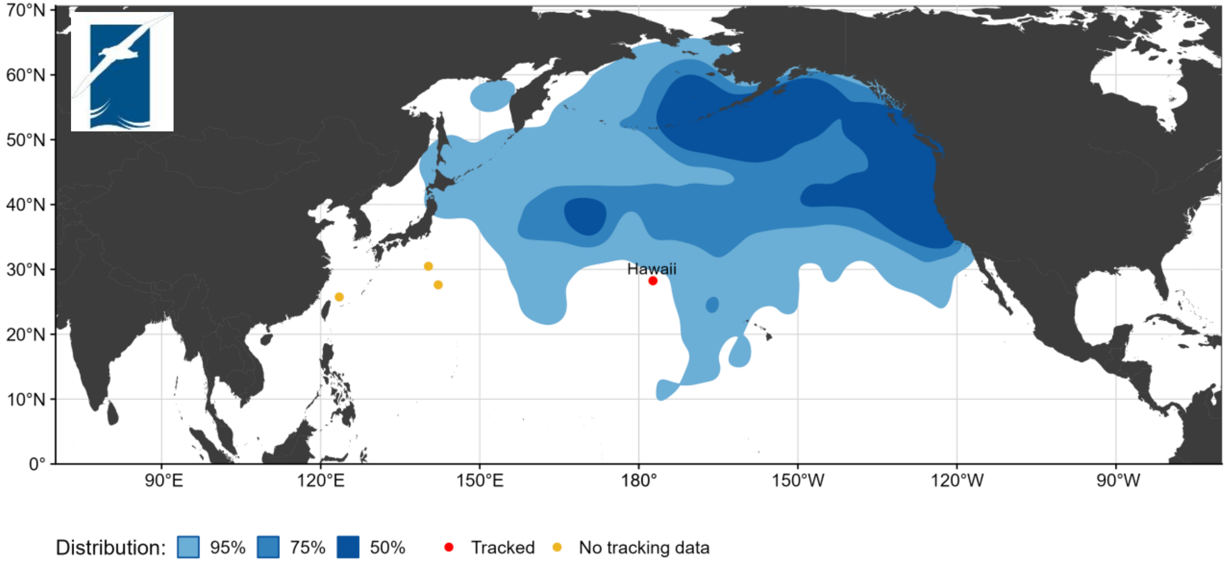
New Zealand isn't the only seabird hotspot: Black-footed Albatross in NH

N_{2017} = ~70,000 breeding pairs

ACAP trend assessment: ↑



Breeding period distribution
(GPS/PTT)



Non-breeding period distribution
(GLS)

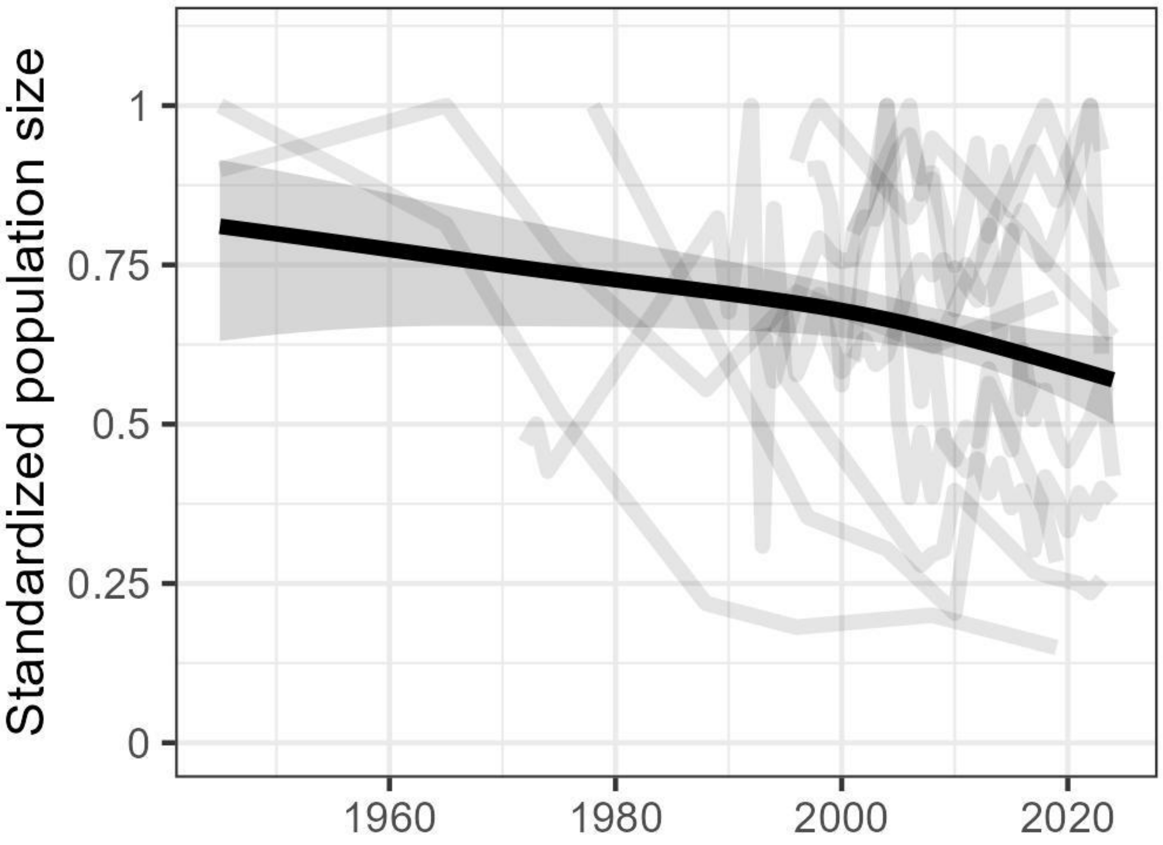
Discussion prompts:

I. Is there any other scientific evidence illustrating the distribution of NH seabirds?

II. Is there a desire for standardized and/or merged maps for NH seabirds as well?

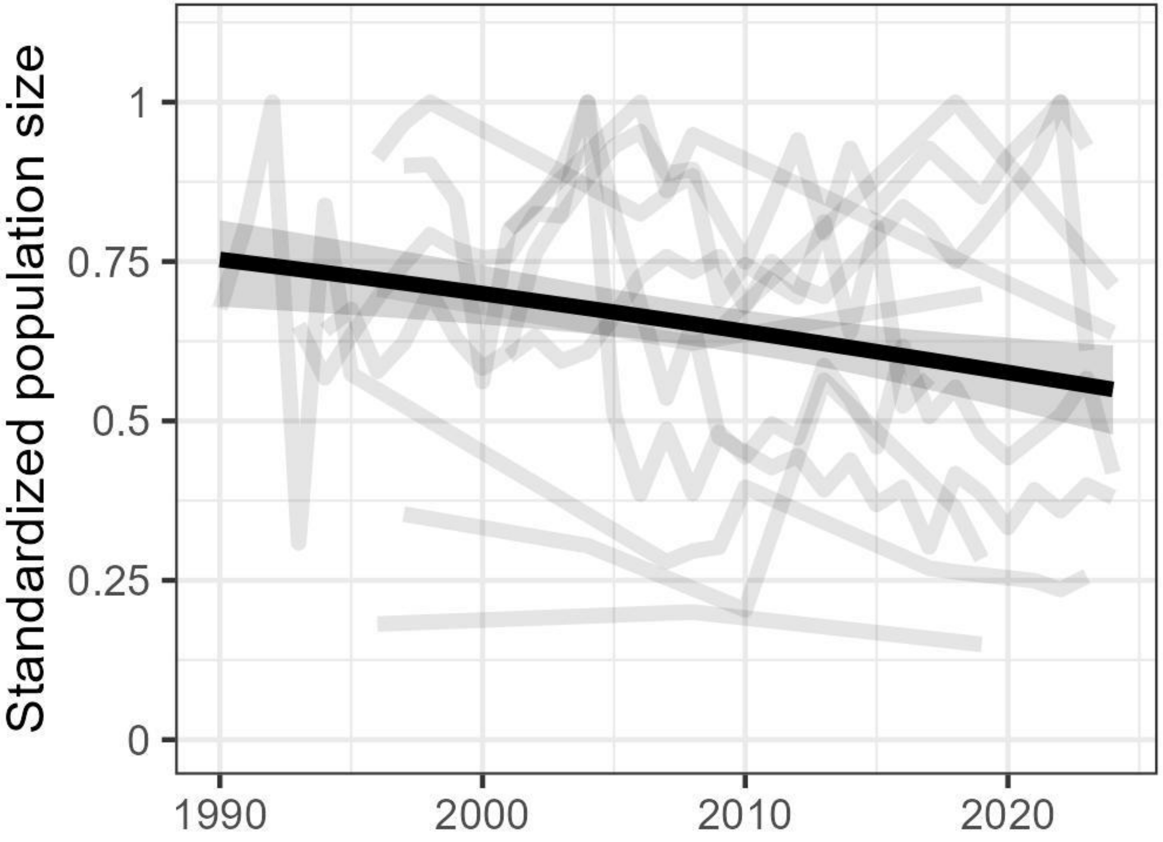
Overall population trends

- A GAM fitted to standardized population sizes of key species shows an ongoing decline across key SH seabird species



Overall population trends

- A GAM fitted to standardized population sizes of key species shows an ongoing decline across key SH seabird species
- Focussing on decades with higher data density does not result in a different trend – future work will shed further light onto overall trends



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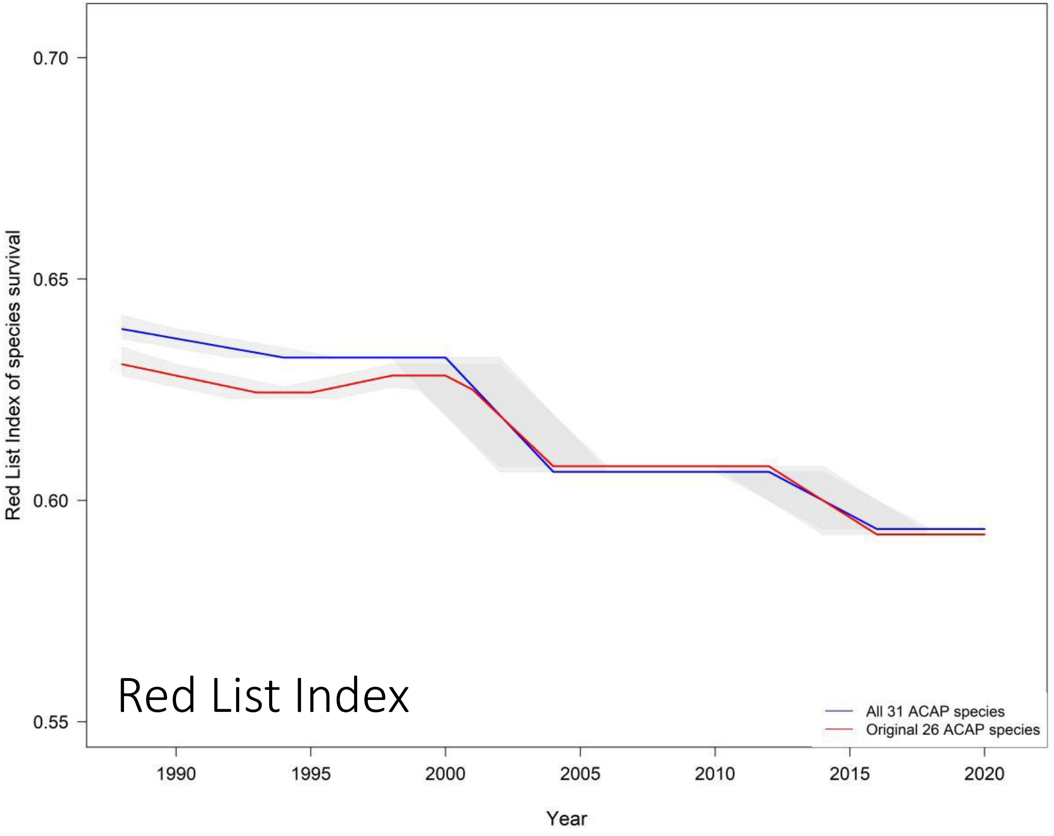

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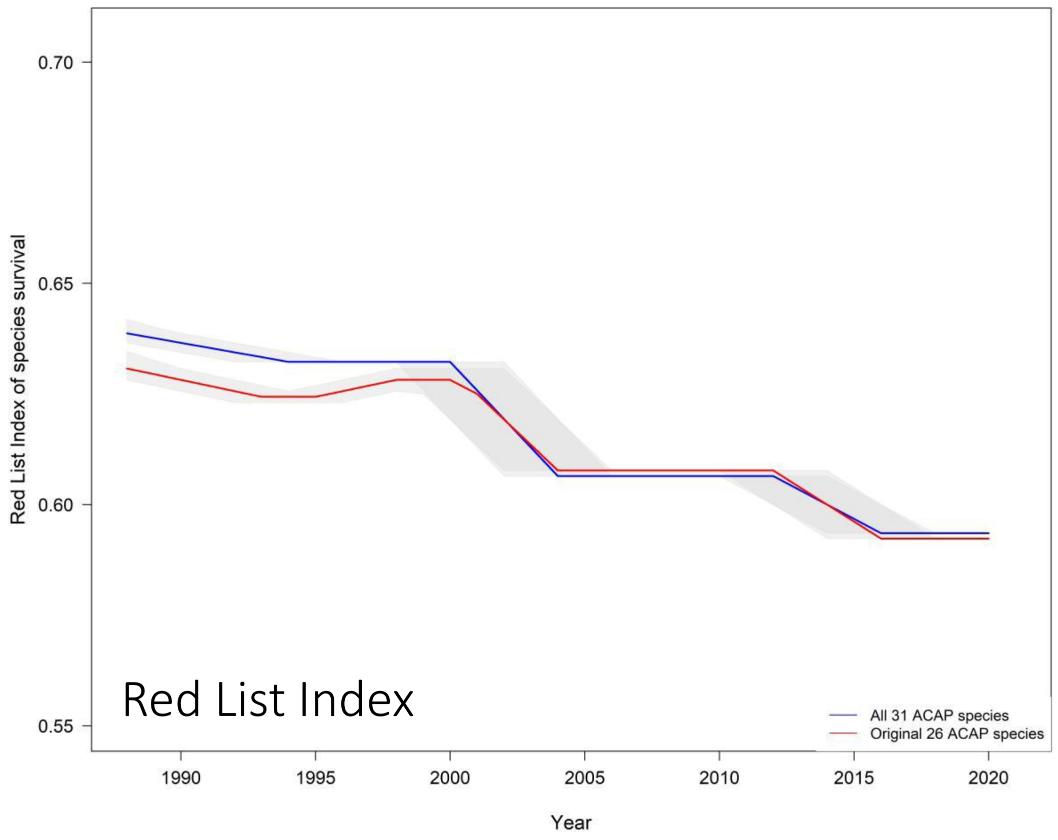


Discussion prompt: Is there any other scientific evidence on the population trends of (SH) seabird species?

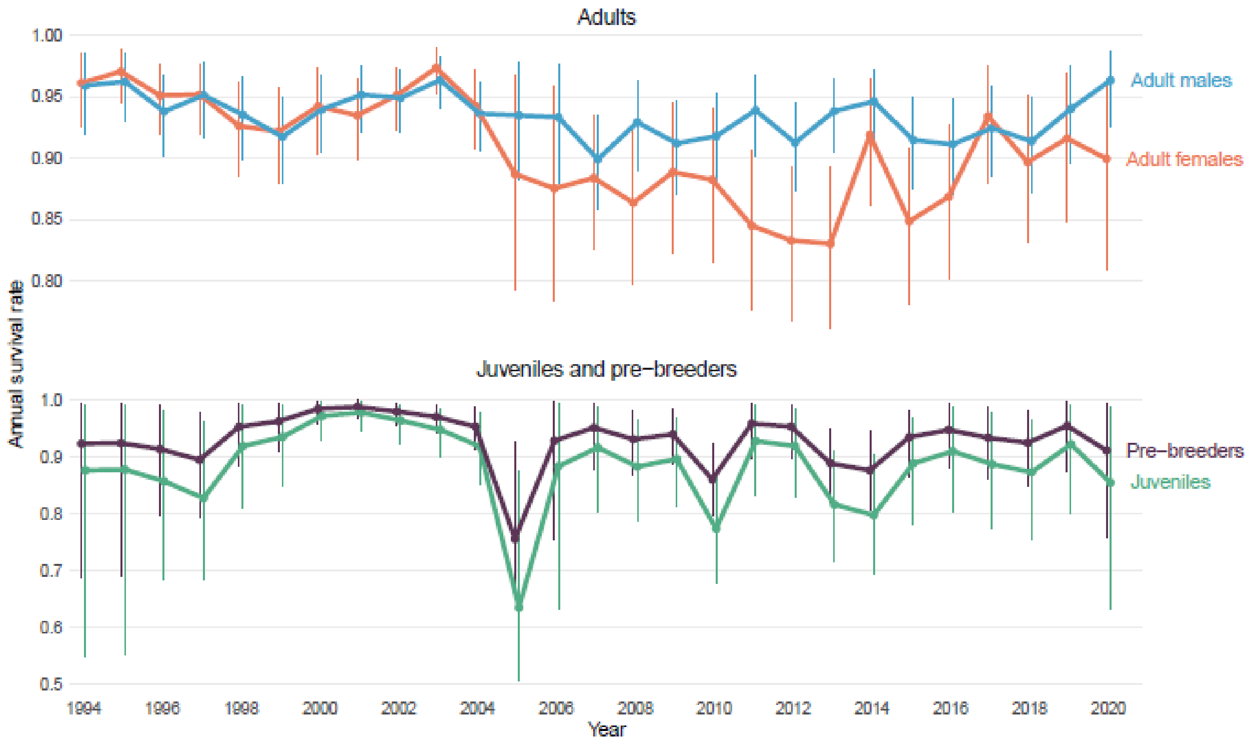
References: ACAP & BLI 2021

Detailed seabird distribution and trend analyses

- Two case studies – Antipodean & Gibson’s Albatross- are presented to investigate the underlying drivers of population trends and their relevance to pelagic longline efforts
- These were selected based on the very high data quality available for these species and their high risk status

Detailed analyses: Antipodean Albatross

- An integrated population model showed highly sex-skewed survival rates



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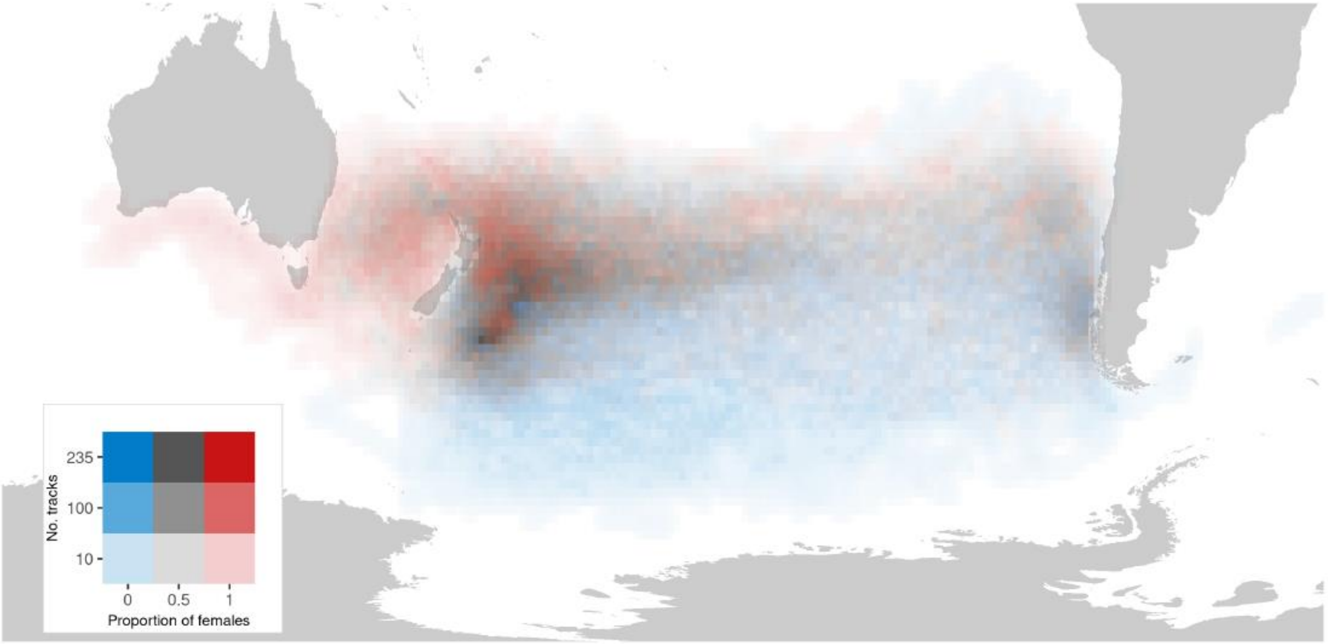

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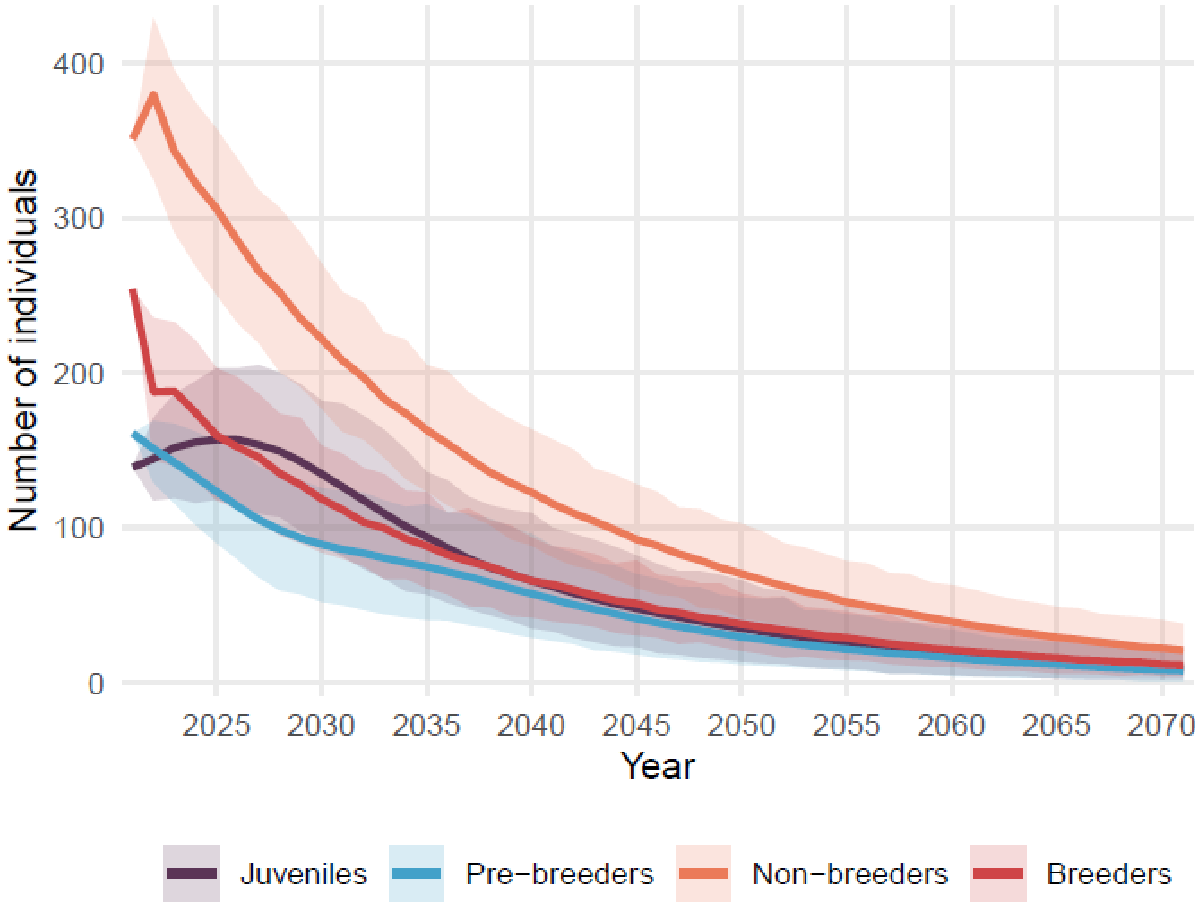
- The low survival results in a projected decline of ~6% p/a, and ultimately, extinction in ~2070



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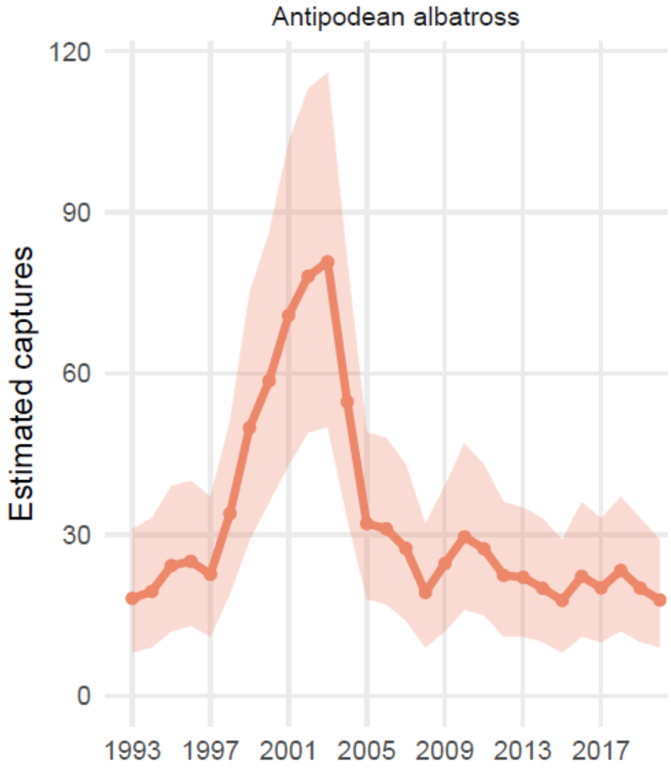

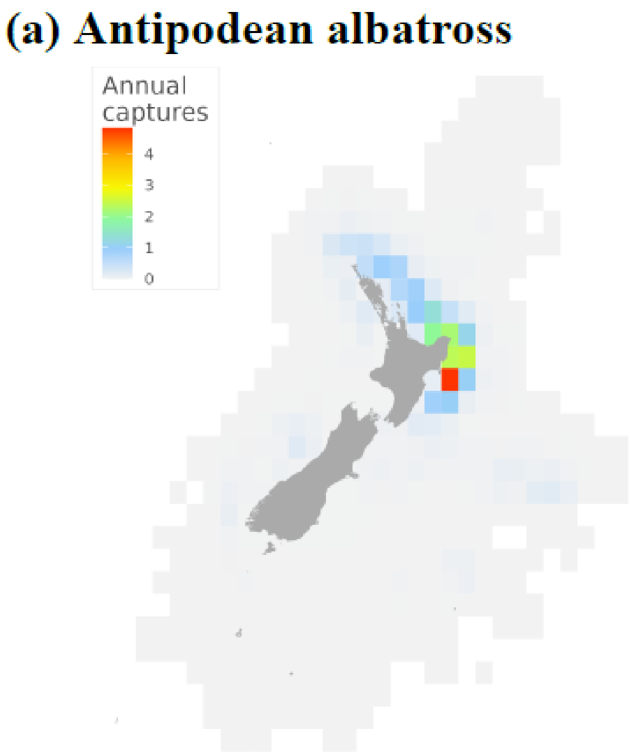

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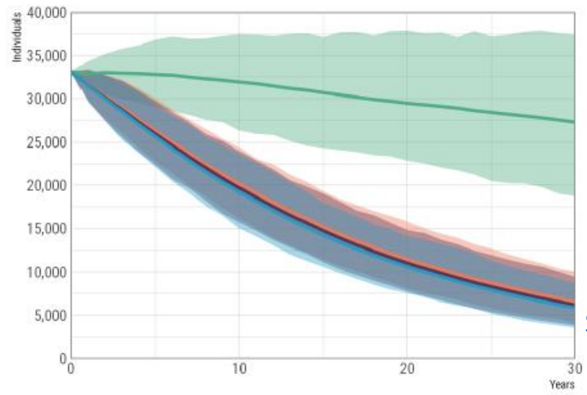
(a) Population size

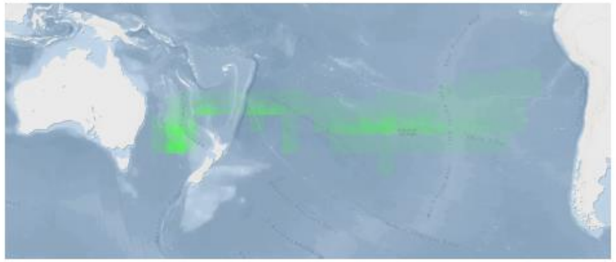


Reduced high seas pelagic LL bycatch

Reduced NZ pelagic LL bycatch

Status Quo

(c)



Key overlap areas with high seas fleets

(d) Fatalities from overlap

Class	Female	Male	Total
Non-breeding adult	513	412	926
Unsuccessful breeder	109	12	120
Successful breeder	259	144	403
Total	881	568	1,449

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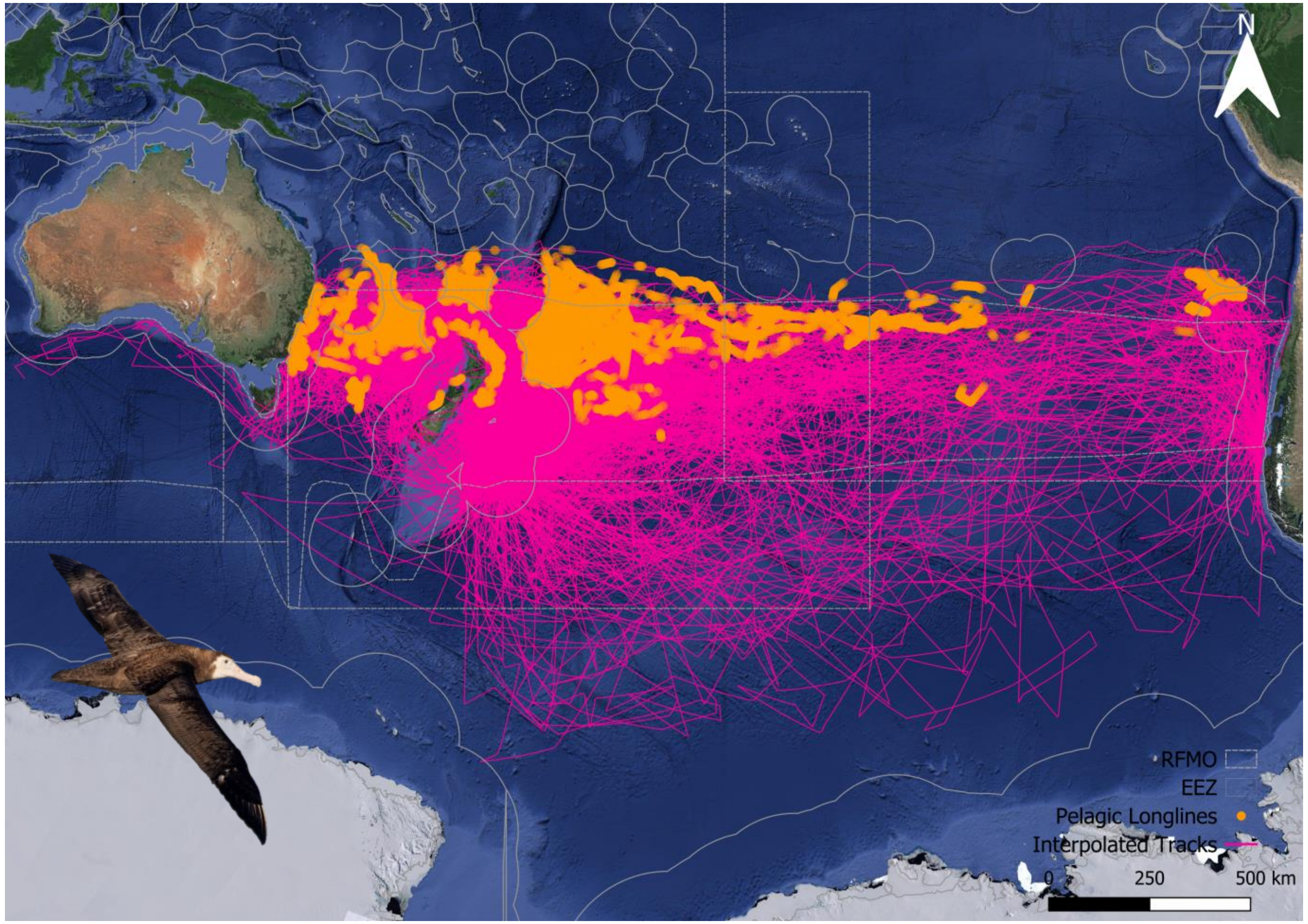

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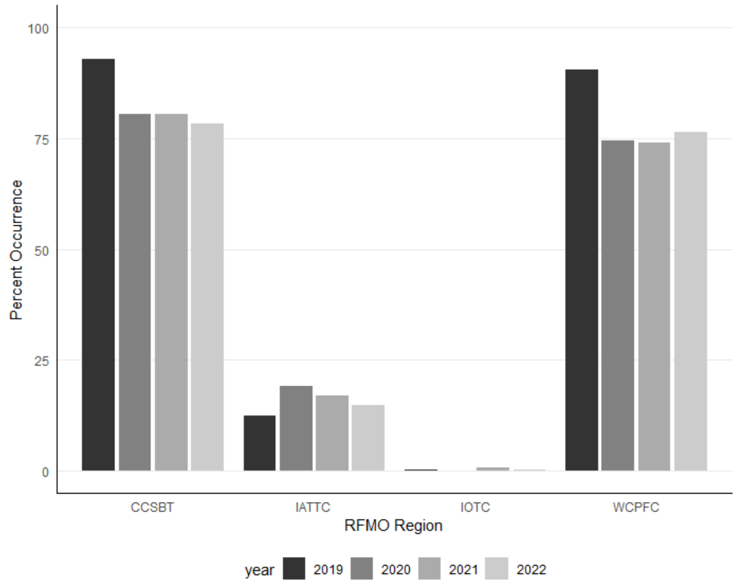
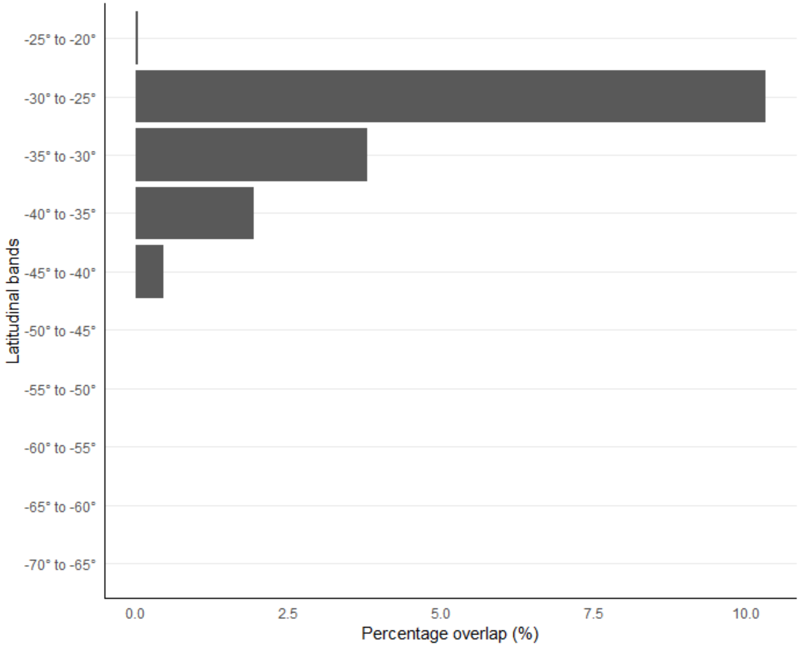
- Fine-scale overlap shows an inverse relationship between overlap frequency and latitude





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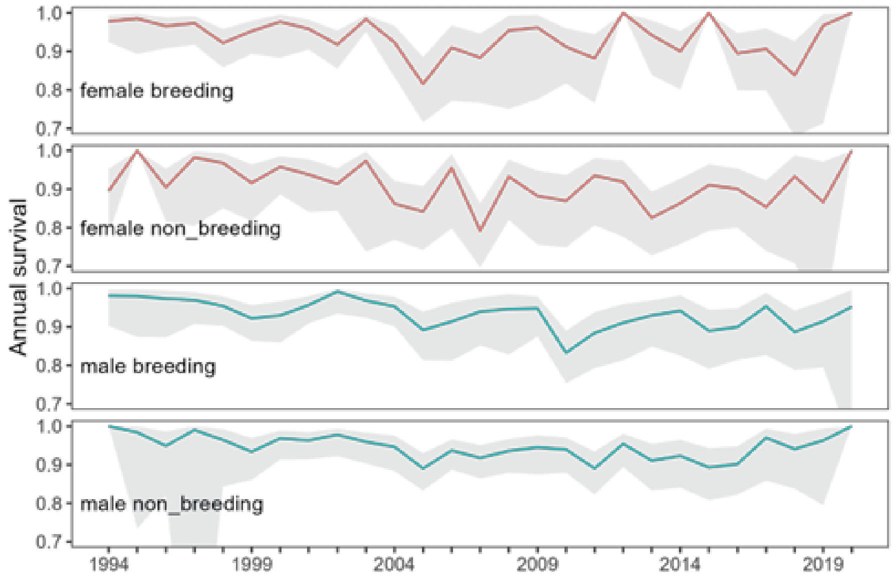

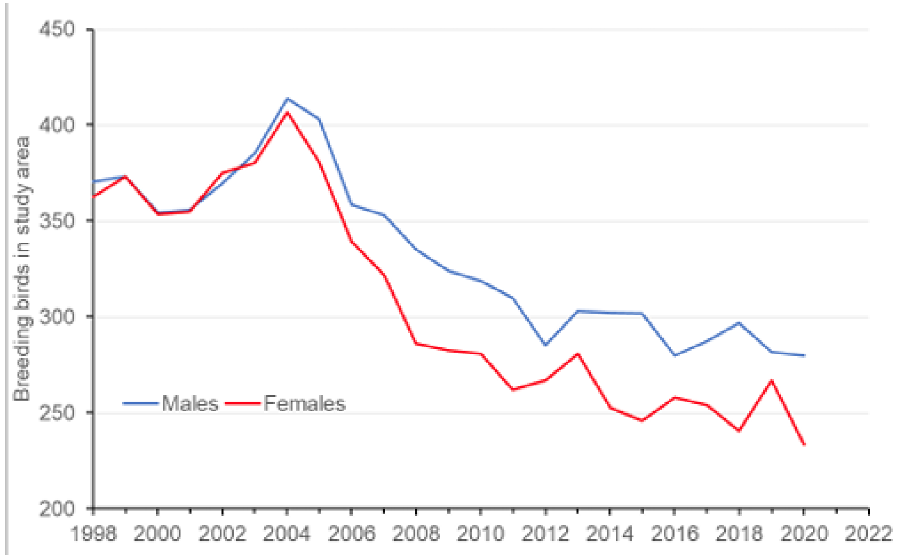

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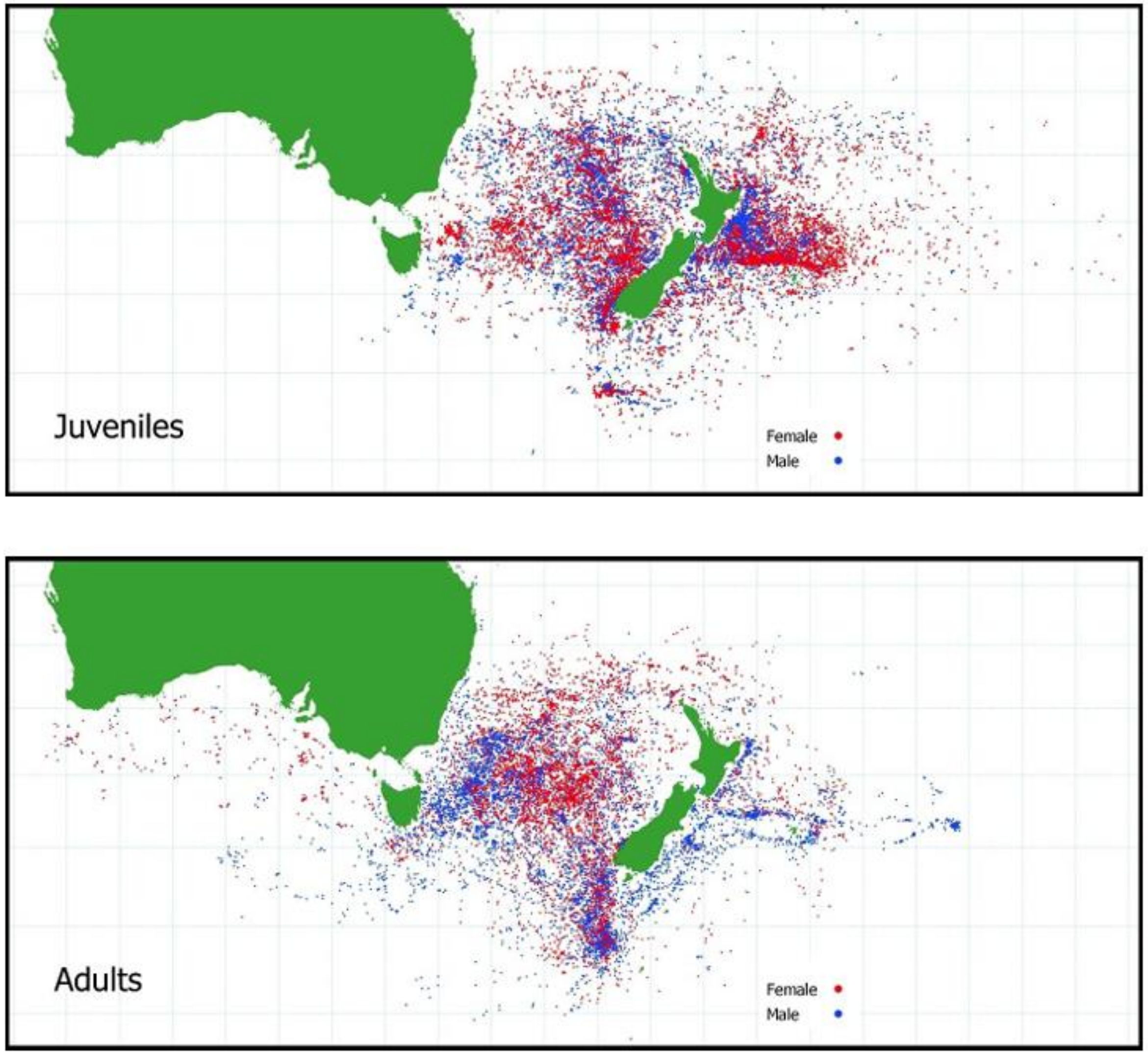

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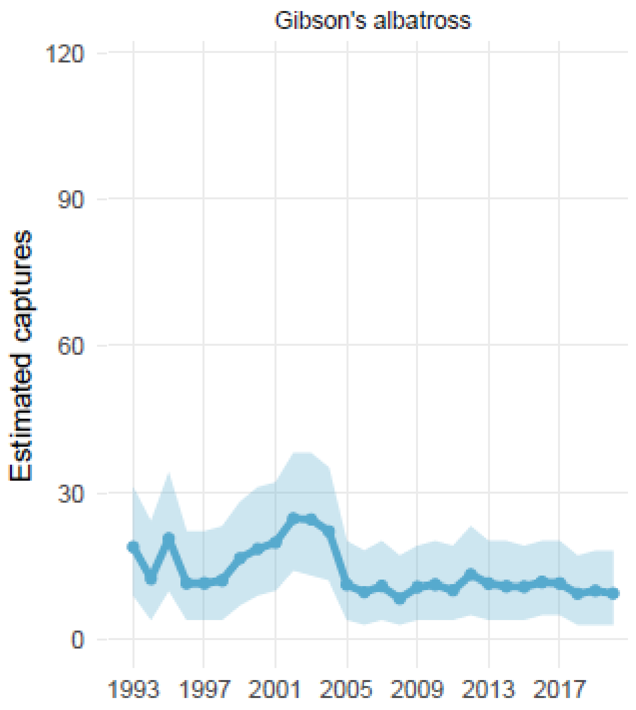

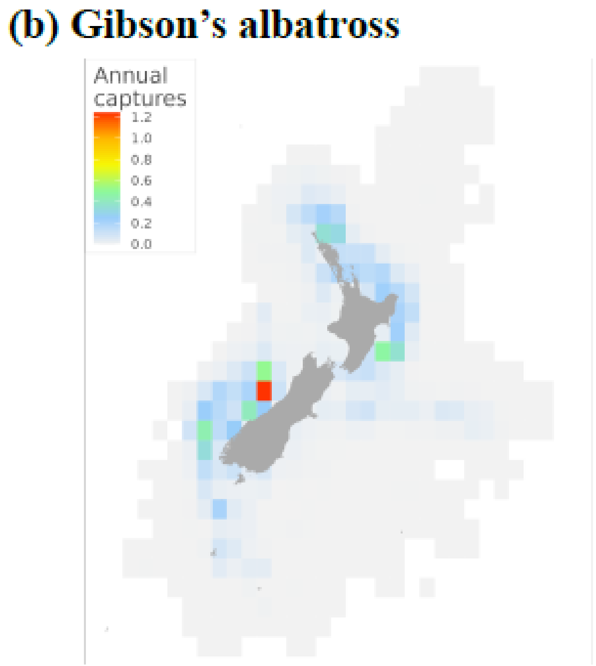

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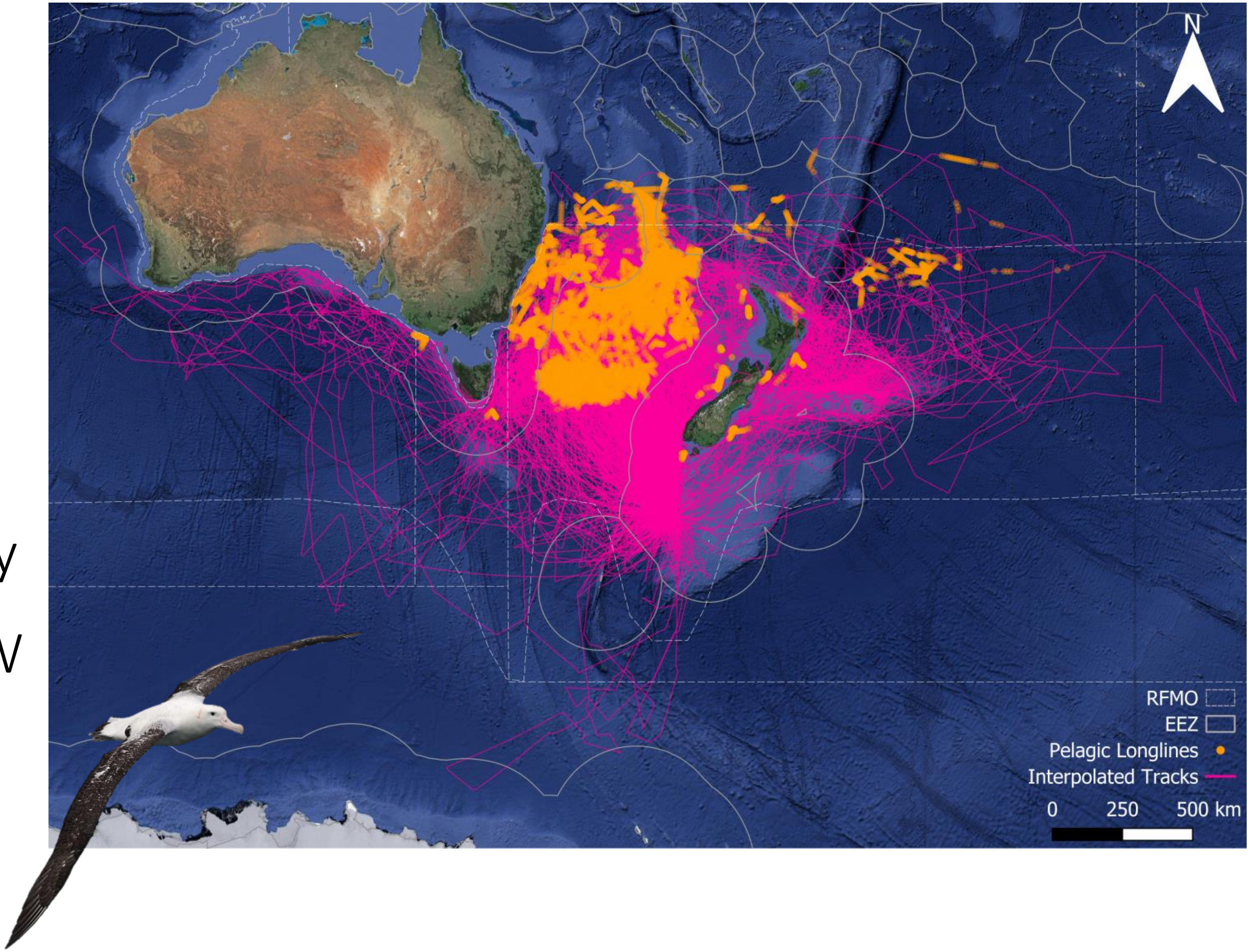

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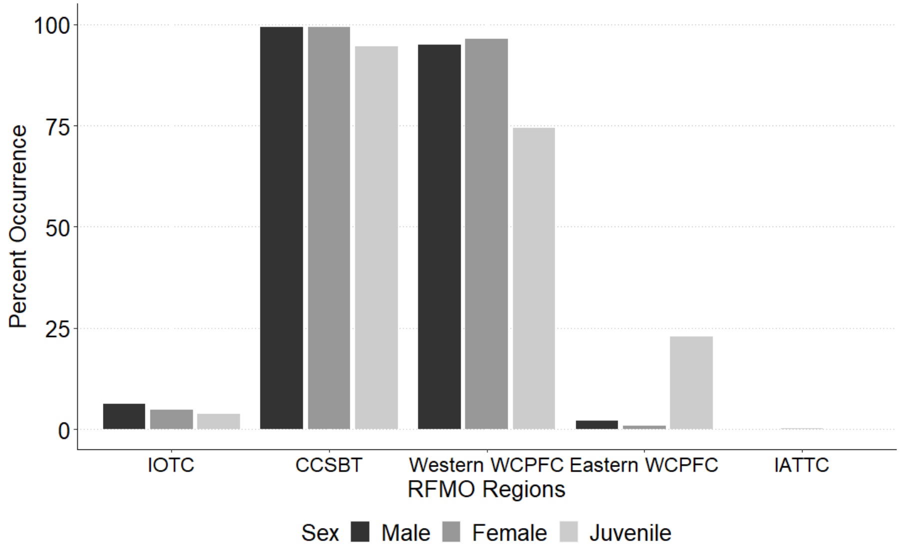
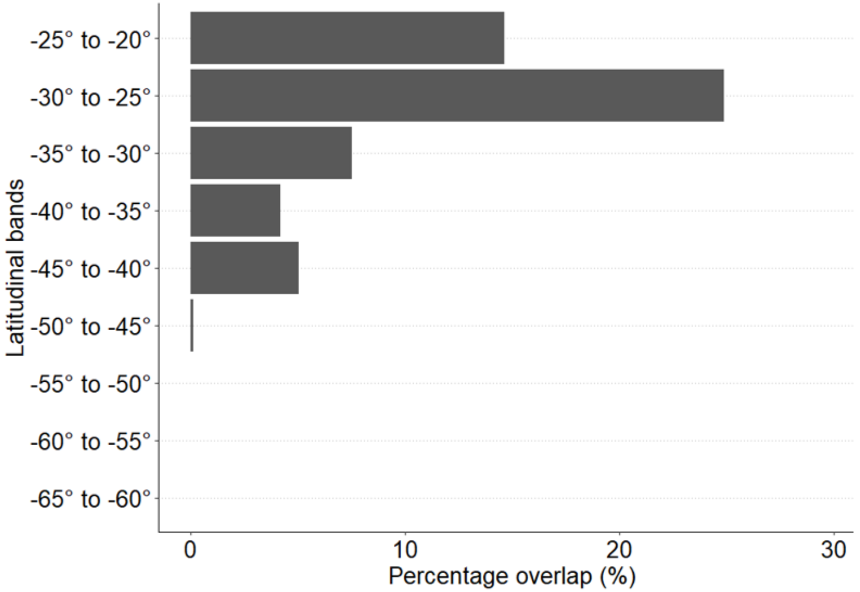
- These results too are supported by fine-scale spatiotemporal overlap analyses of tracking data with GFW data
- These data equally show an inverse relationship between overlap frequency and latitude and highlight the importance of the (western) WCPFC





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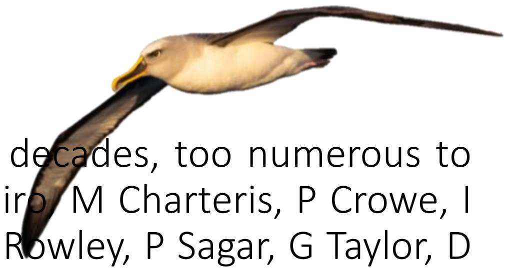
Take-home messages

- The WCPO is a seabird hotspot
- Seabird populations continue to decline, particularly in the SH
- Global extinction is predicted for some species within decades
- Bycatch in longline fisheries across the WCPO is likely to be the primary driver of population declines, as well as the most manageable
- In the SH, bycatch risk to species increases with decreasing latitudes

Discussion prompts: Is there any other scientific evidence on the drivers of population trends of (SH) seabird species?

Acknowledgements



The data presented here would not exist without the commitments and hard work of dozens of people over decades, too numerous to exhaustively name here. Key data contributors include B Baker, B Bell, D Bell, M Bell, S Bose, D Burgin, A Carneiro, M Charteris, P Crowe, I Debski, G Elliott, J Fischer, P Frost, C Mischler, P Moore, G Parker, B Philp, S Ray, K Rexer-Huber, C Robertson, O Rowley, P Sagar, G Taylor, D Thompson, T Thompson, A Waipoua, S Waugh, K Walker, J Watts, E Whitehead & C Wickes.

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