Seabird sightings data preparation

2007–08 to 2018–19

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Department of Conservation Project CSP12302 - 1

DRAGONFLY
Data Science

This presentation is of provisional work, final results may differ.

Introduction

Seabirds distributions

Introduction

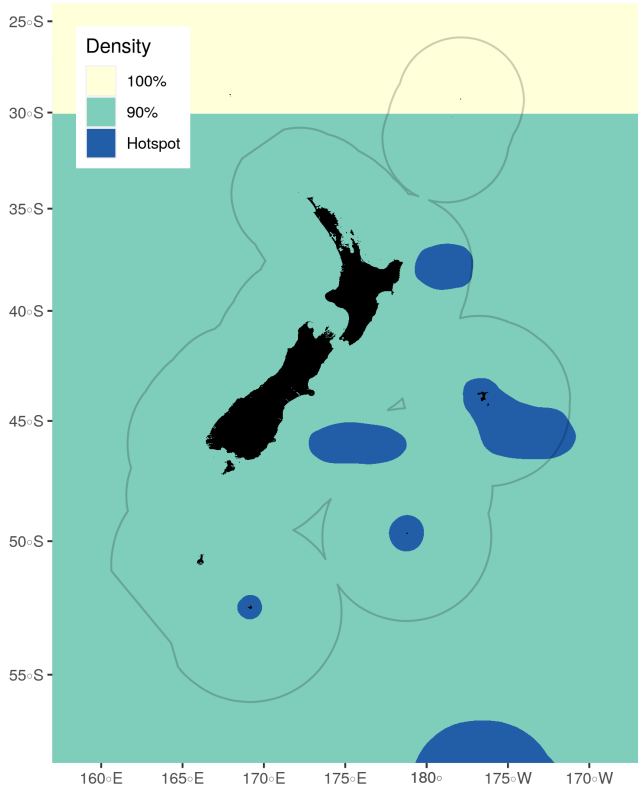
- Fundamental for many analyses, e.g.,
  - Seabird risk assessment
  - Important Bird Areas (IBAs)
  - Impact assessments

- Our knowledge is still very limited
  - NABIS (mostly expert knowledge)
  - Low-resolution southern hemisphere maps (Birdlife)

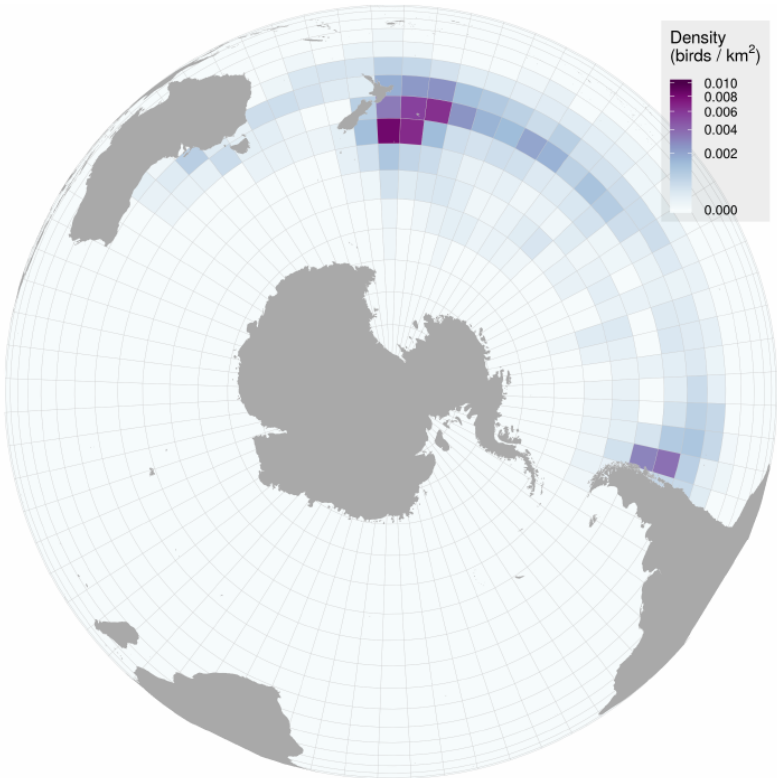
Current knowledge

Introduction

NABIS



5x5° from tracking data



Seabird sightings

- Counts of seabirds by observers at the back of fishing vessels
- Started in 2003–04
- A dataset never used so far.

Two types, treated separately:

- Paper forms, started in 2003
- Nomad electronic devices, started in 2009

Paper forms

Seabird sightings

Paper forms

- Snapshots of seabird abundance by species or species group
- Generally following a standard protocol
  - Trawl: first haul of the day
  - Longline: all sets and hauls, start, middle, and end of the event
  - Setnet: at net setting, then every 30 mins during hauling
- Data processed by Dragonfly in 2011
- Updated in 2013, with a website made public
- Distance information introduced in Oct 2007

CSP Protected Species Abundance Form **Trip:** **Page** 1

Observation Data								Species Code (number)																	
Count No.	Tow / Set No.	Set / Haul	Start / Middle / End	Time	Date 08	< or > 100 m	Sea State	XRA	XWM	XKM	XBM	XCP	XSH	XTP	XCI	XWA	XBG								
1	1	H	Mid	1128	17/10	<	2	3	10	20	40	15	20	0	0	0									
2	1	H	Mid	1128	17/10	>	2	0	50	20	20	30	10	0	0	0									
3	4	H	Mid	1812	18/10	<	2	13	10	20	350	40	10	0	0	0									
4	4	H	Mid	1812	18/10	>	2	0	0	5	50	0	0	0	0	0									
5	5	H	Mid	1254	19/10	<	4	10	0	0	200	100	10	0	0	0									
6	5	H	Mid	1254	19/10	>	4	2	0	0	200	100	0	0	0	0									
7	7	H	Mid	1308	20/10	<	4	20	0	0	300	30	15	5	20	0									
8	7	H	Mid	1308	20/10	>	4	5	0	0	100	0	5	0	0	0									
9	9	H	Mid	0823	21/10	<	2	2	10	0	30	10	0	5	0	0									
10	9	H	Mid	0823	21/10	>	2	0	10	0	10	0	0	10	0	0									
11	12	H	Mid	1809	22/10	<	3	4	10	0	100	50	0	5	50	0									
12	12	H	Mid	1809	22/10	>	3	0	10	0	100	50	0	0	0	0									
13	14	H	Mid	1116	23/10	<	3	40	0	2	110	30	5	15	35	2									
14	14	H	Mid	1116	23/10	>	3	5	0	0	40	0	15	0	5	0									
15	16	H	Mid	1030	24/10	<	2	2	1	1	10	30	10	0	0	1									
16	16	H	Mid	1030	24/10	>	2	4	0	0	20	80	0	6	0	0									
17	19	H	Mid	1308	25/10	<	2	35	20	1	400	10	40	6	30	2									
18	19	H	Mid	1308	25/10	>	2	20	20	0	300	30	50	2	10	0									
19	21	H	Mid	1031	26/10	<	5	15	10	0	180	20	30	5	10	0									
20	21	H	Mid	1031	26/10	>	5	10	10	0	100	30	30	0	5	0									
21	24	H	Mid	1600	27/10	<	3	2	40	5	40	30	20	0	0	0	50								
22	24	H	Mid	1600	27/10	>	3	0	20	0	40	40	0	0	0	0	100								
23	27	H	Mid	1217	28/10	<	3	4	40	1	150	50	40	3	0	2	0								
24	27	H	Mid	1217	28/10	>	3	1	20	0	70	30	20	0	0	0	0								
25	30	H	Mid	1725	29/10	<	2	5	30	1	80	20	2	2	0	0	0								
26	30	H	Mid	1725	29/10	>	2	3	20	0	30	150	3	0	0	0	0								
27	32	H	Mid	1756	30/10	<	2	5	30	0	150	200	0	0	0	0	0								
28	32	H	Mid	1756	30/10	>	2	2	30	0	70	50	0	0	0	0	0								

Data processing

Paper forms

Corrections

- Many typos
- Reconciliation of species codes and descriptions
- Linking to fishing records to get fishing method, target species, and location

Processing already presented in https://www.dragonfly.co.nz/publications/abraham_seabirds_2011.html

Data update

Paper forms

- Counts in last published dataset between 2004 and 2012
- New data up to Nov 2018, provided electronically
- Same processing as before
- Here, only counts within 100 m of the vessel were kept
  - Removal of 28% of data, but less confusing

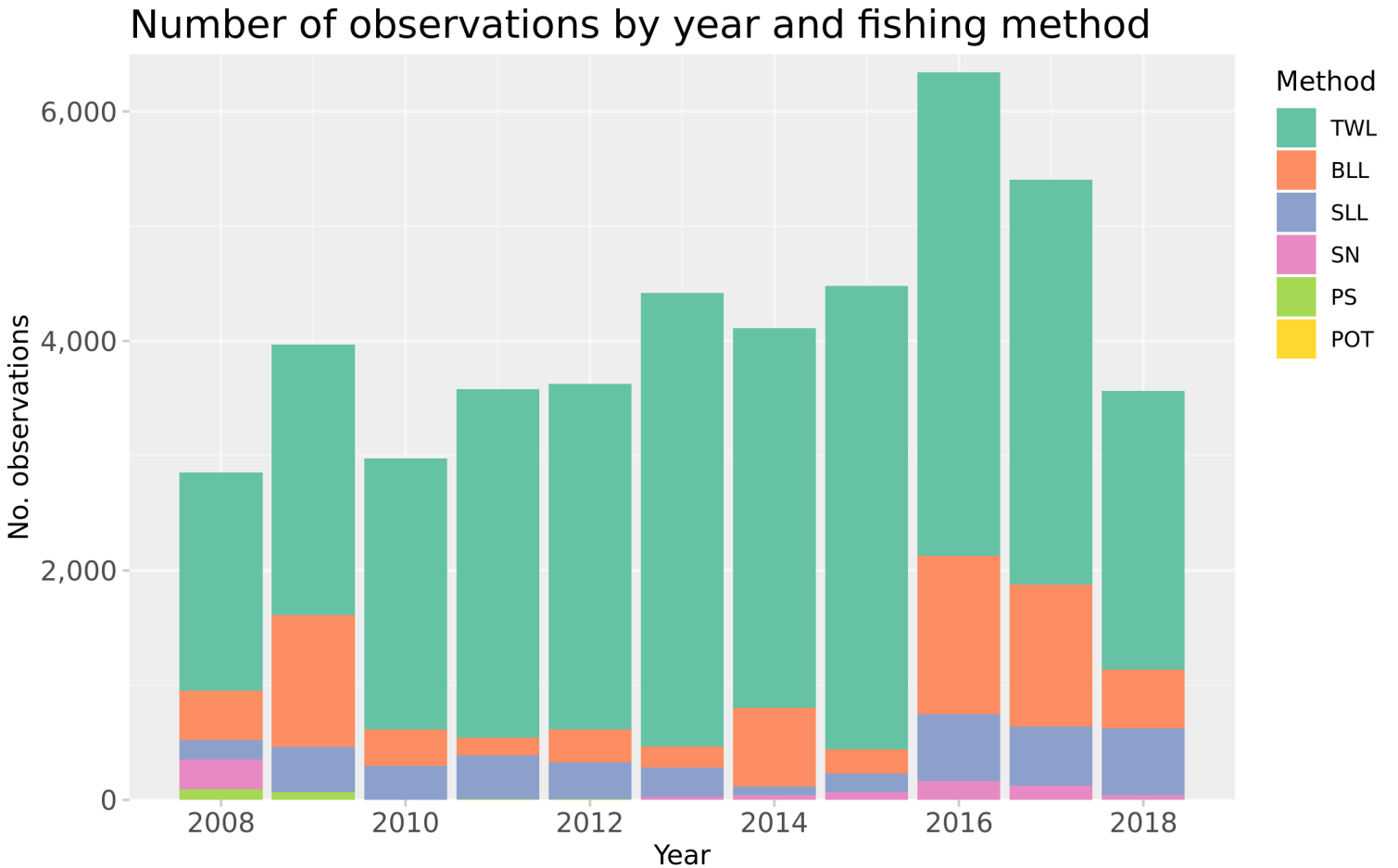
Results

Paper forms

- 45,325 observations, between Jan 2008 and Nov 2018
- 221,746 counts of seabird species and species groups
- 1.2% of zero counts
- 91 codes used, of species and species groups
- 51% of counts at species or sub - species level

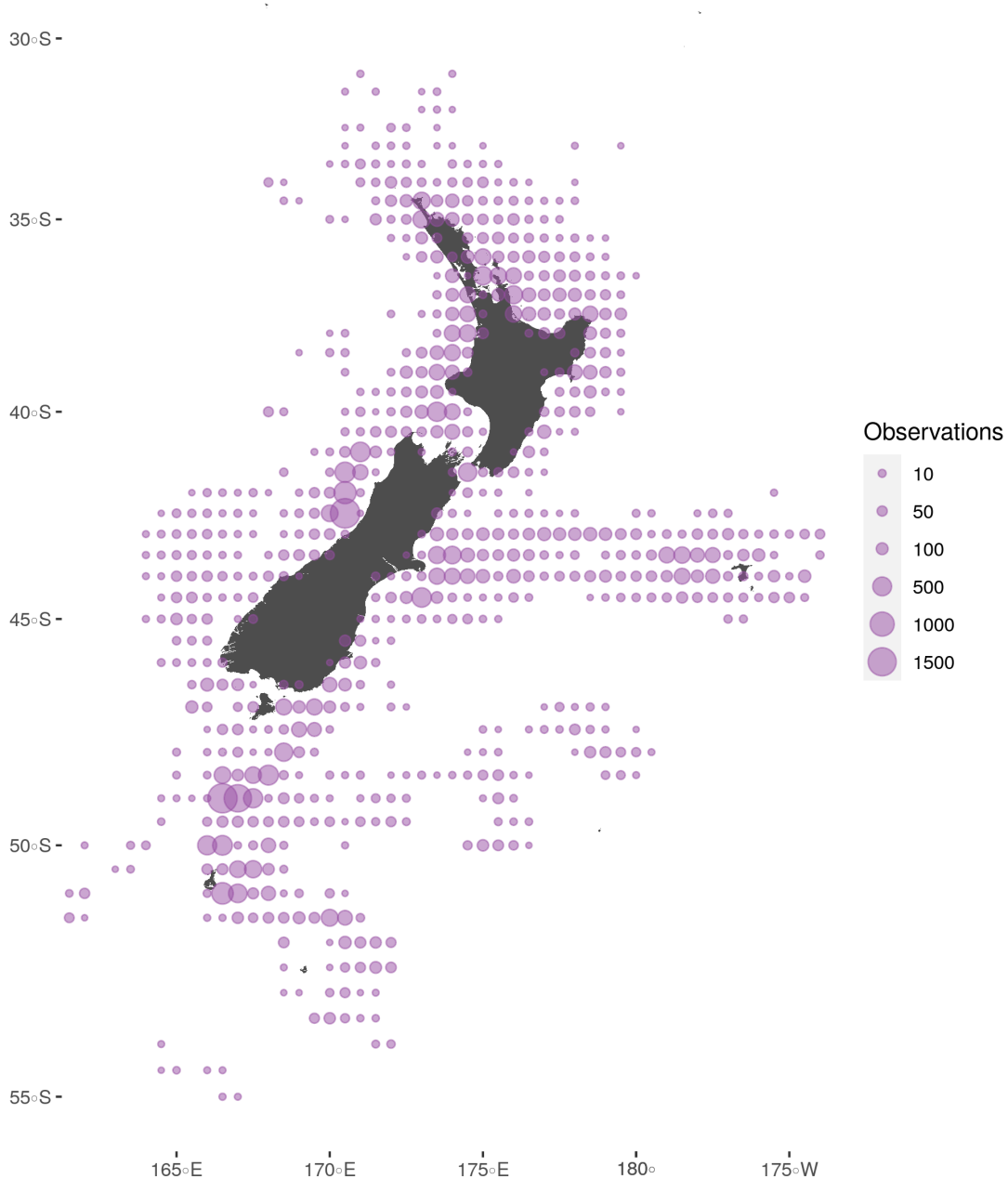
Results

Paper forms



Results

Paper forms



Nomad electronic devices

Data

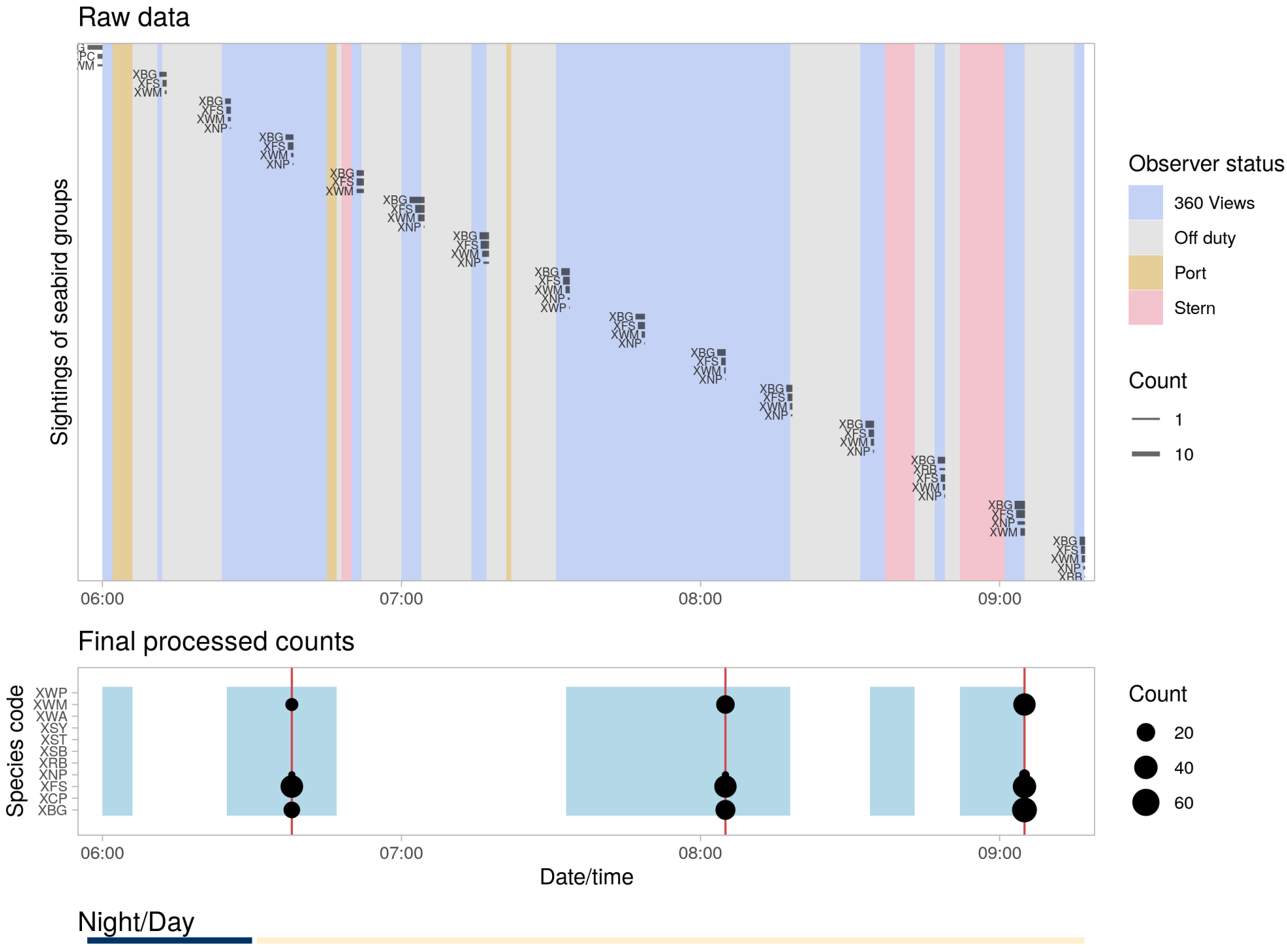
Nomad electronic devices

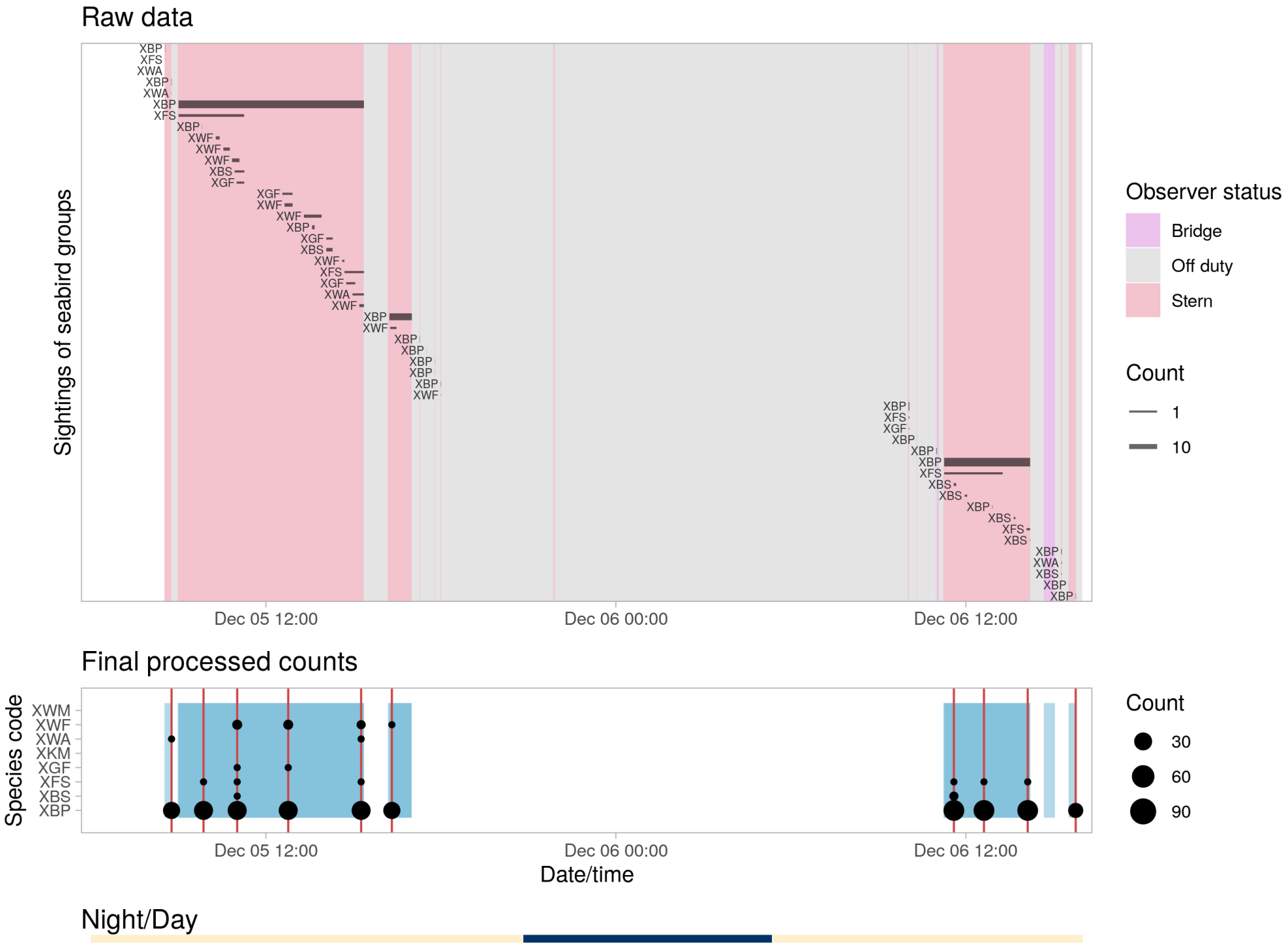
- Use of Nomad handheld devices began in Jan 2009
- Mostly used in inshore fisheries
- Initial focus on marine mammals, but only seabird counts were considered
- Monitoring of “pods” throughout the day
- Counts over time, not snapshots
- Zero counts cannot be entered, but derived from on / off duty periods
- No typos, but issues of timings and locations

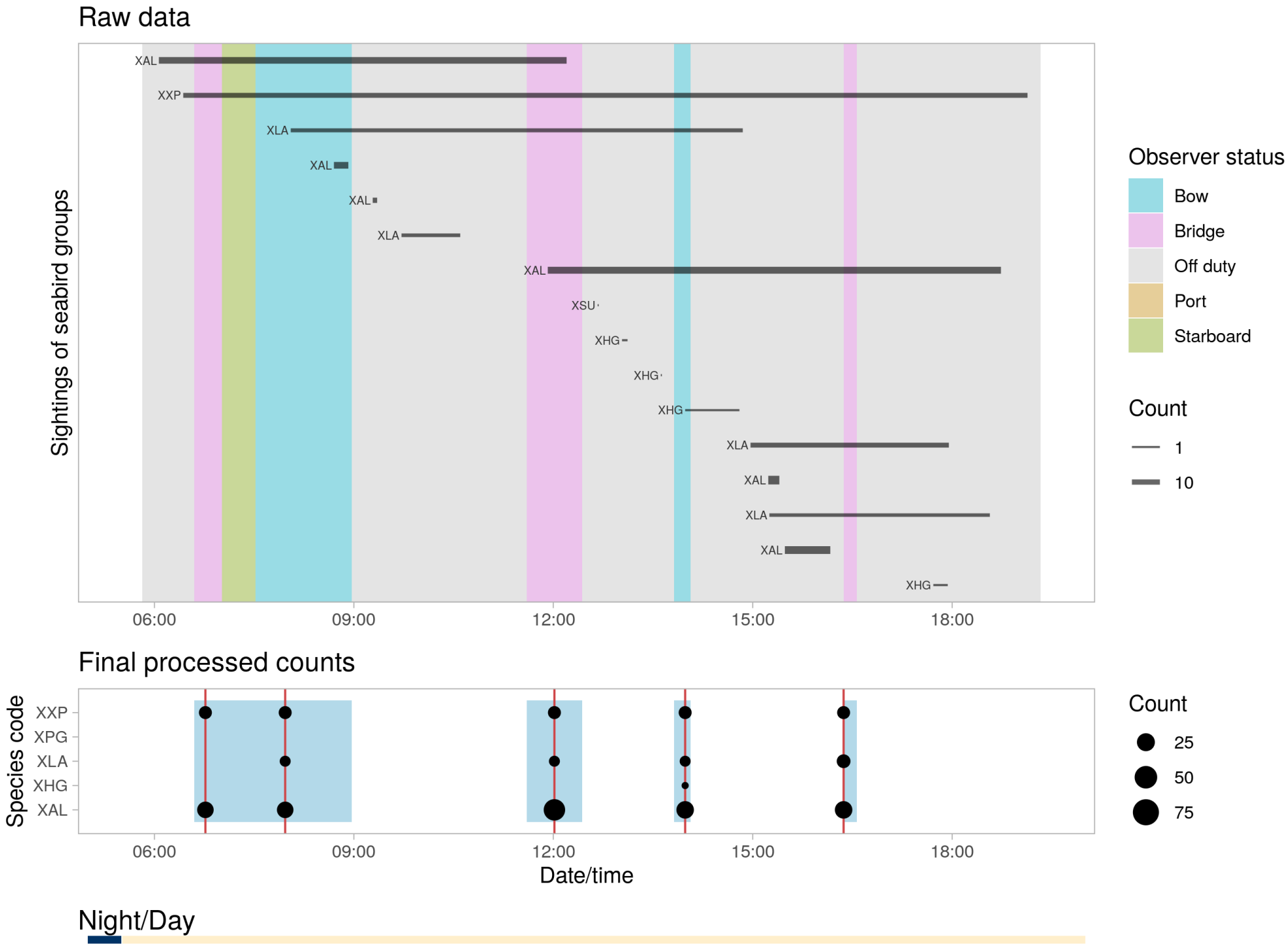
Processing

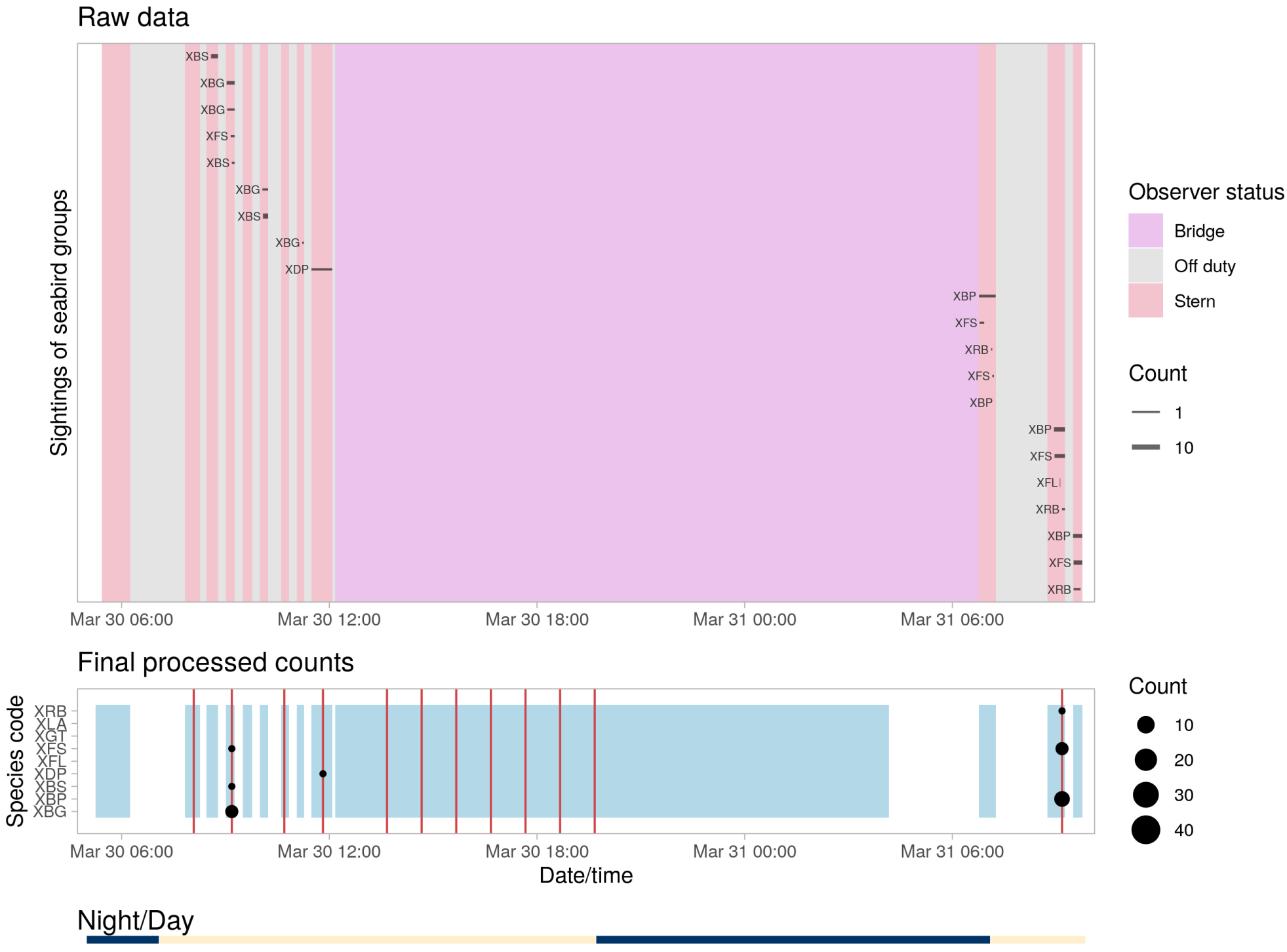
Nomad electronic devices

- Data transformed to be in a similar format to the paper forms dataset
- Snapshots of seabird abundance created at the maximum total count within 1 - hour periods
- Records between civil dusk and dawn were removed
- A few examples…


Raw data
Sightings of seabird groups
06:00
07:00
08:00
09:00
Observer status
360 Views
Off duty
Port
Stern
Count
1
10
Final processed counts
Species code
XWP
XWM
XWA
XSY
XST
XSB
XRB
XNP
XFS
XCP
XBG
Date/time
Count
20
40
60
Night/Day


Raw data
Sightings of seabird groups
Dec 05 12:00
Dec 06 00:00
Dec 06 12:00
Observer status
Bridge
Off duty
Stern
Count
1
10
Final processed counts
Species code
XWM
XWF
XWA
XKM
XGF
XFS
XBS
XBP
Dec 05 12:00
Dec 06 00:00
Dec 06 12:00
Date/time
Count
30
60
90
Night/Day

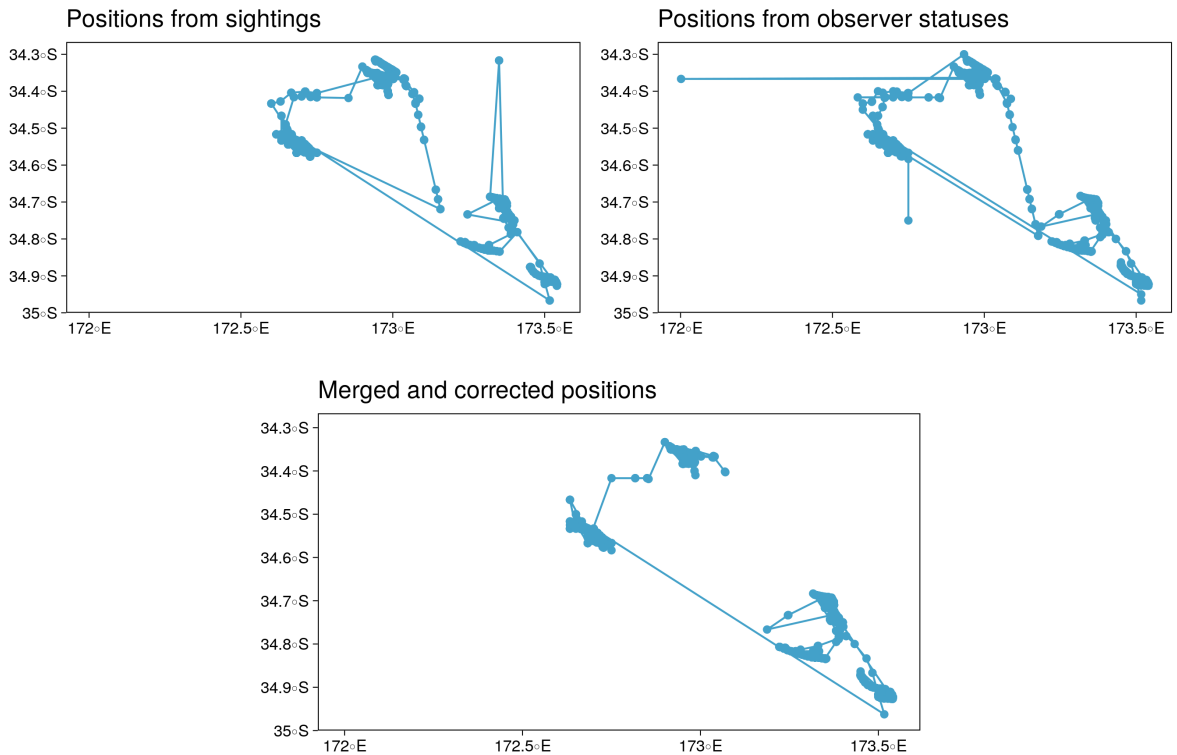

Raw data
Sightings of seabird groups
XAL
XXP
XLA
XAL
XAL
XLA
XAL
XSU
XHG
XHG
XHG
XLA
XAL
XLA
XAL
XHG
06:00
09:00
12:00
15:00
18:00
Observer status
Bow
Bridge
Off duty
Port
Starboard
Count
1
10
Final processed counts
Species code
XXP
XPG
XLA
XHG
XAL
06:00
09:00
12:00
15:00
18:00
Date/time
Count
25
50
75
Night/Day


Raw data
Sightings of seabird groups
XBS
XBG
XBG
XFS
XBS
XBG
XBS
XBG
XDP
XBP
XFS
XRB
XFS
XBP
XBP
XFS
XFL
XRB
XBP
XFS
XRB
Mar 30 06:00
Mar 30 12:00
Mar 30 18:00
Mar 31 00:00
Mar 31 06:00
Observer status
Bridge
Off duty
Stern
Count
1
10
Final processed counts
Species code
XRB
XLA
XGT
XFS
XFL
XDP
XBS
XBP
XBG
Mar 30 06:00
Mar 30 12:00
Mar 30 18:00
Mar 31 00:00
Mar 31 06:00
Date/time
Count
10
20
30
40
Night/Day

Locations processing

Nomad electronic devices

Filtering on distance and speed between successive locations, both for the sightings and observer statuses, which are then merged.



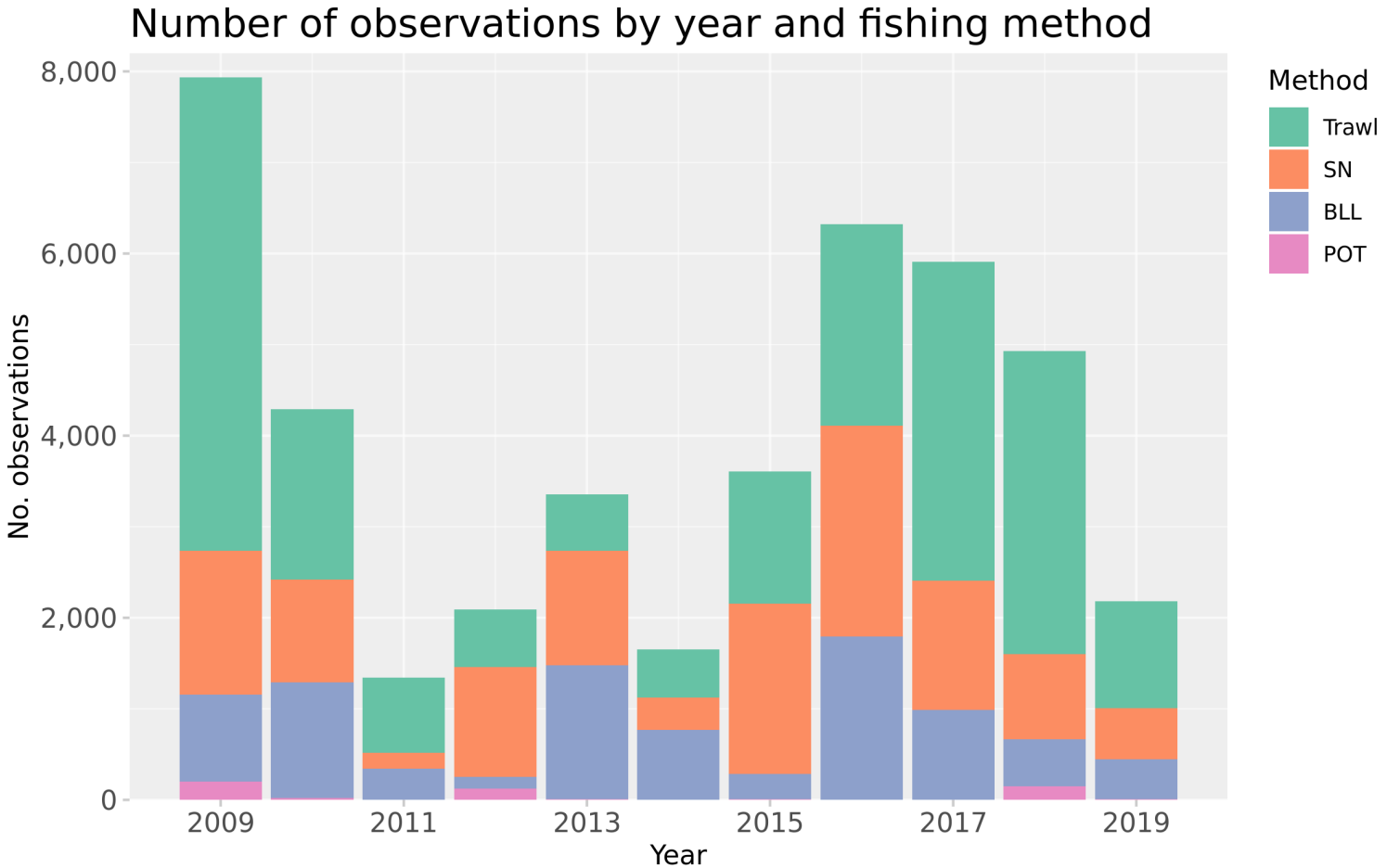
Results

Nomad electronic devices

- 43,609 observations, between Jan 2009 and Oct 2019
- 114,744 counts of seabird species and species groups
- 27.8% of zero counts
- 72 codes used, of species and species groups
- 73% of counts at species or sub - species level

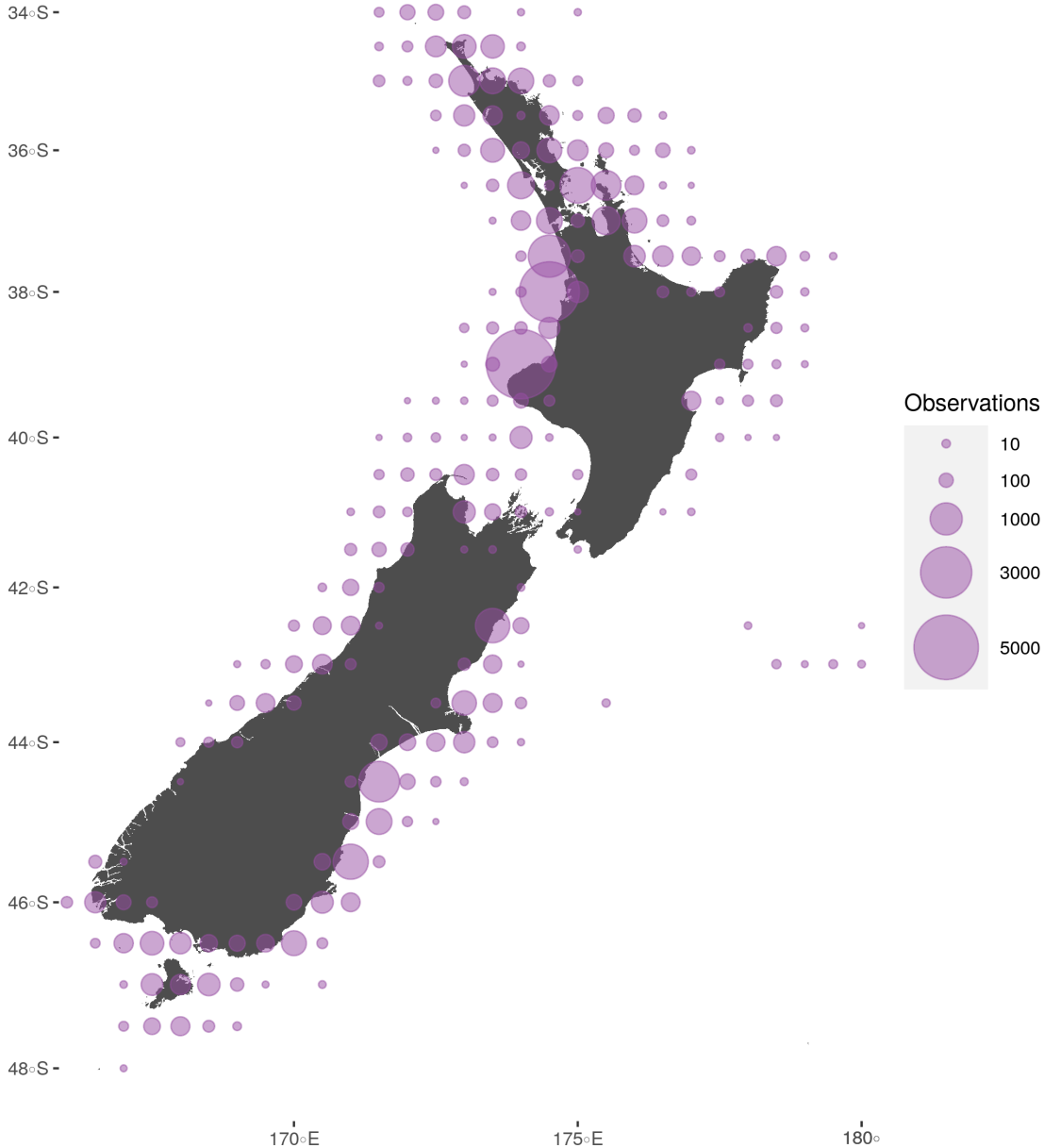
Results

Nomad electronic devices



Results

Nomad electronic devices

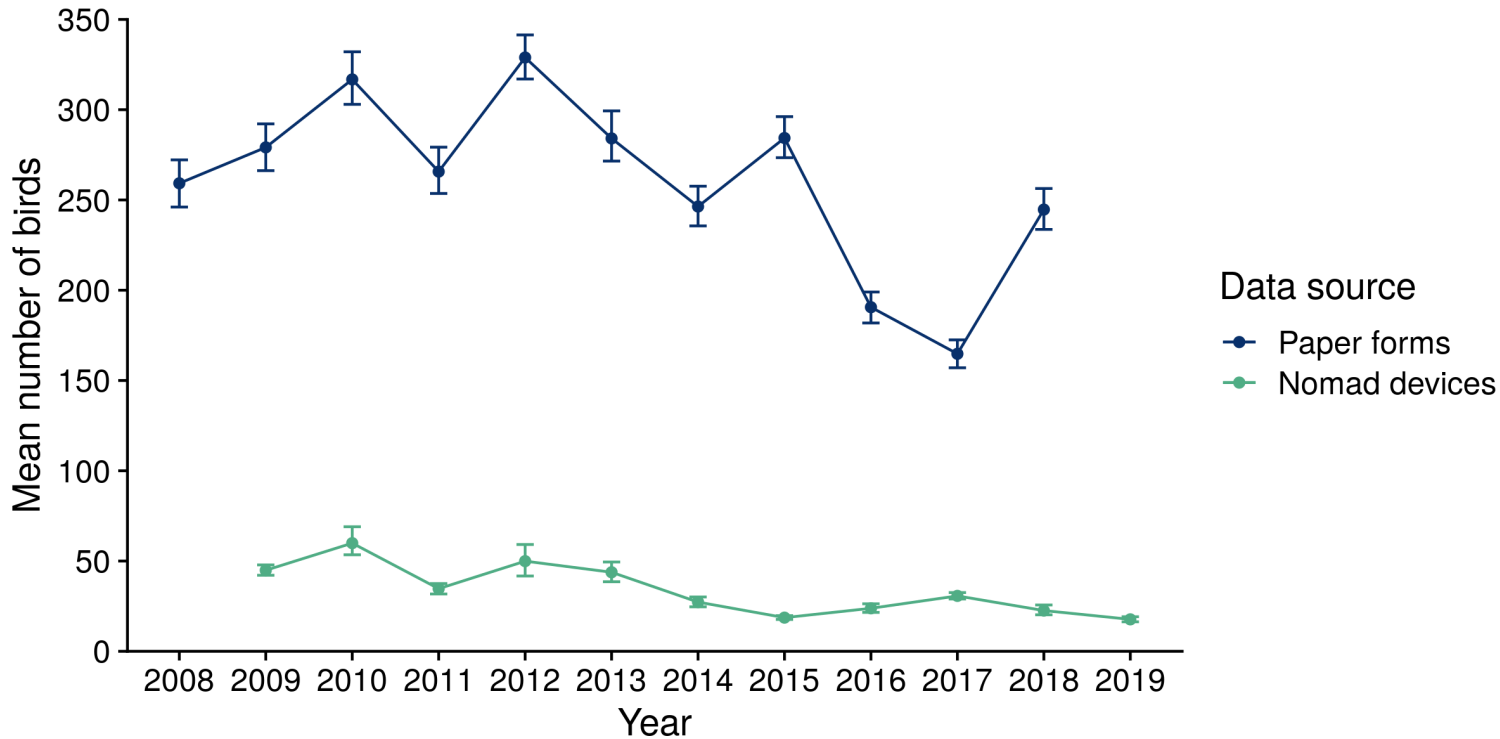


Data exploration

Abundance over time

Data exploration

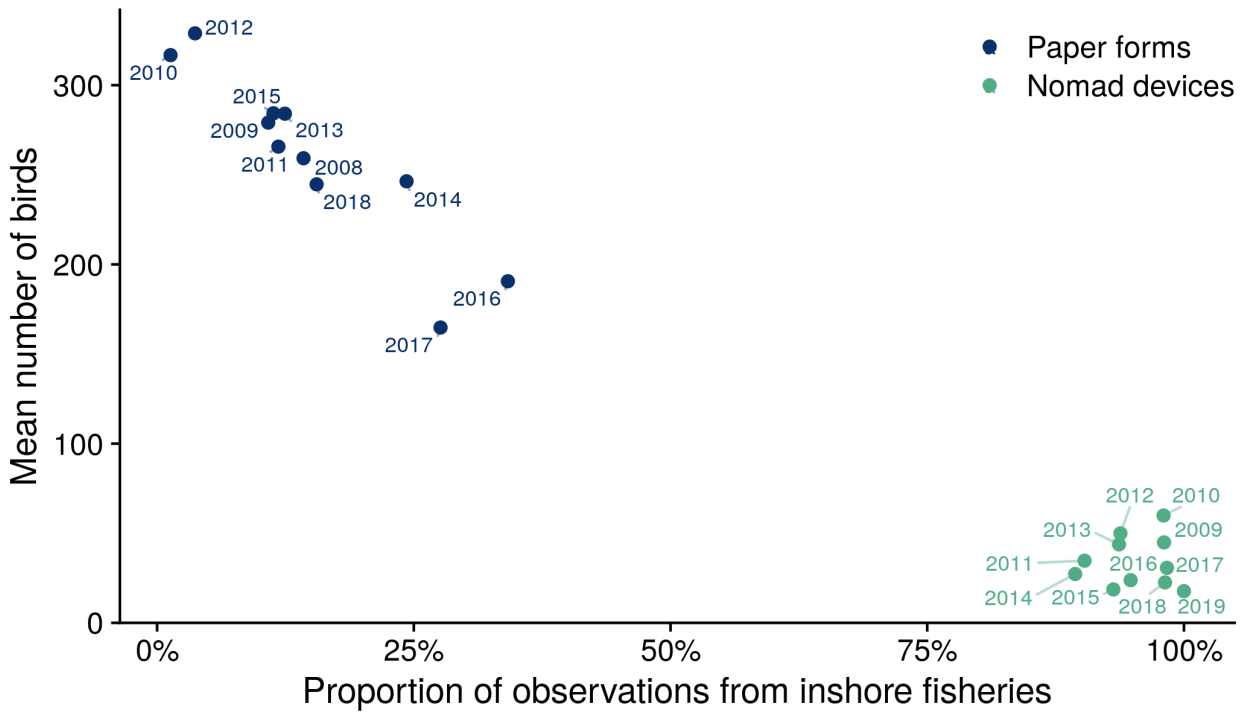
Apparent decrease in the recorded number of birds over time



Abundance over time

Data exploration

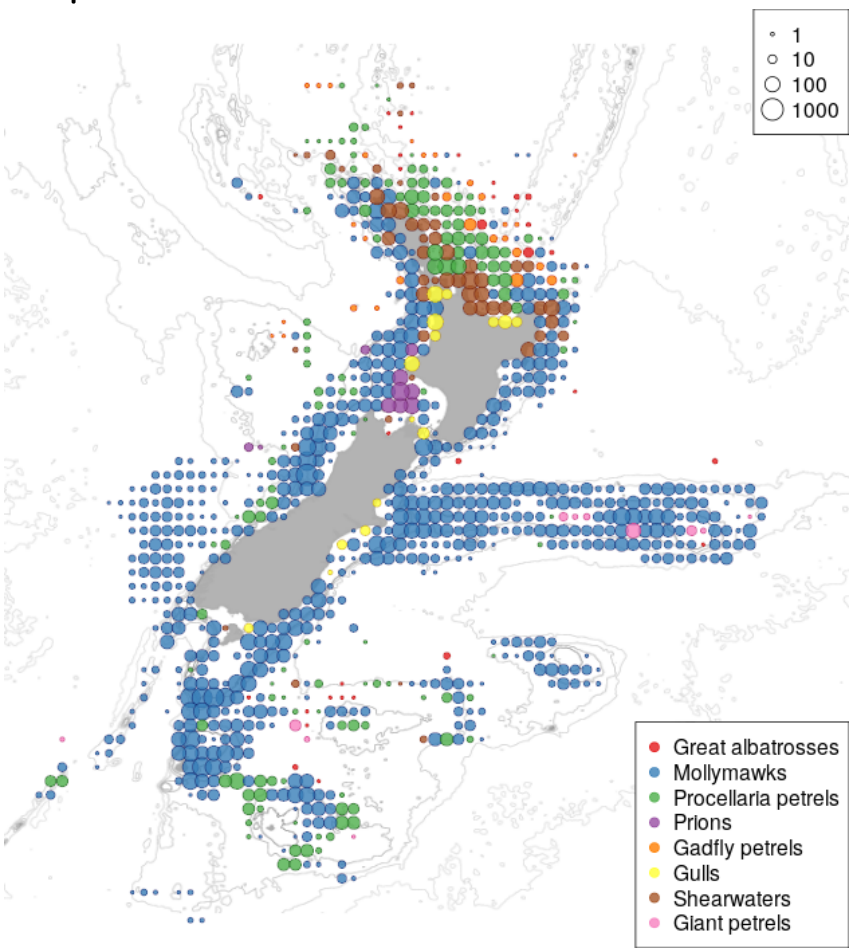
The decrease may partially be explained by the proportion of observations in inshore fisheries



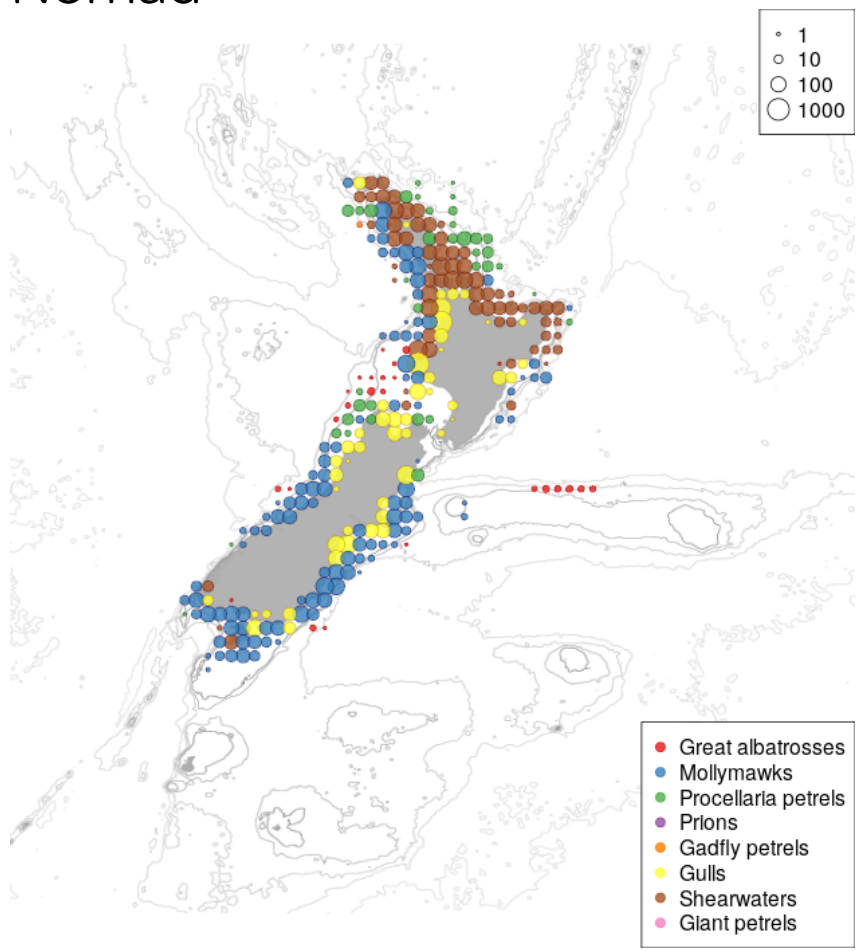
Species dominance

Data exploration

Paper forms



Nomad



Website

Data exploration

Website

- https://seabird-counts.dragonfly.co.nz/?v=1
- Online data exploration tool updated
- Abundance map by species group, species, year, or season
- Paper forms and Nomad datasets kept separate
- Increased resolution from 1° to 0.4°
- Data download not yet available (MPI RDM approval needed)

Counts of seabirds around fishing vessels, collected by New Zealand Government fisheries observers, suitable for studies of seabird distribution.

Photograph courtesy Department of Conservation.

Seabirds following a fishing trawler, Kaikoura, New Zealand.

New Zealand is a global centre of seabird diversity, with over 80 species breeding either on the mainland or on offshore islands. Seabirds are caught during both commercial and recreational fishing, and for some species these fatalities may threaten the viability of the populations.

Little is known about the distribution of seabirds in New Zealand waters. However, regular counts by government fisheries observers of the numbers of seabirds around fishing vessels may allow a greater understanding of the interactions between seabirds and fishing vessels. This in turn will help in the management of fishing to reduce seabird bycatch.

Two types of counts have been carried out. One programme aims at standardising the counts to maximise their comparability, and these counts have been recorded on paper forms. Another programme was developed, aiming predominantly at the survey of marine mammals in inshore fisheries, with the data being recorded on Nomad electronic devices. Due to different protocols, the two datasets are kept separate. The birds are identified as accurately as possible; however, observers' experiences and skills vary, and collecting seabird count data is not their primary task. Because of this variability, and because of the inherent difficulty in accurately counting birds behind fishing vessels, the data should be used cautiously. For further information, a report is available, describing the datasets and their limitations.

The collection of data is coordinated by the Department of Conservation, and processed by Dragonfly Data Science.

Paper forms Nomad devices

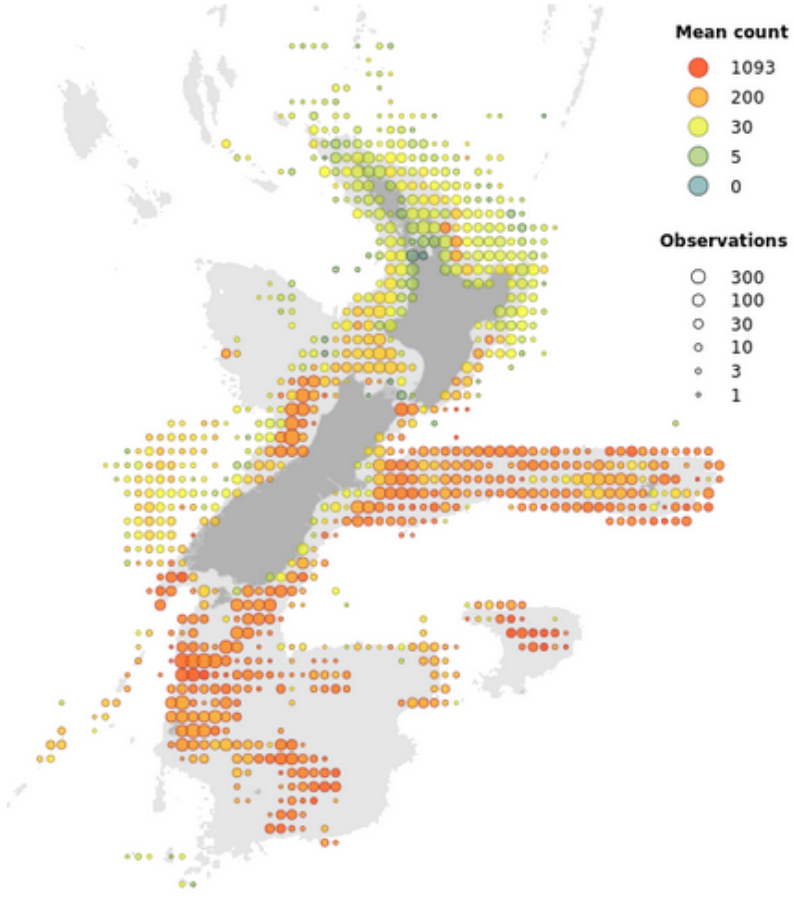
DRAGONFLY Data Science

Department of Conservation Te Papa Atawbai

- All seabirds
- Penguins
- Albatrosses
- Petrels
- Storm petrels
- Diving petrels
- Gannets and boobies
- Cormorants and shags
- Gulls and terns
- Skuas

Counts of all seabirds

Average number of seabirds behind fishing vessels.



Mean number of seabird recorded around fishing vessels during counts carried out by government observers, binned to 0.4 degree of longitude and latitude. The size of the circle indicates the number of observations, whereas the colour indicates the mean number of birds recorded during counts. Empty circles indicate that no birds were observed. The grey areas indicate water depths of less than 1000 m.

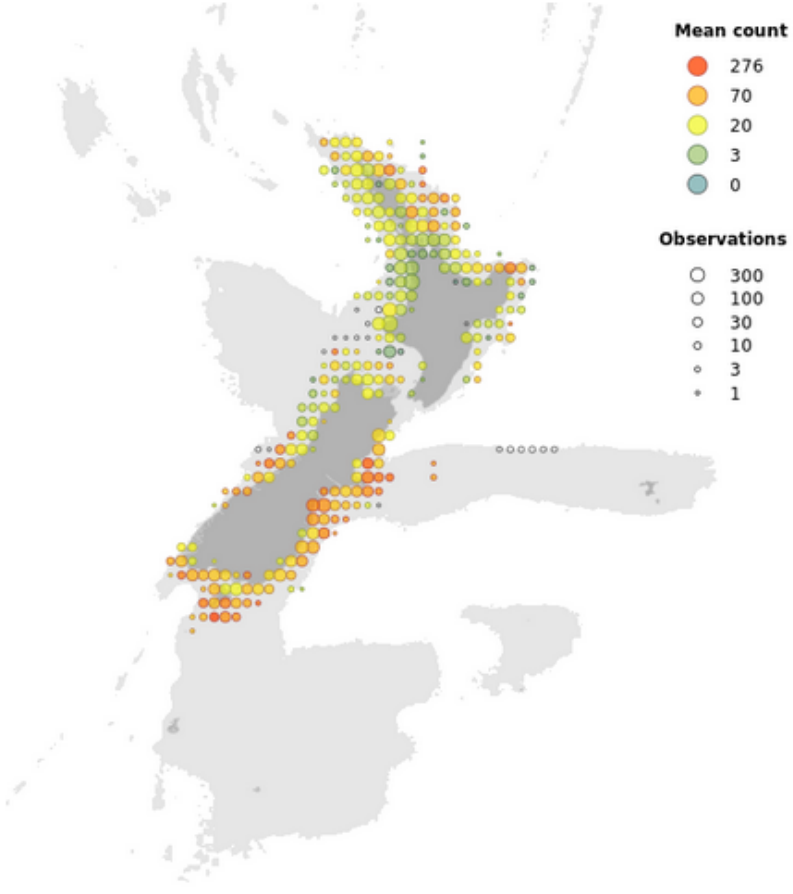
Department of Conservation

Data	Mean count
All data	252
Spring	248
Summer	254
Autumn	204
Winter	303
2008	259
2009	279
2010	316
2011	265
2012	328
2013	284
2014	246
2015	284
2016	190
2017	164
2018	244

- All seabirds
- Penguins
- Albatrosses
- Petrels
- Storm petrels
- Diving petrels
- Gannets and boobies
- Cormorants and shags
- Gulls and terns
- Skuas

Counts of all seabirds

Average number of seabirds behind fishing vessels.



Mean number of seabird recorded around fishing vessels during counts carried out by government observers, binned to 0.4 degree of longitude and latitude. The size of the circle indicates the number of observations, whereas the colour indicates the mean number of birds recorded during counts. Empty circles indicate that no birds were observed. The grey areas indicate water depths of less than 1000 m.

Department of Conservation

Data	Mean count
All data	34
Spring	35
Summer	36
Autumn	34
Winter	21
2009	44
2010	59
2011	34
2012	49
2013	43
2014	27
2015	18
2016	23
2017	30
2018	22

Limitations

Limitations

Care needed for analysis

- Mistakes in species identification may be present
- Use of generic codes may complicate the analysis
- Abundance affected by fishing activity, time of day, season, inshore vs. deepwater
- Different protocol between paper forms and Nomad datasets
- Zero counts in Nomad dataset may be inflated