Seabird distributions from observer count data

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Photograph of a Buller's albatross by angrysunbird, from flikr, CC-BY-SA licensed

Seabird distributions

Distributions of New Zealand seabirds are poorly known

- We have breeding colony locations and breeding season information
- Satellite tracking data has been collected for some of the large seabirds, but usually only for some breeding stages, and from some colonies
- Qualitative maps have been collated by the National Aquatic Biodiversity Information System
- For most species, the available information is poor

Seabird bycatch

Distribution information is needed to understand bycatch

- A key factor for risk of seabirds to fishing is overlap
- If the birds and the fishing are in the same place at the same time, then there may be bycatch, if the fishing is away from birds then there won't be
- Bycatch estimation uses distribution information derived from the bycatch data, which only works for frequently caught species
- Seabird risk assessment uses NABIS, colony information, and heuristics to infer overlap

Abundance data

Observer collected data on seabird abundance

- Observers began recording seabird counts in 2004
- They record the number of birds around the vessel during the first fishing event of the day
- Data were initially kept in diaries, and recorded on BLL forms, with a specific form being introduced in 2006
- The form has since been modified to record counts at both greater and less than 100 m

CSP Observer Bird Count Form

Trip # [redacted]

						Est. #Large Seabirds									Est. # Small Seabirds								*Others		
Date	pls circle one & enter # Tow / Set / Haul	Latitude S	Longitude E	NZST	Bft.	XRA/ XWA	XWM	XKM	XCM	XCI	XSA	XBM	XTP	XGT	XWC	XSH	XGP	XCP	XFS	XBP	XBS	XGF			
16.02		[redacted]	[redacted]	1705	03	5	80	10				10			10			20							
17/02	3	[redacted]	[redacted]	0557	01	5					20	20	5		40			10							
9/02	7	[redacted]	[redacted]	0643	01	2					10	10	5		20			3							
19/02	[illegible]	[redacted]	[redacted]	0607	[illegible]	[illegible]					[illegible]	50	25		80			20							
20.02	16	[redacted]	[redacted]	1110	03	10	30				50	30	50		80			20							
21/02	20	[redacted]	[redacted]	0641	01	5					25	25	10		20			15							
22/02	23	[redacted]	[redacted]	0636	01	10					50	50	30		40			20							
23/02	6	[redacted]	[redacted]	0618	02	30					75	75			90			30							
24/02	27	[redacted]	[redacted]	[illegible]	04	30					70	60	60		40			20							
26/02	35	[redacted]	[redacted]	0803	05	15	25				50	50	10		70			30							
27/02	42	[redacted]	[redacted]	0610	04						15	15	5		60			5							
28/02	46	[redacted]	[redacted]	0645	11	5	5				15	15	5		50			15							
01/03	50	[redacted]	[redacted]	0632	04	10	20				30	30	10		80			20							
02/03	55	[redacted]	[redacted]	0916	07	15					40	40	5		280			20							
05/03	62	[redacted]	[redacted]	0605	04	10					30	30			90	30		10							
06.03	67	[redacted]	[redacted]	1058	05	10	40				50	10	5		80	20		20							
07/03	70	[redacted]	[redacted]	0605	08	10	30				40	40	5		40	25		10							
08/03	75	[redacted]	[redacted]	1037	04	5	20				25	25	5		10	5		5							
09/03	80	[redacted]	[redacted]	1040	06	10	25				40	40	10		40	20		15							
10.03	84	[redacted]	[redacted]	1100	05	5	10	20			50	40	10		50	30		10							
11.03	88	[redacted]	[redacted]	1120	02	2	10	20			50	20	50		100	30		5							
12/03	89	[redacted]	[redacted]	0635	05	15	30				50	50	25		100	20		10							
13.03	96	[redacted]	[redacted]	1110	01	20	10	20			30				10	70		10							
14/03	100	[redacted]	[redacted]	0913	06	5	20				40	40	10		15	5		5							
15/03	104	[redacted]	[redacted]	0921	04	5	5				25	25			30	5		5							
16.03	109	[redacted]	[redacted]	1200	01	10	10				50	50	50		20	50		20							
17/03	113	[redacted]	[redacted]	1020	03	10	15				25	25	15		20	30		10							
18/03	116	[redacted]	[redacted]	0710	06	10	10				20	20	5		60	20		5							
19.03	122	[redacted]	[redacted]	1227	02	10	15	5			20	25	10		50	50		10							
20/03	126	[redacted]	[redacted]	1140	06	5	15				30	30			20	40		10							
21/03	130	[redacted]	[redacted]	1140	02	5	10				20	20			10	30		5							
22/03	134	[redacted]	[redacted]	0910	03	5	5				15	20			20	30		5							

CSP Protected Species Abundance Form | Trip: [redacted] | 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	1309	20/10	<	4	20	0	0	300	30	15	5	20	0								
8	7	H	Mid	1309	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	1149	22/10	<	3	4	10	0	100	50	0	5	50	0								
12	12	H	Mid	1205	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	25	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	20	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	29/10	>	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							

Collating and grooming the abundance data

- Dragonfly have been entering and grooming the abundance data
- Goal is to produce a clean dataset and to make it readily available
- Data will be able to be used in future seabird bycatch estimation
- Data have been entered to the end of June 2009, with more recent data to be included once the grooming is complete

Data to end of June 2009

- Data from 446 trips
- Approximately 13 000 separate observations
- Approximately 77 000 separate bird counts
- Data to be added from inshore coverage programme

Species hierarchy

Codes and taxa

- Data recorded using Ministry of Fisheries codes (XSH, etc.)
- We use Ornithological Society of New Zealand checklist (2010) taxonomic classification
- For each count, we provide the original code, the code description, the species, the genus, and the family
- OSNZ regard New Zealand and Tasmanian white-capped albatross as subspecies, whereas ACAP treat white-capped and shy albatross as separate species
- This classification doesn't include a category for the royal albatross and wandering albatross groups
- All families have separate codes, with the exception of gulls and terns, that are grouped together (XLA)

Counts with multiple codes

- Some counts had multiple codes (e.g., XSA/XWM), first forms had printed XRA/XWA column
- The common parent in the taxonomic hierarchy was chosen, for example XSA/XWM (Salvin's or White-capped albatross) was replaced with XMA (unidentified *Thalassarche* species)
- This affected around 4500 records, largely due to XRA/XWA being replaced with XGA (Unidentified *Diomedea* species)
- In 268 cases a specific code was given with a generic code (e.g., XFS/XPE for fluttering shearwater or unidentified petrel). In these cases, the generic code was used.

Species without codes

Species	Records
Brown skua	14
Soft-plumage petrel	9
White-fronted tern	7
Arctic skua	6
Red-billed gull	5
Antarctic fulmar	2
Kermadec petrel	1
Black swan	1

Expect more species without codes as we include inshore data. Current code system is designed for observed bycatch.

Grooming issues

Linking to Ministry of Fisheries data

- Seabird counts linked to observer station records by station number
- Include latitude, longitude, fishing method, target species, and vessel length from Ministry of Fisheries data
- Use grooming rules to complete some missing date information from Ministry of Fisheries records, and to impute missing location information
- A wide range of other grooming rules to standardize the data

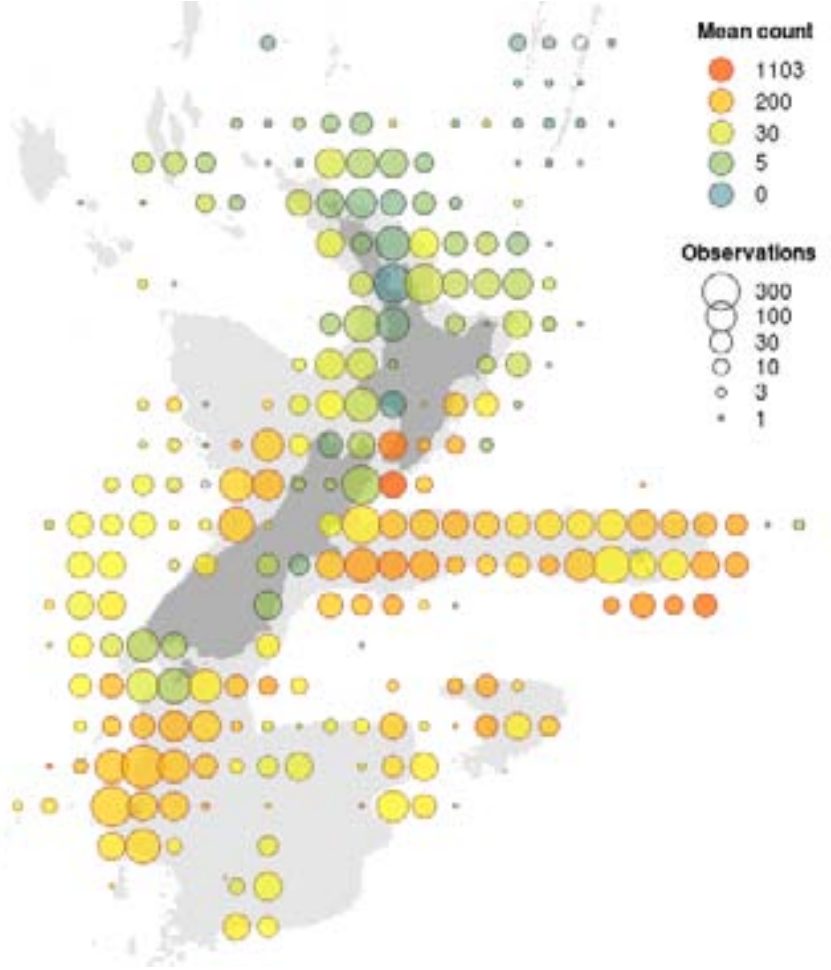
Near and far

- Separate counts of seabirds near and far introduced in 2007
- Indicated using symbols on the forms ($<$ or $>$), some observers found this confusing
- Counts should always be paired (both near counts and far counts), but sometimes only one count was recorded
- Distance used is mainly 100 m, a few forms with a distance of 50 m
- Recommend designing forms with paired rows, a pre-printed near and far description, and only one set of the data (tow number, date, etc.) that is common to both. This would help standardise the data collection
- In presentations of the data, near and far counts are summed together to give total counts that may be compared with the earlier data

Distributions

All albatrosses (Diomedeidae)

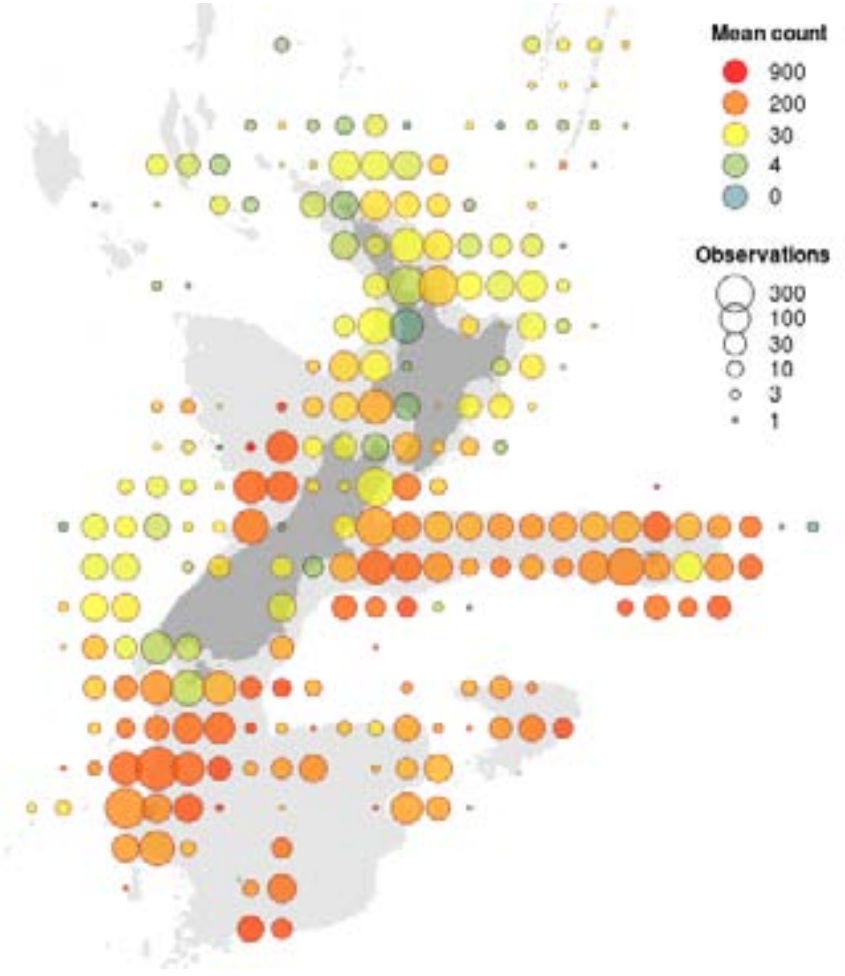
- Average count and number of observations mapped at 1 degree resolution
- Wide coverage has been achieved of areas where fishing occurs
- Limited data from inshore regions
- High albatross numbers in southern waters, on Chatham Rise, and on West Coast
- Highest average counts in Cook Strait region



Distributions

All petrels (Procellariidae)

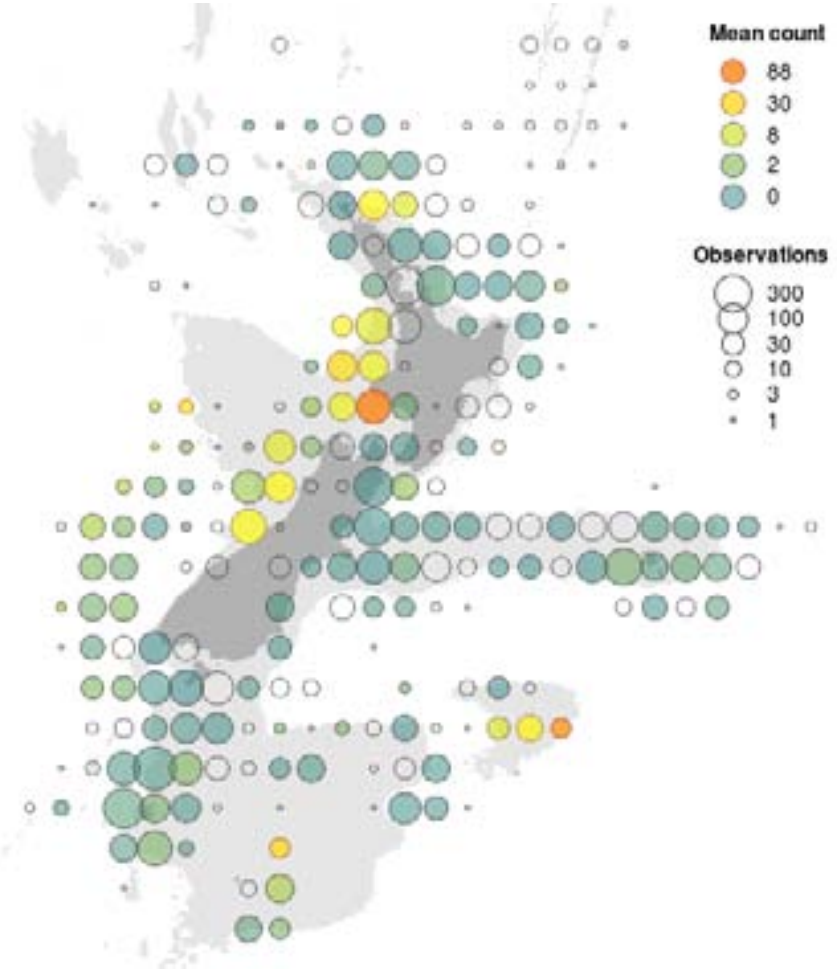
- Family with the highest average counts (a mean of 128 petrels around each fishing vessel across all observed fishing events)
- Wide geographic range



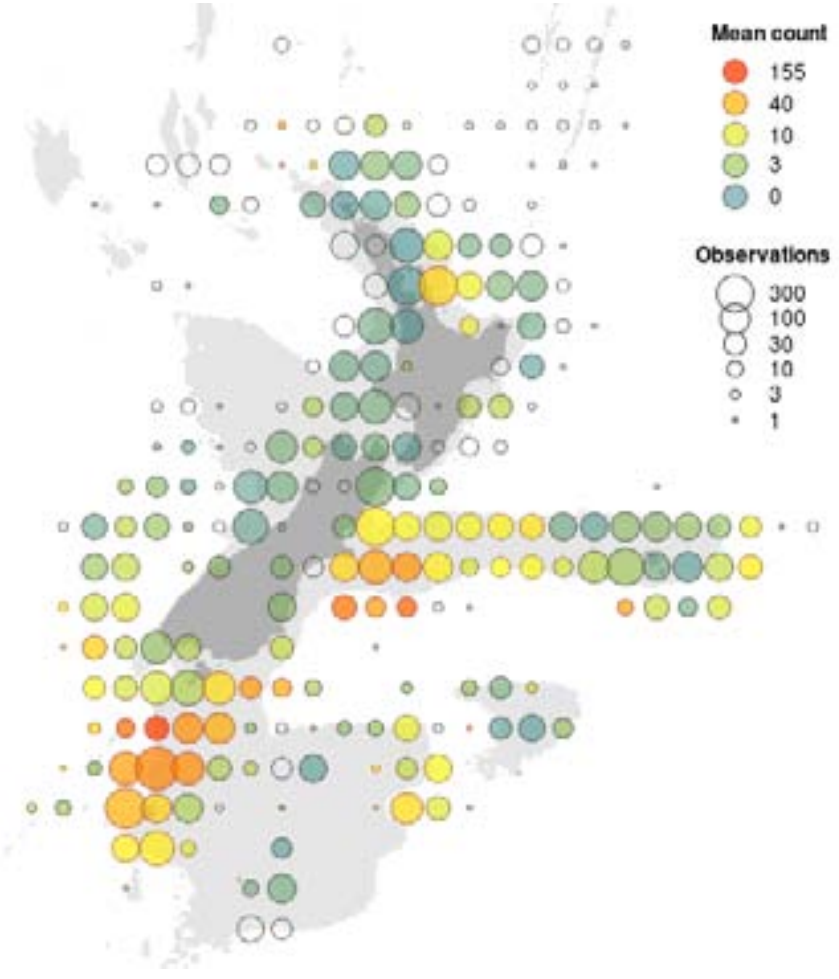
Distributions

Prions (*Pachyptilla* spp.)

- Highest off North Island west coast
- Largest New Zealand breeding colonies of fairy prion are on Stephen's Island in the outer Marlborough Sounds
- Also concentrations around the Bounty Islands, and off north-eastern New Zealand

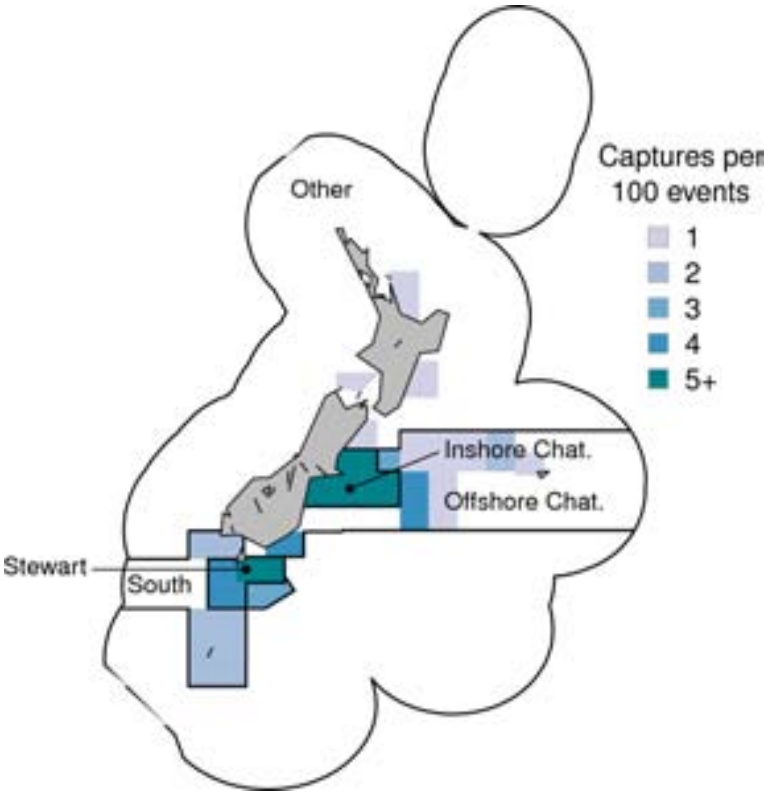


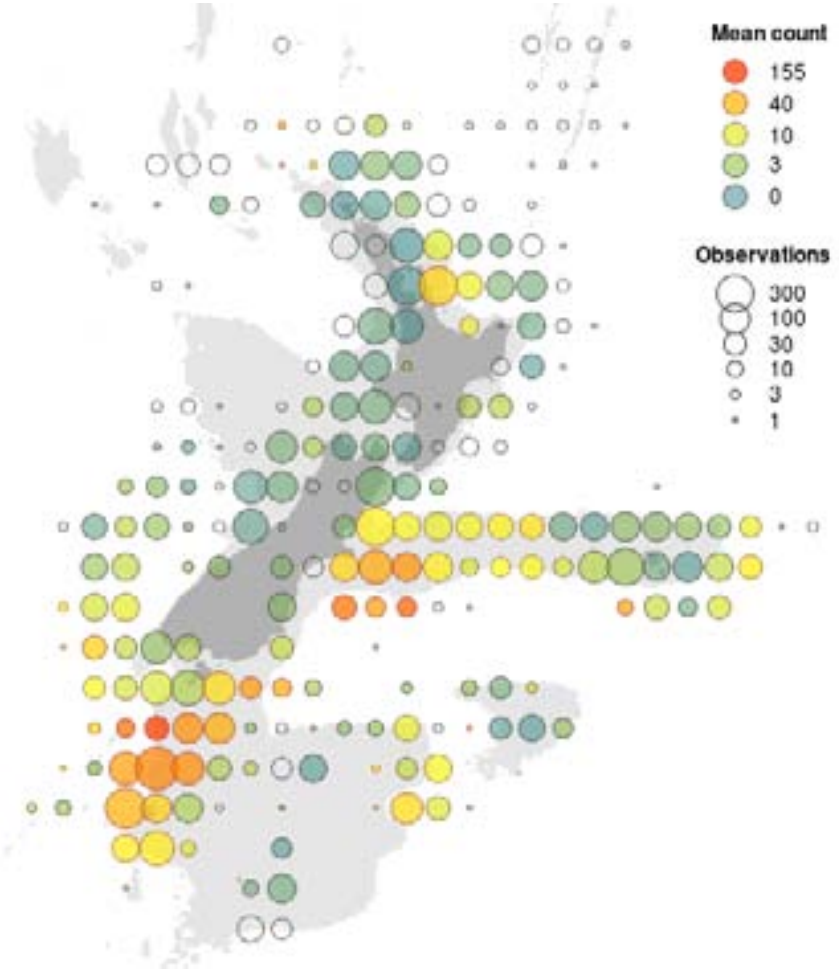
Sooty shearwater - comparison with NABIS



Sooty shearwater - comparison with bycatch

Captures of sooty shearwater per 100 tows, for all observed trawl fishing, by statistical area





Attraction to fishing vessels

Ratio of numbers behind fishing vessels to number of breeding pairs

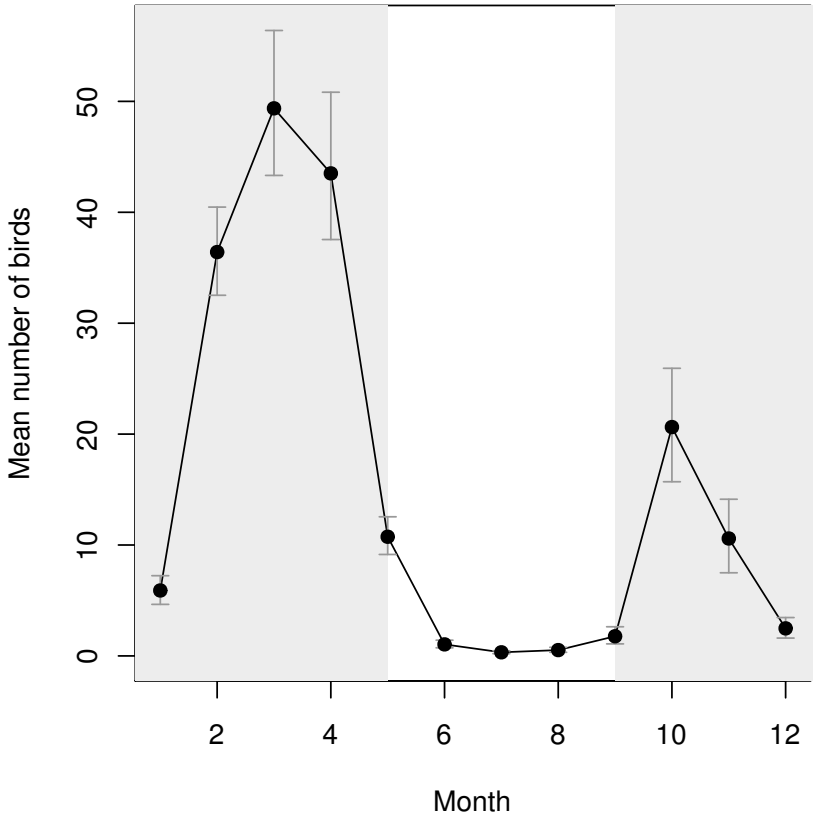
Species	Average number	Breeding pairs	Ratio ($\times$ 1000)
White-capped albatross	38	74 400	0.511
Salvin's albatross	22	25 200	0.873
Buller's albatross	17	26 600	0.640
Grey-headed albatross	0.47	4 600	0.102
Light-mantled sooty albatross	0.03	6 700	0.004

Using the observer counts would be a much better source of data for assessing the potential for seabird bycatch than the combination of known range and population size that was used in the current seabird risk assessment.

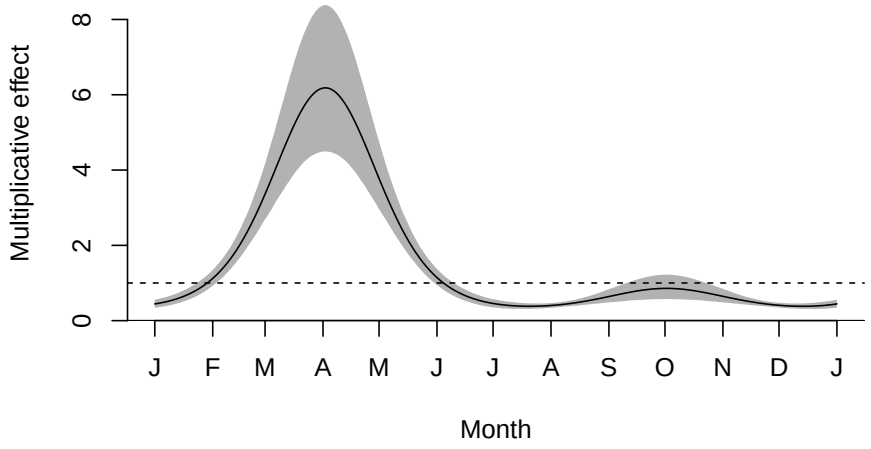
Counts give temporally resolved data

Sooty shearwater abundance

(shading shows breeding season)

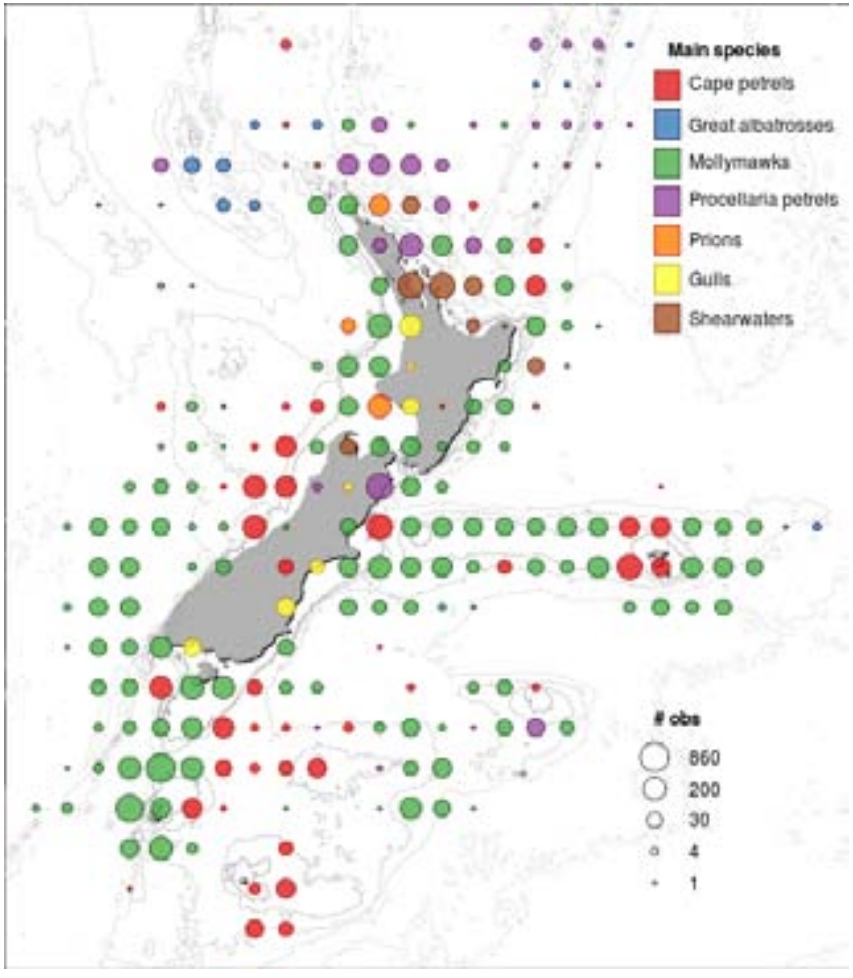


Sooty shearwater relative capture rate estimated from bycatch modelling



Rich source of data on seabird ecology

- Coherent spatial patterns in the most frequent species
- Southern region with mollymawks and Cape petrels
- Northen offshore with great albatrosses and black petrel
- Gulls in coastal waters
- Shearwaters in Bay of Plenty and Hauraki Gulf



Files provided

- Data provided as a csv file, with a single row for each count
- A file also provided with details of all grooming (record updated, old, value, new value, and rule used)
- Trip numbers and observer names anonymized, vessel lengths rounded to the nearest 5 m, and locations rounded to the nearest 0.2 degrees
- Final data set will need approval from Ministry of Fisheries and Department of Conservation before release

Making data available

Creative commons

- Released under a creative commons attribution license
- As recommended by State Services Commission e-govt policy
- Allows free use of the data for any purpose, provided only that due attribution is given
- Aim is to maximise use and availability of the data

Making data available

seabirds.dragonfly.co.nz

- Data will be hosted on website
- Website will also include a simple interface for exploring the data by species, season, and year
- Website will allow updates to be easily made available as new data is processed
- Once it is released it may also be shared with other organisations that archive seabird data (OBIS, seabirds.net, etc.)

Summary

- Observer count data will improve our understanding of interactions between seabirds and fisheries
- Data will give temporal fishery-specific information that is current unavailable, for a range of seabird species
- Data will be released under an open license that allows it to be used in other seabird and fisheries analyses
- The caveat is that the data are of variable quality, being collected by observers with a range of experience, and under a loosely specified protocol
- Recommend that the forms are modified to improve data quality, as will be discussed with DOC

Acknowledgments

- Thanks to Johanna Pierre and Stephanie Rowe who initially supported the project to get these data off paper and made available
- Funding for the project was provided by the Department of Conservation, and we are grateful for their continuing encouragement
- We are especially grateful to all the observers who have put in the time at the back of vessels counting birds, in all sorts of conditions
- Thanks are also due to our data-entry team, who spent many hours typing in a thousand or so detailed forms
- The photograph of a Buller's albatross used in the banner was from angrysunbird on flickr, and was released under a Creative Commons Attribution Sharealike license – pass it on!