What Happened to the 3,330,000 Missing Storm-Petrels? April Hedd [april.hedd@canada.ca], Neil Burgess [neil.burgess@Canada.ca] and Bill Montevecchi [mont@mun.ca] Memorial University of Newfoundland Environment Canada P Regular



LAND ACKNOWLEDGEMENT



We respectfully acknowledge the territory in which we gather as the ancestral homelands of the Beothuk, and the island of Newfoundland as the ancestral homelands of the Mi'kmag and Beothuk. We would also like to recognize the Inuit of Nunatsiavut and NunatuKavut and the Innu of Nitassinan, and their ancestors, as the original people of Labrador. We strive for respectful relationships with all the peoples of this province as we search for collective healing and true reconciliation and honour this beautiful land together.

Detective-like Investigation

- What we know.
- What we need to know.
- What we will never know.
- Current and future research
- What we can do



Approach

• Population Trends



- Mechanisms of Population Change
- Influencing Factors [risk at sea, food + climate, pollution, predation]
- Movements at Sea
- Lack of Scientific Monitoring at Offshore Oil Platforms
- Mitigation Options
- Need for Adequate Regulation



Mother Carey's Chickens



Most Abundant Breeding Seabird in the Northwest Atlantic



11 Breeding Seabird Species



Species' Largest Colony

1980s

3,300,000 pairs

6,600,000 adults

10,000,000 adults + chicks

[Sklepkovych + Montevecchi 1989]



Population Change

2013

2,020,000 pairs

4,040,000 adults

6,600,000 [1980s] - 4,040,000 [2013]

- 2,560,000

[Wilhelm et al unpub]

Witless Bay Ecological Reserve



Gull and Great Islands

8 Breeding Seabird Species



Witless Bay Ecological Reserve

Gull and Great Islands

1990s/early 2000s

699,000 pairs

1,398,000 adults

2,097,000 adults + chicks



Population Change

2011-2012

314,000 pairs

628,000 adults

1,398,000 [2000s] - 628,000 [2012]

- 770,000

[Wilhelm et al 2015; Bond et al unpub]



Witless Bay



- 2,560,000 - 770,000 -

-3,330,000 Missing Storm-Petrels



Witless Bay



- 2,560,000 - 770,000 - 3,330,000 Missing Storm-Petrels

15 % of World Population



Witless Bay



- 2,560,000 - 662,000 - 3,222,000 Missing Storm-Petrels

IUCN Listing = VULNERABLE

National Advisory Panel on Marine Protected Area Standards

• Mandate

• The mandate of the Panel is to gather perspectives and offer recommendations to the Minister of Fisheries, Oceans and the Canadian Coast Guard on categories and associated protection standards for federal MPAs (i.e. *Oceans Act* MPAs, National Wildlife Areas, marine Migratory Bird Sanctuaries and National Marine Conservation Areas), using IUCN guidance as a baseline.

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Population trends

Trend

Declining
Increasing
Stable
Unknown

Sources: Robertson & Elliot 2002 S. Wilhelm *et al.* unpubl. data A. Bond *et al.* unpubl. data Wilhelm *et al.* 2015 Robertson *et al.* 2002 Robertson *et al.* 2006 M. Mallory pers. obs. Oxley (1999) L. Minnich *et al.* unpubl. dat R. Mauck pers. obs.



What do we know about the population?

?

- Adult survival
- Juvenile success
- Breeding productivity



Adult survival is poor

CMR (analyzed with program MARK) Data collected by grubbing annually during incubation



Colony	Years	Annual survival (± se)	Annual recapture rates	Source
Gull Is, NL	2003-15	79 ± 1.5%	0.33 – 0.79	Hedd et al. unpubl.
Baccalieu Is, NL	2013-15	79 ± 3.4%	0.47 – 0.59	Hedd <i>et al.</i> unpubl.
Middle Lawn Is, NL	2003-08	83 ± 4.6%	0.30 - 0.34	Fraser & Russel unpubl.
Bon Portage Is, NS	2010-13	78 ± 4.0%	0.55 – 0.68	Fife <i>et al.</i> 2015
Kent Is, NB	1962-95	~85%		Mauck et al. 2012



Breeding productivity is good



Gull Island

Average = 97 ± 3.1%



Adult survival is poor



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Where is the adult mortality?

Seasonal Effects?

Seasonal survival

- Adult survival poor
- Where is survival bottleneck?
- Custom built PIT tag burrow loggers to record burrow entry/exit.
 - Estimate survival using "known fate" model









~65 units operating at Gull Is in 2016-17

Fifield et al in prep

What are the population threats?

- Spatial risks at-sea (breeding and wintering areas)
 - Attracted to light
- Ocean climate change
 - Effects on food supply
- High Mercury levels
- Predation at colonies



Assessing risks at-sea



- Tracking birds to understand
 - Habitat use
 - Spatial risks (oil platforms)
 - Breeding
 - Non-breeding seasons

Incubation 2013-14 (GLS)





131 birds, 7 colonies (405 trips)

Duration: 4.0 ± 1.4 d

Range: 580 ± 243 km

Distance: 1,410 ± 592 km

Recovery rate = 74

Hedd *et al.* 2018

Core areas: overlap with oil platforms 2013 - 2014



Incubation 2016-17 (GPS)



Baccalieu Island 3.5 ± 0.1 d 1575 ± 118 km

<u>Gull Island</u> 3.4 ± 0.3 d 1324 ± 135 km

<u>Recovery rate (all sites)</u> 81% (77 of 95)

Winter (Dec-Feb): NL colonies





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Colony	Year (n)	
Baccalieu	2013-14 (1) 2014-15 (1)	
**Gull	2012-13 (1) 2014-15 (13)	
Middle Lawn	2014-15 (2)	
Total	18 birds	

****** targeted winter deployment



Mercury exposure of breeding Leach's storm-petrels related to their foraging patterns in the northwest Atlantic Ocean

Neil Burgess, April Hedd, Ingrid Pollet, Robert Mauck, Antony Diamond, Chantelle Burke, Laura McFarlane Tranquilla, William A. Montevecchi, Michelle Valliant, Gregory Robertson

13th International Conference on Mercury as a Global Pollutant, Providence, Rhode Island

Study Sites in Atlantic Canada



Blood Mercury



- Blood samples collected from 193 birds from 7 colonies (2013-15)
- Blood Hg ranged from
 0.14 2.33 µg/g (wet wt.)
- Hg levels: Nfld colonies > Bay of Fundy
 Year: 2013 > 2014, 2015

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Blood Mercury & Maximum Ocean Depth



Why Higher Mercury in Newfoundland?

Primary prey = Lanternfish



- Only in deep ocean
- Large daily vertical migration (0 700m)
- Near ocean surface at night when storm-petrels feed
- Not found in shallow waters on continental shelf

Pollution

• Plastic

1980s/early 2000s

 < 10% of birds had plastic in stomachs
 [Hedd + Montevecchi unpub]

• 2011

48% had plastic in stomachs

• Research needed



Predation at colonies



- Gull predation at some declining colonies in NL
- Great Is ~49,000 petrels taken 1997 (Stenhouse et al 2000)
- Gull Is ~133,000 and ~109,000 petrels taken 2012 and 2013 (A Bond et al. unpubl)
- Also, Small and Middle Lawn Is
- Very few gulls at Baccalieu!
- Nova Scotia Vole and mink predation Country Island

Gull Populations Decresing



S. Wilhelm pers. comm.

Light Attraction to Platforms??



Photo: C Burke

Aggregation at Platforms



Support Vessel Surveys [1999, 2000] showed birds aggregated at platforms

Aggregation at Platforms



FIGURE 4. Distribution of all seabirds binned into 5 km segments from three surveys during July and August 2000.

Influencing Factors [Not Mutually Exclusive]

Leach's Storm-Petrels

Most attracted, most vulnerable and most affected seabird to offshore platforms (magazine articles, anecdotal reports, rig workers)



B Mactavish

Influencing Factors [Not Mutually Exclusive]

- Pollution ??
- Predation NO
- Climate Change & Food Availability ??
- Light Attraction to Platforms ??



Potential Causal Factors [Not Mutually Exclusive]

- Pollution ??
- Predation NO
- Climate Change & Food Availability ??
- Light Attraction to Platforms ??
- Why make this effort?



We Can Reduce Risk

- - monitoring on platforms
- -- return gray water
- turn off flares during critical periods
- - reduce skyward lighting
- reduce all lighting
- ullet

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• - green lighting



Much can be done to reduce risk – green-lit gas platform on Dutch coast



Looming Questions

- What's going on at Baccalieu?
 - Juvenile birds?
- What's going on at platforms?
- Why is the regulation so weak?





Thank you

What do you think?