

What's happening with marine birds?



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‘But, as you have already pointed out, we do not need any more disjointed clues,’ said Bartholomew. ‘That has been our problem all along: we have a mass of small facts and small scraps of information, but we are unable to make any sense out of them. The last thing we need is more.’

Susanna Gregory, *A Summer of Discontent*



Outline

- Seabirds as biological indicators
- Rhinoceros Auklet 2016 breeding season
- Status and trends of Salish Sea seabirds
- Status of forage fish in the Salish Sea



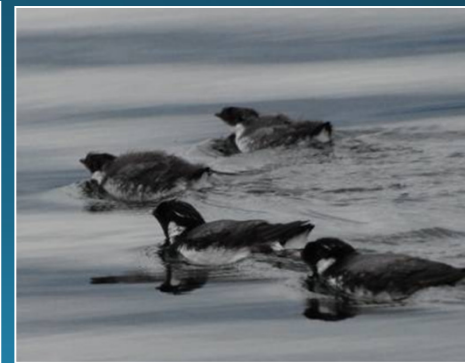
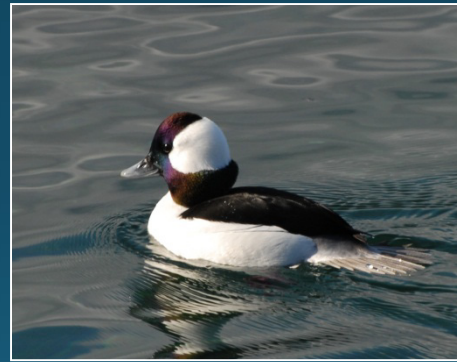
Seabirds as biological indicators



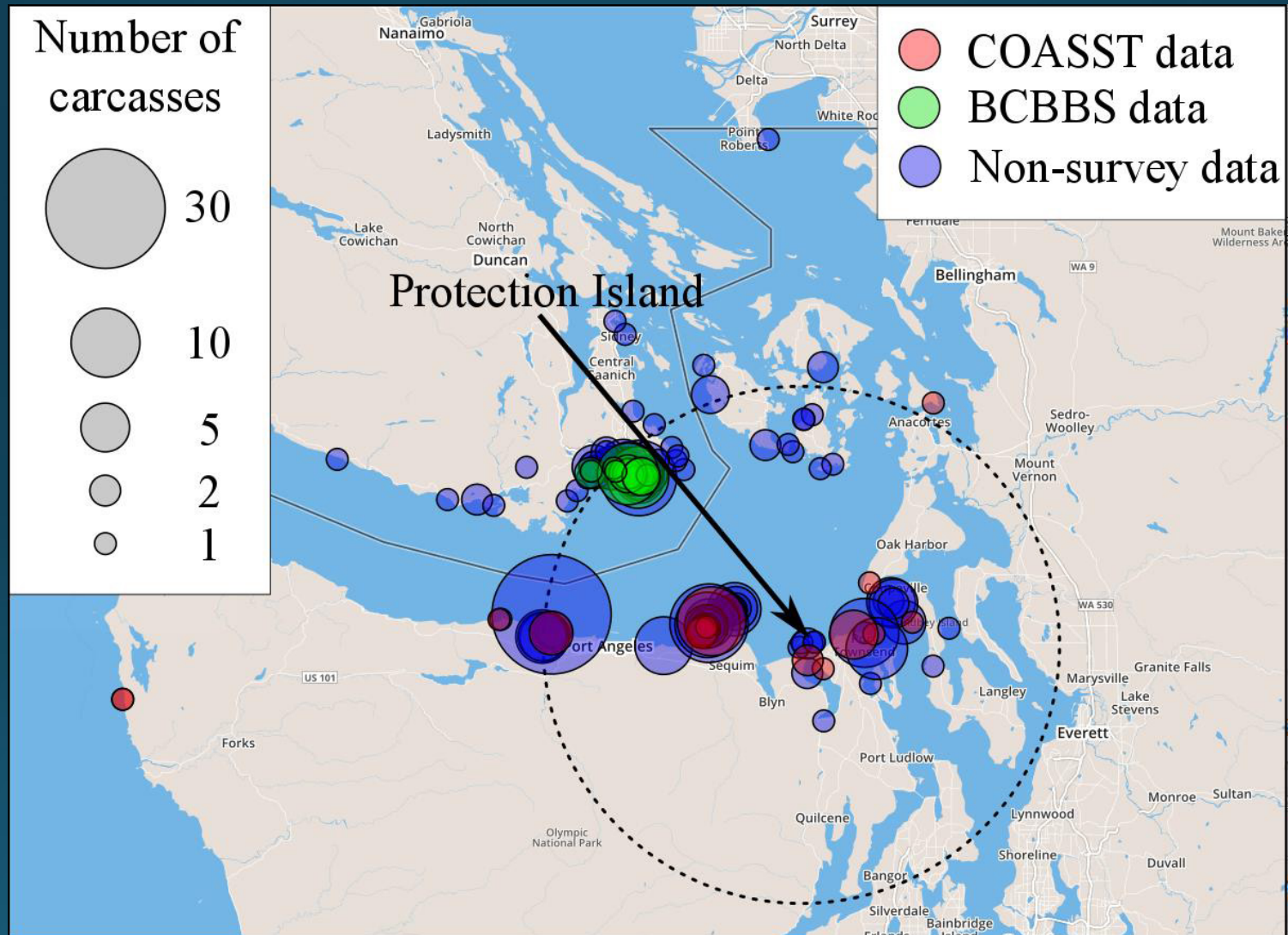
Seabird community in the Salish Sea: *Summer*



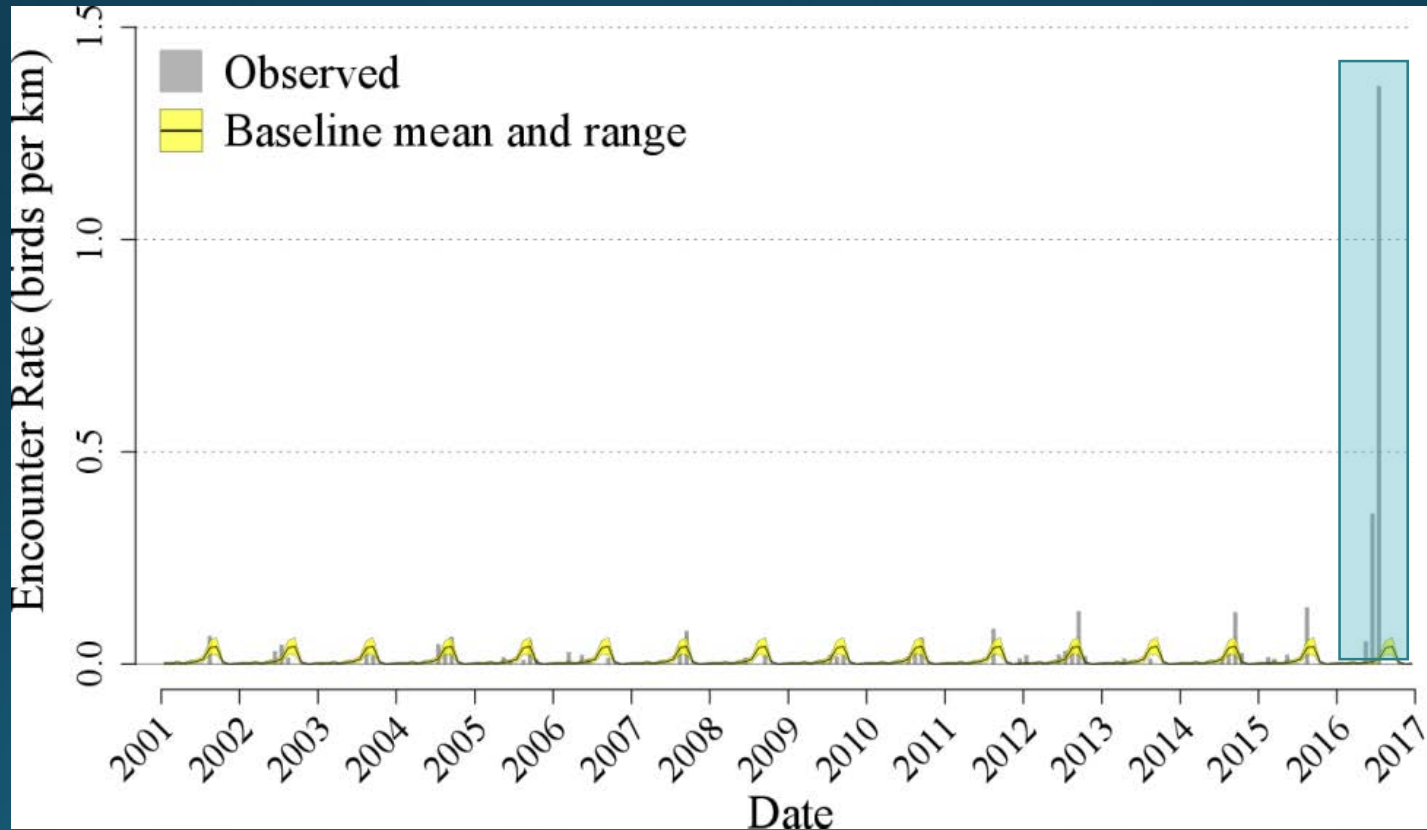
Seabird community in the Salish Sea: *Winter*



Rhinoceros Auklet mass mortality event



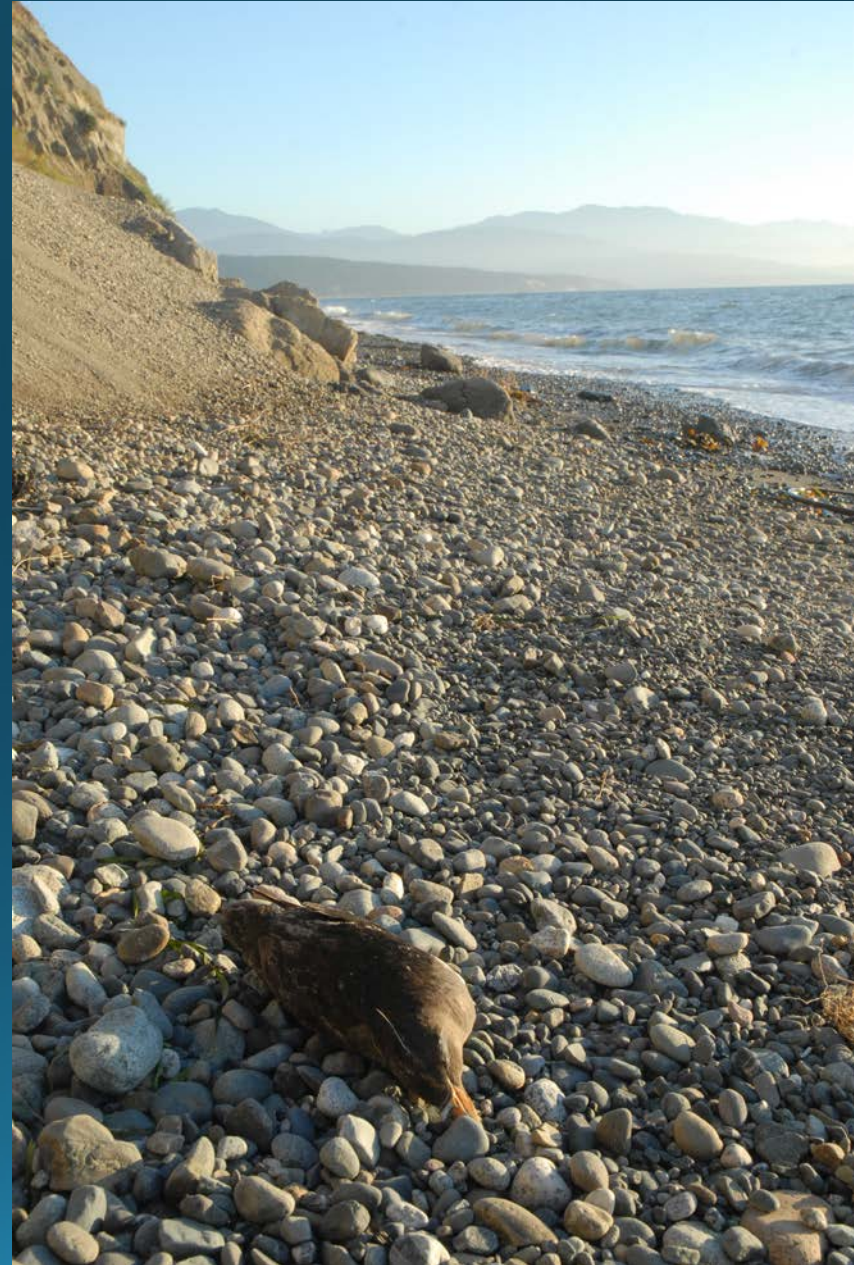
Carcass encounter rates



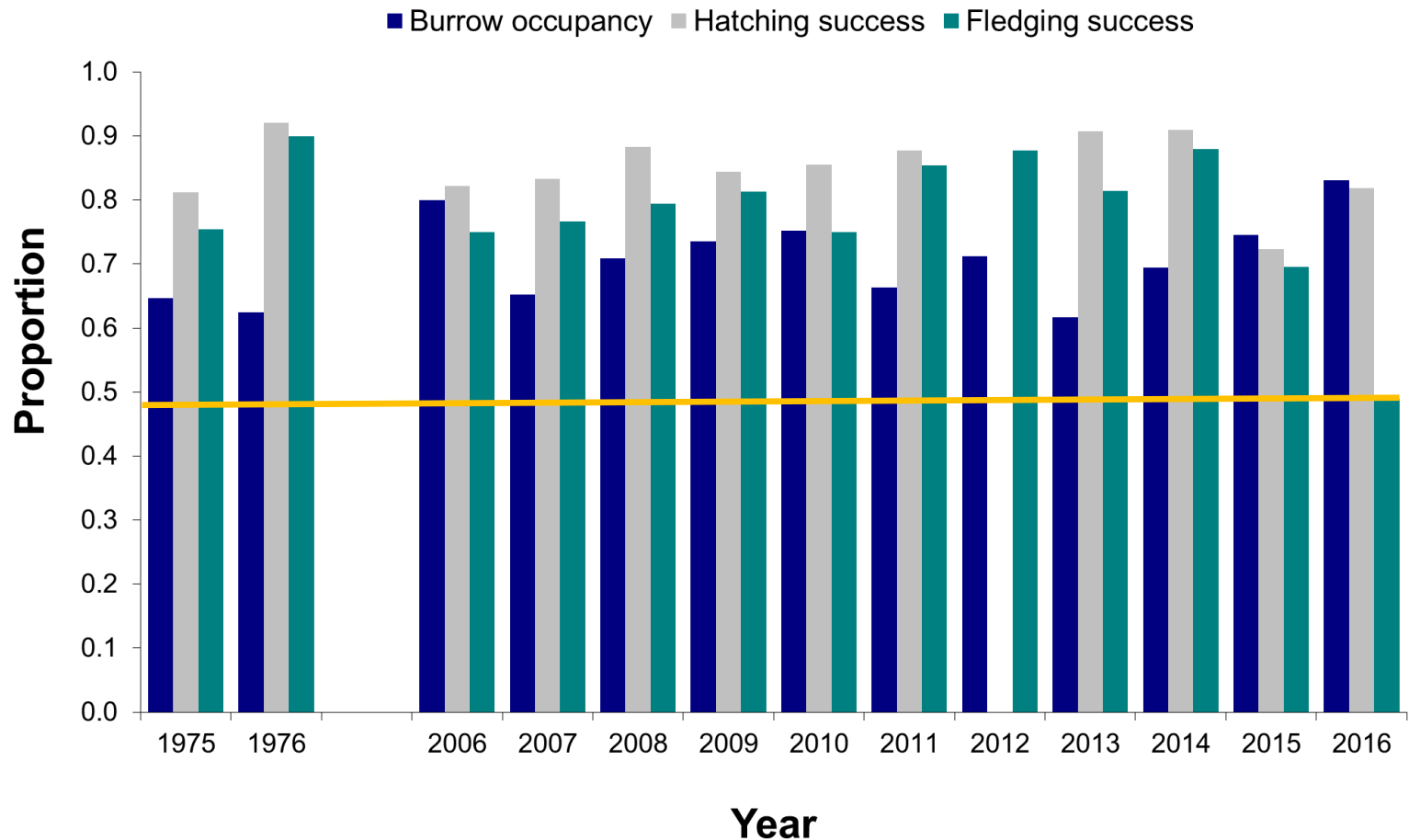
Courtesy of COASST

Causes of event

- Bacterial septicemia and pneumonia
- Poor body condition/ emaciation



Rhinoceros Auklet reproductive success: Protection Island



Rhinoceros Auklet 2016 breeding season

- Fledging success: 49-58%
 - Long-term average: 70-81%
 - Delayed chick development and high chick mortality
 - Highest mortality in 13 years
- Chick necropsies
 - Starvation
- Diet on PI
 - Very small sandlance and herring
- Destruction Island
 - Normal reproductive success



Seabird monitoring programs

Program	Time of year	Method	Scope
Marbled Murrelet WDFW 2001-2016	Spring/Summer (May – July)	Boat – Distance sampling	Puget Sound & Strait of Juan de Fuca
Puget Sound Seabird Survey Seattle Audubon 2007-2016	Winter (Sept – April)	Shore point count – Distance sampling	Puget Sound & Strait of Juan de Fuca
BC Coastal Waterbird Bird Studies Canada 1999-2016	Winter (Sept – April)	Shore point count	Strait of Georgia, Strait of Juan de Fuca, W. coast VI
PSAMP WDFW 1993-2013	Winter (Dec – Jan)	Aerial strip transect	Puget Sound & Strait of Juan de Fuca



Karen Barry



Joe Evenson



Monique Lance
















Local breeders

Species	Trend (2001-2013)
Common murre	↔
Cassin's auklet	↑
Marbled murrelet	↓
Pelagic cormorant	↔
Pigeon guillemot	↔
Rhinoceros auklet	↔

Alcids and cormorants

Species	MAMU (2001-2013)	PSSS (2008-2013)	BCCWS (1999-2013)	PSAMP (1993-2013)
Pigeon guillemot	↔		↑	—
Rhinoceros auklet	↔	↑	↓	—
Marbled murrelet	↓			—
Common murre	↔	↑	↑	—
Double-crested cormorant		↑	↓	—
Pelagic cormorant	↔			—
Brandt's cormorant		↑		—

Loons and grebes

Species	PSSS (2008-2013)	BCCWS (1999-2013)	PSAMP (1993-2013)
Common loon			
Pacific loon			
Red-throated loon			
Loons			
Red-necked grebe			
Western grebe			
Horned grebe			

Mergansers

Species	PSSS (2008-2013)	BCCWS (1999-2013)	PSAMP (1993-2013)
Red-breasted merganser	↑		
Common merganser			
Hooded merganser		↓	
Mergansers			↔



Barry Troutman

Scoters

Species	PSSS (2008-2013)	BCCWS (1999-2013)	PSAMP (1993-2013)
Surf Scoter	↑	↓	
White-winged Scoter	↓	↓	
Black Scoter		↓	
Scoters			↓



A tale of two “puffins”:

Contrasting patterns



Population size

Reproductive success

Diet



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Seabird ecological traits as risk factors

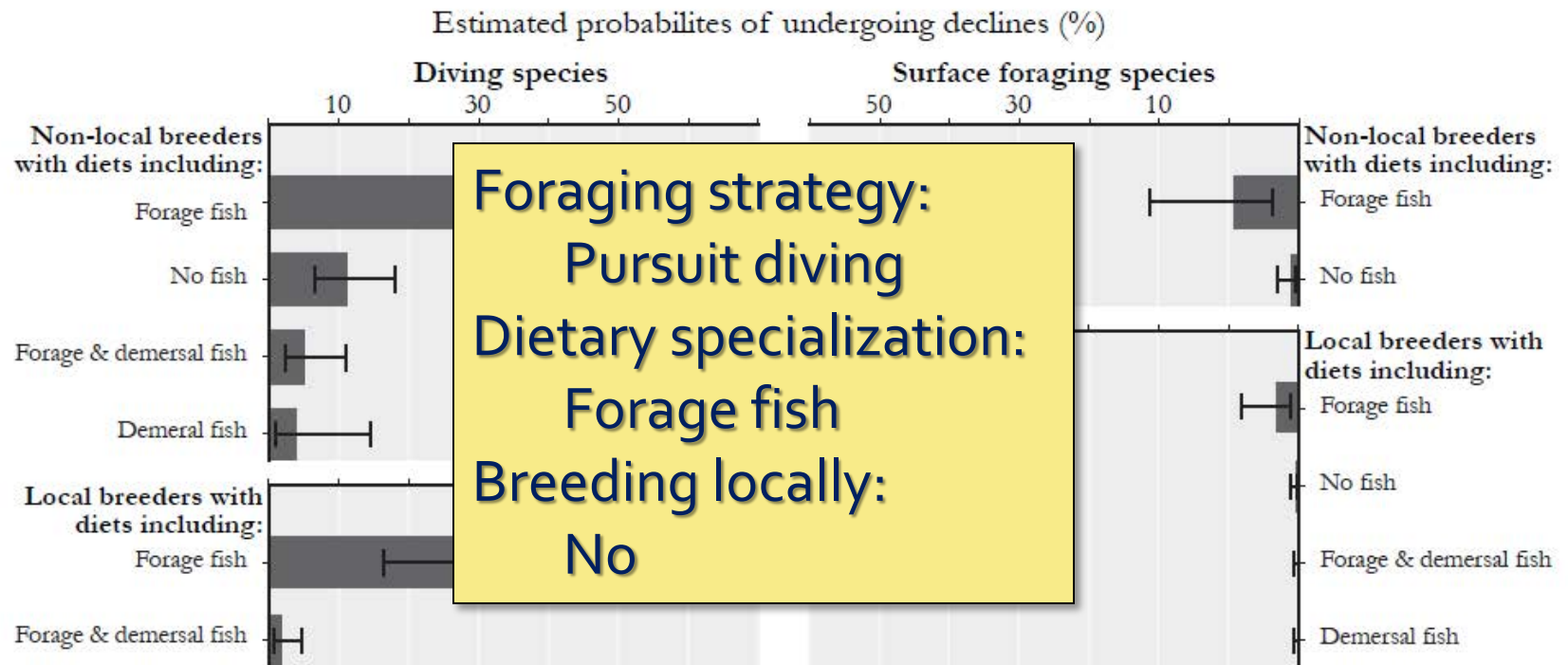
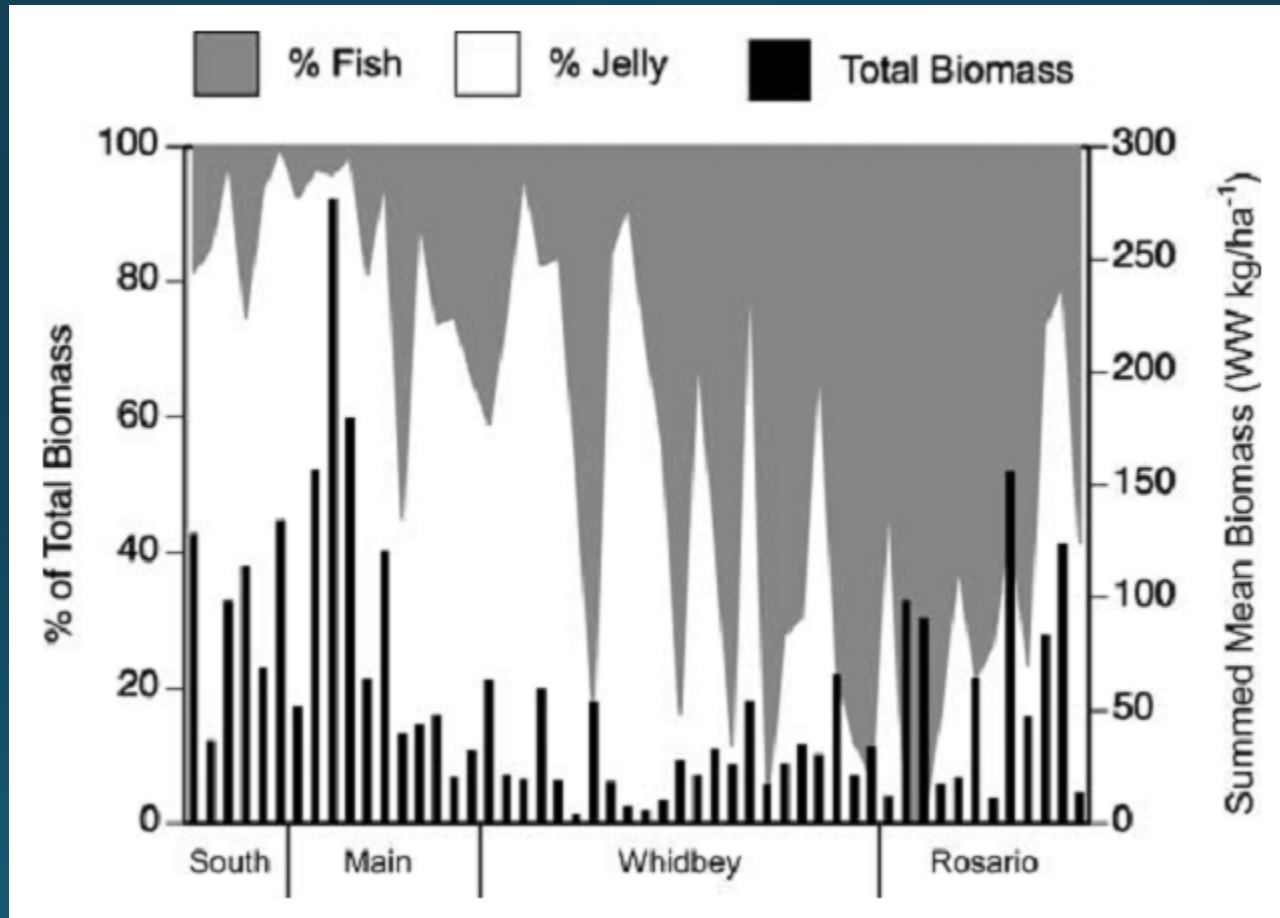


Figure 2. Estimated probabilities of undergoing declines >50% in mean annual counts from 1994 to 2010 for Salish Sea marine birds as a function of ecological traits identified as risk factors by logistic regression (results in Table 3). Error bars show 95% confidence intervals.

Forage fish in the Salish Sea

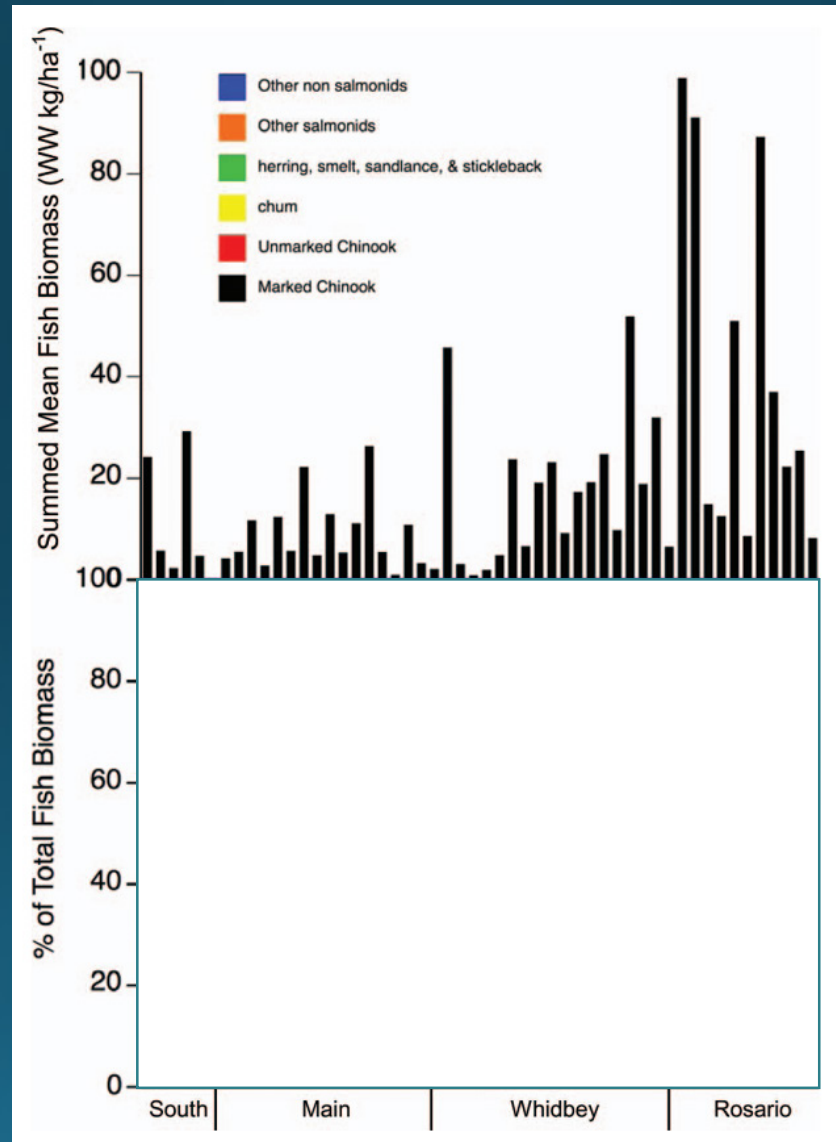


Proportion of fish and jellyfish



Rice et al. 2012

Fish biomass and composition



Take-home messages

- Complexity and dynamism of ecological systems
- Importance of temporal and spatial scales
 - Predictable vs. unpredictable variability
- Rhinoceros Auklets as a case study
 - Variability in forage fish distribution and abundance
- How do we help species buffer?
- Need for long-term, systematic monitoring
 - Marine birds
 - Forage fish
 - Potential stressors



Acknowledgments



Puget Sound Seabird Survey

Science by citizens, not just citizen science



**BC COASTAL
WATERBIRD
SURVEY**

