Planet Ocean: Using Seabirds to Assay Climate Change Implications for Labrador

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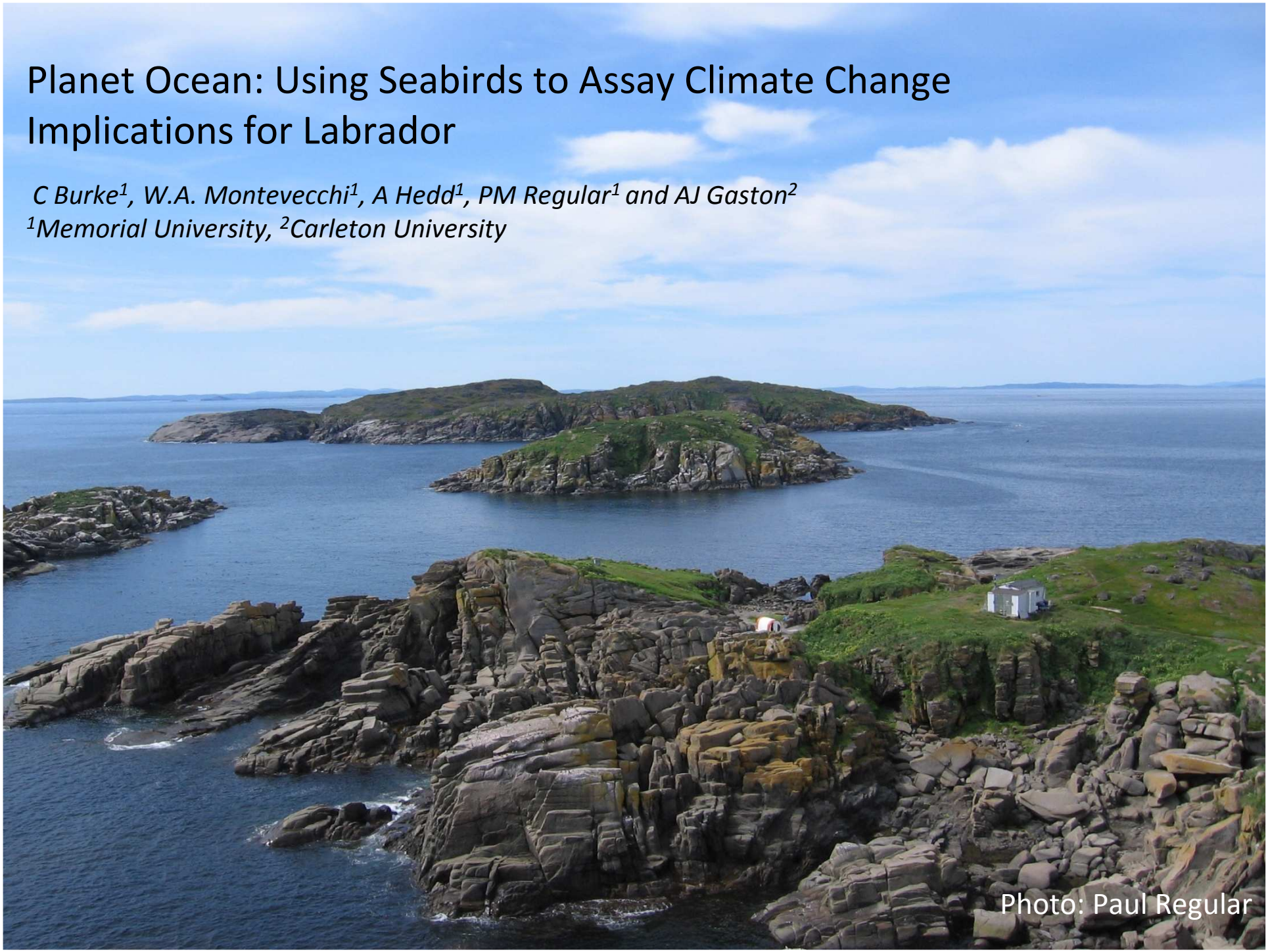


Photo: Paul Regular


The seabirds of the Gannet Islands are well known features of coastal Labrador
Thick-billed Murre
Photo: A Gaston

The Seabirds of the Gannet Islands

Atlantic Puffin

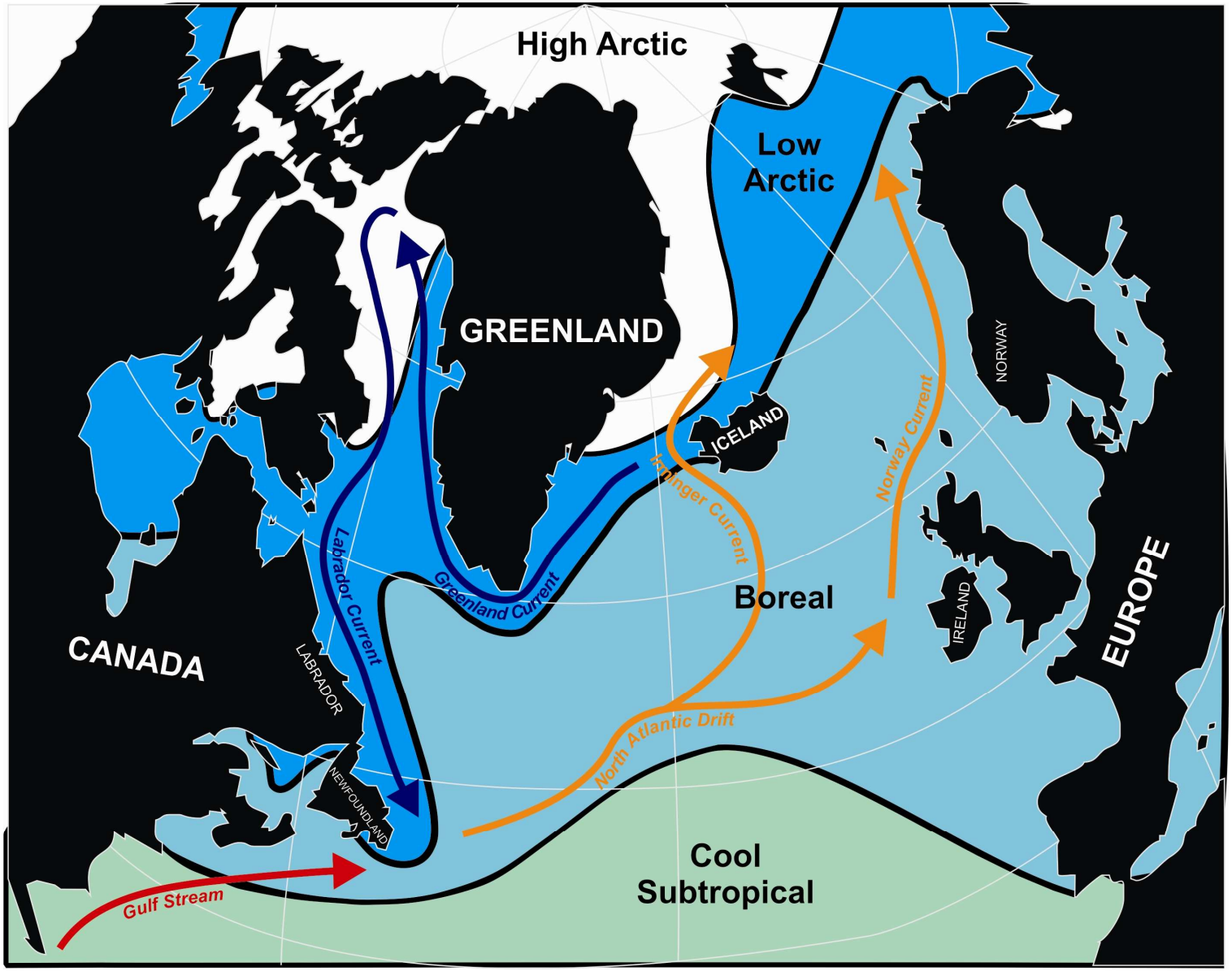
Photo: Paul Regular

The Seabirds of the Gannet Islands

Razorbill

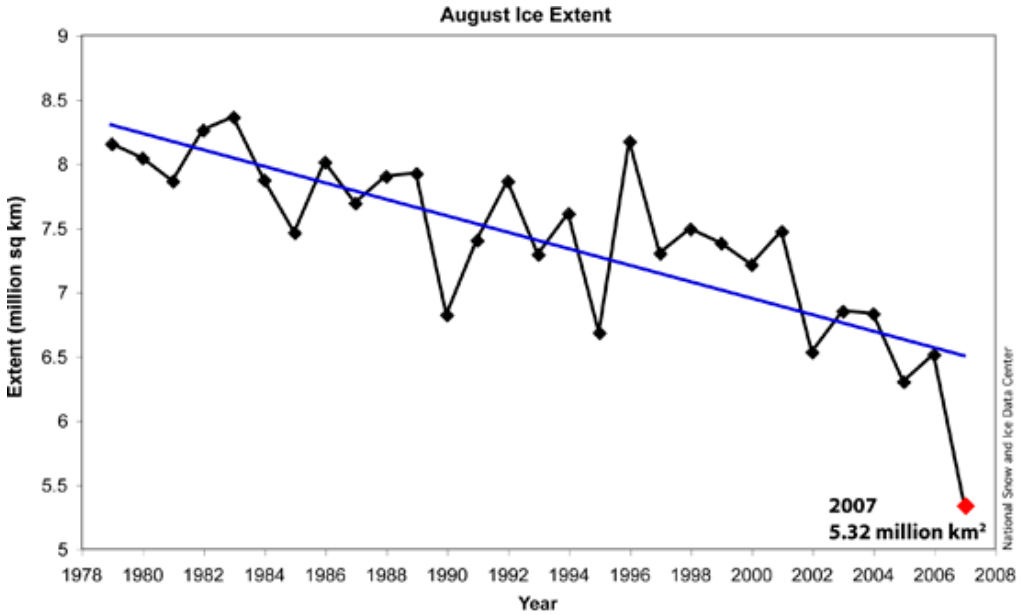
Photo: Paul Regular

The Pervasive Influence of the Labrador Current



the southernmost penetration of arctic water in the North Atlantic

The Relationship between Seabirds and Climate Change

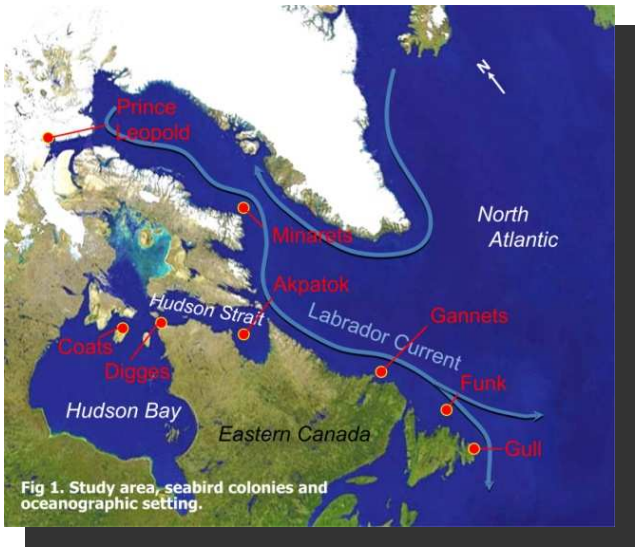


→possible effects of changes in sea ice extent

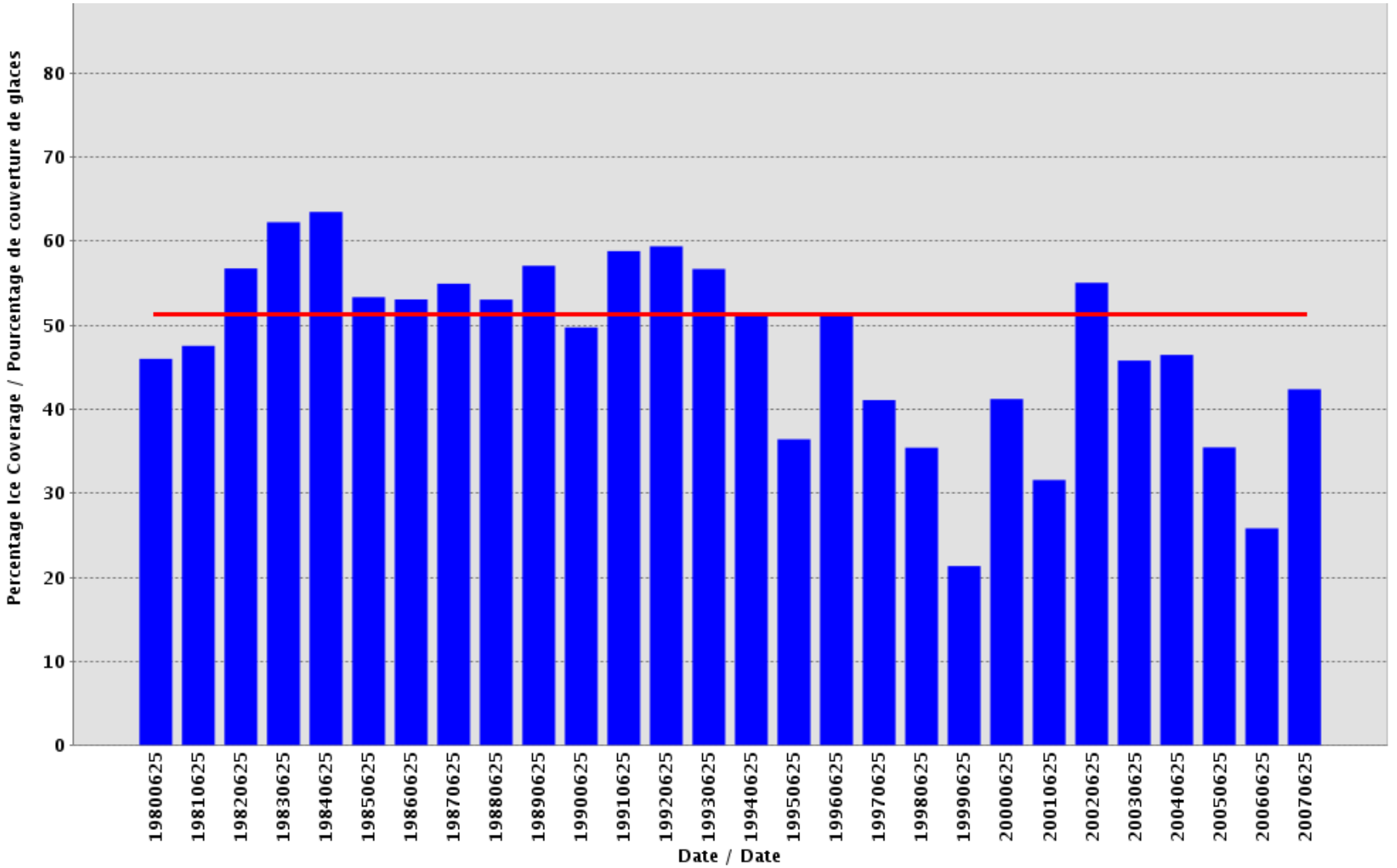
- lower availability of food for seabirds feeding at ice edges
- dietary shifts, reductions in breeding success, population declines

Shifts in Diet Associated with Changes in Sea Ice Cover

Thick-billed Murres (Coats Island, Hudson Bay)

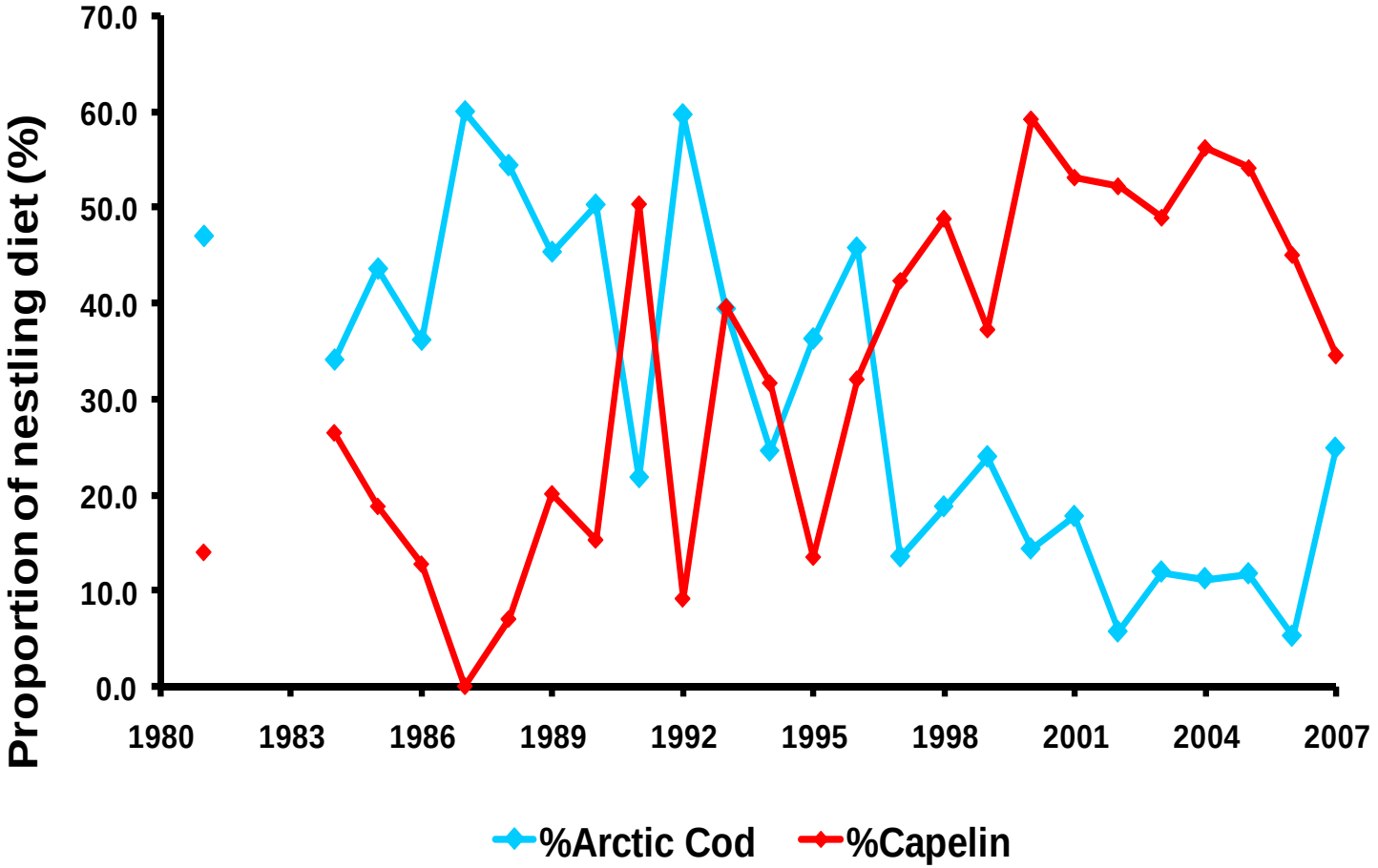


Percent Ice Cover: Hudson Bay (16 June 1980 – 2007)



Canadian Ice Service Data

Thick-billed Murre Chick Diets at Coats Island (1980 - 2007)



data from AJ Gaston

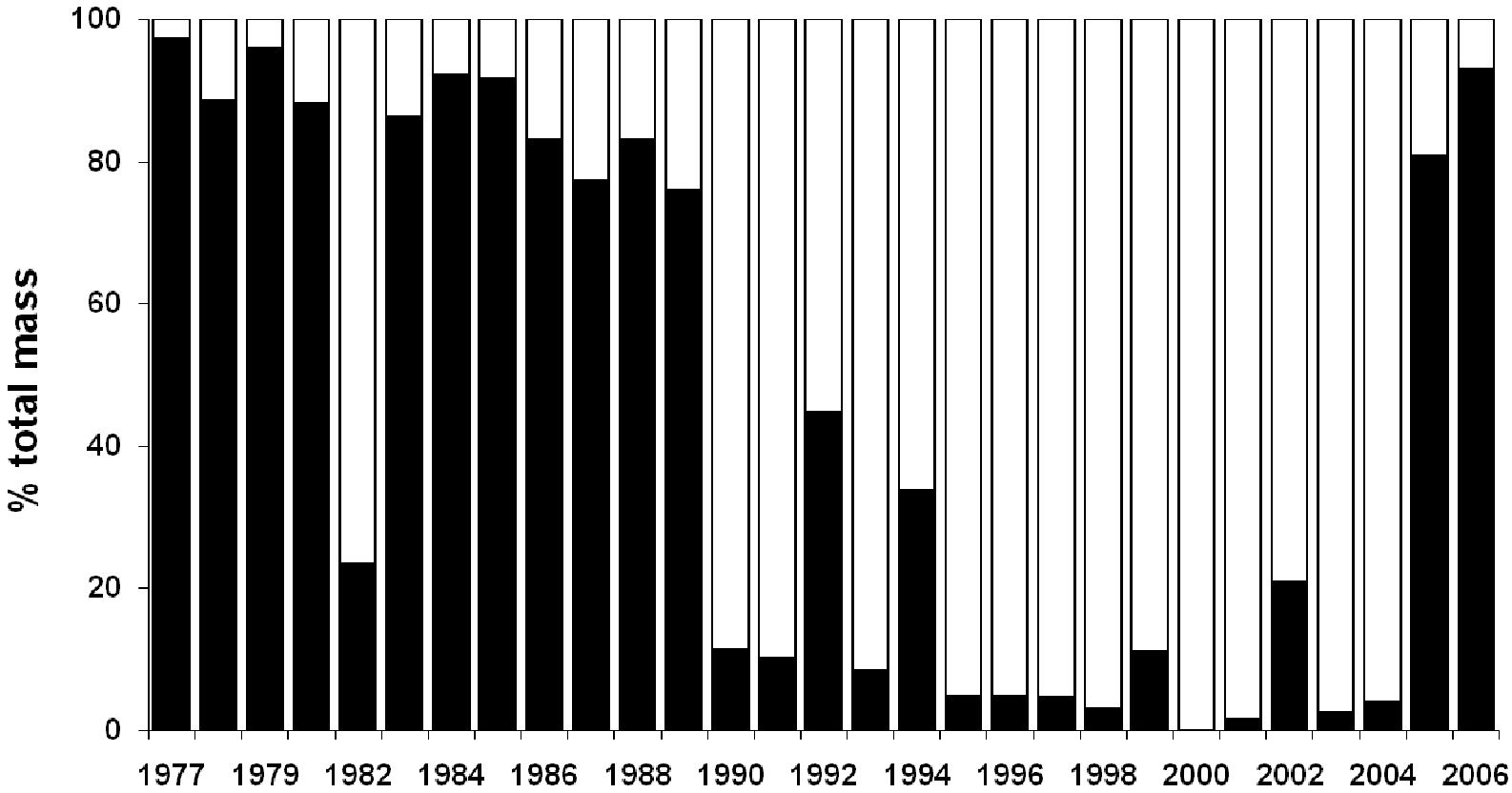
→ possible effects of warming sea surface temperatures

- shifts in prey distribution (across regions and in the water column)
  - negative and/or positive effects: shifts in the species and quality of food available to seabirds

Northern Gannet Diets at Funk Island (1977 - 2006)

Warm water prey: mackerel, squid, saury

Cold water prey: capelin, herring



data from WA Montevecchi

2005 was the first mackerel fishery in Newfoundland in 16 years

→ effects of rising sea level

- habitat loss for near shore nesters (e.g. eiders)

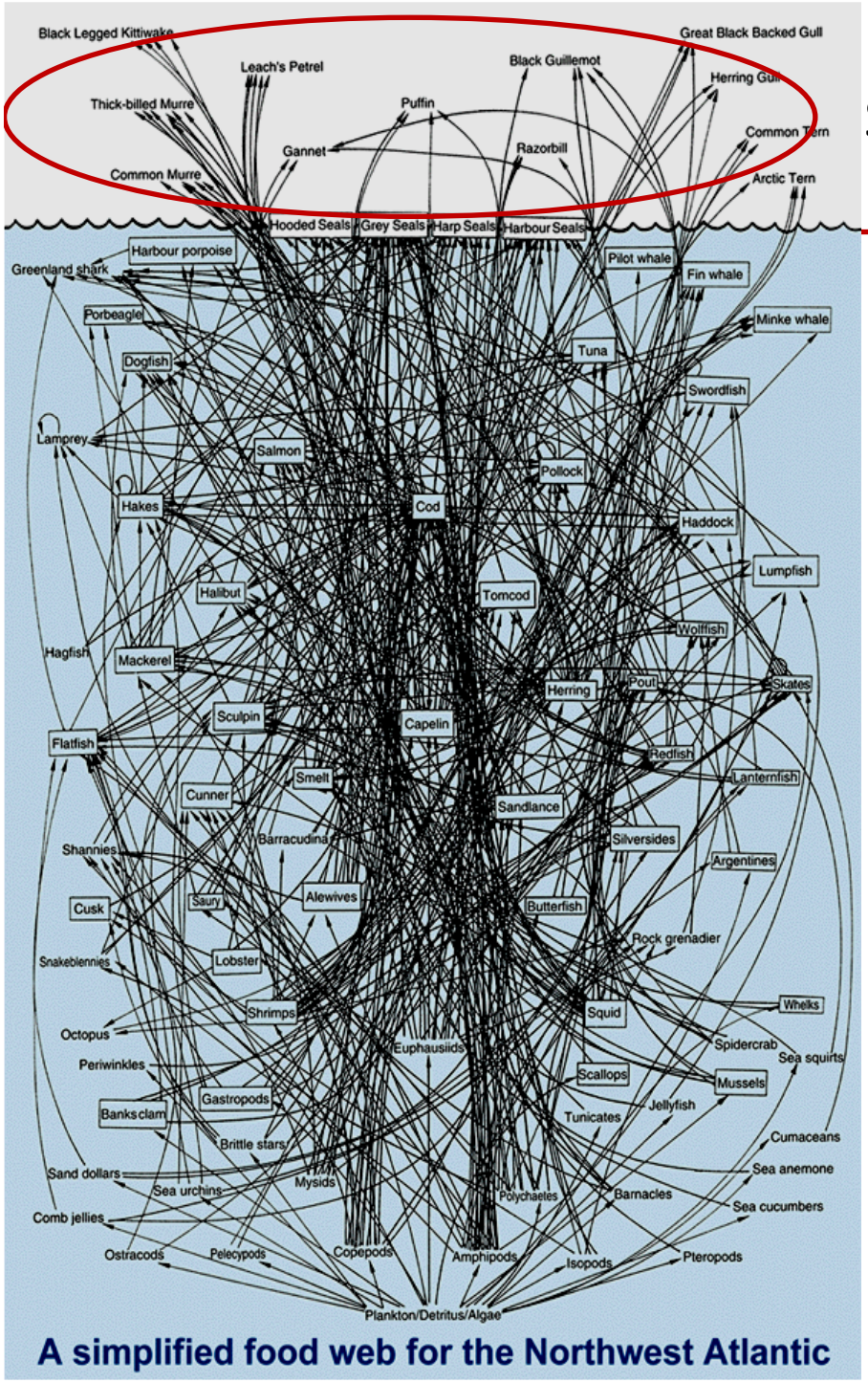
→ effects of increases in storm intensity, precipitation, air temperatures

- nest flooding, exposure, wrecks, chick mortality from mosquitoes

Using Seabirds as Indicators of Climate Change

- accessible animals
- highly conspicuous
- charismatic species; attract public attention/concern

Seabirds as top marine predators



A simplified food web for the Northwest Atlantic

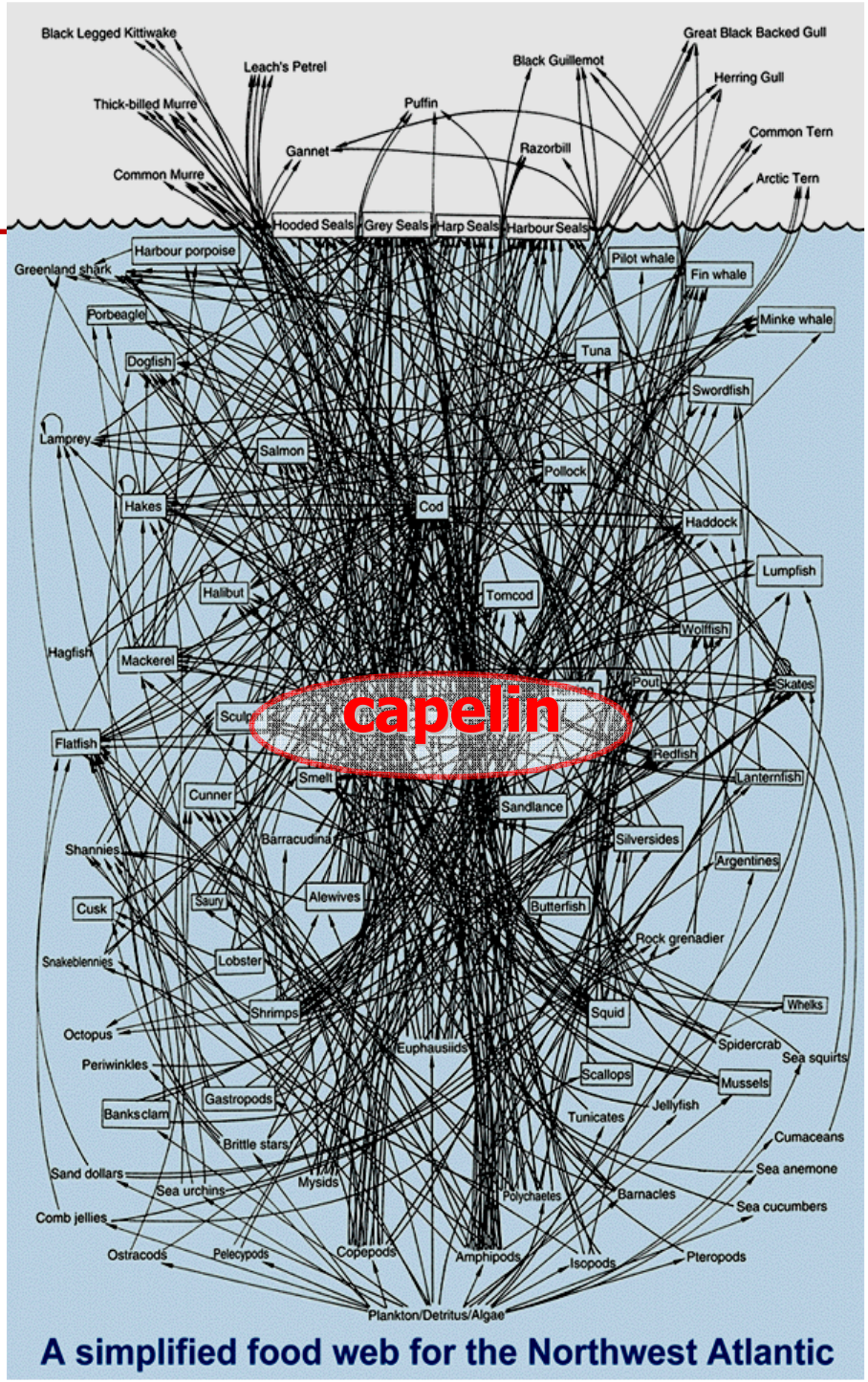
Climate-driven changes in the foodweb are reflected in the behavior of seabirds

- long diet studies are becoming more common
- new technology (data loggers) enhances our understanding of their feeding and movement patterns

from Lavigne (1996)

Capelin

- the nucleus of the marine food web
- main prey for Northern cod
- capelin spawning coincides with seabird breeding
- Capelin respond rapidly to changes in water temperature
- 1991 (the coldest year on record) precipitated major changes in capelin



Seabird Responses to Changes in Capelin Distribution (1990s)

- southward shift in capelin distribution away from Labrador in 1990s:
  → murres and puffins at the Gannet Is stopped eating capelin

- capelin shifted closer to the seabed
  → kittiwakes experienced broad-scale breeding failures

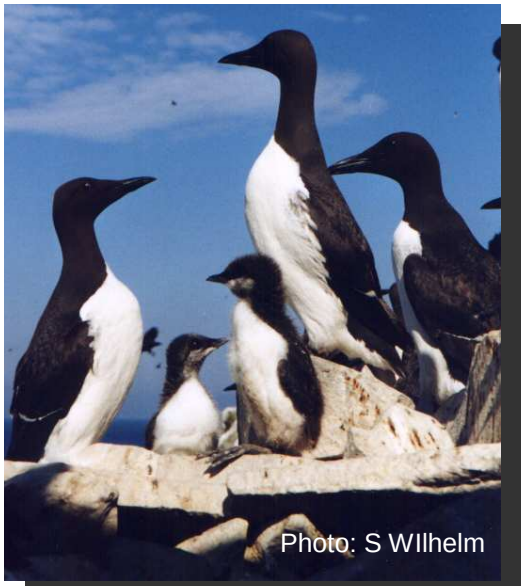

Photo: J Heath

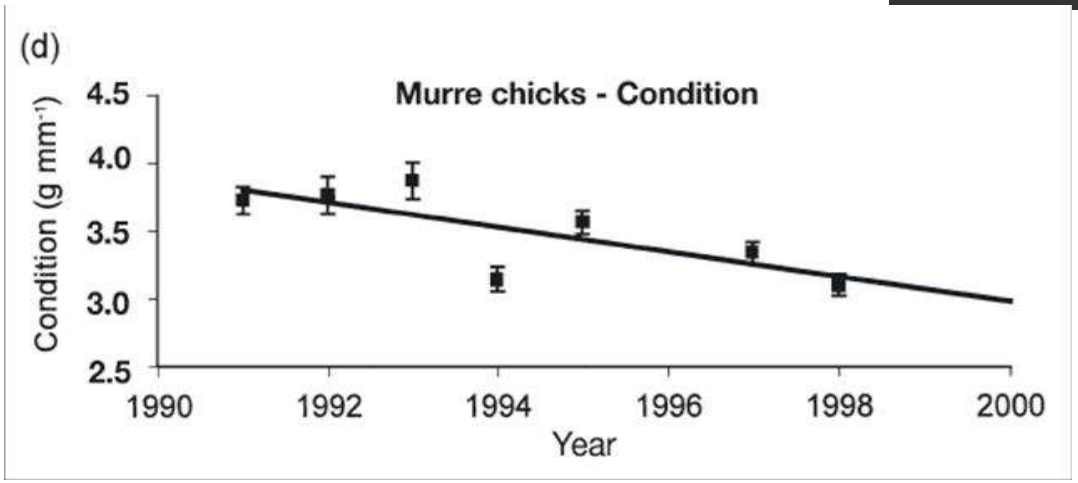

Photo: WA Montevechi

Seabird Responses to Changes in Capelin Biology (1990s)

- Capelin delayed spawning
  → seabirds delayed breeding

- Smaller capelin, reduced condition
  → declines in murre chick condition





The behavior of capelin and seabirds has lagged behind the physical events

Managing Seabirds Populations for Climate Change

→ seabirds are flexible animals that may cope with moderate changes in climate

→but… cumulative effects need to be assessed to ensure populations remain healthy

→ these include non-climate driven stressors (oil pollution, hunting, bycatch)

Cumulative Effects (Fisheries and Climate Change)

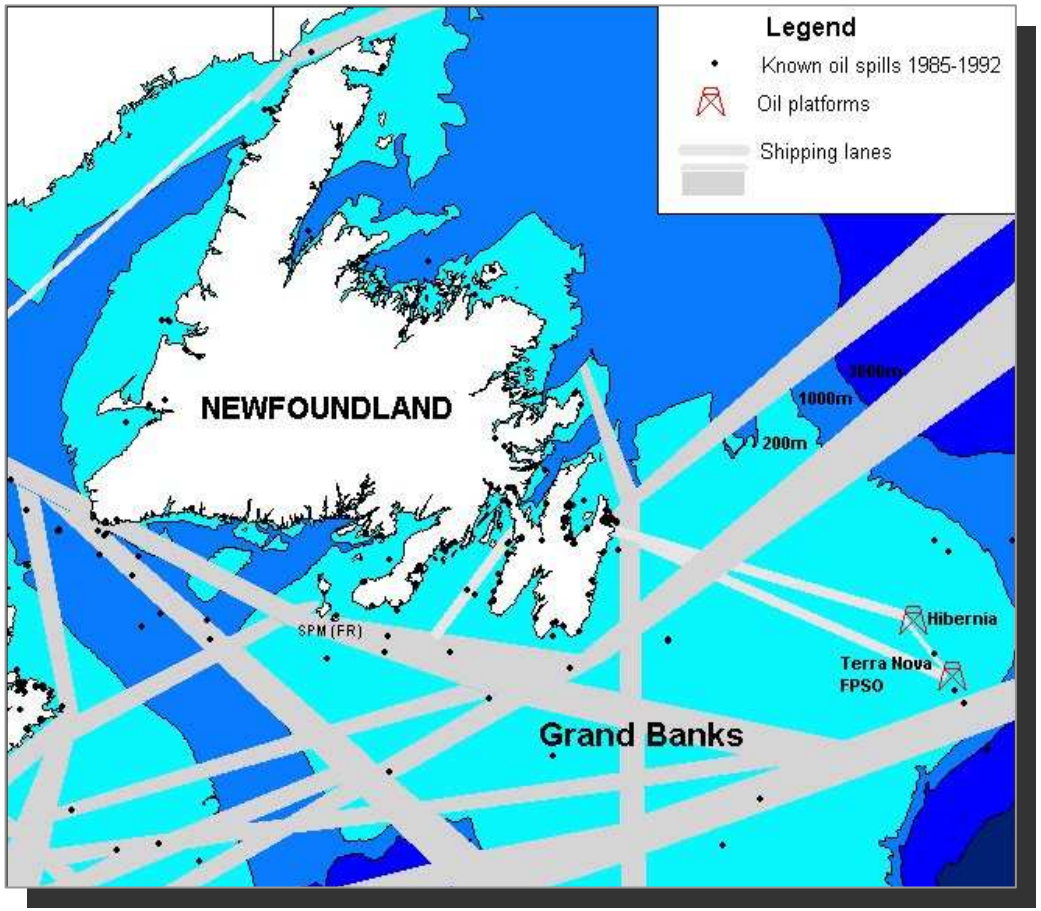
The North Sea example

industrial fishery for sandlance → declines in the main prey for seabirds

warming waters → northward migration of pipe fish to the North Sea

chicks starving that cannot swallow thorny pipe fish

Oil Pollution and Seabirds in the NW Atlantic

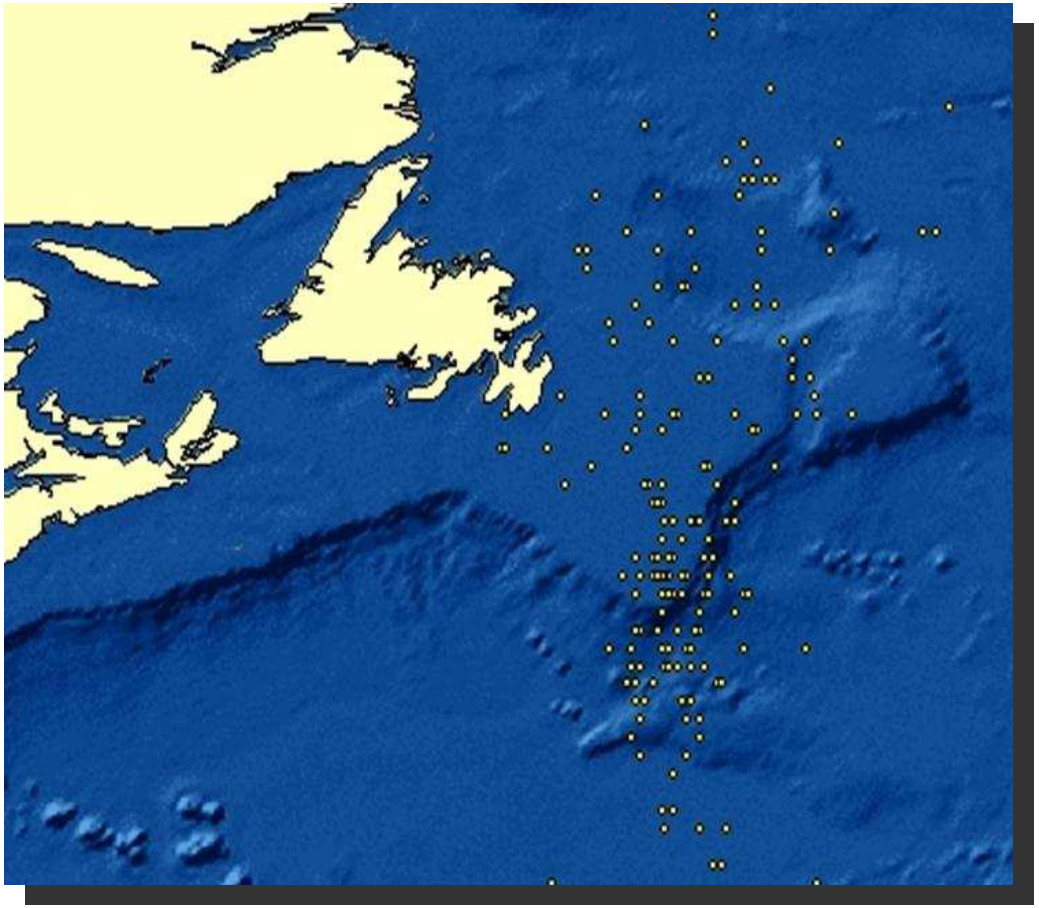


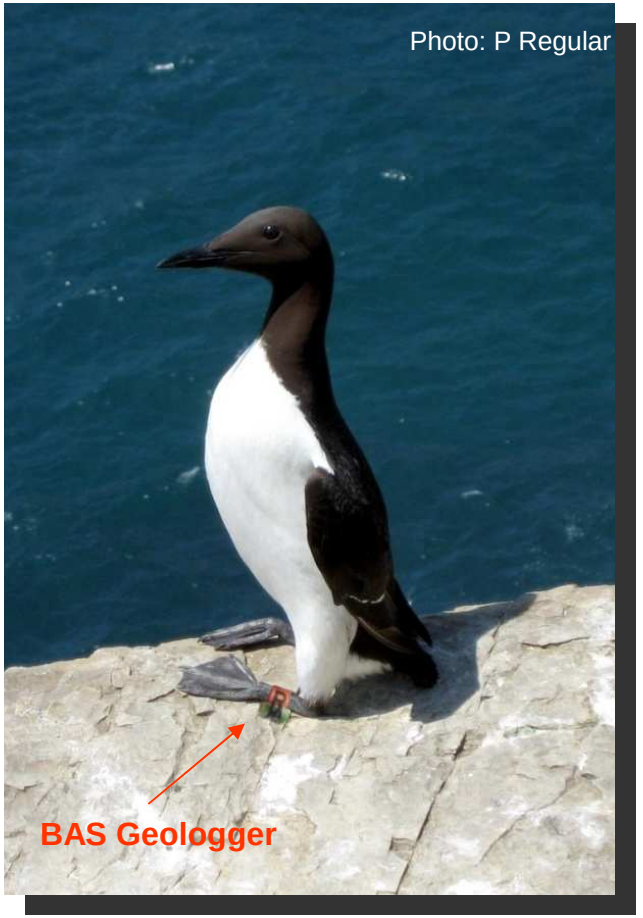
Chronic oil pollution (kills 100,000s seabirds annually)

Goal: define overlap between shipping lanes and important seabird habitat

Protecting Populations Requires Better Information

Goal: to use bird borne data loggers to define overlap between shipping lanes and important seabird habitat





Map showing the year round distribution of a Common Murre recoved at Funk Island (2007). This is the first geologger ever recovered from a Common Murre anywhere in the world.

Information from Hunters, Fishermen, Bird Enthusiasts

Eider nest boxes in St. Peters Bay: Collaboration between Ducks Unlimited, Memorial University and hunters in St. Peters Bay

Using Seabirds to Detect Arctic Ecosystem Change

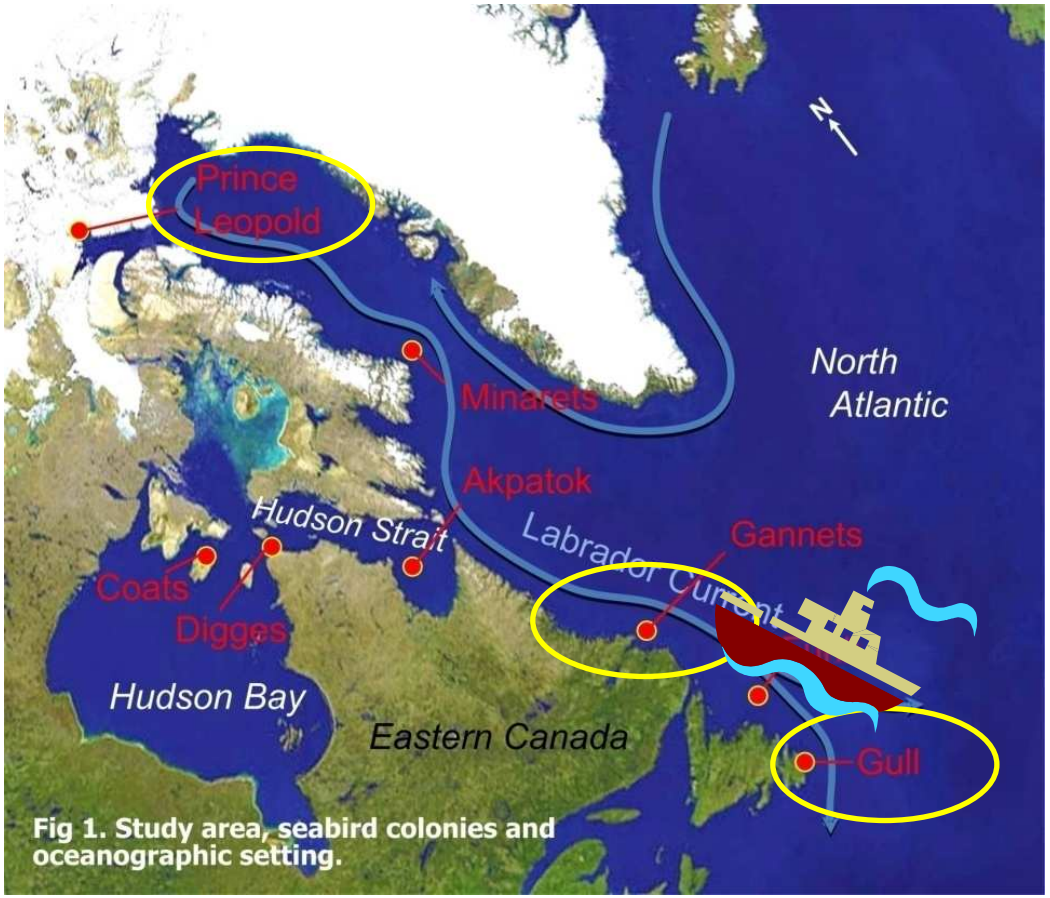


Fig 1. Study area, seabird colonies and oceanographic setting.

Goal: Advance the understanding of how changes in Arctic waters are communicated at lower latitudes - assess downstream effects

Collaborators

MEMORIAL UNIVERSITY

INTERNATIONAL POLAR YEAR 2007-2008
ANNÉE POLAIRE INTERNATIONALE

Carleton UNIVERSITY

NSERC CRSNG

UNIVERSITY OF MANITOBA

Environment Canada

Environnement Canada

British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

LOTEK WIRELESS
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