

# Project 4.7

## *Grey seals (*Halichoerus grypus*) as bioprobes: predicting impacts on their ecosystems*

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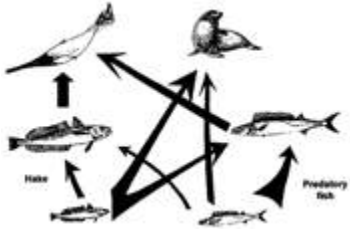
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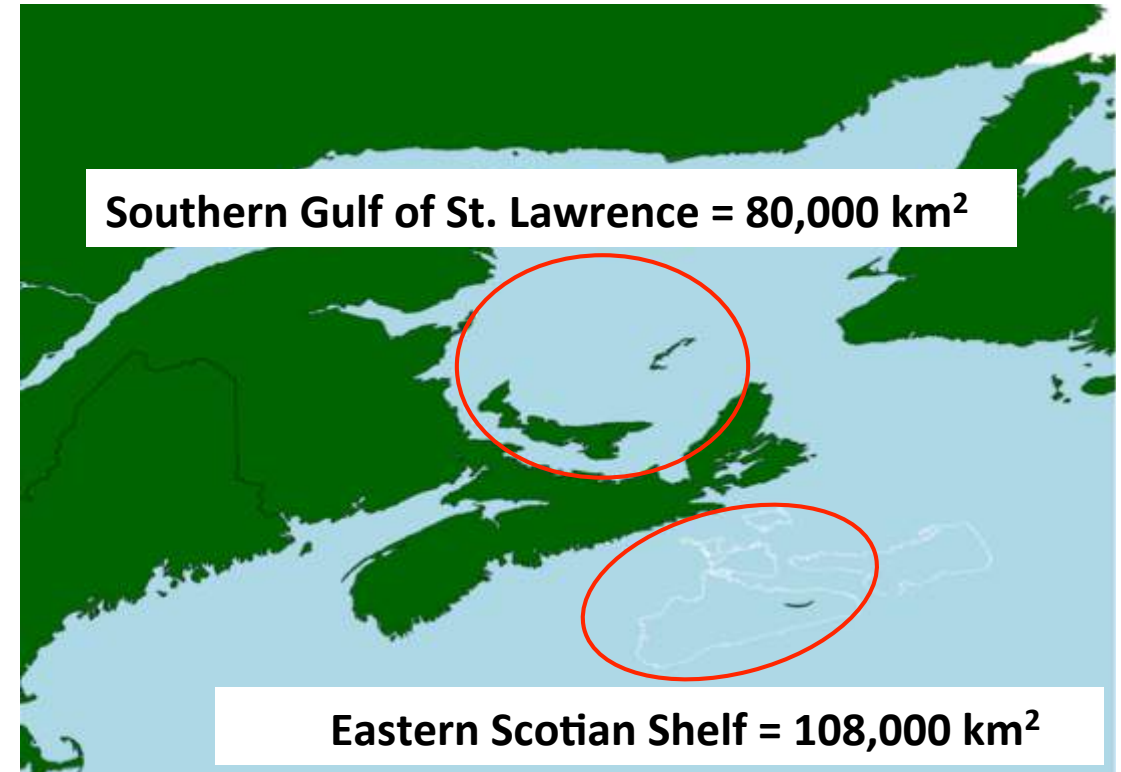


The study of predator-prey interactions in the marine environment is challenging

**Study areas are large**

**Predators and prey move extensively**

**Difficult to retrieve data**





# Project Overview

## Objectives:

- a) Spatial and temporal patterns of predator-prey encounters: using acoustic Vemco Mobile Transceivers (VMTs) on grey seals
- b) The use of accelerometers to determine behavioural signatures for foraging by grey seals
- c) Grey seal movements and foraging distribution in relation to fine- and meso-scale seasonal oceanography on the Scotian Shelf
- d) The collection of oceanographic data by grey seals: using archival light level data as a proxy for phytoplankton biomass

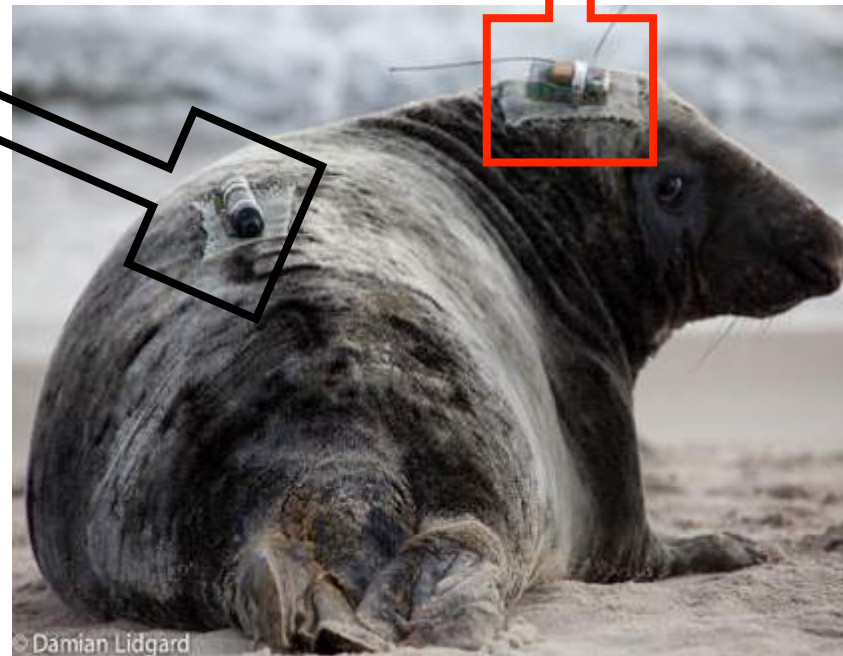


# The Vemco Mobile Transceiver (VMT) transforms the grey seal into a bioprobe



Alternates between transmitting acoustic signals and listening for acoustics transmissions from other Vemco transmitters

GPS satellite-linked tag

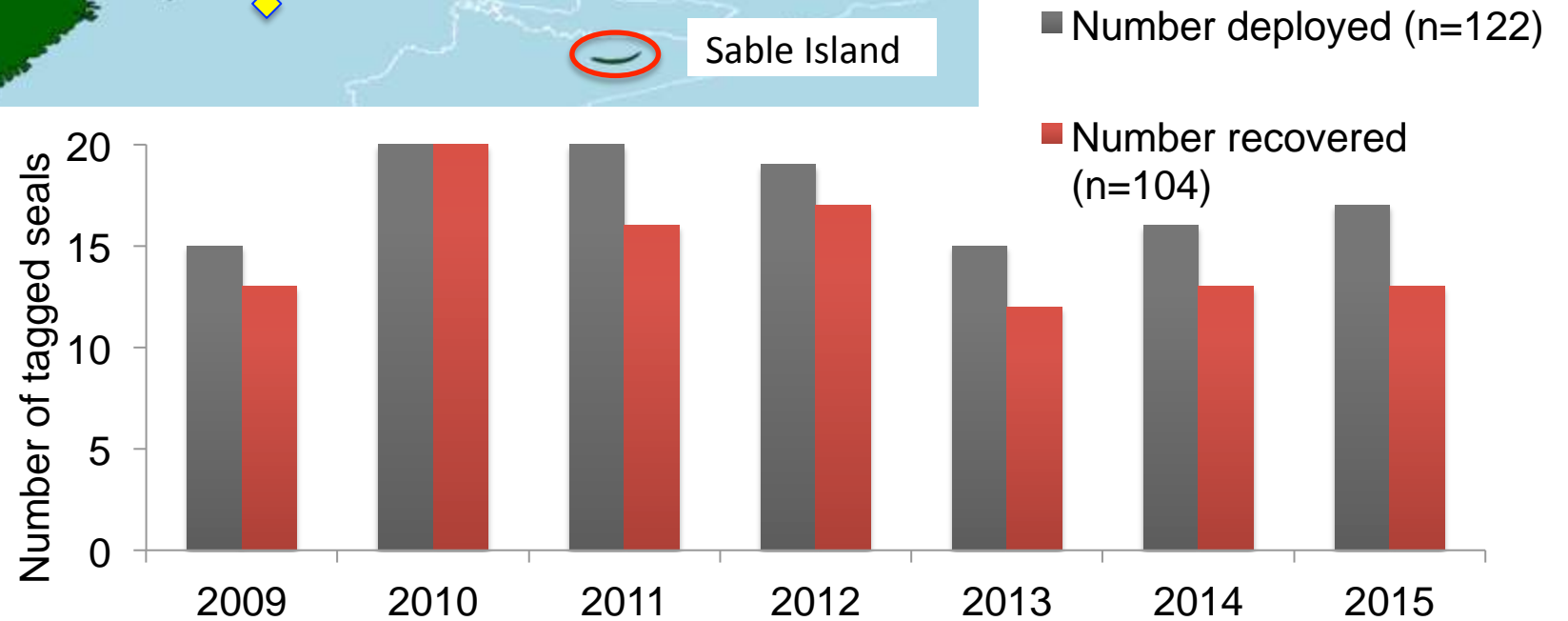


Collects archival dive data:

- Temperature ( $^{\circ}\text{C}$ )
- Dive depth (m)
- Light level

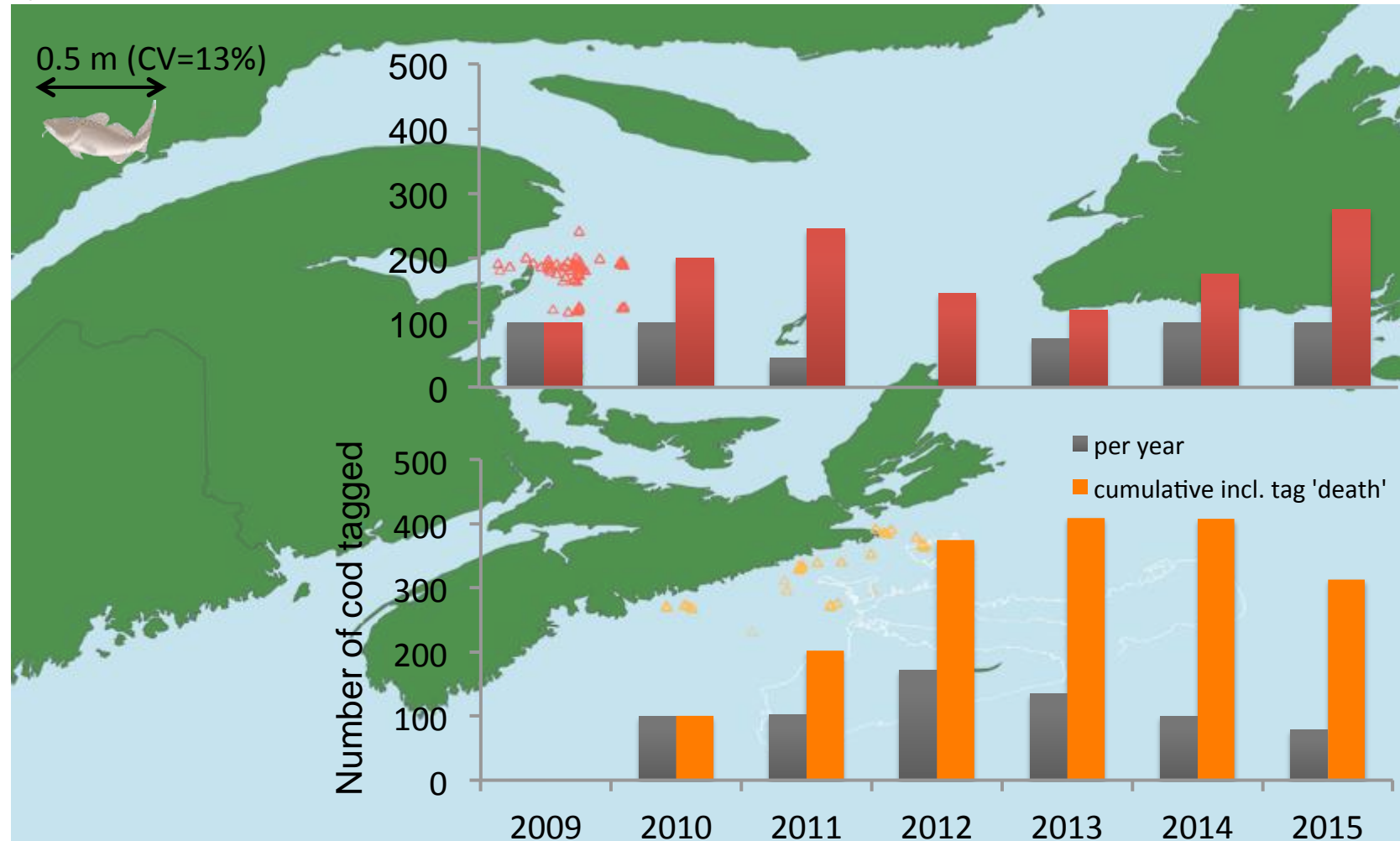


# Dalhousie University and Dept. of Fisheries & Oceans deployed tags on grey seals





# Dept. of Fisheries & Oceans tagged 1,211 Atlantic cod with V13 transmitters

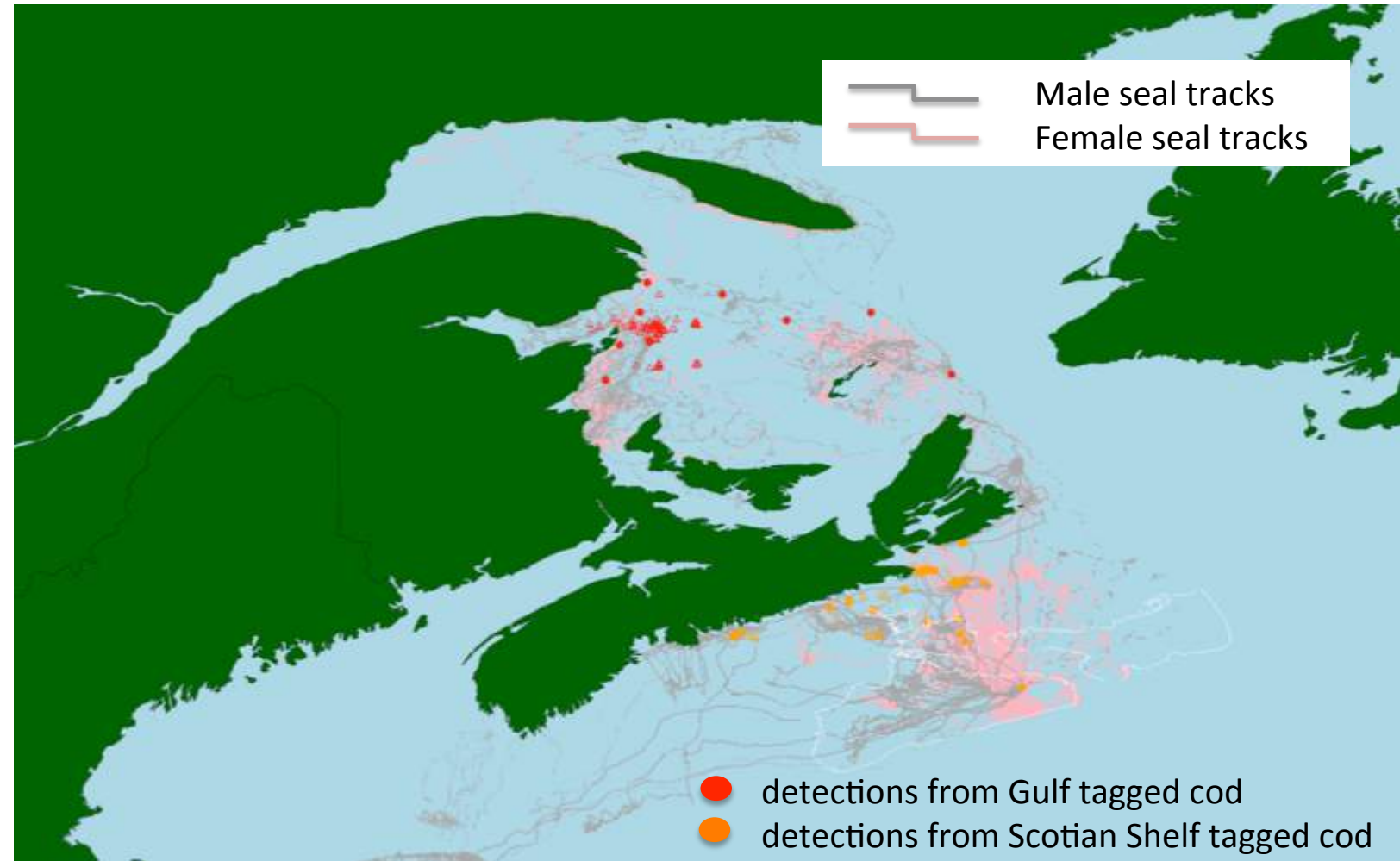


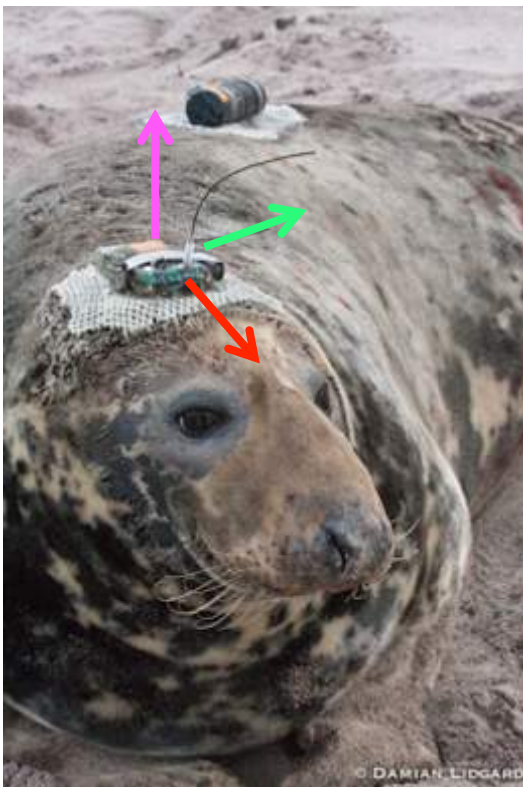


# Detection of cod by tagged seals demonstrates successful proof of concept

22 (27.5%) grey seals detected 64 individual cod

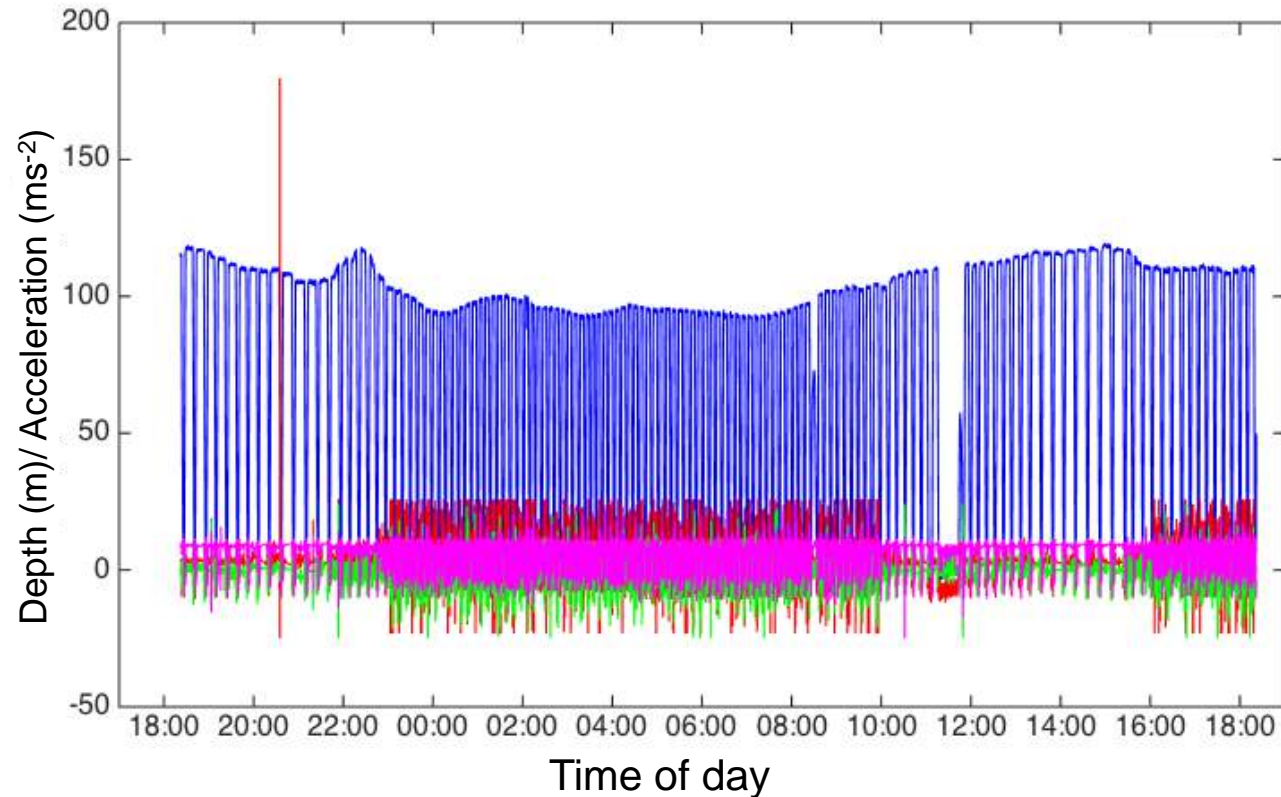
Less than 6% of tagged cod were detected





# Using accelerometers to differentiate between grey seal diving behaviours

24h depth and acceleration profile



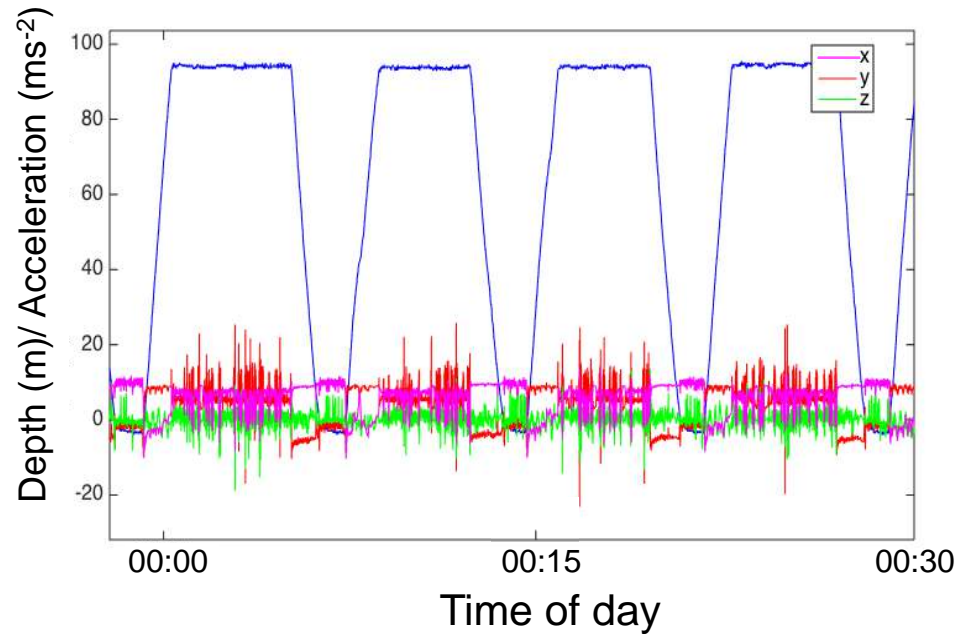
**Depth (m)**  
**Vertical (ms<sup>-2</sup>)**  
**Forward (ms<sup>-2</sup>)**  
**Lateral (ms<sup>-2</sup>)**



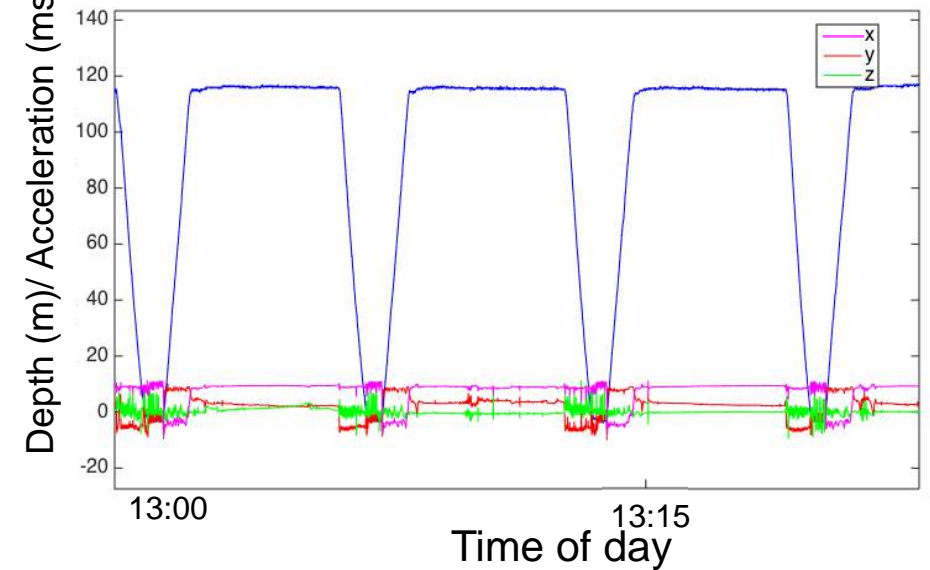


# Using accelerometers to differentiate between grey seal diving behaviours

## Foraging Dives



## Resting Dives



**Depth (m)**

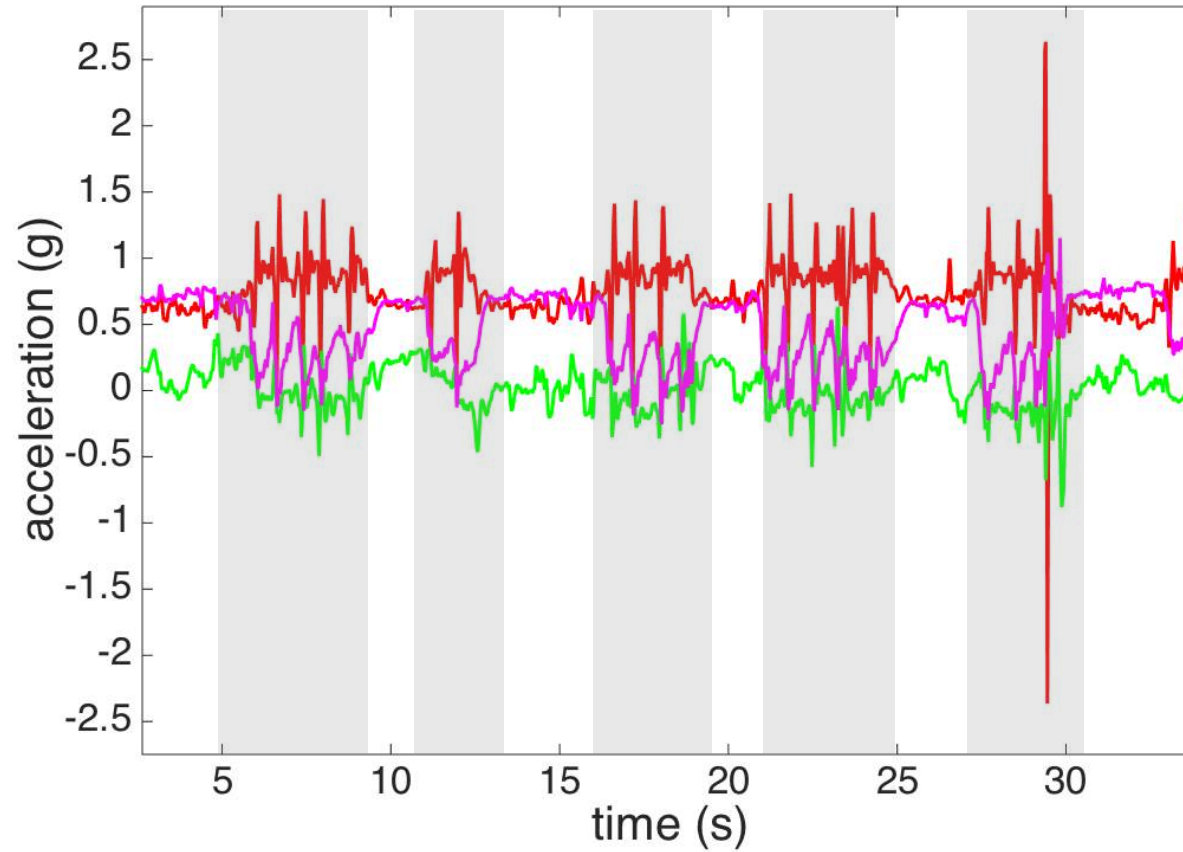
**Vertical ( $\text{ms}^{-2}$ )**

**Forward ( $\text{ms}^{-2}$ )**

**Lateral ( $\text{ms}^{-2}$ )**



# Prey capture attempts (PCA)

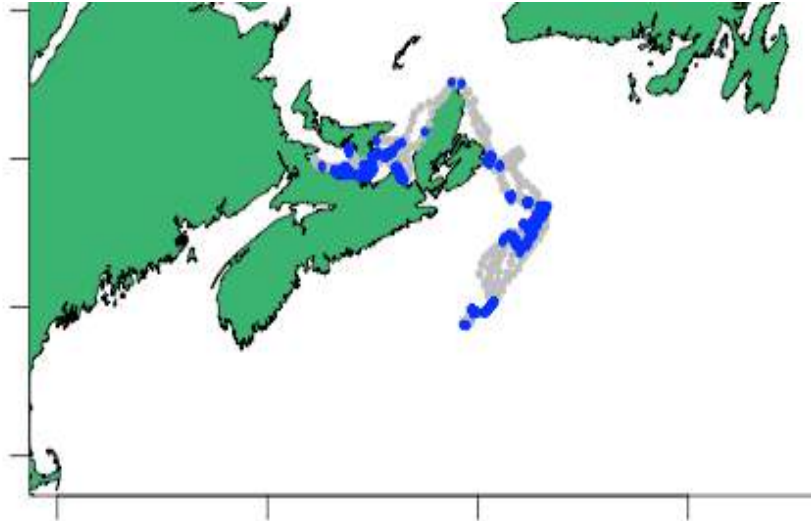


PCA

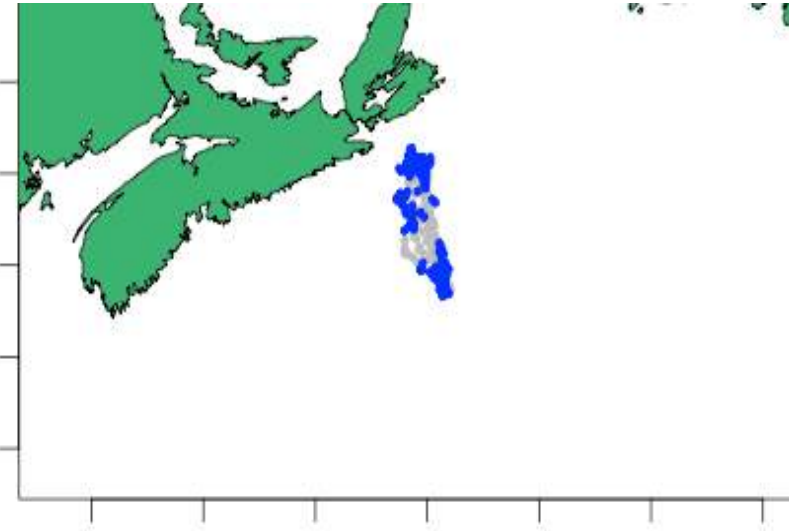
Vertical ( $\text{ms}^{-2}$ )  
Forward ( $\text{ms}^{-2}$ )  
Lateral ( $\text{ms}^{-2}$ )



# Using grey seals as bioprobes to explore the relationship with oceanographic features



Male grey seal track



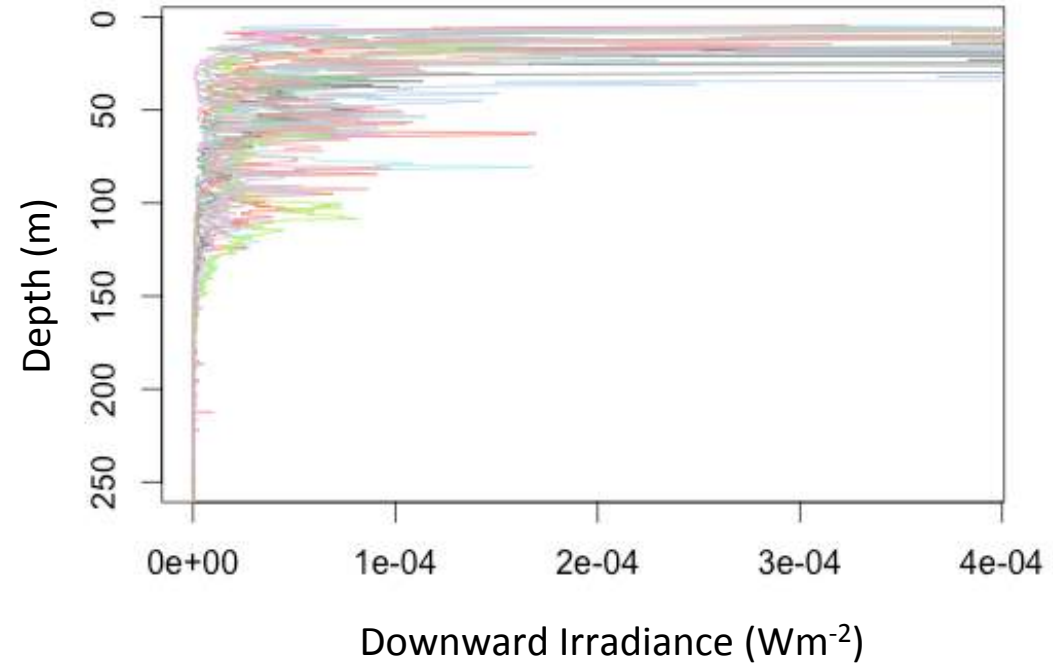
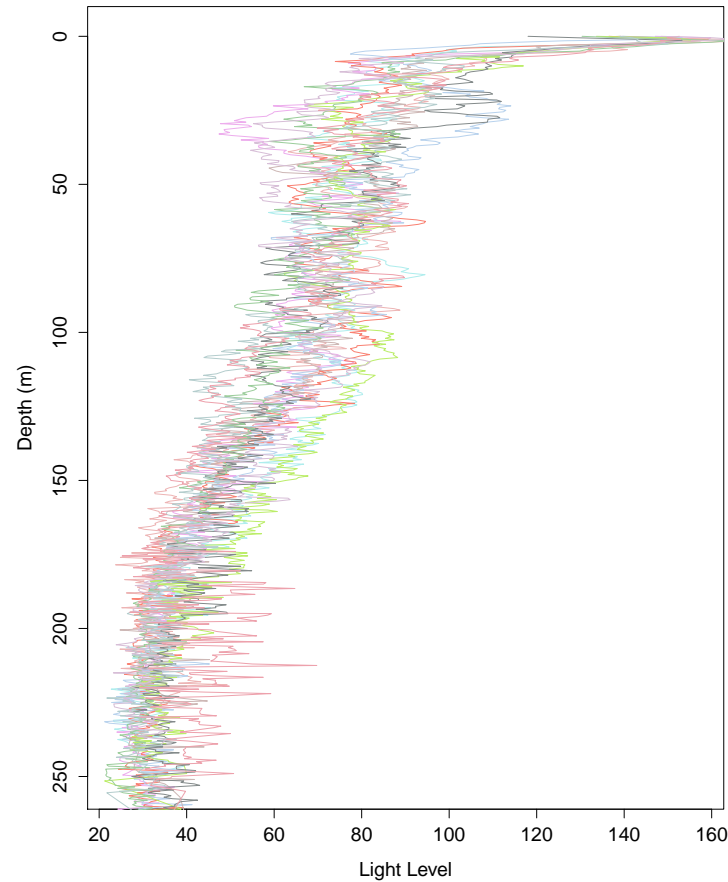
Female grey seal track

GPS satellite tags also collect archival data about the external environment during dives

- Temperature (°C)
- Depth (m)



# Using light level data collected by grey seals as a proxy for primary productivity



- Applying this knowledge for a better understanding of the nature of primary production on the Scotian Shelf



# Conclusions

- Few seals detected tagged cod, even when restricting numbers to those that overlapped cod distribution
- Accelerometry data combined with grey seal dive data has proven to be useful for determining the behavioural signatures of grey seal dives
- Understanding how a large marine predator interacts with their environment may reveal drivers behind sexual and seasonal differences in foraging patterns
- Grey seals are a promising species for use as bioprobes and the collection of oceanographic data

# This project would not be possible without the assistance of these people and organizations:

S. Budge, N. den Heyer, S. Heaslip, W. Joyce, S. Lang, E. Leadon, J. McMillan, R. Ronconi, S. Smith and S. Wong assisted with tagging seals on Sable Island

M. Hammill & J. Van-de-Walle (DFO, Quebec), R. DiGiovanni & K. Durham (Riverhead Foundation, NY) and Ghislain and Rodrick (Magdelan Is.) assisted with tagging seals in the Gulf of St. Lawrence

É. Aubry, L. Comeau, S. Leblanc & S. Smith (Department of Fisheries and Oceans, Canada) tagged cod on the Eastern Shore and in the Gulf of St. Lawrence

Ian Jonsen (Macquarie University) for help with Hidden Markov Model analysis

Environment Canada and Parks Canada provided logistical support on Sable Island

Bernie McConnell and Phil Lovell, Sea Mammal Research Unit, St Andrews, Scotland

Denise King, Tim Stone and Dale Webber, Vemco, Halifax, Nova Scotia

Funding was provided by the Canadian Foundation for Innovation, the Natural Science and Engineering Research Council, Department of Fisheries and Oceans, Canada

