

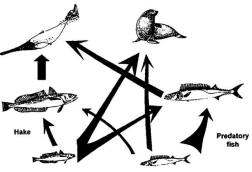
Using acoustics to elucidate the nature of marine predator-prey interactions



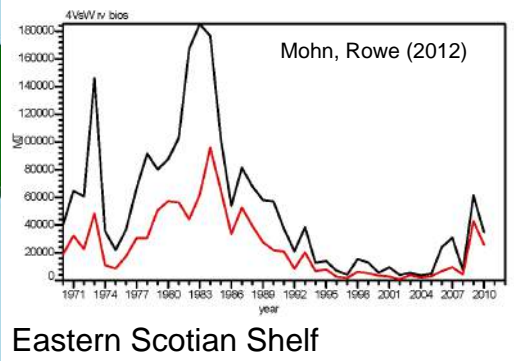
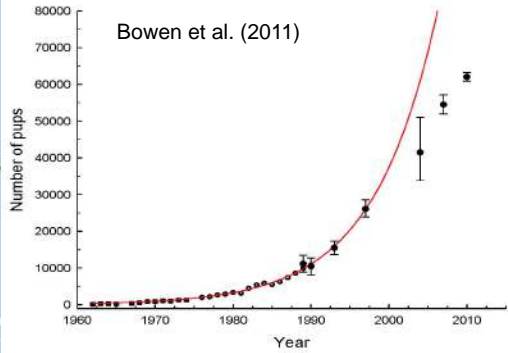
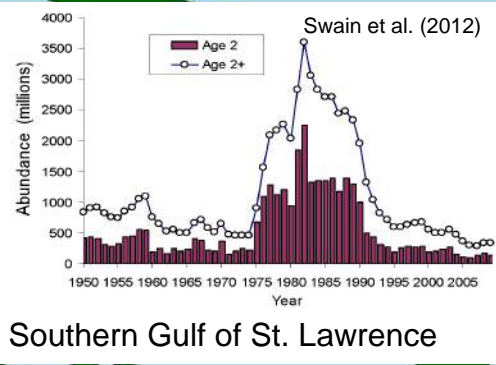
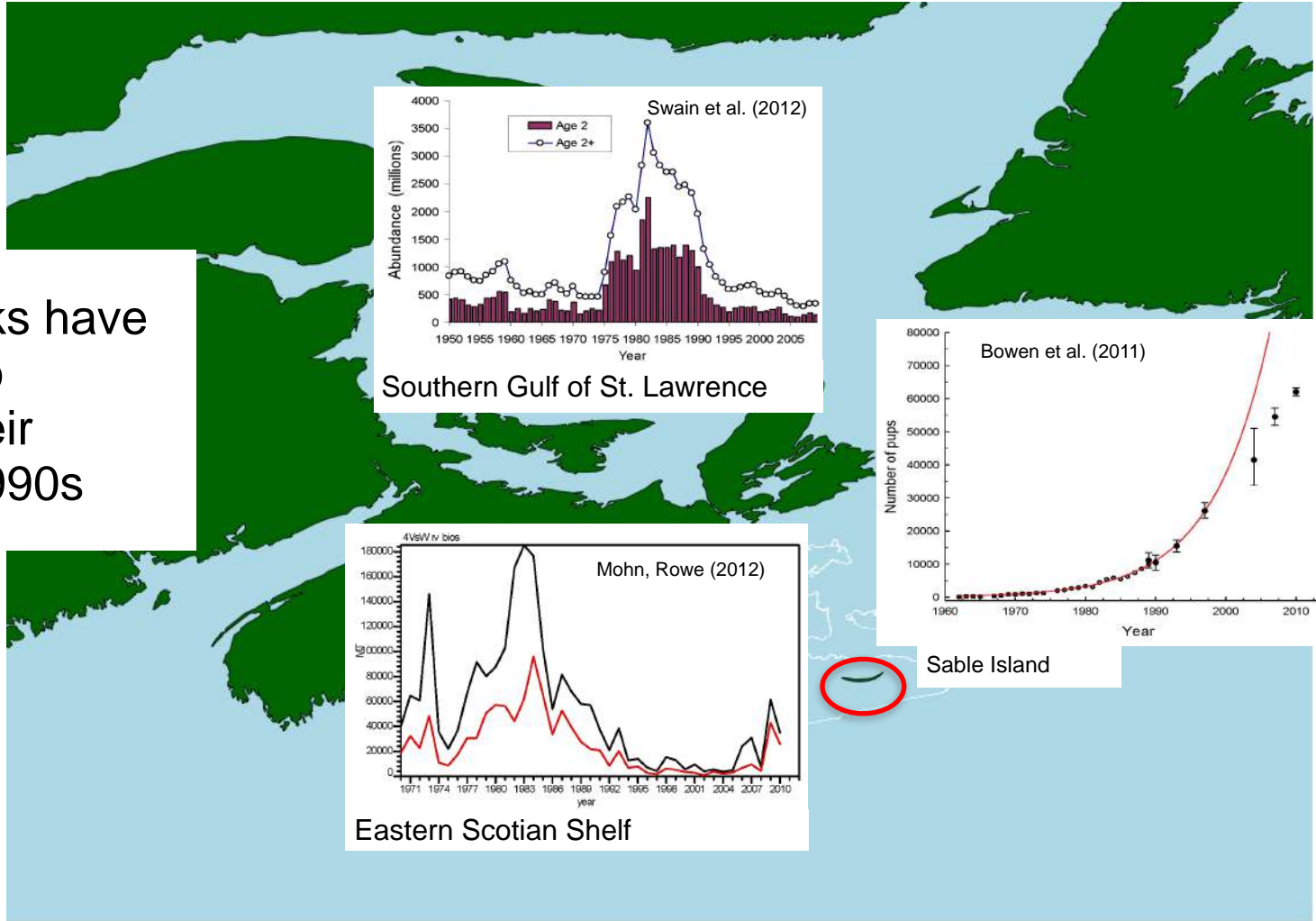
LIDGARD, DC
Dalhousie University

BOWEN, WD
Dept. Fisheries & Oceans

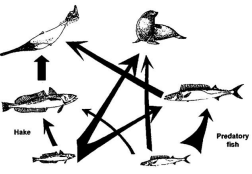
IVERSON, SJ
Dalhousie University



Grey seals are considered to contribute to the high natural mortality of Atlantic cod



Atlantic cod stocks have shown slow or no recovery after their collapse in the 1990s

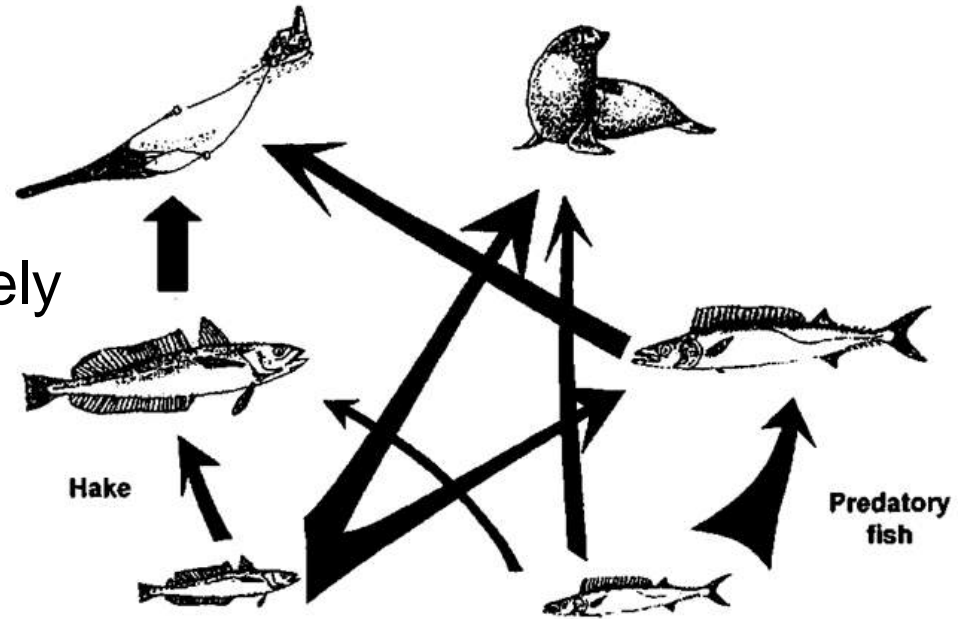


The study of predator-prey interactions in the marine environment is challenging

Study areas are large

Predator and prey move extensively

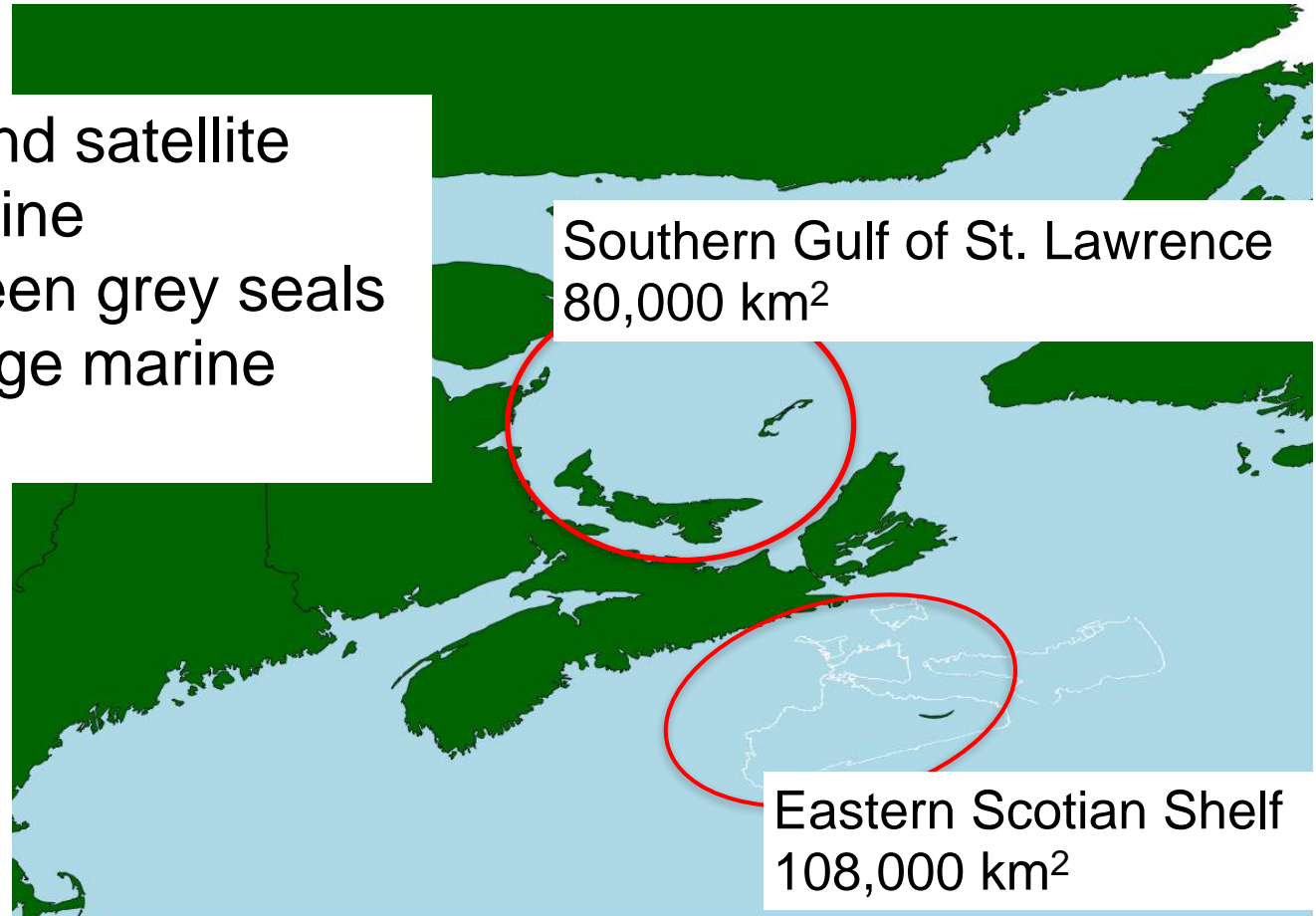
Difficult to retrieve data



<http://what-when-how.com>

The objective of this study is:

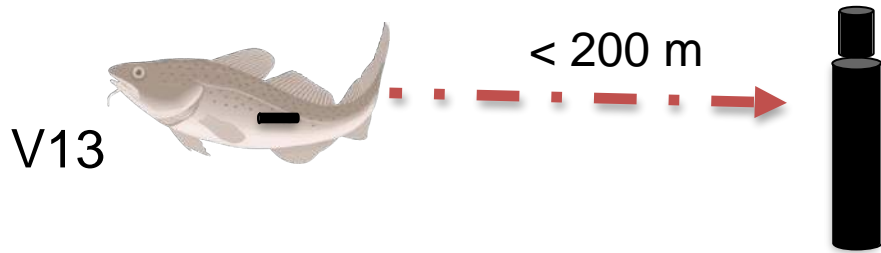
To use acoustic and satellite telemetry to examine interactions between grey seals and cod in two large marine ecosystems



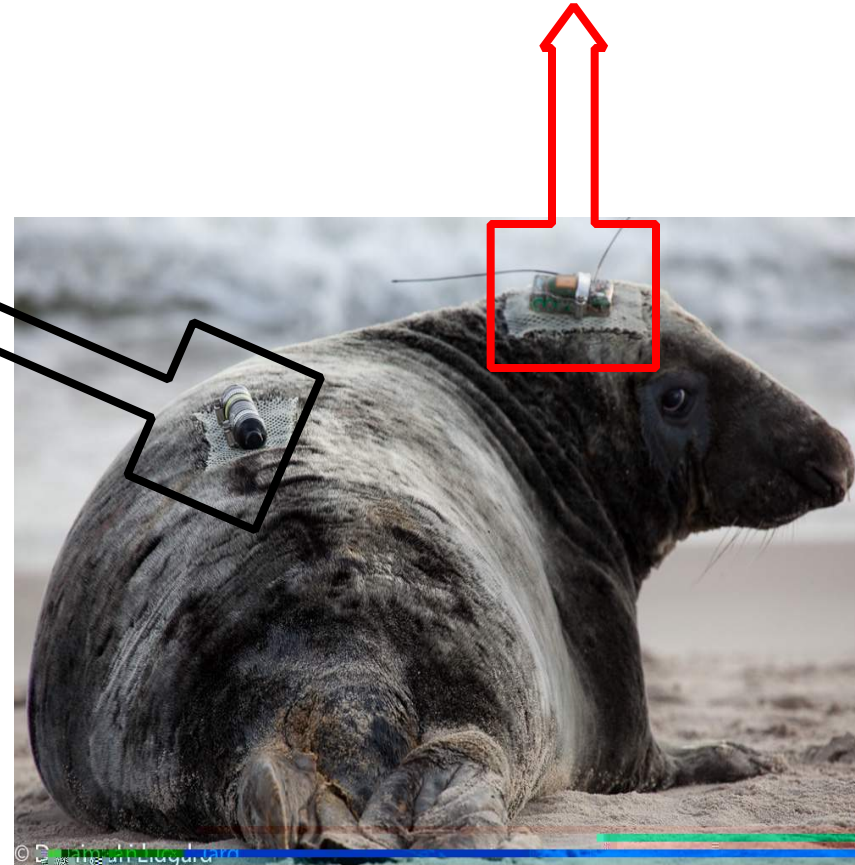


The Vemco Mobile Transceiver (VMT) transforms the grey seal into a bioprobe

GPS satellite-linked tag



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



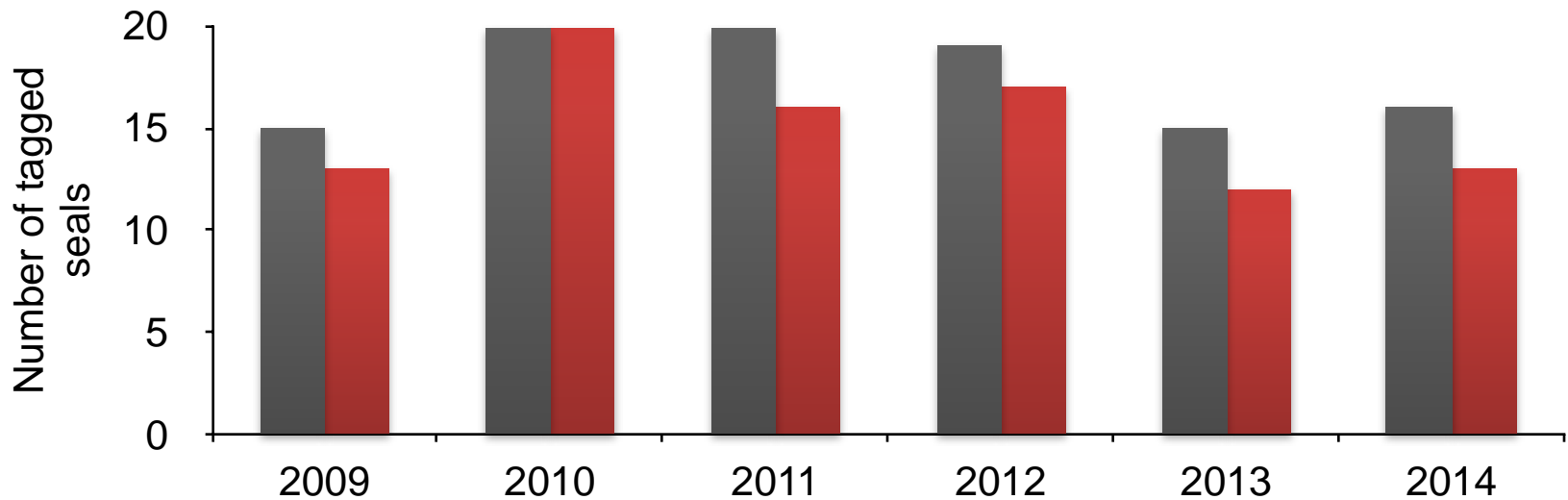


Dalhousie and Dept. Fisheries & Oceans deployed tags on 105 grey seals



Deployment period
195 days (CV = 12%)

■ Number deployed (n=105)
■ Number recovered (n=91)





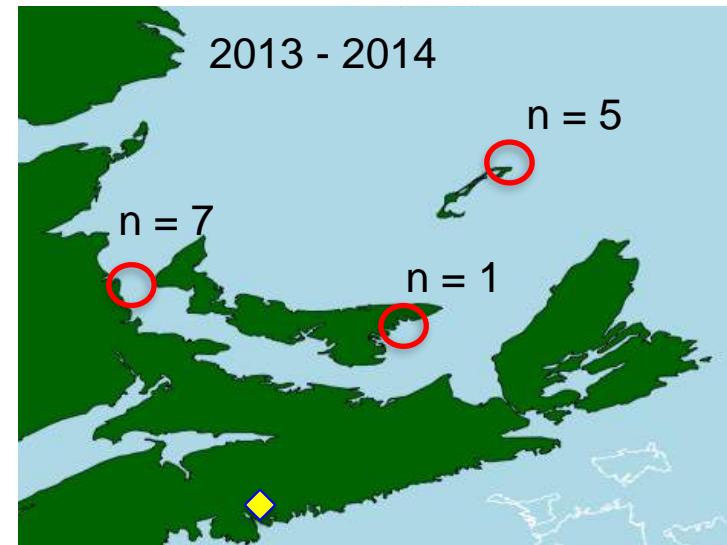
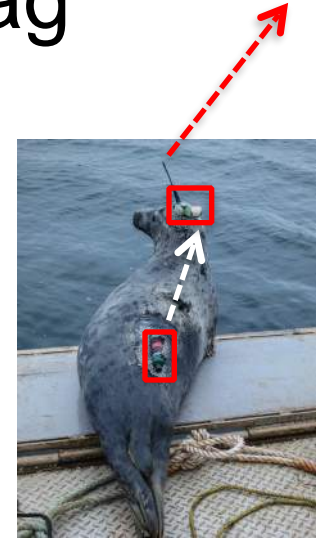
Vemco and SMRU designed data transfer link between VMT and satellite tag

Detections are collected by VMT and transmitted to satellite tag via Bluetooth

Location, behaviour and detections are delivered to user via ARGOS

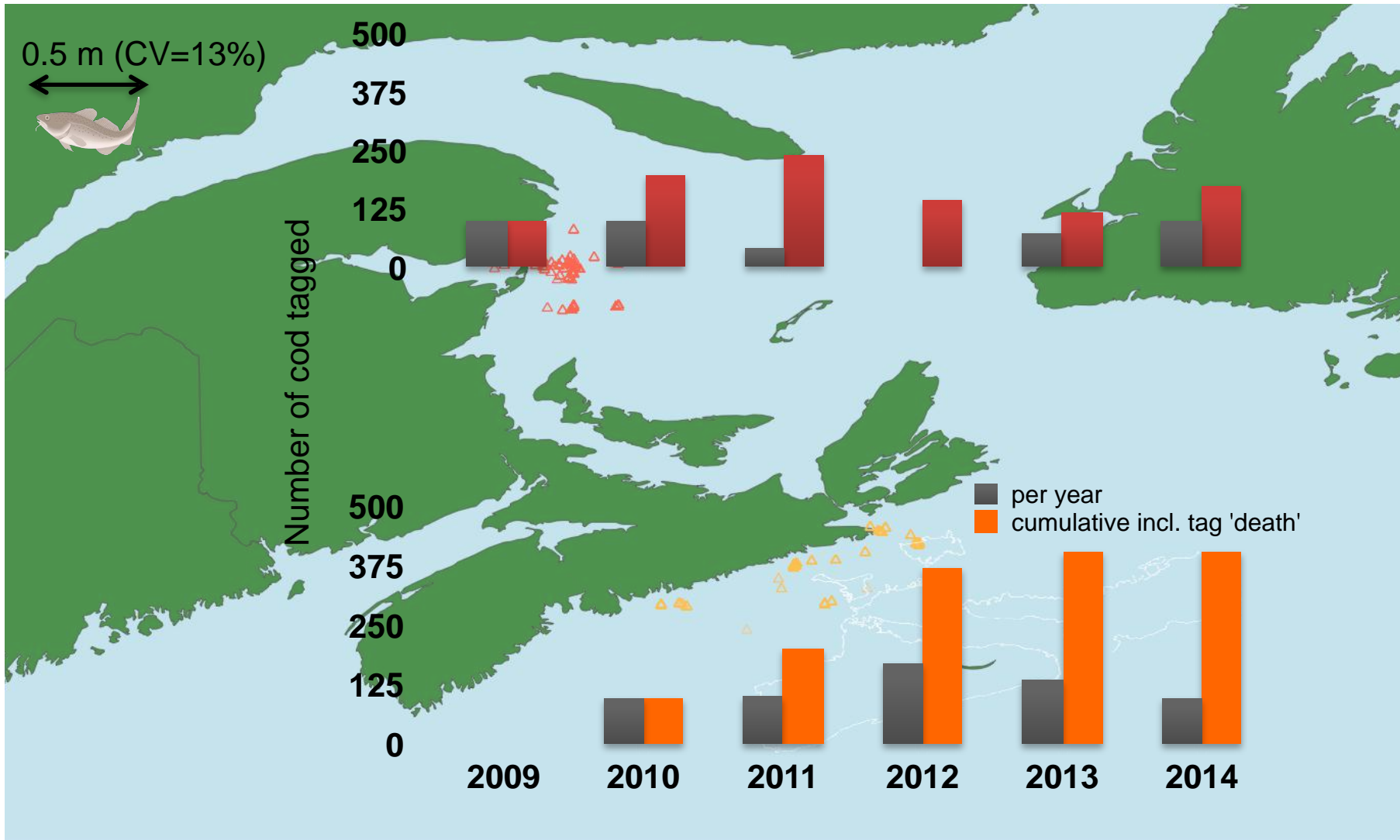
Allows us to deploy instruments on grey seals without the need to recover

Deployment period
226 days (CV = 30%)





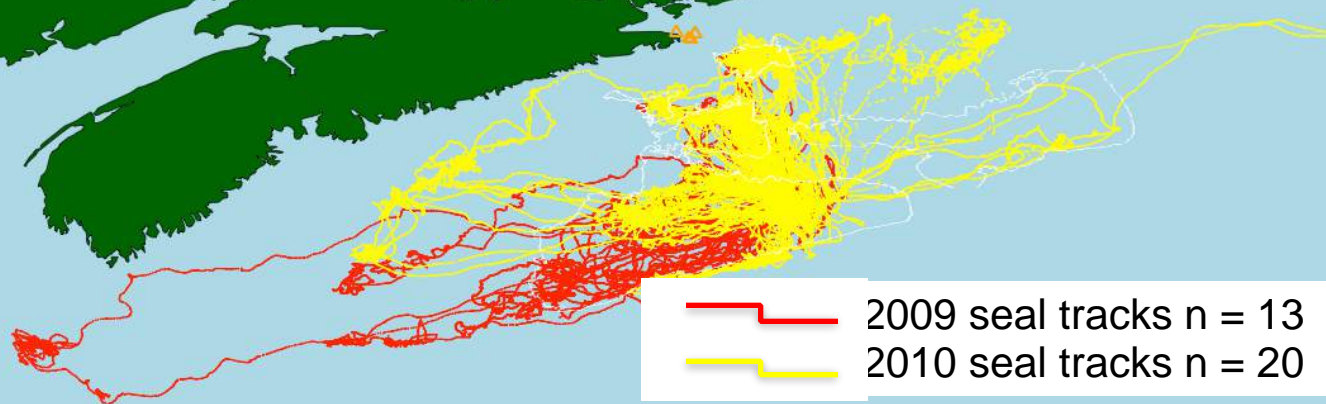
Dept. Fisheries & Oceans tagged 1029 Atlantic cod with V13 transmitters





No interactions were observed between seals and cod in 2009 or 2010

During 2009 and 2010, majority of cod tags were deployed in the Gulf



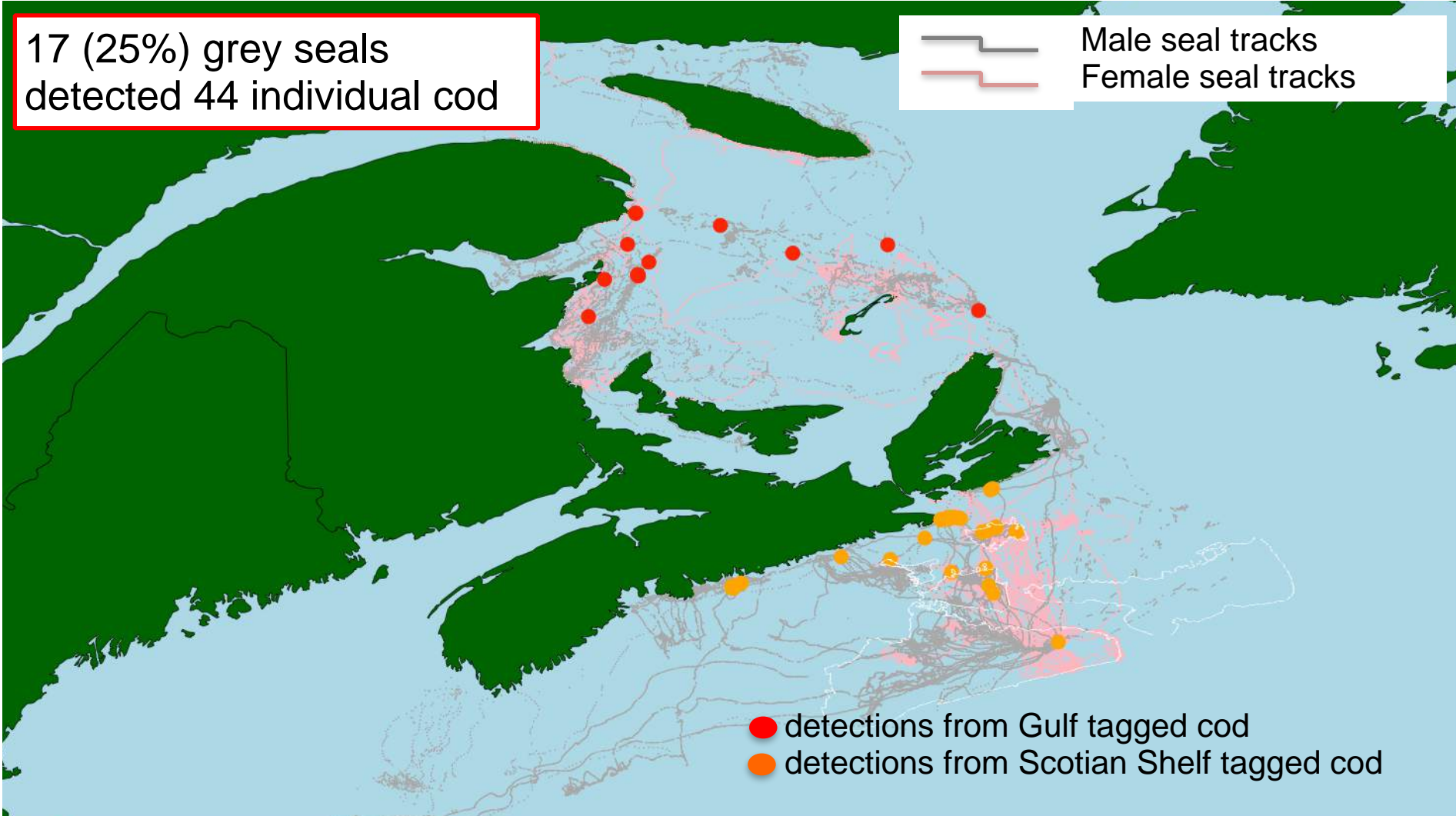
— 2009 seal tracks n = 13
— 2010 seal tracks n = 20



Detection of cod by tagged seals demonstrates successful proof of concept

17 (25%) grey seals detected 44 individual cod

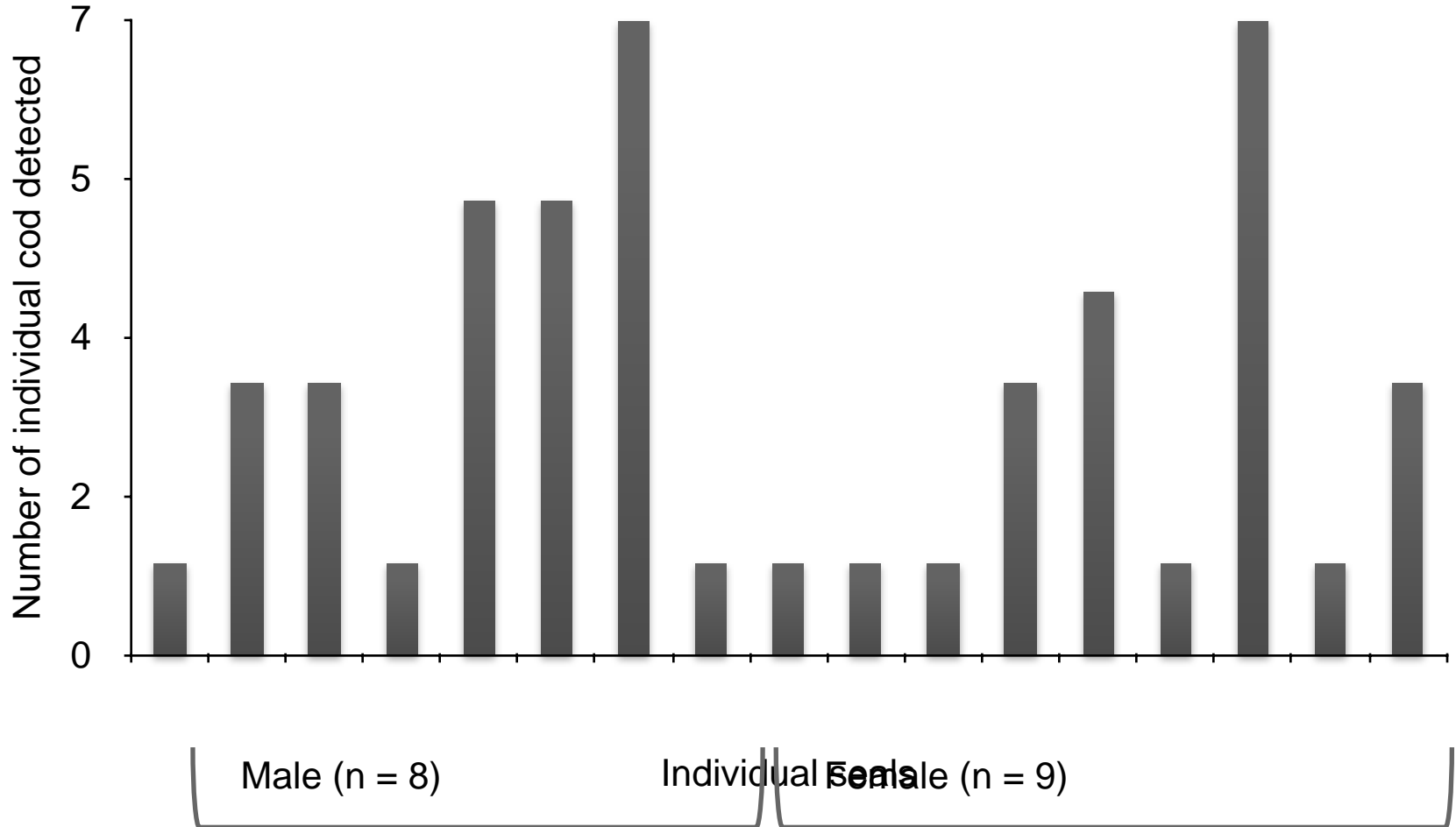
Male seal tracks
Female seal tracks



● detections from Gulf tagged cod
● detections from Scotian Shelf tagged cod

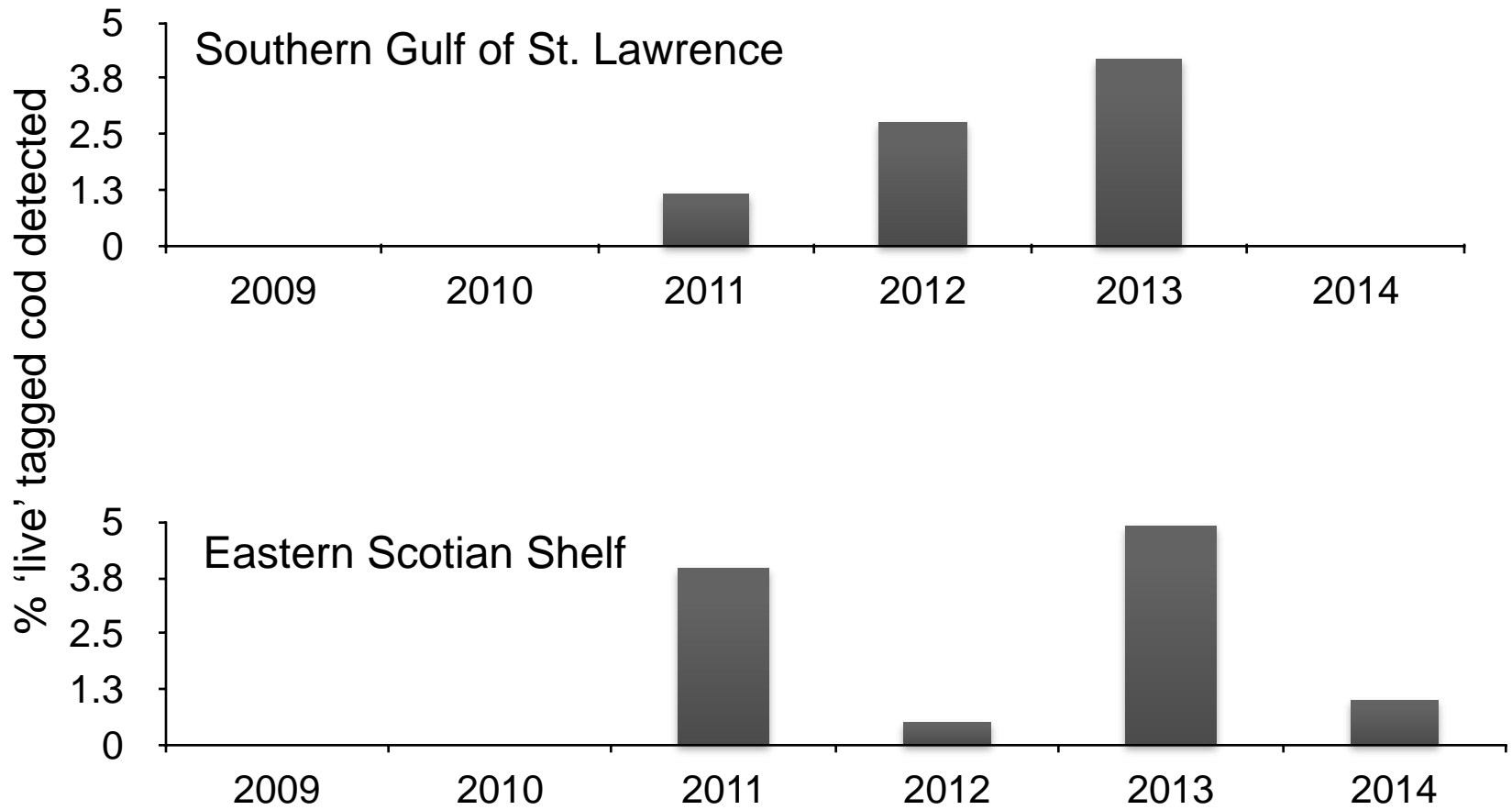


The number of individual cod detected by each seal varied between 1 and 7





Relative to the number of cod tagged, very few were detected by seals

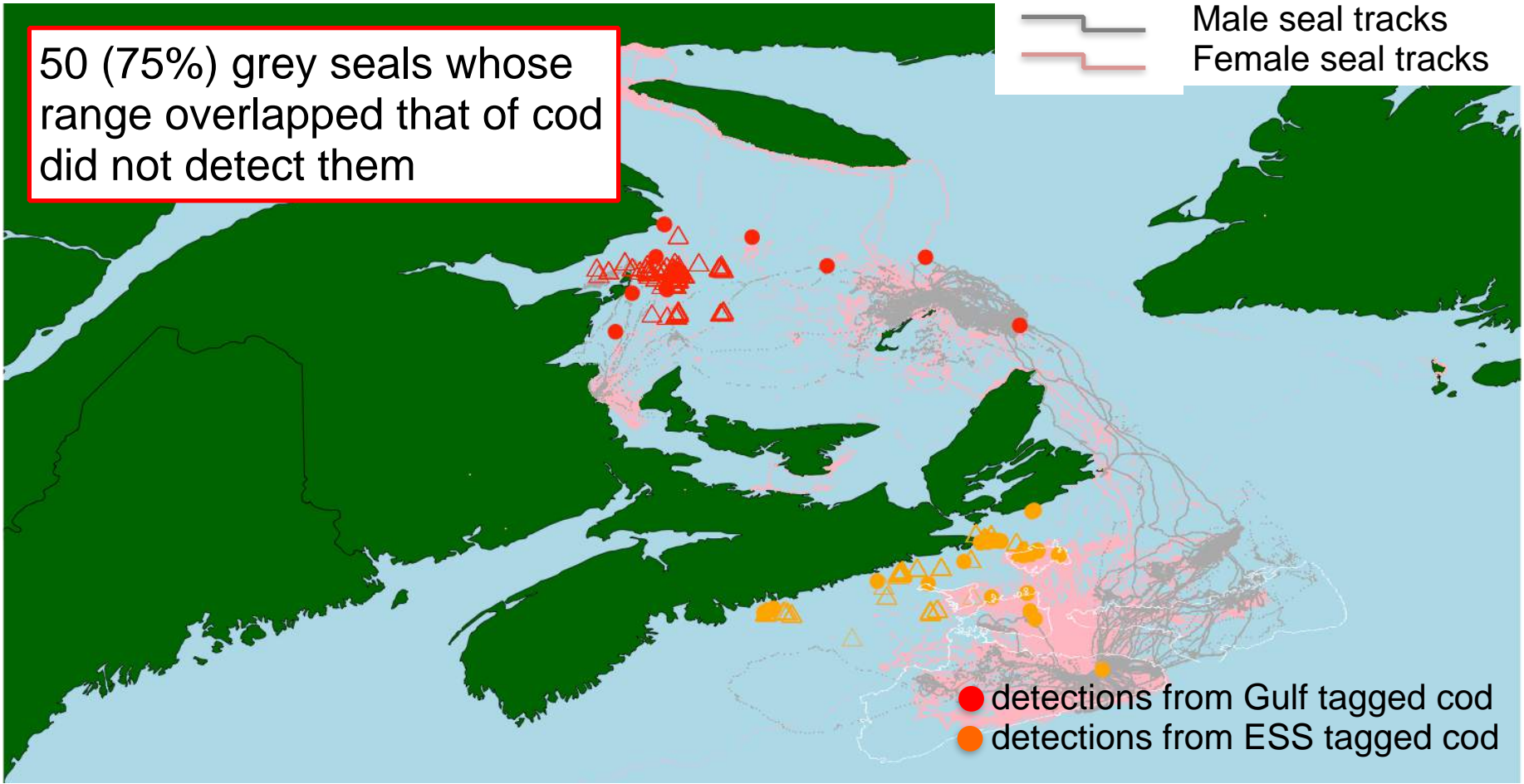




Spatial overlap between seals and cod may be insufficient to infer predation

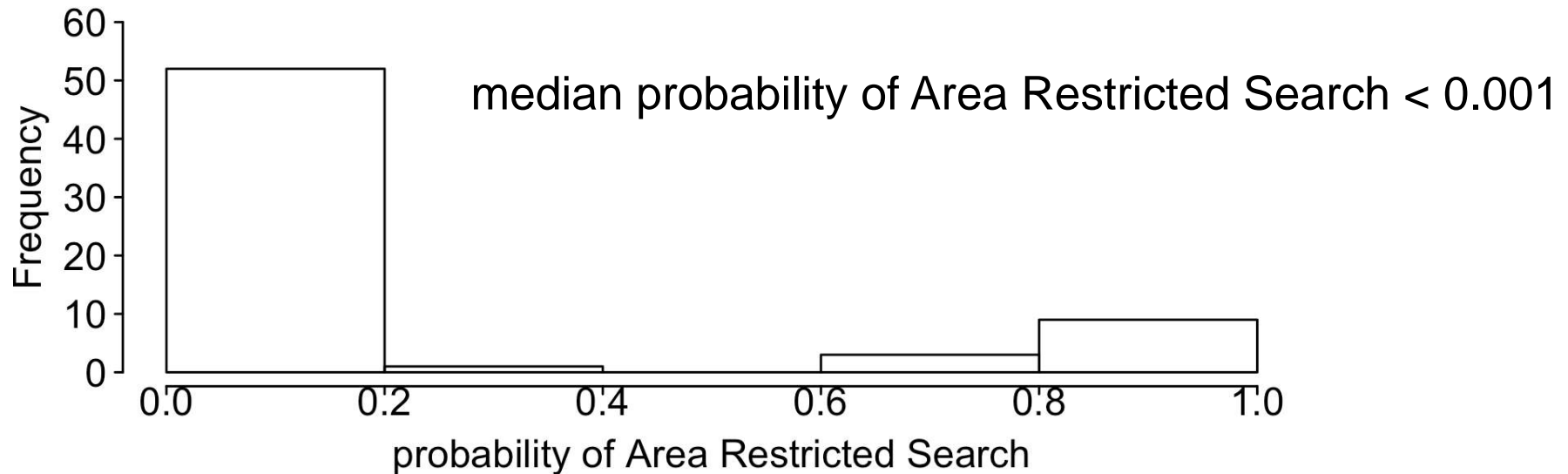
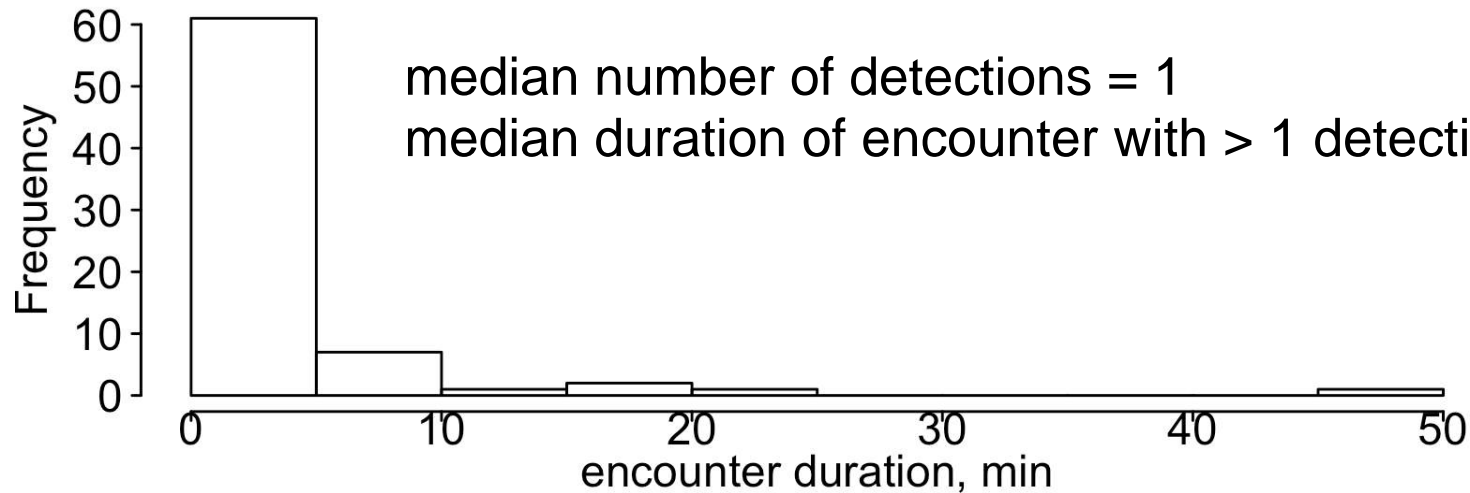
50 (75%) grey seals whose range overlapped that of cod did not detect them

Male seal tracks
Female seal tracks



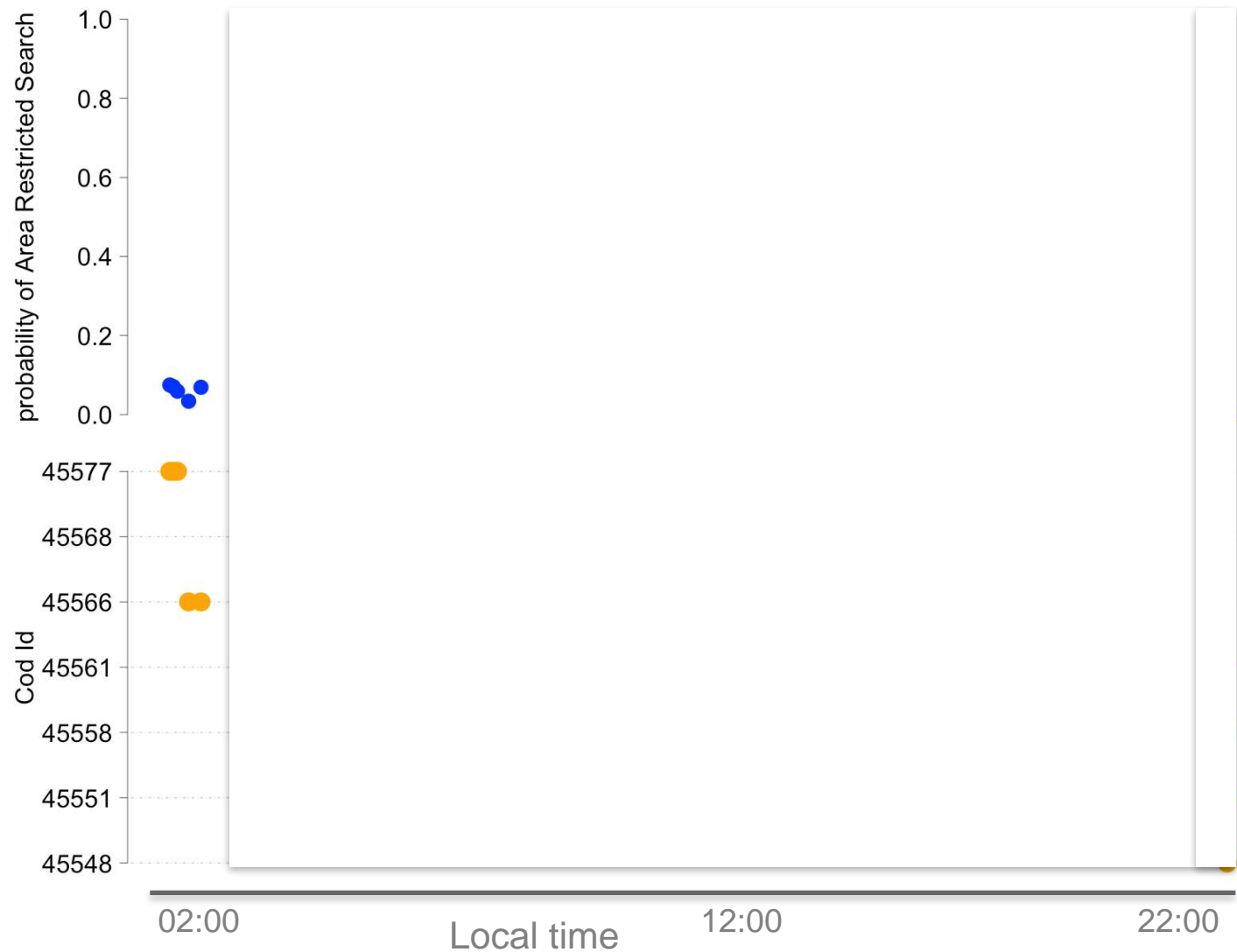


Seal-cod encounters (n = 73) were brief and seals were unlikely to be foraging





Of 73 seal-cod encounters, one may have included a predatory event





Conclusions

We have shown that acoustic and satellite telemetry can be used to study species interactions in marine environments

Few seals detected tagged cod, even when restricting numbers to those that overlapped cod distribution

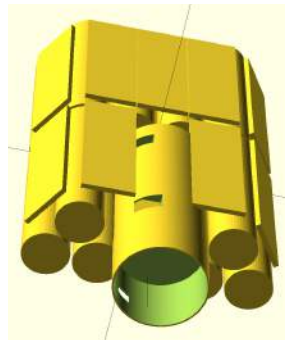
It might be misleading to imply predation occurs when there is spatial overlap among species

There was little evidence of seal predation on cod

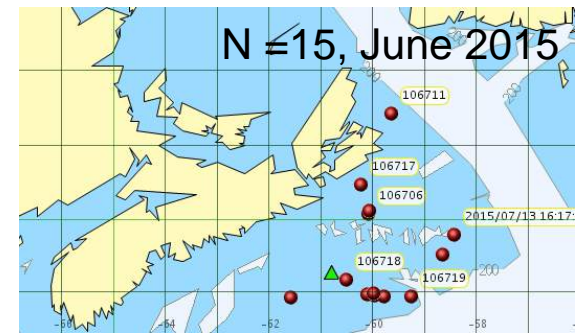


Next steps are to determine probability of encounters & understand seal behaviour

What is the probability of an encounter given the numbers and behaviour of cod and seals



Custom-designed video recorder



This project would not be possible without the assistance of these people and organisations

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 (Magdalen Is.) assisted with tagging seals in Gulf

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

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