

Department of Fisheries and Oceans Canada: An Update on Research and Monitoring Activities

Moors-Murphy, H.B.¹

¹ *Fisheries and Oceans Canada, Bedford Institute of Oceanography, 1 Challenger Drive, Dartmouth, N.S., B2Y 4A2*

hilary.moors-murphy@dfo-mpo.gc.ca

Fisheries and Oceans Canada leads and collaborates on many research and monitoring projects relevant to cetaceans in the Northwest Atlantic, including activities focused on increasing our understanding of North Atlantic right whale distribution, movement patterns and habitat use in eastern Canadian waters. This presentation will provide an overview of recent science activities that have been or are being conducted that will contribute to our knowledge of right whale occurrence in Canadian waters. These activities include visual survey and surveillance efforts, passive acoustic monitoring projects, habitat suitability modelling, prey studies and other work.

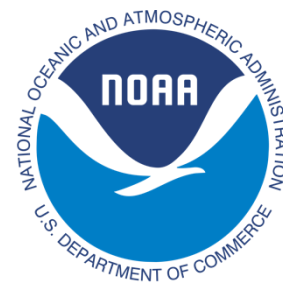
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Dr. Hilary Moors-Murphy
Research Scientist
Fisheries and Oceans Maritimes Region

Acknowledgements

- Thank you to the following groups/organizations who contributed to the work described in these slides:
 - NOAA's Northeast Fisheries Science Center
 - Canadian Whale Institute
 - New England Aquarium
 - Mingan Island Cetacean Study
 - JASCO Applied Sciences
 - Taggart Lab, Dalhousie University
 - Transport Canada
 - DFO Maritimes, Gulf, Quebec and Newfoundland Regions(and any others involved with this work!)



**New England
Aquarium**



JASCO
APPLIED SCIENCES



Transport
Canada

Transports
Canada



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Coordination of Fieldwork

H. Moors-Murphy (DFO) and various collaborators

- Informal North Atlantic right whale research working group (established by DFO) helps coordinate Canadian field efforts
 - Includes researchers, regulators, response networks, others
 - Meet in spring and fall
 - Summary of planned field efforts compiled and distributed in spring
 - Email distribution list for sending daily summaries (if there are new reports) of right whale sightings and real-time acoustic detections throughout the summer and early fall to those interested
 - Live, free-swimming right whale sightings reported to:
XMARWhaleSightings@dfo-mpo.gc.ca or 1-844-800-8568
- Allowed weekly updates to sightings maps throughout 2017
- Will continue this effort in 2018

Summary of Visual Monitoring Efforts 2017

DFO, NOAA, Transport Canada, Canadian Whale Institute, New England Aquarium, Mingan Island Cetacean Study, and others

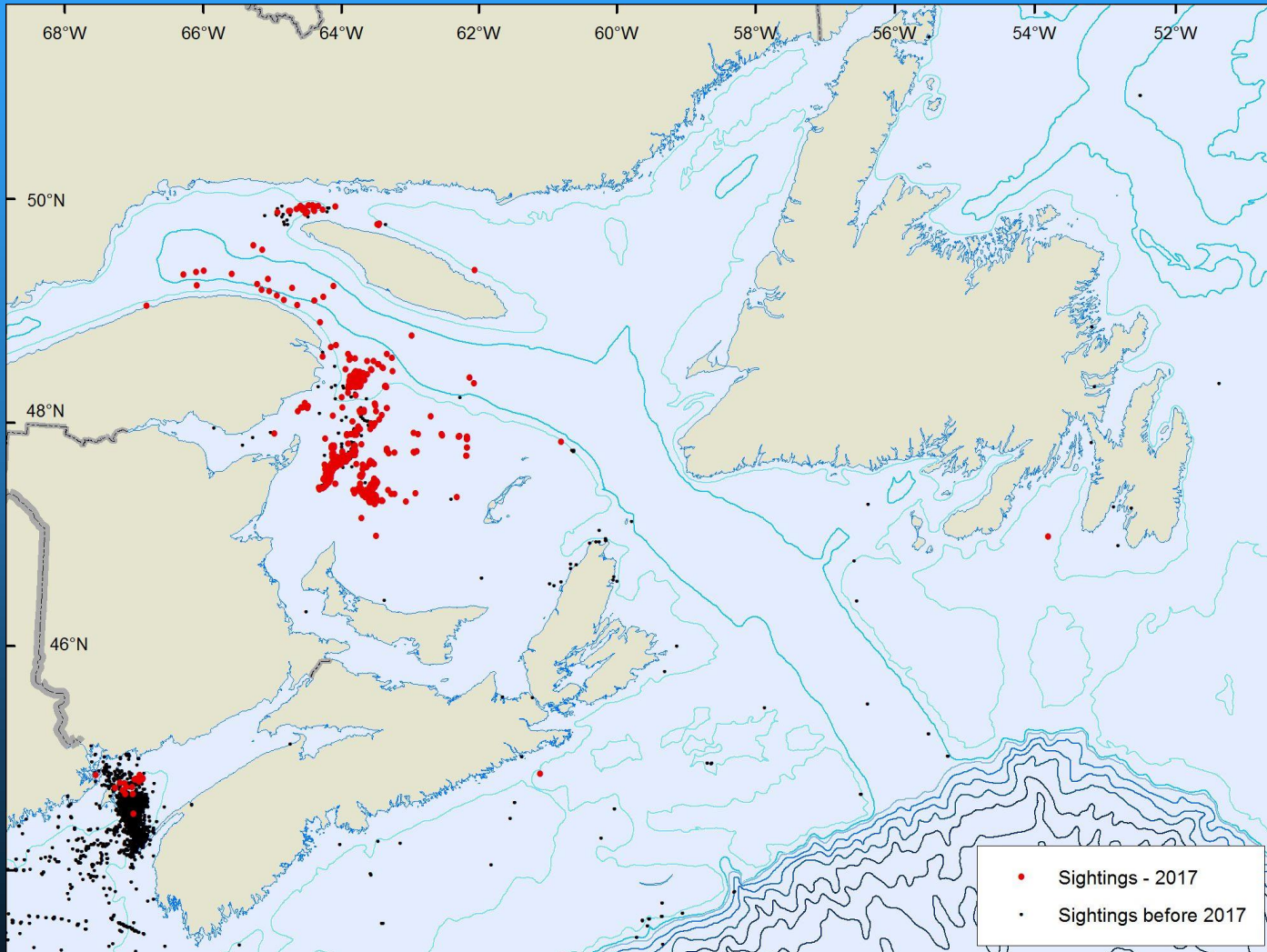


Figure courtesy of Phil Greyson, DFO

Aerial Surveillance Efforts 2017

DFO, NOAA, Transport Canada

- **NOAA Twin Otter:**
extensive dedicated effort June-July
- **TC-EC MART Dash 8:**
effort in July (not shown here),
extensive dedicated effort Aug-present
- **DFO Twin Otter:**
dedicated effort Sept-present
- **DFO C&P PAL plane:**
dedicated effort throughout June-present (not shown in this map)

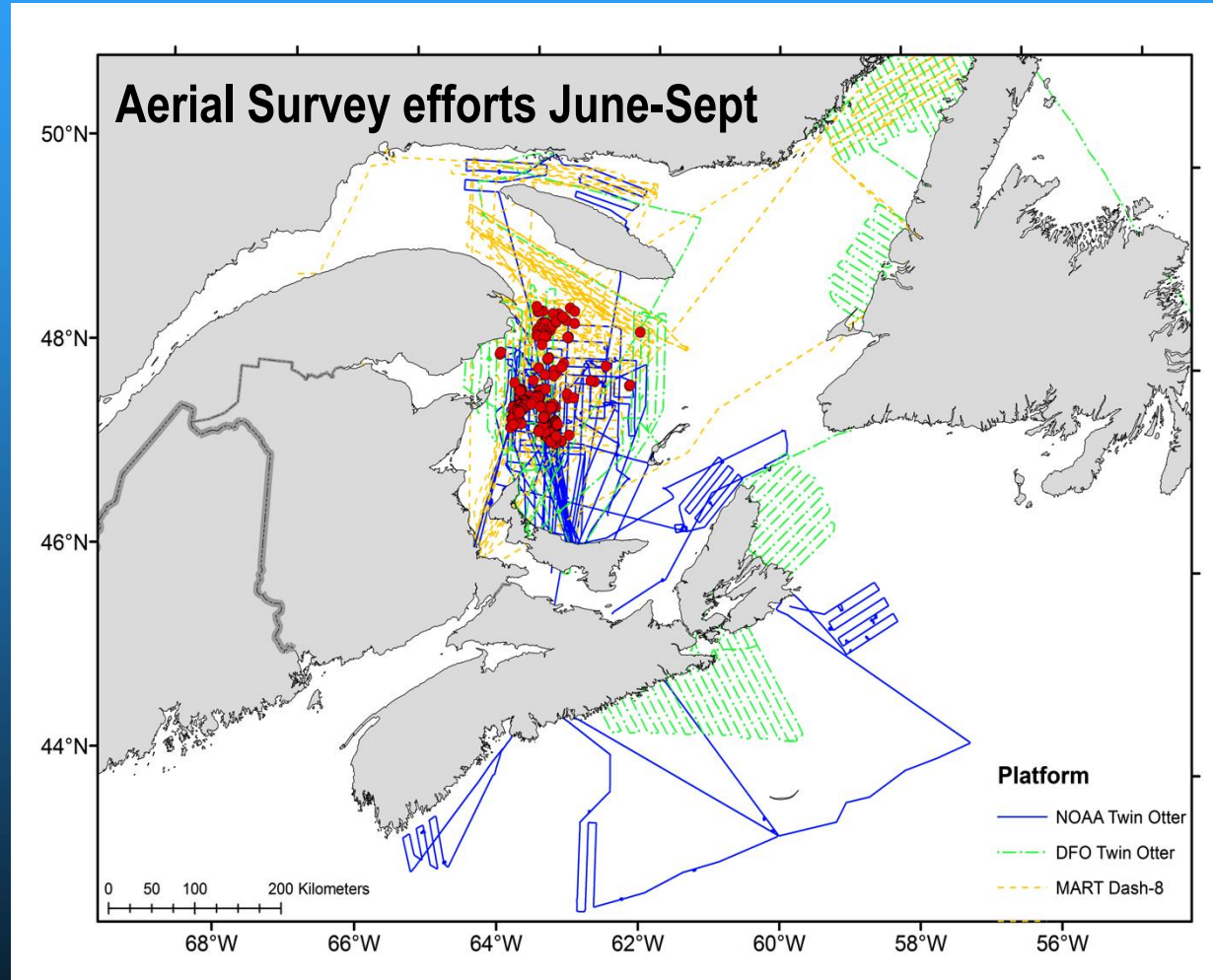


Figure courtesy of Angelia Vanderlaan, DFO

Visual Monitoring Plans 2018

DFO, Transport Canada, and others



Photos: NOAA, CCG, DFO

- Will continue to advertise sightings email and phone number, and collect opportunistic free-swimming right whale sightings data from various sources
- Currently developing visual monitoring plans, including monitoring from aerial platforms, for 2018

Real-Time Passive Acoustic Monitoring 2017-2018

Taggart Lab (Dalhousie University) with various partners

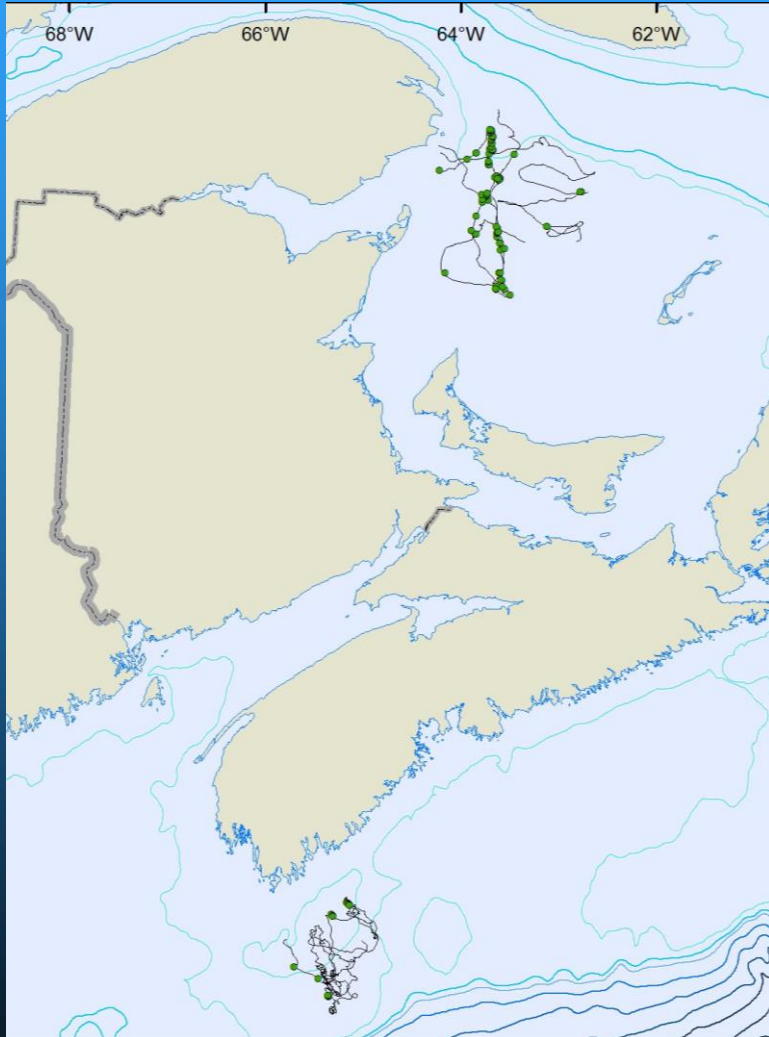


Figure courtesy of Phil Greyson, DFO

- Conducted through Whales Habitat and Listening Experiment led by the Taggart Lab, presented earlier:
“Current Efforts to Mitigate Ship Strikes Using Real-Time Acoustic Monitoring of Right Whales from Autonomous Platforms” - Kim Davies and Mark Baumgartner
- DFO will continue to collaborate on this project in 2018

Bottom-Moored Passive Acoustic Monitoring 2015-2017 – AMARs

H. Moors-Murphy (DFO), JASCO, Taggart Lab (Dalhousie University)

- Two years of near-continuous recordings (summer/fall 2015-summer/fall 2017)
- Duty cycle: 11 min 20 s @ 8 kHz every 20 min
- Analysis is underway using Davis's et al. 2017 methods

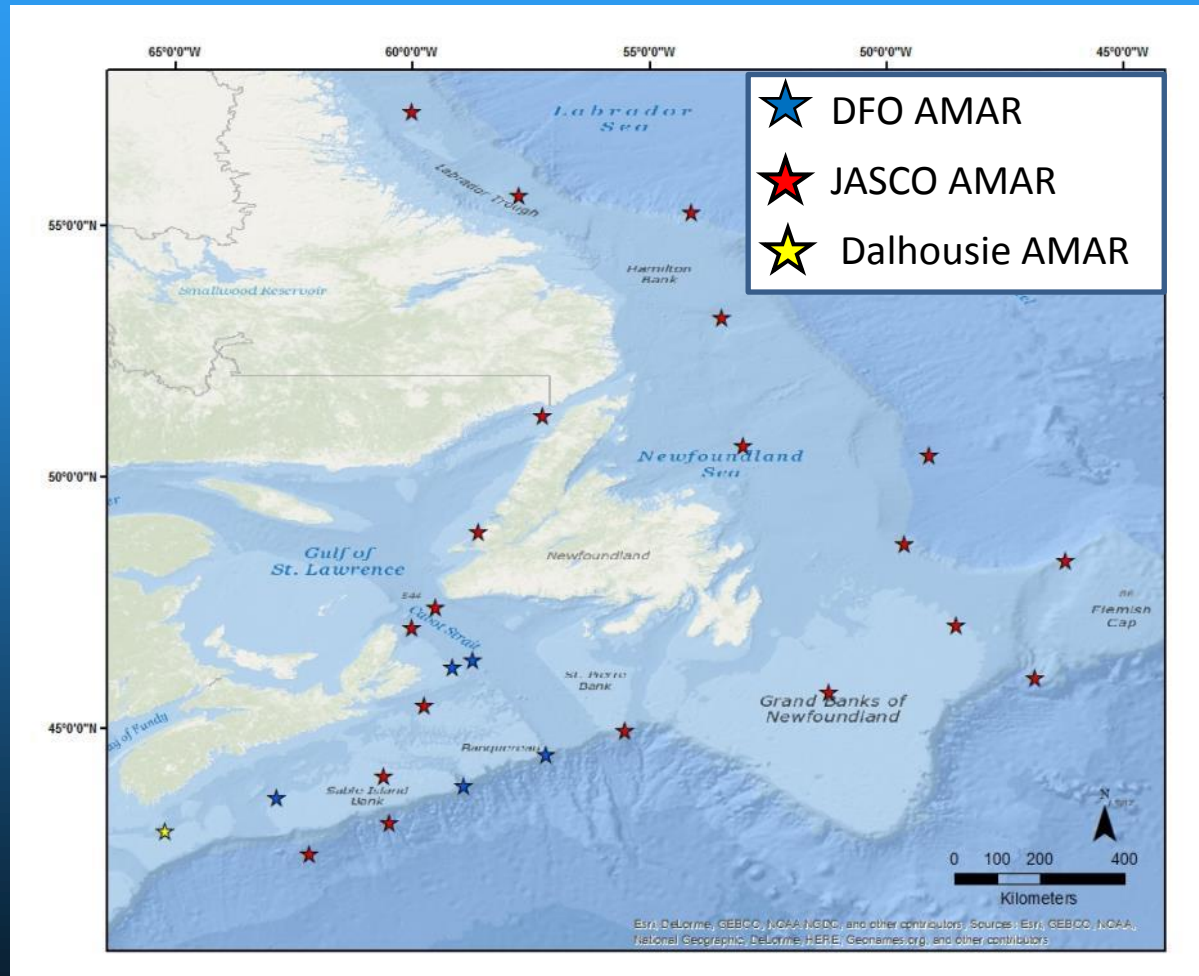


Figure courtesy of Pam Emery, DFO

Bottom-Moored Passive Acoustic Monitoring 2018 – AMARs

H. Moors-Murphy (DFO)

- New DFO deployment locations include Grand Manan Basin, Roseway Basin, and the Gulf of St. Lawrence (locations shown are tentative, not finalized)
- Two-year datasets; similar sampling rates and schedules to previous deployments
- All data collected will be examined for right whale call presence
- Part of larger Oceans Protection Program

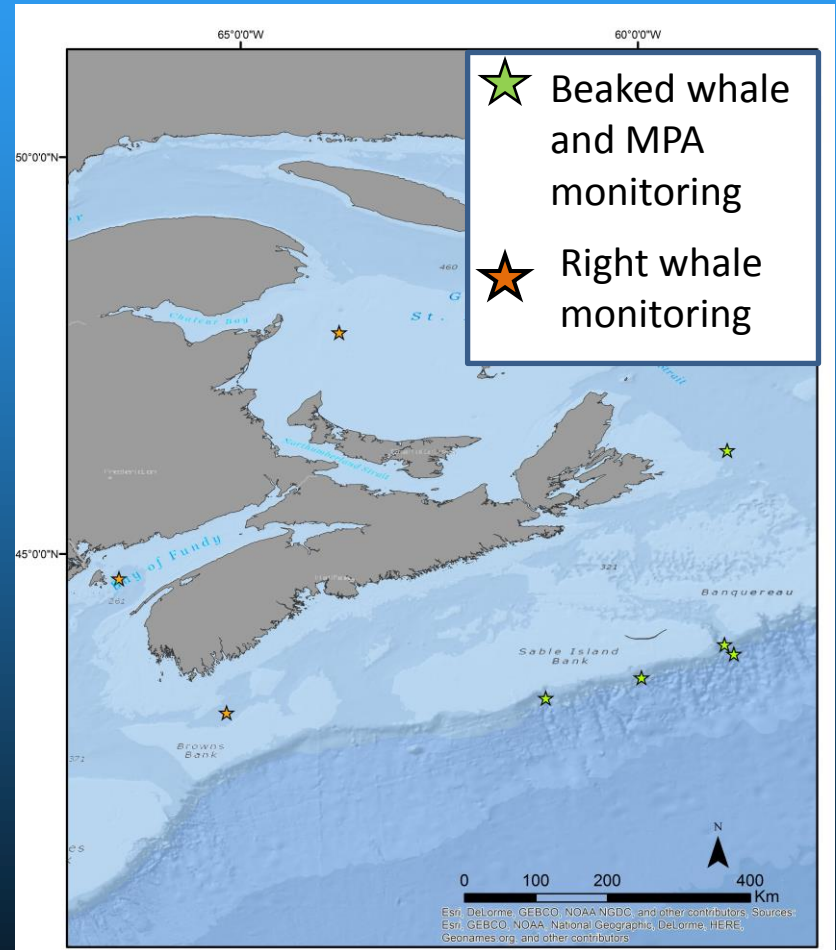


Figure courtesy of Pam Emery, DFO

Bottom-Moored PAM - Newfoundland & Labrador AURALs

Jack Lawson (DFO)

- AURAL recorders
- 14 sites with varying temporal coverage between 2009-present
- Sampling rate of 32,768 Hz
- Duty cycle of 32 min/hour
- Only two confirmed recordings with right whale calls (on the NL south coast) on 2009-2014 datasets
- Analysis of 2015-2017 datasets is ongoing

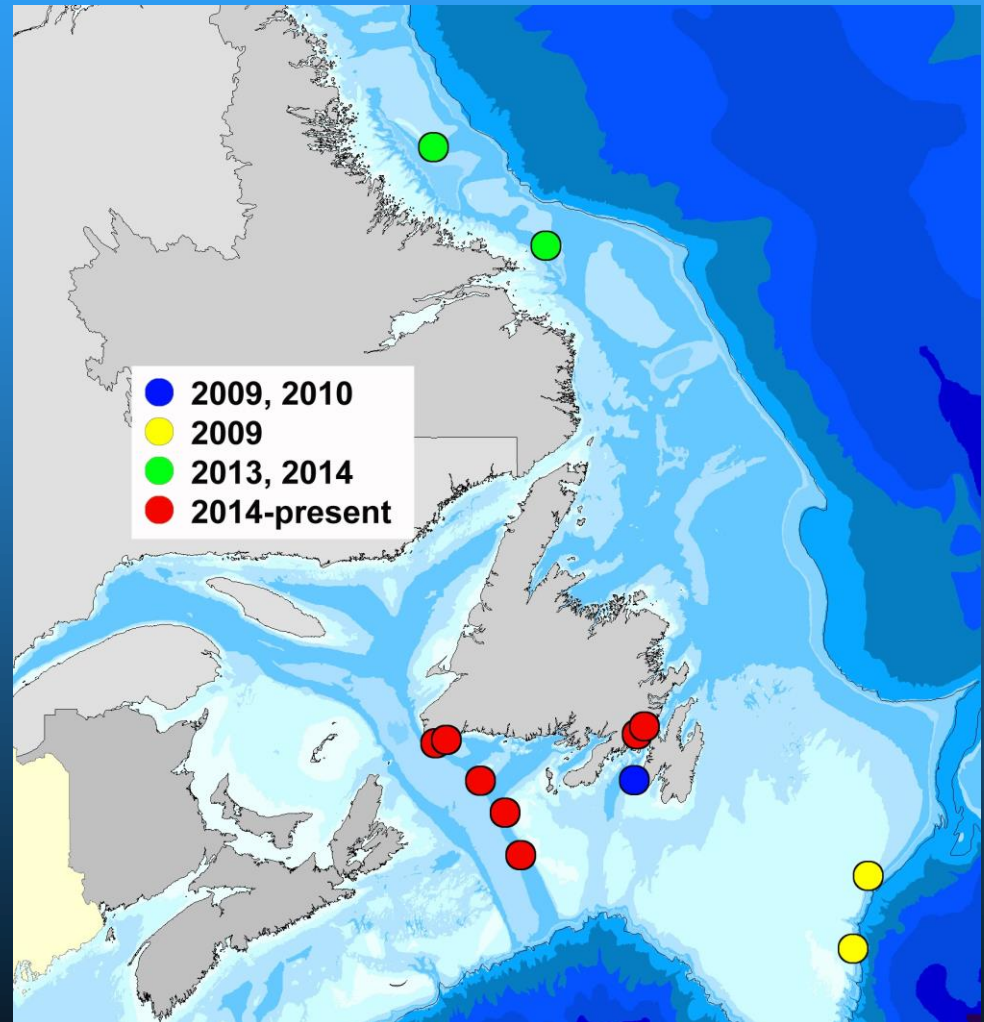
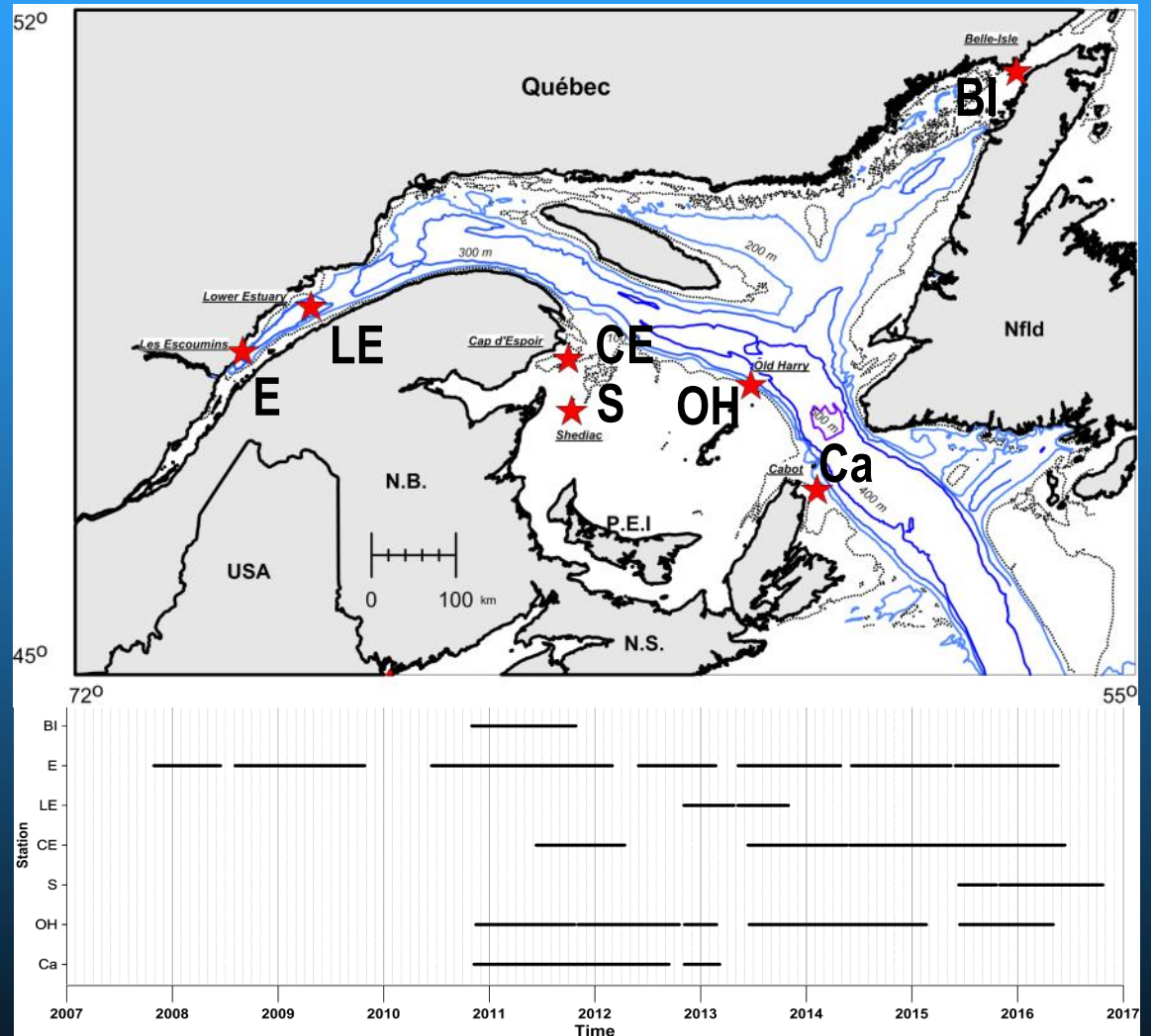


Figure from Jack Lawson

Bottom-Moored PAM- SLE/GoSL AURALs

Yvan Simard (DFO)

- AURAL recorders
- Six sites
- Varying temporal coverage between 2011-present
- Sampling rates between 8,192-32,768 Hz
- Duty cycle of 15 or 30 min/hour



Figures from Yvan Simard

Bottom-Moored PAM- SLE/GoSL AURALs

Yvan Simard (DFO)

- Analysis for right whale calls is underway and ongoing
- Detectors (recall rate ~75%) have been run through the data and all detections are manually validated
- Right whale calls only detected on the Gaspé (CE), Shediac (S) and Old Harry (OH) stations
- No right whale calls detected on the Cabot Strait station
- Calls occur in late summer up to late fall (end of Dec)
- Number of confirmed detections in 2015 and 2016 has increased substantially
- Deployments will continue in 2018

Habitat Suitability Modelling

Angelia Vanderlaan , H. Moors-Murphy (DFO)

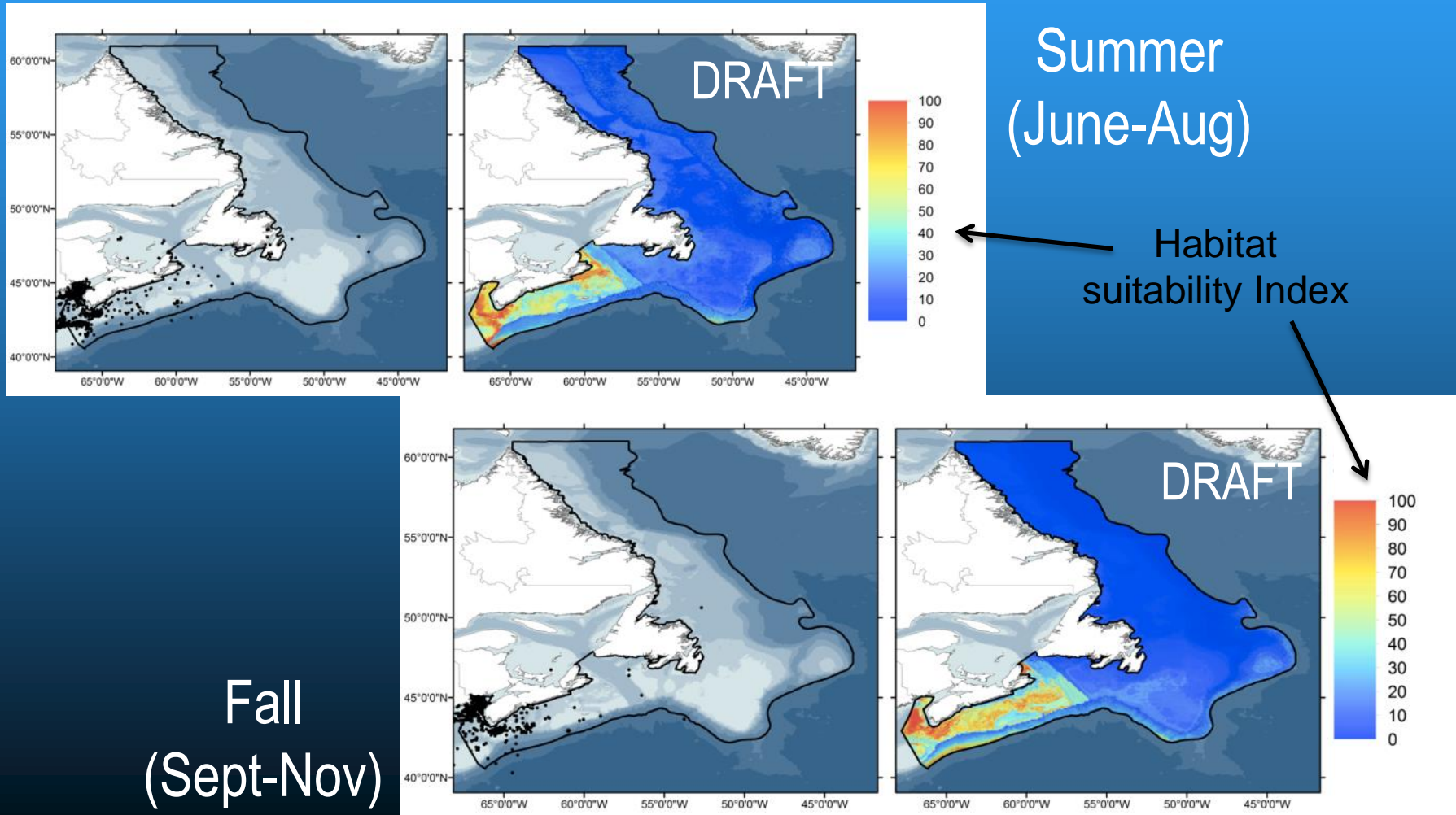
- Habitat suitability modelling underway to identify areas of predicted suitable habitat where future monitoring and research efforts could be focused
- MaxEnt approach
 - Uses non-effort based data
 - Initial focus on blue whales and northern bottlenose whales (Gomez et al. 2017)
 - Effort expanded to 15 species of cetaceans including North Atlantic right whales

Reference: Gomez, C. Lawson, J., Kouwenberg, A.-L., Moors-Murphy, H.B., Buren, A., Fuentes-Yaco, C., Marotte, E., Wiersma, Y.F. & Wimmer, T. 2017. Predicted distribution of whales at risk: identifying priority areas to enhance cetacean monitoring in the Northwest Atlantic Ocean. Endangered Species Research.

Habitat Suitability Modelling

Angelia Vanderlaan ,H. Moors-Murphy (DFO)

- Priority areas for right whale research/monitoring



Right Whale Preliminary Habitat Suitability Index

S. Plourde, V. Lesage, J.F. Gosselin, C. Johnson (DFO)

- North Atlantic right whale foraging suitability maps
 - Derived from *Calanus* biomass spatial climatology combined with regional and monthly specific *Calanus* vertical distribution
 - Considers simplistic right whale foraging bio-energetics
 - Reference point = minimum threshold of 8 kJ m⁻³ (EDmax) at 180 m
- Foraging bio-energetic model currently in development as part of project

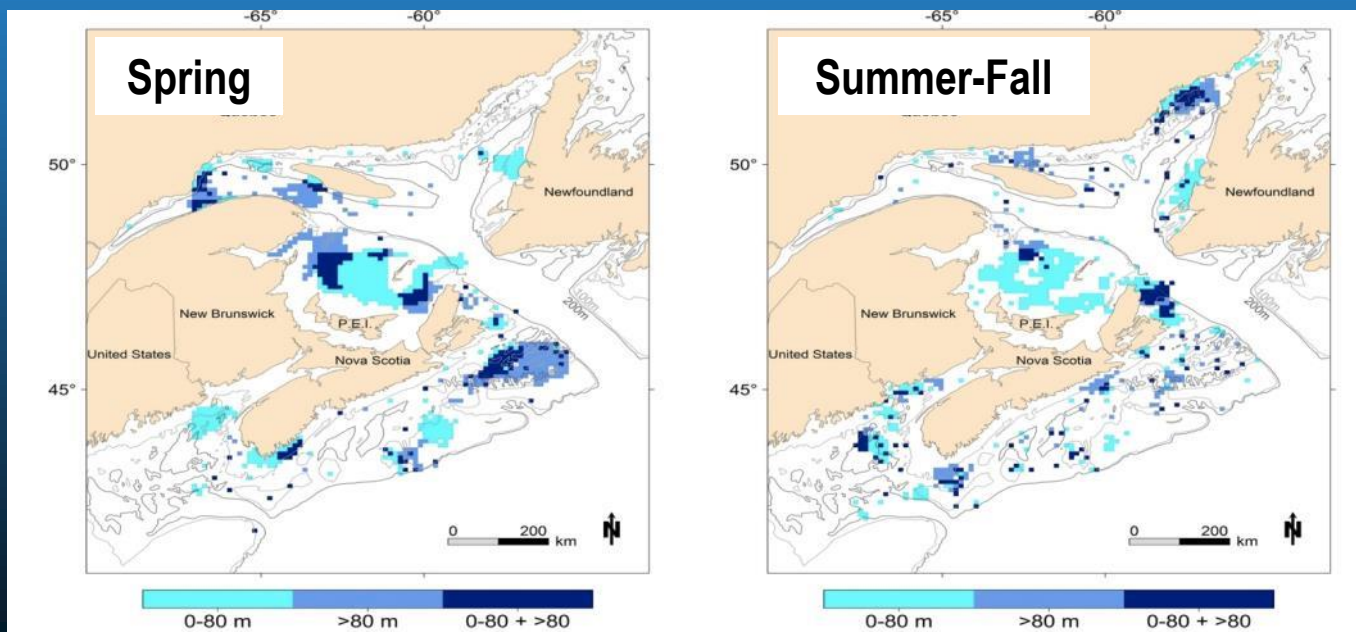


Figure provided by S. Plourde

Calanus Modelling Project

C. Johnson, S. Plourde, D. Lavoie, F. Maps, W. Gentleman (DFO)

- Particle tracking model (nested in an ocean model) to predict persistent *Calanus* hotspots
 - Incorporates transportation of particles via advection, dispersion via horizontal diffusivity, and a random walk in the vertical towards a target depth
- Builds on ongoing work by incorporating state-of-the-art statistical predictions of *Calanus* as initial conditions (e.g. Albouy-Boyer et al. 2016)
- Figures show preliminary results of late stage *C. finmarchicus* abundance in June 2008
 - Highlights role of ocean circulation in transporting *Calanus* onto the Magdalene shallows
- This is the first step towards developing a full 3-D population model for *Calanus*

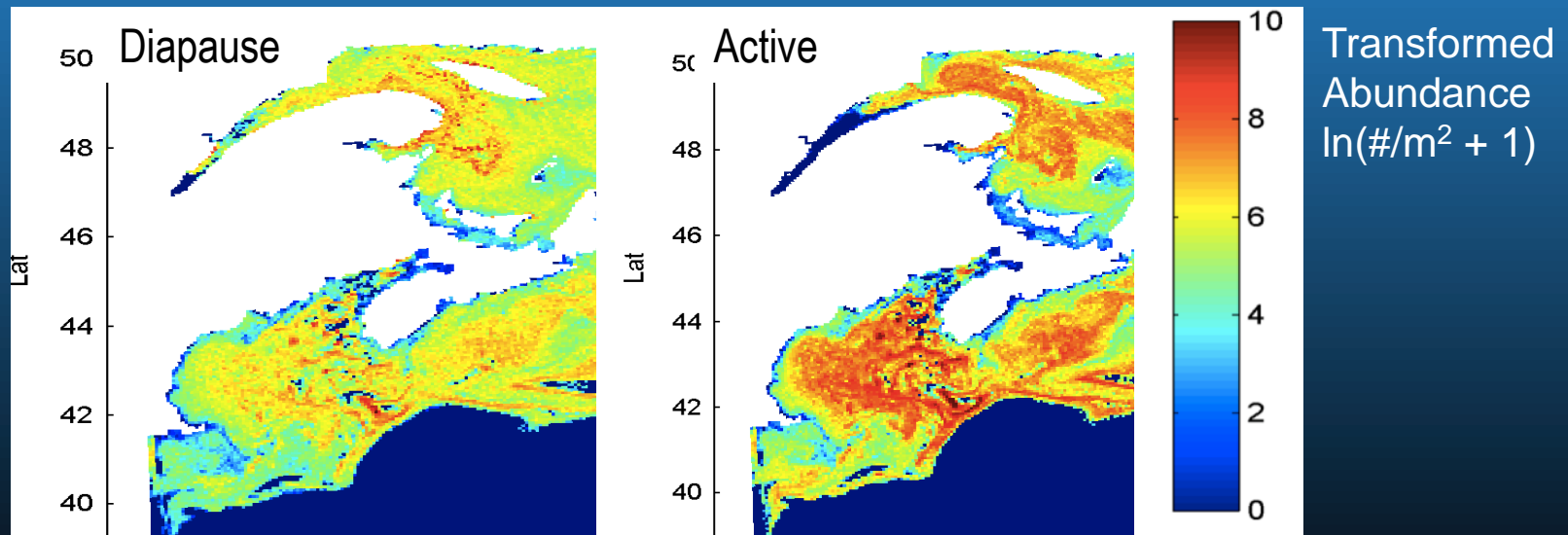


Figure provided by S. Plourde

Summary



Planning for 2018 is underway in collaboration with many organizations and we can expect enhanced right whale focused research and monitoring activities in the future