

Overview: oxygen as indicator of suitable habitat

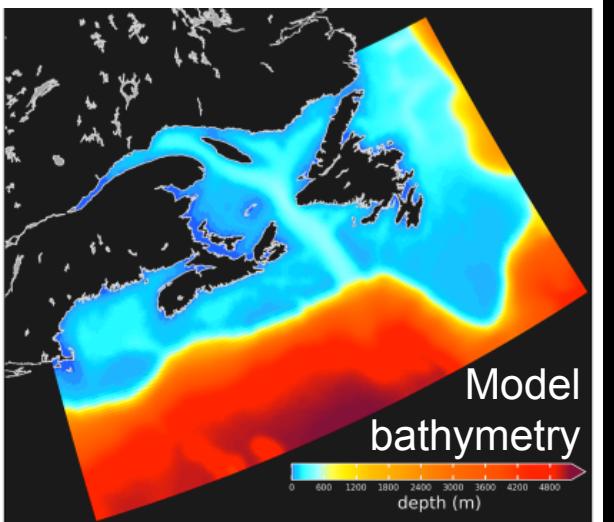
- **Oxygen is decreasing in the ocean** (e.g., Stramma et al. 2008, Gilbert et al. 2010)
- **Low oxygen concentrations can negatively affect marine animals**
- **How low is too low?**

Compilation of oxygen thresholds for 53 important species in Gulf St. Lawrence and Scotian Shelf (*Brennan et al., submitted*)

- ◆ **Is the Scotian Shelf resilient or vulnerable to future conditions?**

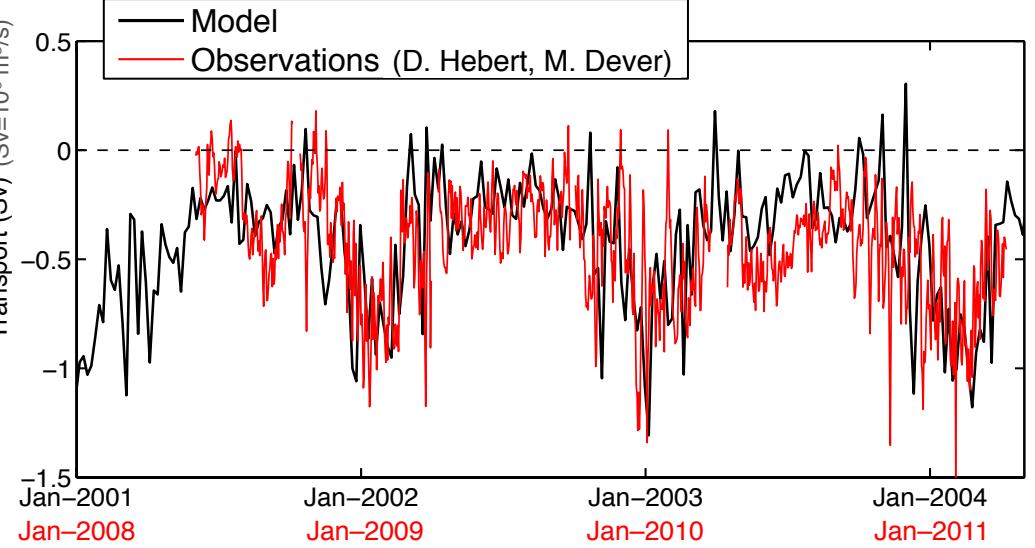
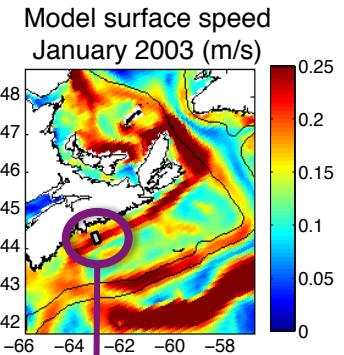
Our approach to the answer:

Thresholds + Regional Ocean Model
+ Climate Change Forcing



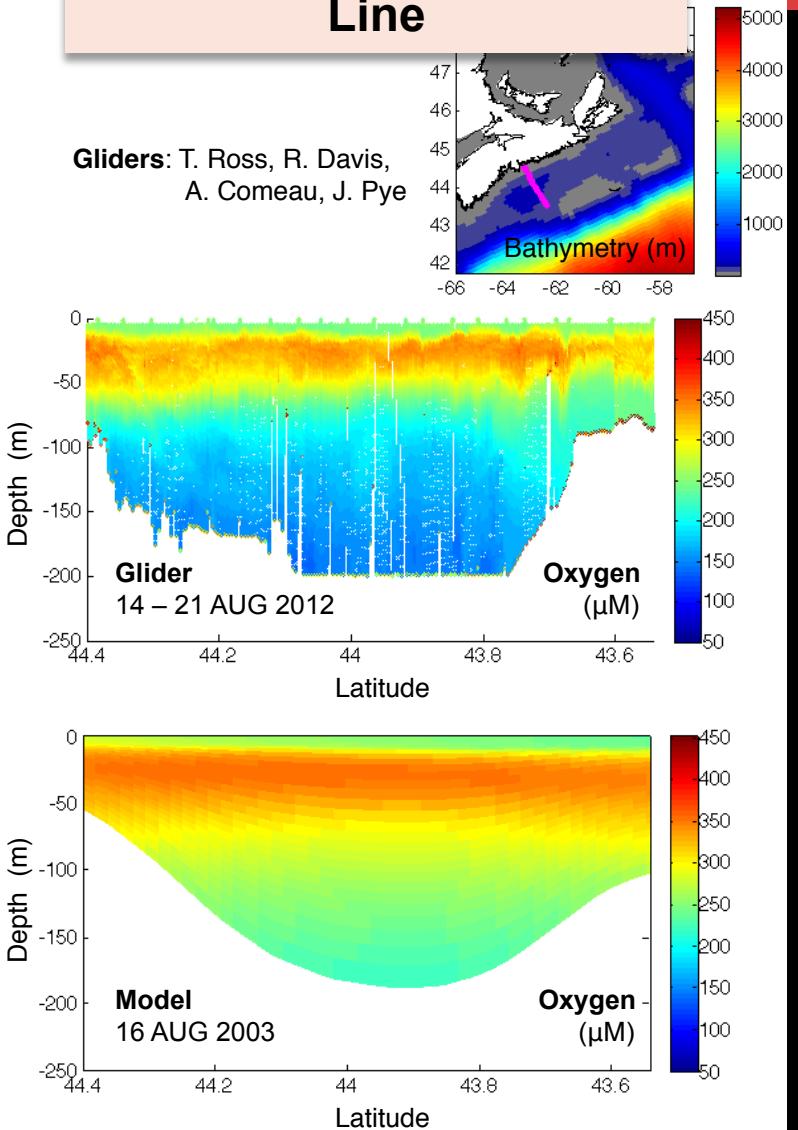
Model vs. Observations from OTN

Transport data from Nova Scotia Current



Glider data from Halifax Line

Gliders: T. Ross, R. Davis,
A. Comeau, J. Pye



Atlantic Wolffish: suitable habitat sensitivity to O₂ changes offshore

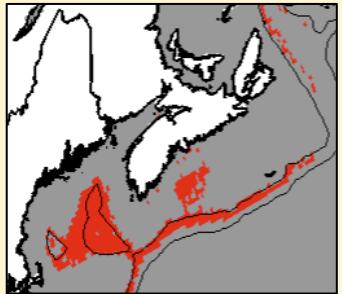
A. *Wolffish*: High critical oxygen threshold (207 µM ~ 6.64 mg/L ~ 70% saturation)

Listed as species at risk under SARA and COSEWIC

Observation-based bottom O₂ climatology

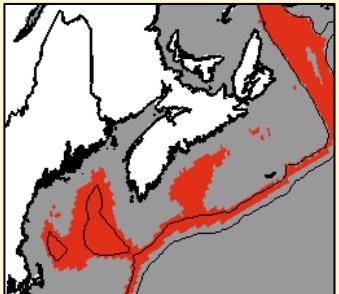
O₂ > threshold
→ Suitable

pre-1980



O₂ < threshold
→ Unsuitable

post-1980

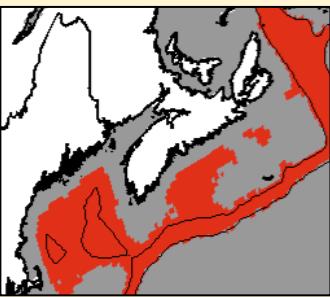


Observed unsuitable habitat expanded on Scotian Shelf and Gulf of Maine

Model Scenario: Offshore waters more depleted in O₂

(Stendardo and Gruber, 2012; Petrie and Yeats, 2000)

$$\Delta O_2^{\text{model}} = O_2^{\text{scenario}} - O_2^{\text{baseline}}$$

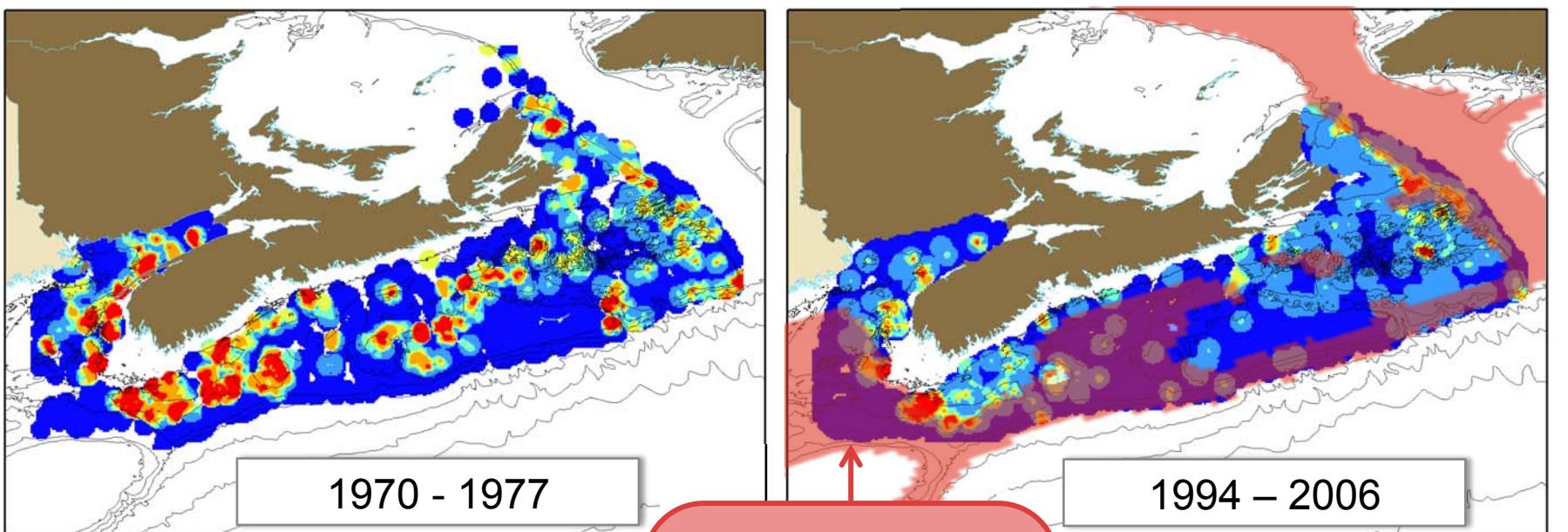


Bottom climatology post-1980 + ΔO₂^{model}

Habitat vulnerable to offshore O₂ depletion
(Gulf of Maine > Scotian Shelf)

Implications for management and policy: example

Observed distribution of Atlantic Wolffish on Scotian Shelf
(data in percentiles) *Horsman and Shackell (2009)*



- Wolffish just an example
- O₂ not only issue → T, pH

Modelled
unsuitable area
under O₂-deplete
offshore
conditions