

Using numerical particle-tracking to study the movement of the American eel and the Atlantic sturgeon

Kyoko Ohashi and Jinyu Sheng

Dept. of Oceanography, Dalhousie University

Collaborators

Physical: Keith Thompson, Katja Fennel, Jorge Urrego Blanco, Shiliang Shan

American eel: Mélanie Béguer, Julian Dodson (U. Laval), Martin Castonguay (DFO-IML)

Atlantic sturgeon: Andrew Taylor and Matt Litvak (Mount Allison U.)

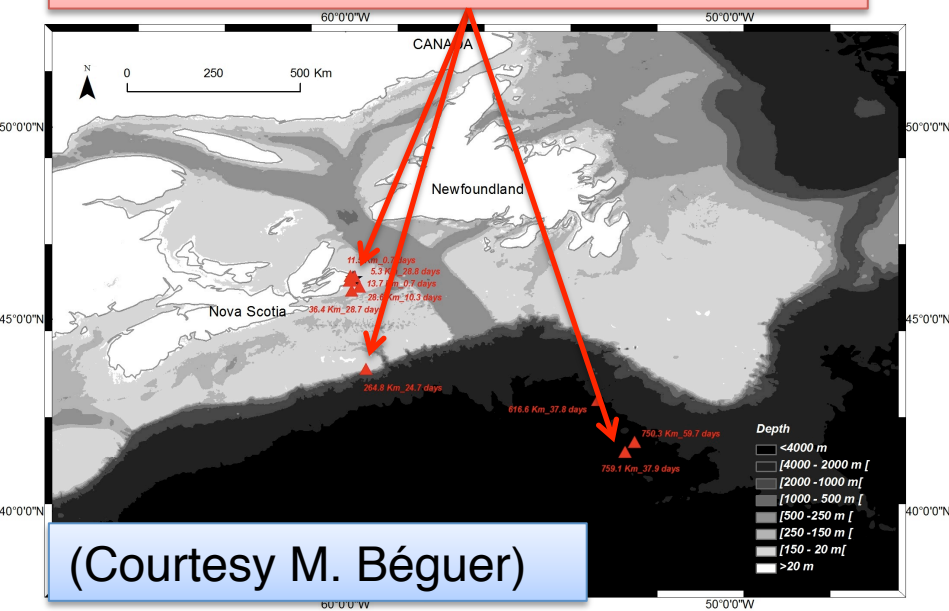


Applications of numerical particle-tracking

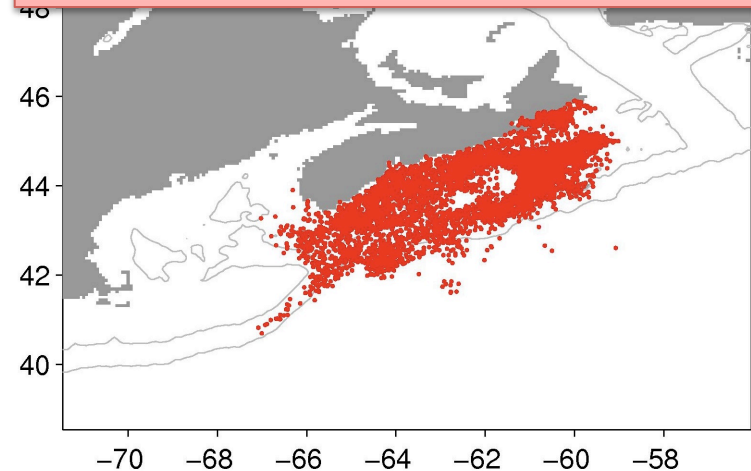
1. Assessing the migration strategy of American eels

- American eels were tagged in Cape Breton during fall 2013

Observed tag pop-up locations:



Simulated distribution after 60 days of passive particles released from Cape Breton:

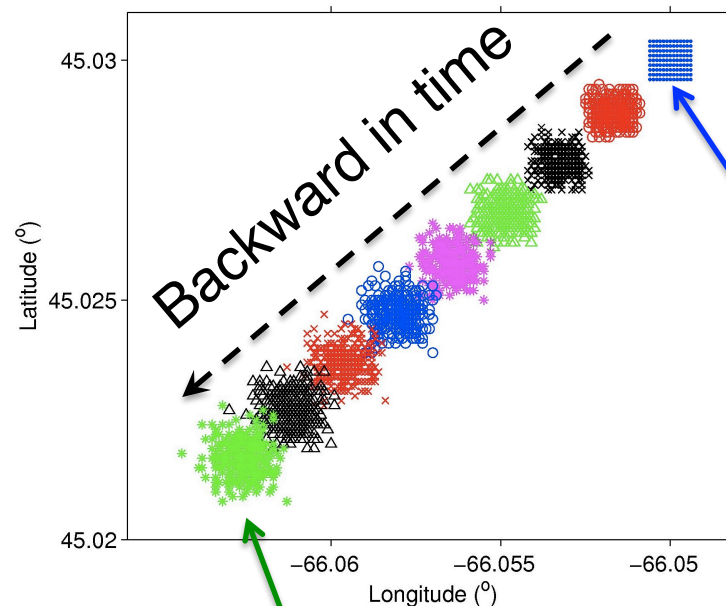


- Passive particles (i.e. movement due to currents only) travel southwestward along the coast & shelf break
- Eels will have to actively orient themselves to reach the Grand Banks area

2. Estimating tag pop-up positions

- Atlantic sturgeon were tagged in the Saint John River during Aug. 2012 by the Mount Allison University group
- Tags were detected by satellite on Feb. 12, Feb. 18, Apr. 10, 2013 in Bay of Fundy

- We estimate the *position of tag pop-up* by running the numerical particle-tracking scheme backward in time, from the *time and place of first satellite detection* to the *time of pop-up*



t_0 : Satellite detection at 2013/2/12 0:27

t_{end} : Estimated pop-up position at 2013/2/12 0:03

Conclusions

1. The combination of a numerical particle-tracking scheme with simulated 3D fields of circulation and hydrography can provide insights into the possible migration behaviours of marine animals, and complement observational information
2. Observations can provide guidance on which behaviours to simulate and parameters of behaviours (e.g. preference for certain depths)
3. Observations can also be combined with the particle-tracking scheme and/or model output to estimate missing information (e.g. animals' tracks or tag pop-up positions)
4. It is hoped that the information on possible migration paths, interaction with ambient conditions, etc. gained from studies such as these can aid in conservation and management efforts