

Potential Connectivity of Benthopelagic Species among Significant Benthic Areas off Newfoundland and Labrador (Canada)

Nicolas Le Corre^{1,2}, Pierre Pepin², Paul Snelgrove¹

¹ Memorial University of Newfoundland, ² Department of Fisheries and Oceans Canada (DFO)

Background

To achieve the objectives of the Convention on Biological Diversity, Canada is currently working on establishing networks of marine protected areas based on a variety of conservation objectives for a broad range of taxa with contrasting life history characteristics. One of the main objectives of such networks is to ensure population connectivity to support existing ecosystems functionality.

Objectives

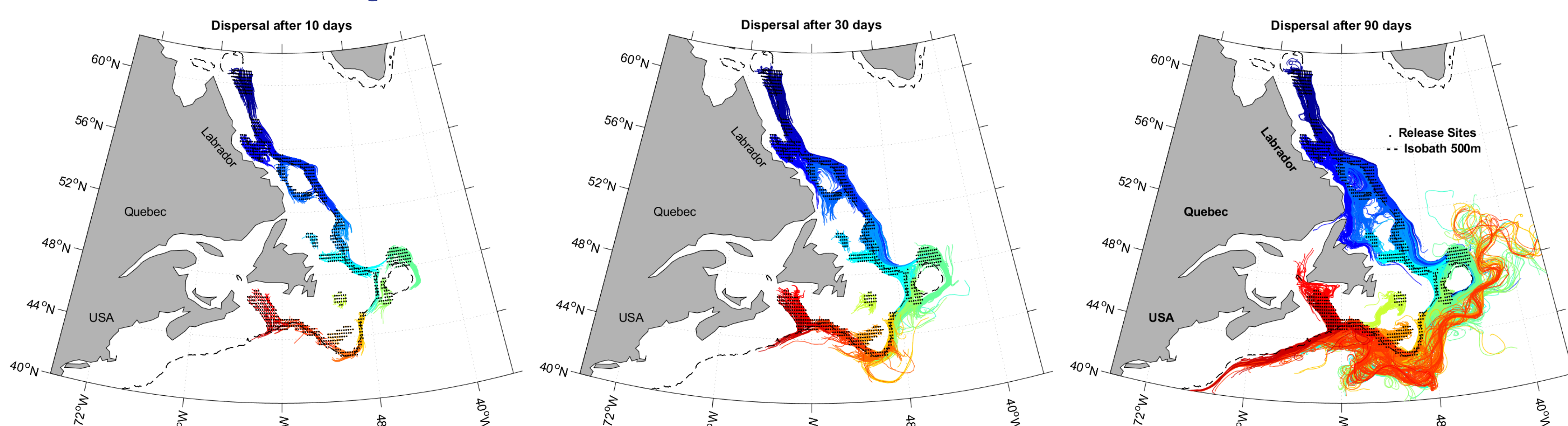
This study aims to assess potential connectivity of benthopelagic species (e.g., cold-water corals, sponges) among 18 Ecologically and biologically significant areas off Newfoundland and Labrador. Our goals:

- Estimate the **scale of larval dispersal** of key taxa.
- Evaluate the linkage among the different areas to identify **potential sources and sinks**.

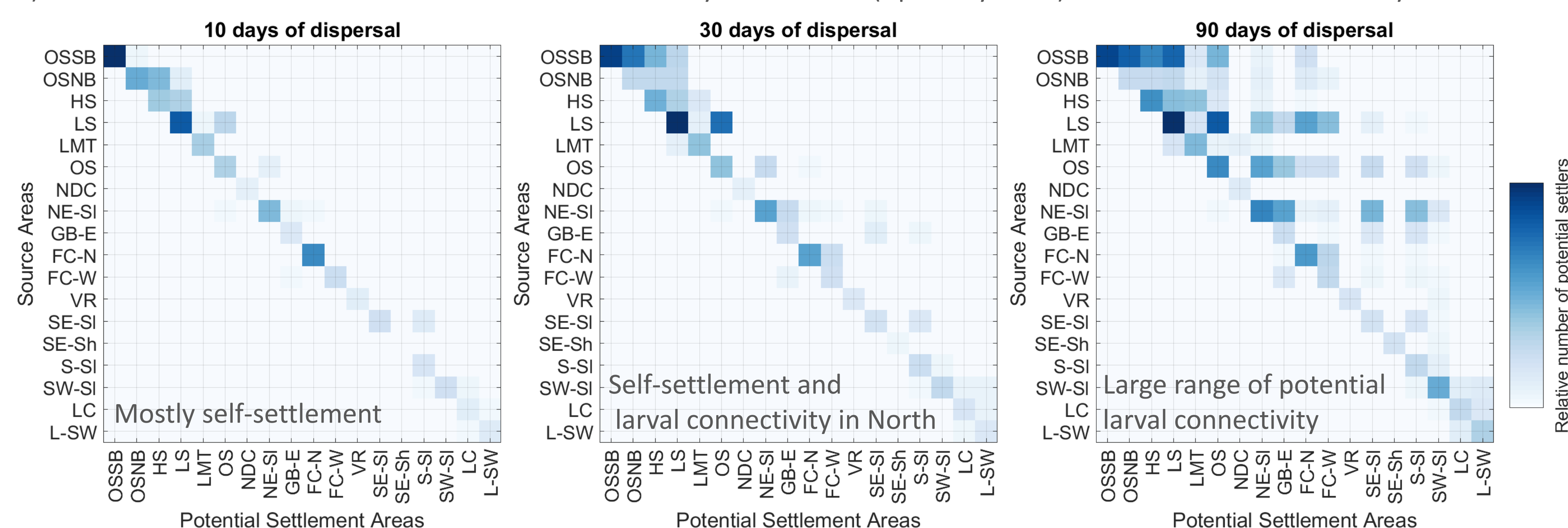
Methods

We selected Ecologically and Biologically Significant Areas (EBSAs) in which cold-water corals and sponges are important, as focal areas for our study. We simulated larval dispersal using an ice-ocean circulation model (NEMO, Wang *et al.* 2017) with a biophysical particle-tracking model (CMS by Paris *et al.*, 2013). We released larvae from the sea floor (and maintained at that depth) during the spawning season of most of the species of interest (Spring-Summer) and tracked them for various periods of time (10 to 90 days).

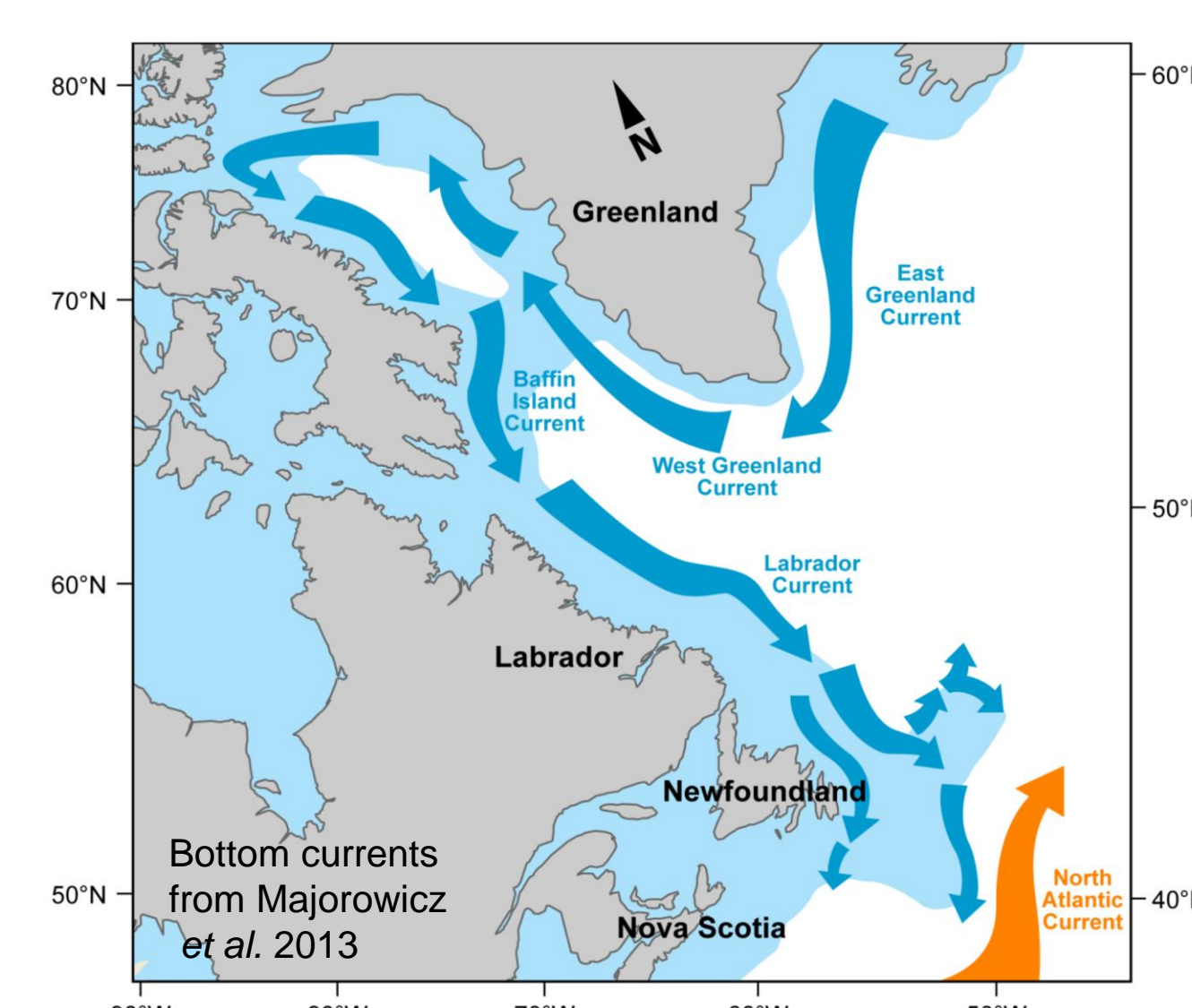
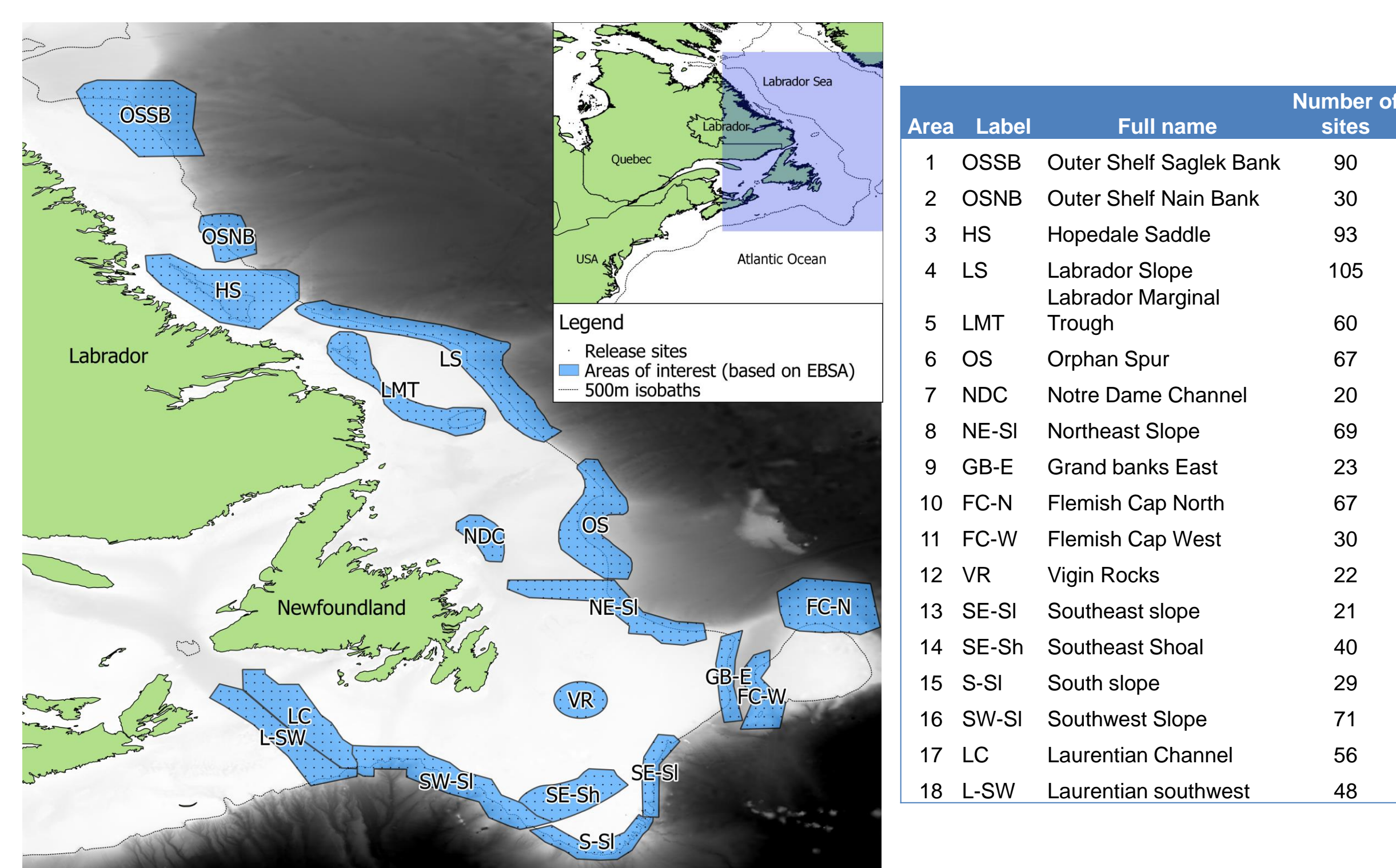
Preliminary results



Drift trajectories of 3764 passive larvae released from 18 EBSAs (one colour per release area) at various depths (depth of the release site). Larvae were released from the 941 sites on the first day of 4 months (April-July 2012) and tracked for 10 to 90 days.



Connectivity matrix representing the potential exchange of larvae between the different EBSAs after 10, 30 and 90 days of dispersal. The colour of the cell correspond to the number of larvae released from the source EBSA (Y axis) that potentially reached the receiving EBSA (X axis), based on all the positions of the larvae during their drifting period (i.e., 10 to 90 positions per larvae).



- The Labrador Current drives larval dispersal from North to South along the shelf edge (70 to 900 km in average after 10 or 90d, respectively).
- Northern areas generally contribute more to the network than southern areas. The network also exports a significant number of potential settlers to deep-sea areas beyond the limit of Canada waters.

Future work

- Focus on specific groups of species (larval duration, behaviour, settlement substrate requirements).
- Assess the effectiveness of the alternative Marine Protected Areas Network scenarios.