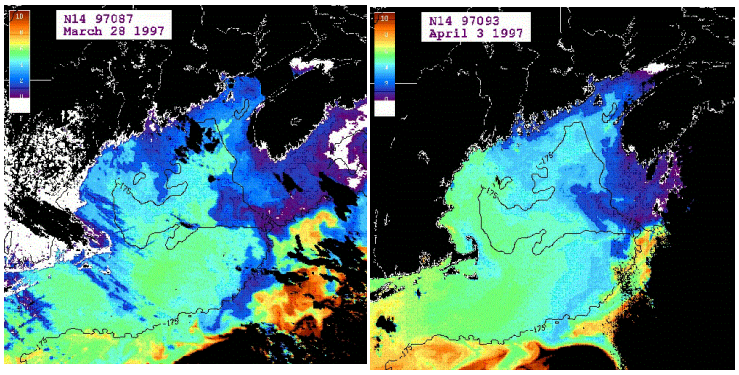
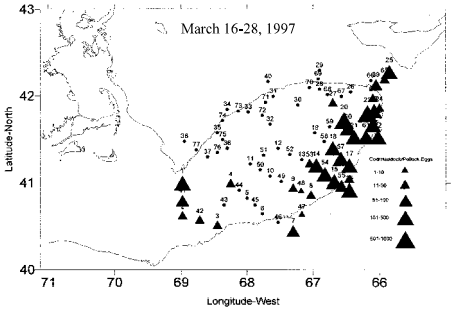
Presentation at Globec Workshop, October 2000, Woods Hole, MA
see:http://globec.whoi.edu/globec-dir/reports/data_workshops/cross-frontal_exchange/cfe-ssc_report_2000/biological_importance_sswater.html

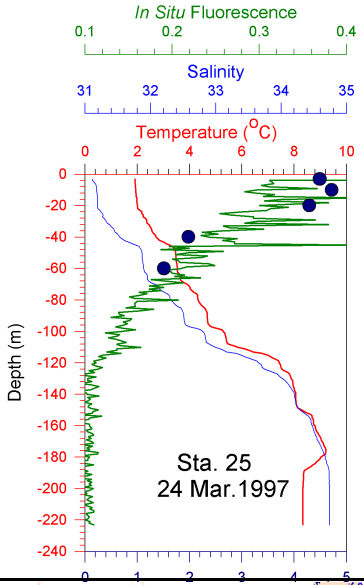
Biological Importance of Scotian Shelf Water (*D.W. Townsend*)

Transport of Scotian Shelf Water (SSW) across the Northeast Channel to Georges Bank (as well as elsewhere throughout the Gulf of Maine) can have interesting and important biological implications. For example, in March of 1997 a patch of gadid eggs, perhaps originating in Canadian waters, were observed in association with a SSW cross-over event on the Bank, as shown in the figures here of eggs, and concurrent sea surface temperatures (28 March and 3 April). The SSW is visible as a patch of colder water extending to the southern flank of Georges Bank.



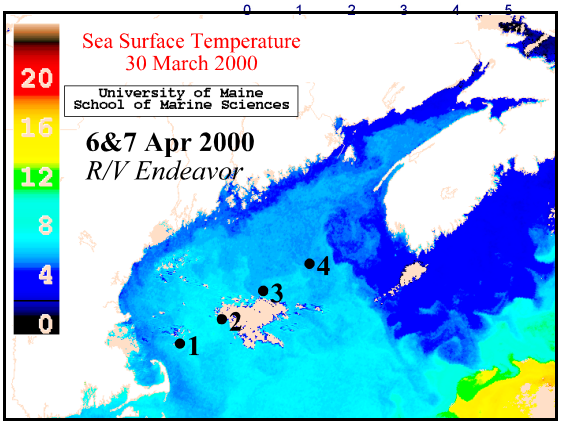


The relative importance of the transport of ichthyoplankton across the Northeast Channel remains a subject of much speculation, pending the completion of Globec ichthyoplankton sample analyses.

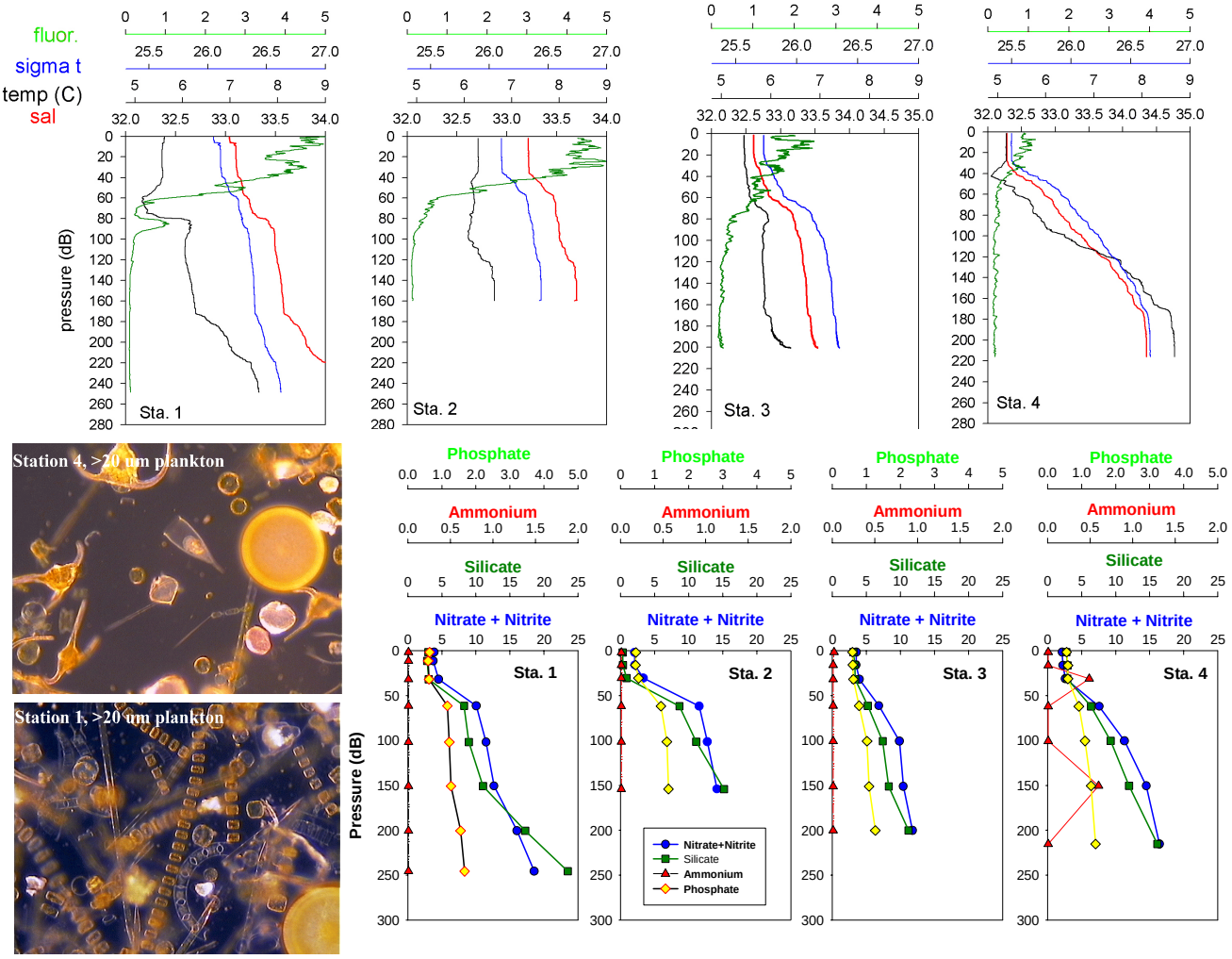


A hydrographic station sampled inside the SSW (Sta. 25, in the Northeast Channel) indicated that those waters might be bringing to the Bank a phytoplankton bloom that had already commenced some time earlier. The potential significance of this observation is in the possible delivery to the Bank of a buoyant water mass (cold but fresh) that is supporting a plankton bloom in what might otherwise be waters too vertically well-mixed to support significant phytoplankton production this early in the season. Additional variability in the timing of these cross-ver events could potentially mean that post-bloom, low-nutrient waters might be delivered to the Bank.

Additional evidence of the possible importance of SSW to the overall Georges Bank – Gulf of Maine region was observed in early April 2000 (figures below). A set of 4 stations was sampled across the Gulf of Maine, which encompassed the spring phytoplankton bloom. Positions of the stations relative to sea surface temperature one week earlier is given in the satellite image here.



The spring phytoplankton bloom was well underway at Stations 1 and 2 (high *in situ* chlorophyll fluorescence); it was less well-developed at Station 3, and the bloom was either over, or it had not yet commenced at Station 4. The phytoplankton species composition at Stations 1 and 4 (>20 µm size fraction) reveled in the photomicrographs suggested that the diatom bloom was underway in the west, but an apparent post-bloom community at Station 4 indicated that the bloom may have



been over in the east. Hydrographic structure at Station 3 and, especially, Station 4 indicated that surface waters in the east were likely an admixture of Gulf of Maine water and fresher, colder Scotian Shelf Water; this is also visible in the satellite image. These data Stations in the SSW had sufficient vertical stability in the upper water column, primarily controlled by salinity, such that a bloom should have been underway, unless nutrients were already depleted. Later analyses of the dissolved inorganic nutrients reveled that indeed they were depleted at Station 4 similar to the other stations, supporting the notion that the bloom had ended.

These data underscore the importance of SSW in initiating an unusually-early spring phytoplankton bloom in the Gulf of Maine and, in 1997, on Georges Bank. Phytoplankton growth in the colder waters of SSW intrusions, 2-3°C colder than surrounding waters, could be important with respect to the trophodynamic fate of that production.