3D Hydrographic Measurements on the Eastern Bering Sea Shelf from the 2008 NOAA Bottom Trawl Survey

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Background: With BSIERP funding we instrumented the Eastern Bering Sea Crab and Groundfish Survey (aka the bottom trawl survey) with 2 rugged Falmouth Scientific NXIC CTDs in 2008 and 2009. Attached to the headropes of the 2 survey vessels (F/V *Aldebaran* and *Arcturus*), the CTDs provided vertical profiles of water temperature and salinity at 281 sites. We gridded the observations onto a 3D-grid with 37 km (20 nm) horizontal and 1 m vertical spacing. The new CTD measurements provide salinity and density fields where previously only temperature measurements were made. We acknowledge the cooperation and hard work at sea of many researchers from the NOAA/AFSC Resource Assessment and Conservation Engineering (RACE) Division, especially Bob Lauth who supervised the survey and Stan Kotwicki for collaborative discussions.

Figure 1. A Falmouth Scientific NXIC CTD in its white plastic protective case and orange net bag being attached to the bottom trawl headrope before deployment. (Photo courtesy of Bob Lauth)

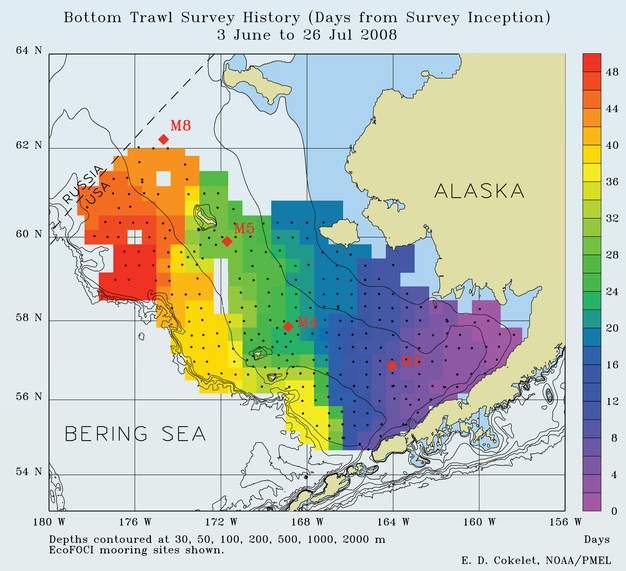

Figure 2. The timing of the bottom trawl survey as it evolved. Locally, measurements were made within a few days of one another, although it took 2 months for the 2 fishing vessels, sailing parallel lines, to complete the survey from the southeast to the northwest. Dots show the CTD cast locations.

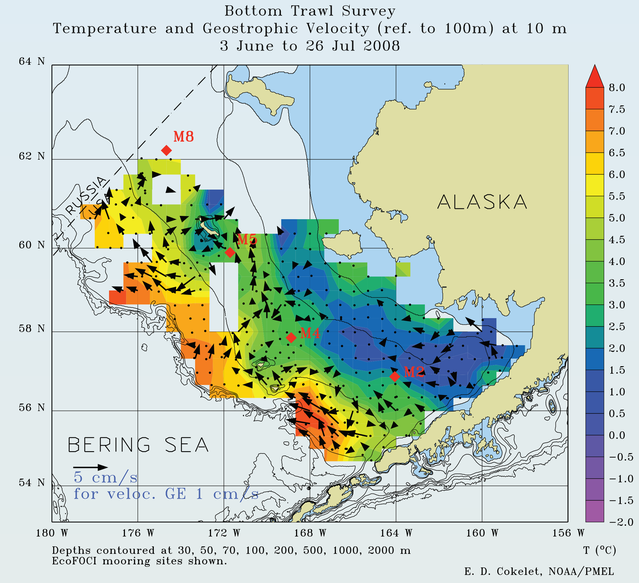

Figure 3. The water temperature at 10 m with geostrophic velocity vectors relative to 100 m or the bottom for shallower depths. Notice stronger northwestward geostrophic flow along the shelf edge. There is recirculation south of the Pribilof Islands and onshore, cross-shelf flow north of them. (The geostrophic velocity is but one component of the actual velocity field and is determined from the water's mass density distribution relative to the chosen reference depth. Wind-driven and tidal currents must be added to this to give the complete velocity field.)

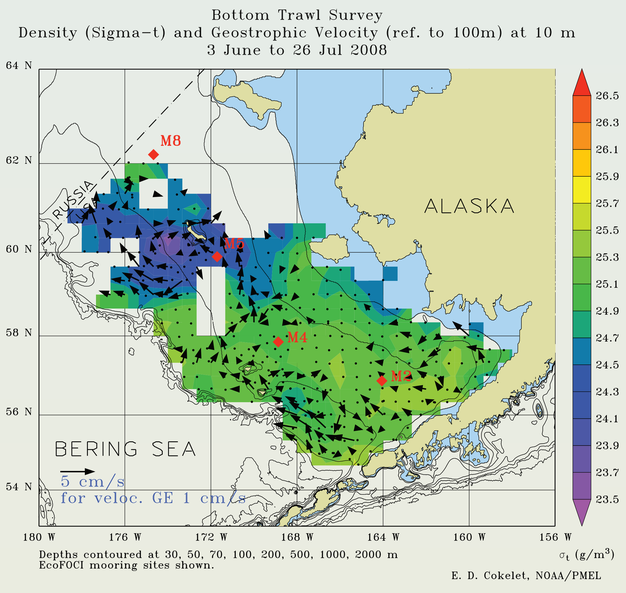

Figure 4. The water mass density at 10 m with geostrophic velocity vectors overlain. The least dense surface water near St. Matthew Island is due to low salinity.

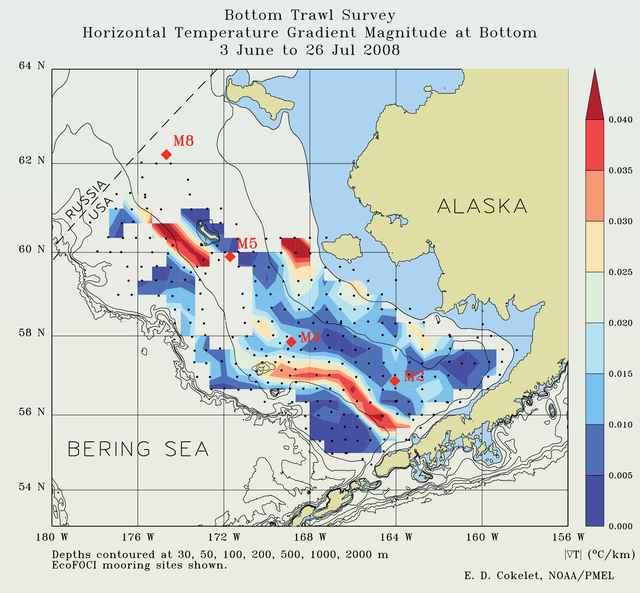

Figure 5. The horizontal temperature gradient magnitude along the bottom. Notice the strong gradient that a bottom fish would encounter just inshore of the 100-m isobath.

Future Work: Trawl-based CTD measurements were made in 2009 and are planned for 2010. We plan to image the measurements in 3D and to study inter-annual variations and the relationship of the 3D-hydrographic field to fish distributions.