Pinkerton et al., 2003), provide continuous time series, and to characterize important subsurface ocean properties.

Ships

Ship sampling is the oldest method of gathering oceanographic data, yet still remains a valuable resource for current HAB research in conjunction with modern, technological sampling platforms. Ship sampling provides: (1) direct, detailed process-oriented measurements for specific research studies, (2) data at multiple depths and over long distances, and (3) means of deployment of other sampling platforms (such as drifters, floats, AUVs, gliders, and moorings). Sampling via ships may include on-station vertical profiling of instruments or instrument packages; on-station and underway ship-mounted, tethered, or hand-held radiometric measurements; and underway sampling using flow-through systems (Balch et al., 2001), towed undulating (Barth et al., 1998), and fixed depth bodies or chains that act as instrument platforms. One of the advantages of ship sampling is that calibrations and cleaning of instruments can be performed between each deployment (profile) to provide more accurate, freshly calibrated, essentially non-biofouled data. A second advantage of ships is that advanced analytical instrumentation that cannot presently be routinely deployed from other *in situ* platforms can be utilized, e.g., mass spectrometers, 'clean' methods for ocean chemistry, and radioactivity measurement systems. In addition, ships remain the only feasible platform capable of collecting whole water samples and conducting net tows for timely biological analyses. It is these biological analyses that are essential for complementing continuous, autonomously sampled interdisciplinary observations in order to investigate details of the physiological and behavioral aspects of HABs. Ships have limitations in terms of their high cost, limited availability, and restricted synopticity in sampling. Also, they are constrained by meteorological and sea-state conditions.

High costs and limited sampling problems have been resolved with the employment of ship-of-opportunity programs (e.g., ferries) to make long-term basic measurements along consistent transects. In the Baltic Sea, regular measurements of surface chlorophyll fluorescence, conductivity-temperature, and nutrients using a flow-through system are conducted on board cooperating merchant ships (Alg@line; http://www.balticseaportal.fi/). These data have proven invaluable for characterizing the spatial and temporal extent of blooms in Scandinavian waters. The M/S Scotia Prince ferry in the Gulf of Maine is equipped with hydrographic, biological, optical and chemical sensors for long-term, continuous measurements to examine factors affecting the distribution of phytoplankton (Balch et al., 2004). Ferrymon, which runs in Pamlico Sound off the coast of North Carolina, regularly collects near-surface temperature, conductivity, dissolved oxygen, pH, turbidity, and chlorophyll fluorescence data (http://www.ferrymon.org/). These data are telemetered via cell phone technology to Duke University for analyses. Ferrymon activities are used to predict ecosystem responses to changes in Pamlico Sound water quality in an effort to direct coastal management. Alaska State ferries are equipped with instruments to make biophysical observations (hydrography, nutrients, and bio-optics) in the Gulf of Alaska to monitor ecosystem changes (http://www.pmel.noaa.gov/foci/GEM/alaska_ferry/GEM_ferry.html).