

The carbonate chemistry of Cape Cod estuaries and bays

A proposed sampling and analytical program to measure the annual cycle of the carbonate system chemistry of select Cape Cod estuaries, bays, and near shore waters. These data (titration alkalinity (TA) and dissolved inorganic carbon concentrations (DIC)) will be used to determine the carbonate ion concentration ($[\text{CO}_3^{2-}]$), aragonite saturation state (Ω), and pH of these waters; in addition, we will collect and analyze samples to determine the carbon isotopic composition ($\delta^{13}\text{C}$) of the DIC, to better quantify CO_2 production (respiration / benthic decomposition) at these sites. These data – the spatial and temporal ranges of TA, DIC, $\delta^{13}\text{C}$, $[\text{CO}_3^{2-}]$, Ω , and pH in bays and the coastal ocean – will document the conditions in which many commercially important shellfish species currently live and reproduce, and will help identify the factors which determine these chemical conditions. These data will add a new component to our picture of water quality in bays and coastal waters; in addition, these data will provide a valuable guide for the design of laboratory-based culturing studies of the influence of ocean acidification on shellfish calcification and health, and also will provide essential ground-truth for the numerical models used to predict the likely shifts in coastal carbonate chemistry in response to rising atmospheric pCO_2 during the 21st century.