

Introduction to Special Issue: Marine Ecosystem Assessment of Pleasant Bay, Cape Cod, Massachusetts

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Pleasant Bay is located on the southeast coast of Cape Cod by the towns of Chatham, Harwich, Brewster, and Orleans, MA. Pleasant Bay is a coastal lagoon that is part of the Nauset Beach/Monomoy Island barrier spit–barrier island system. The westernmost area of the embayment, locally known as “Big Bay”, is an ice-block basin or “kettle hole”, as are many of the sub-embayments within Pleasant Bay.

Two tidal inlets currently provide the embayment with direct tidal exchange to the Atlantic Ocean. The system has a 150-year cycle of inlet formation, migration, and new inlet formation with a period of tide-dominated inlet development followed by a wave-dominated inlet migration phase (Giese et al. 2009). In 2007, a new inlet formed updrift of the exiting inlet which formed in 1987.

Pleasant Bay is 5 km across at its widest point with mean and maximum depths of 2.0 m and 6.0 m, respectively (Howes et al. 2006). At high tide, Pleasant Bay is ~29.5 km² in size and surrounded by ~60 km of coastline. Its watershed is 87.41 km² in size within the 4 towns. Approximately 24% of the bay is within the Cape Cod National Seashore. The bay is a highly valued regional resource, designated by the state and recognized by the surrounding towns as an Area of Critical Environmental Concern (Pleasant Bay Alliance 1998)

In addition to the dynamic geological processes affecting Pleasant Bay, this valuable ecosystem is at risk from development within its watershed and from human activities within the bay. The Commonwealth of Massachusetts has established a threshold total maximum daily load (TMDL) for nitrogen removal in Pleasant Bay that must be met by the 4 towns to restore water quality (MassDEP 2007).

The goal of this assessment was to develop a dataset of baseline information that describes the present status of the natural resources of Pleasant Bay and that can be used to develop a long-term habitat monitoring program. There were 5 aspects of the assessment:

- Bay-wide collection of physical, chemical, and biological data sets that would be used in understanding bay evolution and developing high-resolution benthic habitat maps by employing the coastal and marine ecological classification standard (CMECs).
- Determining the distribution and relative abundance of individual species of shellfish and finfish using a variety of sampling methods.
- Describing the seasonal distribution and numbers for *Halichoerus grypus atlantica* (Fabricius) (Gray Seal) and *Phoca vitulina vitulina* L. (Harbor Seal) at haul-outs inside Pleasant Bay during 2014 and 2015 through monthly aerial surveys.

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- Providing information on the diet of Gray Seals and Harbor Seals through otolith and hard part identification in collected scat samples.
- Providing an initial representation of the interrelationships among the bay's biological and physical features.

The content included in this special issue documents the efforts made to achieve these goals, the data and results obtained from the assessment, the significance and implications of those findings for our understanding of the Pleasant Bay ecosystem and the processes that shape it, and the most promising directions for future research and monitoring efforts.

Literature Cited

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