RI's Climate Challenge
Waves of Change

Why Slow and Steady (or High and Mighty) May Not Win the Race

Seabirds that frequent Rhode Island waters may be affected by climate change impacts occurring in and around the state's waters. Each type of seabird (e.g., pelagics, sea ducks, gulls and relatives, and shorebirds) has a slightly different seasonal use for the area and, therefore, the impacts of climate change may affect them differently.

Species that nest on the ground on low offshore islands (e.g., roseate terns, federally listed as endangered, and common terns) would be extremely vulnerable to sea level rise and loss of critical nesting habitat—for example, the Great Salt Pond on Block Island, which is a regionally important migratory shorebird stopover site.

Piping plovers (listed as federally threatened) and least terns (state threatened) could lose critical beach nesting habitat.

Rhode Island provides valuable stopover habitat for a wide variety of migratory species, particularly in the fall. Birds that breed on the tundra of Canada and Alaska stop in Rhode Island and coastal New England to refuel before heading farther south to the southern U.S., Caribbean, and South America.

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Ocean State beaches (e.g., Napatree Spit in Watch Hill) and coastal ponds on both sides of Narragansett Bay (e.g., Trustom Pond and Ninigret in Charlestown, and Goosewing in Little Compton) provide important foraging habitat for these long and short-distance migrants. Loss of this foraging habitat to sea level rise could have major impacts on shorebird populations.

Food Availability

Many of the seabirds that prey on fish and plankton are likely to have their food supply reduced or relocated if the predicted effects of climate change on lower food chain levels occur. There is not yet data on seabird impacts in Rhode Island waters as a result of changes in food supply, but there is evidence elsewhere.

A mixed flock of seabirds flying near Napatree Point in Westerly, RI

Natural climate variability of the El Niño Southern Oscillation (ENSO) events has provided insight into how sea surface temperature variation can result in significant change in the marine ecosystem.

The population of sooty shearwaters and common murres (also a frequent visitor to Rhode Island) off the west coast of North America greatly declined due to starvation during the 1997–1998 ENSO.

Cormorants and pelicans experienced mass mortalities during the 1982–1983 ENSO that were attributed to reduced nutrients in surface waters leading to decreased primary and secondary production. This is important locally because double-crested cormorants are a common breeding species in Rhode Island, nesting in Narragansett Bay, and great cormorants are common in winter months in coastal Rhode Island.

Six species of sea turtles are known to live in the North Atlantic, with four—green, loggerhead, Kemp's Ridley, and leatherback sea turtles—occurring rarely or occasionally in the Rhode Island waters. All four are on the U.S. endangered species list.

Breeding

Sea surface temperature affects the marine ecosystem and seabird food abundance, distribution and seasonality.

Data analysis done over time of over 100 species of seabirds in the North Atlantic suggests a strong relationship between seabird breeding success and climate variables related to the North Atlantic Oscillation, which influences sea surface temperatures, air temperatures, precipitation and other aspects of regional climate. The results suggest that sea surface temperature was the single most relevant parameter to breeding success of seabirds.

A lack of food affects the reproductive success of seabirds with a reduction in numbers of eggs produced, those successfully hatching, and the number of breeding pairs.

Migration Patterns

On a global scale, climate change also affects the timing of arrivals and departures of migratory seabirds, and average laying dates.

Warmer springs are associated with earlier arrivals and earlier breeding. Reported observations of some bird species in the United Kingdom have been increasingly later in the fall, implying a longer stay on breeding grounds.

Climate-related alterations of the marine ecosystem could cause mismatches between migratory time and cycles when major prey species are in abundance in Rhode Island waters, thereby causing disruptions in natural cycles of life and death within bird populations.

Sea Turtles

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Nesting Grounds Are Critical Areas of Concern

The major impact of global climate change on sea turtles that swim through Rhode Island waters is on their nesting grounds farther to the south and on their feeding grounds along the eastern coast of the U.S.

All female turtles come ashore at nesting beaches, dig nests in the sand, lay their eggs, and then return to the sea. These areas of low-lying, sandy, coastal beaches, key habitat for nesting sea turtles, are also areas that are the most vulnerable to impacts from sea level rise.

Erosion and inundation of beaches caused by rising sea levels and more intense storms adds the potential for further dangers to nesting sites that are already threatened by people and animals.

Coastal flooding can increase rates of egg mortality and decrease reproductive success as sea levels rise ever closer to sea turtle nesting sites.

The Outer Banks of North Carolina is especially prone to this because most beaches are backed by coastal development (e.g., seawalls, roads) or salt marsh, and increased storm surge and coastal land loss will threaten these beaches, which have nowhere to retreat.

Temperature and Incubation

Rising temperatures will affect incubating sea turtle eggs. The optimal temperature range for incubation is 77°F to 95°F with reduced hatchling success outside that range.

Temperature during the middle third of incubation determines the sex of the hatchling. Hatchling sex ratio is 50:50 at 84°F with more males at cooler temperatures and more females at warmer temperatures.

Loggerhead turtles nest in North America from southern Florida to southern Virginia, and it is theorized that more males are born in the northern sites due to cooler temperatures. Loggerhead turtle nests in Florida are already producing 90 percent females owing to high temperatures, and if warming raises temperatures by an additional 1.8°F or more, no males will be hatched there.

Vegetation (shading), beach slope, humidity, rainfall, and egg position in the nest can also influence incubation temperature and sex ratio.

Nesting Seasons

One study of loggerhead sea turtles at Bald Head Island in North Carolina found that increased sea surface temperature is associated with earlier nesting and longer nesting seasons.

These results suggest that there is hope for sea turtle adaptation to climate change, especially along their northern nesting range, and that protecting these male-producing sites should be a priority for future management.

Feeding and Habitat

Adult green sea turtles feed in sea grass beds, and juveniles of several species of sea turtles seek refuge in these areas as well. Unfortunately, sea grass beds are declining for several reasons including pollution and increased sea temperatures from climate change. Water temperature is higher in intertidal sea grass flats, typically feeding grounds for green turtles. Leatherbacks may also shift their northern distribution due to increasing air and sea temperatures.

Hope for Long-term Survivors

Sea turtles have existed for more than 100 million years and have survived ice ages, massive sea level fluctuations, and major changes to the continents and the seas.

They may be able to respond to unfavorable nesting temperatures or inundation of beaches as they have in the past, by seeking out new nesting sites or modifying the seasonality of nesting.

However, what is different today is the limited availability of new habitat due to steadily encroaching human development of coastal areas and the rapid rate of climate change.

A loggerhead turtle. Loggerheads can grow to over six feet in length and live for over 60 years.

Photo Credit: NOAA, National Oceanic and Atmospheric Administration