

Determine causes of wading bird breeding decline on the Boston Harbor Islands

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EXECUTIVE SUMMARY

The Boston Harbor Islands provide habitat for significant numbers of breeding, wintering and migrating coastal waterbirds. In particular, wading bird populations in the harbor have anchored state-wide and regional populations. Approximately 60% of all Black-crowned Night-Heron *Nycticorax nycticorax* and Snowy Egret *Egretta thula* nesting in the state occurred in Boston Harbor in the 1990s. However, abundance of these species declined significantly over the past three decades and their persistence locally and regionally is in jeopardy. Although in-depth studies of wading bird status and productivity were conducted in the 1990s, no recent information exists to explain wading bird declines in the harbor. The current study replicated previous wading bird studies on nesting islands in the harbor.

We assessed productivity of Black-crowned Night-Heron, Snowy Egret, and Great Egret *Ardea alba* during the 2021 and 2022 nesting seasons to 1) quantify measures of breeding performance (abundance, egg and chick production), 2) evaluate the impact of factors potentially leading to population declines, and 3) develop targeted management recommendations to be implemented by land owners and managers in the harbor, as well as state and federal wildlife agencies.

Abundance of breeding wading birds in Boston Harbor during the 2021 and 2022 nesting seasons showed continued declines for Black-crowned Night-Heron and Snowy Egret, and possible cessation of population growth for Great Egret (Appendix A). Over the past decade, the Black-crowned Night-Heron population in the harbor declined by 14%. Similarly, Snowy Egret declined by 77%--only eleven breeding pairs were detected harbor-wide in both 2021 and 2022. Great Egret apparently stabilized at approximately 100 breeding pairs after two decades of logarithmic growth. Wading birds nested on five Boston Harbor islands including new colonization of Button Island in Hingham Harbor.

Productivity of Black-crowned Night-Heron varied significantly over the two-year study (Appendix B). Hatching success was low in 2021 (attributed to predation), but comparable in 2022 to optimal rates documented in the 1990s. Heron chick survival in 2021-2022 was lower than documented in the 1990s.

In 2021, starvation was a primary factor; in 2022, most deaths were attributed to predation. Great Egret hatching and chick survival rates were comparable in 2021 and 2022. Most chick loss in 2021 was attributed to a severe spring storm; most other egg and chick loss was attributed to predation. Diet analysis showed that both species fed on a varied diet of both salt and fresh-water organisms (primarily fish).

Factors identified as potentially limiting abundance and breeding success included: availability of nesting and foraging habitat, predators, weather, and human disturbance (Appendix C). Although the number and location of active colony-sites in the harbor has been relatively stable since the 1990s, all but newly-colonized Button Island currently support smaller numbers of nesting birds than in previous decades. Four island colony-sites were abandoned in the 1990s. Nesting on Sheep Island, which in particular is subject to erosion, has declined by 86% over the past decade and is in danger of abandonment.

Since the 1990s, wading birds have ceased nesting in low thickets and brambles--once important nesting substrate on most nesting islands. In addition, the disappearance (for unknown reasons) of high shrubs on Sarah Island has eliminated habitat that supported 73% of Snowy Egret nesting on the island in the 1990s. We found no definitive evidence that nesting habitat degradation or competition for nest-sites with Double-crested Cormorant was responsible for reduced wading bird nesting.

A majority of Black-crowned Night-Heron chicks on Sarah Island failed to fledge in 2021 due to starvation. Flightline analysis showed that herons flew from the island to foraging locations in a relatively narrow sector to the northwest and SSW, whereas in 2022 when starvation was a minor factor of mortality, flights from the island were in most sectors. Diet analysis also showed that herons might have been subject to foraging limitations in 2021. None of these issues was observed in Great Egret either year, nor in Black-crowned Night-Heron in 2022. It is apparent from diet analysis that both species forage in a variety of wetlands within commuting distance of Sarah Island. Wading birds nesting on the outer harbor islands have less foraging habitat available within similar commuting distances.

We documented the occurrence of avian and mammalian predators on nesting islands in the harbor. Of note, was eastern coyote *Canis latrans* x *C. lycaon* on Sarah Island and Bald Eagle *Haliaeetus leucocephalus* on Calf Island in 2021—both detected in field camera images. Although a Great Horned Owl *Bubo virginianus* pair nested on Sarah Island in 2021, we detected no evidence of significant impact on wading birds. Coyote has undergone range expansion and population growth over the past few

decades and was presumably absent from the harbor in the 1990s. As a result of casual observations by MA Dept. Conservation & Recreation, National Park Service, and Mass Audubon staff, coyotes are known to occur on the most visited/staffed harbor islands, (Sarah, Peddocks, Spectacle, Bumpkin, Grape, Lovells, Georges). Although systematic surveys have not been undertaken, the widespread occurrence of coyote in the harbor and surrounding mainland suggests the species may occur also on less visited islands. It is possible that the harbor-wide elimination of wading bird nesting from low thickets and brambles specifically on Sarah Island, but also on Calf and Middle Brewster Islands may have resulted from coyote predation.

Poor weather reduced fledging success for Great Egret in 2021. Northeast storms regularly occur in eastern Massachusetts in late May and are likely to account for some egg and chick loss annually. Changes to storm intensity and frequency due to global warming are likely to increase threats to nesting in the future. In addition, sea level rise and diminishing size of the harbor islands is likely to contribute to nesting habitat loss.

Finally, we identified multiple ways the general public accesses the nesting islands and recorded their activity in and near the colonies. We documented few instances where recreationists entered the wading bird colonies; most activity was restricted to landing areas (where gulls and oystercatchers nest). However, Sarah Island in particular attracted a number of photographers that were seen boating around the island and at least one photographer entered the colony to take pictures and post them online. In addition, the Town of Hingham conducts a goose management program on Sarah Island (and other islands in Hingham Harbor) and co-sponsors a fireworks event in Hingham Harbor during the summer. In 2022, we coordinated with the town to reschedule the event in order to minimize disturbance to nesting birds. We documented and mitigated investigator disturbance as a result of the current study, and developed recommendations to minimize disturbance from monitoring, research and management in the future.

Priority recommendations for protection and management of the harbor's nesting wading birds are: 1) increase protection through outreach to colony-site owners and managers; 2) eliminate, prevent, and minimize human disturbance from the general public; 3) enhance nesting habitat; 4) reduce predator impacts to nesting birds; 5) identify and protect key foraging locations; 6) minimize human disturbance from monitoring, research and management activities; 7) advocate for greater regulatory protection.

MANAGEMENT RECOMMENDATIONS

Increase protection through outreach to colony-site owners and managers

- Build on established partner networks within the Boston Harbor Islands National and State Park to facilitate communication and outreach to colony-site owners and managers (Town of Hingham, MA Dept Conservation & Recreation, City of Boston, National Park Service).
- Continue outreach to and support of MA Dept Wildlife & Fisheries for protection of wading birds.
- In partnership with the Town of Hingham, create a management plan for the protection of birds and habitats on the Hingham Harbor islands. Continue outreach regarding town events and programs (e.g., fireworks, goose control).
- Advocate to other colony-site owners in the state for maximal wading bird protection.

Eliminate, prevent, and minimize human disturbance from the general public

- Human disturbance to nesting birds on Sarah and Button Islands is a significant threat that is perhaps the most actionable of management recommendations. The islands occur in an urban setting and are within easy access to boaters and other recreationists. Sarah Island in particular is the mainstay of wading bird nesting in the harbor and regionally, and requires special protection to ensure continued nesting. The island with highly visible, exotic nesting birds attracts photographers as well as recreationists. Social media encourages the capture of trophy photographs.
- We recommend prohibiting landing on Sarah, Button and Sheep Islands (Mar 15-Sep 1) because it is not possible to be on the shoreline of these small islands without certain disturbance to state and federally-protected ground-nesting gulls and oystercatchers. Tree-nesting wading birds on the edge of the colonies are also subject to flushing when people land on the small beaches or walk along the shoreline. Wading birds arrive in the harbor in late Mar and young birds continue to be fed and/or roost on the island through early August. Similarly, oystercatchers and gulls nest April through August. Access by the public to Calf Island via the two established landing sites does not necessarily cause disturbance to ground-nesting eiders, gulls and oystercatchers and we found little evidence that people entered the wading bird colony. Access to Outer Brewster Island is significantly more difficult and the nesting habitat (largely briar thicket) used historically on Outer Brewster occurs in several, relatively disjunct habitat patches.

- Provide outreach to residents and visitors to the Town of Hingham, and to the public exploring the Boston Harbor Islands National and State Park. Outreach materials, and particularly the use of photographs, should educate without enticing the public.
- Provide outreach via social media and to online groups focused on photography and natural history to advocate for the practices of ethical photography. Enlist help from Mass Audubon and other environmental partners to educate constituencies.
- Erect signage on nesting islands to educate and manage human activity in areas open to the public.

Enhance nesting habitat (colony-site restoration, nesting substrate restoration)

- Restore and protect layered woody vegetation to all current and historically-used colony-sites.
- Investigate feasibility of restoring Sheep and Gallops Islands as viable colony-sites for wading birds. Herons nested for a few years in a *Forsythia* hedge on Gallops Island (i.e., a deciduous, high shrub). Investigate constraints to establishing wading bird nesting on Rainsford Island. Vegetation in the vicinity of the hospital ruins and the deciduous trees on the headland could potentially serve as nesting substrate.
- Investigate use of dredge material to site and create new nesting islands with adequate elevation, distance to foraging wetlands, nesting substrate, and predator fencing as has been done in mid-Atlantic states.
- Investigate nesting substrate restoration on Sarah Island to remove sumac and replace with native shrubs where they historically occurred. Investigate planting additional cedars on the islands.

Reduce predator impacts to nesting birds

- Educate the public through outreach and signage to emphasize trash removal in open areas of the nesting islands. Conduct off-season trash removal on nesting islands.
- Investigate the feasibility of artificially elevating the *Smilax* and *Rubus* thickets on Sarah Island (and possibly Middle Brewster) to put nests out of reach of coyotes and rats. Inserting a wooden framework or support structure under the greenbrier/*Rubus* layer could potentially accomplish this.

Identify and protect key foraging locations

- Investigate the possible occurrence of legacy contaminants (e.g., metals, organochlorines, petroleum hydrocarbons) in wading birds and prey.
- Design and conduct citizen science projects using standardized methods to identify key foraging wetlands that are used by wading birds.
- Develop a wetlands outreach campaign to increase awareness and protection of key sites.

Minimize human disturbance from monitoring, research and management activities

- Provide specific guidance for research permitting and for habitat restoration activities within the Boston Harbor Islands National and State Park as it pertains to colonially-nesting bird protection.
- Review and adjust the existing NPS monitoring protocol for wading bird colonies within the harbor. After decades of population declines, the status of nesting wading birds is at an all-time low and prospects for continued nesting are dire. Despite instituting an admirable monitoring scheme nearly 20 years ago, current status requires rethinking monitoring objectives and methods. It is understandably challenging to change protocols in an established long-term monitoring program that is part of the NPS's nation-wide monitoring network. However, we recommend that, in undertaking all efforts to minimize monitoring disturbance to nesting wading birds, the NPS should advocate to colony-site owners (DCR, Town of Hingham) that permission be granted for surveying as follows: the frequency of harbor surveys is aligned with state and regional coordinated efforts, reduce ground-based surveys to once per five years, eliminate ground-based surveys on Sheep Island and in other situations where an adult count will suffice and presents a rational balance between data collection and protection, ensure that a strictly limited number of properly trained personnel conduct ground-based counts, adjust data collection objectives to meet essential information needs.
- We recommend the NPS consider convening a technical advisory group as a resource to assist in guiding the park monitoring program. This would bring additional information and experience from studies of wading bird nesting, foraging, and disturbance sensitivity to the substantial experience park personnel have in monitoring and data management.

Advocate for greater regulatory protection

- Investigate the process by which wading bird species would be listed under the Massachusetts Endangered Species Act. Black-crowned Night-Heron is ranked vulnerable, imperiled, or critically imperiled in 38 US states (NatureServe.org). In the northeast, where approximately 26% of the entire US-Canada population nests, Black-crowned Night-Heron is protected under state endangered species laws in Maine, Rhode Island, New Jersey, and Delaware. In Connecticut, Snowy Egret—a species that very rarely nests without Black-crowned Night-Heron—is listed as Threatened.
- Identify benefits and opportunities of listing regarding habitat creation and protection, increased protection from human disturbance. Listing under the New Jersey state endangered species law has resulted in the mapping of current and historical nesting sites, and the identification of foraging locations. The protection of these habitats is explicitly considered in project and activities that undergo permit review.
- Advocate for greater regulatory protection.