

OCCURRENCE AND IMPLICATIONS OF STAGING BLACK SCOTERS *MELANITTA AMERICANA* IN A HEAVILY TRAFFICKED URBAN ESTUARY

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ABSTRACT

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During a land-based survey of wintering seaducks, I detected approximately 50 000 Black Scoters *Melanitta americana* on the Lower New York Bay, which borders both New York and New Jersey. During their 14-day stay, the scoters were regularly disturbed by large container vessels and smaller watercraft, but consistent numbers remained throughout the survey. Based on recent population estimates, this congregation of Black Scoters represents 16.6% to 25% of the eastern North American population. Using data from the National Audubon Society Christmas Bird Count, I found that Black Scoters have dramatically increased in abundance during the winter on count circles at sites around the bay; however those increases were not correlated with North Atlantic Oscillation indices averaged over October–December each year from 1990 to 2017. Bivalve mollusks, a major food source for Black Scoters, are abundant throughout the bay, and they have likely played a role in the increased use of the bay by this species. Local efforts to restore Eastern Oyster *Crassostrea virginica* populations to the bay may promote increased use by Black Scoters and other seaducks, providing an opportunity for targeted conservation efforts. Current plans to build a surge gate at the mouth of the bay as a storm-risk mitigation measure may result in the Lower Bay being avoided by Black Scoters and other seaducks, which in turn may have negative population-level effects for these seaduck species.

Key words: Black Scoters, *Melanitta americana*, seaduck, urban estuary, New York City, conservation, northwestern Atlantic

INTRODUCTION

The non-breeding distribution of seabirds is influenced by a variety of biotic and abiotic factors (Veit & Montevecchi 2006, Veit & Manne 2015). For seaducks (tribe: Mergini) wintering in the northeastern and northwestern Atlantic, prey abundance, weather conditions, and broadscale oceanic climate have been identified as important factors in their distribution (Zipkin *et al.* 2010, Silverman *et al.* 2013, Loring *et al.* 2014, Beuth *et al.* 2017, Pavón-Jordán *et al.* 2018, White & Veit 2020).

During the winter, seaducks extensively use nearshore estuarine habitats, some of which are in highly urbanized areas (Stott & Olson 1973, McKinney *et al.* 2006, Loring *et al.* 2013, Silverman *et al.* 2013, Smith *et al.* 2015, Beuth *et al.* 2017). Although disturbance over nearshore habitats can be pervasive (Davidson & Rothwell 1993), their intra- and inter-annual use makes these areas important for the long-term conservation of seaducks (McKinney *et al.* 2006, De La Cruz *et al.* 2014).

Land-based surveys, including the National Audubon Society's Christmas Bird Count (CBC; White *et al.* 2009), allow for the collection of fine-scale data on the distribution of wintering seaducks in nearshore waters where other survey methods like aerial surveys are not as efficient (Smith *et al.* 2015). These surveys have been successfully implemented in the northeastern United States to monitor wintering seaduck populations, and they supplement broader-scale distributional surveys (Loring *et al.* 2013, McKinney *et al.* 2015, Smith *et al.* 2015).

Until recently, the scoters (*Melanitta* spp.) were among the least-studied migratory ducks in North America (Bordage & Savard 2011, Anderson *et al.* 2015, Brown & Fredrickson 2019), but recent work has provided some baseline demographic and distributional data (Silverman *et al.* 2012, 2013; Loring *et al.* 2014; SDJV 2015a). Black Scoters *Melanitta americana*, the least populous of the three North American scoter species, are globally Near-Threatened and primarily breed in North America (Bordage & Savard 2011, Birdlife International 2018). Along the North American east coast, Black

TABLE 1
High counts of Black Scoters in coastal New York from land-based observation points using data reported to the eBird citizen science database (Sullivan *et al.* 2009)

Location of sighting	Date	Estimated Number of Birds	Source
Montauk Point, NY	06 January 2011	105 000	eBird checklist ID S7384316
Staten Island, NY	15 February–01 March 2019	50 000	<i>This paper</i>
Montauk Point, NY	02 February 2018	40 000	eBird checklist ID S42568185
Breezy Point Tip, NY	12 March 2016	20 000	eBird checklist ID S28151509

Scoters have a highly variable wintering range (Silverman *et al.* 2013, SDJV 2015b), but consistently reach high abundances along the coast of South Carolina and in the Chesapeake and Delaware bays (Nisbet *et al.* 2013, Silverman *et al.* 2013). Large numbers have also been found recently in the Muskeget Channel (Veit *et al.* 2016) and Nantucket Sound (Winship *et al.* 2018). In New York, Black Scoters were historically considered to be the least abundant of the three scoter species, as viewed from shore off Long Island (Bull 1964, Levine 1998). Winter counts of 10000 on 03 January and 16 March 1930 from Montauk Point, Long Island were long considered the highest from New York (Bull 1964), but over the last decade, the species has been observed moving north during winter from Montauk Point by the tens of thousands (Table 1).

This paper documents the use of a bay within the New York–New Jersey Harbor Estuary by Black Scoters in unexpectedly high numbers during February and March 2019, and I discuss implications for conservation and management of the species.

METHODS

Study area

The Lower New York Bay (hereafter “lower bay”) is the southernmost waterbody within the heavily urbanized New York–New Jersey Harbor Estuary (Fig. 1). The lower bay is a near-marine environment that feeds directly into the Atlantic Ocean between the Rockaway and Sandy Hook peninsulas (Waldman 2013). Winter salinities range from 18.4 to 30.9 parts per thousand, with the lowest salinities recorded near the shores of Staten Island and Brooklyn, New York, and along the New Jersey shoreline (Cerrato *et al.* 1989). The highest salinities are recorded off the Rockaway Peninsula, where the bay meets the Atlantic Ocean (Cerrato *et al.* 1989). Most of the lower bay does not exceed 10 m in depth, although the Ambrose Channel, which is the only major shipping lane into the Port of New York and New Jersey, has a dredged depth of ~50 ft (~15 m) (USACE 2012). Throughout the lower bay, bivalve mollusks like blue mussels *Mytilus edulis* and northern quahogs *Mercenaria mercenaria* are abundant, with northern quahogs reaching some of their highest local concentrations in the southern part of the lower bay (within the Raritan Bay; MacKenzie 1997).



Fig. 1. The Lower New York Bay, the southernmost waterbody in the New York–New Jersey Harbor Estuary.

Following the devastating landfall of Hurricane Sandy in October 2012, the US Army Corps of Engineers (USACE) began investigating the feasibility of storm-risk mitigation measures at locations around the lower bay. These projects include a seawall and armored levee system along the shores of Staten Island (USACE 2016) and a surge gate spanning the five miles (8 km) between the Sandy Hook and Rockaway peninsulas (USACE 2019).

Seaducks found in the lower bay include Long-tailed Ducks *Clangula hyemalis*, Surf Scoters *Melanitta perspicillata*, White-winged Scoters *Melanitta deglandi*, Black Scoters, Common Goldeneyes *Bucephala clangula*, Buffleheads *Bucephala albeola*, and Red-breasted Mergansers *Mergus serrator*. Common Eiders *Somateria mollissima* are abundant along the south shore of Long Island but were rarely detected in the lower bay until about 2010 (JRR-G unpubl. data, CBC unpubl. data).

Data collection

From 01 January to 15 March 2019, seaducks were surveyed weekly from 12 land-based points on the New York side of the lower bay. Observations of waterfowl were made with a spotting scope (80 mm, 20–60×, Swarovski HD-ATS 80) and binoculars (Swarovski EL 10 × 50 Swarovision). Individual ducks were counted and identified to species when possible (e.g., scoters were grouped as scoter species if too distant). Following the discovery of a large concentration of Black Scoters from the eastern shore of Staten Island, further observations were made on that shoreline daily; from Fort Wadsworth (40°35'57"N, 074°03'14"W) and Midland Beach (40°34'45"N, 074°04'31"W).

Local abundance trend analysis

To investigate the recent status of Black Scoters in the lower bay, I normalized abundance data collected from bay-facing CBC circles during the 1990–2017 period using a log-transformation, then regressed the abundance against year.

Along the US east coast, the nearshore abundance of scoters has been linked to the North Atlantic Oscillation (NAO), which is the dominant climate mode in the North Atlantic during boreal winter (Hurrell *et al.* 2003; Zipkin *et al.* 2010). On the east coast of the US, positive values for the NAO correspond to wet and mild winter weather conditions, while negative values correspond to harsher, snowy conditions (Bell & Visbeck 2019). Since winter conditions, as described by NAO indices, can affect scoters during migration (Zipkin *et al.* 2010), I related Hurrell's station-based NAO indices, averaged over October–December from 1990 to 2017 (NWS 2002), to the abundance of Black Scoters on CBC circles using a linear regression model.

RESULTS

Surveys

On the morning of 16 February 2019, large numbers of Black Scoters began to congregate between the eastern shore of Staten Island and the northwestern shore of Hoffman Island (40°35'47"N, 074°05'46"W). The highest estimates of Black Scoters were made between 16 February and 01 March. During this period, at least 50000 ducks were found staging between the islands in a single large raft. Most of the scoters departed before the morning of

02 March, after which fewer than 1000 remained; from 04 to 15 March, fewer than 10 were found daily.

Large container vessels passing through the bay into Upper New York Bay via Ambrose Channel disturbed the scoters every three to five minutes. The birds remained in flight for up to four minutes following the disturbances, after which they almost always returned to their original location. Smaller watercraft (e.g., water taxis, fishing boats) often passed directly through the flock. At times, the disturbance caused the scoters to fly along the shoreline of Staten Island, a result that allowed for easier estimates of flock size and identification of individual ducks. At no point were White-winged Scoters detected in the flock; at most, 200 Surf Scoters were identified within the entire flock.

Local abundance trends

During the 1990–2017 period, Black Scoters significantly increased on CBC circles around the bay ($P < 0.001$; Fig. 2). During the same time period, there was no significant relationship between local abundance of Black Scoters and mean NAO.

DISCUSSION

Prey availability is a major factor in the intra-seasonal movement of seaducks (Kirk *et al.* 2008). Black Scoters primarily feed on bivalve mollusks like mussels and clams during the winter (Cottam 1939, Perry *et al.* 2007, Bordage & Savard 2011, Baldassarre 2014). During the survey, I found that the scoters were congregating in approximately the same location in which Cerrato *et al.* (1989) sampled the largest densities of blue mussels during their benthic assessments in the winters of 1986 and 1987 (see Fig. 34 in Cerrato *et al.* 1989). More recent benthic assessments indicate that both blue mussels and northern quahogs remain abundant in the lower bay (USACE 2006, USACE 2011, Dacanay 2016), with northern quahogs increasing significantly from 2000 to 2014 in at least one

location (the Raritan Bay; Dacanay 2016). This suggests that the local increase in Black Scoter abundance may be related to the high-quality food resources available in the bay, likely in combination with its improved water quality over the last decade (NYC DEP 2017). Recent efforts to restore beds of eastern oysters to the New York–New Jersey Harbor Estuary (McCann 2018) could lead to further increases in the number Black Scoters in the lower bay, due to the increase in prey organisms that benefit from the laying of oyster beds (see Perry *et al.* 2007).

Disturbance during the non-breeding season can lead to decreased breeding success in migratory birds in the subsequent breeding season (Newton 2008). The Port of New York and New Jersey is one of the busiest ports in the United States, and any vessels navigating into the Port or up the Hudson River from the Atlantic Ocean must pass through the lower bay. Since disturbance by vessel traffic may lead to a decrease in the amount of time that wintering seaducks can spend foraging (Schwemmer *et al.* 2011), Black Scoters and other seaducks on the lower bay may be unable to take advantage of its seasonably abundant resources (e.g., blue mussels and northern quahog; Cerrato *et al.* 1989, MacKenzie 1997).

Large offshore wind energy developments are planned for multiple locations in the northwestern Atlantic including the New York Bight, close to the mouth of the bay (Nisbet *et al.* 2013, BOEM 2019). Offshore wind energy developments can cause direct mortality of seaducks and other seabirds through collision, and their avoidance of the site may cause indirect mortality through loss of foraging habitat (Drewitt & Langston 2006, Langston 2013, Nisbet *et al.* 2013, Goodale *et al.* 2019). Similarly, the proposed five-mile surge gate between the Sandy Hook and Rockaway peninsulas could deter seaducks from wintering in the bay due to their avoidance of the hardened structures, forcing them to forage and stage elsewhere. However, the surge gate may also lead to an aggregation of bivalves and other prey items via the reef effect (Raoux *et al.* 2017), which could, in turn, lead to an aggregative effect for seaducks and further increase their use of the bay.

Highly gregarious species like scoters are vulnerable to oil spills over inshore waters (Nisbet *et al.* 2013). On 28 March 2019, an unknown volume of oil was spilled into the Estuary from the container vessel *Dublin Express* (Incident News 2019); however, no oil-covered birds were reported. Spills like this are sometimes reported within the Estuary (Burger 1994), and seaducks wintering in the area are likely to be negatively impacted if such a spill were to happen during January or late-February, when they are at their highest local abundances. Although spills are much less frequent now than they were in the past (Nisbet *et al.* 2013), the Port of New York and New Jersey still receives large shipments of oil (Port of New York and New Jersey 2018), so the potential for a spill-related seaduck mortality event may still be high.

Rapid, climate-driven shifts of non-breeding range have been documented in migratory taxa worldwide, including seaducks (Austin & Rehfish 2005; Lehikoinen *et al.* 2013, Pavón-Jordán *et al.* 2018). While there was no significant relationship between mean NAO value and Black Scoter abundance on CBC circles facing the lower bay, the number of Black Scoters increased significantly between 1990 and 2017. From 2005 to 2014, all three scoter species increased in abundance in Narragansett Bay and Boston Harbor, two estuaries that are just north of the New York–New Jersey Harbor Estuary, possibly due to a climate-driven range shift (McKinney *et*

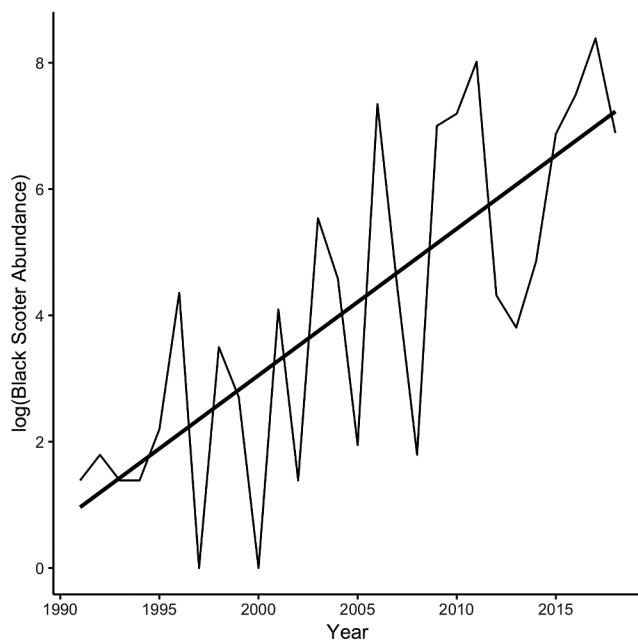


Fig. 2. Black Scoter abundance on Christmas Bird Counts at sites around the Lower New York Bay, 1990–2017 ($R^2 = 0.6$, $P < 0.001$).

al. 2015). Under a changing climate, the conservation of seaducks may depend on designating new protective areas in nearshore areas, where they have not historically occurred in large numbers. If large concentrations of Black Scoters and other seaducks continue to be found on the lower bay during winter, the bay itself may need additional protections. Establishment of a Marine Protected Area (NOAA 2011) or designation of the lower bay as an Important Bird Area may be possible if large proportions of the east coast population of Black Scoters are detected consistently from year to year. Current criteria for the establishment Important Bird Areas include the presence of more than 1% of a flyway's population of birds at a single site, as well as the regular occurrence of more than 20 000 waterfowl (Kushlan *et al.* 2002). Due to the highly variable at-sea distribution of seaducks, there are some discrepancies in their population estimates (Baldassarre 2014), and no reliable long-term trends are evident (SDJV 2015b). The Seaduck Joint Venture estimates a total population of 300 000 Black Scoters in eastern North America, noting that there is little information available on this population (SDJV 2015b). The North American Waterfowl Management Plan, however, lists the eastern North American population as an estimated 200 000 Black Scoters (NAWMP 2018). This suggests that the scoters present on the lower bay in February–March 2019 represented 16.6% to 25% of the eastern North American population.

The observations described here, as well as observations of large numbers of staging Northern Pintails *Anas acuta* presented in Ramírez-Garofalo & Garofalo (2019), highlight the importance of including targeted multi-year waterfowl monitoring in any proposed large-scale project in the bay or its vicinity that could have population-level effects. Oyster restoration projects in the New York Harbor may provide the opportunity for resource managers to develop targeted conservation plans, such as the creation of seasonal no-vessel zones over oyster reefs, which would allow staging or wintering seaducks to have resting and foraging areas with high-quality food resources (Perry *et al.* 2007).

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