

Species Status Assessment

Class: Mammalia
Family: Balaenopterida
Scientific Name: *Balaenoptera borealis*
Common Name: Sei whale

Species synopsis:

The sei whale is the third largest species of baleen whale after the blue and fin whale. This whale is one of the least studied of the large whales. Its taxonomy is currently being disputed, with some arguing for two subspecies of sei whales, a northern form (*B. borealis borealis*) and a southern form (*B. borealis schlegelli*) (Flower 1883, Baker et al. 2004). Other genetic and morphological research found only weak evidence for the existence of a southern subspecies (Perrin et al. 2010). In 2004, a prioritized list of cetacean species in need of further taxonomic research was developed (Taylor 2005, Prieto et al. 2011). Both the northern and southern sei whales were listed under medium priority, indicating that further taxonomic research is needed to determine whether the two populations can be called separate subspecies (Prieto et al. 2011).

Sei whales are found in all oceans, but appear to prefer temperate, offshore areas (Horwood 1987, Perry et al. 1999, NMFS 2011, Prieto et al. 2011). In the western North Atlantic and northeastern United States, sei whales travel to presently unknown breeding grounds in lower latitude waters. The whales are believed to migrate along the continental shelf north to Georges Bank and the southwestern Gulf of Maine (NMFS 2011, Prieto et al. 2011). No known resident seasonal population has been found in New York waters; however, these areas may be important as a migration corridor.

Little is known on the abundance and trends of these elusive whales. Historically, sei whales were targeted by the whaling industry after fin and blue whales became hunted to the point of rarity (Perry et al. 1999, NMFS 2011, Prieto et al. 2011, NMFS 2012). While this hunting was sure to have decreased the population, there are no historical estimates of abundance, so it is not known how much of an effect whaling had on the western North Atlantic sei whales (Perry et al. 1999, NMFS 2011, Prieto et al. 2011, NMFS 2012). Recent trends are also currently unknown. Further research is necessary to establish population estimates.

I. Status

a. Current and Legal Protected Status

- i. **Federal** Endangered **Candidate?**
- ii. **New York** Endangered; SGCN

b. Natural Heritage Program Rank

- i. **Global** G3
- ii. **New York** SNA **Tracked by NYNHP?** Yes

Other Rank:

'Depleted' under the Marine Mammal Protection Act of 1972
CITES Appendix I
Endangered under the Species at Risk Act (Canada)

Status Discussion:

The sei whale was listed as endangered under the Endangered Species Act when it was first passed in 1972. Although initially overlooked by whalers, many populations of sei whales were significantly reduced by commercial whaling when more preferred species were depleted (Perry et al. 1999, NMFS 2011, Prieto et al. 2011, NMFS 2012). These whales were hunted from the 1950s through the early 1970s. Even after they received protection in the early 1970s, Japan and Iceland continued to take low numbers of sei whales (Perry et al. 1999, NMFS 2011, Prieto et al. 2011, NMFS 2012). The sei whale is one of the least understood of the baleen whales, and the current status of most stocks is unknown.

The sei whale is divided into four stocks worldwide: the Hawaiian stock, Eastern North Pacific stock, western North Atlantic stock, and Nova Scotia stock, which includes the entire east coast of the United States. These stocks were defined solely for management purposes (Prieto et al. 2011). Further research is warranted to determine if these populations are distinct. The status of this stock is unknown (NMFS 2012, Prieto et al. 2011). However, since average serious injury and death due to human interactions exceeds PBR this is considered a strategic stock (NMFS 2013).

II. Abundance and Distribution Trends

a. North America

i. Abundance

declining increasing stable unknown

ii. Distribution:

declining increasing stable unknown

Time frame considered: Population trends have never been analyzed for this population.

b. Regional

i. Abundance

declining increasing stable unknown

ii. Distribution:

declining increasing stable unknown

Regional Unit Considered: Northeast: Nova Scotia Stock

Time Frame Considered: Population trends have never been analyzed for this stock.

c. Adjacent States and Provinces

CONNECTICUT **Not Present** _____ **No data** _____

i. Abundance

_____ **declining** _____ **increasing** _____ **stable** **X** **unknown**

ii. Distribution:

_____ **declining** _____ **increasing** _____ **stable** **X** **unknown**

Time frame considered: Population trends have never been analyzed. Probably not present.

Listing Status: Not listed _____ SGCN? No _____

MASSACHUSETTS **Not Present** _____ **No data** _____

i. Abundance

_____ **declining** _____ **increasing** _____ **stable** **X** **unknown**

ii. Distribution:

_____ **declining** _____ **increasing** _____ **stable** **X** **unknown**

Time frame considered: Population trends have never been analyzed.

Listing Status: Endangered _____ SGCN? Yes _____

NEW JERSEY **Not Present** _____ **No data** _____

i. Abundance

_____ **declining** _____ **increasing** _____ **stable** **X** **unknown**

ii. Distribution:

_____ **declining** _____ **increasing** _____ **stable** **X** **unknown**

Time frame considered: Population trends have never been analyzed.

Listing Status: Endangered _____ SGCN? Yes _____

VERMONT Not Present X No data _____

i. Abundance

___ declining ___ increasing ___ stable ___ unknown

ii. Distribution:

___ declining ___ increasing ___ stable ___ unknown

Time frame considered: _____

Listing Status: _____ SGCN? _____

RHODE ISLAND Not Present _____ No data _____

i. Abundance

___ declining ___ increasing ___ stable X unknown

ii. Distribution:

___ declining ___ increasing ___ stable X unknown

Time frame considered: Trends never analyzed.

Listing Status: Not listed. SGCN? Yes

d. NEW YORK No data _____

i. Abundance

___ declining ___ increasing ___ stable X unknown

ii. Distribution:

___ declining ___ increasing ___ stable X unknown

Time frame considered: Considered a rare visitor to New York waters. No abundance or trend analysis has been conducted for this species in New York.

Listing Status: Endangered SGCN? X

Monitoring in New York.

NOAA, NEFSC, Protected Species Branch conducts regular aerial and ship board surveys to determine the abundance and distribution of protected species in the North East. However, sampling, including scale of sampling, is not specific either to large whales in the New York Bight, nor is sampling year round. There are no current monitoring activities or regular surveys conducted by the State of New York or specific to large whales in the New York Bight. However, DEC, Marine Resources and Natural Heritage Program are currently in the planning stages to establish a regular monitoring program for large whales. The monitoring techniques and protocols have not yet been determined. There is currently funding for three years of monitoring.

Trends Discussion:

Sei whales were first hunted in the North Atlantic in the 1800s. However, they were not targeted by whaling operations until the 1950s, when blue, fin and humpback whales were reduced to the point of rarity. It is believed that numbers were drastically reduced as a result of this hunting, although whaling pressure in the North Atlantic was not as heavy as in other areas. In 1972, it was estimated that stocks in the North Pacific were at just 21% of historical levels (Perry et al. 1999). While it is unknown how much of a reduction was seen in the North Atlantic, the large-scale Cetacean and Turtle Assessment Program (1982) estimated that there may be just 2,200 – 2,300 individuals in United States Atlantic waters. Four different abundance estimates have taken place in portions of the known range in the United States in 2002, 2004, 2006, and 2011 (NMFS 2013). The 2002 surveys targeted the southern Gulf of Maine to Maine, and came up with an estimate of 71 sei whales. The 2004 surveys focused on the Gulf of Maine to lower Bay of Fundy, and estimated an abundance of 386 sei whales. The 2006 survey targeted the southern Gulf of Maine to upper Bay of Fundy to the Gulf of St. Lawrence and estimated 207 sei whales. In 2011, the area from North Carolina to the southern Bay of Fundy was surveyed, and an estimate of 467 sei whales was generated. The 2002 and 2006 surveys took place in August, while the 2004 surveys were conducted in June and July, and the 2011 surveys stretched from June – August (NMFS 2013). The differences in abundance estimates is most likely a result of differing survey methods and areas covered, but also could be partially because of differing abundance in sei whales at different times of the year.

Sei whales are sighted infrequently in U.S. waters, so it is currently unknown if their population is increasing, decreasing, or remaining stable. Most sightings are of just a few whales, and sei whales are known to have a highly variable summer distribution, making it difficult to say if increased (or decreased) reports are actually because of a change in population size or simply a shift in distribution in response to food, making them more detectable (Perry et al. 1999, NMFS 2011, Prieto et al. 2011, NMFS 2012, NMFS 2013).

Sei Whale Range

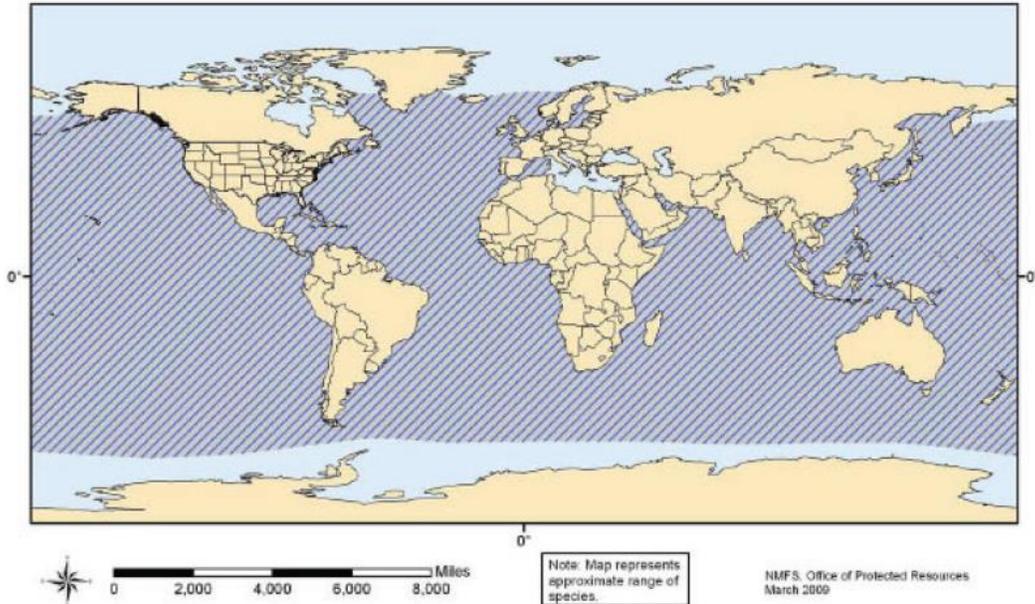


Figure 1. Sei whale global range. Map from NMFS 2011.

Month/Year	Area	N_{best}	CV
Jun-Jul 2004	Gulf of Maine to lower Bay of Fundy	386	0.85
Aug-06	S. Gulf of Maine to upper Bay of Fundy to Gulf of St. Lawrence	207	0.62
Jun-Aug 2011	North Carolina to lower Bay of Fundy	467	0.67

Table 1. Summary of recent abundance estimates for Nova Scotia sei whales with month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV). Table from NMFS stock assessment (2013).

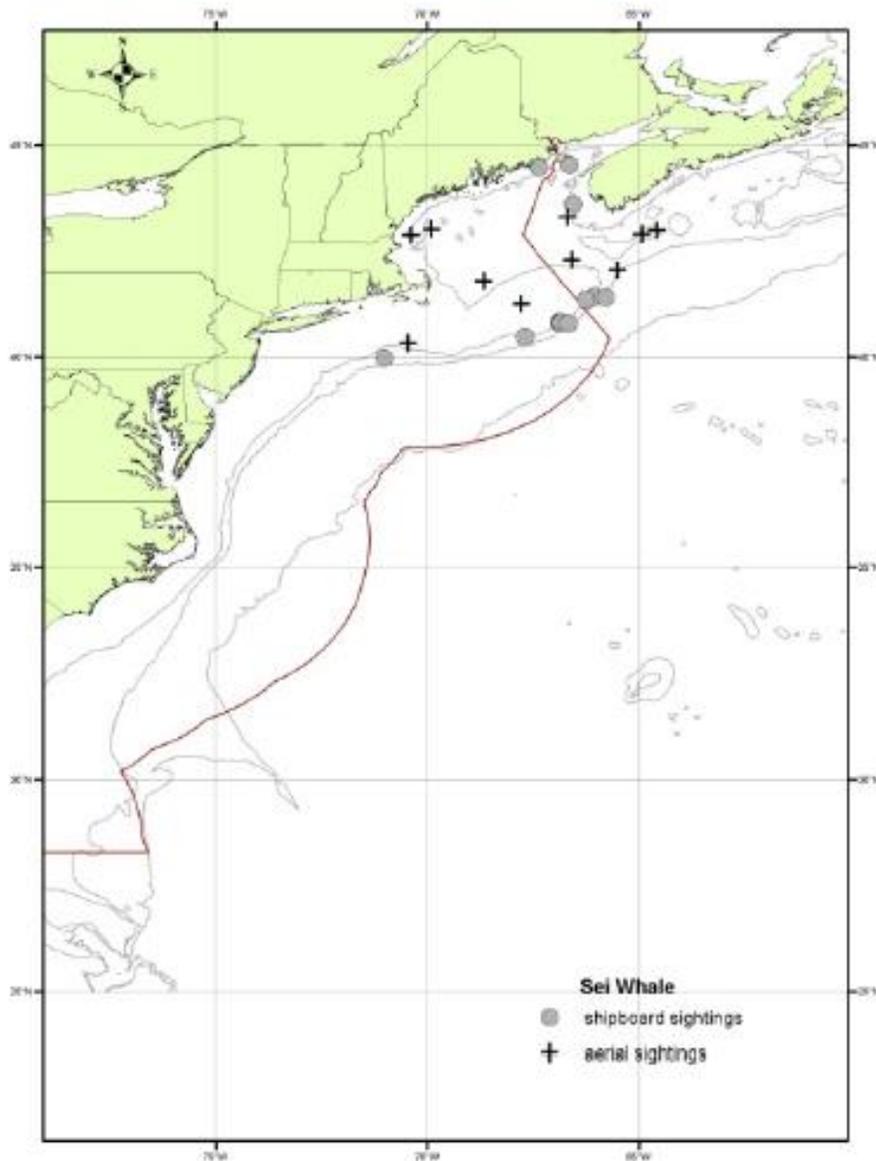


Figure 2. Distribution of sei whale sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008, 2010, and 2011. Isobaths are the 100m, 1000m, and 4000m depth contours. Figure from NMFS stock assessment (2013).

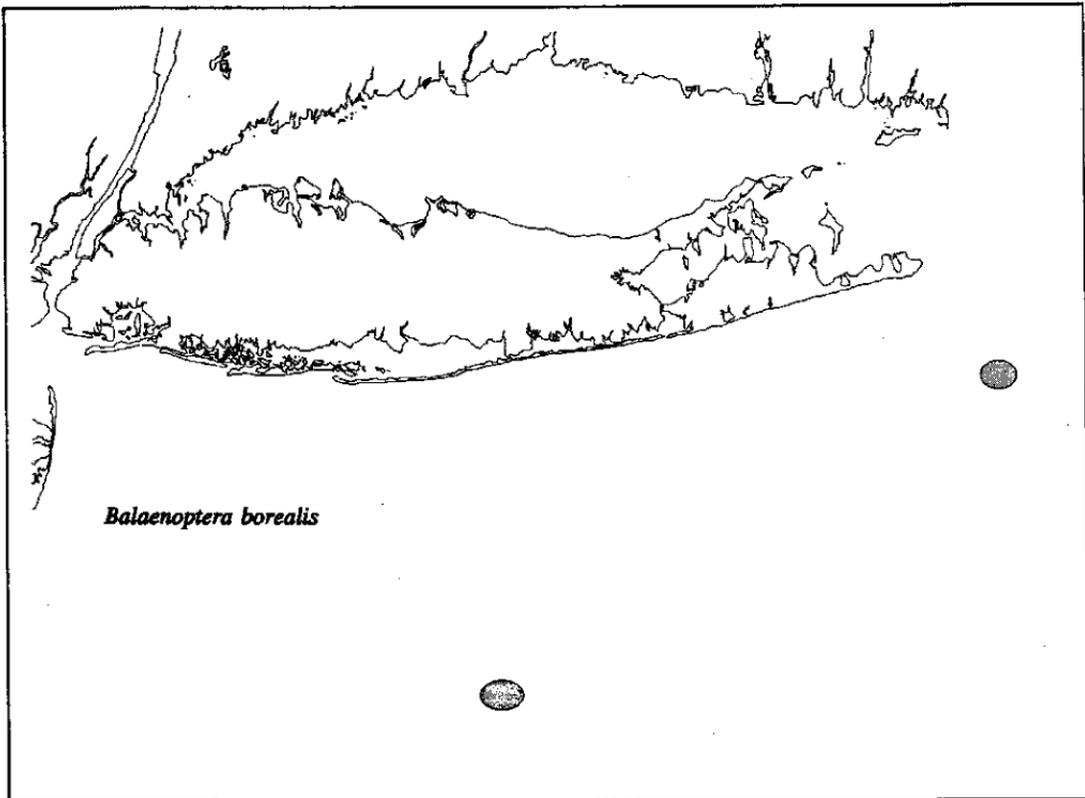


Figure 3. Areas of sei whale sightings in New York waters in 15 years of surveys from 1970s – 1993. Map from Saldoe and Cardinale 1993.

III. New York Rarity, if known:

Historic	<u># of Animals</u>	<u># of Locations</u>	<u>% of State</u>
prior to 1970	_____	_____	_____
prior to 1980	_____	_____	_____
prior to 1990	_____	_____	_____

Details of historic occurrence:

Unknown for New York. Although there are no historical estimates for pre-whaling numbers of sei whales, a study in 1966 estimated that there were 1,856 sei whales in the Nova Scotia stock (Prieto et al. 2011). In 1977, a study estimated between 1,393 and 2,248 sei whales in the Nova Scotia stock (Perry et al. 1999).

Sadove and Cardinale of Okeanos Ocean Research Foundation (1993) reported sei whales being seen “frequently in association with aggregations of fin whales” in the early 1980s, although the species was encountered infrequently between 1985 – 1993. When sighted, the whales were adult animals actively feeding with fin whales during July and August. Although there were not enough sightings of sei whales to develop an accurate population estimate, Okeanos Foundation estimated that there were probably less than 150 individual sei whales that used the New York Bight area during their study period (Sadove and Cardinale 1993).

Current	<u># of Animals</u>	<u># of Locations</u>	<u>% of State</u>
<u>467 from North Carolina to Bay of Fundy, # unknown for New York state</u>			

Details of current occurrence:

Unknown for New York. There have been few, if any, sightings of sei whales in New York waters in recent years. They are known to exist from presence in acoustic surveys that took place from 2008-2009 (BRP 2010). There have been attempts in recent years to gain a more reliable abundance estimate for sei whales in the North Atlantic. Unfortunately, differences in survey effort and methods make it impossible to make direct comparisons of historic and current occurrences. The most recent survey of the Nova Scotia stock was in summer 2011. This survey included both aerial and shipboard surveys that, together, stretched from North Carolina to the lower Bay of Fundy and estimated 357 sei whales (NMFS 2013).

New York’s Contribution to Species North American Range:

% of NA Range in New York	Classification of New York Range
<input type="checkbox"/> 100 (endemic)	<input type="checkbox"/> Core
<input type="checkbox"/> 76-99	<input checked="" type="checkbox"/> Peripheral
<input type="checkbox"/> 51-75	<input type="checkbox"/> Disjunct
<input type="checkbox"/> 26-50	Distance to core population:
<input checked="" type="checkbox"/> 1-25	_____

IV. Primary Habitat or Community Type:

1. Pelagic
2. Marine, Deep Subtidal

Habitat or Community Type Trend in New York:

Declining Stable Increasing Unknown

Time frame of decline/increase: _____

Habitat Specialist? Yes No

Indicator Species? * Yes No

** Potentially, but probably not due to rarity of sightings in NY Bight.*

Habitat Discussion:

Along the east coast of North America, sei whales range from the southeastern United States to West Greenland. It is believed that they travel to lower latitudes to breed during winter months and spend the summer at higher latitudes feeding (Perry et al. 1999, NMFS 2011, Prieto 2011). Sei whales are notorious for having a highly variable and unpredictable distribution. In general, they prefer deeper waters, and are frequently found over the continental slope, shelf breaks, and deep ocean basins between banks (Perry et al. 1999, NMFS 2011, Prieto 2011). Occasionally, they are found in more inshore waters, presumably in response to changes in prey density (Prieto 2011). Sei whales have been found occupying the Great South Channel (offshore from Cape Cod, MA) in the spring, and also have been reported in the southern Gulf of Maine in spring and early summer (NMFS 2011, NMFS 2013). These sightings suggest that sei whales may be reasonably common in the area (NMFS 2011).

Sei whales are often associated with ocean fronts and eddies, which are believed to concentrate prey (Skov et al. 2008, Olsen et al. 2009, NMFS 2011). They may use currents for large scale movements; an individual that traveled 1,500 km in less than two weeks from the Azores Islands to the Labrador Sea was associated with gyre-driven and other currents (Olsen et al. 2009).

As the sei whale is only known in New York from a few instances, habitat use in the New York Bight is poorly understood. While the amount of pelagic ecosystem is not changing, its suitability may be. Changes in prey density may alter an area's suitability for occupancy by sei whales. In addition, pollution (including noise pollution) may make a previously occupied area unsuitable for this species. Further research needs to be done to identify whether these factors are altering habitat availability in the New York Bight.

V. New York Species Demographics and Life History

- Breeder in New York**
 - Summer Resident**
 - Winter Resident**
 - Anadromous**
- Non-breeder in New York**
 - Summer Resident**
 - Winter Resident**
 - Catadromous**
- Migratory only**
- Unknown**

Species Demographics and Life History Discussion:

What little life history information is known for sei whales comes from all different ocean basins, and it is unknown whether different populations of sei whales exhibit different life history patterns. However, it is likely that they are similar (NMFS 2011, Prieto et al. 2011). Sei whales migrate seasonally to lower latitude breeding grounds (NMFS 2011, Prieto et al. 2011). The location of these breeding grounds is currently unknown. Based on historical whaling catch data, the migration is believed to be structured by sex and age class, and pregnant females appear to be the first to migrate to and from these grounds (Prieto et al. 2011).

It is believed that the sei whale gestation period is between 10 ³/₄ and 12 months (Lockyer and Martin 1983). Most calves are born in November and December in the North Atlantic, and conception probably takes place in December and January (Lockyer and Martin 1983). It is believed that sei whale calves are nursed for six to nine months (Lockyer and Martin 1983). Females are believed to have a calving interval of at least two years (Jonsgård and Darling 1977, Lockyer and Martin 1983), and the average age of sexual maturity is believed to be 8-10 years for both males and females (Best and Lockyer 2002).

Little is known on natural mortality in sei whales. Killer whales and sharks may prey upon young or sick individuals, although the extent of this predation is unknown (NMFS 2011, Prieto et al. 2011). An unknown disease in California waters was found to affect 7% of sei whales in the early 1980s. This disease caused the shedding of baleen plates, which impaired the feeding ability of infected

whales (Mizroch et al. 1984). No evidence of such a disease has been found in the North Atlantic. There has been some evidence of a viral disease that caused inflammation in the lungs of 14% of sei whales examined in Iceland, although no causative agent was found (Lambertson 1990).

Parasites are considered to be one of the biggest natural threats to sei whales (Horwood 1987). Sei whales in the Antarctic showed a high incidence of infection with several species of helminth parasites (Dailey and Vogelbein 1991). These parasites are known to be capable of causing severe complications in marine mammals, especially when infecting the liver, urinary and respiratory systems, and brains (Lambertsen 1986, Lambertsen et al. 1986, Dailey 2001).

Vessel collision and entanglement in fishing gear are considered the two major human-caused sources of mortality and serious injury. However, entanglement may be less of an issue for Sei whales than for some other large whales because they are generally found far offshore. (NMFS 2013).

VI. Threats:

Two of the best known anthropogenic threats to large whale populations include vessel strikes and fishery interactions, specifically entanglement in fishing gear. Both of these threats are believed to be more of a problem than observational studies suggest, as many events are most likely not reported, and affected whales may die at sea and not be recovered (Heyning and Lewis 1990). Unfortunately, it is extremely difficult to track a specific event to a geographic location, so it is nearly impossible to know whether an event occurred in New York waters. There are five known sei whale/vessel collisions, including an instance where a sei whale was carried into New York Harbor on the bow of a ship. It is unknown whether the whale was struck and killed in New York waters or if the collision occurred outside of state waters and the carcass was carried in by the ship. Compared to many other species of large whales, such as the closely related fin whale, there are relatively few reported instances of vessel strikes on sei whales (Jensen and Silber 2004). It is unknown if there are actually fewer collisions between sei whales and vessels, or if they go unreported, as sei whales are typically found farther offshore, so carcasses would not be recovered in most instances.

Entanglement in fishing gear is another major threat to many species of cetaceans throughout the North Atlantic. There have only been three reported sei whale entanglement events in the North Atlantic since 1990; only one resulted in a known mortality; however, the other two events were reported as “severe injuries,” and the final status of the individuals were unknown (NMFS 2011, NMFS 2012, NMFS 2013). It is believed that sei whales are not at as high of a risk of entanglement as other rorquals because of their offshore distribution (NMFS 2011). As with vessel strikes, it is unknown if that is actually the case, or if entanglements simply go undetected and unreported.

Stranding and entanglement response and outreach in New York are currently provided by Riverhead Foundation. They respond to all marine mammal strandings; however, they are not

authorized to disentangle large whales. The nearest group authorized by NOAA to perform such entanglements is the Rhode Island Division of Fish and Wildlife.

Sei whale distribution and foraging have been linked to currents and ocean fronts in numerous studies (Skov et al. 2008, Olsen et al. 2009, NMFS 2011). Long term changes in climate and oceanographic processes as a result of climate change could have numerous effects on sei whales. Temperature and current shifts could lead to occupied habitats becoming unsuitable, and the use of previously unoccupied habitat as a response of a shift in distribution. Sei whales in the North Atlantic feed primarily on copepods, which have already exhibited signs of a shift in distribution as a result of climate change (Hays et al. 2005).

The effects of other anthropogenic activities, such as offshore energy development are also largely unknown. Oil spills threaten marine mammals including the sei whale. The other major threat of development and other human activities is noise pollution. Cetaceans, including sei whales, rely heavily on sound to communicate. Increasing levels of anthropogenic noise in the ocean could hamper this ability. Several species of large whales have been found to increase the amplitude of their calls in response to large levels of noise, which could lead to increased energy consumption (See Holt et al. 2008, Parks et al. 2010). Above a certain level of noise, some whale species are known to stop vocalizing (See Melcón 2012), and there is also the potential for masking of calls if background noise occurs within the frequencies used by calling whales (BRP 2010). In a large, solitary species, this could lead to difficulty finding other whales, including potential mates. The acoustic monitoring that took place in the New York Bight region in 2008 and 2009 did find elevated levels of background noise (due in large part to shipping traffic) and the potential for masking of whale calls (BRP 2010).

In some instances, exceptionally loud noises, usually active military sonar, have led to temporary and permanent threshold shifts and even death by acoustic trauma in certain species of cetaceans (NMFS2011). While this has not been documented in sei whales, there is the potential for such deleterious effects to occur.

Recreational vessel activity, such as whale-watching has been known to affect some species of cetaceans. Unlike some other species, sei whales are not the target of heavy whale-watching pressure, so it is assumed that these effects are minimal.

It is currently believed that contaminants such as organochlorines, organotins, and heavy metals do not negatively impact sei whales and other baleen as much as other marine mammals (O'Shea and Brownell 1994). Sei whales feed at a low trophic level, and so there is little chance for the bioaccumulation of toxins that occurs in many of the odontocetes (toothed whales). While no significant effects of contaminants has yet been documented, it is possible that exposure has long-term effects such as reduced reproductive success and/or long-term survival.

Are there regulatory mechanisms that protect the species or its habitat in New York?

No Unknown

Yes

The sei whale is protected in the United States by its status as a federally Endangered species. In addition, the sei whale (along with all other marine mammals) receives federal protection under the Marine Mammal Protection Act of 1972 (MMPA). The sei whale is protected internationally from commercial hunting under the International Whaling Commission's (IWC) global moratorium on whaling. The moratorium was introduced in 1986, and is voted on by member countries (including the United States) at the IWC's annual meeting.

Sei whales are also protected under the Environmental Conservation Law (ECL) of New York. The sei whale is listed as a state endangered species in New York. Section 11 – 0535 protects all state-listed endangered and threatened species and makes it illegal to take, import, transport, possess or sell any listed species or part of a listed species. In addition, Article 17 of the ECL works to limit water pollution, and Article 14 presents the New York Ocean and Great Lakes Ecosystem Conservation Act. This act is responsible for the conservation and restoration of coastal ecosystems “so that they are healthy, productive and resilient and able to deliver the resources people want and need.” Both of these help to protect the habitat of the sei whale. Whether they are adequate to protect the habitat is currently unknown.

The North Atlantic Large Whale Take Reduction Plan identified floating groundline used in the trap and pot fisheries as an entanglement threat for large whales. The National Marine Fisheries Service subsequently passed a new law making it mandatory for all pot and trap fisheries to switch over to sinking groundline by 2008. To encourage compliance by fishermen, DEC's Marine Endangered Species and Crustacean Unit partnered with the Cornell Cooperative Extension of Suffolk County and initiated gear buyback programs, which removed 16.9 tons of floating rope from New York's commercial lobster fishery. Further analysis is required before it is known if any real reduction in large whale entanglement has occurred as a result of the switch from floating to sinking groundline.

Describe knowledge of management/conservation actions that are needed for recovery/conservation, or to eliminate, minimize, or compensate for the identified threats:

It is still largely unknown how frequently sei whales utilize the waters of the New York Bight. Long-term surveys and monitoring strategies should be developed. Historically, vessel and aerial survey techniques have been used. These visual techniques provide valuable information, but also are limited by weather and sea conditions and are rather expensive and time-consuming. In addition, these surveys are often focused in more coastal waters, not over the continental shelf area frequented by sei whales (NMFS 2011). The use of passive acoustics as a way to monitor large whales is promising. Cornell University partnered with NYS DEC and placed marine autonomous recording units in the New York Bight region for periods of time in 2008 – 2009. These recorders detected several species of cetaceans using these waters, including sei whales (BRP 2010).

If it is known where and when sei whales are occurring in New York waters, more effective management and conservation strategies can be deployed. Seasonal speed restrictions on vessels in high use areas could be put into effect. In addition, seasonal and/or area closures on certain fisheries where the gear poses the largest threat to large whales may help minimize entanglement in gear.

Near real-time acoustic monitoring of large whales, specifically right whales, is currently being used off of the coast of Massachusetts in an effort to reduce vessel collisions with large whales. When a right whale is detected, an alert goes out to all large shipping vessels in the area, and a speed restriction goes into place. Similar monitoring in New York could help reduce the threat of vessel collisions with large whales in coastal waters. Even if a speed restriction only goes into place for the critically endangered right whale, knowledge that there are large whales in the area could lead to increased awareness and alertness and possibly reduce the potential of a collision.

The sei whale would benefit greatly from further research. Little is known about general life history and demography of this species, and the real effects of the threats in New York waters are unknown. Further research into the actual effects that threats such as climate change are having on sei whales is warranted. In addition, education on this species and the importance of reporting ship strikes and entanglements is encouraged.

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