Species Status Assessment

Class: **Mammalia**
Family: **Balaenopteridae**
Scientific Name: ***Balaenoptera musculus***
Common Name: **Blue whale**

Species synopsis:

The blue whale is the largest animal to have ever lived on Earth, as well as the largest species of whale and can be found in all of the world's oceans (Gambell 1979, Yochem and Leatherwood 1985, Mead and Brownell 1993). This includes the North Atlantic and North Pacific. There are three known subspecies of blue whales: *Baleanoptera musculus musculus,* which inhabits the Northern Hemisphere; *B. m. intermedia,* which inhabits the Antarctic; and *B. m. brevicauda,* also known as the pygmy blue whale, found in the southern Indian Ocean and southwestern Pacific (Rice 1977, Ichihara 1966).

In the North Atlantic, blue whales are found from the subtropics to the poles, with most recent records being from the Gulf of St. Lawrence, where they can be found during the spring, summer and fall (Sears et al. 1987, Sears and Larsen 2002). They rarely appear in US waters of the North Atlantic and spend much more time further off shore than other baleen whales. It is believed that blue whales are using waters of the New York Bight primarily as part of their migration routes from summer feeding areas to lower latitude winter breeding areas.

The species has been documented in the NY Bight during visual surveys and a pilot passive acoustic study in the New York Bight (Sadove and Cardinale 1993, BRP 2010). Sightings and acoustic detections have been confined to offshore waters greater than 25 miles off the coast (Sadove and Cardinale 1993, BRP 2010). Additionally, blue whales were detected acoustically only during the late winter and early spring. It should be noted, however, that monitoring did not take place during the summer due to a lack of funds. It is, therefore, unknown if blue whales are present in the NY Bight during summer months (BRP 2010).

Blue whales were severely depleted by whaling throughout their range starting with the introduction of steam-powered ships in the second half of the 19th century. At that time the blue whale became the most profitable species due to its size and was heavily targeted before gaining protection in the North Atlantic in the 1955 (Gambell 1979, Best 1993). Long-term studies in the Gulf of St. Lawrence have identified over 400 individual blue whales. Unfortunately, studies only occurred in this small portion of their range due to the rarity of sightings in other parts of the range. Therefore, it is difficult to determine population estimates and trends for this species (NMFS website, NMFS 2010). However, the most recent stock assessment for the western North Atlantic stock by NMFS gives 440 as the minimum population estimate (NMFS 2010).

I. Status

a. Current and Legal Protected Status

i. Federal Endangered **Candidate?** _____

ii. New York Endangered

b. Natural Heritage Program Rank

i. Global G3G4

ii. New York SNA **Tracked by NYNHP?** Yes

Other Rank (e.g. Partners in Flight):

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

Status Discussion:

Estimates of the eastern Canadian population before whaling put the number between 1,100 – 1,500 blue whales (Sergeant 1966, Allen 1970). It is known that the population was severely diminished by whaling during the 19th and early 20th centuries. At least 11,000 blue whales were killed throughout the North Atlantic during this time period (Sigurjónsson and Gunnlaugsson 1990), which is believed to have been approximately 70% of the population (DFO 2009). Blue whales received protection from whaling in 1955 (Reeves et al. 1998). Estimates after this protection was granted put the population in the "very low hundreds, at most" in the western North Atlantic (Mitchell 1974). Some recent estimates suggest that the number of mature blue whales is not greater than 250 individuals (Sears and Calambokidis 2002). However, NOAA, Fisheries estimate for the North Atlantic is 400-600 individuals (NMFS website).

The blue whale was listed under the Marine Mammal Protection Act when it was first enacted in 1972 and under the Endangered Species Act in 1973. In 1983 it was listed as a species of special concern in Canada. The Canadian population was split into two stocks in 2002, and the North Atlantic stock was listed as endangered under the Species at Risk Act (SARA) that year (DFO 2009).

I. Abundance and Distribution Trends

a. North America

i. Abundance

____ declining ____increasing _____stable __X__ unknown

ii. Distribution:

____ declining ____increasing _____stable __X__ unknown

Time frame considered: Late 19th century to present. It should be noted that population trends have not been analyzed for this species since they received protection from whaling in 1955.

b. Regional

i. Abundance

____ declining ____increasing ____stable __X__ unknown

ii. Distribution:

____ declining ____increasing ____stable __X__ unknown

Regional Unit Considered: **Northeast**

Time Frame Considered: Late 19th century to present. It should be noted that population trends have not been analyzed for this species since they received protection from whaling in 1955.

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: ____Late 19th century to present. It should be noted that population trends were never analyzed for this species at a state level. Post-whaling population using state waters is too low to be able to properly determine abundance and trends.___

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: _Late 19th century to present. It should be noted that population trends were never analyzed for this species at a state level. Post-whaling population using state waters is too low to be able to properly determine abundance and trends.___

Listing Status: ___Endangered_____ SGCN? __X____

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

i. **Abundance**

____ declining ____increasing ____stable __X__ unknown

ii. **Distribution:**

____ declining ____increasing ____stable __X__ unknown

Time frame considered: __Late 19th century to present. It should be noted that population trends were never analyzed for this species at a state level. Post-whaling population using state waters is too low to be able to properly determine abundance and trends.___
Listing Status: ___Endangered_____ SGCN? ___X____

ONTARIO **Not Present __X__ No data _____**

i. **Abundance**

____ declining ____increasing _____stable ____unknown

ii. **Distribution:**

____ declining ____increasing _____stable ____unknown

Time frame considered: _____
Listing Status: _____

PENNSYLVANIA **Not Present __X__ No data _____**

i. **Abundance**

____ declining ____increasing ____stable ____unknown

ii. **Distribution:**

____ declining ____increasing ____stable ____unknown

Time frame considered: _____
Listing Status: _____ SGCN? _____

QUEBEC **Not Present _____** **No data _____**

i. **Abundance**

____ declining ____increasing _____stable __X__ unknown

ii. **Distribution:**

____ declining ____increasing _____stable __X__ unknown

Time frame considered: __Long-term studies since 1979, but have never analyzed population trends.

Listing Status: ___Endangered_____

RHODE ISLAND **Not Present ___** **No data _____**

i. **Abundance**

____ declining ____increasing ____stable __X__unknown

ii. **Distribution:**

____ declining ____increasing ____stable __X__unknown

Time frame considered: ___Rare. Trends have not been analyzed._____

Listing Status: _____Not listed_____ _____ SGCN? ___Yes_____

VERMONT **Not Present __X__** **No data _____**

iii. **Abundance**

____ declining ____increasing ____stable ____unknown

iv. **Distribution:**

____ declining ____increasing ____stable ____unknown

Time frame considered: _____

Listing Status: _____ _____ SGCN? _____

d. NEW YORK **No data _____**

i. Abundance

____ declining ____increasing ____stable __X__ unknown

ii. Distribution:

____ declining ____increasing ____stable __X__ unknown

Time frame considered: _ Late 19th century to present. It should be noted that population trends were never analyzed for this species at a state level. Post-whaling population using state waters is too low to be able to properly determine abundance and trends.___

Listing Status: ____Endangered_____SGCN? __X_____

Monitoring in New York.

From February 2008 – March 2009 Cornell University partnered with DEC and conducted passive acoustic monitoring for cetaceans in New York coastal waters (BRP 2010).

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:

It is known that there was a long-term decline of western North Atlantic blue whales since whaling on the species began in the late 19th century. However, post-whaling abundance and trends are currently unknown. The blue whale is seen very rarely along the eastern U.S. seaboard. These sightings are too infrequent to reliably determine population size in this area. Unfortunately, because such a small portion of the blue whale range in the western North Atlantic has been reliably sampled, existing studies cannot be used to analyze abundance of the species (Hammond et al. 1990, Sears and Calambokidis 2002).

Some trend information is available for western North Atlantic blue whales in the Gulf of St. Lawrence, where most research and sightings have occurred. Currently, over 400 individual

blue whales have been photographically identified in this area (DFO 2009). About 40% return to the Gulf of St. Lawrence regularly, while others have been seen for less than three seasons between 1979 – 2002 (Sears and Calambokidis 2002). An unexpectedly small number of blue whales calves have been seen in the area, with only 22 mother-calf pairs being documented in 34 years of research (MICS 2012). This may possibly be related to low calf production. But, it is not possible to say that these observations mean that blue whales have a low calving rate or whether mother-calf pairs use a different area than the one surveyed, or if a certain percentage of calves are weaned before reaching these feeding grounds (Reeves et al. 1998). Regardless of any potential trends, these studies cannot be used to extrapolate for blue whales in areas out the Gulf of St. Lawrence.

Population trends of blue whales in other areas have been determined. Preliminary analysis of blue whale sightings data from vessels in Iceland has documented an increase of about 5% per year since the 1960s (Sigurjónsson and Gunnlaugsson 1990). Blue whales in the Antarctic are estimated to have been increasing at over 7% per year from 1968 – 2001 (Branch et al. 2004). These estimates apply only to the areas studied, and it cannot be assumed that the western North Atlantic population of blue whales is experiencing similar rates of increase.

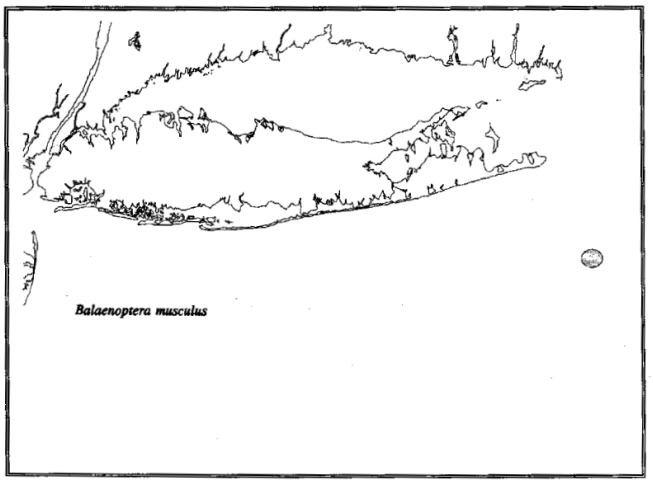


Figure 1. Locations of sightings of blue whales by surveys conducted by the Okeanos Ocean Research Foundation from 15 years of research from the 1970s – early 1990s. From Sadove & Cardinale 1993.

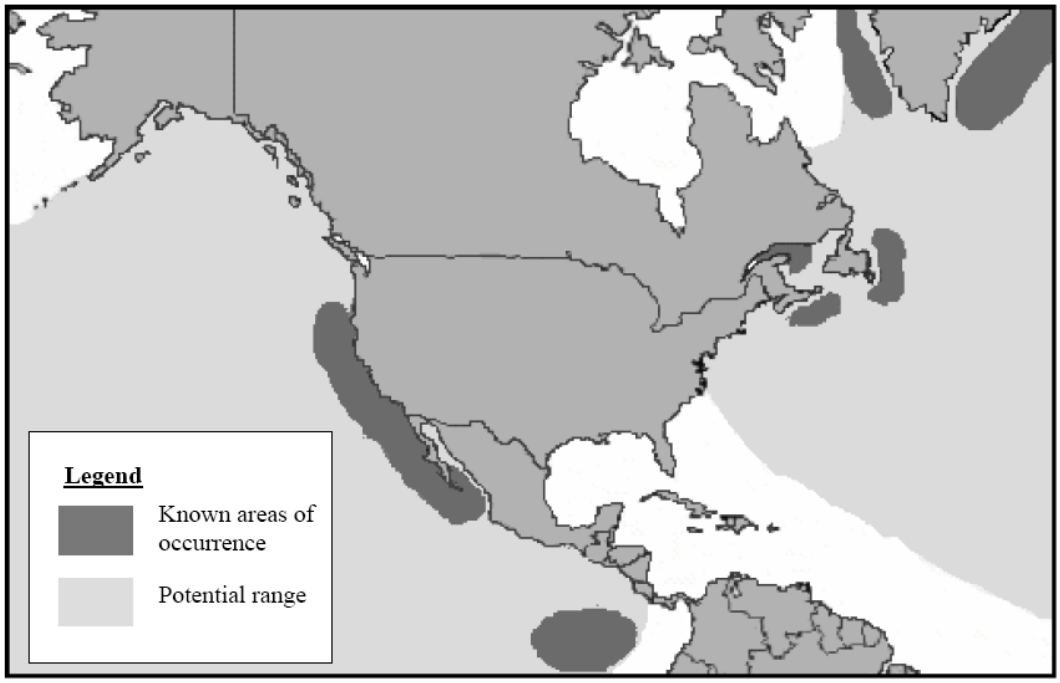
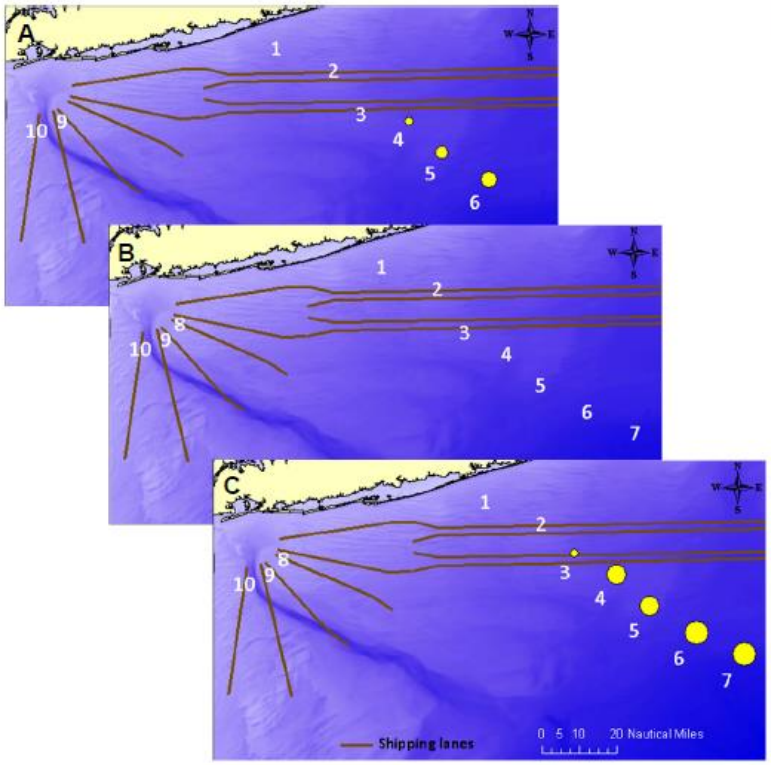


Figure 2. Geographical range of the blue whale, along the coast of North and Central America. Adapted from Sears and Calambokidis (2002).



SPRING 2008			
1	0%	9	0%
2	0%	10	0%
3	0%		
4	5%		
5	9%		
6	11%		

AUTUMN 2008			
1	0%	8	0%
2	0%	9	0%
3	0%	10	0%
4	0%		
5	0%		
6	0%		
7	0%		

WINTER 2008-09			
1	0%	8	0%
2	0%	9	0%
3	4%	10	0%
4	16%		
5	18%		
6	20%		
7	24%		

Figure 3. Seasonal presence of blue whales in the New York Bight region. A) blue whale presence during spring (1 March – 14 May 2008), B) presence during autumn (31 August – 2 Dec 2008), and C) presence during winter (5 December 2008 – 3 March 2009). Tables to the right of each plot show the actual percentages of days with blue whale song during each season. Figure from BRP 2010.

II. New York Rarity, if known:

Historic	# of Animals	# of Locations	% of State
prior to 1970	_____	_____	_____
prior to 1980	_____	_____	_____
prior to 1990	_____	_____	_____

Details of historic occurrence:

Unknown for New York. The only information on blue whales in the state comes from 15 years of surveys (from the 1970s to early 1990s) by Okeanos Ocean Research Foundation, where "less than a dozen" blue whale sightings occurred (Sadove and Cardinale 1993) and occasional sightings in surveys by NOAA, Fisheries.

Current # of Animals

___440 for western North Atlantic, # in NY Bight is unknown ____

Details of current occurrence:

Unknown for New York. Similar surveys to those conducted by Okeanos Ocean Research Foundation (above) have not been conducted in recent years. Surveys have been conducted by NOAA, Fisheries but nature of the surveys and rarity of sightings makes abundances difficult to determine. Blue whales are known to exist from acoustical monitoring conducted by Cornell University in 2008 and 2009, where they were detected on 28 of 258 recording days (BRP 2010).

New York's Contribution to Species North American Range:

% of NA Range in New York	Classification of New York Range
____ 100 (endemic)	____ Core
____ 76-99	__X__ Peripheral
____ 51-75	____ Disjunct
____ 26-50	Distance to core population:
__X__ 1-25	part of migratory route, spend most of the year in the Gulf of St. Lawrence

IV. Primary Habitat or Community Type:

1. Pelagic

2. Marine, Deep Subtidal

Habitat or Community Type Trend in New York:

____ Declining ____Stable ____ Increasing __X__ Unknown

Time frame of decline/increase: _____

Habitat Specialist? _____ Yes __X__ No

Indicator Species? __X__ Yes _____ No

Habitat Discussion:

Little is known about the habitat used by blue whales in New York waters. This area is generally considered to be a migratory corridor, although Sadove and Cardinale (1993) noted that the blue whales seen in surveys by the Okeanos Foundation (all single individuals) were associated with large groups of feeding fin whales and therefore were possibly feeding. Blue whales are often associated with bathymetric features that are believed to concentrate their main prey source, euphausiids (DFO 2009). These include continental shelf edges, underwater canyons, and deep channels where upwelling occurs (DFO 2009). If blue whales are feeding while migrating through New York they may be found in areas where their prey could be expected to be concentrated.

The blue whales seen during Okeanos Foundation surveys were always in water greater than thirty meters deep (Sadove and Cardinale 1993). Observations also came from areas 25 or more miles south of Montauk Point (See Figure 1 in Trends Discussion above). In the Cornell passive acoustic monitoring program, two strings of recording devices were set up. One was in the New York Harbor area, and the other string began ten miles south of Southampton and extended to the edge of the continental shelf (Figure 3, BRP 2010). Blue whales were only detected on the devices off of Long Island, and most frequently on the device farthest out to sea, implying a more offshore distribution (BRP 2010). Blue whales were detected for a week in March 2008, and several times in January and February 2009 (BRP 2010). Further research is needed to be able to determine which areas of New York waters are most frequently used by this species. Also, research is needed to determine if blue whales are feeding while in this area.

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

__X__ Migratory only

_____Unknown

Species Demographics and Life History Discussion:

The most popular method for aging baleen whales involves counting the layers on their waxy ear plug. This method gives an estimation of age, but is not exceptionally precise. The oldest known blue whale aged using this technique was around 110 years old. The average life span is believed to be 40 – 90 years old (Reeves et al. 1998).

The western North Atlantic population of blue whales is known to be far-ranging. Whales photographically identified in the Gulf of St. Lawrence have been seen in New England waters, off the coast of Greenland and over the Scotian Shelf (DFO 2009). At least some portion of the population remains in these waters year-round, others travel to lower latitude breeding grounds in the winter. Females give birth on these breeding grounds after a 10 – 12 month gestation period. Calves are nursed for 6 – 7 months before being weaned en route to or on summer feeding grounds. It is currently believed that female blue whales give birth every two to three years. The age at which blue whales reach sexual maturity is believed to be between 5 – 15 years (Mizroch et al. 1984, Yochem and Leatherwood 1985).

Like other species of baleen whales, blue whales are solitary animals. They may be found associating with one another on occasion, but in general the only true bond is between mothers and young calves (Reeves et al. 1998). There are not long-term family bonds like those that occur in several species of toothed whales. Any associations between adult baleen whales tend to be short-term and are often made when feeding conditions make it beneficial for group feeding to occur. Blue whales are baleen whales whose diet consists primarily of euphausiids. In the Western North Atlantic their diet consists of two main species: *Thysanoessa inermis* and *Meganyctiphanes norvegica*.

Two sources of natural mortality in blue whales include ice entrapment and predation by killer whales. Animals that become caught in ice can die from physical injury by ice blocks or can drown when breathing holes freeze over. However, these occur only while they are in the Gulf of St. Lawrence or further north, and not while they are in the New York Bight (Sears et al. 1990, Stenson et al. 2003). There have been some records of mortality or injury due to ship strikes in the US Atlantic EEZ (NMFS 2010). This may be an issue in New York.

VI. Threats:

In general, threats to blue whales are not well known (NMFS 2010). Two of the potentially most significant known anthropogenic threats to large whale populations include vessel strikes and fishery interactions, specifically entanglement in fishing gear. It is believed that both vessel collisions and entanglements occur more frequently than observational studies would suggest, as many events are most likely not reported, and affected whales may die at sea and not be recovered (Heyning and Lewis 1990). Jensen and Silber (2004) compiled information on ship strikes involving all whale species from 1975 – 2002. They found eight reported instances that involved a blue whale (Jensen and Silber 2004). All of these resulted in death; however, only one took place in the North Atlantic. All others were in the Pacific, with three of the remaining seven occurring off of California (Jensen and Silber 2004). The one event documented event that occurred in the North Atlantic involved a juvenile blue whale and was reported in Rhode Island (Jensen and Silber 2004). Unfortunately, it is extremely difficult to track a specific event to a geographic location and often, as in this instance, the reported location indicates where the carcass (or injured whale) was discovered, not where the actual collision took place. While collisions are not believed to be a major threat to the western North Atlantic blue whales, at least 9% of the blue whales in the Gulf of St. Lawrence have scars indicative of vessel contact (Sears et al. 1990, Reeves et al. 1998). It is not known what impact ship strikes have on blue whale populations.

There have only been two reported blue whale entanglement events in the North Atlantic. One resulted in a mortality and occurred in the Gulf of St. Lawrence, and the other event was a live blue whale on Stellwagen Bank (off the coast of Massachusetts) trailing gear and a lobster pot buoy (Reeves et al. 1998). However, it is possible that the relatively few entanglement events are a factor of incomplete reporting and rarity of sighting. It is not currently known what impact entanglements may have on blue whale populations (Reeves et al. 1998).

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. In an attempt to reduce large whale entanglements, Cornell Cooperative Extension has begun a “ghost” gear removal project. Working with the DEC’s Crustacean Unit and commercial fishermen, the project has removed 4,881 abandoned lobster traps from Long Island Sound as of June 21, 2012.

Long term changes in climate and oceanographic processes as a result of climate change could have numerous effects on blue whales. Blue whales feed almost exclusively on euphausiids, and are dependent on high concentrations of this prey source to survive (DFO 2009). Climate change could alter the suitability of certain areas for euphausiids. For example, one of the major types of krill consumed by blue whales (*Thysanoessa raschi*) depends on a cold intermediate layer, which very

well may be lost with the trend towards increasing water temperature that has been observed in the North Atlantic (DFO 2009, Simard et al. 1986). Additionally, current alterations could lead to changes in concentration of euphausiids, which could lead to distribution shifts in blue whales and possibly detrimental effects in the species.

The effects of other anthropogenic activities, such as offshore energy development are also largely unknown. Oil spills threaten marine mammals including the blue whale. The other major threat of development and other human activities is noise pollution. Cetaceans, including blue whales, rely heavily on sound to communicate. Increasing levels of anthropogenic noise in the ocean could hamper this ability. Ross (1987, 1993) estimated that the ambient noise level in the oceans rose 10 dB from 1950 – 1975 because of shipping; background noise has been estimated to be increasing by 1.5 dB per decade at the 100 Hz level since propeller-driven ships were invented (National Research Council 2003). The oceans are getting progressively louder, and the waters off of New York are no exception (BRP 2010).

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.

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 (NMFS 2011). While this has not been documented in blue 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. (Williams, Trites and Bain 2002). Unlike some other species, blue whales are not the target of heavy whale-watching pressure in New York waters, 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 blue whales and other baleen as much as other marine mammals (O'Shea and Brownell 1994). Blue 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 have yet been documented, it is possible that exposure has long-term effects such as reduced reproductive success and/or long-term survival. It is also possible that ingestion of solid pollutants (garbage) may occur, which could lead to potential blockage of the stomach. Such ingestion has been documented in several species of cetaceans, including sperm and minke whales, but never in a blue whale (Reeves et al. 1998).

There have been several reports of blue/fin whale hybrids (Berube and Aguilar 1998). At least five instances of such hybridization have been reported, although there have been several more observations of possible hybrids (Berube and Aguilar 1998). Of the four cases examined in detail, the mother was confirmed to be a blue whale in three of the instances (Berube and Aguilar 1998). The reproductive capabilities and fitness of the hybrids is unknown. However, some studies indicate that these may be issues (Berube and Aguilar 1998).

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

_____ No ____ Unknown

__X__ Yes

The blue whale is protected in the United States by its status as a federally Endangered species. In addition, the blue whale (along with all other marine mammals) receives federal protection under the Marine Mammal Protection Act of 1972 (MMPA). The blue 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.

Blue whales are also protected under the Environmental Conservation Law (ECL) of New York. The Blue 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. Whether these protections are adequate to protect is currently unknown. There is not currently enough information about distribution and abundance to assess this adequately.

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 blue whales utilize New York coastal waters. 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. 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 blue whales (BRP 2010). Unfortunately, the project ran out of funding and the recorders were removed. However, valuable information was obtained, and DEC, Marine Resources and the Natural Heritage Program are in the planning stages to establish a regular monitoring program.

Better information about abundance and distribution can assist with management and conservation decisions. Additionally, studies to determine behavior of blue whales when they are in the area could help determine whether or not they are feeding as they are migrating. This information is helpful because it is known that, at least in Right whales, feeding behaviors make them more vulnerable to ship strikes (Parks et al. 2011b).

Some potential protective measures could be seasonal speed restrictions on vessels in high use areas could be put into effect and/or seasonal area closures on certain fisheries where the gear poses an entanglement threat. Another possible measure could be the establishment of a near real-time acoustic monitoring of large whales, such as that being used for Right whales in Massachusetts to reduce the threat of vessel collisions.

Finally. 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 blue whales is warranted. In addition, education on this species and the importance of reporting ship strikes and entanglements would be helpful.

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