Species Status Assessment

Class: **Mammalia**
Family: **Balaenopteridae**
Scientific Name: ***Megaptera novaeangliae***
Common Name: **Humpback whale**

Species synopsis:

Humpback whales in the North Atlantic are found in six regions, or feeding grounds. Each area represents a subpopulation, and whales show strong, maternally-driven, site fidelity to these areas (NMFS 2011). Regions include the eastern United States (primarily consisting of the Gulf of Maine), Gulf of St. Lawrence, Newfoundland/Labrador, western Greenland, Iceland, and northern Norway stocks (NMFS 2011). In the past these subpopulations were managed as one stock (Waring et al 1999). More recently, however, the decision was made to manage the Gulf of Maine feeding stock separately (Waring et al. 2000, IWC 2002). Typically, humpback whales migrate from high latitude feeding grounds in the summer to subtropical or tropical calving grounds, such as the Dominican Republic. However, some whales remain on the feeding grounds throughout the year (NMFS website).

While humpback whales often return to the natal feeding grounds, their distribution within those regions is believed to be primarily driven by prey concentrations (NMFS 1991). This pattern has been observed in New York waters, where studies have shown them to be feeding primarily on sand lance (Sadove and Cardinale 1993). Other studies have shown prey shifting between sand lance and herring (and sometimes mackerel) in Humpbacks depending on prey availability (Payne et al. 1986, Fogarty et al. 1991). Humpback diet also includes krill. Generally Surveys by Okeanos Ocean Research Foundation from the 1970s – early 1990s found that humpback whale abundance in the New York Bight region varied widely year to year (Sadove and Cardinale 1993). They often observed humpbacks in shallow waters, including Long Island Sound, Block Island Sound, Gardiner's Bay, Fire Island and New York Harbor (Sadove and Cardinale 1993). Humpbacks of all age classes were seen on surveys from June through September, and juvenile whales were also observed in December and January (Sadove and Cardinale 1993). Humpbacks were acoustically detected in the New York Bight in 2008 and 2009. While, seasonal patterns could not be determined due to survey protocols and analysis time constraints, humpbacks were detected by both the New York Harbor and Long Island arrays (BRP 2010).

NMFS states that humpback populations are increasing in most areas of their distribution (NMFS website). The population trend of the species in New York is unknown. Humpback whales experienced significant declines throughout their range due to -exploitation during the 19th and early 20th centuries. They were frequently hunted by European whalers. Their popularity, in addition to their long pectoral fins, resulted in their scientific name, *Megaptera novaeangliae*, which means "big-winged New Englander" (NMFS 1991). After receiving protection from the International Whaling Commission in 1966, their numbers appear to have been increasing. Stevick (2003) documented an average increase of 3.1% each year for the entire North Atlantic population from 1979 – 1993. Clapham et al. (2003) estimated an average increase of up to 4.0% per year for the

Gulf of Maine stock from 1992 – 2000. The variation in the rate of increase is due to uncertainties in calf survival (Clapham et al. 2003).

I. Status

a. Current and Legal Protected Status

i. Federal Endangered **Candidate?** _____

ii. New York Endangered

b. Natural Heritage Program Rank

i. Global G4

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

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

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

Status Discussion:

Humpback whales were heavily hunted in the 19th and 20th centuries. The species was listed under the Endangered Species Act when it was first enacted in 1973. NOAA, Fisheries states that humpback populations are increasing in most areas of their distribution (NMFS website). NMFS considers the Gulf of Maine population to be a strategic stock, because annual human-related mortality and serious injury exceeds the calculated Potential Biological Removal (PBR) defined by the Marine Mammal Protection Act. However, NOAA, Fisheries considers the Gulf of Maine population to be increasing (Stevic et al. 2003, NMFS 2013). Okeanos Foundation estimated that no more than 50 – 100 individual humpback whales use the New York Bight area at one time, based on the results of their surveys (Sadove and Cardinale 1993). Recent population estimate by NOAA, Fisheries for the western North Atlantic is 11,500 (NMFS 2013). The best abundance estimate of the Gulf of Maine stock is 847 animals; this estimate is derived from line-transect surveys conducted from the southern Gulf of Maine to the upper Bay of Fundy to the Gulf of St. Lawrence in the summer of 2006 (NMFS 2011). The minimum population estimate for this stock is 549 animals (NMFS 2011).

II. Abundance and Distribution Trends

a. North America

i. Abundance

____ declining __X__ increasing _____stable ____unknown

ii. Distribution:

____ declining ____increasing _____stable __X__ unknown

Time frame considered: __Washington/Oregon/California stock increased ~7.5% from 1991 – 2008. Atlantic stock increased between 0.0 and 4.0% from 1992 – 2000.

b. Regional

i. Abundance

____ declining __X__ increasing ____stable _____unknown

ii. Distribution:

____ declining ____increasing ____stable __X__ unknown

Regional Unit Considered: **Northeast**

Time Frame Considered: __Stevick (2003) estimated an increase of 3.1% from 1979 – 2003. Clapham (2003) estimated an increase of between 0.0% and 4.0% from 1992 - 2000 depending on calf survival rates.

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: ___Rare visitor, trends never analyzed.

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: ___State trends never 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: ___State trends never analyzed._____
Listing Status: ___Endangered_____ SGCN? __Yes____

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: Trends not analyzed.
Listing Status: Species of Special Concern

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: Endangered SGCN? Yes

d. NEW YORK **No data _____**

i. Abundance

____ declining ____increasing ____stable __X__ unknown

ii. Distribution:

____ declining ____increasing ____stable __X__ unknown

Time frame considered: State trends never analyzed.
Listing Status: Endangered SGCN? Yes

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:

Humpback whales were heavily hunted in the 19th and 20th centuries. Over-exploitation brought many populations down to below 10% of their historic levels (Braham 1984, NMFS 1991). The humpback whale is believed to be the fourth most numerically depleted species during the time of whaling, behind the North Atlantic right whale (*Eubalaena glacialis*), the blue whale (*Balaenoptera musculus*), and the bowhead whale (*Balaena mysticetus*) (NMFS 1991). American whalers alone killed between 14,000 and 18,000 humpback whales (NMFS 1991). Humpbacks were heavily exploited because of their slow-moving nature, coastal distribution, and high oil yield.

Humpback whales received protection from hunting in the North Atlantic in 1955, and additional protection when listed under the Endangered Species Act in 1973 and the Marine Mammal Protection Act in 1972 (NMFS 1991). Since this time, humpbacks appear to be making a recovery. Most populations, including the Gulf of Maine stock, appear to be increasing (NMFS 2013). The entire North Atlantic is believed to have been increasing at an average rate of 3.1% from 1979 – 1993 (Stevick et al. 2003). The best estimate for maximum productivity (recent estimate of observed population growth) for the Gulf of Maine stock was calculated to be 6.5% by Barlow and Clapham (NMFS 2013). No trend estimates are available for the feeding subpopulations (NMFS 2013). However, an increasing number were documented in the mid-Atlantic during the early 1990s (Wiley et al. 1995).

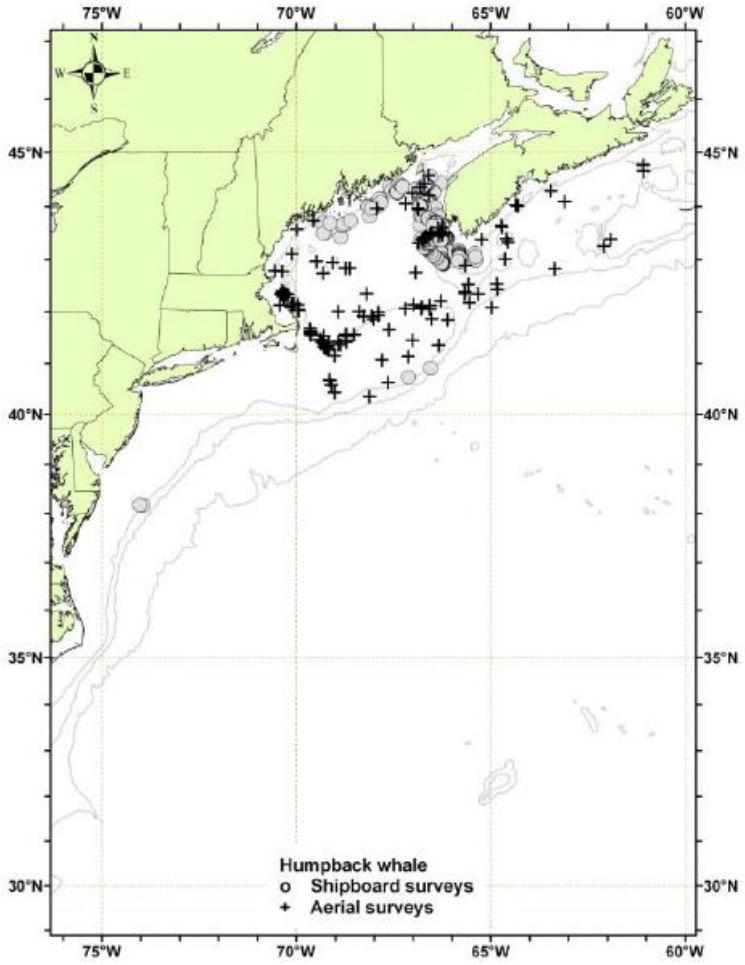

Figure 1. Distribution of humpback whale sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1998, 1999, 2002, 2004, 2006 and 2007. Isobaths are the 100m, 1000m and 4000m depth contours. Figure from NMFS 2011.

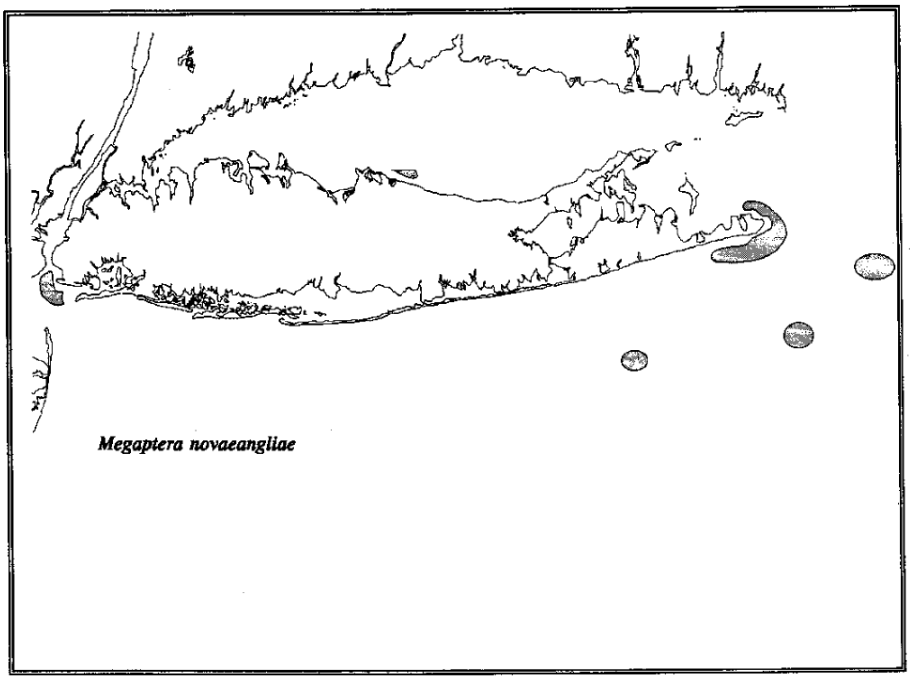

Figure 2. Locations of sightings of humpback whales by surveys conducted by the Okeanos Ocean Research Foundation from 15 years of research from the 1970s – early 1990s. From Sadove & Cardinale 1993.

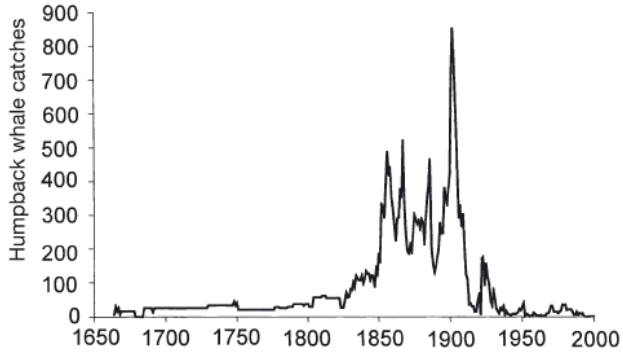

Figure 3. Estimated annual catches of humpback whales from North Atlantic Ocean from 1664 to 2000. Data include individuals caught incidentally through entanglement in fishing nets. Figure from Smith and Reeves 2003, Stevick et al. 2003.

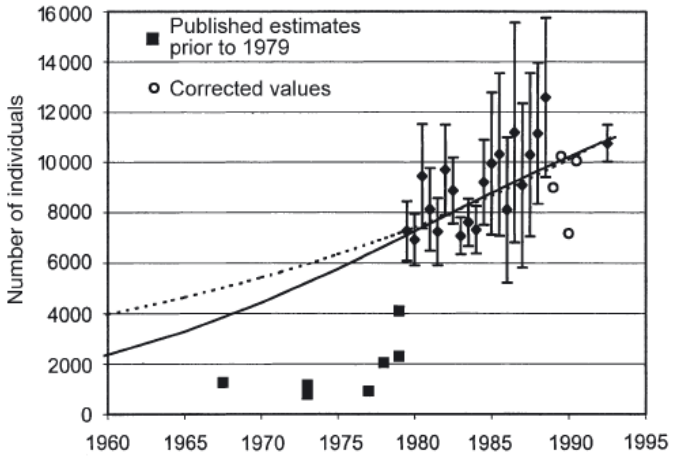

Figure 4. Abundance estimates (±SE) for humpback whales wintering in the West Indies with exponential (---) and logistic (—) population growth models fitted. Approximate corrected values for estimates showing severe bias. These estimates are not used in fitting the regression. Previously published estimates of abundance all fall well below the expected values from either model. Figure from Stevick et al. 2003.

III. 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. Surveys done by Okeanos Foundation documented humpbacks regularly in New York waters in surveys from the 1970s – early 1990s (Sadove and Cardinale 1993). They noted that the actual abundance varied widely from year to year, although humpbacks were most commonly seen during the summer months and between December and January (Sadove and Cardinale 1993). While no population estimates could be developed, the Okeanos Foundation stated that probably no more than 50 – 100 humpbacks used the New York Bight at one time during this time period (Sadove and Cardinale 1993).

Current	# of Animals
	11,500 for western North Atlantic, 847 for Gulf of Maine Stock, # in NY Bight is unknown _____

Details of current occurrence:

Unknown for New York. During recent deployment of passive acoustic recorders in the New York Harbor area and offshore of Long Island by Cornell University Humpbacks were documented opportunistically on 70 of 258 recording days. The majority (98.6%) were in the spring and winter (BRP 2010). The recording buoys were only deployed during spring 2008, autumn 2008, and winter 2008 – 2009 and data for Humpbacks was only collected opportunistically (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	_____

IV. Primary Habitat or Community Type:

1. Pelagic

2. Marine, Deep Subtidal

3. Estuarine, 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:

Humpback whales in the North Atlantic range from high-latitude feeding grounds to low-latitude breeding grounds. In the western North Atlantic, humpbacks can be found in four different feeding areas: Gulf of Maine/eastern U.S., Gulf of St. Lawrence, Newfoundland/Labrador and western Greenland (NMFS 2011). Humpbacks exhibit feeding site fidelity, and calves usually return to the feeding grounds they initially traveled to with their mothers (NMFS 1991). It is believed that a majority of whales from these feeding grounds migrate to the West Indies to mate and calve. The majority of humpbacks are found in the waters off of the Dominican Republic, most notably Silver Bank, Navidad Bank, and Samana Bay (Balcomb and Nichols 1982, Whitehead and Moore 1982, Mattila et al. 1989, Mattila et al. 1994, NMFS 2011). Not all humpbacks migrate to the West Indies each winter. An increasing number have been documented in the Mid-Atlantic states (Wiley et al. 1995). Surveys by Okeanos Foundation in New York waters found juvenile humpbacks using the New York Bight region during December and January, indicating that this area could be an important wintering area for juvenile whales (Sadove and Cardinale 1993). Studies show that that the area of the mid-Atlantic is an additional winter feeding ground (Barco et al. 2002).

Within the feeding area, humpback whales are often associated with areas of upwelling, which typically occur in areas where there are changes in underwater topography, such as underwater banks, ledges and seamounts (CETAP 1982, Payne et al. 1986, Robbins 2007). There is some evidence of demographic differences throughout the Gulf of Maine feeding ground (Robbins 2007). Robbins (2007) found that females were more likely to use southern areas, while males were more frequently encountered in northern areas, such as the Bay of Fundy. Unfortunately, most research covers only the Gulf of Maine north to the Bay of Fundy, and does not include the New York Bight (Robbins 2007). The study did suggest that adult females appeared to primarily use areas where sand lance was the primary prey (Robbins 2007). In the Gulf of Maine these were nearshore areas where sandy shoals were found, including Stellwagen Bank(Payne et al. 19686). However, it was found that Humpbacks sometimes switched to herring (and sometimes mackerel) when prey availability shifted (Payne et al. 1986, Fogarty et al. 1991). When this occurs Humpbacks have been found further offshore in Cultivator Shoal, Jeffrey's Ledge and the Northeast peak of Georges where they also sometimes feed on krill (Wienrich et al 1997).

Sadove and Cardinale (1993) found humpback whales in New York feeding primarily on sand lance; these surveys observed humpbacks of all age classes, including mother and calf pairs. In this study humpback whales were found to use relatively shallow, near-shore areas (Sadove and Cardinale 1993). They have been observed for a week or more in Long Island Sound, Block Island Sound, Gardiner's Bay, and inlets along the south shore of Long Island (Sadove and Cardinale 1993). These inlets include Shinnecock, Fire Island, and New York Harbor. Sadove and Cardinale (1993) hypothesized that the year-to-year distribution of humpbacks in New York waters is driven primarily by the distribution of prey. However, since regular monitoring has not taken place in the New York Bight, it is possible that prey shifting to herring, mackerel and krill may occur as it does in the Gulf of Maine when prey availability changes. This in turn, could lead to use of areas further offshore.

Changes in prey density may alter an area's suitability for occupancy by humpback whales. In addition, pollution (including noise pollution) may make a previously occupied area unsuitable for this species. Passive acoustic monitoring in the New York Harbor region and offshore of Long Island to the continental shelf edge found that there was the potential for acoustic masking of humpback calls due to high levels of anthropogenic noise. It is possible that humpback whales may avoid these areas when noise levels are elevated. Further research is needed to identify whether or not these factors are altering habitat availability in New York waters.

V. New York Species Demographics and Life History

_____ Breeder in New York

_____ Summer Resident

_____ Winter Resident

_____ Anadromous

__X__ Non-breeder in New York

__X__ Summer Resident

__X__ Winter Resident

_____ Catadromous

__Some portion__ Migratory only

_____Unknown

Species Demographics and Life History Discussion:

The expected life span of humpbacks is at least 40 – 50 years, and probably longer (WCNE 2013). Both male and female humpbacks reach sexual maturity around 4 – 6 years of age (NMFS 1991). While on breeding grounds, groups of mature males compete to breed with females (NMFS 1991). This may includes aggressive behavior such as males ramming and hitting one another with their pectoral flippers and flukes and surfacing on top of each other. Injuries may be minor or severe, and

a few deaths have been reported (NMFS 1991). Males sing their distinctive song on breeding grounds; it is believed that this may be a way to attract and/or advertise to females. However, the function has not been definitively determined (NMFS website). Recordings of humpback whale song on the feeding grounds throughout the year are believed to correspond with hormonal activity and potentially demonstrate that not all humpbacks migrate to low-latitude breeding grounds (Vu et al. 2012).

Females typically give birth every two to three years, although annual calving has been observed (NMFS 1991). Calves are born on the winter breeding grounds after an 11 – 12 month gestation period (NMFS 1991). Females with calves are usually the last to arrive on the summer feeding grounds (Dawbin 1997). Calves are weaned in December or January.

Humpback whales give birth in low-latitude breeding grounds (in the West Indies for North Atlantic humpbacks). Humpback whales from all different feeding grounds in the North Atlantic in the West Indies, although those who summer in the waters off of Iceland and Norway are less likely to winter in the West Indies (Stevick et al. 2003b). Stevick et al. (2003b) found that whales from the western North Atlantic arrived on the breeding grounds significantly earlier than those from eastern feeding grounds. This could potentially affect the amount of genetic mixing between these groups (Stevick et al. 2003b).

There are many indications that demographic segregation occurs during migration. In the Southern and North Pacific Oceans, late lactating females and calves are generally the first to arrive on the breeding grounds, followed by juveniles, males, non-reproductive ('resting') females, and pregnant females (Dawbin 1997, Craig et al. 2003). However, in the North Atlantic, Stevick et al. (2003b) found that males arrived in the breeding grounds significantly earlier than all females. Whether these patterns are a result of differing selective pressures in the North Atlantic or differing geographic patterns of migration timing in the North Atlantic is currently unknown.

Most humpback whales exhibit maternally-directed site fidelity, returning to the same feeding ground year after year. Seasonal migrations from feeding grounds to breeding grounds can be as long as 8,000 km (Stevick et al. 1999, Stone et al. 1990, Rasmussen et al. 2007, Robbins et al. 2008). There have been reports of longitudinal migrations between different breeding grounds separated by as much as 6,000 km (Darling and Cerchio 1993, Salden et al. 1999). Occasionally, humpback whales even migrate between oceans (Pomilla and Rosenbaum 2005). These movements are almost always made by males, who are willing to travel farther for potential mating opportunities (Darling and Cerchio 1993, Salden et al. 1999, Pomilla and Rosenbaum 2005). Females usually exhibit strict breeding site fidelity (Stevick et al. 2010). However, the longest mammalian migration every documented was by a female humpback whale. This individual was originally photographed off of Brazil, and was resighted two years later off the coast of Madagascar, a distance of at least 9,800 km (Stevick et al. 2010). It is currently unknown how often such large-scale migrations occur, but the phenomenon is believed to be more common in the Southern Hemisphere, where continents do not restrict movements to as large of an extent as in the Northern Hemisphere (Stevick et al. 2010).

Little is known about natural mortality in humpback whales. Parasites are believed to play some role including the nematode *Crassicauda boopis*, which is believed to cause morbidity and mortality in other species of baleen whales (Lambertson 1985, 1986; Lambertsen et al. 1986). Killer whales are also believed to occasionally prey upon humpback whales. In the western North Atlantic, about 14% of individually identified humpback whales exhibit rake marks on their flukes from killer whales (Katona et al. 1988). There have been at least two documented attacks on humpback whales

by killer whales on the Grand Banks in Newfoundland (Whitehead 1987). Shark predation may also play a role in natural mortality of young and weak individuals (NMFS 1991).

In the winter of 1987 – 1988, at least 14 humpback whales died in Cape Cod Bay from paralytic shellfish poisoning (PSP) (Geraci et al. 1990). Another animal was reported dead in New York waters in 1988, also of PSP. It is believed that the actual number of mortalities is higher than this, as whales most likely died at sea and were never observed (NMFS 2011). Humpback whales also occasionally become trapped in pack ice. In Newfoundland, there was one ice entrapment event when about 25 humpbacks became entrapped in ice, and some mortality occurred (NMFS 1991).

There have been several Unusual Mortality Events (UMEs) declared for humpback whales since 2000. In 2003, a UME was declared when about 12-15 humpbacks died on Georges Bank (NMFS 2011). While the cause has not been officially declared, some of the whales tested positive for low levels of domoic acid (NMFS 2011). Seven humpbacks were part of a UME in New England in 2005, and 21 dead humpbacks were found between July and December in 2006. The causes of the mortalities are currently unknown (NMFS 2011).

Vessel collision and entanglement in fishing gear are considered the two major human-caused sources of mortality and serious injury (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. 60% of humpback whale carcasses examined by Wiley et al. (1995) showed evidence of entanglement or vessel collision being the primary cause of death. The potential biological removal (PBR) for the entire Gulf of Maine stock is currently estimated at 1.1 whales (NMFS 2011). From 2005 – 2009, the minimum annual rate of mortality and serious injury from entanglement and vessel collisions was about 5.2 humpbacks (3.8 from entanglements, and 1.4 from vessel collisions; NMFS 2011). 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; however, the humpback whales observed in New York most likely come from the Gulf of Maine stock (NMFS 2011), so it is beneficial to look at total PBR and anthropogenic injuries and mortalities for this stock.

Jensen and Silber (2004) compiled information on reported ship strikes from 1975 – 2002. They found that humpback whales were the second most commonly affected species of whale, with 44 records. From 2005 – 2009, there were seven confirmed deaths of humpback whales caused by vessel collisions (NMFS 2011). Because of their coastal distribution and slow-moving tendencies, it is believed that humpback whales are at significant risk of being struck by vessels. Humpback whales are one of the few species that have been observed with some regularity in the area around New York Harbor, which has high levels of vessel traffic (Sadove and Cardinale 1993).

Entanglement in fishing gear is another major threat to many species of cetaceans throughout the North Atlantic. From 2005 – 2009, at least six humpbacks have been killed and thirteen seriously

injured by entanglements in fishing gear (NMFS 2011). The fate of many of the injured whales is unknown.

Provincetown Center for Coastal Studies (PCCS) and other organizations have been studying entanglement in Gulf of Maine humpbacks since 1997. Because the caudal peduncle is often involved in entanglements and is visible when humpback whales dive, photographs of scarring on this region have provided critical information on entanglement rates in the Gulf of Maine (Robbins and Mattila 2001, Robbins 2009, Robbins 2011). Between 2003 and 2006, about 65% of new individuals entering the entanglement study had evidence of a prior entanglement on their caudal peduncle (Robbins 2009). There were an estimated 203 entanglement events during this time period; only nine of them were well-documented. This led to a reporting rate of only 5.7%.

31% of humpback whales photographed in 1997 and again in 1999 showed evidence of new entanglement scarring acquired during the study period (Robbins and Mattila 2001). In 2009, 12.5% ± 5.9% of humpbacks photographed in 2008 and 2009 showed scarring that was not visible in 2008, implying that the entanglements had occurred within the year (Robbins 2011). From the work done in the Gulf of Maine, Robbins (2009) estimated an annual mortality rate of about 3% due to entanglement for Gulf of Maine humpbacks. Juveniles are more prone to entanglements than mature animals (Robbins and Mattila 2001, Robbins 2011).

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.

Climate change has led to temperature and current shifts throughout the North Atlantic Ocean. These changes could lead to shifts in distribution of humpback whales as occupied habitats may become unsuitable and previously unsuitable habitats may become occupied (NMFS 1991, Sadove and Cardinale 1993). The effects of other anthropogenic activities, such as offshore energy development are also largely unknown. Oil spills threaten marine mammals including the humpback whale. The other major threat of development and other human activities is noise pollution (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.

Recreational vessel activity, such as whale-watching, has been known to affect some species of cetaceans. Humpback whales are the main target of whale-watching activities in New York and other areas, so there is the potential that some of these negative effects may be seen. Scheidat et al. (2004) found that humpback whales in Ecuador increased dive time in the presence of whale-watching vessels, and increased their path directness when vessels left. In Alaska, Baker and Herman (1989) found that humpback whales decreased their blow intervals and increased dive time when approached by vessels. Work done in the southern Gulf of Maine has so far found no negative long-term effects such as decreased calving rate and calf survival as a result of whale-watching activities (Weinrich and Corbelli 2009).

It is currently believed that contaminants such as organochlorines, organotins, and heavy metals do not negatively impact humpback whales and other baleen as much as other marine mammals (O'Shea and Brownell 1994). Humpback 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. It is also possible that ingestion of solid pollutants (garbage) may occur, which could lead to potential blockage of the stomach.

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

_____ No **____ Unknown**

__X__ Yes

The humpback whale is protected in the United States by its status as a federally Endangered species. In addition, the humpback whale (along with all other marine mammals) receives federal protection under the Marine Mammal Protection Act of 1972 (MMPA). The humpback whale is protected internationally from commercial hunting under the International Whaling Commission's (IWC) global moratorium on whaling. The moratorium was introduced in 1966, and is voted on by member countries (including the United States) at the IWC's annual meeting.

Humpback whales are also protected under the Environmental Conservation Law (ECL) of New York. The humpback 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. Both of these help to protect the habitat of the humpback whale. Whether they are adequate to protect the habitat is currently unknown. Unfortunately, we do not know much about humpback whale distribution in New York, so it is impossible to assess whether the habitat protection afforded by these acts are effective.

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. It is often difficult to determine which fishery entangling gear is from; however, 53% of identified entanglements on North Atlantic right whales and humpback whales examined by Johnson et al. (2005) involved trap and pot gear. 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 humpback whales utilize New York coastal waters. What information we do have comes from surveys done in the 1970s – early 1990s, and it is possible that humpback whales may have shifted their distribution and habitat use patterns since then. Long-term surveys and monitoring strategies should be developed by the state.

If it is known where and when humpback 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 (ie. pot and/or gillnet fisheries) 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.

The humpback whale would benefit greatly from further research. Little is known about its population, behavior and threats while in the New York Bight. Further research into the actual effects that threats such as climate change are having on humpback whales is warranted. In addition, education on this species and the importance of reporting ship strikes and entanglements is encouraged.

References

Baker, S. C. and L. M. Herman. 1989. Behavioral responses of summering humpback whales to vessel traffic: experiments and opportunistic observations. No. NPS/NR/TRS-89/01. 59 pp.

Balcomb, K. C. and G. Nichols. 1982. Humpback whale censuses in the West Indies. Reports to the International Whaling Commission 32: 401 - 406.

Barco, S.G., W.A. McLellan, J.M. Allen, R.A. Asmutis-Silvia, R. Mallon-Day, E.M. Meagher, D.A. Pabst, J. Robbins, R.E. Seton, W.M. Swingle, M.T. Weinrich and P.J. Clapham. 2002. Population identity of humpback whales (Megaptera novaeangliae) in the waters of the U.S. mid-Atlantic states. J. Cetacean Res. Manage. 4(2): 135-141.

Barlow, J. and P. J. Clapham. 1997. A new birth-interval approach to estimating demographic parameters of humpback whales. Ecology 78: 535 - 546.

Best, P. B. 1987. Estimates of the landed catch of right (and other whalebone) whales in the American fishery, 1805 - 1909. Fisheries Bulletin 85(3): 403 - 418.

Bioacoustics Research Program (BRP). 2010. Determining the seasonal occurrence of cetaceans in New York coastal waters using passive acoustic monitoring. Cornell Lab of Ornithology: Bioacoustics Research Program. TR 09-07. 60 pp.

Braham, H. W. 1984. The status of endangered whales: an overview. Marine Fisheries Review 46(4): 2 - 6.

Brandão, A., Butterworth, D.S., and Brown, M.R. 2000. Maximum possible humpback whale increase rates as a function of biological parameter values. Journal of Cetacean Research and Management (Suppl.) 2:192-193.

CETAP. 1982. A characterization of marine mammals and turtles in the mid- and north Atlantic areas of the U.S. outer continental shelf, final report, Cetacean and Turtle Assessment Program, University of Rhode Island. Washington, DC, Bureau of Land Management. #AA551-CT8-48: 576.

Clapham, P.J., J. Barlow, M. Bessinger, T. Cole, D. Mattila, R. Pace, D. Palka, J. Robbins and R. Seton. 2003. Abundance and demographic parameters of humpback whales from the Gulf of Maine, and stock definition relative to the Scotian Shelf. Journal of Cetacean Research and Management 5(1): 13-22.

Darling, J. D. and S. Cerchio. 1993. Movement of a humpback whale (Megaptera novaeangliae) between Japan and Hawaii. Marine Mammal Science 9: 84 - 89.

Dawbin, W. H. 1997. Temporal segregation of humpback whales during migration in southern hemisphere waters. Memoirs of the Queensland Museum 42: 105 - 238.

Fogarty, M.J., E.B. Cohen, W.L. Michaels and W.W. Morse 1991. Predation and the regulation of sand lance populations: An exploratory analysis. ICES Mar. Sci. Symp. 193: 120-124.

Geraci, J. R. et al. 1990. Humpback whales (*Megaptear novaeangliae*) fatally poisoned by dinoflagellate toxin. Canadian Journal of Fisheries and Aquatic Science 46(11): 1895 - 1898.

Hays, G.C., A.J. Richardson, C. Robinson. 2005. Climate change and marine plankton. Trends in Ecology and Evolution: 20(6).

Heyning, J.E., and T.D. Lewis. 1990. Entanglements of baleen whales in fishing gear off southern California. Reports to the International Whaling Commission 40:427-431.

Holt, M. M., D. P. Noren, V. Veirs, C. K. Emmons and S. Veirs. 2008. Speaking up: killer whales (*Orcinus orca*) increase their call amplitude in response to vessel noise. Journal of the Acoustical Society of America 125(1): EL27 - EL32.

IWC 2002. Report of the Scientific Committee. Annex H: Report of the Sub-committee on the Comprehensive Assessment of North Atlantic humpback whales. J. Cetacean Res. Manage. 4 (supplement): 230-260.

Jensen, A. S., and G. K. Silber. 2004. Large Whale Ship Strike Database. U.S. Department of Commerce, NMFS-OPR-25 37.

Johnson, A., G. Salvador, J. Kenney, J. Robbins, S. Kraus, S. Landry and P. Clapham. 2005. Fishing gear involved in entanglements of right and humpback whales. Marine Mammal Science 21(4): 635 - 645.

Katona, S. K., J. A. Beard, P. E. Girton and F. Wenzel. 1988. Killer whales (*Orcinus orca*) from the

Bay of Fundy to the Equator, including the Gulf of Mexico. Rit. Fiskideldar 11: 205 - 224.

Lambertsen, R. H. 1985. Taxonomy and distribution of a *Crassicauda* spp. infecting the kidney of the common fin whale, *Balaenoptera physalus* (Linne 1758). Journal of parasitology 71: 485 - 488.

Lambertsen, R. H., B. Birnir, and J. E. Bauer. 1986. Serum chemistry and evidence of renal failure in the North Atlantic fin whale population. Journal of Wildlife Disease 22: 389 - 396.

Lambertsen, R.H. 1986. Disease of the common fin whale (*Balaenoptera physalus*) crassicaudiosis of the urinary system. Journal of Mammalogy 67(2):353–366.

Mackas, D.L., Goldblatt, and A.G. Lewis. 1989. Importance of walleye Pollack in the diets of marine mammals in the Gulf of Alaska and Bering Sea and implications for fishery management, pp. 701–726 *In* Proceedings of the international symposium on the biology and management of walleye Pollack, November 14-16,1988, Anchorage, AK. Univ. AK Sea Grant Rep. AK-SG-89-01.

Mattila, D. K., P. J. Clapham, O. Vasquez and R. Bowman. 1994. Occurrence, population composition and habitat use of humpback whales in Samana Bay, Dominican Republic. Canadian Journal of Zoology 72: 1898 - 1907.

Mattila, D. K., P. J. Clapham, S. K. Katona and G. S. Stone. 1989. Population composition of humpback whales on Silver Bank. Canadian Journal of Zoology 67: 281 - 285.

Melcón, M. L., A. J. Cummins, S. M. Kerosky, L. K. Roche, S. M Wiggins, and J. A. Hildebrand. 20120. Blue whales respond to anthropogenic noise. PLoS ONE 7(2): e32681. doi:10.1371/journal.pone.0032681

National Marine Fisheries Service (NMFS). 1991. Recovery Plan for the Humpback Whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 105 pp.

National Marine Fisheries Service (NMFS). 2013. Humpback whale (*Megaptera novaeangliae*): Gulf of Maine stock. NOAA Fisheries Marine Mammal Stock Assessment Reports. National Marine Fisheries Service, Silver Spring, MD. 11 pp.

Parks, S. E., M. Johnson, D. Nowacek and P. L. Tyack. 2011. Individual right whales call louder in increased environmental noise. Biology Letters 7(1): 33 - 35.

Payne, P. M., J. R. Nicholas, L. O'Briend and K. D. Powers. 1986. The distribution of the humpback whale, *Megaptera novaeangliae*, on Georges Bank and in the Gulf of Maine in relation to densities of the sand eel, *Ammodytes americanus*. Fisheries Bulletin 84: 271 - 277.

Pomilla, C. and H. C. Rosenbaum. 2005. Against the current: an inter-oceanic whale migration event. Biology Letters 1: 476 - 479.

Quinn, TJ.II, and H.J. Niebauer. 1995. Relation of eastern Bering Sea walleye Pollock (*Theragra chalcogramma*) recruitment to environmental and oceanographic variables, pp. 497-507 *In* R.J. Beamish (ed.), Climate change and northern fish populations. Canadian Special Publication of Fisheries and Aquatic Sciences 121.

Rasmussen, K., D. M. Palacios, J. Calambokidis, M. T. Saborio, L. Dalla Rosa, E. R. Secchi, G. H. Steiger, J. M. Allen and G. S. Stone. 2007. Southern Hemisphere humpback whales wintering off Central America: insights from water temperature into the longest mammalian migration. Biology Letters 3: 302 - 305.

Richardson, W. J., C. R. Greene, Jr., C. I. Malme and D. H. Thomson. 1995. Marine Mammals and Noise. Academic Press, San Diego, California.

Robbins J, and D. K. Mattila. 2001. Monitoring entanglements of humpback whales (*Megaptera novaeangliae*) in the Gulf of Maine on the basis of caudal peduncle scarring. Unpublished report to the Scientific Committee of the International Whaling Commission: SC/53/NAH25.

Robbins, J. 2007. Structure and dynamics of the Gulf of Maine humpback whale population. PhD dissertation. Universitiy of St. Andrews, St. Andrews, Scotland.

Robbins, J. 2009. Scar-Based inference into Gulf of Maine humpback whale entanglement: 2003-2006, Report to the National Marine Fisheries Service. Order Number EA133F04SE0998.

Robbins, J. 2011. Scar-based inference into Gulf of Maine humpback whale entanglement: 2009, Report to the National Marine Fisheries Service. Order number EA133F09CN0253.

Robbins, J., L. Dalla Rosa, J. M. Allen, D. K. Mattila and E. R. Secchi. 2008. Humpback whale photo-identification reveals exchange between American Samoa and the Antarctic Peninsula, and a new mammalian distance record. IWC Scientific Committee Document SC/60/SH5.

Sadove, S. S. and P. Cardinale. 1993. Species composition and distribution of marine mammals and sea turtles in the New York Bight. Final Report to U.S. Dept. of the Interior, Fish and Wildlife Service Southern New England-New York Bight Coastal Fisheries Project. Charlestown, RI.

Salden, D. R., L. M. Herman, M. Yamaguchi, and F. Sato. 1999. Multiple visits of individual humpback whales (*Megaptera novaeangliae*) between the Hawaiian and Japanese winter grounds. Canadian Journal of Zoology 77: 504 - 508.

Scheidat, M. C. Castro, J. Gonzalez and R. Williams. 2004. Behavioural responses of humpback whales (*Megaptera novaeangliae*) to whalewatching boats near Isla de la Plata, Machalilla National Park, Ecuador. Journal of Cetacean Research and Management 6(1): 63 - 68.

Smith, T. D. and R. R. Reeves. 2003. Estimating historic humpback removals from the North Atlantic: an update. Journal of Cetacean Research and Management 5.

Stevick, P. T., M. C. Neves, F. Johansen, M. H. Engel, J. Allen, M. C. C. Marcondes and C. Carlson. 2010. A quarter of a world away: female humpback whale moves 10000 km between breeding areas. Biology Leters 7: 299 - 302.

Stevick, P. T., N. Oien and D. K. Mattila. 1999. Migratory destinations of humpback whales from Norwegian and adjacent waters: evidence for stock identity. Journal of Cetacean Research and Management 1: 147 - 152.

Stevick, P.T., J. Allen, M. Berube, P. J. Clapham, S. K. Katona, F. Larsen, J. Lien, D. K. Mattila, P. J. Palsbøll, J. Robbins, J. Sigurjonsson, T. D. Smith, N. Øien and P. S. Hammond. 2003b. Segregation of migration by feeding ground origin in North Atlantic humpback whales (*Megaptera novaeangliae).* Publications, Agencies and Staff of the U.S. Department of Commerce. Paper 164. 9 pp.

Stevick, P.T., J. Allen, P.J. Clapham, N. Friday, S.K. Katona, F. Larsen, J. Lien, D.K. Mattila, P.J. Palsbøll, J. Sigurjónsson, T.D. Smith, N. Øien and P.S. Hammond. 2003a. North Atlantic humpback whale abundance and rate of increase four decades after protection from whaling. Marine Ecology Progress Series 258: 263-273.

Stone, G. S., L. Florez-Gonzalez and S. Katona. 1990. Whale migration record. Nature (London) 346: 705.

Vu, E. T. et al. 2012. Humpback whale song occurs extensively on feeding grounds in the western North Atlantic Ocean. Aquatic Biology 14: 175 - 183.

Waring, G.T., D.L. Palka, P.J. Clapham, S. Swartz, M.C. Rossman, T.V.N. Cole, K.D. Bisack and L.J. Hansen, eds.1999. U.S. Atlantic marine mammal stock assessments - 1998. NOAA Tech. Memo. NMFS-NE-116. 182 pp.

Waring, G.T., J.M. Quintal and S.L. Swartz, eds. 2000. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments - 2000. NOAA Tech. Memo. NMFS-NE-162. ix +197p. +3 app.

Weinrich, M., M. Martin, R. Griffiths, J. Bove, and M. Schilling. 1997. A shift in distribution of humpback whales, *Megaptera novaeangliae*, in response to prey in southern Gulf of Maine. Fishery Bulletin 95:826-836.

Weinrich, M. and C. Corbelli. 2009. Does whale watching in Southern New England impact humpback whale (*Megaptera novaeangliae*) calf production or calf survival? Biological Conservation 142(12): 2931 - 2940.

Whale Center of New England (WCNE). 2013. Humpback whale (*Megaptera novaeangliae*). Species Info, Whale Center of New England <http://www.whalecenter.org>.

Whitehead, H. 1987. Updated status of the humpback whale, *Megaptera novaeangliae*, in Canada. Canadian Field-Naturalist 101(2): 284 - 294.

Whitehead, H. and M. J. Moore. 1982. Distribution and movements of West Indian humpback whales in the winter. Canadian Journal of Zoology 60: 2203 - 2211.

Wiley, D. N., R. A. Asmutis, T. D. Pitchford and D. P. Gannon. 1995. Stranding and mortality of humpback whales, *Megaptera novaeangliae*, in the mid-Atlantic and southeast United States, 1985 - 1992. Fisheries Bulletin 93(1): 196 - 205.

Date last revised: **05/31/13**