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NORTH ATLANTIC RIGHT WHALE (*Eubalaena glacialis*): Western Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The western North Atlantic right whale population ranges from calving grounds in coastal waters off the southeastern United States to feeding grounds in New England waters and the Canadian Bay of Fundy, Scotian Shelf, and Gulf of St. Lawrence. Knowlton *et al.* (1992) reported several long-distance movements as far north as Newfoundland, the Labrador Basin, and southeast of Greenland. In addition, recent resightings of photographically identified individuals have been made off Iceland, in the old Cape Farewell whaling ground east of Greenland (Hamilton *et al.* 2007), and northern Norway (Jacobsen *et al.* 2004). The September 1999 Norwegian sighting represents one of only two published sightings this century of a right whale in Norwegian waters, and the first since 1926. Together, these long-range matches indicate an extended range for at least some individuals and perhaps the existence of important habitat areas not presently well described. The few published records from the Gulf of Mexico (Moore and Clark 1963; Schmidly *et al.* 1972) represent either distributional anomalies, normal wanderings of occasional animals, or a more extensive historic range beyond the sole known calving and wintering ground in the waters of the southeastern United States. Whatever the case, the location of much of the population is unknown during the winter. Offshore (greater than 30 miles) surveys flown off the coast of northeastern Florida and southeastern Georgia from 1996 to 2001 had 3 sightings in 1996, 1 in 1997, 13 in 1998, 6 in 1999, 11 in 2000 and 6 in 2001 (within each year, some were repeat sightings of previously recorded individuals). Several of the years that offshore surveys were flown were some of the lowest count years for calves and for numbers of right whales in the Southeast recorded since comprehensive surveys began in the calving grounds. Therefore, the frequency with which right whales occur in offshore waters in the southeastern U.S. remains unclear.

Research results suggest the existence of six major habitats or congregation areas for western North Atlantic right whales: the coastal waters of the southeastern United States; the Great South Channel; Georges Bank/Gulf of Maine; Cape Cod and Massachusetts Bays; the Bay of Fundy; and the Scotian Shelf. However, movements within and between habitats may be more extensive than thought. In 2000, one whale was photographed in Florida waters on 12 January, then again eleven days later (23 January) in Cape Cod Bay, less than a month later off Georgia (16 February), and back in Cape Cod Bay on 23 March, effectively making the round-trip migration to the Southeast and back at least twice during the winter season. (Brown and Marx 2000). Results from satellite tags clearly indicate that sightings separated by perhaps two weeks should not necessarily be assumed to indicate a stationary or resident animal. Instead, telemetry data have shown rather lengthy and somewhat distant excursions, including into deep water off the continental shelf (Mate *et al.* 1997; Baumgartner and Mate 2005). Systematic surveys conducted off the coast of North Carolina during the winters of 2001 and 2002 sighted 8 calves, suggesting the calving grounds may extend as far north as Cape Fear. Four of the calves were not sighted by surveys conducted further south. One of the cows photographed was new to researchers, having effectively eluded identification over the period of its maturation (McLellan *et al.* 2004). The Northeast Fisheries Science Center conducts an extensive multi-year aerial survey program throughout the Gulf of Maine region; this program is intended to better establish the distribution of right whales, including evaluating inter-annual variability in right whale occurrence in previously poorly studied habitats.

New England waters are an important feeding habitat for right whales, which feed primarily on copepods (largely of the genera *Calanus* and *Pseudocalanus*) in this area. Research suggests that right whales must locate and exploit extremely dense patches of zooplankton to feed efficiently (Mayo and Marx 1990). These dense zooplankton patches are likely a primary characteristic of the spring, summer, and fall right whale habitats (Kenney *et al.* 1986; 1995). While feeding in the coastal waters off Massachusetts has been better studied than in other areas, right whale feeding has also been observed on the margins of Georges Bank, in the Great South Channel, in the Gulf of Maine, in the Bay of Fundy, and over the Scotian Shelf. The characteristics of acceptable prey distribution in these areas are beginning to emerge (Baumgartner *et al.* 2003; Baumgartner and Mate 2003). NMFS (National Marine Fisheries Service) and Center for Coastal Studies aerial surveys during springs of 1999-2006 found right whales along the

Northern Edge of Georges Bank, in the Great South Channel, in Georges Basin, and in various locations in the Gulf of Maine including Cashes Ledge, Platts Bank and Wilkinson Basin. The consistency with which right whales occur in such locations is relatively high, but these new data further highlight high interannual variability in right whale use of some habitats.

Genetic analyses based upon direct sequencing of mitochondrial DNA (mtDNA) have identified five mtDNA haplotypes in the western North Atlantic right whale (Malik *et al.* 1999). Schaeff *et al.* (1997) compared the genetic variability of North Atlantic and southern right whales (*E. australis*), and found the former to be significantly less diverse, a finding broadly replicated from sequence data by Malik *et al.* (2000). These findings might be indicative of inbreeding in the population, but no definitive conclusion can be reached using current data. Additional work comparing modern and historic genetic population structure in right whales, using DNA extracted from museum and archaeological specimens of baleen and bone, has suggested that the eastern and western North Atlantic populations were not genetically distinct (Rosenbaum *et al.* 1997; 2000). However, the virtual extirpation of the eastern stock and its lack of recovery in the last hundred years strongly suggests population subdivision over a protracted (but not evolutionary) timescale. Genetic studies concluded that the principal loss of genetic diversity occurred prior to the 18th century (Waldick *et al.* 2002). However, revised conclusions of species composition in North American Basque whaling archaeological sites (Rastogi *et al.* 2004) contradict the previously held belief that Basque whaling during the 16th and 17th centuries was principally responsible for the loss of genetic diversity.

High-resolution (using 35 microsatellite loci) genetic profiling has been completed for 66% of all identified North Atlantic right whales through 2001. This work has improved our understanding of genetic variability, number of reproductively active individuals, reproductive fitness, parentage and relatedness of individuals (Frasier *et al.* 2007).

One emerging result of the genetic studies is the importance of obtaining biopsy samples from calves on the calving grounds. Only 60% of all known calves are seen with their mothers in summering areas, when their callosity patterns are stable enough to reliably make a photo-ID match later in life. The remaining 40% of all calves born are not seen on a known summering ground. Because the calf's genetic profile is the only reliable way to establish parentage, if the calf is not sampled when associated with its mother early on, then it is not possible to link it with a calving event or to its mother, and information such as age and familial relationships is lost. From 1980 to 2001, there were 64 calves born that were not sighted later with their mothers and thus unavailable to provide age-specific mortality information (Frasier *et al.* 2007). An additional interpretation of paternity analyses is that the population size may be larger than was previously thought. Fathers for only 45% of known calves have been genetically determined. However, genetic profiles were available for 69% of all photo-identified males (Frasier 2005). The conclusions was that the majority of these calves must have different fathers which cannot be accounted for by unsampled males and the population of males must be larger (Frasier 2005). This inference of additional animals that have never been captured photographically and/or genetically suggests the existence of habitats of potentially significant use that remain unknown.

POPULATION SIZE

Based on a census of individual whales identified using photo-identification techniques and an assumption of mortality of whales not seen in seven years, the western North Atlantic stock size was estimated to be 295 individuals in 1992 (Knowlton *et al.* 1994). An updated analysis using the same method gave an estimate of 299 animals in 1998 (Kraus *et al.* 2001). An IWC workshop on status and trends of western North Atlantic right whales gave a minimum direct-count estimate of 263 right whales alive in 1996 and noted that the true population was unlikely to be substantially greater than this (Best *et al.* 2001). A review of the photo-ID recapture database on 30 May 2007 indicated that 325 individually recognized whales in the catalog were known to be alive during 2003. With the exception of calves of the year and a few probably unique but as yet uncatalogued individuals, this number represents a nearly complete census and therefore represents a minimum population size. This count has no associated coefficient of variation.

Historical Abundance

An estimate of pre-exploitation population size is not available. Basque whalers were thought to have taken right whales during the 1500s in the Strait of Belle Isle region (Aguilar 1986), however, recent genetic analysis has shown that nearly all of the remains found in that area are, in fact, those of bowhead whales (Rastogi *et al.* 2004; Frasier *et al.* 2007). The stock of right whales may have already been substantially reduced by the time whaling was

begun by colonists in the Plymouth area in the 1600s (Reeves *et al.* 2001; Reeves *et al.* 2007). A modest but persistent whaling effort along the coast of the eastern U.S. lasted three centuries, and the records include one report of 29 whales killed in Cape Cod Bay in a single day during January 1700. Based on incomplete historical whaling data, Reeves and Mitchell could conclude only that there were at least hundreds of right whales present in the western North Atlantic during the late 1600s. Reeves *et al.* (1992) plotted a series of population trajectories using historical data and assuming a present day population size of 350 animals. The results suggested that there may have been at least 1,000 right whales in the population during the early to mid-1600s, with the greatest population decline occurring in the early 1700s. The authors cautioned, however, that the record of removals is incomplete, the results were preliminary, and refinements are required. Based on back calculations using the present population size and growth rate, the population may have numbered fewer than 100 individuals by 1935 when international protection for right whales came into effect (Hain 1975; Reeves *et al.* 1992; Kenney *et al.* 1995). However, little is known about the population dynamics of right whales in the intervening years.

Minimum Population Estimate

The western North Atlantic population size was estimated to be at least 325 individuals in 2003 based on a census of individual whales identified using photo-identification techniques. This value is a minimum and does not include animals that were alive prior to 2003, but not recorded in the individual sightings database as seen during from 1 January 2004 to 30 May 2007 (note that matching of photos from 2006 and 2007 is not complete). It also does not include calves known to be born during 2003, but not yet entered into the catalog.

Current Population Trend

The population growth rate reported for the period 1986-1992 by Knowlton *et al.* (1994) was 2.5% (CV=0.12), suggesting that the stock was showing signs of slow recovery. However, work by Caswell *et al.* (1999) suggested that crude survival probability declined from about 0.99 in the early 1980s to about 0.94 in the late 1990s. The decline was statistically significant. Additional work conducted in 1999 was reviewed by the IWC workshop on status and trends in this population (Best *et al.* 2001); the workshop concluded based on several analytical approaches that survival had indeed declined in the 1990s. Although capture heterogeneity could negatively bias survival estimates, the workshop concluded that this factor could not account for the entire observed decline, which appeared to be particularly marked in adult females. Another workshop was convened by NMFS in September 2002, and reached similar conclusions regarding the decline in the population (Clapham 2002).

Recent mortalities, including those in the first half of 2005, suggest an increase in the annual mortality rate (Kraus *et al.* 2005). Calculations based on demographic data through 1999 (Fujiwara and Caswell 2001) indicated that this mortality rate increase would reduce population growth by approximately 10% per year (Kraus *et al.* 2005). Of these recent mortalities, six were adult females, three of which were carrying near-term fetuses. Furthermore, four of these females were just starting to bear calves, and since the average lifetime calf production is 5.25 calves (Fujiwara and Caswell 2001), the deaths of these females represent a lost reproductive potential of as many as 21 animals.

Despite the preceding, examination of the minimum number alive population index calculated from the individual sightings database, as it existed on 30 May 2007, for the years 1990-2003 (Figure 1) suggests a positive trend in numbers. These data reveal a significant increase in the number of catalogued whales alive during this period, but with significant variation due to apparent losses exceeding gains during 1998-1999. Mean growth rate for the period was 1.8%.

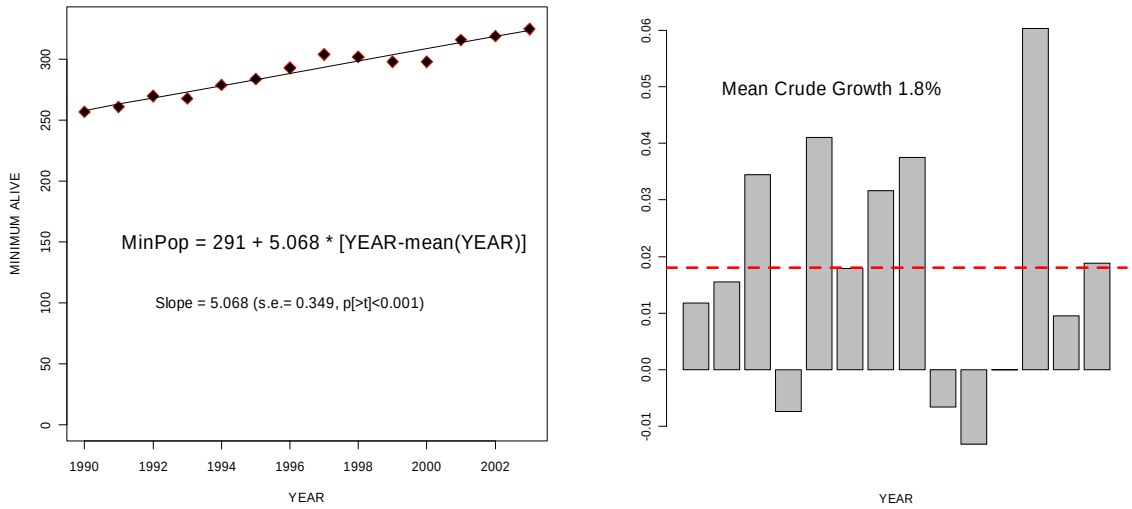

Figure 1. Minimum number alive (a) and crude annual growth rate (b) for cataloged North Atlantic right whales. Minimum number of cataloged individuals known to be alive in any given year includes all whales known to be alive prior to that year and seen in that year or subsequently plus all whales newly cataloged that year. It does not include calves born that year but not yet cataloged.

The minimum number alive may increase slightly in later years as analysis of the backlog of unmatched but high-quality photographs proceeds, with animals matched to previously known individuals added to the catalog as newly identified whales. For example, the minimum number alive for 2002 was calculated to be 313 from a 15 June 2006 data set and revised to 325 using the 30 May 2007 data.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

During 1980-1992, 145 calves were born to 65 identified cows. The number of calves born annually ranged from 5 to 17, with a mean of 11.2 (SE=0.90). The reproductively active female pool was static at approximately 51 individuals during 1987-1992. Mean calving interval, based on 86 records, was 3.67 years. There was an indication that calving intervals may have been increasing over time, although the trend was not statistically significant (P=0.083) (Knowlton *et al.* 1994).

Total reported calf production and calf mortalities from 1993 to 2007 are shown below in Table 1. The mean calf production for this fifteen year period was 15.6 (13.7-17.7; 95% C.I). In addition, one calf was reported as a serious injury in 2002 and during the 2005 calving season three adult females were found dead with near term fetuses.

An updated analysis of calving interval through the 1997/1998 season suggests that mean calving interval increased since 1992 from 3.67 years to more than 5 years, a significant trend (Kraus *et al.* 2001). This conclusion is supported by modeling work reviewed by the IWC workshop on status and trends in this population (Best *et al.* 2001); the workshop agreed that calving intervals had indeed increased and further that the reproductive rate was approximately half that reported from studied populations of *E. australis*. A workshop on possible causes of reproductive failure was held in April 2000 (Reeves *et al.* 2001). Factors considered included contaminants, biotoxins, nutrition/food limitation, disease and inbreeding problems. While no conclusions were reached, a research plan to further investigate this topic was developed. Analyses completed since that workshop found that in the most recent years, calving intervals were closer to three years (Kraus *et al*. 2007).

An analysis of the age structure of this population suggests that it contains a smaller proportion of juvenile whales than expected (Hamilton *et al.* 1998; Best *et al.* 2001), which may reflect lowered recruitment and/or high juvenile mortality. In addition, it is possible that the apparently low reproductive rate is due in part to an unstable age structure or to reproductive senescence on the part of some females. However, few data are available on either factor and senescence has not been documented for any baleen whale.

Table 1: North Atlantic right whale calf production and mortality, 1993-2007		
Year[a]	Reported calf production	Reported calf mortalites
1993	8	2
1994	9	
1995	7	
1996	22	3
1997	20	1
1998	6	1
1999	4	
2000	1	
2001	31	4
2002	21	2
2003	19	
2004	17	
2005	28	
2006	19	
2007	22	
a. includes December of the previous year		

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal (PBR) is specified as the product of minimum population size, one-half the maximum net productivity rate and a "recovery" factor for endangered, depleted, threatened stocks, or stocks of unknown status relative to OSP (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). However, recent publications report unacceptable levels of mortality (Best *et al.* 2001), and forecasts of a high probability that North Atlantic right whales will go extinct in 200 years if anthropogenic mortality is not curtailed (Fugiwara and Caswell 2001) suggest that the application of the PBR control rule is inappropriate for this species. Therefore, the PBR for this population is set to zero.

ANNUAL HUMAN-CAUSED SERIOUS INJURY AND MORTALITY

For 2002 through 2006, the minimum annual rate of human-caused mortality and serious injury to right whales averaged 3.8 per year (U.S. waters, 2.4; Canadian waters, 1.4). This is derived from: 1) fishery entanglement records at 1.4 per year (U.S. waters, 0.6; Canadian waters, 0.8), and 2) ship strike records at 2.4 per year (U.S. waters, 1.8; Canadian waters, 0.6). Beginning with the 2001 Stock Assessment Report, Canadian records were incorporated into the mortality and serious injury rates of this report to reflect the effective range of this stock. It is also important to stress that serious injury determinations are made based upon the best available information; these determinations may change with the availability of new information (Cole *et al.* 2005; Nelson *et al.* 2007; Glass *et al.* 2008). For the purposes of this report, discussion is primarily limited to those records considered confirmed human-caused mortalities or serious injuries. For more information on determinations for this period, see Glass *et al.* (2008).

Background

The details of a particular mortality or serious injury record often require a degree of interpretation. The assigned cause is based on the best judgment of the available data; additional information may result in revisions. When reviewing Table 2 below, several factors should be considered: 1) a ship strike or entanglement may occur at some distance from the reported location; 2) the mortality or injury may involve multiple factors; for example, whales that have been both ship struck and entangled are not uncommon; 3) the actual vessel or gear type/source is often uncertain; and 4) in entanglements, several types of gear may be involved.

The serious injury determinations are susceptible to revision. There are several records where a struck and injured whale was re-sighted later, apparently healthy, or where an entangled or partially disentangled whale was re-sighted later free of gear. The reverse may also be true: a whale initially appearing in good condition after being struck or entangled is later re-sighted and found to have been seriously injured by the event. Entanglements of juvenile whales are typically considered serious injuries because the constriction on the animal is likely to become

increasingly lethal as the whale grows (Cole *et al.* 2005; Nelson *et al.* 2007).

A serious injury was defined in 50 CFR part 229.2 as an injury that is likely to lead to mortality. We therefore limited the serious injury designation to only those reports that had substantiated evidence that the injury, whether from entanglement or vessel collision, was likely to lead to the whale's death (Cole *et al.* 2005; Nelson *et al.* 2007; Glass *et al.* 2008). Determinations of serious injury were made on a case-by-case basis following recommendations from the workshop conducted in 1997 on differentiating serious and non-serious injuries (Angliss and DeMaster 1998). Injuries that impeded a whale's locomotion or feeding were not considered serious injuries unless they were likely to be fatal in the foreseeable future. There was no forecasting of how the entanglement or injury may increase the whale's susceptibility to further injury, namely from additional entanglements or vessel collisions. This conservative approach likely underestimates serious injury rates.

With these caveats, the total estimated annual average human-induced mortality and serious injury incurred by this stock (including fishery and non-fishery related causes) is 3.8 right whales per year (U.S. waters 2.4; Canadian waters, 1.4). As with entanglements, some injury or mortality due to ship strikes is almost certainly undetected, particularly in offshore waters. Decomposed and/or unexamined animals (e.g., carcasses reported but not retrieved or necropsied) represent lost data, some of which may relate to human impacts. For these reasons, the estimate of 3.8 right whales per year must be regarded as a minimum estimate (Glass *et al.* 2008).

Further, the small population size and low annual reproductive rate of right whales suggest that human sources of mortality may have a greater effect relative to population growth rates than for other whales. The principal factors believed to be retarding growth and recovery of the population are ship strikes and entanglement with fishing gear. Between 1970 and 1999, a total of 45 right whale mortalities were recorded (IWC [International Whaling Commission] 1999; Knowlton and Kraus 2001; Glass *et al.* 2008). Of these, 13 (28.9%) were neonates that were believed to have died from perinatal complications or other natural causes. Of the remainder, 16 (35.6%) resulted from ship strikes, 3 (6.7%) were related to entanglement in fishing gear (in two cases lobster gear, and one gillnet gear), and 13 (28.9%) were of unknown cause. At a minimum, therefore, 42.2% of the observed total for the period and 50% of the 32 non-calf deaths were attributable to human impacts (calves accounted for three deaths from ship strikes).

Young animals, ages 0-4 years, are apparently the most impacted portion of the population (Kraus 1990).

Finally, entanglement or minor vessel collisions may not kill an animal directly, but may weaken or otherwise affect it so that it is more likely to become vulnerable to further injury. Such was apparently the case with the two-year-old right whale killed by a ship off Amelia Island, Florida, in March 1991 after having carried gillnet gear wrapped around its tail region since the previous summer (Kenney and Kraus 1993). A similar fate befell right whale #2220, found dead on Cape Cod in 1996.

Fishery-Related Serious Injury and Mortality

Reports of mortality and serious injury relative to PBR as well as total human impacts are contained in records maintained by the New England Aquarium and the NMFS Northeast and Southeast Regional Offices (Table 2). From 2002 through 2006, 7 of 19 records of mortality or serious injury (including records from both USA and Canadian waters) involved entanglement or fishery interactions. Information from an entanglement event often does not include the detail necessary to assign the entanglements to a particular fishery or location.

Although disentanglement is either unsuccessful or not possible for the majority of cases, during the period 2002 through 2006, there were at least four documented cases of entanglements for which the intervention of disentanglement teams averted a likely serious-injury determination. A yearling male, #3120, first sighted off the North Carolina coast on 4/7/02, may have avoided serious injury due to being partially disentangled on 8/25/02 by researchers in the Bay of Fundy, Canada. An unidentified right whale was disentangled in the Bay of Fundy, Canada on 7/09/03. The gear was tentatively identified as US lobster gear and other unknown gear. On 12/6/04, a one-year-old of unknown gender, #3314, was sighted with line wrapped on both its head and tail which would likely have been fatal. Following more than three weeks of attempts, the constricting fishing gear was removed. On 12/3/05, #3445—the 2004 calf of #2145—was first sighted off Brunswick, Georgia, with line across its back and around its right flipper. Over 300 feet of trailing line was removed. This whale was resighted on 6/12/06, apparently gear-free. Sometimes, even with disentanglement, an animal may die of injuries sustained from fishing gear. A female yearling right whale, #3107 (see Table 2) was first sighted with gear wrapping its caudal peduncle on 6 July 2002 near Briar Island, Nova Scotia. Although the gear was removed on 1 September by the New England Aquarium disentanglement team, and the animal seen alive on an aerial survey on 1 October, its carcass washed ashore at

Nantucket on 12 October, 2002 with deep entanglement injuries on the caudal peduncle.

In January 1997, NMFS changed the classification of the Gulf of Maine and U.S. mid-Atlantic lobster pot fisheries from Category III to Category I based on examination of stranding and entanglement records of large whales from 1990 to 1994 (62 FR 33, Jan. 2, 1997).

The only bycatch of a right whale was observed by the Northeast Fisheries Observer Program in the pelagic drift gillnet fishery in 1993, but no mortalities or serious injuries have been documented in any of the other fisheries monitored by NMFS.

Entanglement records from 1990 through 2006 maintained by NMFS Northeast Regional Office (NMFS, unpublished data) included 45 confirmed right whale entanglements, including right whales in weirs, in gillnets, and in trailing line and buoys. Because whales often free themselves of gear following an entanglement event, scarring may be a better indicator of fisheries interaction than entanglement records. In an analysis of the scarification of right whales, 338 of 447 (75.6%) whales examined during 1980-2002 were scarred at least once by fishing gear (Knowlton *et al.* 2005). Further research using the North Atlantic Right Whale Catalogue has indicated that, annually, between 14% and 51% of right whales are involved in entanglements (Knowlton *et al.* 2005). Incidents of entanglements in groundfish gillnet gear, cod traps, and herring weirs in waters of Atlantic Canada and the U.S. east coast were summarized by Read (1994). In six records of right whales becoming entangled in groundfish gillnet gear in the Bay of Fundy and Gulf of Maine between 1975 and 1990, the whales were either released or escaped on their own, although several whales were observed carrying net or line fragments. A right whale mother and calf were released alive from a herring weir in the Bay of Fundy in 1976. For all areas, specific details of right whale entanglement in fishing gear are often lacking. When direct or indirect mortality occurs, some carcasses come ashore and are subsequently examined, or are reported as "floaters" at sea. The number of unreported and unexamined carcasses is unknown, but may be significant in the case of floaters. More information is needed about fisheries interactions and where they occur.

Other Mortality

Ship strikes are a major cause of mortality and injury to right whales (Kraus 1990; Knowlton and Kraus 2001). Records from 2002 through 2006 have been summarized in Table 2. For this time frame, the average reported mortality and serious injury to right whales due to ship strikes was 2.4 whales per year (U.S. waters, 1.8; Canadian waters, 0.6). In 2000, two right whales were sighted in the Bay of Fundy with large open wounds that were likely the result of collisions with vessels. Right whale #2820, a male of unknown age, was first seen injured on 9 July 2000. He was sighted intermittently throughout the remainder of that summer, was seen again in the Bay of Fundy in 2001 and seen once in 2002. The second whale, #2660, was a five-year-old female who was sighted with a wound on the left side of her head, just forward of the blowholes. She was seen with a calf in December 2005. Although both of these injuries were gruesome in appearance, in the absence of a chronic stressor (i.e., entangling fishing gear), they were apparently not fatal.

Table 2. Confirmed human-caused mortality and serious injury records of North Atlantic right whales, January 2002 through December 2006.

Date[a]	Report Type[b]	Location[a]		Assigned Cause: P=primary, S=secondary		Notes/Observations
				Ship strike	Entang./ Fsh inter	
7/6/02	mortality	Yearling Female #3107 11m	Observed alive off Briar Island, NS		P	Carcass ashore on Nantucket, MA; caudal peduncle severely lacerated where entangled; gear consistent with inshore lobster fishery

8/22/02	serious injury	Adult Female #1815	Scotian Shelf, Canada		P	Line tightly wrapped around head and tail stock; no gear recovered
8/22/02	mortality	Yearling Female 12.6m	off Ocean City, MD	P		Large laceration on dorsal surface
8/30/02	serious injury	age & sex unknown #3210	Bay of Fundy, NS		P	Line tightly wrapped around rostrum; resighted in 2004 in poor condition; no gear recovered
1/14/03	serious injury	Adult Female #2240	Jacksonville, FL		P	Body condition poor; no gear recovered
10/02/03	mortality	Adult Female #2150 15m (est)	Digby, NS	P		Large fracture in skull; subdermal hemorrhage
2/7/04	mortality	Adult Female #1004 16m	Virginia Beach, VA	P		Severe subdermal bruising; complete fracture of rostrum and laceration of oral rete
9/6/04	mortality	Adult Female #2301 15m (est)	Roseway Basin, NS		P	Extensive constricting line on head and left flipper; found dead March 3, 2005 on Ship Shoal Island, VA
11/24/04	mortality	Adult Female #1909 14.9m	Ocean Sands, NC	P		Left fluke lobe severed and large bore blood vessels exposed
1/12/05	mortality	Adult Female #2143 13m	Cumberland Island, GA	P		Healed propeller wounds from strike as a calf re-opened as a result of pregnancy
3/10/05	serious injury	age & sex unknown #2425	Cumberland Island, GA	P		43 ft power yacht partially severed left fluke; resighted 9/4/05 in extremely poor condition
4/28/05	mortality	Adult Female #2617 14.7m	Monomoy Island, MA	P		Significant bruising and multiple vertebral fractures
1/10/06	mortality	Calf Male 5.4m w/out fluke	Jacksonville, FL	P		Propeller lacerations associated with hemorrhaging and edema; flukes completely severed
1/16/06	serious injury	Calf 5m (est)	Corpus Christi Bay, TX		P	Wrapping laceration with heavy cyamid load on dorsal surface of calf; vertebral processes noticeable indicating fat loss

1/22/06	mortality	Calf 5.6m	off Ponte Vedra Beach, FL		P	Significant pre-mortem lesions from entanglement in apparent monofilament netting
3/11/06	serious injury	Yearling Male #3522	Off Cumberland Island, GA	P		11 propeller lacerations across dorsal surface
7/24/06	mortality	age unknown Female 9.6m	Campobello Island, NB	P		Propeller lacerations through blubber, into muscle and ribs
8/24/06	mortality	Adult Female 14.7m	Roseway Basin, NS	P		16 fractured vertebrae; dorsal blubber bruise from head to genital region
12/30/06	mortality	Yearling Male #3508 12.6m	off Brunswick, GA	P		20 propeller lacerations along right side of head and back with associated hemorrhaging

a. The date sighted and location provided in the table are not necessarily when or where the serious injury or mortality occurred; rather, this information indicates when and where the whale was first reported beached, entangled, or injured.
b. National guidelines for determining what constitutes a serious injury have not been finalized. Interim criteria as established by NERO/NMFS (Nelson *et al.* 2007) have been used here. Some assignments may change as new information becomes available and/or when national standards are established.

STATUS OF STOCK

The size of this stock is considered to be extremely low relative to OSP in the U.S. Atlantic EEZ, and this species is listed as endangered under the ESA. The North Atlantic right whale is considered one of the most critically endangered populations of large whales in the world (Clapham *et al.* 1999). A Recovery Plan has been published for the North Atlantic right whale and is in effect (NMFS [National Marine Fisheries Service] 2005). Three critical habitats, Cape Cod Bay/Massachusetts Bay, Great South Channel, and the Southeastern U.S. were designated by NMFS (59 FR 28793, June 3, 1994). A National Marine Fisheries Service ESA status review in 1996 concluded that the western North Atlantic population remains endangered. This conclusion was reinforced by the International Whaling Commission (Best *et al.* 2001), which expressed grave concern regarding the status of this stock. Relative to populations of southern right whales, there are also concerns about growth rate, percentage of reproductive females, and calving intervals in this population. The total level of human-caused mortality and serious injury is unknown, but reported human-caused mortality and serious injury was a minimum of 3.8 right whales per year from 2002 through 2006. Given that PBR has been set to zero, no mortality or serious injury for this stock can be considered insignificant. This is a strategic stock because the average annual human-related mortality and serious injury exceeds PBR, and also because the North Atlantic right whale is an endangered species.

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