NORTHERN RIGHT WHALE (*Eubalaena glacialis*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Individuals of the western North Atlantic right whale population range from wintering and calving grounds in coastal waters of the southeastern United States to summer feeding and nursery grounds in New England waters and northward to the Bay of Fundy and the Scotian Shelf. 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 and arctic Norway. The latter (in September 1999) represents one of only two 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. Similarly, records from the Gulf of Mexico (Moore and Clark 1963; Schmidly *et al.* 1972) represent either geographic anomalies 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 a large segment of the population is unknown during the winter. A small offshore survey effort in February 1996 reported three sightings in waters east of northeastern Florida and southeastern Georgia: a mother/calf pair, a single individual, and a group of four juveniles. These sightings suggest a distribution further offshore than previously reported.

Research results to date suggest five major habitats or congregation areas for western North Atlantic right whales; these are the coastal waters of the southeastern United States, the Great South Channel, Cape Cod and Massachusetts Bays, the Bay of Fundy, and the Scotian Shelf. However, movements within and between habitats may be more extensive than is sometimes thought. Results from a few successfully attached satellite tags suggest that sightings separated by perhaps two weeks should not 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). These findings cast new light on movements and habitat use, and raise questions about the purpose of such excursions.

New England waters are a primary feeding habitat for the right whale, which appears to 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). Acceptable surface copepod resources are limited to perhaps 3% of the region during the peak feeding season in Cape Cod and Massachusetts Bays (Mayo and Goldman, pers. comm.). While feeding in the coastal waters off Massachusetts has been better studied than in most areas, feeding by right whales has been observed elsewhere on the margins of Georges Bank, 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 not well known. New England waters also serve as a nursery for calves and perhaps also as a mating ground.

Genetic analyses of tissue samples are providing insights into stock definition. Schaeff *et al.* (1993) used Restriction Fragment Length Polymorphism (RFLP) analysis to suggest that western North Atlantic right whales represent a single breeding population that may be based on as few as three matrilines. However, more recent analyses based upon direct sequencing of mitochondrial DNA (mtDNA) have identified five mtDNA haplotypes (Malik *et al.* 1999). Schaeff *et al.* (1997) compared the genetic variability of northern and southern (*E. australis*) right whales, 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 specimens of baleen and bone, is also underway (Rosenbaum *et al.* 1997). Preliminary results suggest that the eastern and western North Atlantic populations were not genetically distinct (Rosenbaum *et al.* 2000). However, the virtual extirpation of the eastern stock and its lack of recovery this century strongly suggests population subdivision over a protracted (but not evolutionary) timescale.

To date, skin biopsy sampling has resulted in the compilation of a DNA library of more than 250 North Atlantic right whales. When work is completed, a genetic profile will be established for each individual, and an assessment provided on the level of genetic variation in the population, the number of reproductively active individuals, reproductive fitness, the basis for associations and social units in each habitat area, and the mating system. Tissue analysis has also aided in sex identification: the sex ratio of the photo-identified and catalogued population (through December of 1997) is 144 females and 143 males, not significantly different from parity (M.W. Brown, pers. comm.). Analyses based on sighting histories of photographically identified individuals also suggest that, in addition to the Bay of Fundy, there exists an additional and undescribed summer nursery area utilized by approximately one-third of the population. As described above, a related question is where individuals other than calving females and a few juveniles overwinter. One or more additional wintering and summering grounds may exist in unsurveyed locations, although it is also possible that "missing" animals simply disperse over a wide area at these times.

POPULATION SIZE

Based on a census of individual whales identified using photo-identification techniques, the western North Atlantic population size was estimated to be 295 individuals in 1992 (Knowlton *et al.* 1994); an updated analysis using the same method gave an estimate of 291 animals in 1998 (Kraus *et al.* 2000). Because this was a nearly complete census, it is assumed that this represents a minimum population size estimate. However, no estimate of abundance with an associated coefficient of variation has been calculated for this population. Calculation of a reliable point estimate is likely to be difficult given the known problem of heterogeneity of distribution in this population. 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 (IWC 2000).

Historical Population Estimate

An estimate of pre-exploitation population size is not available. Basque whalers may have taken substantial numbers of right whales at times during the 1500s in the Strait of Belle Isle region (Aguilar 1986), and 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 and Mitchell 1987). A modest but persistent whaling effort along the eastern USA 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 (1987) could conclude only that there were at least some hundreds of right whales present in the western North Atlantic during the late 1600s. In a later study (Reeves *et al.* 1992), a series of population trajectories using historical data and an estimated present population size of 350 were plotted. The results suggest that there may have been at least 1,000 right whales in this 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 are 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 the time that international protection for right whales came into effect in 1935 (Hain 1975; Reeves *et al.* 1992; Kenney *et al.* 1995).

Minimum Population Estimate

The western North Atlantic population size was estimated to be 291 individuals in 1998 (Kraus *et al.* 2000), based on a census of individual whales identified using photo-identification techniques. A bias that might result from including catalogued whales that had not been seen for an extended period of time and therefore might be dead, was addressed by assuming that an individual whale not sighted for five years was dead (Knowlton *et al.* 1994). It is assumed that the census of identified and presumed living whales represents a minimum population size estimate. The true population size in 1998 may have been higher if: 1) there were animals not photographed and identified, and/or 2) some animals presumed dead were not.

Current Population Trend

The population growth rate reported for the period 1986-92 by Knowlton *et al.* (1994) was 2.5% (CV=0.12); this suggested that the stock was showing signs of slow recovery. However, work by Caswell *et al.* (1999) has suggested that crude survival probability declined from about 0.99 in the early 1980's to about 0.94 in the late 1990's. The decline was statistically significant. Additional work conducted in 1999 was reviewed by the IWC workshop on

status and trends in this population (IWC 2000); the workshop concluded based on several analytical approaches that survival had indeed declined. Although heterogeneity of capture could negatively bias survival estimates, the workshop concluded that this factor could not account for all of the observed decline, which appeared to be particularly marked in adult females.

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 be increasing over time, although the trend was not statistically significant (P = 0.083) (Knowlton *et al.* 1994).

Since that report, total reported calf production in 92/93 was 6; 93/94, 9; 94/95, 7; 95/96, 21; 96/97, 19; and 97/98, 6. The total calf production was reduced by reported calf mortalities: 2 mortalities in 1993, 3 in 1996, 1 in 1997, and 1 in 1998. Of the three calf mortalities in 1996, available data suggested one was not included in the reported 20 mother/calf pairs, resulting in a total of 21 calves born. Eleven of the 21 mothers in 1996 were observed with calves for the first time (*i.e.*, were "new" mothers) that year. Three of these were 10 years old or younger, two were 9 years old, and six were of unknown age. An updated analysis of calving interval through the 1997/98 season suggests that mean calving interval increased since 1992 from 3.67 years to more than 5 years, a significant trend (Kraus *et al.* 2000). This conclusion is supported by modeling work reviewed by the IWC workshop on status and trends in this population (IWC 2000); the workshop agreed that calving intervals had indeed increased and further that the reproductive rate was half that reported from southern hemisphere populations of *E. australis*.

The annual population growth rate during 1986-1992 was estimated to be 2.5% (CV=0.12) using photo-identification techniques (Knowlton *et al.* 1994). A population increase rate of 3.8% was estimated from the annual increase in aerial sighting rates in the Great South Channel, 1979-1989 (Kenney *et al.* 1995). However, as noted above more recent work has suggested that the population is now in decline (Caswell *et al.* 1999, IWC 2000).

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, IWC 2000), 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 unstable age structure or to reproductive senescence on the part of some females. However, data on either factor are poor; senescence has been demonstrated in relatively few mammals (including humans, pilot whales and killer whales) and is currently undocumented for any baleen whale.

The relatively low population size indicates that this stock is well below its optimum sustainable population (OSP); therefore, the current population growth rate should reflect the maximum net productivity rate for this stock. The population growth rate reported by Knowlton *et al.* (1994) of 2.5% (CV=0.12) was assumed to reflect the maximum net productivity rate for this stock for purposes of previous assessments. However, review by the IWC workshop of modeling and other work indicates that the population is now in decline; consequently, no growth rate can be used for western North Atlantic right whales.

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). The recovery factor for right whales is 0.10 because this species is listed as endangered under the Endangered Species Act (ESA). However, in view of the apparent decline in this population (Caswell *et al.* 1999, IWC 2000), the PBR for this population is set to zero.

ANNUAL HUMAN-CAUSED SERIOUS INJURY AND MORTALITY

For the period 1994 through 1998, the total estimated human-caused mortality and serious injury to right whales is estimated at 2.4 per year (USA waters, 1.4; Canadian waters, 1.0). This is derived from two components: 1) non-observed fishery entanglement records (USA waters, 0.8; Canadian waters, 0.6), and 2) ship strike records (USA waters, 0.6; Canadian waters, 0.4). Note that in past stock assessment reports, a six-year time frame was used to calculate these averages. A five year period was used for this report to be consistent with the time frames used for calculating the averages for other species. 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. For the purposes of this report, discussion is primarily limited to those records considered confirmed human-caused mortalities or serious injuries.

Background

Approximately one-third of all right whale mortality is caused by human activities (Kraus 1990). The details of a particular mortality or serious injury record often require a degree of interpretation. The assigned cause is based on the best judgement of the available data; additional information may result in revisions. When reviewing Table 1 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 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 most susceptible to revision. There are several records where a struck and injured whale was re-sighted later, apparently healthy, or 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 harmful as the whale grows.

We have limited the serious injury designation to only those reports that had substantial evidence that the injury, whether from entanglement or vessel collision, was likely to significantly impede the whale's locomotion or feeding in the immediate future. There was no forecasting of how the injury may affect the whale over a longer term, namely from infection or susceptibility to further injury, such as additional entanglement. This conservative approach likely underestimates serious injury rates.

With these caveats, the total estimated annual average human-induced mortality and serious injury within USA Atlantic waters (including fishery and non-fishery related causes) was 2.4 right whales per year (USA waters 1.4; Canadian waters, 1.0). As with entanglements, some injury or mortality due to ship strikes almost certainly passes 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 figure of 2.4 right whales per year must be regarded as a minimum estimate.

There was one USA record of a right whale serious injury that did not fall into the 1994-1998 annual average, but is mentioned here since it was overlooked in previous stock assessment reports. The whale was a juvenile sighted off the southeastern USA on 11 January 1992, apparently the victim of an entanglement. It had a long, deep gash on its fluke and entanglement scars on its tail. It appeared emaciated and in poor health.

While this assessment relates to USA fisheries and/or USA waters, there are additional records for Canadian waters within the same time frame. Six Canadian records of mortalities or serious injuries are included in Table 1. In addition to these records, there was one Canadian record examined that is probably a serious injury, but currently for which there is insufficient information to confirm this. This animal, #1705, was initially seen in mid-July 1997 in the Bay of Fundy with a small amount of line with several small, oval black buoys attached coming out of the right side of its mouth. The whale was also seen on 7/18/97, 8/25/97, and 9/6/97, still trailing the line and floats in each sighting. Although the injury resulting from the gear appeared minimal, it may have the potential to impair the animal's feeding. Future observations of the whale may help determine whether the gear has resulted in serious injury.

Further, the small population size and low annual reproductive rate 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 1999, Knowlton and Kraus 2000). Of these, 13 (28.9%) were neonates which are believed to have died from perinatal complications or other natural causes. Of the remainder, 16 (35.6%) were determined to be the result of ship strikes, two (4.4%) were related to entanglement in fishing gear (in both cases lobster gear), and 14 (31.1%) were of unknown cause. At a minimum, therefore, 40% of the observed total for the period, and 56.3% of the 32 non-calf deaths, were attributable to human impacts.

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. 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), as well as #2220, discussed above.

For waters of the northeastern USA, a present concern not yet completely defined, is the possibility of habitat degradation in Massachusetts and Cape Cod Bays due to a Boston sewage outfall due to come on-line in 2000.

Awareness and mitigation programs for reducing anthropogenic injury and mortality to right whales have been set up in two areas of concern. The first was initiated in 1992 off the coastal waters of the southeastern USA, and it has been upgraded and expanded annually. It involves both government and non-government organizations, including the Navy, Army Corps of Engineers, U.S. Coast Guard, and Florida and Georgia state agencies. In 1996, a program was established in the northeastern USA, largely in cooperation with the U.S. Coast Guard and the State of Massachusetts. In July 1999, a Mandatory Ship Reporting System was implemented in both the southeastern United States and in the Great South Channel/Cape Cod Bay/Massachusetts Bay critical habitats. This system requires vessels over 300 tons to report information about their identity, location, course and speed; in return, they receive information on right whale occurrence and recommendations on measures to avoid collisions with whales. This system is expected to provide much-needed information on patterns of vessel traffic in critical habitat areas.

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 Northeast Regional Office/NMFS (Table 1). From 1994-1998, 8 of 12 records of mortality or serious injury (including records from both USA and Canadian waters) involved entanglement or fishery interactions. The reports often do not contain the detail necessary to assign the entanglements to a particular fishery or location. However, based on re-examination of the records for the right whale observed entangled in pelagic drift gillnet in July 1993, which included the observer's documentation of lobster gear on the whale's tail stock and subsequent entanglement reports of this whale, the suspected mortality of this whale was reassigned to the Gulf of Maine and USA mid-Atlantic lobster pot fisheries In this case, the pre-existing entanglement of lobster gear was judged to have been sufficient cause of eventual mortality independent of the drift net entanglement. In another instance, a 2 year-old dead male right whale with lobster line through the mouth and deeply embedded at the base of the right flipper beached in Rhode Island in July 1995. This individual had been sighted previously, entangled, east of Georgia in December 1993, and again in August 1994 in Cape Cod Bay. In this case, the entanglement became a serious injury and (directly or indirectly) the cause of the mortality.

In January 1997 (62 FR 33, Jan. 2, 1997), NMFS changed the classification of the Gulf of Maine and USA 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.

Fishery Information

Data on current incidental takes in USA fisheries are available from several sources. In 1986, NMFS established a mandatory self-reported fisheries information system for large pelagic fisheries. Data files are maintained at the Southeast Fisheries Science Center (SEFSC). The Northeast Fisheries Science Center (NEFSC) Sea Sampling Observer Program was initiated in 1989, and since that year, several fisheries have been covered by the program. In late 1992 and in 1993, the SEFSC provided observer coverage of pelagic longline vessels fishing off the Grand Banks (Tail of the Banks), and currently provides observer coverage of vessels fishing south of Cape Hatteras. Bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet fishery, but no mortalities or serious injuries have been documented in either the pelagic longline, pelagic pair trawl, or other fisheries monitored by NMFS. The only documented bycatch of a right whale by NMFS Sea Samplers was female released from a pelagic drift gillnet as noted above.

In a recent analysis of the scarification of right whales, a total of 61.6% of the whales bore evidence of entanglements with fishing gear (Hamilton *et al.* 1998). Entanglement records maintained by NMFS Northeast Regional Office (NMFS, unpublished data) from 1970-1996, included 42 right whale entanglements or possible entanglements, including right whales in weirs, entangled in gillnets, and trailing line and buoys. An additional record (M. J. Harris, pers. comm.) reported a 9.1-10.6 m right whale entangled and released south of Ft. Pierce, Florida, in March 1982 (this event occurred in the course of a sampling program and was not related to a commercial fishery). Incidents of entanglements in groundfish gillnet gear, cod traps, and herring weirs in waters of Atlantic Canada and the USA 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 right whales were either released or escaped on their own, although several whales have been 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; however, 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 & Kraus 2000). Records from 1994 through 1998 have been summarized in Table 1. For this time frame, the average reported mortality and serious injury to right whales due to ship strikes was 1.0 whales per year (USA waters, 0.6; Canadian waters, 0.4).

In the period January to March 1996, an 'unusual mortality event' was declared for right whales in southeastern USA waters. Five mortalities were reported, at least one of which (on 1/30/96) was attributable to ship strike. A second mortality (on 2/22/96) showed evidence of barotrauma but no proximate cause of death could be determined. Of the remaining three mortalities, two were calves (1/2/96 and 2/19/96), one of which may have died from birthing trauma (inconclusive). The third (2/7/96) was decomposed and could not be towed in for examination.

Table 1. Summarized records of mortality and serious injury likely to result in mortality, North Atlantic right whales, January 1994 - December 1998. Causes of mortality or injury, assigned as primary or secondary, are based on records maintained by NMFS/NER and NMFS/SER.

Date	Report Type	Sex, age, ID	Location	Assigned Cause: P=primary, S=secondary		Notes
				Ship strike	Entang./ Fsh inter	
2/22/94	serious injury	calf, sex unknown #2404	offshore NE FL	S	P	deep wounds from line or cable on head, probable propeller gashes on flukes
9/21/94[1]	serious injury	12 y.o. male #1247	Bay of Fundy		P	line of unknown gear type wrapped tightly around tail stock; has not been sighted since
11/17/94	serious injury	3 y.o., #2151	near Plum I., MA		P	line tightly wrapped around rostrum and deeply embedded in gums
7/17/95	mortality, beached	2 y.o. male #2366	Middletown, RI		P	lobster line through mouth, embedded deeply into bone at base of right flipper
8/13/95	serious injury, offshore	adult female, #1045	S. Georges Bank	P		large head wound exposing bone
10/20/95[1]	mortality, beached	male, age unknown #2250	Long I., Nova Scotia	P		large gash on back, broken vertebrae

Date	Report Type	Sex, age, ID	Location	Assigned Cause: P=primary, S=secondary		Notes
				Ship strike	Entang./ Fsh inter	
1/30/96	mortality, offshore	adult male, #1623	offshore GA	P		shattered skull, broken vertebrae and ribs
3/9/96	mortality, beached	male, age unknown #2220	Cape Cod MA	P	S	3.3 meter gash on back, broken skull, Canadian lobster gear wrapped through mouth and around tail
8/5/96	serious injury	unknown	SE of Glouce ster, MA		P	unknown type of gear entangled around head
8/19/97[1]	mortality	female, age unknown #2450	Bay of Fundy	P		necropsy found evidence of traumatic impact on left side and lower jaw
8/23/97[1]	serious injury	5 y.o. male #2212	Bay of Fundy		P	reports from subsequent observations indicate the whale ingested some gear of an unknown type
8/29/97[1]	serious injury	2 yr old female #2557	Bay of Fundy		P	Line of unknown origin tightly wrapped on body and one flipper, whale emaciated

[1] Record was not included in the text's calculations of estimated annual average human-induced mortality and serious injury within USA Atlantic waters

STATUS OF STOCK

The size of this stock is considered to be extremely low relative to OSP in the USA 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 and is in effect (NMFS 1991). Three critical habitats, Cape Cod Bay/Massachusetts Bay, Great South Channel, and the Southeastern USA, were designated by NMFS (59 FR 28793, June 3, 1994). The NMFS ESA 1996 Northern Right Whale Status Review concluded that the status of the western North Atlantic population of the northern right whale remains endangered; this conclusion was reinforced by the International Whaling Commission in 1998 (IWC 1998), which expressed grave concern regarding the status of this stock. The total level of human-caused mortality and serious injury is unknown, but reported human-caused mortality and serious injury has been a minimum of 2.4 (USA waters, 1.4; Canadian waters, 1.0) right whales per year since 1994. 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 fishery-related mortality and serious injury exceeds PBR, and because the North Atlantic right whale is an endangered species.

Relative to other populations of right whales, there are also concerns about growth rate, percentage of reproductive females, and calving intervals in this population.

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