

SC/68D/NH/01

Sub-committees/working group name: NH

Population status update for North Atlantic right whales: 2021-2022

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Population status update for North Atlantic right whales: 2021-2022

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The North Atlantic right whale (*Eubalaena glacialis*) is listed as endangered under the U.S. Endangered Species Act (ESA) and critically endangered on the IUCN Red List. Despite ongoing management measures by both the U.S. and Canada, the species continues to decline in abundance (Pace 2021). The median total abundance during 2020 calculated from the posterior of a Bayesian, hierarchical state-space model was 340 (credible interval 328-352). Those model results continue to show a diverging sex ratio with an estimate of only 149 (133-147) females in the population during 2020 (Figure 1). As noted in Pace et al. (2017) the last estimate in the time series from this model is slightly biased low in expectation, however the continued downward trend in estimated abundance is well demonstrated. The population appears to be at its lowest level in 20 years.

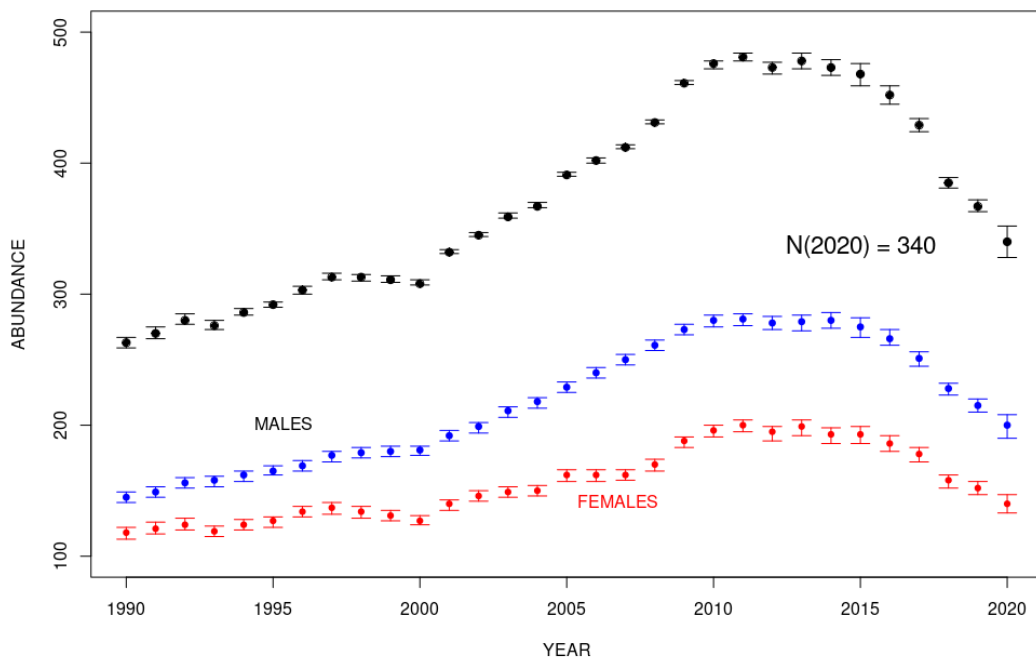


Figure 1. Abundance estimates (medians and 95% credible intervals) from hierarchical state-space models of North Atlantic right whale mark-resight data including separate estimates for the total number of males and females.

Reduced Survival

Since 2010, a well-documented and substantial change occurred in the feeding area-use patterns among North Atlantic right whales (Davis et al. 2017, Davies et al. 2019, Simard et al. 2019). Pace (2021) used a revised parameterization of the Pace et al. (2017) abundance model to test the hypothesis that survival rates

changed after 2010. The model continues to support a decline in survival rates during 2011-2019 (Figure 2). The total estimated mortality continues to far exceed the recovered carcasses (Pace et al 2021), and recent increases in these model results strongly support the declared unusual mortality event by the US National Marine Fisheries Service (Figure 3). Results from the hierarchical state-space model, combined with available datasets on animal health, serious injuries and mortalities, indicate that observed carcasses accounted for only 36% of all estimated deaths during 1990-2017 (Pace et al. 2021).

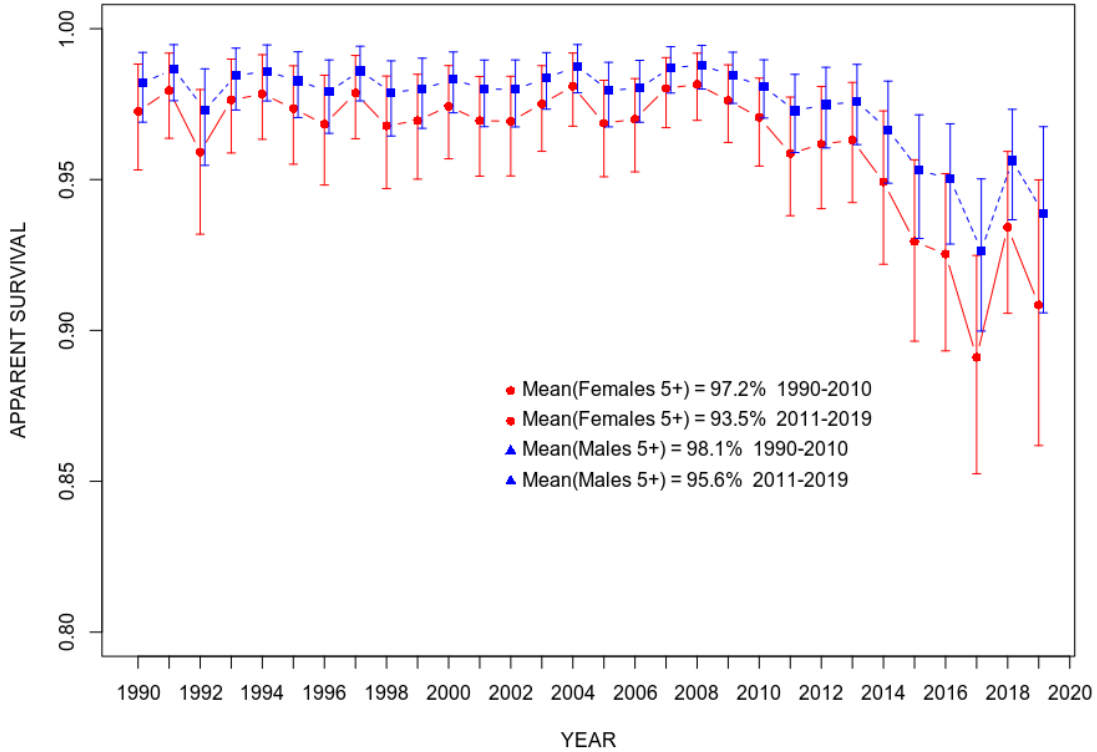


Figure 2. Estimated survival rates (medians and 95% credible intervals) from hierarchical state-space models of North Atlantic right whale mark-resight data parameterized to estimate abundance but with an added to test the hypothesis of a change in mean survival during 2011–2019. Upper line (blue) is for adult (5+ males) and the lower line, point estimates and credible intervals are for adult (5+) females. Different periodic mean estimates for adult females are displayed in text.

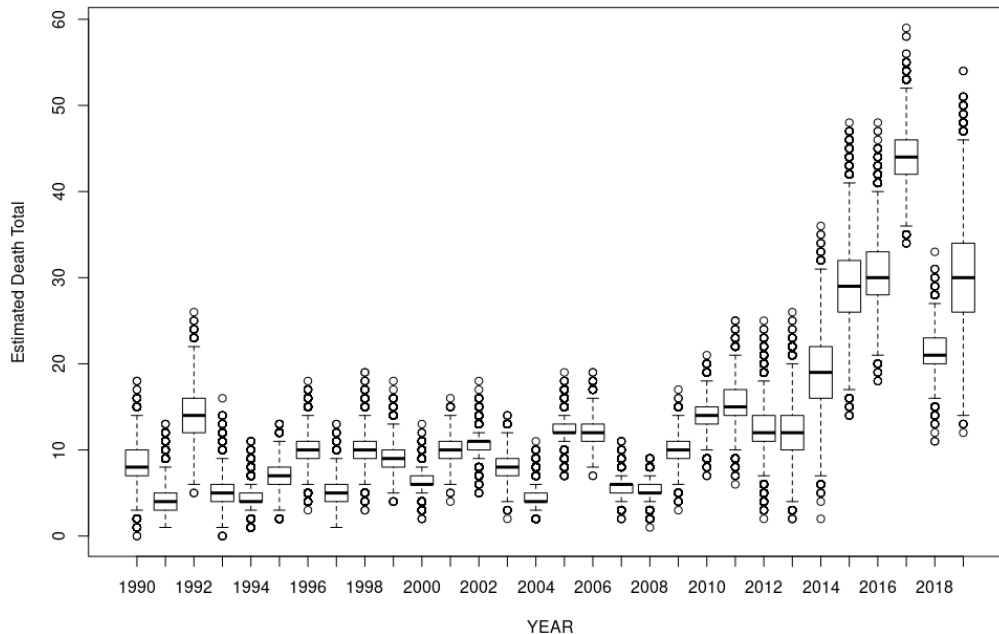


Figure 3. Estimated total number of dead North Atlantic right whales derived from a hierarchical state-space model of mark-resight data evaluated for 2011–2019.

Serious Injury & Mortality

The average observed annual serious injury and mortality rates related to anthropogenic causes decreased 6% in 2015-2019, compared to 2014-2018 (7.65 from 8.15; Henry et al. 2022). A total of 37 mortalities were observed from 2015-2019, with entanglements and vessel strikes each accounting for 10 of the mortalities. The cause of death for the remaining 17 cases was undetermined. There were a total of 56 confirmed injury events, 20 of which were considered serious injuries, all from entanglement. Thirty-six injuries were considered “non-serious”.

Since June 2020, four mortalities have been observed in US waters, including two calves that experienced vessel interactions. A recent modeling study found that vessels of all sizes, including those under 20m in length, can cause serious injury or mortality to right whales (Kelley et al. 2021).

Based on the abundance model (Pace et al. 2017, 2021) an estimated 156 (121,195) NARW died during 2015-2019 which was more than 4 times the number of observed deaths. The disparity between observed causes of serious injury in right whales, and causes of mortality determined through necropsies of dead whales, indicate that the cause of death of examined carcasses may not accurately characterize the cause of cryptic mortalities. Ongoing work as part of recovery plan implementation¹ has explored an integrated model of live sightings and carcass recoveries to estimate cause-specific rates of injury and mortality during 1990–2019. Preliminary results indicate higher rates of mortality due to entanglement and vessel strike since 2010, with increased entanglement mortality for females after reproductive events.

¹ <https://www.fisheries.noaa.gov/new-england-mid-atlantic/endangered-species-conservation/north-atlantic-right-whale-recovery-plan-northeast-us-implementation-team>

Examination of estimated death numbers and observed births placed on a *per capita* basis clearly demonstrates this dilemma for the population: since 2012 a low birth rate has failed to replace whales lost during a period of sharply increased mortality rate.

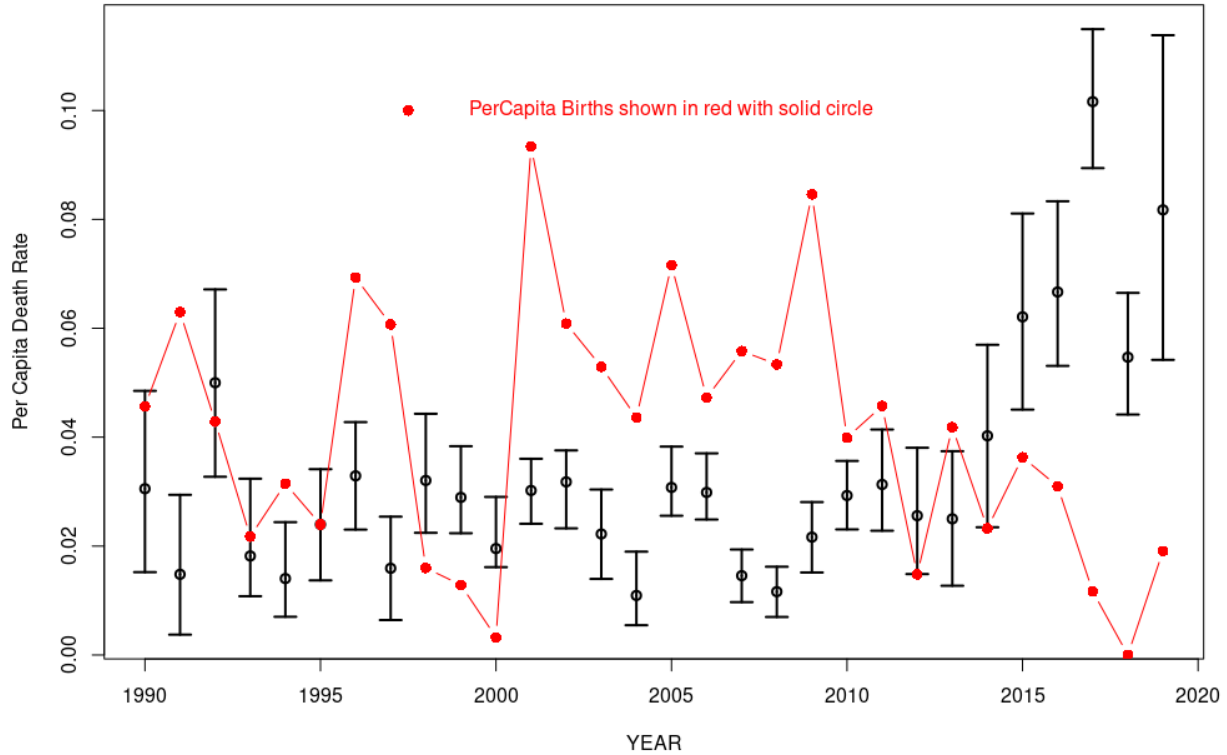


Figure 4. North Atlantic right whale per capita birth rate (red line, closed circles) and death rate with associated 95% credible intervals, 1990 – 2019

Proven Females and Reproduction

In the 2022 calving season (winter 2021-2022), 15 females were observed with calves, with the first sightings ranging from November 2021 through March 2022. All females had previously calved, and ranged in age from >11 years to at least 40 years old (based on known ages and/or years in the catalog). Two of these females (#2360 and #3560) had calves that were struck by vessels during the winter 2020 (2019-2020) calving season. One calf was confirmed dead; the other is presumed dead.

The number of calves observed each year has varied considerably in recent years. Productivity for this stock has been highly variable over time, but the per capita birth rate has been generally trending downward since 2011 (Figure 4).

Based on the most recent population model, less than 70 “proven” females (ie females that have been observed to have calved at least once) have a 50% probability of still being alive.

Regional Mark-Recapture Studies

Two recent studies have described recent high use patterns by North Atlantic right whales in the Gulf of St. Lawrence and southern New England waters. Crowe et. al (2021) examined opportunistic and dedicated mark-recapture aerial survey data collected from 2015-2019 in the Gulf of St. Lawrence and identified 187 individuals in that region, including at least 12 female-calf pairs and 15 pregnant females. Approximately 95% of the individuals sighted in 2019 had been sighted in earlier years in the study, indicating a high rate of inter-annual return. Based on Jolly-Seber models, approximately 140 animals were estimated to have used the area in 2019, and capture rates indicated residency of several months. Quintana-Rizzo et. al (2021), examining aerial survey data collected in southern New England in the region of the Massachusetts-Rhode Island wind energy areas, found an increase in right whale occurrence in that region during the study period (2011-2015 and 2017-2019). Starting in 2017, animals were present in the area nearly every month, and models suggest that 23% of the population may be using that habitat between December and May.

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