New England Aquarium

Protecting the blue planet

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Re: **Draft Biological Opinion on 10 Fishery Management Plans in the Greater Atlantic Region and the New England Fishery Management Council's Omnibus Habitat Amendment 2**

In response to the *Draft Biological Opinion on 10 Fishery Management Plans*, the New England Aquarium (Aquarium) submits this comment strongly urging the National Oceanic and Atmospheric Administration (NOAA) to reconsider its finding of no jeopardy for North Atlantic right whales (NARW).

Founded in 1969, the Aquarium is a global leader in marine conservation and a catalyst for global change through public engagement, commitment to marine animal conservation, leadership in education, innovative scientific research, and effective advocacy for vital and vibrant oceans. For decades, the Aquarium has been working to protect marine and freshwater ecosystems from human impacts and conserve threatened and endangered animals and habitats. The Aquarium's scientists conduct cutting-edge research to understand, quantify, and reduce the consequences of human activities on the health of marine species and ecosystems by developing science-based solutions and advocating for policies that balance human use of the ocean with the need for a healthy, thriving ocean now and in the future.

Scientists at the Aquarium have been researching NARWs for more than 40 years with the goal of preventing this species from going extinct. In addition, representatives from the Aquarium have served on the Atlantic Large Whale Take Reduction Team since it was formed in 1996. The Aquarium is pleased to see that published research by our scientists was used to inform aspects of these measures.

Here we provide comments and recommendations on the Draft Biological Opinion (BiOp) and the Conservation Framework associated with it. This comment focuses on findings in the Draft BiOp pertaining to NARWs based on our long-standing scientific expertise and commitment to conserving this species. In addition, as the most endangered species reviewed in the Draft BiOp, it is critical to the conservation plan, pending rulemaking, and draft environmental impact statement that the findings in the Final BiOp are accurate and based on the best-available science.

First, we wish to compliment NOAA staff on aspects of this work. The review of the NARW in the Status of the Species section of the Draft BiOp is well written and cites the appropriate and best-available scientific literature. The modeling work conducted by Dr. Daniel Linden of Greater Atlantic Regional Fisheries Office (GARFO) presented in the document "*Population projections of North Atlantic right whales under varying human-caused mortality risk and future uncertainty*" (Appendix 3) is excellent, and we compliment his analysis. While it is possible to argue some of the detail of the models (as we do below), the work is of a very high standard. We see that the reviews of this work, conducted by expert reviewers for the Center for Independent Experts (CIE) were supportive, offering only a few suggestions for possible improvement to the science[1]. We also note that, although it is not part of the Draft BiOp or Conservation Framework, the recent paper led by Dr. Richard Pace of the Northeast Fisheries Science Center (NEFSC), which we cite several times below, is a very important contribution that informs our

[1] https://www.st.nmfs.noaa.gov/science-quality-assurance/cie-peer-reviews/cie-review-2020

comments. Dr. Pace is to be complimented for his excellent analyses that have advanced our understanding of the current situation of NARWs.

Although we are impressed by these aspects of the work, we have significant concerns with other aspects of the Draft BiOp and Conservation Framework. While we concentrate our comment on the scientific content of the Draft BiOp, we also take this opportunity to raise one initial, yet critical, concern.

No Jeopardy Finding

The Draft BiOp finds no jeopardy based on the assumption that, in the first phase of the Conservation Framework, regulations still in draft form are sufficient enough to reduce fisheries-induced mortality and morbidity of NARWs to the extent that they will recover. As these regulations are still in draft form, there is no guarantee that they will be promulgated, implemented, and/or enforced. Whether or not they are sufficient is another question entirely, which the Aquarium will address in its response to the *Proposed Rule to Amend the Atlantic Large Whale Take Reduction Plan to Reduce Risk of Serious Injury and Mortality to North Atlantic Right Whales Caused by Entanglement in Northeast Crab and Lobster Trap/Pot Fisheries* and Draft Environmental Impact Statement.

Recommendation 1: In the absence of a final rule, the Aquarium does not think it is appropriate to make a "no jeopardy" finding.

Furthermore, as detailed below, the Aquarium has significant issues of concern with the Draft BiOp and Conservation Framework and strongly asserts that the science supports a jeopardy finding.

Risk reduction and the time required to implement changes

North Atlantic right whales have been in decline for a decade. In the absence of strong rules preventing entanglements and vessel strikes, we have come to expect the abundance of the species to continue to decline. Because it takes time to finalize regulations (and Biological Opinions) and even longer for those to result in action on the water, we understand that while these processes are ongoing, it is likely that the species' abundance will continue declining. The Draft BiOp does not account for this time delay, despite having a strong model that indicates the trajectory of the species' abundance while the BiOp and regulations were being drafted (see also Meyer-Gutbrod et al. 2018 on this topic in the Canadian management setting). This is not well thought through and should be.

It was clear after the Atlantic Large Whale Take Reduction Team (ALWTRT) meeting in 2017 that NARW Serious Injury and Mortality (SI/M) had exceeded the "jeopardy" threshold identified, thus initiating the need for a new BiOp. Despite this, it took almost four years for this Draft BiOp to be released, during which time the number of NARWs kept declining. The redrafted BiOp needs to account for this continuing decline and must account for the time in which it takes NOAA to implement changes on the water. Corkeron et al.'s (2018) matrix model [disclosure: Aquarium employees are authors of Corkeron et al. 2018], as applied by Linden 2021 and suitably corrected for uncertainty (see below), can be used to project what the abundance of NARWs is likely to be, and from that, appropriate measures reconsidered.

To give a concrete example, the Draft BiOp and Conservation Framework are predicated on the idea that a 60% reduction in anthropogenic mortality will be sufficient to take NARWs from jeopardy. While 60% risk reduction may have been satisfactory when this process started in 2017, in 2021 60% risk reduction is

no longer sufficient as there are now substantially (16%) fewer NARWs than there were in 2017. An 80% risk reduction target initially is now more appropriate and should be used in the redrafted BiOp.

Recommendation 2: We recommend that the redrafted BiOp be based on an 80% risk reduction target.

Incorporating Uncertainty

There are several instances where the modeling that informs the Draft BiOp and Conservation Framework does not incorporate uncertainty in the data sufficiently, especially given the scale of the conservation challenges facing NARWs.

We note the significant paper on this topic by Dr. Barb Taylor and coauthors, "*Incorporating Uncertainty into Management Models for Marine Mammals,*" published in Conservation Biology in 2000 (Taylor et al. 2000). As Taylor et al. (2000) discuss in their paper, "The history of marine mammal management clearly demonstrates the need to incorporate uncertainty into management models" (p.1250); and "The simulations clearly show that accounting for uncertainty by using a lower percentile is precautionary, whereas the typical practice of the best estimate is not" (p.1248)—in this quote, the "best estimate" is generally considered the mean.

For example, the matrix modeling in Linden (2021) uses the mean estimates of posterior distributions of survival from the re-run mark-recapture model of Pace et al. 2017 as matrix model inputs. A more appropriate approach for conservation, following the findings of Taylor et al. (2000), would be to use the 80th percentile of these posterior distributions to account for the substantial uncertainty in them. To be clear, this is not a criticism of the model used, but of how the model is applied *for conservation* to inform a Section 7 decision under the Endangered Species Act. We note parenthetically that better allowing for uncertainty was raised as a concern by Dr. New in her CIE review[2] of the Linden 2021 paper.

Likewise, the data used for the Decision Support Tool (DST, see, e.g., page 220 of the Draft BiOp) includes substantial uncertainties in both the models of whales' distribution and the data on fisheries. The DST should be re-run using appropriate percentiles rather than means or medians to estimate overlap of fisheries and the whales' distributions.

Recommendation 3: We recommend that the redrafted BiOp re-run the analyses using appropriate uncertainty parameters and that the conservation implications of the revised models be reassessed in the revised Section 7 assessment.

Cryptic mortality and its implications

A recent 2021 paper by Dr. Richard Pace and coauthors [disclosure: Aquarium employees are authors of this paper] estimates the unobserved ("cryptic") mortality of NARWs (Pace et al. 2021). In this paper, the authors show that for the period 2010-2017 (which is most relevant to the Draft BiOp), the probability of detecting a whale carcass was 29% (with two standard errors of 2.8%). In addition, during the 2019 North Atlantic Right Whale Consortium meeting, Dr. Pace gave a talk entitled, "*Estimating latent mortality of North Atlantic right whales*" that summarized the earlier stages of this analysis. Because the manuscript was submitted on July 2, 2020, we presume that it was reviewed and cleared by NOAA's NEFSC prior to submission based on Dr. Pace's affiliation with NEFSC. As these scientific results were available to

[2] https://www.st.nmfs.noaa.gov/Assets/Quality-Assurance/documents/peer-review-reports/2020/2020_05%20New%20NARW%20Pop%20Model%20Review%20Report.pdf

NOAA prior to publication of the paper, they should have been considered in the Draft BiOp. To ensure that the final BiOp findings are based on the best-available science, we contend that the results presented in Pace et al. 2021 should now be considered in the forthcoming redrafted BiOp.

Important inferences drawn from the work published in Pace et al. 2021 are summarized in the discussion including (1) "There is a striking mismatch between the causes of serious injuries observed in living whales and the causes of mortality revealed in necropsies of dead whales;" and (2) "…the disparity in observed rates of serious injury by cause suggests that cryptic deaths due to entanglements significantly outnumbers cryptic deaths from vessel collisions or other causes." The relevance of the analyses presented in section 7.2.1.3 (e.g., Table 56) needs to be revisited in the redraft of the BiOp.

We are gratified to see the Draft BiOp's authors state "Although the observed entanglement data include non-SI/M events, these observed events are considered a minimum estimate, and the actual entanglement rate is likely higher. To account for this underrepresentation of non-SI/M events in the observed entanglement data, our annual entanglement estimate for this Opinion is based on the scarring analysis presented in Hamilton et al. (2019). We, however, suggest that the apportioning of SI/M proportions on pages 223-225 of the Draft BiOp needs to be reviewed in light of the findings of Pace et al. (2021).

Recommendation 4: We recommend that the redrafted BiOp include this review of apportioning SI/M in light of the findings of Pace et al. (2021).

Timing of conservation actions and their evaluation

The timeline for implementing the Conservation Framework (Table 2 of the Draft BiOp) is insufficient. For example, it is not clear if Phase 1 will even be fully implemented by the start of 2023. Since it has already been at least four years since the 2017 Atlantic Large Whale Take Reduction Team (ALWTRT) meeting during which it was determined that the number of deaths were over jeopardy to initiate Phase 1, we do not reasonably expect that an ALWTRT meeting in 2021 will result in implementation of Phase 2 by 2023.

In addition, the timing allowed to evaluate the efficacy of actions is inappropriately short. Although some evaluations can be based on analysis of scarring rates on individually identified whales, these analyses invariably have a lag of a year or so, as it takes time to obtain and process these data. As Pace et al. (2021) note in their Conclusion, "Annual counts of right whale carcasses do a poor job of indicating the total mortality for that year." This demonstrates that it is inappropriate to use one or two years of SI/M observations to make a definitive inference on whether a management action (or actions) is (are) reducing deleterious anthropogenic impacts on NARWs.

Recommendation 5: We recommend that the redrafted BiOp include a revised Section 10.3.1 Large Whale Monitoring that addresses the timeline of conservation actions and includes simulation modeling to demonstrate the efficacy of the monitoring program developed.

Reporting SI/M when there is an expectation that SI/M will fall to less than 0.2/year

NOAA Fisheries reports SI/M data on rolling five-year averages, as discussed in Section 10.3.1 of the Draft BiOp. The expectation in the Draft BiOp is that Phase 4 of the Conservation Framework (p.232) will result in an average annual SI/M of 0.11/year. Assuming this optimistic projection is realized, for NOAA staff to calculate SI/M, NOAA will need to revise the timing over which SI/M is calculated. If the

expectation is that there will be one SI/M every nine years, then using rolling five-year averages is, from very basic mathematics, inappropriate. The rolling average will need to be longer. We note parenthetically that this is already a problem for the Gulf of Mexico Whale (*Balaenoptera ricei*)— another very-low abundance species managed by NOAA (also Red Listed as Critically Endangered).

Recommendation 6: We recommend that the redrafted BiOp discuss how NOAA will change its practices for reporting SI/M to account for low annual rates of this measure, should they arise.

Essential physical or biological features

There is a very salient point missing in the Draft BiOp discussion of "essential physical or biological features" of NARW Critical Habitat, Section 4.1.10 (pp. 83-88). Of the four physical states of matter (gas, liquid, solid, and plasma), both liquid and solid forms are relevant in this context. Seawater is a liquid and fishing gear is a solid. By introducing numerous solid objects (i.e. fishing gear) into seawater, it is inevitable that the physical features of NARW Critical Habitat (liquid) are fundamentally altered by those activities.

Recommendation 7: We recommend that the redrafted BiOp recognize that fishing using vertical lines alters the essential physical features of the ocean in areas where gear is introduced.

Climate change

Section 6.2. of the Draft BiOp, which addresses "Species Specific Information on Climate Change Effects," for whales is weak. It glosses over the fact that NARWs are already impacted by climate change as demonstrated by recent literature cited in the Draft BiOp (e.g. Meyer-Gutbrod et al 2014 and 2017). It also fails to recognize the changes in distribution of other baleen whales from work led by NOAA's NEFSC scientists (Davis et al. 2020 [disclosure: an Aquarium employee is an author on this paper]). Without argument, the current decline of NARWs is exacerbated by ecosystem changes driven by climate.

The Draft BiOp also lacks discussion of what can be done to ameliorate the impacts of climate change on NARWs despite a substantial body of literature focused on applying resilience-based management to address climate change in marine environments (for an introduction, see Bellwood et al. 2004; Hughes et al. 2005) and examples of using these approaches for on-water management (e.g., Fernandes 2005). There has not, to our knowledge, been any work that embeds managing climate impacts on a whale population explicitly into a resilience framework. We recommend that NOAA consider this approach in the revised BiOp as it offers a way forward for this challenging problem. Notwithstanding this existing body of research, all citations in the final paragraph of Section 6.2 on whales are based on NOAA's work, much of which is not peer-reviewed, and should be remedied in subsequent versions.

Briefly, we suggest that managing for resilience, rather than managing to avoid extinction, will give greater likelihood that NARWs will avoid extinction in the face of our current climate emergency. For a whale species, managing for resilience would include ensuring that their abundance is sufficiently large to buffer against climate-induced deleterious changes, such as those we have seen in NARWs. Comparative work on other right whales that do have this buffer (Corkeron et al. 2018 [disclosure: Aquarium employees are authors of this paper]) shows that adult female mortality from anthropogenic sources has been the primary cause of NARW's lack of recovery. Further, at an individual level, NARWs lack the energy buffer that other right whales have to increase calving rates (Christiansen et al. 2020 [disclosure:

an Aquarium employee is an author of this paper]). For example, entanglements can have substantial impacts on individual NARW's energy budgets (van der Hoop et al. 2017 [disclosure: an Aquarium employee is an author of this paper]), and the energy stores of NARWs can be measured reliably with drone-based photogrammetry (Christiansen et al. 2020). Monitoring the relationships between entanglement scarring and energy stores can provide a way to manage for resilience of individuals' energy stores, as one example.

Recommendation 8: We recommend that the redrafted BiOp include a discussion of managing for resilience in the face of climate change and that that consideration is reflected throughout the redrafted document.

Minor issues

We raise a couple of minor points, one of which requires correction, and the other is a suggestion for further research.

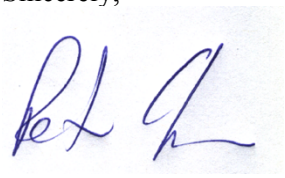
First, on page 220 of the Draft BiOp, the statement "However, at this time, there is no further evidence to make the conclusion that sublethal effects from fishing gear entanglement alone causes a decline in large whale health" is incorrect. See van der Hoop's work on morbidity from entanglement, particularly van der Hoop et al. 2017 where the models demonstrate that entanglement alone is sufficient to cause a decline in reproductive output.

Second, as a suggestion for an area of future research, we note that the mark-recapture model that NOAA is using for NARWs still defines adults as whales over five years of age. This was a reasonable assumption when the model was developed. Now, however, the age at first reproduction of female NARWs is substantially greater than five. This year's calving cohort included five first-time mothers whose ages are 12, 12, 13, 14, and 19, respectively. The cutoff for adults in NOAA's model should be revised to take into account recent changes in age at first reproduction.

The Aquarium thanks NOAA for the opportunity to review and comment on the Draft Biological Opinion. As part of the management strategy and conservation plan to recover NARWs, the Aquarium submits our recommendations to improve and strengthen the scientific basis under which NOAA determined a "no jeopardy" finding for this species and respectfully requests that this finding be revisited in light of information shared in this submission.

Our scientists are available to answer any questions or provide additional information.

Sincerely,



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