Blue Whale
(*Balaenoptera musculus*)

5-Year Review:
Summary and Evaluation

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National Marine Fisheries Service
Office of Protected Resources
Silver Spring, MD

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5-YEAR REVIEW
Blue Whale (*Balaenoptera musculus*)

1. GENERAL INFORMATION

1.1 Reviewers

Lead Regional or Headquarters Office: Heather Austin, Office of Protected Resources, 301-427-8422.
Cooperating Science Center: Nancy Young, Alaska Fisheries Science Center, National Marine Mammal Laboratory, 206-526-4297.

1.2 Methodology used to complete review

A 5-year review is a periodic analysis of a species' status conducted to ensure that the listing classification of a species as threatened or endangered on the List of Endangered and Threatened Wildlife and Plants (List) (50 CFR 17.11 – 17.12) is accurate. The 5-year review is required by section 4(c)(2) of the Endangered Species Act of 1973, as amended (ESA) and was prepared pursuant to the joint National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife 5-year Review Guidance and template (NMFS and USFWS 2006). The NMFS Office of Protected Resources led the 5-year review in collaboration with Alaska Fisheries Science Center staff and input from other NMFS regional offices and science centers. This 5-year review was accomplished through the development of the National Marine Fisheries Service (NMFS) Revised Recovery Plan for the blue whale (NMFS 2020). The Revised Recovery Plan is a revision to the 1998 Recovery Plan. We rely on the Revised Recovery Plan because it represents the best scientific and commercial data on the status and threats to the blue whale. In addition, the 1998 Recovery Plan did not contain recovery criteria. Information was updated as part of the development of the aforementioned Revised Recovery Plan, based on peer-reviewed publications, government and technical reports, conference papers, workshop reports, dissertations, and theses. We gathered information through January 2020. The information on the blue whale (*Balaenoptera musculus*) biology and habitat, threats, and conservation efforts was summarized and analyzed based on ESA section 4(a)(1) factors (see Section 2.0) and the recovery criteria identified in the Revised Recovery Plan to determine whether a reclassification or delisting may be warranted (see Section 3.0).

1.3 FR Notice citation announcing initiation of this review

NMFS initiated a 5-year review of the blue whale on October 12, 2018 (83 FR 51665). Six public comment letters, including literature citations were received and incorporated as appropriate in this review.

2. REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy[1]

The ESA defines a species as including any subspecies of fish or wildlife or plants, and any DPS of any species of vertebrate fish or wildlife that interbreeds when mature. The blue whale is not currently listed as a DPS. The subspecific taxonomy is an area of continued research and is still being defined. Please refer to the NMFS Revised Recovery Plan for further information (NMFS 2020). Since the species was listed, studies of intraspecific variability and life history characteristics supports the identification of five subspecies currently recognized by the Society for Marine Mammalogy (NMFS 2020). *B. m. musculus* (Linnaeus, 1758) is the northern blue whale (North Atlantic and North Pacific Oceans); *B. m. intermedia* (Burmeister, 1871) is the Antarctic blue whale, sometimes referred to as the "true" blue whale; *B. m. brevicauda* (Ichihara 1966) is the pygmy blue whale, generally occurring in the sub-Antarctic southern Indian Ocean and the southwestern Pacific Ocean (Ichihara 1966; Rice 1977); *B. m. indica* (Blyth, 1859) is the northern Indian Ocean blue whale; and there is a recently recognized, unnamed subspecies that generally occurs off Chile and annually migrates to waters off Peru, Ecuador, and up to the Galapagos Islands (Hucke-Gaete *et al.* 2018) in the southeastern Pacific Ocean (Branch *et al.* 2007, Committee on Taxonomy 2016).

2.2 Review Summary

In this section, we present new information under each of the five listing factors obtained as part of development of the Revised Recovery Plan for the blue whale (NMFS 2020). We also provide a brief summary of the Revised Recovery Plan and explain why the species meets the definition of endangered outlined in Section 3.0.

Please refer to the Revised Recovery Plan (NMFS 2020) for a thorough discussion on the species status including biology, habitat, threats, and management efforts.

Factor A: The present or threatened destruction, modification, or curtailment of a species' habitat or range.

No new information was found pertaining to Factor A.

Factor B: Overutilization for commercial, recreational, or educational purposes.

No new information was found pertaining to Factor B.

[1] To be considered for listing under the ESA, a group of organisms must constitute a "species," which is defined in section 3 of the ESA to include "any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature." NMFS and USFWS jointly published a policy regarding the recognition of DPSs of vertebrate species under the Endangered Species Act (61 FR 4722, February 7, 1996). "DPS" is not a scientifically defined term; it is a term used in the context of ESA law and policy. Furthermore, when passing the provisions of the ESA that give us authority to list DPSs, Congress indicated that this provision should be used sparingly. We have discretion with regard to listing DPSs and, in order to be consistent with the directive of the Congressional report that followed the introduction of the DPS language in the ESA to identify DPSs sparingly, we will generally not, on our own accord, evaluate listings below the taxonomic species or subspecies level if the best available information indicates that the species or subspecies is in danger of extinction throughout all or a significant portion of its range. We should only identify DPSs if there is an overriding conservation benefit to the species.

Factor C: Disease or Predation.
The Revised Recovery Plan for the blue whale (NMFS 2020) did not identify recovery criteria for factor C: Disease or Predation, because there were no data to indicate this factor was a potential threat to blue whale recovery. However, in this section we provide updated information from studies related to factor C.

Parasites have been known to cause major health issues for a number of cetaceans and can cause severe complications to respiratory and urinary systems (Prieto *et al.* 2012). For example, blue whales infected with the giant nematode *Crassicauda boopis* suffer from chronic inflammatory reactions of the blood vessels which drain the kidneys, and can cause complete vascular occlusion and kidney failure (Lambertsen 1990). Whale calves and juveniles typically suffer the heaviest parasite burdens following transplacental infection of the developing whale fetus, with potential whale-to-whale transmission post-partum. Additionally, nutritionally stressed juveniles and newly weaned calves in particular may be vulnerable to the effects of this parasitic nematode (Lambertsen 1990).

More recently, several species of helminth parasites were found to infect the gastrointestinal tract of blue whales in the Gulf of California within the Eastern North Pacific population. Records of helminth parasites were found in 100 blue whale fecal samples, collected during the winter from 1993-2014 (Flores-Cascante *et al.* 2019). Blue whale feces had 18.2% of adult acanthocephalans (*Bolbosoma* sp.) and a very high percentage of helminth egg prevalence (100%), and showed similar helminth egg intensity independent of sex, age class, reproductive status over several time scales (same day and year and between years) (Flores-Cascante *et al.* 2019). Additionally, *Diphyllobothrium* sp. eggs have been identified in blue whale feces (Flores-Cascante *et al.* 2019). Within the Northern Indian Ocean population, de Vos *et al.* (2018) revealed the presence of acanthocephalan endoparasites within the stomach and intestines of blue whales. Acanthocephalan infections have been shown to cause changes in host phenotype of other cetacean species, impacting host behavior and immunity (Gunalan *et. al.* 2013). This is the first record of Acanthocephala in blue whales within the Northern Indian Ocean and highlights the need for future studies on both the ecto- and endoparasitic flora and monitoring of health of blue whales in regards to management and conservation. However, parasites are not known to have any population-level effects for any blue whale population. Thus further research is required to assess whether and to what extent parasites impact blue whales.

Factor D: The inadequacy of existing regulatory mechanisms.
No new information was found pertaining to Factor D.

Factor E: Other natural or manmade factors affecting its continued existence.

- *Ship strikes have been evaluated, and, if determined by NMFS to be impeding blue whale recovery, measures have been taken to minimize effects. Following this evaluation and where effects to specific management units are known, management unit specific measures have been taken to minimize effects.* (Potential threat discussed in Recovery Plan section H.1.2).
- *Entanglement with fishing gear has been evaluated, and, if determined by NMFS to be impeding blue whale recovery, measures have been taken to minimize effects. Following this evaluation and where effects to specific management units are known, management*

unit specific measures have been taken to minimize effects. (Potential threat discussed in Recovery Plan section H.1.3).

Ship Strikes

As noted in the Revised Recovery Plan for the blue whale, some blue whale populations are likely more vulnerable than others to ship strikes, largely based on differences in distribution relative to shipping traffic (NMFS 2020). However, some blue whale populations are vulnerable to ship strikes due in large part to coastal populations which seasonally reside in feeding grounds that overlap with shipping routes, such as off southern California. Thousands of large commercial vessels travel in and out of the ports of Los Angeles, Long Beach, Hueneme, and Oakland each year (Redfern *et al.* 2013). Between 2007 and 2011, nine blue whales were killed and one seriously injured by ship strikes in California waters (Carretta *et al.* 2013). Since 2007, documented ship strikes have totaled twelve blue whales and four unidentified whales (Carretta *et al.* 2013; Carretta *et al.* 2019). Recently, ship strike mortality was estimated for blue whales in the U.S. West Coast EEZ (Rockwood *et al.* 2017), using an encounter theory model (Martin *et al.* 2016) that combined species distribution models of whale density (Becker *et al.* 2016), vessel traffic characteristics, along with whale movement patterns obtained from satellite-tagged whales in the region to estimate encounters that would result in mortality. The estimated number of annual ship strike deaths was 18 blue whales, which includes only the period of July-November when whales are most likely to be present in the U.S. West Coast EEZ (NMFS 2019). This estimate was based on cetacean habitat models derived from line-transect surveys and assumption of moderate level of vessel avoidance (55%) by blue whales, measured by satellite-tagged whales in the presence of vessels (Becker *et al*. 2016; Rockwood *et al*. 2017; McKenna *et al.* 2015).

Vessel traffic within the U.S. West Coast EEZ continues to be an issue to all large whale populations (Redfern *et al.* 2013; Moore *et al.* 2018; Redfern *et al.* 2019). A variety of vessel types, speeds, and destination ports all contribute to variability in ship traffic and these factors may be influenced by economic and regulatory changes. For example, Moore *et al.* (2018) found that primary vessel travel routes changed when emission control areas (ECAs) were established off of the U.S. West Coast. And they found that large vessels usually reduce speed by 3-6 knots in ECAs between 2008 and 2015. Moreover, these speed reductions are considered a strategy to reduce operating costs associated with more expensive, cleaner burning fuels required within the ECAs. Conversely, Moore *et al.* (2018) also noted that some vessels increased speed when transiting longer routes to avoid ECAs. However, Redfern *et al.* (2019) have noted that a combination of vessel speed reductions (VSR) and expansion of areas to be avoided may help mitigate ship strikes.

Ship speed reduction strategies have been examined in the Southern California Bight off the coast of California by Redfern *et al.* (2019), who developed methods to estimate ship-strike risk in strategies proposed by stakeholders to reduce risk in this region. They found that speed reductions and expanding the existing area to be avoided may provide an optimal solution for addressing stakeholder needs and reducing ship strike risk. Additionally, speed reduction incentives have been studied in the Santa Barbara Channel (SBC). Freedman *et al.* (2017) found that a voluntary incentivized approach had a higher percentage of participation compared to voluntary measures without incentives applied in the SBC. Additionally, cash incentives helped

spur vessel participation. The Channel Islands National Marine Sanctuary (CINMS) paid out $2,500 per transit for incentivized speed reduction trials in 2014 (Freedman *et al.* 2017). By providing this financial incentive and positive public relations benefits, agencies and conservation groups can help shipping companies meet best management practices and improve cooperation with non-regulatory conservation efforts (Freedman *et al.* 2017). Overall, participation in incentivized vessel speed reduction programs has been very positive with up to 13 of the largest shipping lines in the world engaged, but a relatively low number of ship transits (143 transits in 2017) slowing down; this is less than 10% of the total number of transits. The VSR incentive program is easily scalable to slow down more ship transits to reduce risk of ship strikes, as additional incentive funding becomes available (Abramson *et al.* 2011; Vessel Strikes and Acoustic Impacts 2012; Hastings *et al.* 2016; Protecting Blue Whales and Blue Skies Website).

To help reduce large whale ship strikes, many voluntary vessel speed reduction measures have been used each year by CINMS and NMFS in the SBC and San Francisco Bay Area since 1998 and 2015, respectively. Based on recommendations from NOAA, the International Maritime Organization (IMO) amended the Santa Barbara Channel Traffic Separation Scheme (TSS) on June 1, 2013 (Freedman *et al.* 2017). The Santa Barbara Channel TSS was narrowed and the San Francisco Bay Area TSS was narrowed, lengthened, and adjusted, in part to shift commercial shipping traffic away from historically high concentrations of whales as well as to increase safety to mariners (IMO 2012a; IMO 2012b).

Entanglement in Fishing Gear

A few confirmed cases of blue whale entanglements in fishing gear (derelict or actively fished) have been documented (NMFS 2020). Two blue whales were possibly seriously-injured from California Dungeness crab pot gear and a third whale was seriously injured in an unidentified pot/trap fishery during 2013-2017 (Carretta *et al.* 2019). Additionally, five serious injuries were observed during the same time period, including one in the California Dungeness crab fishery and four in unidentified fishing gear (NMFS 2019). However, some gillnet mortality may go unobserved because whales swim away with a portion of the net. The total observed serious injury and mortality due to commercial fisheries from 2013-2017 is 6.75 whales, or 1.35 whales, annually (NMFS 2019). There are no observed fishery-related mortalities or serious injuries of Western North Atlantic blue whales in U.S. fisheries (NMFS 2019).

Entanglement has been documented in foreign waters as well, including off the coast of Sri Lanka in 2013 (de Vos 2015). Bycatch and entanglement records dating from 1887 to 2016 were collected across Australia (n = 1987), including two recorded incidental entanglements for blue whales (Tulloch *et al.* 2020). However, the small number of documented cases of entanglement is likely only a fraction of interactions with fishing gear, thus more information is needed to determine if this is a significant cause of mortality. Data on entanglement and entrapment in non-U.S. waters is largely anecdotal and not reported systematically because observer coverage may not exist or fisheries are only partially observed. Non-lethal effects from entanglement incidences could affect recovery. Additionally, whales that are carrying gear could die later, become further debilitated or seriously injured, but with no evidence of the incident documented.

Currently, a number of whale disentanglement initiatives exist worldwide to attempt to reduce the threat of fisheries entanglement on cetaceans. In 2011, the IWC launched a Global Whale Entanglement Response Network to help build an effective response network, with the goal of preventing entanglements from happening. The IWC holds specialist workshops around the world to help educate scientists, government representatives, and conservationists on entanglement issues, importance of data gathering, and releasing whales safely at sea (Description of IWC's Global Whale Entanglement Response). At a more local scale, the United States has taken action under the Marine Mammal Protection Act (MMPA) by developing and implementing Marine Mammal Take Reduction Plans to help recover and prevent extirpation of strategic marine mammal stocks. The goal of each plan is to reduce incidental mortality and serious injury of marine mammals from commercial fishing activities (including entanglement) (Description of NOAA Fisheries Marine Mammal Take Reduction Plans and Teams). In addition, NMFS has led efforts to mitigate the effects of whale entanglement via collaboration with stakeholders along with communication and outreach efforts directed at the commercial and recreational fishing communities. This included implementing recommended gear changes, modifying best practices, and enhancing reporting requirements of entangled whales. While both of these initiatives do not specifically focus on blue whales, the resulting outcome(s) and/or action(s) could help mitigate gear entanglement as a potential threat to the blue whale population. More recently, with the increasing entanglement threats to North Atlantic right whales (Hayes *et al.* 2018), a great deal of focus has been put on advancing fishing technology to minimize the amount of vertical line in the water column with the pursuit of buoy-less technologies (Moore and Browman 2019).

Summary

The information above discusses ship strike issues and reduction strategies for the Eastern North Pacific population of blue whales in coastal waters along the U.S. West Coast. However, as noted in the Revised Recovery Plan, while there is some information on ship strikes for other blue whale populations (i.e. the Sri Lankan and Chilean population), data is insufficient to determine how these known ship strikes are affecting these populations and additional information is needed to determine whether and to what extent ship strikes may be impeding recovery of blue whales on a global scale. Therefore, we consider ship strikes to be a potential threat to the globally listed entity.

Additionally, fishing gear entanglement has been observed and reported in both foreign and U.S waters, but the number of occurrences is low. This coupled with the uncertainty of frequency of entanglement events across populations, further highlights the need for additional information to determine whether entanglement in marine debris and fishing gear is impeding recovery of blue whales on a global scale. Therefore, we consider entanglements to be a potential threat to the globally listed entity.

Summary of the Revised Recovery Plan for the Blue Whale

The blue whale is a globally listed species that was originally listed as endangered throughout its range under the precursor to the ESA, the Endangered Species Conservation Act of 1969 (35 FR 8491; June, 2, 1970), and remained on the list of threatened and endangered species after the

passage of the ESA in 1973. Blue whale populations declined, due largely from commercial whaling during the 20th century, with over 380,000 blue whales taken between 1868 and 1978, predominantly from Antarctic waters (NMFS 2020). The global mature population size in 1926 was around 140,000. The current global mature population size is uncertain, but estimated to be in the range of 5,000-15,000 mature individuals. This corresponds to a reduction of 89%-97% compared to the 1926 global population estimate (Cooke *et al.* 2018). This current mature population is between 3-11% of the 1926 level (Cooke *et al.* 2018). The blue whale consists of five currently recognized subspecies (NMFS 2020). The Revised Recovery Plan identifies nine management units within these five subspecies, as recognized by the Society for Marine Mammalogy. The delineation of these nine units reflects our current understanding of blue whale taxonomy and population structure, despite some inherent uncertainties discussed in the Revised Recovery Plan (NMFS 2020).

Even though blue whales were listed as endangered under the ESA because of their historical decline from commercial whaling, the Revised Recovery Plan does not consider commercial whaling to be an operative threat as long as the international moratorium remains in place. Therefore, the primary strategy of the Revised Recovery Plan is to maintain the international ban on commercial whaling that was established in 1986. While it is not known whether and to what extent current threats are putting the globally listed species at risk of extinction, the Revised Recovery Plan identifies and discusses a number of potential threats[2] under the factors in section 4(a)(1) of the ESA such as directed hunting, ship strikes, entanglement in marine debris and fishing gear, anthropogenic noise, and loss of prey base due to climate and ecosystem change. Although other stressors were identified, it was determined that there is currently no evidence that the effects (which may include the loss of individual blue whales) are having population-level consequences or are significant enough to contribute to the species' extinction risk. Additionally, the Revised Recovery Plan contains a research strategy to improve our understanding of how potential threats may be limiting blue whale recovery. It also contains a strategy to obtain the required data to determine blue whale taxonomy, population structure, distribution, and habitat to help inform estimation of population abundance and trends. Lastly, because blue whales move freely across international borders, the Revised Recovery Plan stresses the importance of a multinational approach to management, as it would be ineffective to confine recovery efforts to just U.S. waters.

Synthesis

There are insufficient data to undertake an assessment of the blue whale's current status on a global scale. While the Revised Recovery Plan reports abundance and trend information for the Eastern North Pacific and Antarctic management units, due to a lack of systematic monitoring of population abundance and subsequent lack of trend information, no comprehensive global trend exists for this species (NMFS 2020). These data gaps highlight the importance and need for long-term monitoring for estimating abundance and distribution trends. Additionally, there is some uncertainty behind the abundance estimates for blue whales in the North Atlantic and portions of

[2] The Revised Recovery Plan defines a potential threat as "a stressor that a) contributed to the species' extinction risk, such as commercial whaling, and has the potential to do so again unless certain measures are taken or remain in place; or b) is known to be affecting one or more subspecies or populations, but more research is needed to understand the extent to which the stressor occurs or affects the globally listed entity".

the North Pacific, due to inherent uncertainties in the historical estimates regarding sampling design and data collection methodologies.

This 5-year review and Revised Recovery Plan for the blue whale (NMFS 2020) report a number of potential threats which include: 1) ship strikes; 2) entanglement in marine debris and fishing gear; 3) anthropogenic noise; and 4) loss of prey base due to climate and ecosystem change and one true threat – directed hunting, which is no longer a threat as long as the international moratorium on commercial hunting remains in place. However, it is not known whether and to what extent current potential threats are putting the globally listed species at risk of extinction, thus further research is needed to understand how potential threats may be limiting recovery to fully evaluate whether anthropogenic threats have been identified and demonstrably minimized or eliminated as called for under the Revised Recovery Plan downlisting criteria. Additionally, new information reported under Factor E regarding ship strikes and entanglement indicate these may be potential threats to the species especially in regards to the Eastern North Pacific population of blue whales within the U.S. West Coast EEZ. New information identified in this 5-year review regarding disease from parasites also warrants further research to determine whether it impacts blue whales, especially with respect to the Northern Indian Ocean population.

Overall, lack of comprehensive information on this species' status and trends creates a challenge to successfully evaluating recovery. If we knew whether the global population was increasing or decreasing, we could better understand if and how the potential threats outlined above may be limiting blue whale recovery. Furthermore, some potential threats may be intensifying (e.g., ship strikes within the Eastern North Pacific population) and new information has surfaced in the Northern Indian Ocean population about an emerging potential stressor (e.g., disease from parasites). Additionally, the minimum data needed to satisfy criteria 1 and 2 in the Revised Recovery Plan for downlisting calls for population structure studies and abundance surveys, which could take decades, given the species global distribution coupled with the need to evaluate the trend in abundance over a 30 year period (NMFS 2020).

In summary, none of the recovery criteria outlined in the Revised Recovery Plan have been fully met at this time to warrant downlisting. Furthermore, there is insufficient data to undertake an assessment of the blue whale's present status due to a number of uncertainties regarding this species: (1) lack of comprehensive information on global status and trends; (2) existence of critical knowledge gaps; (3) intensification of ship strikes in the Eastern North Pacific population; and (4) emergence of a potential new stressor in the Northern Indian Ocean population. For these reasons, we recommend the blue whale remain classified as endangered.

3. RESULTS

3.1 Recommended Classification

_____Downlist to Threatened
_____Uplist to Endangered
_____Delist *(Indicate reason for delisting per 50 CFR 424.11):*
_____Extinction
_____Recovery
_____Original data for classification in error
___X__No change is needed

3.2 New Recovery Priority Number: 8C

Brief Rationale: The new recovery priority number (8C) is based on new guidelines, which were implemented in 2019 (April 30, 2019; 84 FR 18243). The priority number indicates a moderate demographic risk due to uncertainty in abundance and trends within a number of management units, low to moderate understanding of major threats because other than whaling, all other threats have an associated high level of uncertainty. Additionally, low to moderate U.S. jurisdiction, authority, or influence exists for management or protective actions to address major threats due to its global distribution, high certainty that management or protective actions will be effective because species appear to be responding positively to the cessation of whaling, and is in conflict with development or other forms of economic activities (e.g., shipping).

4. RECOMMENDATIONS FOR FUTURE ACTIONS

The recommendations herein are made within the context of agency resources and priorities.

Existing knowledge of the population structure of blue whales is insufficient. This coupled with data deficiencies to assess abundance and trend information for a number of management units, results in a lack of global status and trend information called for under Criteria 1 and 2 for downlisting or delisting in the Revised Recovery Plan. While the Revised Recovery Plan reports both abundance and trend information for the Eastern North Pacific and Antarctic management units, basin-wide and global estimates are relatively fragmented and incomplete. The minimum data needed to satisfy the criteria in the Revised Recovery Plan call for extensive population structure studies and basin-wide abundance surveys, which will take decades, given the species global distribution and the need to evaluate the abundance trend across a minimum of 30 years. Future analyses and studies should focus on examining trends over time, and attempts should be made to correlate observed changes in whale populations with physical, biological, or human-induced changes in the environment. Additionally, continuing routine surveys in U.S. waters (such as for the Eastern North Pacific, Western/Central North Pacific, and North Atlantic populations), would greatly enhance information on U.S. populations and provide a better picture of trend data in the North Atlantic and North Pacific. Furthermore, the U.S. should promote and participate in cooperative surveys with other countries to not only augment existing abundance and trend information for populations outside U.S. waters, but to foster international collaboration and cooperation in the study and protection of blue whales.

While this 5-year review and the accompanying Revised Recovery Plan identify a number of potential threats along with new information regarding disease from parasites, it is not known whether and to what extent current threats are putting this globally listed species at risk of extinction, thus further research is needed to fully understand how potential threats and stressors may be limiting recovery, as called for under Objective 2 (factor E), as well as new information identified under Objective 2, factor C. Conducting research is necessary to fill critical knowledge gaps and assess the impact(s) of potential threats to blue whale populations, in order to meet recovery Objective 2 criteria. Furthermore, emerging information regarding ship strikes, entanglement, and disease from parasites should continue to be monitored and assessed to determine whether and to what extent they impact blue whales.

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NATIONAL MARINE FISHERIES SERVICE
5-YEAR REVIEW
Blue Whale

Current Classification: Endangered

Recommendation resulting from the 5-Year Review

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__ **X**_No change is needed

Review Conducted By: Heather Austin, Office of Protected Resources

LEAD OFFICE APPROVAL:

Director, Office of Protected Resources, NOAA Fisheries

Approve: WIETING.DONNA.S.1365710607 Digitally signed by WIETING.DONNA.S.1365710607 Date: 2020.10.30 12:44:55 -04'00' Date: _____

HEADQUARTERS APPROVAL:

Assistant Administrator, NOAA Fisheries

_____Concur _____ Do Not Concur

Signature OLIVER.CHRISTOPHER.WAYNE.1408430670 Digitally signed by OLIVER.CHRISTOPHER.WAYNE.1408430670 Date: 2020.11.05 19:46:21 -05'00' Date_____