Draft Biological Report

for the

Proposed Designation of Critical Habitat for the Mexico, Central America, and Western North Pacific Distinct Population Segments of Humpback Whales (*Megaptera novaeangliae)*

Peer Reviewer Comments

We solicited review of the *Draft Biological Report for the Proposed Designation of Critical Habitat for the Mexico, Central America, and Western North Pacific Distinct Population Segments of Humpback Whales* (*Megaptera novaeangliae*) from 10 potential reviewers. Five people agreed to serve as peer reviewers. One of the five reviewers, however, was unable to complete the review. Another reviewer (C. Gabriele), of her own accord, worked with a colleague and co-worker (J. Neilson) to complete one, joint review. Names and affiliations of all individuals who reviewed the Draft Biological Report are listed below, and comments received from these individuals are compiled below. The comments are not associated with the order of the reviewers as listed below.

Reviewers (alphabetically):

Jay Barlow
NOAA Fisheries
Southwest Fisheries Science Center
La Jolla, CA

Christine M. Gabriele/Janet L. Neilson
National Park Service
Glacier Bay National Park and Preserve
Gustavus, AK

Lori K. Polasek
Alaska Department of Fish and Game
Division of Wildlife Conservation
Juneau, AK

Janice Straley
University of Alaska Southeast
Sitka, AK

General Comments (not associated with order of names as they appear above)**:**

Reviewer 1:

I have conducted a review of the Draft Biological Report for the Proposed Designation of Critical Habitat for the Mexico, Central America, and Western North Pacific Distinct Population Segments of Humpback Whales (Megaptera novaeangliae) (version dated 03/06/2019). I found it to be well reasoned, well written, and reasonably complete. I have added some comments within the PDF (attached) including the addition of a few missing references. The conclusions are well supported and logical, and I generally agree with all. My suggested edits should not change the conclusions.

I want to emphasize two of my recommendations in the background section. Since the relisting of the Mexico and Central American DPSs, new information has become available that indicates that fishery mortality and ship strikes are higher than recognized at that time. Ship strikes of humpback whales may, alone, exceed the potential biological removal (PBR) level for the CA/OR stock (which is comprised of the MX and CAM DPSs) (see Rockwood et al. 2017). Also, humpback whale entanglement in trap and pot gear has increased dramatically since 2014. The background section should be updated to include this new information. There has not been a recent review of whether these recently recognized sources of anthropogenic mortality might impact the survival of these DPSs, but it is misleading to cite this conclusion from 2015.

Also, I sent you a figure from a report by Hamilton et al that shows all SWFSC survey effort and humpback whale sightings. You may want to include this in the report.
https://www.westcoast.fisheries.noaa.gov/publications/protected_species/marine_mammals/5.2.2018_wcr_2018_entanglement_report_508.pdf

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Specific Comments (by section of the report; reviewer numbers are not associated with order of names as they appear above):

Acknowledgements

Reviewer 3: change “Chris Gabriel” to “Christine Gabriele”

Reviewer 4: add “e” to end of Chris Gabriel

Executive Summary

Reviewer 2: *RE: NMFS convened a critical habitat review team (CHRT) consisting of 10 biologists from NMFS and NOS to evaluate critical habitat for each of the three DPSs of humpback whales.*

Write out National Ocean Service in front of abbreviation (NOS)

Reviewer 3: *RE: The geographical area occupied by the Mexico DPS*

Need to add eastern GOA

Reviewer 3: *RE: Map*

WNP sighted in Kodiak and SBC/NBNC not seak nbc. You cannot justify WNP DPX in SEAK without data. Just because SEAK is in the middle between two areas where they HAVE minimal sightings does not mean they will be here because it is a totally different feeding aggregation.

Reviewer 4: change – “the Mexico, Central America, and Western North Pacific DPSs.” to “the Central America, and Western North Pacific and Mexico DPSs.”

Reviewer 4: move – “The geographical area occupied by the Mexico DPS of humpback whales includes breeding areas off mainland Mexico and the Revillagigedos Islands; transiting areas off Baja California; and feeding areas in the North Pacific Ocean, primarily off California-Oregon, off northern Washington/southern British Columbia, in the northern and western Gulf of Alaska, and in the East Bering Sea (50 CFR 223.102(e)).” - to end of paragraph

Reviewer 4: *RE: The geographical area occupied by the Central America DPS includes breeding areas off Central America (from Panama north to Guatemala, and possibly into southern Mexico) and feeding areas along the West Coast of the United States (California, Oregon, and Washington) and southern British Columbia (50 CFR 224.101(h)). Humpback whales of the Western North Pacific DPS occupy breeding areas off Okinawa and the Philippines (as well as a not-yet described breeding ground in the Western North Pacific Ocean), transiting areas around Ogasawara, and feeding areas in the North Pacific Ocean, primarily in the West Bering Sea and off the Russian coast and the Aleutian Islands (50 CFR 224.101(h)).*

Give precedence to endangered DPS's. Add "endangered" in front of "Central American DPS" and "Western North Pacific DPS". I would even suggest putting population estimates in here to illustrate the gravity of the situation in the WNP especially.

Reviewer 4: Add **"**As such, calving / breeding areas were not considered whatsoever in these analyses." After "Because critical habitat cannot be designated in foreign countries or areas outside of U.S. jurisdiction, the CHRT limited its review to habitats occupied and used by the whales within U.S. waters, which primarily serve as feeding areas."

Note: Even if we can't designate foreign waters as critical habitat, an analysis / acknowledgement of the importance of calving and breeding habitat as essential features is warranted.

Reviewer 4: *RE: CHRT unanimously concluded that prey within humpback whale feeding areas are essential to the conservation of each of the three DPSs of humpback whales.*

Is this the only Essential Feature? What about calving habitat? Acoustic environment? Oceanographic features (water temperature, upwelling)? Water quality? Feeding, calving and migratory habitats not unduly compromised by risk of entanglement or ship strike?

I can't believe that the group concluded that "All they need is food." "Prey" is important but it is not the whole story.

For example: Japan resumes coastal whaling and the WNP group is doomed no matter if the "prey" is protected in Critical Habitat. Mexico and Hawaii calving habitat matters too, even if you can't designate it.

Reviewer 4: *RE: The CHRT concluded that this essential features may*

Delete the "s" in features

Table of Contents

Reviewer 2: RE: *Appendix A and B titles*

All other titles have capital letter for each word and these do not. For consistency these should be in caps

List of Figures

Reviewer 2: Use of periods and spacing is inconsistent.

Background

Reviewer 1: *RE: Entanglement has been documented in gillnet, pot, and trap gear (Carretta et al. 2010).*

The entanglement of humpback whales in crab gear has sky-rocketed in the last 3 years. I don't know of any published account of this (except in newspapers), but this report seems out-of-date without mentioning it.

Reviewer 1: RE: *Other threats include ship strikes and persistent organic pollutants, although these threats are not currently considered to be significantly impacting the survival of this DPS (Fleming and Jackson 2011, Bettridge et al. 2015).*

Change "are not currently" to "were not, at that time,"

Reviewer 1: Add – "More recently, Rockwood et al. (2017) estimated that the mortality due to ship strikes (n=22) is greater than the estimated fishery bycatch and is equal to the potential biological removal (PBR) level for this stock (Carretta et al. 2018)." – Before "Whales within this DPS have a broad distribution within U.S. waters and occur along the U.S. West coast as well as off Alaska."

Rockwood, R.C., J. Calambokidis, J. Jahncke. 2017. High mortality of blue, humpback and fin whales from modeling of vessel collisions on the U.S. West Coast suggests population impacts and insufficient protection. PLoS ONE 12(8): e0183052.

RE: (Carretta et al. 2018) - This is the 2017 Stock Assessment Report.

Reviewer 3: *RE: Several other individuals from external organizations (specifically, Cascadia Research Collective, Oregon State University, and Moss Landing Marine Laboratories) participated during parts of the workshop either in person or remotely to present and discuss their relevant research. This report summarizes the available data on habitat uses and needs of humpback whales and the CHRT's process for determining what areas meet the definition of critical habitat.*

This selection of researchers outside NMFS biased your report. For Alaska, the tagging results are heavily represented and I believe only tell a selected story. You neglected to consider years of mark recapture data modeled to show distribution and movement from a geographical stratified model at least for SEAK.

Reviewer 4: *Re: On September 8, 2016, the National Marine Fisheries Service (NMFS) published a final rule that revised the listing of humpback whales by removing the taxonomic species listing, listing list four distinct population segments (DPSs) as endangered, and listing one DPS as threatened (81 FR 62260).*

Delete "list"

Reviewer 4: Add period at the end of paragraph two. The sentence ending with "critical habitat cannot be designated for these whales".

Reviewer 4: *RE: was identified as the primary threat to this DPS.*

Really, anthropogenic climate change is the primary threat to this DPS (and all DPS's). I would also list pollution.

Reviewer 4: Change – "Entanglement has been documented gillnet, pot, and trap gear (Carretta et al. 2010)." To "Entanglement has been documented primarily in pot/trap fisheries but also gillnet, pot, and trap gear (Carretta *et al.* 2010)."

Note: Replace (Carretta *et al.* 2010) with more recent stock assessment report (Carretta et al. 2018)

Reviewer 4: *RE: although these threats are not currently considered to be significantly impacting the survival of this DPS*

But see Rockwood et al. 2017 which concluded "death from vessel collisions may be a significant impediment to population growth and recovery. "

https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0183052

Reviewer 4: *RE: off the West coast of the United States.*

Vague – I think you mean CA/OR/WA but this infers Alaska as well

Reviewer 4: *RE: and it is possible that whaling could be posing a threat to this species (Brownell et al. 2000, Baker et al. 2006).*

This warrants serious consideration.

Should it be DPS instead of species?

Reviewer 4: *RE: and it is possible that whaling could be posing a threat to this species (Brownell et al. 2000, Baker et al. 2006).*

Japan just announced it was resuming commercial whaling in its territorial waters, so presumably whaling is poised to increase as a threat for this DPS.

Reviewer 4: *RE: Within U.S. waters, whales from this DPS have been observed in waters off Alaska, primarily the eastern Aleutian Islands.*

Add the word "near" after "primarily"

Critical Habitat

Reviewer 4: replace "insure" with "ensure"

Species Description and Life History

General Overview

Reviewer 1: *(Fleming and Jackson 2011)*

Original literature should be cited, rather than this review.

Reviewer 2: add ")" after (Borowski 1781)

Reviewer 2: (Norris et al 1999, Noad and Cato 2007) – italics "et al" and add period after "al"

Reviewer 4: add an "s" to "fluke" and "edge"

Reviewer 4: *RE: (Fleming and Jackson 2011)*

> Gabriele, Christine M., Christina Lockyer, Janice M. Straley, Charles M. Jurasz, and Hidehiro Kato. "Sighting history of a naturally marked humpback whale (Megaptera novaeangliae) suggests ear plug growth layer groups are deposited annually." Marine Mammal Science 26, no. 2 (2010): 443-450.

This is the correct citation re age, because it establishes that in earplugs, 1 GLG per year is accreted, and then goes back to the 96 GLG whale found off Australia in the 1950s.

Reviewer 4: *RE: Average generation time is estimated to be 21.5 years (Taylor et al. 2007)*

Replace "time" with "Length"

Suggest removing this as it is based on modeling and does not seem accurate, at least based on whales in SE Alaska.

Reviewer 4: *RE: (Taylor et al. 2007)*

> Pierszalowski, Sophie P., Christine M. Gabriele, Debbie J. Steel, Janet L. Neilson, Phoebe BS Vanselow, Jennifer A. Cedarleaf, Janice M. Straley, and C. Scott Baker. "Local recruitment of humpback whales in Glacier Bay and Icy Strait, Alaska, over 30 years." Endangered Species Research 31 (2016): 177-189.

Talks about generation length and population growth mechanisms.

Reviewer 4: *RE: (Wiley and Clapham 1993, Steiger and Calambokidis 2000) and (Clapham and Mayo 1990, Steiger and Calambokidis 2000)*

Add "Gabriele et al. 2017"

Reviewer 4: (Payne and Mcvay 1971) – Capitalize the "V"

Reviewer 4*: RE: populations have been steadily increasing but most have yet to return to historical abundance levels*

But….over past five years, at least the Hawaii DPS has declined.

Reviewer 4: *RE: (Clapham 1992, Gabriele et al. 2007, Robbins 2007)*

Add "2017" after "Gabriele et al. 2007"

Reviewer 4: *RE: Since the moratorium on commercial whaling, populations have been steadily increasing but most have yet to return to historical abundance levels (Zerbini et al. 2006, Ford et al. 2009).*

It's ESSENTIAL to capture the recent negative population trend in Alaska and Hawaii.

Perhaps PIRO could provide you a summary and reference for the meeting held in November 2018 in Honolulu where researchers talked about wide spread declines. Also read and cite this one

> Cartwright, R., A. Venema, V. Hernandez, C. Wyels, J. Cesere, and D. Cesere. "Fluctuating reproductive rates in Hawaii's humpback whales, Megaptera novaeangliae, reflect recent climate anomalies in the North Pacific." Royal Society Open Science 6, no. 3 (2019): 181463.

Distribution and Habitat Use

Breeding and Calving Areas

Reviewer 2: delete parentheses around – "Although Baja California has been considered a breeding area, genetic evidence suggests that humpback whales in these waters are whales migrating to and from other Mexico breeding locations (Baker et al. 2013)."

Reviewer 2: delete parentheses around – "2012"

Reviewer 2: *RE: 0.12 for the Hawaii breeding region (non-listed Hawaii DPS), and 0.11 in the Mexico breeding*

These are pretty low numbers. I would not consider this representative of high site fidelity. It represents some site fidelity but I think the use of "high" may be overstating what the data represents.

Reviewer 2: Change "There is also evidence that a very small number of whales will overwinter in SEA and not undergo winter migrations to breeding areas (Straley et al. 2018)." To "There is also evidence that a very small number of whales will overwinter in SEA and do not undergo winter migrations to breeding areas (Straley et al. 2018)."

Reviewer 4: *RE: Low frequencies of whales occurring in different breeding regions in different breeding seasons have also been observed in other studies (e.g., Darling and McSweeney 1985, Darling and Cerchio 1993, Salden et al. 1999). For example, in a multi-year, basin-wide study (the "SPLASH study"), of 586 uniquely identified whales from the Asia breeding region, only two were sighted in the Hawaii breeding region; and of 2,317 uniquely identified whales in Hawaii, 17 were also sighted in the Mexico breeding area (Calambokidis et al. 2008). Two individual whales, thought to be males, were observed to repeat this behavior of moving between breeding regions in subsequent years, suggesting that some whales may be highly flexible in terms of their choice of wintering area (Salden et al. 1999). Almost all sightings of whales in different breeding regions have been reported for different years; however, Forestell and Urban (2007) observed a humpback whale in the Revillagigedos Islands, Mexico, and 51 days later, the whale was observed again in Hawaii. Overall, such movements among breeding areas appear to be rare and remain poorly understood in terms of their biological significance.*

This is more common and more flexible than is portrayed here.

The more we look, the more we find that whale have used both Mexico and Hawaii breeding areas. Comparatively limited sample sizes from Mexico during SPLASH are part of under-estimating this effect. SE Alaska database has n=32 whales confirmed to have used MX breeding area.

Song studies (e.g., Jim Darling's) indicate a lot of flexibility in song exchange in the North Pacific, implying migratory flexibility on a regular basis.

In the recent years when the whales did not show up in Hawaii, where were they? If it wasn't a massive die-off (which remains to be seen), probably some of them chose Mexico.

You need to explicitly state that there's a lot of uncertainty here.

Basing the DPS on these very fluid wintering areas was probably a bad idea.

Reviewer 4: *RE: because the documented breeding areas for the three listed DPSs of humpback whales all occur outside of U.S. jurisdiction,*

That's not strictly true because whales use Hawaii as well as Mexico as a breeding habitat.

Feeding Areas

Reviewer 3: Be consistent in what is reported for each area. Abundance is given for PWS, some areas have diet and stable isotopes**.** I suggest headers for a subject area for consistency.

Reviewer 3*: RE: The whales become more evenly distributed during the summer months and make use of the various habitat types within this region*

Widely might be a better word to use instead of evenly

Reviewer 3: *RE: Humpback whales are present year-round in PWS, with highest abundances occurring in summer and fall months.*

I think the 2007-2009 surveys show more whales in fall than summer

Reviewer 3: *RE: Analysis of 30 years of survey data collected between April and September during 1978 - 2009 indicate that humpback whale abundance in PWS increased at an average annual rate of 4.53% (95% CI 3.28 - 5.79) from an estimated 39 whales (SE = 26) to 194 whales (SE = 17) during this time period (Teerlink et al. 2015). Data from surveys of PWS conducted in September to March of 2007-2009 indicated that humpback whale abundance remained high throughout the fall and began to decline in late December to early January (Straley et al. 2018). The peak abundances of humpback whales during these surveys corresponded with the peak abundances of overwintering Pacific herring (Straley et al. 2018). As with SEA, a small number of whales (under 2%, n= 4) have been observed to forego their winter migration and overwinter in PWS (Rice et al. 2011, Straley et al. 2018).*

Seems out of context here to present abundance estimates for PWS and no other feeding areas.

Reviewer 4: *RE: Such physical features may in turn be influencing humpback whale distributions.*

Of course.

Reviewer 4: Replace “Farralon” with “Farallon”

Reviewer 4: *RE: Off Southern California,* ***upwelling*** *occurs almost year round, and lasts for progressively shorter durations with increasing latitude (Bograd et al. 2009).*

This would be a good Essential Feature

Reviewer 4: Add “an archipelago” after “Southeast Alaska (SEA),”

Reviewer 4: *RE: reach peak abundances in late August through early October*

August through October is wrong. Maybe the whales congregate at that time but the peak numbers would be found in May through September, with intense hotspots in fall in Sitka, Seymour Canal, etc.

Reviewer 4: Change “There is also evidence that a very small number of whales will overwinter in SEA and not undergo winter migrations to breeding areas (Straley *et al.* 2018).” To “There is also evidence that a very small number of whales have overwintered in SEA and did not undergo winter migrations to breeding areas (Straley *et al.* 2018).”

Reviewer 4: *RE: In the spring, when humpback whale abundance is lower, the whales tend to concentrate in and around Icy Strait*

I guess so based on Dahlheim’s paper but it sounds weird to me. I think of whales concentrating in Sitka Sound in spring more than in Icy Strait….but Dahlheim’s “spring” = April/May

Reviewer 4: *RE: Pacific herring and krill comprise the bulk of humpback whale diet in this area (Straley et al. 2018), and a short-term study in Glacier Bay and Frederick Sound in summer of 1979 indicated that humpback whale abundance and distribution was linked to euphausiid abundance (Bryant et al. 1981; see also “Diet and Feeding Behavior,” below).*

Humpback whales in Glacier Bay & Icy Strait primarily feed on small schooling fishes such as capelin, sand lance, juvenile walleye pollock, and herring (Krieger and Wing 1986, Gabriele et al. 2017, NPS unpublished data.

Witteveen et al. 2011 offers insights into trophic levels for SEA, PWS, and Kodiak humpbacks and could be cited here as well as in the PWS and Kodiak sections that follow.

> Witteveen, B. H., et al. (2011). "Using movements, genetics and trophic ecology to differentiate inshore from offshore aggregations of humpback whales in the Gulf of Alaska." Endangered Species Research 14: 217-225.

Why no estimates for SEA of population size and population trends like with PWS below?

Reviewer 4: *RE: Pacific herring and krill comprise the bulk of humpback whale diet in this area* [SEAK]...

Capelin and sand lance are also important.

Reviewer 4: *RE: Within the northern Gulf of Alaska, Prince William Sound (PWS), has been surveyed extensively and is recognized as an important feeding area...*

Important how? Recognized where? There are not very many whales there actually.

Reviewer 4: Add "Moran et al. 2018" to "(Teerlink *et al.* 2015, Ferguson *et al.* 2015a)"

Reviewer 4: *RE: Analysis of 30 years of survey data collected between April and September during 1978 - 2009 indicate that humpback whale abundance in PWS increased at an average annual rate of 4.53% (95% CI 3.28 - 5.79) from an estimated 39 whales (SE = 26) to 194 whales*

See what I mean?

Reviewer 4: change "Witteveen and Wynn 2016" to "Witteveen and Wynne 2016"

Reviewer 4: *RE: indicates that during this study humpback whales around Kodiak Island were feeding mainly on euphausiids but also consumed various fish species*

Verify – I think the paper says the opposite for around Kodiak…mostly fish and less zooplankton.

Reviewer 4: Remove the "a" at the end of "Witteveen *et al.* 2011a"

Reviewer 4: *RE: (with an average of 5.6 efforts days per season)*

Delete the "s" in "efforts"

Reviewer 4: *RE: high densities of humpback whales are also known to occur in waters around the eastern Aleutian Islands and in the southeastern Bering Sea*

Though this appears to be rapidly changing with loss of sea ice and increased sightings of humpbacks farther north into the Chukchi and Beaufort.

Main months of peak abundance are June – August or maybe September.

Fidelity to Feeding Areas

Reviewer 2: *RE: Figure 2*

Final figures may be a different quality – but many of the figures in this draft are not very high quality and become quite pixilated when enlarged on screen. If possible, higher quality images that retain quality when enlarged would be ideal

Reviewer 2: *RE: These results are consistent with SPLASH results, which showed limited inter-annual movement of whales among the broader feeding areas, and any interchange that was observed occurred mainly between adjacent areas (Table 1).*

Less than 50% of the whales were re-sighted so I just advise cautions with application of the conclusions. I agree that 43% re-sight rate is really good – but we do not know where the other whales went.

Reviewer 3: *RE: These results are consistent with the SPLASH results, which showed limited inter-annual movement of whales among the broader feeding areas,*

This study used splash data and took the splash analysis further in looking at whales seen offshore

Reviewer 4: *RE: These results are similar to earlier sightings data*

Delete the "s" at the end of "sightings"

Reviewer 4: *RE: although some interchanges was observed*

Delete the "s" at the end of "interchanges"

Reviewer 4: *RE: Results of the GAP study, which extended over a 17-year period, indicated that humpback whales had an average annual rate of return of 34% to the Kodiak region (out of 1,187 unique whales over 17 seasons) and an average annual rate of return of 37% to the Shumagin Islands (out of 654 unique whales over 14 feeding seasons (Witteveen and Wynne 2016a).*

Also should mention Glacier Bay and Icy Strait in SEA (Gabriele et al. 2017): "Sixty-three percent (n = 244) of the non-calves that we documented in the study area from 1985 to 2013 (n = 386) returned to Glacier Bay and/or Icy Strait in more than 1 yr. Many whales were sighted annually (n = 66, including 21 females, 31 males, and 14 whales of unknown sex) or missed just 1 yr (n = 39, including 12 females, 15 males, and 12 whales of unknown sex). In total, these individuals represent 58% of the whales that were sighted in more than 1 yr. eleven whales (seven males and four females) were identified in the study area every year from 1985 to 2014."

Reviewer 4: Add "NPS unpublished data" to (Baker *et al.* 1992, Gabriele *et al*. 1997, Sharpe 2001, Hendrix *et al.* 2012).

Reviewer 4: *RE: (Baker et al. 1987).*

> Also Pierszalowski, S. P., C. M. Gabriele, D. J. Steel, J. L. Neilson, P. B. S. Vanselow, J. A. Cedarleaf, J. M. Straley, and C. S. Baker. 2016. Local recruitment of humpback whales in Glacier Bay and Icy Strait, Alaska, over 30 years. Endangered Species Research 31:177–189.

Fine-Scale Usage Patterns

Reviewer 3: Whales move around SEAK following prey, hence these movements determined by tagging or photo id are really whales finf…food hotspots. I am uncertain that the tagging data is that valuable here. I don't think if a whale stays in an area it is a home range (especially on migratiom) if the food leaves so will the whale. See more on home range

Photo id is the gold standard in documenting movements and there is a lot of published data on photo id that is not included here.

Reviewer 3: *RE: feeding-season "home ranges"*

Read the following definition on home range. You need a lot more information than just where an animal was located. I believe this as presented is pointless.

> Roger A. Powell Michael S. Mitchell Journal of Mammalogy, Volume 93, Issue 4, 14 September 2012, Pages 948–958, https://doi.org/10.1644/11-MAMM-S-177.1

Reviewer 3: *RE: This result is difficult to interpret given the range of seasons of tagging efforts (spring, summer, and fall) in all areas, the durations of tag deployments in Alaska (averages of 28.2 days in 2014/15 (SE=4.7) and 38.6 days in 1997 (SE= 9.6) compared to West Coast deployments (e.g., averages of 44.1 (SE= 7.7), 56.8 (SE=10.9), and 61.8 (SE=14.4) days), and the small samples sizes in general. Overall though, these HRs corresponded well to sightings data and further supported that the whales typically forage over shelf and shelf edge habitats (Mate et al. 2018).*

It is hard to interpret because you need to assess the prey. It is not a new finding that humpbacks prefer shelf and edge habitats, because their food is here as well.

Reviewer 3: *RE: Figure 6 - Feeding home-ranges for four whales satellite-tagged off coastal Oregon during September – October, 2017. Figure from Mate et al. 2018.*

This is a worthless analysis FOUR whales?

Reviewer 3: *RE: Some additional insights into fine-scale movements of whales in the feeding areas come from **limited satellite telemetry** data from whales that were tagged in their breeding areas, prior to undergoing their seasonal migrations.*

I honestly do not understand why movements from photo id were not used

Reviewer 4: *RE: feeding-season "home ranges"*

Tagging data limited in sample size, temporal and geographic scope is not appropriate for assessing home range. The whales use MULTIPLE areas within SE Alaska within a given year.

Better references indicating whales use of these areas, based on hundreds of individual whales with multiple years of data is found

Straley, J. M., Quinn II, T. J., & Gabriele, C. M. (2009). Assessment of mark-recapture models to estimate the abundance of a humpback whale feeding aggregation in Southeast Alaska. Journal of Biogeography, 1-12.

Hendrix, A. N., Straley, J., Gabriele, C. M., & Gende, S. M. (2012). Bayesian estimation of humpback whale (Megaptera novaeangliae) population abundance and movement patterns in southeastern Alaska. Canadian Journal of Fisheries and Aquatic Sciences, 69, 1783-1797.

Reviewer 4: *RE: Figure 8*

Chichagof is mis-spelled on map

Migratory Areas

Reviewer 1: Add – "Norris et al. (1999) also documented an offshore north-bound migratory route between the Revillagigedo Archipelago and Alaska using visual and acoustic detections on a ship-based survey." After "The migration routes were well offshore, averaging 444 km from the coast and ranging from 115 to 935 km from the coast (Lagerquist et al. 2008)."

Norris, T.F., M. McDonald, and J. Barlow. 1999. Acoustic detections of singing humpback whales (Megaptera novaeangliae) in the eastern North Pacific during their northbound migration. J. Acoustics Society of America. 106(1):506-514.

Reviewer 4: *RE: Figure 10*

Would be really great to have IDs on the 48 whales tagged in SEA to link these individuals to breeding areas.

Diet and Feeding Behavior

Reviewer 3: *RE: Although more recent diet studies are available, many of these studies (e.g., stable isotope analyses of tissue samples, acoustic assessments) cannot identify prey to the species level, or instead, provide observational information (e.g., plankton tows within feeding areas, analysis of dive behaviors).*

The wording implies these data are invalid. We (Straley et al 2018) ground truthed visual and captured prey with stable isotopes for PWS and calculated percentages of prey in the diet. These multi modal methods do id prey to species. Also juv salmon are a published prey (Chenoweth et al 2017). And there are reports of whales feeding on market squid in SEAK

Reviewer 4: *RE: Figure 11 – 12. Doherty and Neilson 2012; 13. Doherty and Gabriele 2012;*

Cite more recent annual reports plus Gabriele et al. 2017. Also add Chenoweth ref for juvenile salmon.

Why does figure highlight Sitka Sound?

U.S. West Coast (California, Oregon, and Washington)

Reviewer 3: *RE: Recent anecdotal observations indicate humpbacks have been feeding very nearshore, not only in Monterey Bay, but also under the Golden Gate Bridge and along shorelines and beaches to the north. This nearshore distribution may be related to anchovy or other prey species, but it is currently unknown what these whales are targeting (pers. comm., W. Sydeman, Farallon Institute, 12/6/2018). Other anecdotal reports stating that the whales are feeding specifically on anchovy in this area (mainly Monterey Bay) have appeared in the local news during several summers*

This report has been a stickler for solid data…anecdotal statements seem inconsistent

Reviewer 4: *RE: Recent anecdotal observations indicate humpbacks have been feeding very nearshore, not only in Monterey Bay, but also under the Golden Gate Bridge and along shorelines and beaches to the north.*

approx. what years?

Alaska

Reviewer 3: *RE: Prey availability, and thus humpback diet composition, vary both spatially and temporally across feeding areas in Alaska.*

Prey availability follows the prey biology

Reviewer 3: *RE: Within the Gulf of Alaska (GOA), euphausiids appear to be more concentrated within coastal bays and troughs relative to broad,* ***flat areas of the shelf*** *(Simonsen et al. 2016).*

There are extensive layers of krill on and at the shelf edge in the GOA see McGowan's work

Reviewer 3: *RE: that Pacific herring are found throughout the GOA but occur mainly inshore and in the eastern Gulf, with concentrations or "hotspots" near* ***Kodiak Island***

There are herring on the shelf. I have heard the feeding call on our recordings for sperm whales but have yet to locate these group feeders

I thought it was capelin in Kodiak?

Reviewer 4: Capitalize the" A" in "arctic cod"

Reviewer 4: Add "primarily" before "*Stenobrachius leucopsarus"*

Southeast Alaska

Reviewer 3: Add Szabos work in frederick sound? And Seymour Canal for krill in late fall and early winter. Straley 1990 1994

Reviewer 4: Add reference to Arimitsu et al. unpublished hyrdoacoustic data?

Prince William Sound

Reviewer 3: Peer reviewed paper is Straley et al 2018

Northern Bering Sea and Chukchi Sea

Reviewer 4: Capitalize the "P" in "pacific lamprey"

Diet Preferences

Reviewer 4: *RE: Relative consumption of krill versus small schooling fish by the whales is mainly a reflection of the relative density and abundance of the available prey as well as the oceanographic conditions or features that influence prey abundance.*

But based on multi-year observations of some individual whales in Glacier Bay and Icy Strait, some animals appear to target specific prey species (not only forage fish over krill, but specific species of forage fish).

Reviewer 4: Delete the word "some" in the following sentence. *RE: Although not yet established, some evidence suggests that humpback whales may preferentially target specific prey over another in order to maximize the energetic benefit.*

Energy Requirements

Reviewer 1: Add - Since that study, humpback whale populations in the CCE may have doubled (Barlow 2016), which would result in a doubling of the estimated prey consumption.

Barlow, J. 2016. Cetacean abundance in the California Current estimated from ship-based line-transect surveys in 1991-2014. NOAA Southwest Fisheries Science Center Administrative Report LJ-16-01. 63pp.

Reviewer 1: *RE: Similarly, using an average body mass of 30,408 kg and a diet reflecting the relative occurrences of prey (as determined by mid-water trawl surveys) off northeastern Kodiak Island, Witteveen et al. (2006) estimated that the whales would need to consume 370 kg/day.*

Change to - Similarly, using an average body mass of 30,408 kg and a diet reflecting the relative occurrences of prey (as determined by mid-water trawl surveys) off northeastern Kodiak Island, Witteveen et al. (2006) estimated that each whale, on average, would need to consume 370 kg/day.

Reviewer 4: Table 2 – Delete the second "i" in McMillian (2014)

Vocalizations and Sound

Reviewer 3: *RE: There is also evidence that male humpback whales sing during fall and winter on high latitude feeding grounds, indicating that song production is likely tied more to the breeding season than to particular breeding habitats (Stimpert et al. 2012, Magnúsdóttir et al. 2014).*

For refs on song on feeding grounds in relation to testostersone see

> Cates, K.A., Atkinson, S., Gabriele, C.M., Pack, A.A., Straley, J.M., Yin, S., Testosterone Trends Within and Across Seasons in Male Humpback Whales (Megaptera novaeangliae) from Hawaii and Alaska, General and Comparative Endocrinology (2019), doi: https://doi.org/10.1016/j.ygcen.2019.03.013

Reviewer 3: *RE: Several studies have documented the use of sounds by foraging humpback whales. These sounds vary by feeding context and location. D'Vincent et al. (1985) described whales feeding on schools of krill and herring in Southeast Alaska while producing extended bouts of tonal sounds centered around 500 Hz. These sounds are typically associated with coordinated lunge feeding, often involving bubble nets used to concentrate the prey.*

Published on feeding call purpose:

> Fournet, M. E., Gabriele, C. M., Sharpe, F. , Straley, J. M. and Szabo, A. (2018), Feeding calls produced by solitary humpback whales. Mar Mam Sci, 34: 851-865. doi:10.1111/mms.12485

Reviewer 3: *RE: Observed responses of prey to humpback whale sounds further supports that sound is used as a herding mechanism. Using recorded vocalizations of humpback whales, Sharpe (2001) showed that herring (prey), in the lab and in the wild, will move away from humpback vocalizations and form denser schools (with smaller distances between individuals). This aggregates herring for foraging whales and may further facilitate foraging if herring flee towards the surface, allowing for bubble net/cloud capture. It has also been hypothesized that humpback whales may benefit from sounds of other marine mammals. Specifically, it has been hypothesized that humpback whales may be attracted to aggregations of fish prey by sounds produced by fish-eating ecotypes of killer whale (Jourdain and Vangraven 2017).*

See:

> Fournet, M. E., Gabriele, C. M., Sharpe, F. , Straley, J. M. and Szabo, A. (2018), Feeding calls produced by solitary humpback whales. Mar Mam Sci, 34: 851-865. doi:10.1111/mms.12485

Reviewer 4: Capitilize the “v” in Mcvay (1971)

Reviewer 4: Change “There is also evidence that male humpback whales sing during fall and winter on high latitude feeding grounds,” to “Some male humpback whales also sing during fall and winter on high latitude feeding grounds,”

Reviewer 4: Add an “a” before “breeding season and between seasons.”

Reviewer 4: Delete extra “.” In (Fournet *et al.*. 2018).

Reviewer 4: *RE: Specifically, it has been hypothesized that humpback whales may be attracted to aggregations of fish prey by sounds produced by fish-eating ecotypes of killer whale (Jourdain and Vangraven 2017).*

This also seems plausible re other marine mammals that target the same prey as humpback whales – e.g., harbor porpoise, Dall’s porpoise, Steller sea lions, etc – assuming their vocalizations/echolocation are audible to humpbacks.

Predators and Sound

Reviewer 4: *RE: Killer whales are considered the most common predator of humpback whales, calves in particular (Fleming and Jackson 2011).*

What about sharks on the breeding grounds? Don't they prey on calves sometimes?

Mexico DPS

Reviewer 2: *RE: The genetic similarity of these whales provides strong evidence that Mexico DPS whales, in particular females of this DPS, migrate to these particular foraging areas.*

Some clarity is needed here. In the first paragraph on this page it is stated that the Mex DPS primary foraging ground is CA and OR. Here -the genetic data is pointing to AK. For AK this is a smaller number of whales and that needs to be addressed. Is this only 10% of the population that is using AK? If this is not clarified it reads at two contradictory results and overstates the importance of the feeding grounds in AK.

Reviewer 4: *RE: The Mexico DPS of humpback whales is defined as those humpback whales that breed or winter in the area of mainland Mexico and the Revillagigedos Islands, transit Baja California, or feed in the North Pacific Ocean, primarily off California-Oregon, northern Washington/southern British Columbia, in the northern and western Gulf of Alaska, and in the East Bering Sea (50 CFR 223.102(e)).*

No mention of SE Alaska here?

Western North Pacific DPS

Reviewer 3: *RE: and off the northern*

Did not see this in Calambokidis 2001

Reviewer 3: *RE: photo-identified individuals from this DPS were matched to the Gulf of Alaska (between Yakutat and Alaska Peninsula, n=2), the Aleutian Islands/Bering Sea (n=9), and Kamchatka foraging area (n=21, Barlow et al. 2011; Figure 12).*

Delete – "and Alaska Peninsula, n=2), the Aleutian Islands/Bering Sea (n=9), and Kamchatka foraging area (n=21, Barlow"

Cannot find Yakutat sighting in SPLASH

Reviewer 4: *RE: this DPS were matched to the Gulf of Alaska (between Yakutat and Alaska Peninsula, n=2),*

Please provide me the details these specific datapoints, may not be correct.

Prey as Essential Feature

Reviewer 3: *RE: Prey species, primarily euphausiids (of genus Euphausia, Thysanoessa, Nyctiphanes, and Nematoscelis) and small pelagic schooling fishes of sufficient quality, abundance, and accessibility within humpback whale feeding areas to support feeding and population growth.*

This needs to be taken a step further and describe the biology and life history of these prey to link with distribution/movements of humpback whales. Follow the prey.

Reviewer 4: Change section title to "Prey as an Essential Feature"

Reviewer 4: *RE: accessibility within humpback whale feeding areas to support feeding and population growth.*

Thus it is not just the "prey" but the quality of the habitat that the prey are in that allows them to be "accessible".

USFWS guidance says that:

These physical and biological features include:

- space for individual and population growth and for normal behavior;
- food, water, air, light, minerals, or other nutritional or physiological requirements;
- cover or shelter;
- sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal;
- habitats protected from disturbance or representative of the historic geographical and ecological distributions of a species.

Reviewer 4: *RE: this recovery objective and the related actions regarding adequate nutrition and prey abundance and availability are still relevant today for the Mexico, Central America, and Western North Pacific DPSs of humpback whales.*

Yes indeed, but I fear that there is little quantitative information on these non-commercially fished species that the whales are relying on.

And the concept of "adequate nutrition" is poorly understood or defined for baleen whales, so will be difficult to evaluate. Lack of information tends to err on the side of the proposed action rather than giving the species the benefit of the doubt, so it's important to have something solid to rely on.

I worry that using Prey as the only essential feature of the critical habitat is going to result in difficulties in assessing it under Section 7 (the prey itself as well as the "access" to it) resulting in very weak protection of the habitat for the above reasons.

If it is possible I would advocate considering the prey as well as the feeding habitat itself, so that it will include the aspects pertaining to the existing effects that humans have on the habitat itself: most notably vessel disturbance and collision, entanglement in fishing gear, and disturbance and inability to communicate due to manmade underwater noise. It doesn't seem right not to explicitly include these features and impacts.

Including the feeding habitat would allow you to include the physical oceanographic features (that are objectively measurable) that the prey rely on. I think there is precedence for this in the North Atlantic Right Whale example. See article for importance:

> Gentemann, C. L., M. R. Fewings, and M. García-Reyes (2017), Satellite sea surface temperatures along the West Coast of the United States during the 2014–2016 northeast Pacific marine heat wave, Geophys. Res. Lett.,44, 312–319, doi:10.1002/2016GL071039.

Current ecological disruptions already documented during the Blob marine heat wave (see also Ecosystem Considerations and Cartwright article for example) in the North Pacific are the "writing on the wall", in my opinion. Using Prey as your sole Essential Feature is setting NMFS up for having to try to determine the effect of a proposed action on Prey and access to Prey against a backdrop of uncertainty and turmoil, and likely continued downward ecological trends. It won't be straightforward or successful, I fear, and will not meet the objectives of ESA protection.

Other Features Considered

Reviewer 4: What about calf rearing habitat?

This would be essential in "space for individual and population growth and for normal behavior"

And it is quantifiable (calf proportion in a particular area) in the event of Section 7 consultation.

Even calving habitat itself: even if not in US waters, there needs to be some written acknowledgement that it's a key life stage that needs to be protected!

Oceanographic features (water temperature range, upwelling, water depth)?

Feeding, calving and migratory habitats not unduly compromised by risk of entanglement or ship strike?

Sound

Reviewer 3: *RE: Sightings data clearly demonstrate that humpback whales in the North Pacific routinely use and occupy relatively quiet areas* ***(e.g., Prince William Sound)*** *as well as some of the noisiest areas along the U.S. West Coast (e.g., southern California, Redfern et al. 2017).*

Have you listened to oil tankers? Really loud underwater.

Reviewer 3: *RE: absent. In this study, humpback whales were actually more likely to continue feeding in the presence of vessels than without vessels present (Di Clemente et al. 2018). Comparisons of levels of cortisol (a steroid hormone associated with stress level) in humpback whales from the Juneau area to those from humpback whales in more remote areas with little vessel traffic indicated that concentrations of cortisol were not elevated as a response to vessels disturbance (Teerlink et al. 2018). In fact, in spite of the substantial contrast in vessel disturbance levels, the cortisol concentrations in the Juneau area were lower than they were for two of three control areas (Teerlink et al. 2018). These results suggest that humpback whales in this area may have habituated to the high numbers of whale watching vessels and the associated low-frequency vessel noise.*

How does this fit under sound?

Reviewer 4: The fact that this is called "Sound" instead of "Acoustic Enviroment" or "Acoustic Habitat" tells me that you did not have the right people in the room to adequately discuss this topic. Although Alison Stimpert did a good tele-presentation on the topic!

Clearly the acoustic environment meets the definition of an essential feature with regard to ESA

Critical Habitat that provides "Space for individual and population growth, and for normal behavior" and "Cover or shelter" "sites for breeding, reproduction and rearing of offspring" All of these have an acoustic component.

> From: Fournet, Michelle EH, Leanna P. Matthews, Christine M. Gabriele, Samara Haver, David K. Mellinger, and Holger Klinck. "Humpback whales Megaptera novaeangliae alter calling behavior in response to natural sounds and vessel noise." Marine Ecology Progress Series 607 (2018): 251-268.

"However, in the many parts of the ocean characterized by chronic anthropogenic noise, this same strategy may not allow a sufficient number of opportunities to communicate over distances comparable to 'quiet' conditions (Clark et al. 2009, Hatch et al. 2012), with potential negative impacts to individuals that may have cascading effects. While the functions of feeding ground vocalizations are not well understood, it is known that humpback whales use vocalizations at high latitudes in concert with critical life functions including foraging (D'Vincent et al. 1985, Stimpert et al. 2007, Fournet et al. 2018a), social interactions (Wild & Gabriele 2014, Fournet 2014), and potentially as a precursor to breeding activities (Gabriele & Frankel 2002). A deeper understanding of the role of acoustic communication from a behavioral ecology perspective holds high conservation value."

Reviewer 4: *RE: The multiple reasons for this conclusion are summarized here.*

All of the reasons point to lack of scientific understanding, or team understanding, of the importance of the acoustic environment to a baleen whale. Moreover, it is an objectively measurable attribute of the environment, and there are NMFS standards for exposure, making it amenable to evaluation under Section 7.

See guidance in:

> Southall, Brandon L., Ann E. Bowles, William T. Ellison, James J. Finneran, Roger L. Gentry, Charles R. Greene Jr, David Kastak et al. "Marine mammal noise-exposure criteria: initial scientific recommendations." Bioacoustics 17, no. 1-3 (2008): 273-275.

Reviewer 4: *RE: anthropogenic noise received a "low" rating*

Again, the answer you get depends on who is at the table, and how well they understand acoustics and baleen whale behavior. The BRT was not chosen for their understanding of acoustics, but rather population biology and gene flow.

Acoustic effects are complex, and many scientists shy away from the topic due to lack of understanding. But that does not mean that the acoustic environment is unimportant.

Reviewer 4: *RE: in a study conducted near Juneau, Alaska, where whale-watching activity is relatively intense, Di Clemente et al. (2018) monitored activity budgets of humpback whales during the summer feeding season and detected no reduction in foraging time when whales were in the presence of vessels,*

A more rigorous study completed recently by Univ Alaska Southeast MS student Alicia Schuler found something quite different; effects on respiration, directional travel, and likelihood of surface activity.

Neither study, however directly addresses the importance of the acoustic environment.

Reviewer 4: *RE: concentrations of cortisol were not elevated as a response to vessels disturbance*

More extensive and more rigorous work is needed. Is it reasonable to presume that cortisol would respond as quickly as needed to be measurable for this purpose? I highly doubt it.

Reviewer 4: *RE: the associated low-frequency vessel noise.*

You see? The kinds of vessels in this study do not produce "low frequency noise" to a trained acoustician.

This whole section is suspect. I recommend that you ask someone with training in acoustics to re-write it.

Reviewer 4: *RE: "Such behavioral plasticity may allow the whales to avoid impacts from acoustic masking (i.e., acoustic interference with natural auditory signal processing)."*

Replace “avoid” with “reduce”

Reviewer 4: *RE: For example, data from two separate studies, one conducted in Australia and one in Glacier Bay, Alaska, indicate that humpback whales will change the amplitude of their calls in response to increases in ambient noise (referred to as the Lombard effect) Dunlop et al. 2014, Fournet et al. 2018). Two other studies reported that humpback whale songs lengthened when exposed to low-frequency active (LFA) sonar (Miller et al. 2000, Fristrup et al. 2003). Humpback whales have also been found to change signaling strategies from vocal to non-vocal communications (e.g. breaches and tail slaps) in response to increased wind speeds and background noise (Dunlop et al. 2010). Dunlop (2016) compared the responses of humpback whales exposed to natural (wind) versus anthropogenic noise (vessels), and found that the whales increased their vocalizations levels and increasingly relied on non-vocal communications in response to wind noise.*

And ALL of these point to the importance of the acoustic environment to humpback whales!

Just because the whales are sometimes, and with varying degrees of success, able to work around noise sources in their environment does NOT mean that the acoustic environment is unimportant.

I don’t know how much more plain it could be that the acoustic environment is essential to humpback whales.

Reviewer 4: *RE: the whales showed neither response when exposed to vessel noise,*

Complex social systems respond in complex ways. That does not make the acoustic environment non-essential.

Reviewer 4: *RE: per se does not appear to be associated with habitat use or occupancy.*

But it is related to stress and health and the ability to communicate with conspecifics.

Rolland, Rosalind M., Susan E. Parks, Kathleen E. Hunt, Manuel Castellote, Peter J. Corkeron, Douglas P. Nowacek, Samuel K. Wasser, and Scott D. Kraus. "Evidence that ship noise increases stress in right whales." Proceedings of the Royal Society B: Biological Sciences 279, no. 1737 (2012): 2363-2368.

Gabriele, Christine M., Dimitri William Ponirakis, Christopher W. Clark, Jamie N. Womble, and Phoebe Vanselow. "Underwater Acoustic Ecology Metrics in an Alaska Marine Protected Area Reveal Marine Mammal Communication Masking and Management Alternatives." Frontiers in Marine Science 5 (2018): 270.

Reviewer 4: *RE: prevent a clear understanding of the acoustic ecology of humpback whales.*

So the whales pay the price for our lack of understanding? In my opinion, that is unacceptable.

Reviewer 4: *RE: Furthermore, broader and longer-term consequences of noise on the fitness and viability of humpback whales are not yet known (NRC 2003; Wartzok et al. 2003; NRC 2005, Bettridge et al. 2015, Gomez et al. 2016).*

But doesn’t this attention to the issue point to its importance?

Reviewer 4: *RE: The CHRT noted that* ***metrics and tools by which managers can assess adverse impacts*** *on the whales themselves are currently available (e.g., NMFS 2018), and that impacts of noise on the whales will continue to be evaluated and managed as appropriate (e.g., under the jeopardy standard of section 7 of the ESA).*

Most of the habitat is not actively “managed” by anyone with the jurisdiction or funding to use these metrics and assess or mitigate compromised acoustic habitats. So this isn’t really happening or likely to happen.

Migratory Corridors and Passage

Reviewer 4: *RE: migratory corridor or passage-related essential feature.*

I think you got off on the wrong track due to the tagging focus. These issues are important on feeding grounds and breeding grounds and in migration. It is not sufficient to disregard these threats because you dismissed migration habitat as an essential feature.

Reviewer 4: *RE: these or similar activities (e.g., large-scale aquaculture), either independently or in combination, prevent or impede the whales’ ability to access prey, that this could constitute a negative impact on the prey feature defined above.*

Entanglement and ship strike already do impede whale’s ability to access prey. Covering it in one sentence at the end of a paragraph doesn’t suffice.

Special Management Considerations or Protections

Reviewer 4: *RE: through ecosystem shifts driven by climate change,*

This is numero uno. Most of the prey species are not commercially harvested so there will be little info available.

Reviewer 4: *RE: various forms of pollution in the marine environment.*

Radford, Andrew N., Emma Kerridge, and Stephen D. Simpson. "Acoustic communication in a noisy world: can fish compete with anthropogenic noise?." Behavioral Ecology 25, no. 5 (2014): 1022-1030.

Voellmy, Irene K., Julia Purser, Douglas Flynn, Philippa Kennedy, Stephen D. Simpson, and Andrew N. Radford. "Acoustic noise reduces foraging success in two sympatric fish species via different mechanisms." Animal Behaviour 89 (2014): 191-198.

Weilgart, Linda. "A review of the impacts of seismic airgun surveys on marine life." In CBD Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity. London, United Kingdom, pp. 1-10. 2013.

Gabriele, Christine M., Dimitri William Ponirakis, Christopher W. Clark, Jamie N. Womble, and Phoebe Vanselow. "Underwater Acoustic Ecology Metrics in an Alaska Marine Protected Area Reveal Marine Mammal Communication Masking and Management Alternatives." Frontiers in Marine Science 5 (2018): 270.

Commercial Fisheries

Reviewer 4: *RE: Within the areas under consideration for designation, several commercial fisheries directly target prey species that form a major part of the humpback whale diet (e.g., Pacific herring, Northern anchovy), and other commercial fisheries can incidentally capture important prey species.*

Change “several” to “a few”

Reviewer 4: *RE: Observations of whales with poor body condition*

Move this out of the Commercial Fishing section into the Climate section.

Reviewer 4: *RE: pers. comm. C. Gabriele, May 22, 2018*

Or Neilson and Gabriele 2019:

> Neilson, J.L., and C.M. Gabriele. 2019. Glacier Bay & Icy Strait Humpback Whale Population Monitoring: 2018 Update. National Park Service Resource Brief, Gustavus, Alaska.

Reviewer 4: Change "(2016-2017)" to "(2016-2018; Neilson and Gabriele 2019)"

Reviewer 4: Replace "Zador and Yasumiishi 2017" with "Gabriele and Neilson 2018"

Pages 106-106 in Zador and Yasumiishi 2018. Ecosystem Considerations report (https://www.afsc.noaa.gov/refm/stocks/plan_team/2018/ecosysGOA.pdf)

Reviewer 4: Start new paragraph after "It is not yet clear whether nutritional stress or some other factor (e.g., parasites, disease) is the cause of the poor body condition of these whales, but some researchers have hypothesized that reduced prey availability and quality may be the cause."

Reviewer 4: *RE: (Zador and Yasumiishi 2017)*

Update to 2018 report

Climate Change

Reviewer 4: This section needs work. Prey quality as well as quantity are affected by changing ocean conditions.

See page 47 here about lipid content of zooplankton in the Gulf of Alaska. As a food source for many fish including the ones whales eat, it's a bad sign.

https://www.afsc.noaa.gov/refm/stocks/plan_team/2017/ecosysGOA.pdf

Reviewer 4: *RE: Climate change may also alter the spatial and temporal distributions of humpback prey species.*

In this context, using Prey as the sole essential feature of this critical habitat will be virtually impossible to evaluate actions under Section 7

Reviewer 4: Replace: "n" with "ñ" in El Nino

Specific Areas

Reviewer 1: *RE: Figure 14 - The 19 critical habitat units, encompassing a total of 207,908 nmi2 of marine habitat. DPSs of whales documented or considered to occur in each unit is indicated by color.*

In a printed version of this figure, the numbers and boundaries in the purple region are not discern-able. White fonts would work better.

Reviewer 1: *RE: Figure 15 - Location of humpback whale feeding BIAs in waters off Alaska and critical habitat Units 1-10.*

What are the orange squiggly lines in this figure? Using the same color as BIA areas is confusing.

Reviewer 1: *RE: Based on these data, the 1 m depth contour (relative to MLLW) was selected for the habitat units in Alaska, with the exception of Unit 10.*

When a number and its units are used as an adjective modifier, it is conventional to hyphenate them (ie. 1-m depth contour). This should be done throughout this manuscript wherever "depth contour" or "isobath" occur.

Reviewer 1: *RE: Humpback whales in Alaska have frequently been observed feeding very close to shore during high tide (J. Moran, AFSC, pers. comm., May 23, 2018), which comports with the CHRT's selection of the 1 m isobath.*

Change 1 m to 1-m

Reviewer 1: Delete - [DATES??] (CRC, data courtesy of J. Calambokidis)

Reviewer 2: *RE: Figure 16 - Abundance predicted in approximately 10 x 10 km grid cells by the a) Becker et al. (2016) summer habitat models and b) Becker et al. (2017) winter habitat models. The categories displayed in the maps divide the study area abundance into 10% intervals. Cells containing the highest 90% of the study area abundance were used to help delineate specific area boundaries and determine their offshore extent. Humpback whale feeding BIAs and critical habitat unit boundaries also shown.*

Describe/delineate Fig A and B in legend

Reviewer 2: *RE: Figure 17 - Critical habitat Units 11 -19, humpback whale feeding BIAs, and highest 90% of the predicted abudances based on a) Becker et al. (2016) summer habitat models and b) Becker et al. (2017) winter habitat models. The highest 90% of the study area abundance (shaded in blue) was used to help determine the offshore extent of specific area boundaries. Remaining 10% of predictions are shown as gray shaded areas.*

Describe/delineate Fig A and B in legend

Reviewer 2: *RE: (relative to MLLW)*

This is not on your acronym page nor is it defined in the text

Reviewer 4: This section needs a better title. Its methods for how you guys defined areas.

Reviewer 4: *RE: It is not appropriate to use these models to delineate critical habitat*

Seems like a lot of text about these models especially in light of this sentence. Simplify.

Reviewer 4: *RE: "home-ranges"*

Not a correct usage of this term. It may have been fun to do the analysis of tag data in GIS (heck it is a relief to have data to put on a map!), but it's far too limited a dataset to make conclusions for a matter as important as critical habitat.

Reviewer 4: *RE: 90% fixed kernel density distributions derived from satellite telemetry data for humpback whales exhibiting area restricted searches (ARS),*

This is inappropriate, and greatly under-estimates the actual home ranges of individual whales on the scale of a full feeding season, not to mention years and decades of patterns. See Straley et al for a much better approach.

> Straley, J. M., Quinn II, T. J., & Gabriele, C. M. (2009). Assessment of mark-recapture models to estimate the abundance of a humpback whale feeding aggregation in Southeast Alaska. Journal of Biogeography, 1-12.

Reviewer 4: *RE: (i.e., we did not consider movements representing just a single whale)*

Arbitrary.

Reviewer 4: *RE: Along the coast of Alaska, selection of the shoreward boundary for habitat units (i.e., Units 1-10) was based on*

Why not also include historic whaling data? Seems like offshore GOA is underrepresented.

Reviewer 4: *RE: recorded during SPLASH surveys in Alaska*

Biased greatly toward near shore because mainly small vessel surveys.

Historic whaling data could help reverse the bias.

Humpback whales are known to inhabit the edge of the continental shelf off SE Alaska.

Reviewer 4: Add "e" to end of "courtesy of C. Gabriel"

Unit 1 – Bristol Bay

Reviewer 2: *RE: Unit 1 does not extend into the intertidal portions of northern Bristol Bay based on the lack of detections of humpbacks in the small bays along the coast and in northern Bristol Bay (Friday et al. 2012, Matsuoka et al. 2018, and J. Moran, AFSC, pers. comm. May 23, 2018).*

Why does this unit have a 1 m near shore boundary if there is a lack of detection in the near shore areas. Additionally the BIA does not encompass the nearshore regions so the need to extend to the coast line is not justified.

Unit 2 – Aleutian Island Area

Reviewer 2: *RE: the northern boundary of this area extends from 55° 41N/ 162° 41' W, tangentially along the northern edge of a BIA west out to 169° 30' W. The western boundary extends southward through Samalga Pass to the 2,000 m isobaths*

The northern extent of this boundary goes well beyond the BIA. I know whales have been documented outside the BIA but the need is to focus on the most critical habitat, not all habitat. Additionally, including a range up to the 2000m isobath when the data from appendix B strongly support that the whales spend a majority of their time closer to shore.

Reviewer 2: *RE: The northwestern edge of the Unit 2 also extends slightly north of the BIA, because available sightings data indicate humpback whales use waters north of Unimak Pass and along the middle and outer Bering Sea shelf and slope (Calambokidis et al. 2008, Friday et al. 2012, Friday et al. 2013, Matsuoka et al. 2018).*

The focus needs to be on critical areas, not all areas. This NW edge does not provide enough value for inclusion in the CH designation

Unit 4 – Central Peninsula Area

Reviewer 2: My Comments here are in references to Units 4, 6, 7, and 9. These areas only support a small part of the population and they do not house BIAs. BIAs have been established by a team of experts as has been stated and these regions were not designated. The number of whales in the area relative to the whole DPS need to be considered. As stated above the extension of these areas into deep water in these regions (1000-2000 M isobaths) is not supported by the dive data. There is not enough justification to include these 4 areas in the CH designation.

Unit 6 – Cook Inlet

Reviewer 2: *RE: indicating that the whales feeding in this area do not comprise a completely distinct feeding aggregation.*

This further supports the idea that this unit should not be included in the CH designation

Unit 9 – Northeastern Gulf of Alaska

Reviewer 4: Add "e" to end of "and SPLASH data courtesy of C. Gabriel"

Unit 10 – Southeastern Alaska

Reviewer 4: *RE: Photo-identification data collected in Southeast Alaska from 1979 to 1983 indicate a high degree of site fidelity to this area, with 47.2 % of whales being sighted in more than one year (154 whales out of 326 unique individuals; Baker et al. 1986). Sightings histories for three female humpback whales in particular indicate these whales returned in each of 12 or 13 years during 1977-1992 (Straley et al. 1994).*

Gabriele et al. 2017 offers additional data on site fidelity.

Reviewer 4: *RE: (Hendrix et al. 2012)*

See also

> Straley, J. M., Quinn II, T. J., & Gabriele, C. M. (2009). Assessment of mark-recapture models to estimate the abundance of a humpback whale feeding aggregation in Southeast Alaska. Journal of Biogeography, 1-12.

Reviewer 4: Add "sand lance, myctophids" to end of "Humpback whales are known to feed on krill, herring, capelin,"

Reviewer45: delete "also" in "and also juvenile pollock within Southeast Alaska,"

Unit 11 – Coastal Washington

Reviewer 2: *RE: This area was drawn to encompass the Northern Washington BIA (Calambokidis et al. 2015), located at the northern edge of this unit, and cells containing the highest 90% of the study area bundance....*

I understand where this 90% is derived from but the 90% is just of the study area. It would be helpful to put this in context of an actual abundance. If there are only 10 animals in the population while in this unit 9 of the 10 are there, then 90% holds high value. If there are 500 animals, but only 10 are in the region and 9 of those are in the unit you can still get 90% abundance in the unit but the value of that 90% drops. Some actual abundance reference would be helpful.

Unit 14 – Southern Oregon/Northern California

Reviewer 2: *RE: The area extends offshore to the 2,000 m isobath.*

Again – extensions to deep isobaths does not appear warranted. They do use the areas but they are not necessarily critical just to create a contiguous boundary.

Unit 15 – California North Coast Area

Reviewer 2: *RE: Krill hotspots, measuring about 216 - 320 km^2, have also been documented offshore of Point Arena near the 2,000-m isobath (Santora et al. 2011, Dorman et al. 2015).*

Then why extend to the 3000 m iso. In this case the unit extends beyond the 90% abundance data. This extension needs more justification beyond the use of 3 whales.

Unit 19 – California South Coast Area

Reviewer 2: *RE: This area does not contain a BIA but was added to capture cells containing the highest 90% of the study area abundance predicted by the Becker et al. (2017) habitat model. This area falls outside of the predicted high use area in the summer/fall months but is predicted to support high densities of whales in the winter/spring months (Becker et al. 2017). The higher densities of humpback whales in winter may stem from the fact that some of the whales sighted in this area may be transiting through the area, rather than occupying the area as a feeding destination. Within this unit, krill hotspots ranging in size from about 210 km2 – 430 km2 have been observed off San Nicolas and Santa Barbara Islands (Santora et al. 2011), and additional hotspots have been observed in association with submarine canyons (Santora et al. 2018).*

No BIA, falls outside of high seasonal use and when seen likely just in transit, therefore not enough reasoning for CH. There are some hot spots for prey but as has been noted previously these change seasonally.

Conservation Value of Specific Areas

Methods

Reviewer 4: This document is long and unwieldy. Consider making the Methods sections into an Appendix so readers can get to the point quicker without wading through all this.

Reviewer 4: *RE: (3) medium - meaning the available data indicate the area is moderately important to the conservation of the DPS; and,*

The maps have an additional "Medium Low" category. Glad to see that's not included here.

But if this is the methods, did CHRT use 5 or 4 "votes"?

Reviewer 4: *RE: (Matched sightings are the total number of whales photo-identified in both breeding area and the critical habitat unit).*

Here is where you need to state plainly that MOST WHALES IN FEEDING AREAS ARE NOT FROM A KNOWN DPS.

Reviewer 4: *RE: For units where no category had half or more of the votes, the category with the greatest number of votes was chosen as the final score, but with a lower degree of certainty.*

I would far rather see a method that errs on the side of higher conservation value.

Reviewer 4: *RE: (For example: unit 12 for the CAM DPS had 18 votes in medium and 18 in low, therefore was given a score of M/L).*

This is wishy washy. Omit.

Results

Reviewer 2: *RE: Table 3. Conservation value ratings for specific critical habitat areas. Votes from all CHRT members across the four possible conservation value categories (VH = very high, H = high, M = medium, L = low) are shown for each applicable critical habitat unit by DPS. Each of 10 team members was given four votes to apply to the four categories (giving a total of 40 points possible for each unit), or forego voting and mark "data deficient" for a unit. A ✓ in the "data deficient" column indicates that team member(s) deemed the available data too limited or too uncertain to determine the relative conservation value of the habitat unit. (Number of ✓'s corresponds to how* *many CHRT members selected "data deficient" for the unit). The final conservation rating (i.e., score column) was determined using the category with the majority of votes for each unit. If the category with the greatest number of votes received less than half the total possible votes, the score is shown in italics to indicate the greater degree of uncertainty.*

Language needs to be added to explain what the shaded cells indicate.

The scores that are in "italics" are not easily identified on the PDF. I would recommend using some other method of indicating the uncertainty, so it is more apparent to the reader.

Group comments on the units based on these ratings. There are three units that have low ratings for all DPS: units 7, 9 and 19. In my opinion I think even the low-medium should be grouped here (units 6 and 10). The consideration here is for critical habitat. If all habitat is critical the power and protection for that habitat loses strength. The focus should be on the areas with BIAs and with all medium or high ratings. We should not water down the areas of most value with those that are clearly not.

Reviewer 4: Add "to" to the end of "the conservation ratings are relative to other areas used by a given DPS and not relative"

Reviewer 4: *RE: Table 3 – (A) Western North Pacific DPS*

Due to low fluke matching sample sizes, migratory connections to the Western North Pacific DPS could all be considered "data deficient".

Unit 1 – Bristol Bay

Reviewer 3: Let the data speak not voters most of whom are unfamiliar with the Alaska data

Unit 5 – Kodiak Island Area

Reviewer 3: *RE: WNP DPS: High conservation value (13 of 40 votes).*

High with one or two Wnp sightings?? This is flawed logic

Reviewer 4: *RE: MEX DPS: High conservation value (22 of 40 votes).*

Sounds Very High to me.

Unit 9 – Northeastern Gulf of Alaska

Reviewer 4: *RE: There are no reported sightings of photo-identified whales of the WNP DPS in this specific area; however, presence of these whales has been assumed based on photo-identification and genetic data suggesting that humpback whales from WNP wintering areas could occur in this general region (Table C8).*

Move this text up under WNP DPS

Unit 10 – Southeastern Alaska

Reviewer 3: *RE: identified off Japan (WNP breeding area) were also sighted in British Columbia, Canada, to the southeast of Unit 10 (Calambokidis et al. 2001). Therefore, Unit 10 was still included in the conservation rating analysis to give it full and fair consideration.*

The WNP sightings were closer to US west coast than SEAK

Reviewer 4: Add ", including several individuals that use Unit 10 as their feeding range annually for decades" after "There is a BIA in Unit 10 that encompasses approximately 45% of the total area of the unit. There are confirmed sighting of MEX DPS whales in this unit"

Reviewer 4: Delete "are" from the following "8.5% were are of the MEX DPS;"

Reviewer 4: *RE: There are no reported sightings of WNP DPS whales in this unit; however, given that whales of the WNP DPS have been documented to occur in regions on either side of Unit 10 (e.g. Kodiak Island area and British Columbia; Calambokidis et al. 1997), the CHRT included this unit in their evaluation to ensure the area was not overlooked and was instead thoroughly considered.*

Move this text up under WNP DPS

Unit 11 – Costal Washington

Reviewer 3: Add wnp dps…those sightings were next door

Reviewer 4: *RE: Both the MEX and CAM DPSs have relatively small probability of movement to this area.*

How does this reconcile with a High or Very High rating?

Unit 19 – California South Coast Area

Reviewer 3: *RE: Map A. Western North Pacific Humpback Whale Distinct Population Segment*

8 9 10 should be NOT PRESENT

THIS IS unjustified and really bad science. There is no reason to believe WNP whales will appear in PWS and SEAK

There are better reason to link US west coast than the N and E GOA

Reviewer 3: *RE: Figure 18.*

PWS should be green this was A sampling issue during SPLASH the percentages of MX should increase as you move west and it does but the areas 4 AND 8 are I believe sampling

Reviewer 4: *RE: Map A. Western North Pacific Humpback Whale Distinct Population Segment*

IN the maps that follow, Medium Low doesn't seem to be used. And it seems like a lot of categories. Remove that one?

Literature Cited

Reviewer 4: *RE: Di Clemente, J., F. Christiansen, E. Pirotta, D. Steckler, M. Wahlberg, and H. C. Pearson. 2018. Effects of whale watching on the activity budgets of humpback whales, Megaptera novaeangliae (Borowski, 1781), on a feeding ground. Aquatic Conservation: Marine and Freshwater Ecosystems in press.*

Published now

Reviewer 4: *RE: Gabriele, C. M., J. L. Neilson, J. M. Straley, C. S. Baker, J. a. Cedarleaf, and J. F. Saracco. 2017. Natural history, population dynamics, and habitat use of humpback whales over 30 years on an Alaska feeding ground. Ecosphere 8:e01641.*

Capitalize a in "J. a. Cedarleaf"

Reviewer 4: *RE: Gabriele, C. M., J. M. Straley, L. M. Herman, and R. J. Coleman. 1996. Fastest documented migration of a North Pacific humpback whale. Marine Mammal Science 12:457-464.*

> Gabriele, Christine M., Christina Lockyer, Janice M. Straley, Charles M. Jurasz, and Hidehiro Kato. "Sighting history of a naturally marked humpback whale (Megaptera novaeangliae) suggests ear plug growth layer groups are deposited annually." Marine Mammal Science 26, no. 2 (2010): 443-450.

Reviewer 4: *RE: Payne, R., and S. Mcvay. 1971. Songs of humpback whales. Science 173:585-597.*

Capitalize "v" in "Mcvary"

Reviewer 4: *RE: Szabo, A., and D. Duffus. 2008. Mothereoffspring association in the humpback whale, Megaptera novaeangliae: following behaviour in an aquatic mammal. Animal Behaviour 75:1085-1092.*

Add "-" between *Mothere offspring*

Reviewer 4: *RE: Witteveen, B. H., J. M. Straley, E. Chnoweth, C.S. Baker, J. Barlow, C. Matkin, C.M. Gabriele, J. Neilson, D. Steel, O. von Ziegesar, A.G. Andrews, A. Hirons. 2011. Using movements, genetics, and trophic ecology to differentiate inshore from offshore aggregations of humpback whales in the Gulf of Alaska. Endangered Species Research 14: 217-225.*

Change "*Chnoweth" to "Chenoweth"*

Appendix A

Reviewer 4: *RE: Table A2. Humpback whale diet studies and reported prey for Southeast Alaska (including Glacier Bay, Sitka Sound, and Lynn Canal) and Prince William Sound, by prey type and study period.*

Additional herring refs:

> Neilson, J. L., C. M. Gabriele, and L. F. Taylor-Thomas. 2018. Humpback whale monitoring in Glacier Bay and adjacent waters 2017: Annual progress report. Natural Resource Report NPS/GLBA/NRR—2018/1660. National Park Service, Fort Collins, Colorado.

> Neilson, J. L., C. M. Gabriele, and L. F. Taylor-Thomas. 2017. Humpback whale monitoring in Glacier Bay and adjacent waters 2016: Annual progress report. Natural Resource Report NPS/GLBA/NRR—2017/1503. National Park Service, Fort Collins, Colorado.

And additional NPS annual reports

Also eulachon in Glacier Bay in 2018

> Neilson, J.L., and C.M. Gabriele. 2019. Glacier Bay & Icy Strait Humpback Whale Population Monitoring: 2018 Update. National Park Service Resource Brief, Gustavus, Alaska.

And Pacific sandfish (Trichodon trichodon) in 2017

> Neilson, J. L., C. M. Gabriele, and L. F. Taylor-Thomas. 2018. Humpback whale monitoring in Glacier Bay and adjacent waters 2017: Annual progress report. Natural Resource Report NPS/GLBA/NRR—2018/1660. National Park Service, Fort Collins, Colorado.

Reviewer 4: *RE: Table A2. Humpback whale diet studies and reported prey for Southeast Alaska (including Glacier Bay, Sitka Sound, and Lynn Canal) and Prince William Sound, by prey type and study period.*

Capitalize the “p” in “Stephens passage”

Reviewer 4: *RE: Table A2. Humpback whale diet studies and reported prey for Southeast Alaska (including Glacier Bay, Sitka Sound, and Lynn Canal) and Prince William Sound, by prey type and study period.*

Capitalize the “s” in “Sitka sound”

Reviewer 4: *RE: Table A2* –

Add Juvenile before “Walleye pollock (*Theragra chalcogramma*)”

Note they target juvenile walleye pollock, not adults?

Reviewer 4: *RE: Table A2* - Myctophids (likely northern lampfish - *Stenobrachius leucopsarus*)

Also 2018

Neilson, J.L., and C.M. Gabriele. 2019. Glacier Bay & Icy Strait Humpback Whale Population Monitoring: 2018 Update. National Park Service Resource Brief, Gustavus, Alaska.

Reviewer 4: *RE: Table A2. Humpback whale diet studies and reported prey for Southeast Alaska (including Glacier Bay, Sitka Sound, and Lynn Canal) and Prince William Sound, by prey type and study period.*

Capitalize the “s” in “Icy strait”

Reviewer 4: *RE: Table A2. Humpback whale diet studies and reported prey for Southeast Alaska (including Glacier Bay, Sitka Sound, and Lynn Canal) and Prince William Sound, by prey type and study period.*

Replace “Ammodytes hexapterus” with “Ammodytes personatus”

Reviewer 4: *RE: Table A3. Humpback whale diet studies and reported prey for the Gulf of Alaska and Kodiak region, by prey type and study period.*

Replace “Ammodytes hexapterus” with “Ammodytes personatus”

Reviewer 4: *RE: Table A3* - Pacific herring (*Clupea harengus pallasi* now known as *Clupea pallasii*)

Above these are Herring, not Pacific herring. Be consistent.

Reviewer 4: *RE: Table A4*

Add Juvenile before “Walleye pollock (*Theragra chalcogramma*)”

Appendix B

Reviewer 4: *RE: Depth frequency histograms for humpback whales sightings.*

Delete the “s” in whales

Reviewer 4: *RE: Figure B2 – “*Central Alaskan coast,”

Label each graph with the geography. “Alaska” is far too broad to be useful.

This data is difficult to interpret without knowing how much survey effort occurred in shallower vs deeper waters. For large ship work, of course the hwales will be found deeper because the ship can’t go in to the shallower waters. This is probably why SPLASH graph B has so much shallow water sightings because it was mainly small skiff work.

Appendix C

Reviewer 3: *RE: Table C1 – *The CHRT generally treated unit 10 as outside of the range of the WNP DPS. However, Calambokidis et al. (2001) sighted two whales in Japan and again off of British Columbia,* ***near Southeast Alaska. Therefore, it was included in this analysis.***

NO it is a different feeding aggregation than SBC

Reviewer 3: *RE: Table C5 – Unit 10*

You used abundance for other areas why not seak? Plus our estimates give a geographical exchange among areas in seak…far more robust than the sat tag data to show how whales move within a feeding area

Reviewer 4: *RE: Table C1 – Unit 10*

Why is BIA n/a here?

Reviewer 4: *RE: Table C3 – Unit 10*

Why is BIA n/a here?

Surely density could be calculated from existing data and population estimate publications?

Reviewer 4: *RE: Table C6 – Unit 10*

Not sure why this density does not show up elsewhere in tables where density is listed as n/a

Reviewer 4: *RE: Table C7 - Total matched sightings and percentage of unique sightings of a DPS by critical habitat unit. This table shows - of all matched sightings (i.e., whales of any DPS photo-identified in both a breeding area and in a feeding unit*

Replace: "sightings" with "photo-identifications from the SPLASH study (e.g., Calambokidis et al. 2008)" and add ". Note that a low proportion (17%) of whales identified on feeding grounds during SPLASH are from a known DPS" to the end

In regards to the added content - I think this is a key point that needs to be made here as well as in the text before we start throwing numbers and proportions around. Most whales in the feeding areas are NOT FROM A KNOWN DPS.

Reviewer 4: *RE: Table C7 – Unit 10*

WNP sightings - Maybe a footnote about the Calambokidis et al. 2001 sightings of the WNP whales in BC as mentioned in the text.

MEX sightings- Note that this number has gone up with recent "HappyWhale" automated matching efforts.

Reviewer 4: *RE: Table C8 – Unit 10*

Add "NMML Fluke Finder database" to the references

References given by Reviewer 3 (many of which had already been cited in the draft report):

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