Potential Marine Mammal Offshore Biologically Important Areas for Surveillance Towed Array Sensor System Low Frequency Active Sonar:

Marine Areas under Consideration

February 2019

INTRODUCTION

Given the unique transmission characteristics of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar, and recognizing that certain areas of biological importance lie outside of the coastal standoff range (i.e., 12 nmi [22 km] from any emergent land) for SURTASS LFA sonar, Navy and NMFS developed the concept of marine mammal offshore biologically important areas (OBIAs) for SURTASS LFA sonar. OBIAs for SURTASS LFA sonar are not intended to apply to any other Navy activities and were established solely as a mitigation measure to reduce incidental takings of marine mammals associated with the use of SURTASS LFA sonar. OBIAs only pertain to marine mammals.

Further details about the development of OBIAs and the OBIA process over the history of SURTASS LFA sonar may be found in Chapter 5 of the 2018 Draft SEIS/SOEIS for SURTASS LFA sonar (DoN, 2018). This document advances the OBIA process beyond the DSEIS/SOEIS, asking for comments from the public on regions being considered as OBIAs. The marine area summaries that follow are divided into two sections: (1) marine areas that preliminarily will be further considered because they meet the geographic criteria and low-frequency sensitivity factor and appear to have biological relevance and (2) those areas that preliminarily will not be further considered because they do not meet the geographic, low-frequency, or biological criteria (see below for a summary of the OBIA selection criteria).

Each marine area is described within the same structure. The type of marine area is identified, which includes the following check boxes:

☐ **OBIA in Regulations/LOA**

☐ **Mission Blue Hope Spot**

☐ **Pew Ocean Legacy Site**

☐ **IUCN Green List Site:** International Union for Conservation of Nature

☐ **IMMA**: Important Marine Mammal Areas

☐ **EBSA**: Ecologically or Biologically Significant Marine Areas

☐ **U.S. Marine National Monument**

☐ **Hoyt Cetacean MPA**: Marine Protected Area

☐ **U.S. MPA**: Marine Protected Area

☐ **U.S. ESA Critical Habitat**: Endangered Species Act Critical Habitat

☐ **NRDC Recommendation**: Natural Resources Defense Council suggestion in written comments on Navy's SURTASS LFA sonar DSEIS/SOEIS (DoN, 2018)

Then an overview of the area is presented that summarizes the available information relevant to the OBIA analysis process. Following the Area Overview section, there are sections with check boxes for the geographic criteria (i.e., whether the area is located in the SURTASS LFA sonar study area and outside of the coastal standoff range [i.e., greater than 12 nmi {22 km} from any emergent land]) and low-frequency sensitive species in the area. The check boxes for the biological criteria remain blank because that analysis is ongoing. Finally, the summary of each marine area ends with an annotated bibliography including the supporting documentation and summaries of their insights into the marine area.

In addition to the analysis described in this document, if an area meets the geographic, biological, and hearing criteria/factors, it is considered a candidate OBIA and the Navy conducts a practicability assessment, including consideration of personnel safety, practicality of implementation, and impacts on the effectiveness of SURTASS LFA active sonar testing and training activities. If the Navy determines that the candidate area passes the practicability assessment, then the marine area is considered to meet all criteria for designation as a SURTASS LFA sonar OBIA for marine mammals. If the Navy determines that it is not practicable to designate the area as an OBIA, the Navy would identify the concerns that lead to this conclusion and discuss with NMFS whether modifications could be made to the proposed OBIA to alleviate the Navy's practicability concerns.

OBIA Selection Criteria

The process of identifying potential marine mammal OBIAs involves an assessment by both NMFS and the Navy to identify marine areas that meet established criteria. In their comprehensive reassessment of potential OBIAs for marine mammals conducted for the 2012 SEIS/SOEIS, NMFS and the Navy established geographical and biological criteria as the basis for consideration of an area's eligibility as a candidate OBIA.

➢ *Geographic Criteria for OBIA Eligibility*

For a marine area to be eligible for consideration as an OBIA for marine mammals, the area must be located where training and testing activities of SURTASS LFA sonar would occur (Figure 1-1, Chapter 1), but cannot be located in:

- Coastal Standoff Zone or Range—the area within 12 nmi (22 km) of any emergent land including islands or island systems. This part of the study area already receives the same protection as OBIAs where sound levels would not exceed 180 dB re 1 µPa (rms) SPL.
- Polar Regions—including the Arctic (e.g., Bering Sea) and Antarctic (south of 60°S latitude) waters. Polar regions are outside the study area.

➢ *Low-Frequency Hearing Sensitivity*

SURTASS LFA sonar transmissions are well below the range of best hearing sensitivity for most odontocetes and most pinnipeds based on the measured hearing thresholds (Au and Hastings, 2008; Houser et al., 2008; Kastelein et al., 2009; Mulsow and Reichmuth, 2010; Nedwell et al., 2004; Richardson et al., 1995; Southall et al., 2007). The intent of OBIAs is to protect those marine mammal species, such as baleen whales, most likely to hear and be affected by LFA sonar transmissions and to provide them additional protections during periods when they are conducting biologically significant activities. Thus, the primary focus of the OBIA mitigation measure is on LF hearing sensitive species. Two OBIAs have, however, been designated to provide additional mitigation protection for non-LF hearing specialists, such as elephant seals and sperm whales, since the available hearing data for these species indicate an increased sensitivity to LF sound (compared to most odontocetes and pinnipeds).

➢ *Biological Criteria for OBIA Eligibility*

In addition to meeting the geographical criteria, a marine area must also meet at least one of the following biological criteria to be considered as a marine mammal OBIA for SURTASS LFA sonar. When direct data relevant to one of the following biological criteria are limited, other available data and information may be used if those data and information, either alone or in combination with the limited direct data, are sufficient to establish that the biological criteria are met:

- *High Densities*: an area of high density for one or more species of marine mammals. High density areas are those marine waters where the density within a definable area (and potentially, time) measurably and meaningfully exceeds the average density of the species or stock within the region. The exact basis for the identification of "high density areas" may differ across species/stocks and regions, depending on the available information and should be evaluated on a stock-by-stock or species-by-species basis, although combining species or stocks may be appropriate in some situations. The best source of data for this determination is publically-available, direct measurements from survey data.
- *Known Breeding/Calving or Foraging Ground or Migration Route:* an area representing a location of known biologically important activities including defined breeding or calving areas, foraging grounds, or migration routes. Potential designation under this criterion is indicative that these areas are concentrated areas for at least one biologically important activity. For the purpose of the assessment, "concentrated" means that more of the animals are engaged in the particular behavior at the location (and perhaps time) than are typically engaged in that behavior elsewhere.
- *Small, Distinct Populations of Marine Mammals with Limited Distributions:* geographic areas in which small, distinct populations of marine mammals occur and whose distributional range are limited.
- *U.S. ESA-designated Critical Habitat for an ESA-listed Marine Mammal Species or Stocks:* areas designated as critical habitat under the ESA for listed marine mammal species. Effective seasonal periods are consistent with that designated for the critical habitat area. As with the other biological criteria, critical habitat is considered as one of the possible factors in the OBIA process, but designation as critical habitat does not necessarily comport with designation as an OBIA due to differences in the intent of these designations. Critical habitat is defined and used in the ESA and includes specific geographic areas that contain features essential to the conservation of an endangered or threatened species, including areas that are not currently occupied by the relevant species. However, the intent of OBIA designation is to expand upon the coastal standoff, and provide protection from potential SURTASS LFA sonar impacts by avoiding or minimizing impacts in areas beyond the coastal standoff distance where marine mammals are known to engage in specific behaviors that may lead to more severe impacts if interrupted; known to congregate in higher densities; and/or known to have a limited range and small abundance that creates more vulnerability for the stock as a whole.

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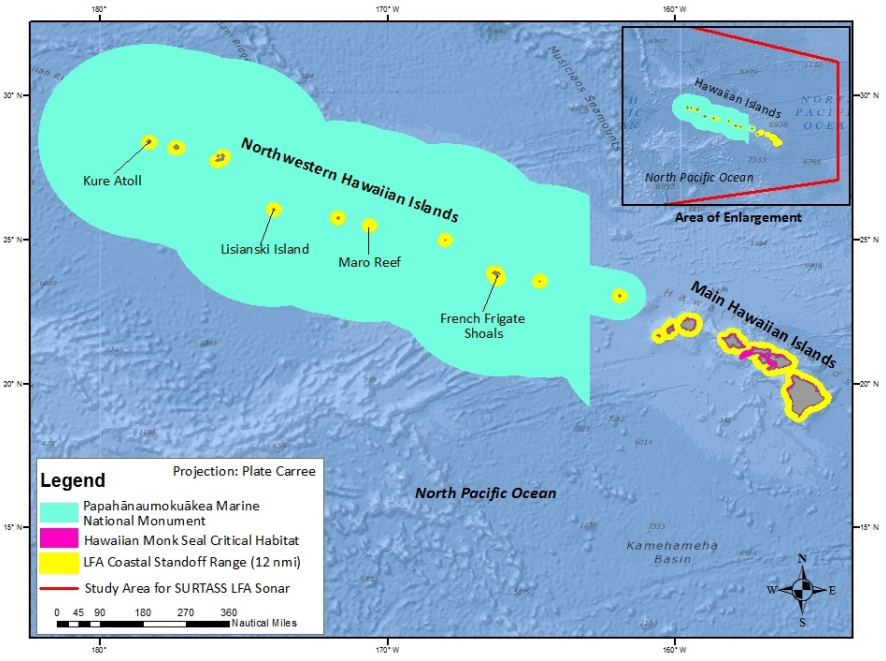
Marine Areas for Further Consideration—Areas That Preliminarily Meet Geographic Criteria and LF-Sensitivity Factor, and Appear to have Biological Relevance

Papahānaumokuākea Marine National Monument 1

MARINE REGION: Central North Pacific Ocean

COUNTRY: U.S.A.

SPECIES OF CONCERN: Humpback whale, Hawaiian monk seal, beaked whales



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☒ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☐ **EBSA**
- ☒ **U.S. Marine National Monument**
- ☒ **Hoyt Cetacean MPA**
- ☒ **U.S. MPA**
- ☒ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

The Papahanaumokuakea Marine National Monument (MNM) encompasses the Northwest Hawaiian Islands (NWHI). It is the largest contiguous fully protected conservation area under the U.S. flag, and one of the largest marine conservation areas in the world. It encompasses 439,916.13 nautical miles squared (nmi^2) (362,073 square kilometers (km^2)) of the central Pacific Ocean (National Ocean Service, 2017).

Many of the islands and shallow water environments are important habitats for rare species such as the endangered Hawaiian monk seal. ESA-designated critical habitat for the Hawaiian monk seal is

located in the nearshore waters of this MNM; all the critical habitat for the Hawaiian monk seal in the NWHI is located within the coastal standoff range for SURTASS LFA sonar.

Although previously it was assumed that humpback whales may migrate through the waters of the NWHI, visual and acoustic observations of humpback whales during winter in the NWHI indicate that these whales occur in these waters seasonally and may be relatively common (Johnson et al., 2007; Lammers et al., 2011, 2016). Johnson et al. (2007) modeled the available habitat in the NWHI and determined that the amount of shallow, warm-water habitat in the NWHI is almost double that available in the Main Hawaiian Islands (MHI). The sighting and acoustic data as well as the habitat suitability modeling indicate to researchers that the NWHI may be an important winter habitat for humpback whales and potentially may represent an unidentified breeding site. Current information and data are insufficient to determine whether the humpback whales occurring in the NWHI and MHI represent the same breeding stock (Bettridge et al.,2015; Lammers et al., 2011). Bettridge et al. (2015) proposed an alternative theory for the presence of humpback whales in the NWHI during winter: the breeding populations in the MHI have simply expanded their range to include the NWHI. Although the specific activity of humpbacks in the NWHI has yet to be fully ascertained, it does seem clear that the shallower habitat of the NWHI is seasonally important to the humpback whale.

NOTE: Another marine area in the NWHI is also under assessment as a potential marine mammal OBIA for SURTASS LFA sonar. Marine area #10, NWHI IMMA, encompasses much of the same geographic area with the same relevant marine mammal species.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside

Eligible Areal Extent: 433, 593.28 nmi^2 (1,487,183.34 km^2)

Source of Official Boundary: NOAA National Marine Sanctuaries System

Spatial File Type: GIS shapefiles

Spatial File Source: NOAA National Marine Sanctuaries System, <https://sanctuaries.noaa.gov/library/imast_gis.html>

Date Obtained/Created: 7/13/2018

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Humpback whale

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification

☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; enough data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles/Book Sections

Paper	*Synopsis*
Lammers M.O., & Munger L.M. (2016) From shrimp to whales: Biological applications of passive acoustic monitoring on a remote Pacific coral reef. Pages 61-81 in Au W., & Lammers M. (eds). *Listening in the ocean. Modern acoustics and signal processing.* New York, NY: Springer.	The authors analyzed passive acoustic monitoring (PAM) data from 2006 to 2009 at French Frigate Shoals (FFS) in the NWHI. Humpback whale songs were detected in December through April; occurrence was greater during 2008 to 2009 than 2006 to 2007, possibly reflecting an increase in whale density near FFS. The results also provide the first long-term record of minke whales in the NWHI and indicated that minke "boing" sounds were detected from late October, with one or two peaks in the December to March period; during March 2009, minke whale calls were present nearly every day.
Baumann-Pickering, S., Roch, M. A., Jr, R. L. B., Simonis, A. E., McDonald, M. A., Solsona-Berga, A., . . . Hildebrand, J. A. (2014). Spatio-temporal patterns of beaked whale echolocation signals in the North Pacific. *PLoS ONE, 9*(1), e86072. doi: 10.1371/journal.pone.0086072.	High-frequency acoustic recording packages (HARPs) were deployed multiple times across many geographic locations, and depths in the northeast Pacific, off southern California, and around the Northwest Pacific Islands. The highest relative daily presence for beaked whale signals occurred at Kingman Reef, followed closely by Perl & Hermes Reef and Wake Atoll. Moderate relative presence was found at the North Shore of Palmyra Atoll and Cross Seamounts off the HI Islands. Deraniyagala's beaked whales were detected every day nearby Kingman Reef.
Lammers, M. O., Fisher-Pool, P. I., Au, W. W. L., Meyer, C. G., Wong, K. B., & Brainard, R. E. (2011). Humpback whale *Megaptera novaeangliae* song reveals wintering activity in the Northwestern Hawaiian Islands. *Marine Ecology Progress Series, 423*, 261-268. doi:10.3354/meps08959.	Seven passive acoustic recorders were deployed in the NWHI and two recorders were deployed off Oahu in the MHI to record humpback whale songs as an indicator of winter breeding activity. Humpback whale songs were recorded at differing schedules from June 2008 through October 2009 at the nine sites, with humpback

	songs found to be prevalent at Maro Reef, Lisianski Island, and French Frigate Shoals but were also recorded at Kure, Midway, Pearl, and Hermes atolls in the NWHI. The timing and quantity of songs at several of the NWHI sites were consistent with those found in the breeding areas of the MHI. These data and trends suggested to the researchers that humpbacks use the NWHI as a wintering area.
Johnston, D.W., Chapla, M. E., Williams, L. E., & Matthila, D. K. (2007). Identification of humpback whale (*Megaptera novaeangliae*) wintering habitat in the Northwestern Hawaiian Islands using spatial habitat modeling. *Endangered Species Research, 3*, 249–257. doi:10.3354/esr00049.	This study consisted of spatial habitat modeling as well as visual and acoustic surveys to determine if the NWHI were a wintering spot for humpback whales, which were previously thought to only overwinter in the MHI. Humpback whales prefer warm, shallow regions in winter months, which has been linked to reproductive status and success. Central North Pacific humpback whales winter in the MHI with peak densities occurring in late March. This study conducted surveys from March 26 through April 12, 2007, cruising across the NWHI. During surveys, nine groups of humpbacks were detected visually. At least two of these groups had young calves present and three groups were engaged in activity consistent with breeding. Previous hypotheses were that the NWHI were used as a migratory corridor on way to wintering grounds in the MHI but migrating whales' movements are not generally restricted to shallow habitats such as those occupied during breeding periods. All observations were made in shallow regions at or within the 656-feet (ft) (200-meters (m)) isobath (shallow waters) despite considerable survey effort in deeper regions. Authors noted that no humpback whales were found at Ladd Seamount despite extensive surveys in that location. Further, results from satellite telemetry studies (Mate et al., 2007) showed that none of the tagged whales on the winter grounds in the MHI moved through the NWHI on their way back to summer foraging grounds. Instead, these whales moved either directly north or northeast toward the mainland U.S. after leaving Hawaii. Therefore, results from this study suggest that NWHI should now be considered wintering habitat for humpback whales. The authors also note that the amount of

	shallow, warm-water habitat in the NWHI is almost double that available in the MHI, indicating its importance as overwintering habitat.
Stewart, B. S., Antonelis, G. A., Baker, J. D., & Yochem, P. K. (2006). Foraging biogeography of Hawaiian monk seals in the Northwestern Hawaiian Islands. *Atoll Research Bulletin, 543*, 131-145.	Authors documented the geographic and vertical foraging patterns of 147 Hawaiian monk seals from all six NWHI breeding colonies (Kure, Midway, and Pearl & Hermes atolls, Lisianski, and Laysan islands, and French Frigate Shoals) from 1996 through 2002. The authors report that seals foraged extensively within barrier reefs of the atolls and on the leeward slopes of reefs and islands at all colony sites, with virtually all seals foraging within atoll lagoons or around island colonies where they were tagged. Seals also ranged away from these sites along the Hawaiian Islands Archipelago submarine ridge to most nearby seamounts and submerged reefs and banks. Overall, all seals remained within the US EEZ and in waters from the NWHI and exposed atolls out to 200 nmi (370 km) while foraging. Core foraging areas (i.e., 50% probability distributions) were generally centered over areas of high bathymetric relief (e.g., submerged banks, seamounts) or focal areas within atoll lagoons. When foraging around colonies, 95% of the locations were within 20.5 nmi (38 km) of the center of the atoll or island, except at French Frigate Shoals where the ranges for adult females extended up to 50 to 58 km. 75% of those locations were within 11 nmi (20 km) of the colony centers. Movement of seals among colonies is evidently limited (Harting et al., 2002). Consequently, each breeding colony has been considered to be a relatively distinct subpopulation.

Committee or Government Reports

Paper	*Synopsis*
Bettridge, S., Baker, C. S., Barlow, J., Clapham, P. J., Ford, M., Gouveia, D., Mattila, D. K., Pace, III, R. M., Rosel, P. E., Silber, G. K., & Wade, P. R. (2015). *Status review of the humpback whale (Megaptera novaeangliae) under the Endangered Species Act.* NOAA Technical Memorandum NOAA-TM-NMFS-	As part of the comprehensive review of the status of humpback whales as the basis for possible revisions under the ESA, all available information and data on humpback whales were compiled by the Humpback Biological Review Team. The team differentiated the global populations of humpback whales into 15 distinct population

SWFSC-540. La Jolla, CA: Southwest Fisheries Service, National Marine Fisheries Service.	segments (DPSs) based on the primary breeding location of the associated population. Descriptions of the breeding and foraging ranges of each DPS are included in the status review. The risk of each DPS for extinction was assessed as the subsequent basis for designation of each DPS's status under the ESA.
Stewart, B. S. (2004). *Geographic patterns of foraging dispersion of Hawaiian monk seals (Monachus schauinslandi) in the northwestern Hawaiian Islands.* NMFS-PIFSC Administrative Report H-04-05C. Pacific Islands Fishery Science Center, National Marine Fisheries Service. 25 pages.	This report provides results of recent research efforts to ascertain the habitat use and foraging ecology of Hawaiian monk seals in the NWHI. From 1996 through 2002, the movements and dive patterns of 147 Hawaiian monk seals were monitored for several months or more with data-recording, satellite-linked radio transmitters. Seals foraged extensively within the fringing atoll lagoons at French Frigate Shoals, Pearl and Hermes Reef, Midway Atoll, and Kure Atoll, and on the outer slopes of these atolls and seaward of Laysan and Lisianski Island. Seals also ranged to and evidently foraged along the submarine ridges between those atolls and island and nearby seamounts.
Stewart, B.S., & Yochem, P.K. (2004). *Use of marine habitat by Hawaiian monk seals (Monachus schauinslandii) from Laysan Island: Satellite-linked monitoring in 2001-2002*. NMFS Pacific Island Fisheries Science Center, Administrative Report H-04-02C. 131 pages.	This report presents the results of studies conducted at Laysan Island, on the second largest colony of Hawaiian monk seals, at 250 to 300 seals, from October 2001 through September 2002 to define the general geographic and vertical marine habitats used by seals when foraging. Thirty seals were captured between October 6 and 17, 2001 for biomedical sampling and deployment of tracking instrumentation. Twenty (67%) of all seals traveled to and spent substantial time foraging at Maro Reef. Ten seals traveled as far as Raita Bank to forage, including three pups. Twelve seals also foraged around the Northampton Seamounts. Over one million maximum depth dives were recorded, indicating that most dives were shallower than 40 m, though there were clearly secondary deeper modes at 60 to 80 m for juveniles and weaned pups; 120 to 140 m for adult females and weaned pups; and 250 to 350 m for adult females and juveniles.

Websites / Social Media

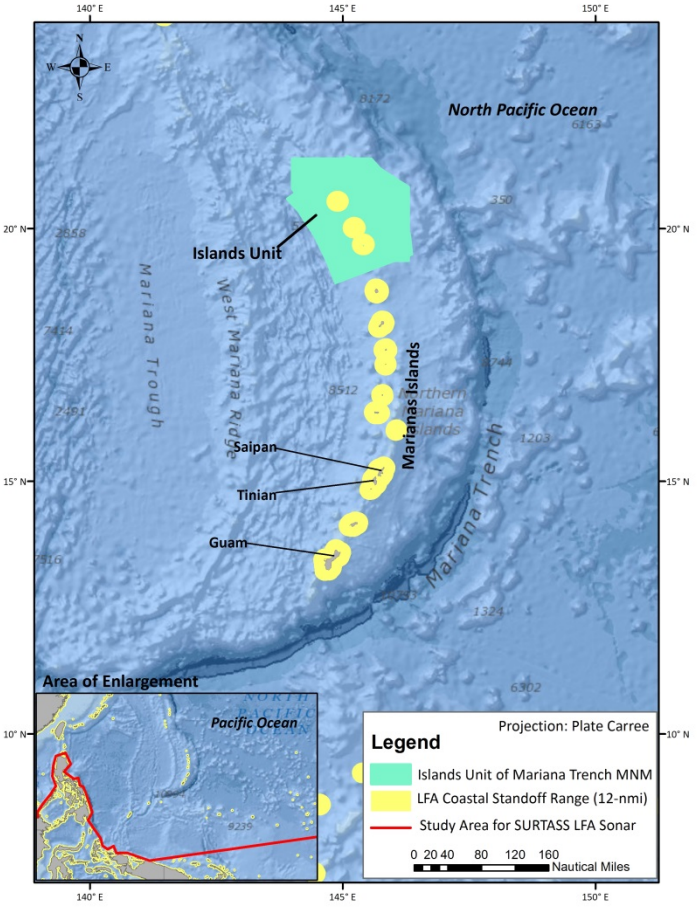
Website/Organization	*Synopsis*
National Ocean Service. (2017). *About Papahānaumokuākea Marine National Monument*. National Marine Sanctuaries Office, National Oceanic and Atmospheric Administration. Retrieved from <https://www.papahanaumokuakea.gov/new-about/>.	This website presents the basic information about the Papahanaumokuakea Marine National Monument, including the monument's vision, mission, history, and management.

Marianas Trench Marine National Monument (Islands Unit) 2

MARINE REGION: Western North Pacific Ocean

COUNTRY: U.S.A.

SPECIES OF CONCERN: Humpback, common minke, Bryde's, sei, sperm, short-finned pilot, and beaked whales



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☒ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☐ **EBSA**
- ☒ **U.S. Marine National Monument**
- ☒ **Hoyt Cetacean MPA**
- ☒ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

The Marianas Trench MNM is comprised of three units: Islands Unit, Volcanic Unit/Arc of Fire Refuge, and Trench Unit/Refuge. The Volcanic Unit/Arc of Fire Refuge and Trench Unit/Refuge include only submerged lands but not the waters above the seafloor while the Island Unit includes both submerged lands and the marine waters above the seafloor. The Volcanic Unit/Arc of Fire Refuge includes the submerged lands within 1 nmi (1.9 km) of 21 designated volcanic sites, while the Trench Unit/Refuge encompasses the submerged lands extending from the northern limit of the Exclusive Economic Zone (EEZ) in the Commonwealth of the Northern Mariana Islands (CNMI) to the southern limit of the EEZ of the U.S. in the Territory of Guam. The Islands Unit includes the waters and submerged lands of the three northernmost Mariana Islands of Farallon de Pajaros (also known as Uracus), Maug, and Asuncion. Although the waters surrounding the Mariana MNM and Mariana Islands were considered herein, only the boundary of the MNM's Islands Unit's surface waters is shown here.

Several studies have documented marine mammal behaviors associated with breeding and have observed cow-calf pairs and young-of-the-year calves of humpback, sperm, Bryde's, and sei whales;

some of calves appeared to have been recently birthed as the umbilicus was still attached (Fulling et al. 2011; Hill et al. 2015, 2017). Humpback whales were detected acoustically by their song during the winter to spring surveys reported by Fulling et al. (2011) in the waters of Guam and the CNMIs. Humpback were only rarely sighted off Saipan but were engaged in social behaviors that have been frequently observed on humpback breeding grounds elsewhere. Humpbacks exhibited acoustic singing displays, another behavior commonly exhibited on breeding and feeding grounds (Fulling et al. 2011). Cow-calf pairs of sperm, sei, and Bryde's whales were sighted during the Mariana's surveys, which had also been documented in previous studies in these waters (Navy, 2005; Shimada and Miyashita, 2001; and Eldredge, 2003). The presence of reproductive behavior and mother-calf pairs suggests that breeding may be occurring in these waters. Sightings of sperm, beaked, and Bryde's whales were associated with areas of steep bathymetric relief.

NMFS's Pacific Islands Fisheries Science Center's (PIFSC) Cetacean Research Program (CRP), in partnership with the Navy's U.S. Pacific Fleet Environmental Readiness Division, has been conducting visual surveys and long-term acoustic monitoring for cetaceans in the waters surrounding Guam and the CNMI (Saipan and Tinian) since 2010. These principally coastal, small boat surveys are conducted annually, weather permitting, in winter (February to March) and summer (August to September). One goal of the winter surveys is to document the presence of humpback whales in these waters during their seasonal migration. Mother-calf pairs of humpback whales have been observed in the winter surveys, with the calves clearly identified as neonates (young-of-the-year). The repeated presence of humpback mother-calf pairs in the waters of the southern Marianas Archipelago suggests to the scientists of the PIFSC that this area may be important breeding/calving habitat for humpback whales.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside (nearly entire Islands Unit outside CSR)

Eligible Areal Extent: 15,097.67 nmi^2 (51,783.57 km^2)

Source of Official Boundary: World Database on Protected Areas (UN EP and IUCN)

Spatial File Type: GIS shapefile

Spatial File Source: World Database on Protected Areas, <https://www.protectedplanet.net/400010>

Date Obtained/Created: 8/6/2018

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Humpback, common minke, Bryde's, sei, and sperm whales

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification (humpback whales)
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification (humpback whales)
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round
☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Hill, M. C., Bendlin, A. R., Cise, A. M. V., Milette-Winfree, A., Ligon, A. D., Ü, A. C., . . . Oleson, E. M. (2018). Short-finned pilot whales (*Globicephala macrorhynchus*) of the Mariana Archipelago: Individual affiliations, movements, and spatial use. *Marine Mammal Science, 9999*(9999), 1-28. doi:10.1111/mms.12567.	To expand understanding of short-finned pilot whale ecology in the region, the authors conducted small-boat surveys from 2010 to 2016 within the Marina Archipelago (Guam and CNMIs) and investigated their individual associations, movement, spatial use, and dive behavior. The area with the highest probability of use by short-finned pilot whales was off the northwest side of Guam extending north to Rota Bank (area encompassing 193.9 nmi^2 [665 km^2]). Satellite tag data also suggests that some individuals are island-associated year-round and demonstrate site fidelity. Satellite tag data indicate that short-finned pilot whales are primarily using near-island waters (median distance from shore 7.2 nmi [13.4 km]), despite occasional distant offshore movements up to >216 nmi (400 km) from shore.
Norris, T. F., Dunleavy, K. J., Yack, T. M., & Ferguson, E. L. (2017). Estimation of minke whale abundance from an acoustic line transect survey of the Mariana Islands. *Marine Mammal Science, 33*(2), 574-592. doi:10.1111/mms.12397.	In the North Pacific Ocean, common minke whales produce a distinctive sound known as a "boing". Although commonly occurring in most oceanic waters, minke whales are rarely observe in subtropical waters. A vessel-based survey using both visual and passive acoustic monitoring was conducted during the spring of 2007 over a large (179,596.86 nmi^2 [616,000 km^2]) area that encompassed the Mariana Islands. Line transect methods were applied to data collected from a towed hydrophone array to estimate the abundance of calling minke whales in the study

	area. Although no minke whales were sighted, hundreds of acoustic "boing" detections were recorded. Analysis of these acoustic data resulted in two best abundance estimates of 80 and 91 minke whales (0.13 and 0.15 animals per 1,000 km^2, respectively; CV = 34 percent). Since not all minke whales in an area vocalize, these abundance estimates are considered minimum estimates of the true number of actual minke whales in the area and additionally represent the first abundance estimates made from towed hydrophone data.
Fulling, G. L., Thorson, P. H., & Rivers, J. (2011). Distribution and abundance estimates for cetaceans in the waters off Guam and the Commonwealth of the Northern Mariana Islands. *Pacific Science, 65*(3), 321-343. doi:10.2984/65.3.321.	This was the first line-transect visual survey in the waters of Guam and the CNMI, conducted during January to April 2007. Trackline coverage (5,957 nmi [11,033 km]) was dominated by high seas, but 13 cetacean species were recorded. The sperm whale was most frequently encountered whale, followed by Bryde's and sei whales. Pantropical spotted dolphins were the most frequently encountered delphinid, followed by striped dolphins and false killer whales. Numerous cetacean sightings were associated with steep bathymetric features including the West Mariana Ridge, the Mariana Ridge, and the Mariana Trench. Although no calves were seen, humpback whales were sighted 8 nmi (15 km) off Saipan engaged in social behaviors frequently observed on the breeding grounds of the species. Humpbacks were also acoustically detected by their song, which is commonly heard on breeding and feeding grounds. There were several sightings of cow-calf pairs of sperm whales, sei whales, and Bryde's whales, which had also been documented in previous studies (Navy, 2005; Shimada and Miyashita, 2001; and Eldredge, 2003). Sperm whales were found to be associated with areas near steep bathymetric relief; sei and Bryde's whales were seen near underwater ridges and in an area between the Chamorro seamounts and the start of the Caroline Ridge; two of the three sightings of beaked whales occurred over the northern end of the west Mariana Ridge near a few unnamed sea mounts; and there were

	several sightings of delphinids near slopes and seamounts.

Committee or Government Reports

Paper	*Synopsis*
Hill, M.C., Bradford, A.L., Ligon, A.D., Ü, A.C., & Oleson, E.M. (2018). Cetacean monitoring in the Mariana Islands range complex, 2017. Prepared for the U.S. Pacific Fleet Environmental Readiness Office. PIFSC Data Report DR-18-002. 28 pages.	The NMFS's Pacific Islands Fisheries Science Center's (PIFSC) Cetacean Research Program (CRP) in partnership with the Navy's U.S. Pacific Fleet Environmental Readiness Division has been conducting visual surveys for cetaceans in the waters surrounding Guam and the CNMI as part of an ongoing effort to develop a record of cetacean occurrence in the region and to comply with cetacean monitoring conditions of the Navy's LOA for the Mariana Islands Testing and Training (MITT) area. Visual surveys have been conducted aboard small boats 24.9 to 40 ft (7.6 to 12.2 m) since 2010 off the southernmost islands of the Mariana Archipelago (Guam, Rota, Saipan, Tinian, and Aguijan). These surveys include the collection of photographs for individual identification, tissue samples for genetic analysis of population structure, and the deployment of satellite tags for assessment of individual movements throughout the broader region. This report includes a summary of the most recent visual surveys that were conducted in the "winter" (February) and "summer" (May) of 2017. Encounter rates during the May surveys were lower than in previous years perhaps due to the higher sea states encountered (81 percent of survey effort in Beaufort sea states 4 to 5). Beaked whales (Blainville's, Cuvier's, and one unidentified) were observed during the May visual and acoustic surveys. Spinner dolphins were the most frequently encountered species during the May 2017 visual surveys but were also encountered during the February surveys, suggesting that they occur year-round. The surveys were conducted in February to coincide with potential seasonal occurrences of baleen whales in these waters based on previous survey data. Humpback whales were encountered at a similar rate to the previous two survey years, but more adult humpbacks were present during the February 2017 survey. One

Bryde's whale was observed during the May survey. The only baleen whales observed during all years of the small boat visual surveys have been humpback and Bryde's whales.

Hill, M.C., Bendlin, A.R., Ü, A.C., Yano, K.M., Bradford, A.L., Ligon, A.D. & Oleson, E.M. (2017). Cetacean monitoring in the Mariana Islands range complex, 2016. Prepared for the U.S. Pacific Fleet Environmental Readiness Office. PIFSC Data Report DR-17-002. 46 pages. doi:10.7289/V5/DR-PIFSC-17-002.

Since 2010, NMFS's PIFSC has been conducting visual surveys in waters surrounding Guam and the CNMI in partnership with the Navy's Pacific Fleet, which is mandated to monitor cetaceans within the MITT study area.

Specific locations of greater relative cetacean abundance cannot be addressed, but habitat use (depth and distance from shore) and encounter rates reveal varying patterns for species occurring around Guam, Rota, Saipan, Tinian, and Agujan. Patterns of habitat use by some odontocetes (e.g., spinner dolphins, pantropical spotted dolphins, bottlenose dolphins, and short-finned pilot whales) were similar to those described previously (Hill et al., 2014, 2015, 2016), while new information emerged for rough toothed dolphins, dwarf sperm whales, and sperm whales.

Information suggests spinner dolphins may use the area year-round and most encounters were on Marpi Reef. Pantropical spotted dolphins were encountered more off Guam than other islands and varied broadly in location from shore 1 to 18.6 nmi (1.9 to 15.9 km). Short-finned pilot whales were encountered at distances of 1.5 to 4.6 nmi (2.7 to 8.5 km) off the west side of Guam similar to previous years. Satellite tag data indicate greater use of nearshore areas off Guam with an overall median distance from shore of 8.6 km for this species. Rough-toothed dolphin encounter rates mirrored previous studies averaging 3.7 nmi (6.8 km) from shore. Dwarf sperm whales were encountered for the first-time off Guam and were seen four times (two of these encounters were the same mother-calf pair). Encounters indicated potential preference for the area near Agat Bay. Encounters ranged from 0.9 to 2.1 nmi (1.6 to 3.8 km) from shore. Sperm whales were encountered off Saipan and Guam where they had been encountered in previous years, but tag data from two sperm whales showed travel distances of up to 59 nmi (110 km) offshore and up to 13,976 ft (4,260 m)

	in depth. Surveys were conducted in March 2016 to coincide with known seasonal occurrence of humpback whales off Saipan and Tinian based on 2015 survey work. Five mother-calf pairs were encountered, and all calves were clearly neonates. Four mother-calf pairs were observed in 2015, and one of the mothers was a re-sighting from 2007, suggesting site fidelity and that the Marianas may be a calving area. This could be important if these whales are part of the North Pacific humpback population. During 2010 through 2012, recordings off Saipan and Tinian detected other baleen whales (blue, fin, and minke); however, no other baleen whales were observed in 2016.
U.S. Fish and Wildlife Service. (2017). Final environmental assessment, finding of no significant impact, memorandum of agreement, and patent for the Marianas Trench Marine National Monument Northern Lands Transfer to the Commonwealth of the Northern Mariana Islands. Pacific Region, Portland, OR. 126 pages.	ESA-listed marine mammals that may occur in the Mariana Archipelago are the sperm, humpback, sei, blue, and fin whales. Several other non-ESA-listed marine mammals have been recorded in the Mariana Archipelago, including short-finned pilot, pygmy killer, Bryde's, Cuvier's beaked, melon-headed, pygmy sperm, and dwarf sperm whales, as well as several dolphin species. Only a limited number of marine mammal surveys have been conducted in the Mariana Archipelago. One of the first, and most complete, was funded by the Department of Defense (DoD), and was conducted from January to April 2007 covering 6,850 miles (11,033 km) of trackline. This study documented 153 sightings of 13 different marine mammal species. The most frequently sighted species was the sperm whale (n=23), followed by Bryde's whale (n=18), and sei whale (n=16) (Fulling et al., 2007). Subsequent to the 2007 surveys, both the Navy and NMFS's Pacific Island Fishery Science Center (PIFSC) have conducted numerous surveys around Guam and CNMI. Ninety-five cetacean groups have been documented. The most common cetacean species recorded was the spinner dolphin (55 percent of total encounters). The next most common species was the pantropical spotted dolphin, short-finned pilot whales, and bottlenose dolphins.
Hill, M.C., Oleson, E.M., Baumann-Pickering, S.,	NMFS's PIFSC Cetacean Research Program

VanCise, A.M., Ligon, A.M., Bendlin, A.R., Ü, A.C., Trickey, J.S., & Bradford, A.L. (2016). Cetacean monitoring in the Mariana Islands range complex, 2015. Prepared for the U.S. Pacific Fleet Environmental Readiness Office. PIFSC Data Report DR-16-01. 36 pages.

conducted visual surveys and long-term acoustic monitoring in waters surrounding Guam and the CNMI in partnership with the Navy's Pacific Fleet. Visual surveys including satellite-tagging, photo-IDing, and biopsy darting, were conducted in winter (February to March) and summer (August to September) 2015 from small boats (24.9 to 40 ft [7.6 to 12.2 m]) in the waters of the southern islands of Guam, Rota, Saipan, Tinian, and Agujan. PISFC has additionally been collecting long-term passive acoustic data using HARPs at two sites near Tinian and Saipan since 2010. The report describes the beaked whale acoustic data collected from the passive acoustic monitoring, but analysis of the baleen whale data was not yet completed.

The winter surveys targeted humpback whales specifically, which from previous sighting information were known to occur in these waters seasonally during winter. The summer surveys were broader in scope, focusing on capturing the entire cetacean faunal assembly. No surveys were conducted around Saipan during the summer due to destruction caused by a typhoon.

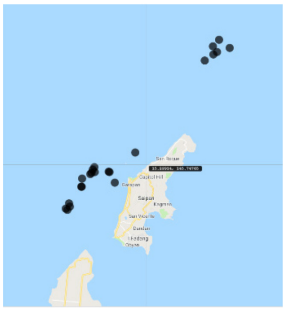
At the Saipan HARP location, acoustic signals from both Blainville's and Cuvier beaked whales were identified as well as a third signal, possibly from a ginkgo-toothed beaked whale. Only Blainville's beaked whale signals with one signal possibly from a ginkgo-toothed beaked whale were detected at the Tinian site. No diel variability was noted in the Cuvier or Blainville's signals, but the possible ginkgo-toothed signal only occurred at night.

During the summer surveys, only one group of Blainville's beaked whales was observed. Spinner dolphins were the most commonly sighted cetacean in all survey years, but during the summer 2015 surveys, pantropical spotted dolphins were more frequently encountered. The same group of pygmy killer whales was observed off Guam. Tagging data of a false killer whale in the CNMIs indicated that the population of false killer whales in the Mariana Islands may be transient.

Four mother-calf pairs of humpback whales were

	observed during the winter surveys, with the calves being identified as young-of-the-year, suggesting that the Mariana Islands may be a breeding site for humpback whales. One Bryde's whale was observed in the southernmost part of the Mariana's archipelago.

Surveys

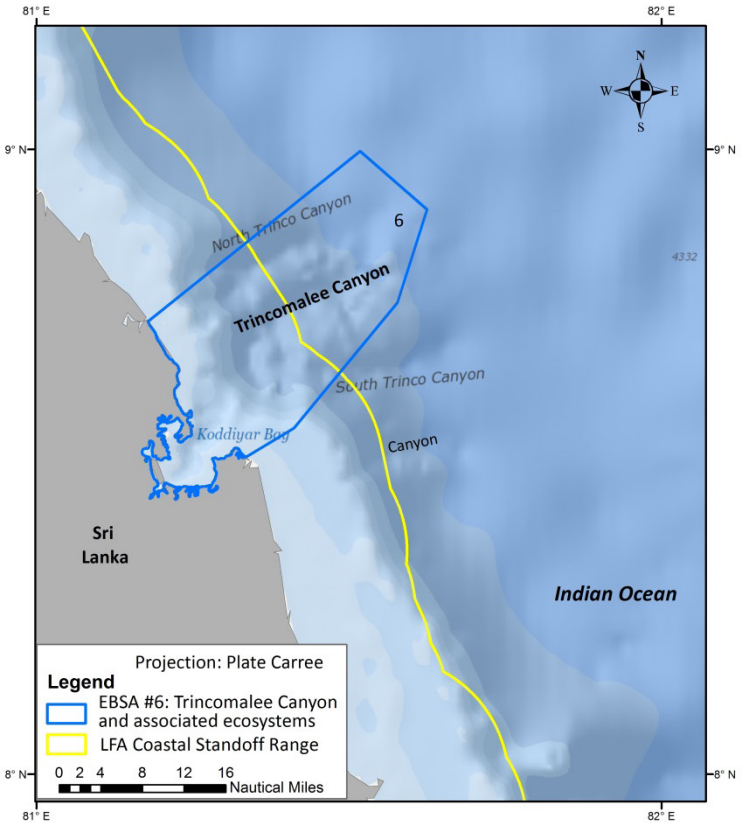
Paper	*Synopsis*
Hill, M.C. (2018). Personal communication between Dr. M.C. Hill, Cetacean Research Program, NMFS and Mr. D. Youngkin, Office of Protected Resources, NMFS regarding humpback whale mother-calf data, Marianas Islands. November 14, 2018.	Mother-calf locational data for Saipan and Tinian waters from 2015 to 2018. 
Hill, M.C., Bradford, A.L., Ligon, A.D., Ü, A.C., & Oleson, E.M. (2018). Cetacean monitoring in the Mariana Islands range complex, 2017. Prepared for the U.S. Pacific Fleet Environmental Readiness Office. PIFSC Data Report DR-18-002. 28 pages.	See summary above.
Hill, M.C., Bendlin, A.R., Ü, A.C., Yano, K.M., Bradford, A.L., Ligon, A.D. & Oleson, E.M. (2017). Cetacean monitoring in the Mariana Islands range complex, 2016. Prepared for the U.S. Pacific Fleet Environmental Readiness Office. PIFSC Data Report DR-17-002. 46 pages. doi:10.7289/V5/DR-PIFSC-17-002.	See summary above.
Hill, M.C., Oleson, E.M., Baumann-Pickering, S., VanCise, A.M., Ligon, A.M., Bendlin, A.R., Ü, A.C., Trickey, J.S., & Bradford, A.L. (2016). Cetacean monitoring in the Mariana Islands range complex, 2015. Prepared for the U.S. Pacific Fleet Environmental Readiness Office. PIFSC Data Report DR-16-01. 36 pages.	See summary above.

Trincomalee Canyon and Associated Ecosystems 3

MARINE REGION: Northeast Indian Ocean

COUNTRY: Sri Lanka

SPECIES OF CONCERN: Blue (pygmy) and sperm whales



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☒ **EBSA** (NEIO #6)
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

The Trincomalee area consists of a complex of multiple submarine canyons, of which the Trincomalee Canyon is the largest. Trincomalee Canyon is one of the 20 largest submarine canyons in the world. The Mahaweli River, the largest in Sri Lanka, flows into the Trincomalee Canyon complex, increasing the nutrient concentrations of the regional waters. The Trincomalee Canyon extends about 21.6 nmi (40 km) and is as deep as 8,202 ft (2,500 m) (UNEP CBD, 2017). Virtually no information is available about the offshore pelagic environment of the Trincomalee region (UNEP CBD, 2017). Moors-Murphy (2014) has shown that canyon habitat such as that of the Trincomalee Canyon Complex are important cetacean habitat areas. The Trincomalee Canyon EBSA principally encompasses the entirety of the Trincomalee Canyon.

High concentrations of cetaceans, including sperm and pygmy blue whales, have been reported in the waters of this EBSA (Alling et al., 1991; Nanayakkara et al., 2014). A total of 11 species of cetaceans have been identified in the area, including the two mysticetes species: blue and Bryde's whales, and nine species of odontocete species: sperm, killer, dwarf sperm, Longman's beaked, false killer whales as well as rough-toothed, common bottlenose, striped, and spinner dolphins (Nanayakakra et al., 2014).

Pygmy blue whales principally occur in the region from November through April, with peak occurrences in December to January and March to April, periods that coincide with monsoon seasons and are when blue whales are thought to be migrating through the canyon waters from the northwestern or western Indian Ocean eastward in November and returning westward in late spring (de Vos, 2016; di Silva Wijeyeyeratne, 2007). Blue whales have been observed diving and foraging in the waters of the canyon complex (Ailing et al., 1991; Sri Lanka Whales Watching, 2015; Taylor, 2018). The migrational patterns of pygmy blue whales in the Northern Indian Ocean are not well understood or documented, but occurrence records indicate no Antarctic migration (Branch et al., 2007). Anderson et al., (2012) hypothesized that pygmy blue whales in the Northern Indian Ocean migrate east-and-west, with seasonal movements triggered by the advent of the southwest (from about May to October) and northeast (December to March) monsoon seasons.

Fewer records of sperm whales are available in the region (Sathasivam, 2000), but sperm whales are present in the waters of the canyon complex in the same seasonal time frame as blue whales, from about October/November through April (Ilangakoon, 2012). Gordon (1987) reported that the frequent sightings in Sri Lankan waters of large groups of female sperm whales and calves may be indicative of Sri Lankan waters being an important calving ground as well as foraging area for sperm whales. Although Bryde's whales occur in these waters, no information is available that indicate the area to be significant to the species or that important biological activities occur in this region (Ilangakoon, 2012).

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside

Eligible Areal Extent: 203.92 nmi^2 (699.41 km^2)

Source of Official Boundary: UNEP Convention of Biological Diversity

Spatial File Type: GIS shapefile

Spatial File Source: UNEP Convention of Biological Diversity
(/api/v2013/documents/996BAA02-58AE-4781-9B20-D92BC79672B0/attachments/NEIO_6_EBSA.zip)

Date Obtained/Created: 5/7/18

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Blue (pygmy) and sperm whales

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification (for blue whales)
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

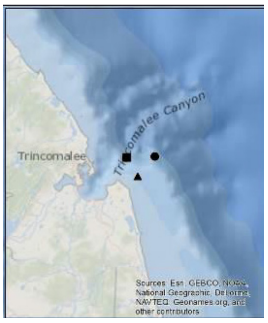
Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

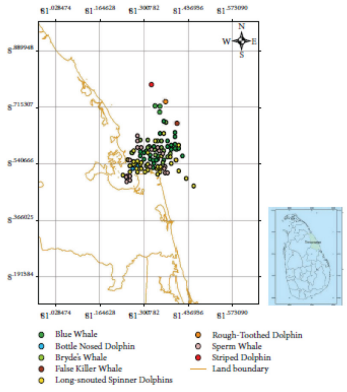
☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
de Vos, A. (2016). 27 years: The longest longevity and residency record for northern Indian Ocean blue whales. *TAPROBANICA, 8*(1), 21-23. 	de Vos noted that blue whales in Sri Lankan waters are considered pygmy blue whales and that some of the blue whales observed may remain resident year-round. Principally this paper describes the photographic matches of 3 blue whale sightings in a small area in the Trincomalee Canyon vicinity over 27 years (see map to left for sighting locations). The 3 sightings (2 of which were on consecutive days in 1984) were in March and April. DeVos concludes that these sightings represent the longest recorded sighting interval and longevity record for this subpopulation of pygmy blue whales.
Moors-Murphy, H.B. (2014). Submarine canyons as important habitat for cetaceans, with special reference to the Gully: A review. *Deep Sea Research II 104*, 6-19.	In this summary of the importance of canyon habitat to cetaceans, Moors-Murphy cites the records of Gordon (1991) of high concentrations of sperm whales at the mouth of Trincomalee Canyon and Ailing et al. (1991) reports of blue whale concentrations in the canyon waters during their surveys as examples of the association of cetaceans with canyon habitat.

Nanayakkara, R.P., Herath, J., & de Mel, R.K (2014). Cetacean presence in the Trincomalee Bay and adjacent waters, Sri Lanka. *Journal of Marine Biology, 2014 (*Article ID 819263). Hindawi Publishing Corporation.



Boat surveys of the waters of Trincomalee Bay and its adjacent waters were conducted over 19 months. Eleven cetacean species were observed: blue, Bryde's, sperm, killer, dwarf sperm, Longman's beaked, and false killer whales, as well as rough-toothed, common bottlenose, striped, and spinner dolphins. Spinner dolphins were the most abundant and regularly observed species, but blue whales were the next most numerous species of marine mammal observed. Most sightings were located in the waters of the CSR (see map insert of sightings in Trincomalee Canyon area) as the transect survey lines only went 10 nmi from the mouth of the bay; some sightings of blue, sperm, and Bryde's whales were located just offshore of the CSR limit. The authors noted that the highest abundances of marine mammals were observed at the beginning of the two monsoon seasons: Southwest monsoon season (May–September) and Northeast monsoon (December–February).

Anderson, R.C., Branch, T.A., Alagiyawadu, A., Baldwin, R., & Marsac, F. (2012). Seasonal distribution, movements and taxonomic status of blue whales (*Balaenoptera musculus*) in the northern Indian Ocean. *Journal of Cetacean Research and Management, 12*(2), 203-218.

Using all available blue whale occurrence data (sightings, strandings, acoustic detections, and whaling catches) from the Northern Indian Ocean, the authors developed a hypothesis about the east-and-west migrational patterns of blue/pygmy blue whales in the Northern Indian Ocean. Triggered by the advent of the southwest (from about May to October) and northeast (December to March) monsoon seasons that result in intense upwelling in the Arabian Sea off the coasts of Somalia and the Arabian peninsula or off eastern Sri Lanka, west of the Maldives, the vicinity of the Indus Canyon, and some parts of the southern Indian Ocean, respectively, blue whale seasonal movement patterns are east and west.

Ilangakoon, A.D. (2012). A review of cetacean research and conservation in Sri Lanka. *Journal of Cetacean Research and Management, 12*(2), 177–183.

Spinner dolphins are the most common marine mammals in Sri Lankan waters, including the Trincomalee Canyon region, while blue and Bryde's whales are the most common and widely distributed baleen whales in Sri Lankan waters. Blue and sperm whales near Trincomalee Canyon were first observed in abundance in the early 1980s. Sperm whales are thought to occur abundantly in the Trincomalee Canyon area since

	deep waters approach close to land.
Branch, T. A., Stafford, K. M., Palacios, D. M., Allison, C., Bannister, J. L., Burton, C. L. K., . . . Warneke, R. M. (2007). Past and present distribution, densities and movements of blue whales *Balaenoptera musculus* in the Southern Hemisphere and northern Indian Ocean. *Mammal Review, 37*(2), 116-175.	Records of blue whale stranding or sightings in the Trincomalee Canyon area are reported beginning with the first recorded in 1932. General Sri Lankan distributional information listed but nothing specific to the Trincomalee region.

Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
di Silva Wijeyeyeratne, G. (2007). *Sri Lankan wildlife: A visitor's guide*. Bucks, England: Brandt Travel Guides, Ltd.	Noted that blue and sperm whales can be observed in the waters of Trincomalee Canyon/Bay, with blue whales occurring in these waters during what is understood to be migrational movements from the Arabian Sea eastwards in December and return westerly movements in April.
Sathasivam, K. (2000). A catalogue of Indian marine mammal records. Blackbuck 16(2 and 3). Retrieved from <https://www.cbd.int/doc/meetings/mar/ebsaws-2015-01/other/ebsaws-2015-01-gobi-submission5-en.pdf>.	Lists first records of sperm, blue, and Bryde's whale in the Trincomalee Canyon area, all from the early 1980s.
Alling, A., Dorsey, E.M., & Gordon, J.C.D. (1991). Blue whales *(Balaenoptera musculus)* off the northeast coast of Sri Lanka: Distribution, feeding and individual identification. *UNEP Marine Mammal Technical Report, 3*, 247-258.	Blue whale acoustic and sighting records detected during 1983 and 1984 surveys of the NE Sri Lankan waters, including the Trincomalee Canyon area. Photographs were taken, and dive information was recorded from depth recorders. Conclusions about seasonality in Sri Lankan waters and notes that migration to other waters likely during remainder of year.

Committee or Government Reports

Paper	*Synopsis*
United Nations Environmental Programme (UNEP) Center for Biological Diversity (CBD). (2017). Ecologically or biologically significant areas: Trincomalee Canyon and associated ecosystems. Retrieved from <https://chm.cbd.int/pdf/documents/marineEbsa/237766/1>.	Overview of EBSA information collected on this area along with the criteria for designation. This area is important to threatened, endangered, or declining species and/or habitat due to the occurrence of 11 cetacean species (species listed in Area Overview), including two baleen whales and the sperm whale.
Gordon, J.C.D. (1987). Sperm whale groups and	Surveys of Sri Lankan waters in 1983 and 1984 to

social behaviour observed off Sri Lanka. *Reports of the International Whaling Commission 37*, 205–17.	document sperm whale behavior resulted in the detection of varying sized groups composed principally of mature females and calves. Foraging behavior was exhibited more often by smaller groups while social interactions were more common in larger groups. Gordon speculated that the higher than expected calf to adult ratio may be either indicative of the norm, meaning that calf-adult ratios in more well studied areas were only representative of exploited populations of that Sri Lankan waters were an important nursery ground.

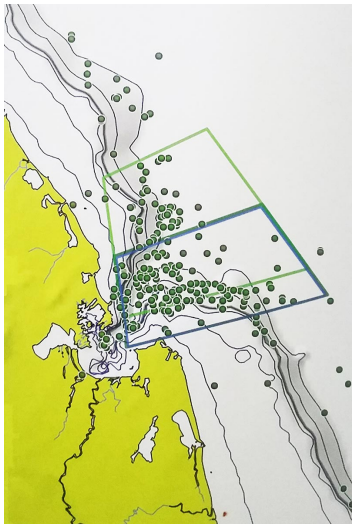
Surveys

Paper	*Synopsis*
Nanayakkara, R.P., Herath, J., & de Mel, R.K (2014). Cetacean presence in the Trincomalee Bay and adjacent waters, Sri Lanka. *Journal of Marine Biology, 2014 (*Article ID 819263). Hindawi Publishing Corporation.	See summary above.
Alling, A., Dorsey, E.M., & Gordon, J.C.D. (1991). Blue whales *(Balaenoptera musculus)* off the northeast coast of Sri Lanka: Distribution, feeding and individual identification. *UNEP Marine Mammal Technical Report, 3*, 247-258.	See summary above.

Websites / Social Media

Website/Organization	*Synopsis*
Taylor, C. (2018). 'Fantastic beasts'–Marine mammals on the loose. Blue Lanka Tours blog. Retrieved from <https://www.bluelankatours.com/blog/fantastic-beasts-marine-mammals-on-the-loose-they-are-coming-for-you>.	Blue Lanka Tours sponsors whale watching trips to two Sri Lanka locations, one of which is Trincomalee Canyon. The author notes that blue whales can reliably be observed in these waters in March through April, with the most optimal sighting time being the first two weeks of March, when the whales are most abundant.

Sri Lanka Whales Watching. (2015). Getting the best out of your marine mammal encounters. Retrieved from <http://www.srilanka whaleswatching.com/getting-the-best-out-of-your-marine-mammal-encounters/#comment-2>.



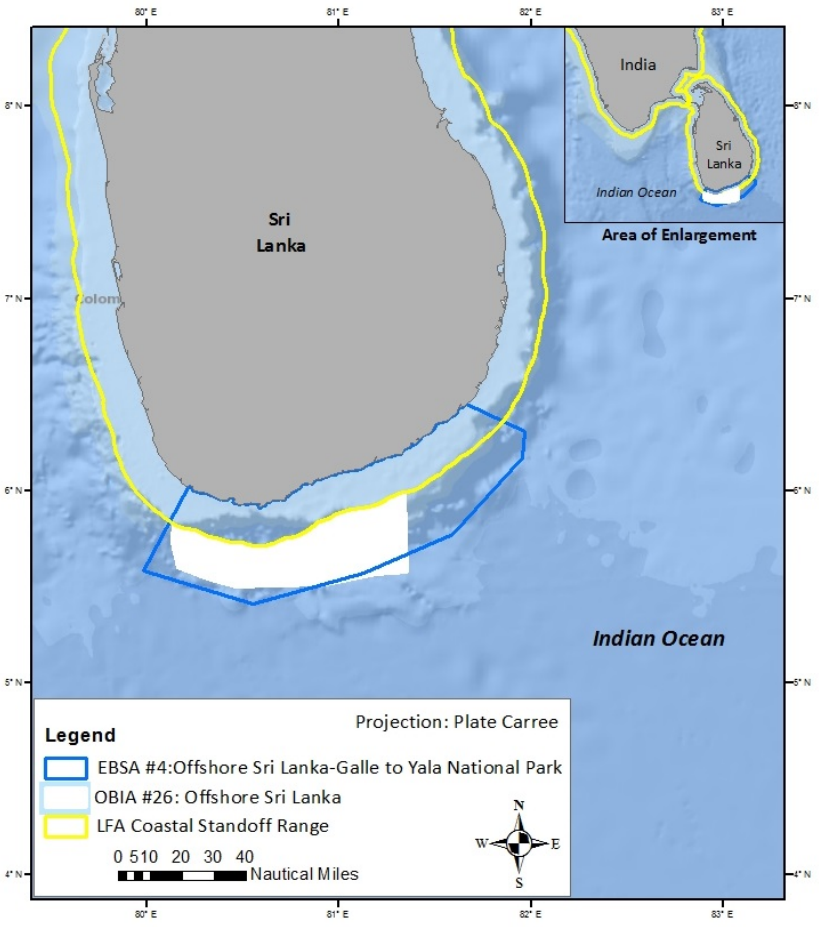
This whale watching company describes the best times of year to observe specific marine mammals in the Trincomalee Canyon area and less than 12 nmi from shore. March to April is the best time of the year to see beaked whales and the largest aggregations of Bryde's whales; blue whales and sperm are present in largest numbers between October and April; orcas are most frequently spotted in September; while March to June is best for pilot whales and false killer whales. Spinner dolphins can be observed year-round.

Southern Coastal/Offshore Waters between Galle and Yala National Park 4

MARINE REGION: Northeast Indian Ocean

COUNTRY: Sri Lanka

SPECIES OF CONCERN: Blue (pygmy), sperm, Bryde's whales



MARINE AREA TYPE

- ☒ **OBIA in Regulations/LOA** (OBIA #26, Offshore Sri Lanka)
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☒ **EBSA** (NEIO #4)
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

This EBSA area encompasses existing OBIA #26/Offshore Sri Lanka that was designated for the blue whale (effective period October to April). The EBSA encompasses a narrow, steep continental shelf and slope and two submarine canyons and other areas of physiographic relief that along with the associated circulation features, including monsoonal regime of seasonally reversing currents, flow convergence, and associated offshore transport, result in upwelling and enhanced year-round productivity off the southern Sri Lankan coast (de Vos et al., 2014a). Consequently, the waters off southern Sri Lanka are more productive compared to other tropical waters (de Vos et al., 2014a). Blue whales are typically and consistently observed off southern Sri Lankan waters during the northeast monsoonal season even though the waters are not as productive during that period (de Vos et al., 2014b).

The year-round higher productivity of the waters off southern Sri Lanka provide important seasonal and year-round migrational, foraging, and possibly reproductive habitat to the pygmy blue whale. There are also twenty regularly occurring cetacean species in the area, including Bryde's and sperm whales (de Vos et al., 2012; Thilakarathne et al., 2015; UNEP CBD, 2017a). Sighting, stranding, and acoustic data all show that blue whales occur in Sri Lankan waters year-round (Alling et al., 1991; Branch et al., 2007; de Vos et al., 2012 and 2018; Ilangakoon and Sathasivam, 2012; Randage et al., 2014).

Pygmy blue whales in the northern Indian Ocean form a resident population (Branch et al. 2007). Unlike other blue whale populations, the northern Indian Ocean population of blue whales does not appear to migrate annually from tropical to cooler waters (i.e., north and south seasonal movements) but remains in warm tropical waters year-round, seasonally moving in an east-west pattern (Alling et al., 1991; Anderson et al., 2012; de Vos et al., 2012 and 2014b). de Vos et al. (2014b) observed that blue whales were detected in southern Sri Lankan waters during the northeast monsoonal season, which is consistent with the results of data analysis by Anderson et al. (2012) for the waters off eastern Sri Lanka. It appears clear that pygmy blue whales migrate seasonally through the waters off southern Sri Lanka. Given this migrational pattern, mating and calving likely take place opportunistically throughout the year, explaining why small calves have been observed during periods that are 6 months out of phase with blue whales in the Southern Ocean and why mother-calf pairs and blue whales engaged in courtship displays have been observed (de Vos et al., 2018; Randage et al., 2014; UNEP CBD, 2017a).

In addition to its importance as a migrational pathway and as a calving and reproductive area, waters off southern Sri Lanka are important foraging grounds for the blue whale, which have been observed in foraging aggregations and diving deeper and longer than in other areas, which are indicative of area-specific foraging patterns (de Vos et al., 2013 and 2014a; UNEP CBD, 2017a). Mother-calf pairs and foraging Bryde's and sperm whales have also been observed in southern Sri Lankan waters (de Vos et al., 2012).

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside (Overlap with OBIA #26/Offshore Sri Lanka

Eligible Areal Extent: EBSA: 2,132.89 nmi^2 (7,315.61 km^2)
LFA OBIA #26: 1,225.62 nmi^2 (4,203.76 km^2)

Source of Official Boundary: EBSA: UNEP Convention of Biological Diversity
LFA OBIA #26: DoN, 2017

Spatial File Type: GIS shapefiles

Spatial File Source: EBSA: UNEP Convention of Biological Diversity
(*/api/v2013/documents/9A89FE77-6631-A9CE-4F0C-1D31674AF980/attachments/NEIO_4_EBSA.zip*)
LFA OBIA #26: DoN, 2017

Date Obtained/Created: EBSA: 5/7/2018; LFA OBIA #26: 8/9/17

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Blue (pygmy), sperm, Bryde's whales

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
de Vos, A., Faux, C.E., Marthick, J., Dickinson, J. & Jarman, S.N. (2018). New determination of prey and parasite species for northern Indian Ocean blue whales. *Frontiers of Marine Science, 5*,104. doi: 10.3389/fmars.2018.00104	This study focused on feeding behavior of blue whales using dietary DNA derived from fecal samples collected off southern Sri Lanka from January through March 2013. Unlike in other foraging areas where blue whales feed predominantly on krill, southern Sri Lankan blue whales feed on sergestid shrimp, which are found within the top 984 ft (300 m) of the water column off southern Sri Lanka.
Thilakarathne, E.P.D.N., Pradeep Kumara, P.B.T., & Thilakarathna, R.M.G.N. (2015). Diversity and distribution of cetaceans off Mirissa in the southern coast of Sri Lanka II. Relationship with sea surface temperature, salinity and water density. *Sri Lanka Journal of Aquatic Science, 20*(1), 35-45.	Ship survey of marine mammals and associated oceanographic conditions in waters off Mirissa, Sri Lanka over 43 days from January to April. Eight cetacean species were observed, including the blue, fin, and sperm whales. Blue whales and sperm whales were recorded in relatively high temperature areas, ranging between 28° C and 28.5° C while blue whales also occurred in waters with the highest salinity 36 psu).
de Vos, A., Pattiaratchi, C. B., & Harcourt, R. G. (2014a). Inter-annual variability in blue whale distribution off southern Sri Lanka between 2011 and 2012. *Journal of Marine Science and*	A part of the northern Indian Ocean blue whale population remains around Sri Lanka year-round, with blue whales found close to the southern coast during the Northeast Monsoon. Systematic

Engineering, 2, 534-550. doi: 10.3390/jmse2030534.	conductivity-temperature-depth (CTD) and visual surveys (and 3 years of opportunistic sightings) of blue whales were conducted between January and March 2011 and 2012 off southern Sri Lanka. The distribution of blue whales off southern Sri Lanka is clearly tied to the location of their prey, since a noticeable shift in sightings occurred in 2011 from waters ranging in depth from 328 to 3,281 ft (100 and 1,000 m) to water depths >4,921 ft (1500 m). This distributional shift occurred due to the anomalously large rainfalls and high freshwater concentrations in upper coastal waters off southern Sri Lanka and the resultant lower productivity. The authors hypothesized that blue whales moved into deeper, upwelled waters with higher productivity further offshore where their prey had moved in response to the low salinity of the coastal waters.
de Vos, A., Pattiaratchi, C.B., & Wijeratne, E.M.S., 2014b). Surface circulation and upwelling patterns around Sri Lanka. *Biogeosciences, 11*, 5909-5930.	The waters off southern Sri Lanka experience bi-annually reversing current system caused by the reversing monsoon winds. The major upwelling region during two monsoon periods (southwest and northeast) is located off southern Sri Lanka, although the highest chlorophyll concentrations only occur during the southwest monsoonal season. Aggregations of blue whales have been observed along the southern coast of Sri Lanka during the northeast monsoon, when satellite imagery indicates lower primary productivity in the surface waters, although the presence of feeding aggregations suggests overall higher secondary productivity. This study shows that the upwelling system along the southern coast of Sri Lanka is not driven by Ekman dynamics but by an interaction of the wind-driven circulation around Sri Lanka, which results in a converging coastal current system that flows offshore, creating a divergence at the coastline and results in upwelling that maintains relatively higher productivity during both monsoon periods.
Randage, S.M., Alling, A., Currier, K., Heywood, E. (2014). Review of the Sri Lanka blue whale (*Balaenoptera musculus*) with observations on its distribution in the shipping lane. *Journal of Cetacean Research and Management, 14*, 43-49.	Blue whales are resident year-round in the waters off southern Sri Lanka, based on sighting evidence collected opportunistically from 2009 through 2012 by a whalewatching crew during the southeast (May to November) and northeast (December through April) monsoon periods. Blue whale sightings ranged from 1 to 30 whales with

	an average of 4.56 individuals observed per sighting. Calves were observed during January through March and October through November.
de Vos, A., Christiansen, F., Harcourt, R.G., & Pattiaratchi, C.B. (2013). Surfacing characteristics and diving behaviour of blue whales in Sri Lankan waters. Journal of Experimental Marine Biology and Ecology, 449, 149–153.	Focal follows of blue whales were conducted in waters off southern Sri Lanka from January through March of 2012 and 2013 to detail their diving behavior and dive characteristics. The blue whales lifted their tail flukes out of the water on 55 percent of terminal dives, which is considerably more frequent than elsewhere in the world but was not suggestive that the whales were diving deeper. Blue whales performed surface and deep dives, breathing between 3 and 20 times (average 11) at the surface over a 29 to 421 second period. Following this surface period, the whales dove for an average of 640 seconds. Overall, dive characteristics are similar to blue whales in other ocean areas.
Anderson, R.C., Branch, T.A., Alagiyawadu, A., Baldwin, R., & Marsac, F. (2012). Seasonal distribution, movements and taxonomic status of blue whales (*Balaenoptera musculus*) in the northern Indian Ocean. *Journal of Cetacean Research and Management, 12*(2), 203-218.	Using all available blue whale occurrence data (sightings, strandings, acoustic detections, and whaling catches) from the Northern Indian Ocean, the authors developed a hypothesis about the east-and-west migrational patterns of blue/pygmy blue whales in the Northern Indian Ocean. Triggered by the advent of the southwest (from about May to October) and northeast (December to March) monsoon seasons that result in intense upwelling in the Arabian Sea off the coasts of Somalia and the Arabian peninsula or off eastern Sri Lanka, west of the Maldives, the vicinity of the Indus Canyon, and some parts of the southern Indian Ocean, respectively, blue whale seasonal movement patterns are east and west.
de Vos, A., Clark, R., Johnson, C., Johnson, G., Kerr, I., Payne, R., & Madsen, P. T. (2012). Cetacean sightings and acoustic detections in the offshore waters of Sri Lanka: March–June 2003. *Journal of Cetacean Research and Management, 12*(2), 185-193.	Marine mammal ship surveys were conducted in western, southern, and southeastern waters of Sri Lanka from March through June 2003. Eleven species of cetaceans were observed, including blue, sperm, and Bryde's whales. Spinner dolphins were the most commonly observed small cetacean. The correlation with cetacean sightings and submarine canyons was noted.
Ilangakoon, A.D., & Sathasivam, K. (2012). The need for taxonomic investigations on Northern Indian Ocean blue whales (*Balaenoptera musculus*): implications of year-round occurrence	Examination of blue whale sighting records from Sri Lankan waters and stranding records from Sri Lanka and India showed that blue whales are present year-round in Sri Lankan waters and that

off Sri Lanka and India. *Journal of Cetacean Research and Management, 12*(2), 195-202.	these waters are ecologically important to the blue whale population in the northern Indian Ocean. The taxonomy, however, of this population remains unresolved.
Branch, T.A., Stafford, K.M., Palacios, D.M., Allison, C., Bannister, J.L., Burton, C.L.K., . . . Warneke, R.M. (2007). Past and present distribution, densities and movements of blue whales *Balaenoptera musculus* in the Southern Hemisphere and northern Indian Ocean. *Mammal Review, 37*(2), 116-175.	Records of blue whale stranding or sightings in the Trincomalee Canyon area are reported beginning with the first recorded in 1932. General Sri Lankan distributional information listed but nothing specific to the Trincomalee region.

Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
Alling, A., Dorsey, E.M., & Gordon, J.C.D. (1991). Blue whales *(Balaenoptera musculus)* off the northeast coast of Sri Lanka: Distribution, feeding and individual identification. *UNEP Marine Mammal Technical Report, 3*, 247-258.	Blue whale acoustic and sighting records detected during 1983 and 1984 surveys of northeast Sri Lankan waters, including the Trincomalee Canyon area. Photographs were taken, and dive information was recorded from depth recorders. Conclusions about seasonality in Sri Lankan waters and notes that migration to other waters likely during remainder of year.

Committee or Government Reports

Paper	*Synopsis*
UNEP CBD. (2017a). Ecologically or biologically significant areas: Southern Coastal/Offshore Waters between Galle and Yala National Park, NEIO #4. Retrieved from <https://chm.cbd.int/pdf/documents/marineEbsa/237763/1>.	Overview of EBSA information collected on this area along with the criteria for designation. The highly productive waters off southern Sri Lanka are particularly important to the endangered blue whale and marine turtles, but 20 species of cetaceans occur in these waters; little information is available on the importance of this area to Bryde's and sperm whales.

Surveys

Paper	*Synopsis*
Thilakarathne, E.P.D.N., Pradeep Kumara, P.B.T., & Thilakarathna, R.M.G.N. (2015). Diversity and distribution of cetaceans off Mirissa in the southern coast of Sri Lanka II. Relationship with sea surface temperature, salinity and water density. *Sri Lanka Journal of Aquatic Science, 20*(1), 35-45.	Ship survey of marine mammals and associated oceanographic conditions in waters off Mirissa, Sri Lanka over 43 days from January to April. Eight cetacean species were observed, including the blue, fin, and sperm whales. Blue whales and sperm whales were recorded in relatively high temperature areas, ranging between 28° C and 28.5° C while blue whales also occurred in waters

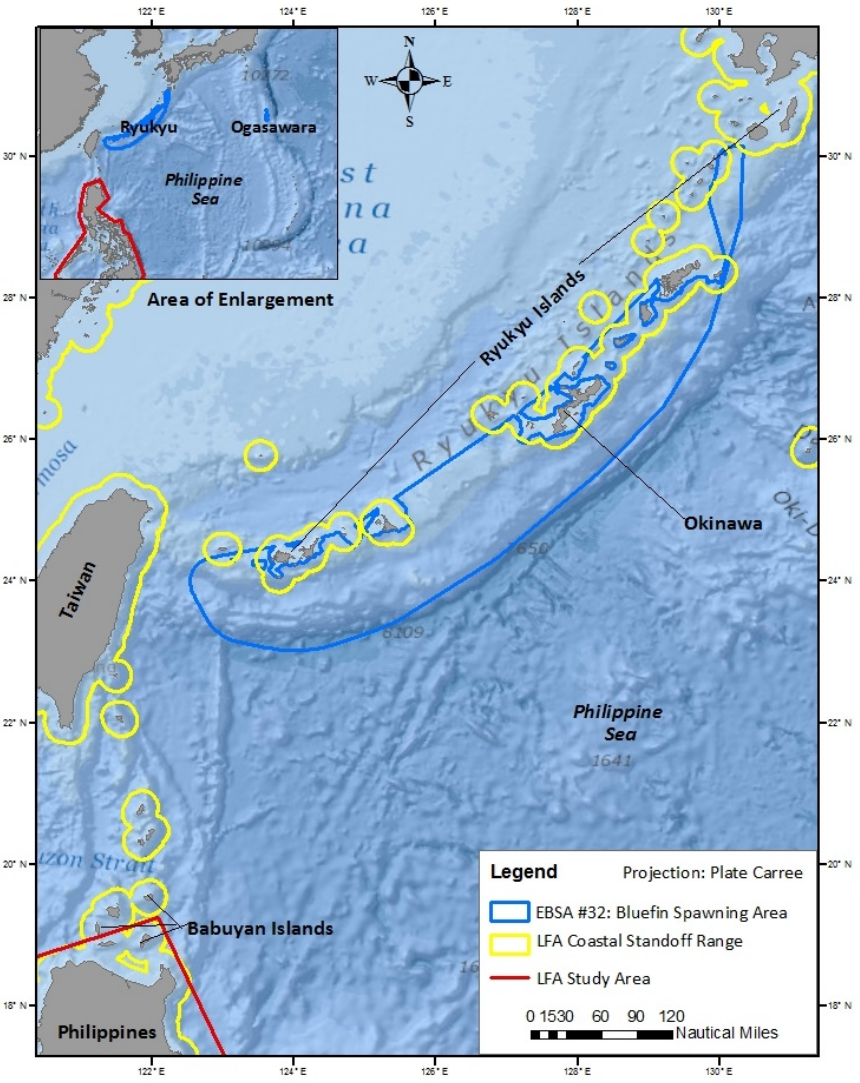
	with the highest salinity 36 psu).
de Vos, A., Pattiaratchi, C. B., & Harcourt, R. G. (2014a). Inter-annual variability in blue whale distribution off southern Sri Lanka between 2011 and 2012. *Journal of Marine Science and Engineering, 2*, 534-550. doi: 10.3390/jmse2030534.	See summary above.
de Vos, A., Clark, R., Johnson, C., Johnson, G., Kerr, I., Payne, R., & Madsen, P. T. (2012). Cetacean sightings and acoustic detections in the offshore waters of Sri Lanka: March–June 2003. *Journal of Cetacean Research and Management, 12*(2), 185-193.	See summary above.
Alling, A., Dorsey, E.M., & Gordon, J.C.D. (1991). Blue whales *(Balaenoptera musculus)* off the northeast coast of Sri Lanka: Distribution, feeding and individual identification. *UNEP Marine Mammal Technical Report, 3*, 247-258.	See summary above.

Modification of Bluefin Spawning 5

MARINE REGION: Western North Pacific Ocean

COUNTRY: Japan

SPECIES OF CONCERN: Humpback whale



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☒ **EBSA** (EA #32)
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW

The waters of the Bluefin Spawning EBSA are influenced by the subtropical, northeastward flowing Kuroshio Current. The Kuroshio Current (also known as the Japanese Current) is a fast-moving (2 to 4 knot (kt) [1 to 2.1 m/sec]), narrow (~54 nmi [100 km] wide) surface western boundary current that flows northeastward from the Philippines and Taiwan past the Ryukyu Islands, close to the southern and eastern coasts of the main islands of Japan, to about 150° E, where it deflects offshore to become the Kuroshio Extension Current. Waters of the Kuroshio Current are characterized by high temperatures-and salinities and low nutrient concentrations (UNEP CBD, 2017c).

Although this EBSA was designated due to its importance as the principle spawning area for bluefin tuna in the North Pacific Ocean, it also is known to be an important reproductive area for the humpback whale in the North Pacific Ocean (Bettridge et al., 2015; UNEP CBD, 2017c). In the North Pacific Ocean, the known humpback whale breeding grounds are located in three regions: (1) the central North Pacific (CNP) in the waters of the Hawaiian Islands; (2) the eastern North Pacific (ENP) off the Mexican Baja Peninsula and Islas Revillagigedo; and (3) the western North Pacific (WNP) in the Bonin (Ogasawara) Island chain south of Japan and Ryukyu (Okinawa) Islands northeast of Taiwan (Baker et al., 1994;

Bettridge et al., 2015). Guan et al. (1999) noted that humpback whales were acoustically recorded during the winter breeding season from January to March in areas of the Ryukyu Islands.

Although two WNP populations of humpback whales are thought to exist, the WNP has not been differentiated into two humpback subpopulations because no breeding location is known for the second putative WNP subpopulation. Thus, the one humpback endangered subpopulation (DPS) designated for the WNP is based on humpbacks wintering and breeding in the area from the Ryukyu Islands (e.g., Okinawa) to the Philippines, including the Ogasawara Island areas (Acebes et al., 2007; Bettridge et al., 2015; Calambokidis et al., 2008; Darling and Mori, 1993; NOAA, 2016). Calambokidis et al. (2008) extended this winter/breeding range somewhat to encompass the Marianas Islands. Calambokidis et al. (2008) noted that humpback whales in the Asia breeding area are distributed over a large area along the island chains of the western Philippine Sea. The two nominal WNP humpback subpopulations are believed to overlap in the Ogasawara Island region (Bettridge et al. 2015).

The waters of the Ryukyu Islands, particularly around Okinawa, were once an important seasonal (January to March) whaling ground for humpback whales, with as many as 970 humpback whales having been killed off Okinawa between 1958 and 1961, while 817 were killed off Ogasawara between 1924 and 1944 (Nasu, 1966; Nishiwaki, 1959).

Kobayashi et al. (2016, 2016a, and 2017) conducted sighting and photo-identification surveys in the waters off islands (Ie and Kerama Islands) west of Okinawa, Japan to determine the timing of humpback whale migration and to verify the peak breeding season as well as the movement patterns between the islands off Okinawa. Mid-February through March is the peak calving period for humpback whales in the Okinawa area, with the breeding period beginning in late January (Kobayashi et al., 2016; Visit Okinawa Japan, 2018). Kobayashi et al. (2017) found that male and female humpback whales, but typically not humpback females with calves, move between the islands of Ie and Kerama, while females with calves remain in shallow, nearshore waters. Acebes et al. (2007) documented the occurrence of humpback whales, including cow-calf pairs, in the Babuyan Islands of Luzon, Philippines from late February through May, with photo IDs of whales in the Philippines matching those documented in the Ryukyu and Ogasawara Islands, proving that the breeding grounds of the WNP population of humpback whales extended as far south as the northern Philippines; Balyena.org continues the sighting and surveys of humpback whales in the Babuyan Islands (Balyena, 2018).

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside

Eligible Areal Extent: 33,783.17 nmi^2 (115,873.04 km^2)

Source of Official Boundary: UNEP Convention of Biological Diversity

Spatial File Type: GIS shapefile

Spatial File Source: UNEP Convention of Biological Diversity
(/api/v2013/documents/0BB21D56-B364-37EB-A5D6-764C80DC0502/attachments/EA_32_EBSA.zip)

Date Obtained/Created: 7/18/2018

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Humpback whale

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Titova, O. V., Filatova, O. A., Fedutin, I. D., Ovsyanikova, E. N., Okabe, H., Kobayashi, N., . . . Hoyt, E. (2018). Photo-identification matches of humpback whales (*Megaptera novaeangliae*) from feeding areas in Russian Far East seas and breeding grounds in the North Pacific. *Marine Mammal Science, 34*(1), 100–112. doi:10.1111/mms.12444.	The Russian Far East consists of multiple high latitude feeding areas for humpback whales, with 102 foraging humpback whales having been identified from breeding area catalogs during the SPLASH surveys. The goal of this study was to use photographs collected in the Russian Far East from 2004 through 2014 to further refine the migratory destinations of the humpback whales foraging in Russian waters seasonally. These researchers compared photographs taken of wintering humpbacks with photo catalogs from the breeding grounds of Hawaii, Mexico, Okinawa, and the Philippines. The highest number of matches was with Asian breeding grounds (i.e., Okinawa and the Philippines); for the Kamchatka feeding ground, the majority of whales were from the Asian breeding grounds while in the Commander Islands foraging grounds, the proportion of whales from Asian was twice that from the Hawaii breeding ground and six times higher than the Mexican breeding

	ground. The total match rate was considered low, which continues to support and suggest the hypothesis of some undiscovered humpback whale breeding location in the North Pacific.
Kobayashi, N., Okabe, H., Kawazu, I., Higashi, N., Kato, K., Miyahara, H., . . . Uchida, S. (2017). Distribution and local movement of humpback whales in Okinawan waters depend on sex and reproductive status. *Zoological Science, 34*(1), 58-63. doi:10.2108/zs160012.	The distribution and movement patterns of humpback whales in waters off western Okinawa Island, southwest Japan, were investigated using line transect and photo-identification methodologies. Line transect surveys were conducted in February and March from 2011 to 2014, with photo-identification surveys having been conducted from January to March 2006 through 2012. During the surveys, humpback whales aggregated in the areas around Ie and Kerama Islands and tended to travel along the inshore coast of Okinawa Island when they move locally between the two sites. The sexes of 496 humpback whales were photo-identified (322 males, 75 females, and 99 females with a calf). Of these, 24.8% were confirmed moving locally between the sites of Ie and Kerama Islands within the same season. Additionally, the data indicate that male humpback whales tend to move more actively between the local breeding sites as compared to females and females with a calf. The authors speculate that the males search for more opportunities to mate, whereas females with a calf tend to remain in the same areas to nurse their calves. This study confirmed that humpback whales were found most frequently in the areas of Ie and Kerama islands in the waters west of Okinawa Island at depths shallower than 656 ft (200 m), in agreement with observations from other North Pacific breeding grounds. The results of these surveys also suggest to the authors that the waters around the Ie and Kerama islands are equally important breeding sites for humpback whales.
Kobayashi, N., Okabe, H., Kawazu, I., Higashi, N., Miyahara, H., Kato, H., & Uchida, S. (2016). Peak mating and breeding period of the humpback whale—(*Megaptera novaeangliae*) in Okinawa Island, Japan. *Open Journal of Animal Sciences, 6* 169-179. doi:10.4236/ojas.2016.63022.	The migratory timing of humpback whales in Okinawan waters, one of their breeding grounds in the North Pacific Ocean, was researched to distinguish the reproductive status (male, female, or female with a calf), group compositions (singleton, pair, or whales more than three) and group types (singer or competitive group) in

	order to assess the peak period of breeding activities. A total of 7,366 humpback whales were sighted during 1,192 days of photo-identification surveys from 1991 to 2012. The sex was determined in 1,284 of the observed humpback whales (848 males, 147 females, and 289 females with a calf), with 1,138 individual whales, 1416 pairs, and 710 groups of more than three whales having been observed. Females without calves tended to occur from late January to late February, which was the beginning of the breeding season and male-female pairs were observed most frequently during this period. The peak occurrence of competitive groups, which was considered a mating-related behavior group formed by females and males, was also observed during this period. These results indicated that humpback whales peak mating period in Okinawa occurred between late January and late February. Females with a calf tended to increase from mid-February toward the end of the breeding season, maintaining a high sighting per unit effort (SPUE) value in late March. We, therefore, suggested that the peak time of birthing and newborn care was probably from mid-February through late March in Okinawa.
Kobayashi, N., Okabe, H., Kawazu, I., Higashi, N., Miyahara, H., Kato, H., & Uchida, S. (2016a). Spatial distribution and habitat use patterns of humpback whales in Okinawa, Japan. *Mammal Study, 41*, 207–214. doi:10.3106/041.041.0405.	Using sighting survey data of humpback whales collected over 21 years in the waters of Kerama and Ie Islands, Okinawa, Japan, the distribution, environmental conditions, and reproductive status of the whales on part of their North Pacific breeding ground was investigated. Of the 1,402 humpback whales that were photo-identified (856 males, 100 singers, 150 females, and 296 females with calves) in the Okinawa area, males, females, and singers were mainly distributed in deep offshore waters, while females with a calf were distributed in shallow nearshore, interisland waters. These analysis results suggest that certain reproductive activities, such as mating behavior or competition among males over females with whom to mate, might occur in the offshore waters (<656 to 1,640 ft [200 to 500 m]) north of the Kerama Islands and west of Ie Island, while nurturing of calves by females occurs in the shallower (<263 to 328 ft [80 to 100 m]), interisland waters of Kerama and Ie Islands.

	These patterns of habitat use are similar to those observed in the Hawaii and Mexico breeding areas of the North Pacific.
Silberg, J. N., Acebes, J. M. V., Burdin, A. M., Mamaev, E. G., Dolan, K. C., Layusa, C. A., & Aca, E. Q. (2013). New insight into migration patterns of western North Pacific humpback whales between the Babuyan Islands, Philippines and the Commander Islands, Russia. *Journal of Cetacean Research and Management, 13*(1), 53-57.	Much of the Asian population of humpback whales spends the summer season foraging in the waters of the Kamchatka Peninsula, Russia and overwinters in the waters in the breeding grounds of the Okinawa and Ogasawara islands, Japan and Babuyan Islands, northern Philippines. Prior studies of humpback whales foraging grounds grouped the Commander Islands, Russia with the eastern Aleutian Islands as part of the central North Pacific stock of humpback whales. The authors of this study used photo-ID data from the Commander Islands and Babuyan Islands, Philippines to establish an unreported humpback migrational path between the Commander Islands and the Philippines. This finding suggests that a small number of humpback whales supposedly migrating to a 'missing' or unknown breeding ground are actually instead migrating to the Philippines.
Acebes, J. M. V., Darling, J. D., & Yamaguchi, M. (2007). Status and distribution of humpback whales (*Megaptera novaeangliae*) in northern Luzon, Philippines. *Journal of Cetacean Research and Management, 9*(1), 37-43.	After humpback whales were first observed in the Babuyan Islands off northern Luzon, Philippines in 1999, boat-based sighting surveys were conducted from February through May 2000 through 2003 to determine the seasonal distribution and occurrence, with photo-identifications of flukes and biopsy samples also being taken and songs recorded as well. A total of 367 humpback whales were sighted over the four annual seasons around the Babuyan Islands, including one cow-calf pair off northern Sierra Madre Island, which indicated that breeding occurs as far south as the Philippines. Several individuals photo-identified in the Philippines were matched to humpback whales identified in Ogasawara and Okinawa, Japan, indicating that the humpbacks occurring in Philippine waters are part of the same population that occur in the Ryukyu and Ogasawara Islands. Characteristics of the humpback songs from the Philippines whales indicates some similarity and mixing acoustically with humpback whales in Hawaii.
Guan, S., Takemura, A., & Koido, T. (1999). An introduction to the structure of humpback whale,	Humpback whale songs were recorded during the winter breeding season from January to March in

Megaptera novaeangliae, song off Ryukyu Islands, 1991/1992. *Aquatic Mammals, 25*(1), 35-42.	1991 and 1992 off Zamami, Ryukyu Islands, Japan. Each of the humpback songs was composed of six fundamental themes, with each theme constructed of repeating phrases emitted in a sequence. Sixteen different units were recognized among songs recorded during the research period. The average song duration was 7.76 (± 1.8l) min in 1991 and 11.94 (±4.62) min in 1992.
Baker, C. S., Slade, R. W., Bannister, J. L., Abernethy, R. B., Weinrich, M. T., Lien, J., . . . Palumbi, S. R. (1994). Hierarchical structure of mitochondrial DNA gene flow among humpback whales *Megaptera novaeangliae*, world-wide. *Molecular Ecology, 3*, 313-327.	Mitochondrial DNA analysis of samples taken from six humpback whale subpopulations around the world revealed that maternal lineages are highly subdivided among the three major oceanic populations of humpbacks, with maternal lineages showing greatest segregation on summer feeding grounds. The majority of the results were on the delineation of the central and eastern North Pacific stocks of humpback whales, the North Atlantic humpbacks, and those in the Southern Ocean. The analysis supports the division of the North Pacific into a central stock which feeds in Alaskan waters and winters predominantly in Hawaii, and an eastern or 'American' stock that migrates between feeding grounds along the coast of California and wintering grounds along the coast of Mexico. The analysis results further support the division of the western and eastern Australia/New Zealand Southern Ocean humpback populations.
Darling, J. D., & Mori, K. (1993). Recent observations of humpback whales (*Megaptera novaeangliae*) in Japanese waters off Ogasawara and Okinawa. *Canadian Journal of Zoology* 71(2):325-33.	Photos of 177 individual humpback whales' tail flukes were collected from 1987 to 1990 in Okinawa and Ogasawara waters and analyzed to estimate abundance and determine behavior patterns. Humpback whales were commonly sighted throughout the Ogasawara Archipelago and near the Kerama Islands, Okinawa from December to May. Humpback whales were not regularly seen near Saipan in the Northern Mariana Islands or near Kenting, Taiwan. The predominant behavior patterns related to calving and mating. Two whales were identified in both the Okinawa and Ogasawara regions in different years, suggesting that both regions are used by the same population of humpback whales.
Nasu, K. (1966). Fishery oceanographic study on the baleen whaling grounds. *Scientific Reports of*	This paper describes the Japanese whaling grounds in the Pacific and Southern oceans for

the Whales Research Institute, 20, 157-210.	baleen whales and includes a few notes about humpback whales in the Ryukyu Islands. Humpback whales were primarily caught in waters adjacent to Okinawa Island in the Ryukyu Islands. In abundant years, more than 200 animals were taken during January to March (the catch in 1958 reached 240 animals). The Ryukyu Island's whaling operation closed around 1963.
Nishiwaki, M. (1959). Humpback whales in Ryukyuan waters. *Scientific Reports of the Whales Research Institute, 14*, 49-86.	Whaling around the Bonin (Ogasawara) Islands began in 1924 but whaling operations were closed due to the significant decreases in catch. In Ryukyuan waters, fishermen often reported the occurrence of humpback whales and started to kill them with rifles in 1954, harvesting 13 whales in 1956 and 23 in 1957. Japanese commercial whaling industry began in the Ryukyu area in 1958. Although these companies expected to kill 50 humpback whales and 30 sperm whales, no sperm whales were ever harvested. However, the whaling companies caught as many as 290 humpback whales in Ryukyuan waters. The author estimated the number of migrating humpback whales in 1959 to be around 1,200 to 1,600 individuals. Based on the total number of humpbacks harvested in 1959, some lactating females or with calves, the total abundance is now estimated to be 2,250 migrating humpbacks with an estimated North Pacific population of 5,000 to 6,000.

Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
Calambokidis, J., E.A. Falcone, T.J. Quinn, A.M. Burdin, P.J. Clapham, J.K.B. Ford, C.M. Gabriele, R. LeDuc, D. Mattila, L. Rojas-, Bracho, J. M. S., B.L. Taylor, J. Urbán R., D. Weller, B.H. Witteveen, M. Yamaguchi, A. Bendlin, D. Camacho, K. Flynn, A., & Havron, J. H., & N. Maloney. (2008). *SPLASH: Structure of populations, levels of abundance and status of humpback whales in the North Pacific.* Final report for Contract AB133F-03-RP-00078. Olympia, Washington: Cascadia Research. 56 pages.	SPLASH (Structure of Populations, Levels of Abundance and Status of Humpbacks) was a large, international (50 research groups and more than 400 researchers in 10 countries) collaboration of humpback whale studies and data synthesis in the North Pacific Ocean. It was designed to determine the abundance, trends, movements, and population structure of humpback whales throughout the North Pacific and to examine human impacts on this population. Field efforts were conducted on all known winter breeding regions for humpback whales in the North Pacific during three seasons (2004, 2005, 2006) and all known summer

	feeding areas during two seasons (2004, 2005). A total of 18,469 quality fluke identification photographs were taken during over 27,000 approaches of humpback whales. A total of 7,971 unique individual humpback whales were cataloged in SPLASH. Migratory movements and population structure of humpback whales in the North Pacific were found to be more complex than had been previously described. The overall pattern showed that coastal wintering regions of the western (Asia) and eastern (mainland Mexico and Central America) North Pacific were the primary wintering areas for the lower latitude coastal feeding regions, while the wintering areas off Hawaii and the Revillagigedo Archipelago were the primary wintering regions for humpbacks feeding in more central and northern latitude foraging areas. The SPLASH data suggested the existence of missing wintering area(s); humpbacks that feed off the Aleutian Islands and in the Bering Sea were not well represented on any of the sampled wintering areas and must be going to one or more unsampled winter locations. Thus, it is likely that SPLASH has revealed a new breeding ground for humpback whales. The best humpback whale estimate of overall abundance in the North Pacific, excluding calves, is the average of two modeled results or 18,302 individuals.

Committee or Government Reports

Paper	*Synopsis*
UNEP CBD. (2017c). Ecologically or biologically significant areas: Bluefin spawning area, EA #32. Retrieved from <https://chm.cbd.int/pdf/documents/marineEbsa/237881/1>.	Overview of EBSA information collected on this area along with the criteria for designation. The waters of the Kuroshio Current's subtropical zone from the Nansei (Okinawa) Islands, where the Kuroshio Current flows north, to the waters off the coast of southern Kyushu are connected to form the Coral Triangle and provide a major spawning area for bluefin tuna.
NOAA. (2016). Endangered and threatened species identification of 14 distinct population	Identification of 14 global populations of humpback whales based on the location of their

segments of the humpback whale (*Megaptera novaeangliae*) and revision of species-wide listing; Final rule. *Federal Register 81*, 174, 62260-62320.	breeding areas; the feeding areas for each population or distinct population segments (DPSs) is also provided. This rule formally relists four (Western North Pacific, Cape Verde Islands/North Atlantic, Central America, and Arabian Sea) of the 14 global DPSs as endangered and one (Mexico) DPS as threatened under the ESA. The remaining nine DPSs are not listed under the ESA. The Western North Pacific DPS is described as those humpback whales that breed or winter in the region around Okinawa and the Philippines in the Kuroshio Current (as well as unknown breeding grounds in the Western North Pacific Ocean), transiting through the Ogasawara area, and feeding in the North Pacific Ocean, primarily in the West Bering Sea, off the Russian coast, and the Aleutian Islands.
Bettridge, S., Baker, C. S., Barlow, J., Clapham, P. J., Ford, M., Gouveia, D., Mattila, D. K., Pace, III, R. M., Rosel, P. E., Silber, G. K., & Wade, P. R. (2015). *Status review of the humpback whale (Megaptera novaeangliae) under the Endangered Species Act.* NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-540. La Jolla, CA: Southwest Fisheries Service, National Marine Fisheries Service.	As part of the comprehensive review of the status of humpback whales as the basis for possible revisions under the ESA, all available information and data on humpback whales were compiled by the Humpback Biological Review Team. The team differentiated the global populations of humpback whales into 15 distinct population segments (DPSs) based on the primary breeding location of the associated population. Descriptions of the breeding and foraging ranges of each DPS are included in the status review. The risk of each DPS for extinction was assessed as the subsequent basis for designation of each DPS's status under the ESA.

Surveys

Paper	*Synopsis*
Kobayashi, 2016, 2017	See summary above.
Acebes et al., 2007	See summary above.

Websites / Social Media

Website/Organization	*Synopsis*
Balyena.org. (2018). Balyena at lumba sa Pilipinas. Humpback whale research in the Babuyan Islands—research, education and conservation. Retrieved from <http://balyena.org.ph/research/humpbacks>.	Information about the annual boat-based surveys of the humpback whale breeding grounds in the Babuyan Islands off Luzon, north Philippines. Through comparisons of fluke photos and song recordings from humpbacks from Russia, Japan,

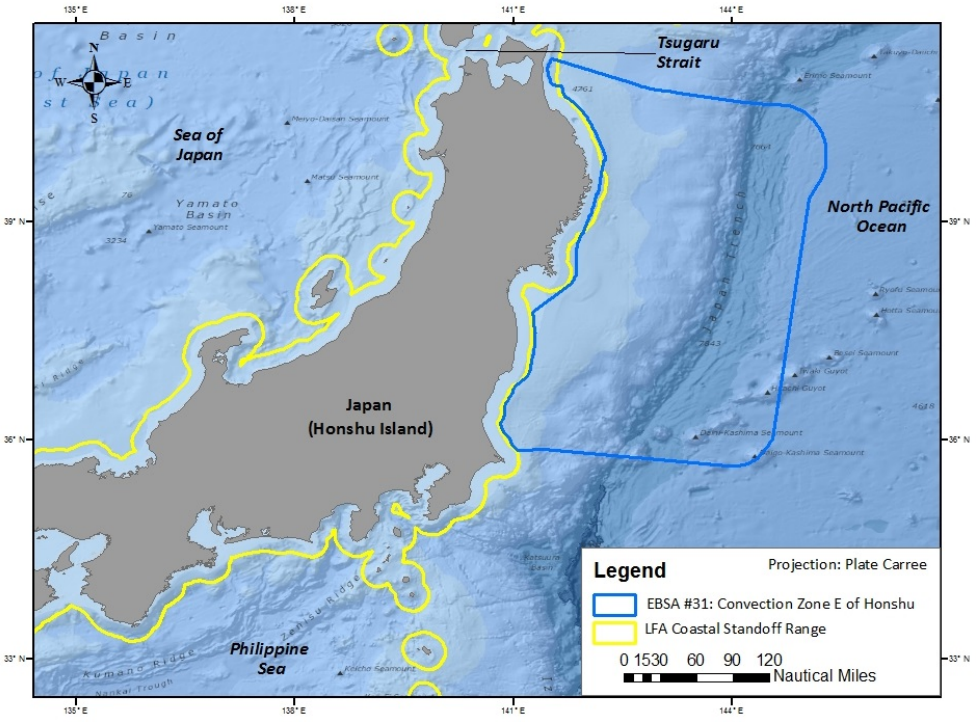
	and Hawaii, we aim to better understand the links with other populations in the western North Pacific, particularly in feeding grounds. Their photo-ID study has currently identified 241 humpback whale individuals. Twelve other marine mammal species as well as sea turtles and whale sharks are also found in these diverse waters.
Visit Okinawa Japan. (2018). Whale watching guide—An impressive experience to encounter in Okinawa! Retrieved from <https://www.visitokinawa.jp/information/whale-watching>.	Information about humpback whale watching from January to March around the coast of Zamami Island, Okinawa, Japan. This is said to be the time of year when humpbacks are confirmed to be in the waters of Zamami Island during the best season of whale watching.

Convection Zone East of Honshu 6

MARINE REGION: Western North Pacific Ocean

COUNTRY: Japan

SPECIES OF CONCERN: Gray whale, baleen whales



MARINE AREA TYPE

☐ **OBIA in Regulations/LOA**

☐ **Mission Blue Hope Spot**

☐ **Pew Ocean Legacy Site**

☐ **IUCN Green List Site**

☐ **IMMA**

☒ **EBSA** (EA #31)

☐ **U.S. Marine National Monument**

☐ **Hoyt Cetacean MPA**

☐ **U.S. MPA**

☐ **U.S. ESA Critical Habitat**

☐ **NRDC Recommendation**

AREA OVERVIEW:

East and offshore of Honshu, Japan is the complex and unique oceanographic environment that results from the convection and mixing of the cold, southwesterly flowing Oyashio Current; the warm, northeasterly flowing Kuroshio Current; and the warm, easterly flowing Tsugaru Current (through the Tsugaru Straits) (UNEP CBD, 2017f). Complex oceanographic frontal boundaries and features such as eddies and upwelling result off the Honshu region from these converging currents. As a result, productivity is high near the surface in this area, with biota from both cold- and warm-water species represented. This unique convergence region is a very productive fishing region and foraging area for baleen whales and seabird species as well as spawning areas for several fish species and the finless porpoise (UNEP CBD, 2017f). The finless porpoise, however, is a coastal species found within the coastal standoff range of SURTASS LFA sonar and not considered herein.

Historically, this area along the Pacific coast of Honshu, Japan, as well as the coastal waters of eastern Russia and Korea, was one of the migrational routes of the Western North Pacific gray whale that feed in summer off the northeastern coast of Sakhalin Island, Russia (OBIA #12, Offshore Piltun and Chayvo) and migrated south to winter breeding grounds (Kato and Kasuya, 2002; Weller et al., 2008). Currently, however, the winter breeding grounds of the very small, endangered DPS of Western North Pacific gray whales is not known, and the migrational routes of the members of this population are not fully understood. Tracking of Western North Pacific gray whales from the Sakhalin feeding grounds equipped with satellite tags and photo-ID matching showed that at least some of the Western North Pacific population of gray whales migrates across the North Pacific Ocean and have been observed during winter in the Pacific Northwest and Mexico (Cooke, 2018; Weller et al., 2012).

However, not all Western North Pacific gray whales migrate east across the Pacific. Since 1990, about 30 sightings and strandings have been documented in Japan, mainly on the Pacific Honshu coast (Kato et al., 2016). Weller et al. (2008) reported on the entanglement and death in 2005 to 2007 of four migrating gray whales along the Pacific coast of Honshu. Nakamura et al. (2017) reported that from 2015 to 2016, seven sightings and two strandings of gray whales along the Honshu coast of Japan were reported; three of the 2015 sightings were all the same animal, photo-matched to a gray whale last observed in Sakhalin during 2014, indicating that this whale had migrated along the coast of Japan for two consecutive years. Weller et al. (2016) also reported on the repeated sightings of a reproductive female moving between Sakhalin in summer and Pacific Japan in winter and spring 2014 to 2016, which was the same gray whale reported by Nakamura et al. (2017). No strandings or fishery interactions with gray whales along the Pacific coast of Honshu were reported in 2016 to 2018 (IWC, 2017 and 2018); Weller (IWC, 2018) reported four gray whale sightings from the Honshu/Pacific coast in the late winter and early spring of 2017 and 2018, although no photo-ID matches could be made with Sakhalin whales. It is unclear whether the paucity of gray whale occurrence data off eastern Japan reflects the true sparse migration/rare occurrence of this whale along the east coast of Japan or is entirely an indication of the low level of research effort and/or reporting opportunities.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside (nearly entire area)

Eligible Areal Extent: 59,921.43 nmi^2 (205,524.75 km^2)

Source of Official Boundary: UNEP Convention of Biological Diversity

Spatial File Type: GIS shapefile

Spatial File Source: UNEP Convention of Biological Diversity
(/api/v2013/documents/6D82D227-416C-C5A8-8964-9AC566DBEEF1/attachments/EA_31_EBSA.zip)

Date Obtained: 5/7/2018

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Gray whale

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Nakamura, G., Katsumata, H., Kim, Y., Akagi, M., Hirose, A., Arai, K., & Kato, H. (2017). Matching of the gray whales off Sakhalin and the Pacific coast of Japan, with a note on the stranding at Wadaura, Japan in March, 2016. *Open Journal of Animal Sciences, 7*, 168-178. doi:10.4236/ojas.2017.72014.	The coast of Japan is a migratory corridor for the western stock of the gray whales, which was once considered extinct and remains endangered. From 1955 to 2014, only 21 gray whale occurrences were recorded in Japan over this 59-year period. However, from 2015 to 2016, seven sightings and the two strandings of gray whales on the Honshu coast were reported. Four of the sightings were later identified to be of the same gray whale, who had been photo-matched as a gray whale that feeds off Sakhalin Island. One of the stranded whales was examined and determined to have been a young female that was photo-matched from the Sakhalin feeding group. The authors concluded that between 2015 and 2016 at least three gray whales migrated along the Honshu coast of Japan.
Weller, D. W., Klimek, A., Bradford, A. L., Calambokidis, J., Lang, A. R., Gisborne, B., . . . Brownell, R. L. (2012). Movements of gray whales between the western and eastern North Pacific.	Photo-catalog comparisons of gray whales in the western and eastern North Pacific were undertaken to assess possible mixing between the two populations. Photographs of Western

Endangered Species Research, 18(3), 193-199. doi:10.3354/esr00447.	North Pacific (WNP) gray whales from the Sakhalin Island catalog were compared to photographs of Eastern North Pacific (ENP) gray whales from San Ignacio Lagoon in Mexico and from the Pacific Northwest. Six WNP gray whales were identified in the ENP Pacific Northwest catalog, having been photographed off Vancouver Island, British Columbia, Canada, and four WNP gray whales were identified in the ENP catalog from San Ignacio, Mexico. This along with recent sightings of gray whales off Japan makes it clear that not all WNP gray whales share a common winter ground.
Weller, D. W., Bradford, A. L., Kato, H., Bando, T., Otani, S., Burdin, A. M., & R.L. Brownell, J. (2008). A photographic match of a western gray whale between Sakhalin Island, Russia, and Honshu, Japan: The first link between the feeding ground and a migratory corridor. *Journal of Cetacean Research and Management, 10*(1), 89-91.	Between 2005 and 2007, four female western gray whales were accidentally entrapped and died in Japanese set nets while migrating along the Pacific coast of Honshu, Japan. Photographs of these animals were compared to a photo-identification catalogue of western gray whales from their feeding ground off Sakhalin Island, Russia, to look for matches of individuals between the two areas. Only one photograph of any of the four gray whales from Japan from the Sakhalin feeding catalog was available to confirm a match between the two areas. This photographic match is the first recent evidence of a link between the Sakhalin feeding group and a migratory corridor off the east coast of Japan.
Kato, H., & Kasuya, T. (2002). Some analyses on the modern whaling catch history of the western North Pacific stock of gray whales (*Eschrichtius robustus*), with special reference to the Ulsan whaling ground. *Journal of Cetacean Research and Management, 4*(3), 277-282.	The authors reviewed whaling records of gray whale captures after 1900 in the Yellow Sea and Sea of Japan (Ulsan) whaling grounds off Korea. Apparently small-scale harvest of gray whales continued until the mid-1960s after commercial whaling ceased in the 1935 to 1945 timeframe, which the authors suggest as a possible cause for this populations lack of recovery after release from harvest pressure. Analysis of the whaling data indicated two distinctive migration peaks along the east coast of the Korean peninsula: the first peak in December/January due to southbound migration for winter breeding somewhere south of Korea, and the later March/ April peak representing the return northbound migration for summer feeding off Russia.

Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
Cooke, J.G. (2018). *Eschrichtius robustus*. The IUCN red list of threatened species 2018: e.T8097A50353881. Retrieved from <http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T8097A50353881.en>.	IUCN Red List review of both the Eastern and Western North Pacific populations of the gray whale. Cooke notes that the breeding capability of the WNP population of gray whales no longer exists due to the small size of the remaining population. Former whaling grounds off Korea and southwestern Japan indicate the existence of a separate WNP or Asian population that migrated to breeding grounds south of the Korean Peninsula, based on the seasonality of catches in the Korean grounds, but the last sighting in Korean waters was in 1977, and recent surveys in Korean waters have reported no gray whales. The whales that feed off Sakhalin Island, Russia were thought to be a remnant of this breeding population, but some members of the feeding stock have recently been shown to migrate across the Pacific to the North American coastal area during winter, which shed doubt on this notion. However, recent records from winter and spring off eastern (Honshu) Japan, the Yellow Sea, and Taiwan Strait indicate that some of the Sakhalin feeding gray whales do migrate southward, presumably to an unknown calving/nursery area, and may be the remnant of the historical WNP gray whale population.

Committee or Government Reports

Paper	*Synopsis*
International Whaling Commission (IWC). (2018). Fifth rangewide workshop on the status of North Pacific gray whales. Paper SC/67B/REP/07 Rev1. WGWAP-19/INF.4, Western Gray Whale Advisory Panel, 19th meeting, November 2018.	The primary identified tasks of the workshop were to review the results of the modelling to validate the gray whale stocks, to examine the new proposed Makah Management Plan, and to update the scientific components of the Conservation Management Plan for Western gray whales, including obtaining updated occurrence data. Reports of recent strandings (none from Japan) and sightings and photo-matches with Sakhalin feeding group whales were reviewed (four from Honshu area of Japan).
IWC. (2017). Report of the scientific committee, IWC meeting SC/67a, Bled, Slovenia, 9-21 May 2017. IWC/67/Rep01. Retrieved from	Report of all IWC scientific committee groups, including updated occurrence information from the various reporting regions on North Pacific

<https://archive.iwc.int/pages/search.php?search=!collection24503&bc_from=themes>.	gray whales. Japan reported no fishery or other anthropogenic related incidents with gray whales and two sightings in Tokyo Bay in February and April 2017. Further details of the sighting at Izu Archipelago and Shizuoka prefecture from 2015 to 2016 clarified that they were of the same gray whale, but that a report and photograph of a gray whale at Aogashima Island, Japan could not be verified.
UNEP CBD. (2017f). Ecologically or biologically significant areas: Convection zone east of Honshu, EA #31. Retrieved from <https://chm.cbd.int/pdf/documents/marineEbsa/237875/1>.	Overview of EBSA information collected on this area along with the criteria for designation. In this area where the Oyashio Current (cold current), Kuroshio Current (warm current), and Tsugaru Current (warm current) mix and result in very complex oceanographic features such as oceanographic fronts from which warm- and cold-water eddies are generated. Production is high in this area, making it a key foraging area for seabirds, fishes, and baleen whales. It is also the spawning area for the finless porpoise and several fish species.
Kato, H., Nakamura, G., Yoshida, H., Kishiro, T., Okazoe, N., Ito, K., Bando, T., Mogoe, T., & Miyashita, T. (2016). Status report of conservation and researches on the western North Pacific gray whales in Japan, May 2015-April 2016. Paper SC/66b/BRG/11 presented to the IWC Scientific Committee. Retrieved from <https://archive.iwc.int/pages/download.php>.	The Japanese delegation to the IWC meeting presented the updated occurrence information on western gray whales in Japan. They reported that there were no entanglements of gray whales from May 2014 through April 2015 but two strandings of female gray whales had occurred along the southern (Honshu) coast during this period. Three sightings of gray whales were reported from Sagami Bay, Tokyo Bay, and Izu Islands area, but through photo-ID analyses were shown to be sightings of the same whale previously reported off Kozushima Island near Tokyo in March 2015.
Weller, D.W., Takanawa, N., Ohizumi, H., Funahashi, N., Sychencko, O.A., Burdin, A.M., Lang, A.R., Brownell, Jr., R.L. (2016). Gray whale migration in the western North Pacific: Further support for a Russia-Japan connection. Paper SC/66b/BRG/16 presented to the IWC Scientific Committee. Retrieved from <https://www.iucn.org/sites/dev/files/wgwap_17-inf.8_rs6104_sc_66b_brg_16_weller_et_al_wg_russia-japan_connection.pdf>.	The authors report on the migratory movements of a photo-identified gray whale (no. 233 from the Sakhalin Feeding Group Catalog) as it moved between Sakhalin Island, Russia and the Pacific coast of Honshu, Japan during 2014 to 2016. The gray whale was first sighted as a calf with its mother off Sakhalin Island in August 2014. The following spring, in March through May, it was sighted four times in three separate locations off Japan's Honshu coast. That summer in August 2015, whale 233 was again observed and photographed off Sakhalin Island, Russia. The

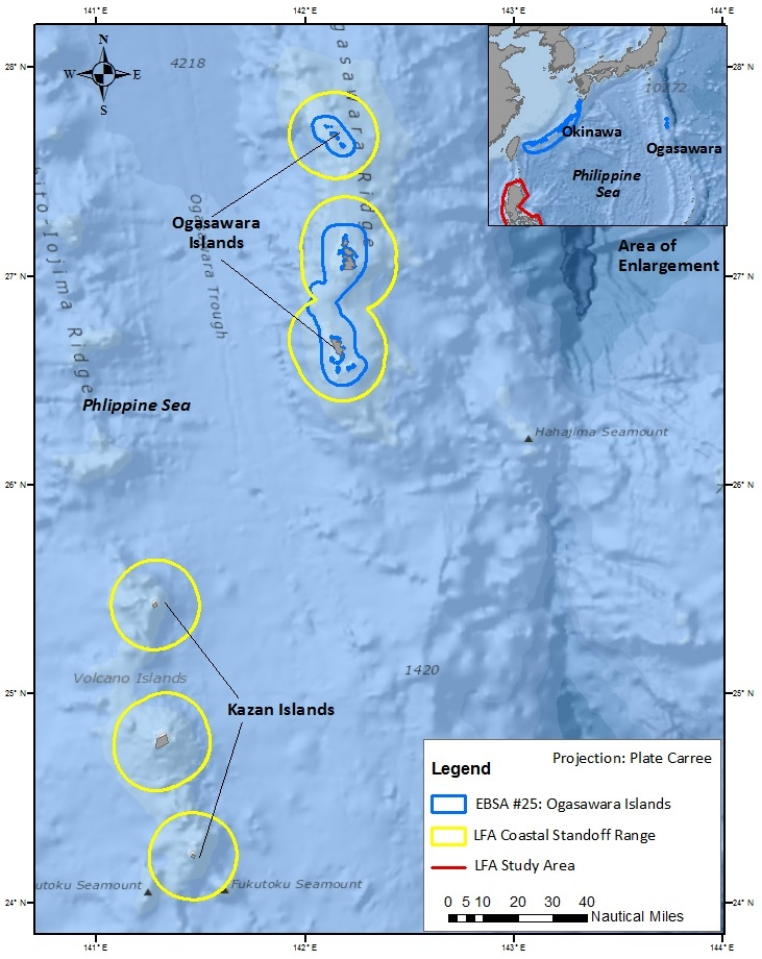
following January and February, whale 233 was again sighted and photographed at two separate locations along Japan's Honshu coast.

Ogasawara Islands 7

MARINE REGION: Western North Pacific Ocean

COUNTRY: Japan

SPECIES OF CONCERN: Humpback and sperm whales



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☒ **EBSA** (EA #25)
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☒ **UNESCO World Heritage Site**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

The Ogasawara Islands (or Bonin Islands) are a group of Japanese islands located about 540 nmi (1,000 km) southeast of Tokyo, Japan. Located in the subtropical climate region, well-developed coral reefs are along the coasts of these oceanic islands, which are also known as important breeding grounds for seabirds, humpback whales, and green turtles (UNEP CBD, 2017d).

The Ogasawara Islands are also an important waypoint in the migration route of the WNP DPS of humpback whales between their feeding grounds in the Commander Islands and off Kamchatka, Russia and their breeding grounds that range from the Ogasawara Islands to the Ryukyu Islands (surrounding Okinawa primarily) and the Babuyan Islands (northern Philippines) (Baker et al., 1994; Bettridge et al. 2015; Calambokidis et al., 2008; Silberg et al. 2013; Titova et al., 2018). The waters of the Ogasawara Islands were once part of the seasonal (January to March) whaling ground for humpback whales, with as many 817 humpback whales killed in Ogasawara waters between 1924 and 1944 (Nasu, 1966; Nishiwaki, 1959). Humpback breeding behavior has also been reported in the Kazan Islands, which lie just southwest of the Ogasawara Islands (Mori et al., 1998; Ohizumi et al., 2002).

Although two WNP populations of humpback whales are thought to exist, the WNP population could not be differentiated into two humpback subpopulations because no breeding location is known for the second putative WNP subpopulation, although the two nominal WNP humpback subpopulations are believed to overlap in the Ogasawara Island region (Bettridge et al. 2015). Thus, one humpback endangered subpopulation (DPS) was designated for the WNP, which is based on humpback wintering and breeding in the area from the Ryukyu Islands (e.g., Okinawa) to the northern Philippines, including the Ogasawara Island areas (Bettridge et al., 2015; Calambokidis et al., 2008; Darling and Mori, 1993; NOAA, 2016); Calambokidis et al. (2008) extended this winter/breeding range somewhat to encompass the Marianas Islands. Calambokidis et al. (2008) noted that humpback whales in the Asia breeding area are distributed over a large area along the island chains of the western Philippine Sea.

Humpback whales are observed around the Ogasawara Islands typically from December through May (Darling and Mori, 1993; Journey of Japan, 2016). Mori et al. (1998) found that humpback whales were densely distributed in the shallow, coastal (~656 ft [200 m] but within about 3.2 nmi [6 km] of shore) waters of the Ogasawara and the Kazan Islands from December through May, with a peak density in February. During their occupancy period in these waters, humpback whales move repeatedly among the Ogasawara and Kazan Islands, crossing offshore waters, with male humpbacks having greater mobility than females with calves (Mori et al., 1998). Females with calves begin to appear around the main Ogasawara island of Chichi-jima in mid-February and early March and continue to occur until between late April and mid-May (Mori et al., 1998).

The same whales in both the Ogasawara and Okinawa island breeding grounds have been photo-ID'd in different years, suggesting that whales in the WNP humpback DPS likely do not use any one Asian breeding area exclusively but instead use all the breeding areas (i.e., Ogasawara, Ryukyus, and Philippines) interchangeably (Darling and Mori, 1993). Ohizumi et al. (2002) noted that mother-calf pairs migrate later in Ogasawara than in Hawaii; there are fewer calves and fewer breeding activities, such as mating pods, observed in Ogasawara than in Hawaii; and the water temperature in the Ogasawara Islands is about (5 °C) cooler than that preferred by mating humpbacks in Hawaii.

Additionally, sperm whales were hunted by commercial Japanese whalers in the Ogasawara Islands until the 1980s (Kasuya and Miyashita, 1988). Female and juvenile sperm whales have been reported in the waters of the Ogasawara Islands with the suggestion that groups of sperm whales are not resident but rather migrate into these waters periodically, perhaps to use the area as a nursery ground, as all sperm whales observed were mature females and immature male and female sperm whales, but no mature male sperm whales are ever observed (Mori et al., 1999). Mori et al. (1999) observed sperm whales throughout the year in Ogasawara Island waters >656 ft (200 m) deep but more typically about 3,281 ft (1,000 m) deep, with denser concentrations in areas where the bottom topography is steeply sloping near shore. Kasuya and Miyashita (1988) reported that previous researchers believed that western Pacific breeding sperm whales migrated in winter to waters around the Ogasawara Islands and summered in the waters off Sanriku and Hokkaido, Japan. Sperm whales are reported to be present around the Ogasawara Islands at least from July through September (Japan Guide, 2018).

Sperm whales in the Ogasawara Islands have been tagged with dive and acoustic sensors since 2002, with genetic analysis of tissue samples of tagged whales supporting the data and observations of Mori et al. (1999) that all tagged Ogasawara sperm whales were mature females and immature (male and female) sperm whales (Aoki et al., 2007, 2012; Amano et al., 2014). The dive results obtained by Aoki et al. (2012, 2015) on 12 sperm whales tagged in the Ogasawara Islands indicated that the sperm whales were actively hunting prey and foraging during their studies, indicating that sperm whales were also feeding in the waters of the Ogasawara Islands. Amano et al. (2014) recorded the vocalization repertoire of clicks, termed codas, of the female and immature sperm whales in the Ogasawara Islands and

compared them to codas of sperm whales recorded off the Kumano (southern, Pacific) coast of Honshu, Japan and found that the codas of the Ogasawara sperm whales were representative of a different clan of sperm whales than those off the Kumano coast, suggesting that two vocal clans of sperm whales inhabit these waters. The coda data suggested to Amano et al. (2014) that the sperm whales found off the Ogasawara Islands are from the Short clan, which is found widely in the South Pacific Ocean, while the sperm whales off the Kumano coast may be part of the ''++1/+1+1'' clan, that has only been reported once off Tonga.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☒ Entirely Inside
☐ Partially Outside

Eligible Areal Extent: None

Source of Official Boundary: UNEP Convention of Biological Diversity

Spatial File Type: GIS shapefile

Spatial File Source: UNEP Convention of Biological Diversity
(/api/v2013/documents/B499E8AA-0C1D-D1A6-016FB88E3B26F444/
attachments/EA_25_EBSA.zip)

Date Obtained: 5/7/18

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Humpback and sperm whales

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round: ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Titova, O. V., Filatova, O. A., Fedutin, I. D., Ovsyanikova, E. N., Okabe, H., Kobayashi, N., . . . Hoyt, E. (2018). Photo-identification matches of humpback whales (*Megaptera novaeangliae*) from feeding areas in Russian Far East seas and breeding grounds in the North Pacific. *Marine Mammal Science, 34*(1), 100–112. doi:10.1111/mms.12444.	The Russian Far East consists of multiple high latitude feeding areas for humpback whales, with 102 foraging humpback whales having been identified from breeding area catalogs during the SPLASH surveys. The goal of this study was to use photographs collected in the Russian Far East from 2004 through 2014 to further refine the migratory destinations of the humpback whales foraging in Russian waters seasonally. These researchers compared photographs taken of wintering humpbacks with photo catalogs from the breeding grounds of Hawaii, Mexico, Okinawa, and the Philippines. The highest number of matches was with Asian breeding grounds (i.e., Okinawa and the Philippines); for the Kamchatka feeding ground, the majority of whales were from the Asian breeding grounds while in the Commander Islands foraging grounds, the proportion of whales from Asian was twice that from the Hawaii breeding ground and six times higher than the Mexican breeding ground. The total match rate was considered low, which continues to support and suggest the hypothesis of some undiscovered humpback whale breeding location in the North Pacific.
Aoki, K., Amano, M., Kubodera, T., Mori, K., Okamoto, R., & Sato, K. (2015). Visual and behavioral evidence indicates active hunting by sperm whales. *Marine Ecology Progress Series, 523*, 233-241. doi:10.3354/meps11141.	Cameras and accelerometers were attached to 17 sperm whales in the Ogasawara Islands from 2010 through 2012 to verify that sperm whales use an actively pursuit strategy when hunting prey. Nearly 43 hours of sperm whale dive data resulted in 17,715 images, of which only 1.5 percent showed visible imagery or identifiable material and were recorded at water depths deeper than <1112 ft (339 m). Some of the recorded images were associated with bursts of speed twice the normal dive swimming speed of the sperm whales. The authors concluded that these data verified the hypothesis that sperm whales actively hunt to capture prey.
Amano, M., Kourogi, A., Aoki, K., Yoshioka, M., & Mori, K. (2014). Differences in sperm whale codas between two waters off Japan: Possible	Vocalizations of mature female and immature sperm whales from two areas of Japan, the Ogasawara Islands and off the Kumano coast of

geographic separation of vocal clans. *Journal of Mammalogy, 95*(1), 169-175. doi:10.1644/13-mamm-a-172.	Honshu Island, were recorded to determine whether these groups of whales shared a repertoire of vocalizations (codas) and belonged to the same social or clan structure. Both the repertoire and duration of the codas for each of the areas was different, suggesting that the sperm whales in each area were from different clans, with such a clear geographic clan structure being unknown elsewhere in the Pacific Ocean. The coda data analysis suggested to the authors that the sperm whales found off the Ogasawara Islands are from the Short clan, which is found widely in the South Pacific Ocean, while the sperm whales off the Kumano coast may be part of the ''++1/+1+1'' clan, that has only been reported once off Tonga.
Silberg, J. N., Acebes, J. M. V., Burdin, A. M., Mamaev, E. G., Dolan, K. C., Layusa, C. A., & Aca, E. Q. (2013). New insight into migration patterns of western North Pacific humpback whales between the Babuyan Islands, Philippines and the Commander Islands, Russia. *Journal of Cetacean Research and Management, 13*(1), 53-57.	Much of the Asian population of humpback whales spends the summer season foraging in the waters of the Kamchatka Peninsula, Russia and overwinters in the waters in the breeding grounds of the Okinawa and Ogasawara islands, Japan and Babuyan Islands, northern Philippines. Prior studies of humpback whales foraging grounds grouped the Commander Islands, Russia with the eastern Aleutian Islands as part of the central North Pacific stock of humpback whales. The authors of this study used photo-ID data from the Commander Islands and Babuyan Islands, Philippines to establish an unreported humpback migrational path between the Commander Islands and the Philippines. This finding suggests that a small number of humpback whales supposedly migrating to a 'missing' or unknown breeding ground is instead actually migrating to the Philippines.
Aoki, K., Amano, M., Mori, K., Kourogi, A., Kubodera, T., & Miyazaki, N. (2012). Active hunting by deep-diving sperm whales: 3D dive profiles and maneuvers during bursts of speed. *Marine Ecology Progress Series, 444*, 289-301. doi:10.3354/meps09371.	Data loggers were attached to 12 mature and immature sperm whales in the Ogasawara Islands to record speed, duration, and depths during dives. The tagged whales completed 126 dives and spent the majority of their time diving to water depths that exceeded 656 ft (200 m). The maximum dive depth and duration were 4,665 ft (1,422 m) and 53 min, respectively. The whales swam continuously during deep dives, with the mean dive swim speed of 2.9 kt (1.5 m/sec). Bursts of speed twice the typical dive speed occurred during about a third of deep dives

	(>1,312 ft [400 m]) and were suggestive of chasing of prey. Our results strongly indicate that sperm whales use an active-pursuit hunting strategy and use the bursts of speed only to capture powerful and/or nutritious (i.e., large and/or muscular) prey that compensate for the energetic cost of the speed burst.
Aoki, K., M. Amano, M. Yoshioka, K. Mori, D. Tokuda, and N. Miyazaki. (2007). Diel diving behavior of sperm whales off Japan. *Marine Ecology Progress Series, 349*, 277-287.	To investigate the possible diel dive patterns in sperm whales, data loggers were attached to sperm whales in two areas of Japan, off the Pacific coast of Kumano and the Ogasawara Islands. Obvious diel patterns of diving behavior were found off the Ogasawara Islands, where the whales dived deeper and swam faster during the day than at night, whereas, off Kumano, the sperm whales showed no diel rhythm in diving depths or swimming speed. The authors suggest that the likely difference in the diel dive patterns of the sperm whales at these two locations was due to the diel behavior of the sperm whale's prey.
Ohizumi, H., Matsuishi, T., & Kishino, H. (2002). Winter sightings of humpback and Bryde's whales in tropical waters of the western and central North Pacific. *Aquatic Mammals, 28*(1), 73-77.	Sighting surveys of cetaceans were conducted in tropical waters of the western and central North Pacific Ocean during January and February 1993. Humpback whales were sighted around Hawaii and Iwo Island, Kazan Islands, which is thought to be the most probable southernmost area of the common wintering and breeding grounds of humpback whales in the Ogasawara-Kazan-Mariana region. No cetaceans were observed in the Marianas Islands. A solitary humpback whale was sighted some distance from Hawaii, which may have been a 'wanderer' that was flexible in its selection of wintering grounds.
Mori, K., Abe, H., Suzuki, M., & Kubodera, T. (1999). School structure, distribution and food habits of sperm whales near the Ogasawara Islands, Japan. Paper presented at the Abstracts, Thirteenth Biennial Conference on the Biology of Marine Mammals. *28 November-December 1999* (Abstract), 130.	Sighting and photo-ID studies were conducted during 1994 to 1998 to investigate the habitat use of sperm whales near the Ogasawara (Bonin) Islands. During 37 daytime whale-sighting cruises conducted within 20 miles of shore, 234 sperm whales in 24 schools were observed, with schools usually composed of 3 to 25 female and immature sperm whales; no male sperm whales were observed. This later finding suggests that the waters off Ogasawara may serve as a nursery ground for sperm whales in the western North Pacific. In total, 129 individuals were photo-

	identified, with 17 of those whales re-sighted over the five-year study and five whales re-sighted four times during the study period. Our data suggest that whales are not permanent residents near the islands, but rather that several different schools alternately migrate to this area every year. Sperm whales were observed at the bottom depths greater than 200 m (mostly >1,000 m) through the year. Whales appeared to concentrate in a small area where the continental slope makes a narrow valley toward the island, particularly during mid-summer through fall. Such bottom topography may promote strong upwelling, which could increase the amount of prey. In this area
Mori, K., Sato, F., Yamaguchi, M., Suganuma, H., & Ueyanagi, S. (1998). Distribution, migration and local movements of humpback whale (*Megaptera novaeangliae*) in the adjacent waters of the Ogasawara (Bonin) Islands, Japan. *Journal of the School of Marine Science and Technology Tokai University, 45*, 197-213.	From 1987 to 1992, land- and ship-based sighting surveys were conducted of humpback whales in the Ogasawara and Kazan islands, although the majority of surveys were conducted in the waters of Chichi-jimi (largest of Ogasawara Islands). Most humpbacks were sighted within the 200-m isobath and typically within 5 km of the coast, which indicated an insular coastal distribution. Humpbacks began arriving in December and remained in the area until May, when they were no longer observed in the area. Females with calves were observed from mid-February to early March and continuing until late April through mid-May; the authors noted that the exact location of humpback calving is not known. Photo-ID catalogs indicates a high rate of recurrence for humpbacks returning annually to the Ogasawara region.
Baker, C. S., Slade, R. W., Bannister, J. L., Abernethy, R. B., Weinrich, M. T., Lien, J., . . . Palumbi, S. R. (1994). Hierarchical structure of mitochondrial DNA gene flow among humpback whales *Megaptera novaeangliae*, world-wide. *Molecular Ecology, 3*, 313-327.	Mitochondrial DNA analysis of samples taken from six humpback whale subpopulations around the world revealed that maternal lineages are highly subdivided among the three major oceanic populations of humpbacks, with maternal lineages showing greatest segregation on summer feeding grounds. The majority of the results were on the delineation of the central and eastern North Pacific stocks of humpback whales, the North Atlantic humpbacks, and those in the Southern Ocean. The analysis supports the division of the North Pacific into a central stock which feeds in Alaskan waters and winters predominantly in Hawaii, and an eastern or

	'American' stock that migrates between feeding grounds along the coast of California and wintering grounds along the coast of Mexico. The analysis results further support the division of the western and eastern Australia/New Zealand Southern Ocean humpback populations.
Darling, J. D., & Mori, K. (1993). Recent observations of humpback whales (*Megaptera novaeangliae*) in Japanese waters off Ogasawara and Okinawa. *Canadian Journal of Zoology* 71(2):325-33.	Photos of 177 individual humpback whales' tail flukes were collected from 1987 to 1990 in Okinawa and Ogasawara waters and analyzed to estimate abundance and determine behavior patterns. Humpback whales were commonly sighted throughout the Ogasawara Archipelago and near the Kerama Islands, Okinawa from December to May. Humpback whales were not regularly seen near Saipan in the Northern Mariana Islands or near Kenting, Taiwan. The predominant behavior patterns related to calving and mating. Two whales were identified in both the Okinawa and Ogasawara regions in different years, suggesting that both regions are used by the same population of humpback whales.
Kasuya, T., & Miyashita, T. (1988). Distribution of sperm whale stocks in the North Pacific. *Scientific Reports of the Whales Research Institute, 39*, 31-75.	This paper discusses the two contrary hypotheses of sperm whale stock segregation in the North Pacific Ocean, longitudinal versus latitudinal, which were reflected by the changes in Japanese whaling of sperm whales. The authors believe that two stocks of sperm whales formerly inhabited the western North Pacific with only one stock inhabiting the eastern North Pacific Ocean. One of the western North Pacific's stocks were so heavily exploited that it was effectively extirpated, leaving only one without enough members to fill in the area left by the extirpated stock.
Nasu, K. (1966). Fishery oceanographic study on the baleen whaling grounds. *Scientific Reports of the Whales Research Institute, 20*, 157-210.	This paper describes the Japanese whaling grounds in the Pacific and Southern oceans for baleen whales and includes a few notes about humpback whales in the Ryukyu Islands. Humpback whales were primarily caught in waters adjacent to Okinawa Island in the Ryukyu Islands. In abundant years, more than 200 animals were taken during January to March (the catch in 1958 reached 240 animals). The Ryukyu Island's whaling operation closed around 1963.
Nishiwaki, M. (1959). Humpback whales in Ryukyuan waters. *Scientific Reports of the Whales*	Whaling around the Bonin (Ogasawara) Islands began in 1924 but whaling operations were

Research Institute, 14, 49-86.	closed due to the significant decreases in catch. In Ryukyuan waters, fishermen often reported the occurrence of humpback whales and started to kill them with rifles in 1954, harvesting 13 whales in 1956 and 23 in 1957. Japanese commercial whaling industry began in the Ryukyu area in 1958. Although these companies expected to kill 50 humpback whales and 30 sperm whales, no sperm whales were ever harvested. However, the whaling companies caught as many as 290 humpback whales in Ryukyuan waters. The author estimated the number of migrating humpback whales in 1959 to be around 1,200 to 1,600 individuals. Based on the total number of humpbacks harvested in 1959, some lactating females or with calves, the total abundance is now estimated to be 2,250 migrating humpbacks with an estimated North Pacific population of 5,000 to 6,000.

Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
Calambokidis, J., E.A. Falcone, T.J. Quinn, A.M. Burdin, P.J. Clapham, J.K.B. Ford, C.M. Gabriele, R. LeDuc, D. Mattila, L. Rojas-, Bracho, J. M. S., B.L. Taylor, J. Urbán R., D. Weller, B.H. Witteveen, M. Yamaguchi, A. Bendlin, D. Camacho, K. Flynn, A., & Havron, J. H., & N. Maloney. (2008). *SPLASH: Structure of populations, levels of abundance and status of humpback whales in the North Pacific.* Final report for Contract AB133F-03-RP-00078. Olympia, Washington: Cascadia Research. 56 pages.	SPLASH (Structure of Populations, Levels of Abundance and Status of Humpbacks) was a large, international (50 research groups and more than 400 researchers in 10 countries) collaboration of humpback whale studies and data synthesis in the North Pacific Ocean. It was designed to determine the abundance, trends, movements, and population structure of humpback whales throughout the North Pacific and to examine human impacts on this population. Field efforts were conducted on all known winter breeding regions for humpback whales in the North Pacific during three seasons (2004, 2005, 2006) and all known summer feeding areas during two seasons (2004, 2005). A total of 18,469 quality fluke identification photographs were taken during over 27,000 approaches of humpback whales. A total of 7,971 unique individual humpback whales were cataloged in SPLASH. Migratory movements and population structure of humpback whales in the North Pacific were found to be more complex than had been previously described. The overall pattern showed

	that coastal wintering regions of the western (Asia) and eastern (mainland Mexico and Central America) North Pacific were the primary wintering areas for the lower latitude coastal feeding regions, while the wintering areas off Hawaii and the Revillagigedo Archipelago were the primary wintering regions for humpbacks feeding in more central and northern latitude foraging areas. The SPLASH data suggested the existence of missing wintering area(s); humpbacks that feed off the Aleutian Islands and in the Bering Sea were not well represented on any of the sampled wintering areas and must be going to one or more unsampled winter locations. Thus, it is likely that SPLASH has revealed a new breeding ground for humpback whales. The best humpback whale estimate of overall abundance in the North Pacific, excluding calves, is the average of two modeled results or 18,302 individuals.

Committee or Government Reports

Paper	*Synopsis*
UNEP CBD. (2017d). Ecologically or biologically significant areas: Ogasawara Islands, EA #25. Retrieved from <https://chm.cbd.int/pdf/documents/marineEbsa/237869/1>.	Overview of EBSA information collected on this area along with the criteria for designation. The Ogasawara Islands host a variety of endemic species. In 2011, the whole area was declared a UNESCO World Heritage Site. Located in the subtropical climate region, the coastal sea areas have well-developed coral reefs specific to oceanic islands, and the islands are also known as important breeding grounds for seabird colonies.
NOAA. (2016). Endangered and threatened species identification of 14 distinct population segments of the humpback whale (*Megaptera novaeangliae*) and revision of species-wide listing; Final rule. *Federal Register 81*, 174, 62260-62320.	Identification of 14 global populations of humpback whales based on the location of their breeding areas; the feeding areas for each population or distinct population segments (DPSs) is also provided. This rule formally relists four (Western North Pacific, Cape Verde Islands/North Atlantic, Central America, and Arabian Sea) of the 14 global DPSs as endangered and one (Mexico) DPS as threatened under the ESA. The remaining nine DPSs are not listed under the ESA. The Western North Pacific DPS is described as those humpback whales that breed or winter in

	the region around Okinawa and the Philippines in the Kuroshio Current (as well as unknown breeding grounds in the Western North Pacific Ocean), transiting through the Ogasawara area, and feeding in the North Pacific Ocean, primarily in the West Bering Sea, off the Russian coast, and the Aleutian Islands.
Bettridge, S., Baker, C. S., Barlow, J., Clapham, P. J., Ford, M., Gouveia, D., Mattila, D. K., Pace, III, R. M., Rosel, P. E., Silber, G. K., & Wade, P. R. (2015). *Status review of the humpback whale (Megaptera novaeangliae) under the Endangered Species Act.* NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-540. La Jolla, CA: Southwest Fisheries Service, National Marine Fisheries Service.	As part of the comprehensive review of the status of humpback whales as the basis for possible revisions under the ESA, all available information and data on humpback whales were compiled by the Humpback Biological Review Team. The team differentiated the global populations of humpback whales into 15 distinct population segments (DPSs) based on the primary breeding location of the associated population. Descriptions of the breeding and foraging ranges of each DPS are included in the status review. The risk of each DPS for extinction was assessed as the subsequent basis for designation of each DPS's status under the ESA.

Surveys

Paper	*Synopsis*
Mori et al., 1998	See summary above.
Ohizumi et al., 2002	See summary above.

Websites / Social Media

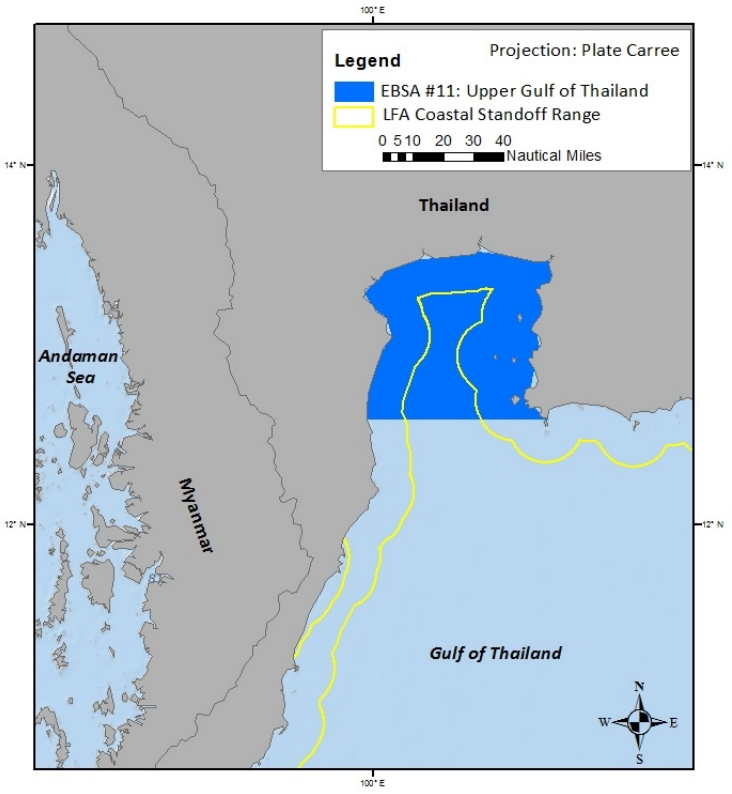
Website/Organization	*Synopsis*
Japan-guide. (2018). Chicijimi island. Retrieved from <https://www.japan-guide.com/e/e8202.html>.	Website about travel to Chici-jimi Island and activities available on the island, including whale watching. Japan-guide notes that humpback whales can be seen in the waters of Chici-jimi from February to April while sperm whales can be seen from July to September and swim-with programs for both taxa are available.
Journey of Japan. (2016). Ogasawara islands—You can see whales! Retrieved from <https://journey-of-japan.com/article/268/en>.	Information about taking a trip to the Ogasawara Islands from Tokyo, Japan (the Ogasawara's are part of Tokyo prefecture) to visit the World Heritage islands and go whale watching to see spinner, Indo-Pacific bottlenose, pantropical spotted dolphins, and sperm whales year-round and humpback whales seasonally when they migrate to the area from December through May.

Upper Gulf of Thailand/Bay of Bangkok 8

MARINE REGION: Northeast Indian Ocean

COUNTRY: Thailand

SPECIES OF CONCERN: Bryde's whale



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☒ **EBSA** (EA #11)
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

The Bay of Bangkok in the upper Gulf of Thailand is influenced by the input of five rivers and seasonal monsoons, with the northeastern monsoon bringing cooler, drier weather to the region from November to February while the southeastern monsoon brings rainy stormy weather from May to September. The upper Gulf of Thailand is characterized by high biodiversity and a wide range of coastal habitats (UNEP CBD, 2017b).

The Bay of Bangkok in the upper Gulf of Thailand is an important reproductive and foraging habitat for Bryde's whales. Neither the IUCN Red List nor International Whaling Commission (IWC) has yet to assess the population of Bryde's whales in this region, but data on the seasonal occurrences, strandings, and fishery interactions were presented to the IWC Scientific Committee (IWC, 2018). Although Bryde's whales have been observed in the upper Gulf of Thailand previously, in 2010, Byrde's whales began to be seen in the upper Gulf in large groups (20+ animals). Annually, Bryde's whales migrate into the Gulf in April and remain until about November (Cherdsukjai et al., 2016), although Bryde's whales have been observed in the Gulf during all months of the year. Both foraging and reproductive behavior has been observed in Bryde's whale in the waters of the upper Gulf, including nursing and mating behaviors (Cherdsukjai et al., 2015; Thongsukdee et al., 2014).

According to photo identification data compiled by the Thailand Department of Marine and Coastal Resources, the population of Bryde's whales in the upper Gulf of Thailand is estimated to be very small, approximately 50 individuals; the information provided to the IWC (2018) described the population of

Bryde's whales in the Gulf as 63±8 (S.E.) individuals. Researchers have observed mating behavior and have reported mother-calf pairs in this region from April to November, with detection of the mother-calf pairs during mark-recapture studies indicating that this region is likely an important nursing ground for this population (IWC, 2018; Roney, 2017; Thongsukdee et al., 2014). One of the calves observed in the mother-calf pairs was so young that the researchers believed it had been born in the Gulf (Animal Welfare Institute, 2011). From 2010 through 2014, 12 female Bryde's whales were observed with 19 calves (Thongsukdee et al., 2014). Cherdsukjai et al. (2016) found that tagged Bryde's whales moved on average 16 nmi/day (30 km/day) when on the feeding grounds in the upper Gulf but averaged as much as 54 nmi/day (100 km/day) when moving out of the upper Gulf of Thailand into a different habitat.

The Thai government considers the Bryde's population in the upper Gulf of Thailand to be relatively unique because the small population appears to be closed, with little breeding occurring with other populations. Additionally, Bryde's whales in the upper Gulf of Thailand exhibit a foraging method or behavior not witnessed elsewhere. Bryde's whales in the area feed primarily on anchovy, ilisha, and sardines. Iwata et al. (2017) described the unique foraging as tread-water or head-lifting feeding since Bryde's whales tread water vertically with their mouths open at the sea surface, with fishes being trapped in their open mouths (Australian Broadcast Corporation, 2016). This feeding method is thought to be an energy conservation strategy.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside

Eligible Areal Extent: 769.30 nmi^2 (2,638.92 km^2)

Source of Official Boundary: UNEP Convention of Biological Diversity

Spatial File Type: GIS shapefile

Spatial File Source: UNEP Convention of Biological Diversity, *</api/v2013/documents/B1290F26-F6DA-D879-41BE-F0FAE1473FFB/attachments/EA_11_EBSA.zip>*

Date Obtained: 5/7/2018

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Bryde's whale

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification

☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Iwata, T., Akamatsu, T., Thongsukdee, S., Cherdsukjai, P., Adulyanukosol, K., & Sato, K. (2017). Tread-water feeding of Bryde's whales. *Current Biology, 27*, R1141-R1155. doi: 10.1016/j.cub.2017.09.045.	Bryde's whales, among other rorquals, are known to use the lunge feeding strategy to capture prey, which allows for a vast quantity of prey to be captured. However, lunge feeding entails a high energetic cost due to the drag created by the whale's open mouth as it moves at high speed. In the upper Gulf of Thailand, Bryde's whales, which were feeding on small fish species, demonstrated a range of feeding behaviors such as oblique, vertical, and lateral lunging in addition to a novel head-lifting foraging behavior. The head-lifting feeding behavior was characterized by whales treading water to hold themselves for several seconds in a vertical posture with an open mouth at the water surface. This paper describes the head-lifting foraging behavior in detail. The authors concluded that the passive feeding behavior of tread-water feeding is an energy-saving foraging strategy.
Cherdsukjai, P., Thongsukdee, S., Passada, S., Prempree, T., & Yaovasuta, P. (2016). Satellite tracking of Bryde's whale (*Balaenoptera edeni*), in the upper Gulf of Thailand. O-F-015. Pages 104 to 114 in Proceedings of the 5th Marine Science Conference 1-3 June 2016 Rama Gardens Hotel, Bangkok. Retrieved from <http://www.bims.buu.ac.th>.	The movements of Bryde's whales residing in the upper Gulf of Thailand (Bay of Bangkok) were studied using seven satellite tags (model: SPOT-240C) during June to November 2015. The tags were attached on the whales for 0 to 22 days (average of 7.5 days). The Bryde's whales moved on average 16 nmi/day (30 km/day) when on the feeding grounds in the upper gulf but averaged as much as 54 nmi/day (100 km/day) when moving out of the upper Gulf of Thailand into a different habitat. Moreover, the study showed that, in the study period, some Bryde's whales resided only in the northwestern Bay of Bangkok, while several other tagged whales traveled to the southeastern part of the by off Prachuap Khiri Khan Province.

Cherdsukjai, P., Thongsukdee, S., Adulyanukosol, K., Passada, S., & Prempree, T. (2015). Population size of Bryde's whale (*Balaenoptera edeni*) in the upper Gulf of Thailand, estimated by mark and recapture method. *Proceedings of the Design Symposium on Conservation of Ecosystem Volume* 3 (14th SEASTAR2000 workshop), *3,* 1-5.	The population size of Bryde's whale (*Balaenoptera edeni*) in the Upper Gulf of Thailand was estimated using a mark-recapture method during the period of January 2010 to December 2013. Forty-five whales were observed by identifying distinctive markings. Using the M(bh)-Pollock and Otto model in the Program CAPTURE and CJS model in the Program MARK, the Bryde's whale population size and survival rate probability estimations were estimated as 63±8.48 (S.E.) animals and 0.88±0.04 (S.E.), respectively. Although the size of the Bryde's whale population in the upper Gulf was small, the likely population trend is expected to increase.
Thongsukdee, S., Adulyanukosol, K., Passada, S., & Prempree, T. (2014). A study of Bryde's whale in the upper Gulf of Thailand. *Proceedings of t*he *1st Design Symposium on Conservation of Ecosystem (SEASTAR2000), 1,* 26-31.	In the upper Gulf of Thailand, Bryde's whales are distributed along the coastlines of six provinces. This study was conducted during January 2010 to December 2012 using photo identification. The Bryde's whale population was identified by recognizing the different characteristics of the dorsal fin and other wounds such as marks on the dorsal fin, body, and fluke in addition to the color patterns around the mouth and jaw. Bryde's whales primarily were observed from April to November. The population of 40 Bryde's whales was identified, including seven females with 10 calves. The mother-calf pairs stayed together for at least 17 months. The authors recognized the upper Gulf of Thailand area as suitable habitat for Bryde's whale foraging, breeding, and nursing grounds.

Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
Thongsukdee, S., Adulyanukosol, K., Passada, S., & Prempree, T. (2014). A study of Bryde's whale in the upper Gulf of Thailand. *Proceedings of t*he *1st Design Symposium on Conservation of Ecosystem (SEASTAR2000), 1,* 26-31 (Powerpoint presentation).	Presentation of scientific paper at conference on conservation of ecosystems. The purpose of the research was to study the Bryde's whale population and distribution in the upper Gulf of Thailand and to learn more about foraging, breeding, and nursing behavior conducted by Bryde's whales in these waters. The researchers conducted small boat surveys and photographed the observed Bryde's whales, which were later photo-identified and a catalog of the whale population developed, with 48 individuals having been identified. The distribution of Bryde's

	whales from 2010 through 2014 was mapped. Twelve female Bryde's whales were observed over this period with 19 calves. Breeding behavior was observed from April to November, although Bryde's whales in the upper gulf may breed and give birth year-round.

Committee or Government Reports

Paper	*Synopsis*
International Whaling Commission (IWC). (2018). Gulf of Thailand Bryde's whales. Paper SC/67b/HIM/09rev01. Page 8 in *Report of the scientific committee, Annex G, Report of the sub-committee on Northern Hemisphere whale stocks*. IWC/67/Rep01. IWC, Bled, Slovenia. 18 pages.	Information present to the Scientific Committee on Bryde's whales in the Bay of Bangkok, northern Gulf of Thailand; the IWC has not yet assessed this population. The population is estimated to be 63±8 (S.E.) individuals based upon photo-identification data collected between January 2010 and December 2013. Researchers reported mother-calf pairs in this region from April to November. Detection of mother-calf pairs during mark recapture studies suggest this region could serve as an important nursing ground for this population. Bryde's whales in this area, including a calf, have been killed due to fishery interactions, which highlights the fishery threat to this small population.
UNEP CBD. (2017b). Ecologically or biologically significant areas: The Upper Gulf of Thailand. Retrieved from <https://chm.cbd.int/pdf/documents/marineEbsa/237851/1>.	Information about the physical characteristics of the Gulf of Thailand, including its importance to Bryde's whales and coastal marine mammal species, sea turtles, and marine and migratory birds. Included are the designations and justifications under each of the EBSA criteria for the area. Overview information on the use of these waters and associated seasonality by Bryde's whales is provided.

Surveys

Paper	*Synopsis*
Cherdsukjai, P., Thongsukdee, S., Adulyanukosol, K., Passada, S., & Prempree, T. (2015). Population size of Bryde's whale (*Balaenoptera edeni*) in the upper Gulf of Thailand, estimated by mark and recapture method. *Proceedings of the Design Symposium on Conservation of Ecosystem Volume* 3 (14th SEASTAR2000 workshop), *3,* 1-5.	See summary above.

Thongsukdee, S., Adulyanukosol, K., Passada, S., & Prempree, T. (2014). A study of Bryde's whale in the upper Gulf of Thailand. *Proceedings of t*he *1st Design Symposium on Conservation of Ecosystem (SEASTAR2000), 1,* 26-31.	See summary above.

Websites / Social Media

Website/Organization	*Synopsis*
Roney, T. (2017). Thar she blows: Thailand's whale watching season kicks off. Retrieved from <https://www.remotelands.com/travelogues/thar-blows-thailands-whale-watching-season>.	Article about a whale watching trip to observe foraging Bryde's whales in the upper Gulf of Thailand that notes the optimal time to see the whales is September through December, although whale watching trips run from April through January. The whale watch operator noted that Bryde's whales are more typically seen closer to shore and they have been observed trap-feeding.
Australian Broadcast Company. (2016). Thailand's whales at risk after mystery deaths. Retrieved from <https://www.abc.net.au/news/2016-10-11/thailands-whales-at-risk-after-mystery--deaths/7923696>.	Concern about the 10 percent mortality in the population of 55 Bryde's whales in the upper Gulf of Thailand and the potential causes are described. The article describes the unique foraging strategy many Thai Bryde's whales use to forage on anchovies.
Coconuts Bangkok. (2014). 20 Bryde's whales frolic in Gulf of Thailand. Retrieved from <https://coconuts.co/bangkok/news/20-brydes-whales-frolic-gulf-thailand/>.	Posting of the sighting of a pod of 20 Bryde's whales in August 2014 off Samut Sakhon province in the Gulf of Thailand. Also noted were the deaths of two Bryde's whales in July and August, due to fishery interactions.
Animal Welfare Institute. (2011). Scientists study Bryde's whales in Gulf of Thailand. Retrieved from <https://awionline.org/awi-quarterly/2011-fall/scientists-study-brydes-whales-gulf-thailand>.	Article describes the research on Bryde's whales conducted in the northern Gulf of Thailand by Dr. K. Adulyanukosol and Mr. S. Thaongsukdee from Thailand's Marine and Coastal Resources Research Center. Since 2003, the department conducted boat surveys and photo-ID studies of the Bryde's whales to discern more about their foraging and feeding ground. In 2011, researchers observed a pod of 35 Bryde's whales that included seven mother-calf pairs. In addition to foraging behavior, the observers also observed mating behavior. One of the calves observed in the mother-calf pairs was so young that the researchers believed it had been born in the Gulf.

Southeast Kamchatka Coastal Waters 9

MARINE REGION: Northwest Pacific Ocean

COUNTRY: Russia

SPECIES OF CONCERN: Killer, fin, humpback, North Pacific right, Western North Pacific gray, and sperm whales; Steller sea lion

MARINE AREA TYPE

☐ **OBIA in Regulations/LOA**

☐ **Mission Blue Hope Spot**

☐ **Pew Ocean Legacy Site**

☐ **IUCN Green List Site**

☐ **IMMA**

☒ **EBSA** (NP #3)

☐ **U.S. Marine National Monument**

☒ **Hoyt Cetacean MPA** (southern tip of Kamchatka)

☐ **U.S. MPA**

☐ **U.S. ESA Critical Habitat**

☐ **NRDC Recommendation**

AREA OVERVIEW:

The coastal waters of southeast Kamchatka are a highly biodiverse marine habitat characterized by an irregular, high-relief coastline incised with bays, fjords, and islands; relatively narrow continental shelf; and temperate waters (UNEP CBD, 2016b). Migration routes and foraging area for marine birds, cetaceans (killer and gray whales), pinnipeds (Steller sea lions), and salmon are located in these coastal waters (UNEP CBD, 2016b).

This area is a seasonal migrational route for Western North Pacific gray whales, which have been regularly observed foraging in Vestnik Bay and Olga Harbor (Kronontsky Gulf) (Filatova et al., 2017; Tyurneva et al., 2010; Yakovlev et al., 2011). Yakovlev et al. (2011) reported 78 Western North Pacific gray whales from 2004 and 2006 to 2009 in Kamchatka waters, with one mother-calf pair observed in Olga Harbor during the summer of 2008 (Tyurneva et al., 2010) and seven mother-calf pairs documented in Olga Harbor/Bay in 2009. Sightings of these mother-calf pairs off southeastern Kamchatka waters may indicate that Olga Harbor/Bay is a second nursery ground for Western North Pacific gray whales (Yakovlev et al., 2011). Recent photo-ID matching studies between Sakhalin, Kamchatka, and Mexican

photographic catalogs of gray whales resulted in nine matches, with two gray whales having been observed in all three locations, three gray whales having been observed in both Sakhalin and Mexico, and four gray whales having been observed in Kamchatka and Mexican waters (Urbán R et al., 2013). The results of this photo-ID matching study along with genetic and tagging studies show that Western and Eastern North Pacific gray whale populations mix during the winter reproductive season and that at least some of the Western North Pacific gray whale population that summer in both Sakhalin and Kamchatka engage in lengthy transoceanic migrations (Urbán R et al., 2013).

Sighting surveys during summer in coastal waters of southeastern Kamchatka waters observed foraging humpback and fin whales in Karaginsky, Ozernoy, and Kamchatsky gulfs, with one right whale recorded in Avachinskaya Bay (aka Avacha Bay) in 2016 (Filatova et al., 2017). Ovsyanikova et al. (2015) compiled all available records of opportunistic sightings of right whales in the waters of eastern Kamchatka and noted that right whales were sighted during summer with some regularity in the inshore waters (typically within 12 nmi [22 km] of shore) of Kambalny and Vestnik Bays.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside

Eligible Areal Extent: 1,601.58 nmi^2 (5,493.25 km^2)

Source of Official Boundary: UNEP Convention of Biological Diversity

Spatial File Type: GIS shapefile

Spatial File Source: UNEP Convention of Biological Diversity
</api/v2013/documents/A65F9731-8AD3-8242-2A8D-FA6C2E1CBCED/attachments/NP_3_EBSA-GIS%20shapefile.zip>

Date Obtained: 5/7/18

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Fin, humpback, North Pacific right, Western North Pacific gray, and sperm whales

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Ovsyanikova, E., Fedutin, I., Belonovich, O., Burdin, A., Burkanov, V., Dolgova, E., Filatova, O., Fomin, S., Hoyt, E., Mamaev, E., Richard, G., Savenko, O., Sekiguchi, K., Shpak, O., Sidorenko, M., & Titova, O. (2015). Opportunistic sightings of the endangered North Pacific right whales (*Eubalaena japonica*) in Russian waters in 2003-2014. Marine Mammal Science, 31, 4, 1559-1567. doi: 10.1111/mms.12243.	Population estimates of North Pacific right whale do not include all Russian waters nor do they include potential sightings or use by right whales of inshore habitats. From 2003 to 2014, various Russian researchers working on marine mammal projects along the coast of the Russian Far East have collected records of 19 opportunistic encounters with right whales that represented sightings of 31 right whales, with one whale sighted twice (records No. 2 and 3), 17 days and about 224 nmi (415 km) apart. Previously little was known about the distribution of right whales off the Pacific coast of the Kamchatka Peninsula. Thus, the regularity of sightings of right whales in waters along the east coast of Kamchatka (Kambalny and Vestnik Bays) indicates that this area is frequently utilized by the whales. Most of the observations off Kamchatka noted in this paper took place inshore (all sightings except Nos. 1 and 15 are within 12 nmi [22 km] from shore).
Yakovlev, Y.M., Tyurneva, O.Y., Vertyankin, V.V., Gailey, G., & Sychenko, O. (2011). Discovering a new feeding area for calf-cow pairs of endangered western gray whales *Eschrichtius robustus* on the south-east shelf of Kamchatka in 2009 and their utilizing different feeding regions within one season. *Egyptian Journal of Aquatic Research, 37,* 1, 95-101.	In 2009, photo-ID studies were conducted off Sakhalin Island and eastern Kamchatka (Olga and Vestnik Bays) of Western North Pacific gray whales. Photo-ID studies conducted offshore southeast Kamchatka since 2006 revealed that some of Kamchatka whales belong to the western gray whale (WGW) population. Solitary gray whales have been previously been detected in the waters of southeast Kamchatka. From 2004, and 2006 to 2009, 78 gray whales were observed and photographed in areas offshore of Kamchatka, with 41 of those whales having been matched to photographs in the Sakhalin/Piltun photo-catalog. In 2008, a mother-calf pair was recorded in Olga Bay, Kamchatka for the first time. In 2009, seven

	mother-calf pairs were observed in Olga Bay, Kamchatka; four of these females/mothers had been identified off Sakhalin Island in previous years and two of the seven calves were later observed in Sakhalin waters later in the 2009 season. Five mother-calf pairs and one solitary calf were identified in Sakhalin waters during 2009. Thus, a total of 10 calves with mothers in the Sakhalin photo catalog were recorded in 2009. These results indicate that the Piltun/Sakhalin offshore area is not the only foraging area for mother-calf pairs of Western North Pacific gray whales but that a second "nursery ground" exists in Olga Bay, Kamchatka.
Tyurneva, O.Y., Yakovlev, Y.M., Vertyankin, V.V., & Selin, N.I. (2010). The peculiarities of foraging migrations of the Korean-Okhotsk gray whale (*Eschrichtius robustus*) population in Russian waters of the Far Eastern seas. *Russian Journal of Marine Biology, 36*(2), 117-124. doi:10.1134/s1063074010020069.	From June to October 2008, photo-ID studies were conducted in the waters off northeastern Sakhalin Island and Olga Bay, southeastern Kamchatka, Russia. Fifty gray whales were observed in Kamchatka waters during 2008. Photographs of those observed gray whales were matched against the existing Sakhalin-Piltun photo-ID catalog, which includes 165 discrete gray whales. Twenty-four gray whales from the Sakhalin-Piltun catalog were observed in Olga Bay. Of the gray whales observed off Kamchatka during 2008, 25 whales had never previously been observed off Sakhalin Island before, making it unclear if these gray whales were part of the Western gray whale stock, which feeds principally off Sakhalin Island, or was instead part of the Eastern gray whale stock, which feeds in the Chukchi and migrates along the North American coast. The results from this study indicate that gray whales likely forage in more than one feeding ground during the same season, which means that these whales can make long intra-annual movements. Two whales in 2006 and one whale in 2008 were first identified off Kamchatka, and later in the same season were observed in the offshore Sakhalin foraging area. In 2007, 13 gray whales sighted off Kamchatka were then observed foraging in Sakhalin waters. Conversely, some gray whales only relocate to foraging grounds interannually. Half the ways observed in Olga Bay in 2008 had been observed off Sakhalin Island in previous years.

	In 2008, for the first time, one mother-calf pair was observed in Olga Bay. This female gray whale had been recorded off Sakhalin Island in 2002 through 2006, when she was accompanied by a calf in 2003, and was observed in Kamchatka waters in 2007. Recent sightings of gray whales in other locations (e.g., Kuril Islands, northern Sea of Okhotsk, Medny Island) besides Sakhalin and Kamchatka waters suggests that the foraging and migrational pathways of the gray whale in the northwestern Pacific Ocean are not well known nor understood.

Committee or Government Reports

Paper	*Synopsis*
UNEP CBD. (2016b). Ecologically or biologically significant areas: Southeast Kamchatka coastal waters. Retrieved from <https://chm.cbd.int/pdf/documents/marineEbsa/204111/2>.	Overview of EBSA information collected on this marine area along with the criteria justification for designation. The southeast Kamchatka coastal waters (Northwest Pacific) are critical for several species of marine megafauna and are a rich marine habitat characterized by a high level of biodiversity. Migration routes of different vertebrates (marine birds, cetaceans, pinnipeds, salmons) are located along the shore. Gray whales are regularly seen in Kronotsky Bay and Vestnik Bay. Steller sea lions are observed at Cape Kozlova. Avachinskaya Bay is a feeding ground for killer whales. Closed bays are inhabited by sea otters. Starichkov and Utashud islands are important bird areas, harboring 13 species of colonial seabirds.
Urbán R., J., Weller, D., Tyurneva, O., Swartz, S., Bradford, A., Yakovlev, Y., Sychenko, O, Rosales N., H., Martínez A., S., Burdin, A., & Gómez-Gallardo U., A. (2013). Report on the photographic comparison of the Sakhalin Island and Kamchatka Peninsula with the Mexican gray whale catalogues. Paper SC/65/BRG04 presented to the Scientific Committee of the International Whaling Commission. Retrieved from <https://www.academia.edu/33141597/SC_65_BRG04_Report_on_the_Photographic_Comparison_of_the_Sakhalin_Island_and_Kamchatka_Peninsula_with_the_Mexican_Gray_Whale_Catalogues>.	A photo-ID matching study of 382 gray whales photographed on their Russian summer feeding grounds off Sakhalin Island (232 photographs taken from 1994 to 2012) and Kamchatka (150 photographs taken from 2004 through 2011) were compared to 4,352 gray whales photographed on their winter calving/breeding lagoons in Baja California Peninsula, Mexico (from 2006 and 2012). The comparison between the three catalogs resulted in nine confirmed matches, one male, three females, and five whales whose sex was unknown. Two whales were observed in all three locations, three gray whales had been identified in both Sakhalin and

	Mexico, and four gray whales were identified in Kamchatka and Mexico. Seven of the nine whales photographed in Mexico were only observed during one winter season, one whale was photographed in Mexico during two winter seasons, and only one whale was photographed in Mexico during three winters. Some of the gray whales were photographed in consecutive seasons. For example, female gray whale #2 was first observed off Kamchatka in 2008, in Mexico with in winter 2009, in Kamchatka in summer 2009, and in Mexico winter 2012 and Sakhalin summer 2012. These results along with tagging and genetic studies show that the Western and Eastern North Pacific gray whale populations mix during the winter reproductive season and that at some of the Western North Pacific gray whale population that summer in Russian waters engages in transoceanic migrations.

Surveys

Paper	*Synopsis*
Filatova, O.A., Fedutin, I.D., Titova, O.V., Shpak, O.V., Burdin, A.M., Hoyt, E. (2017). Cetacean surveys in the coastal waters of the Russian Pacific in 2014-2016. Paper SC/67A/NH/06 presented at 18th Gray Whale Advisory Panel Meeting, International Whaling Commission (WGWAP-18/INF.8). Retrieved from <https://www.iucn.org/sites/dev/files/content/documents/wgwap_18-inf.8_filatova_et_al_cet_surveys_sc_67a_nh_06_highlights.pdf>.	Working from platforms ranging in size from 7.5 m inflatable catamaran to 30 m cargo ship, surveys to estimate cetacean distribution were conducted in the coastal waters of the eastern Kamchatka peninsula, Commander and Kuril Islands, as well as the western and northern Okhotsk Sea from 2014 to 2016; incidental sightings of large whales reported during killer whale surveys of Avacha Gulf were also included. Since the International Whaling Commission has jurisdiction over large whales such as all baleen whales and the sperm whale, only sightings of these whales are noted in this paper. Eastern Kamchatka—Waters of eastern Kamchatka waters were surveyed in 2015 but in 2016, only a short survey of Kronotsky Bay/Gulf was conducted. Feeding aggregations of fin and humpback whales were sighted in Karaginsky, Ozernoy, and Kamchatsky Gulfs. In Karaginsky Gulf, 56 humpback whales were photo-identified, eight of which were matched to humpbacks photographed in the Commander Islands. One of

the humpbacks photographed near Kozlova Cape was identified in 2013 off Bering Island. In Avacha Gulf, humpback whales were common but not frequent. They also occurred south of the gulf near Piratkov Cape and north of the gulf near Shipunsky Cape.

Eleven fin whales were identified, with one pair of fin whales identified three times, twice in Ozernoy Gulf in August and once in September in Kamchatsky Gulf. Gray whales were observed Olga Bay in the northern Karaginsky Gulf, as well as in other regions of Kronotsky Gulf and near Kronotsky Cape. Last, in 2016, a single right whale was observed in Avacha Gulf.

Commander Islands—The most common large whale sighted was the humpback whale, with 1365 humpbacks identified in this area. Common minke and sperm whales are also commonly detected in these waters. Fin whales were not detected.

Kuril Islands—In August 2014, the northern Kuril Islands and southwestern Kuril Islands were surveyed, and in 2016, the entire Kuril Island chain was surveyed. Sperm whales occurred along the length of the Kuril Island chain but were more frequent in areas with steep underwater slopes. A small feeding aggregation of humpback whales off observed off the northern Kuril Islands while two humpback whales were encountered off southern Kuril Islands. Only one fin whale was observed off Urup Island (southern Kuril Islands). In 2014, we observed two right whales in the northern Kuril Islands. Minke whales were common in the northern Kuril Islands but rare in other regions of the island chain.

Okhotsk Sea—In the western Okhotsk Sea, we surveyed the western coast of Sakhalinsky Bay, around the Shantar Islands and in adjacent mainland bays in 2015. We observed minke and bowhead whales off Shantar Islands and near the mainland coast. Minke whales were mostly encountered in open waters of the Shantar archipelago. Additionally, several bowhead whales were encountered near the shoreline of Lindholm Strait. Gizhiginskaya and Tauiskaya

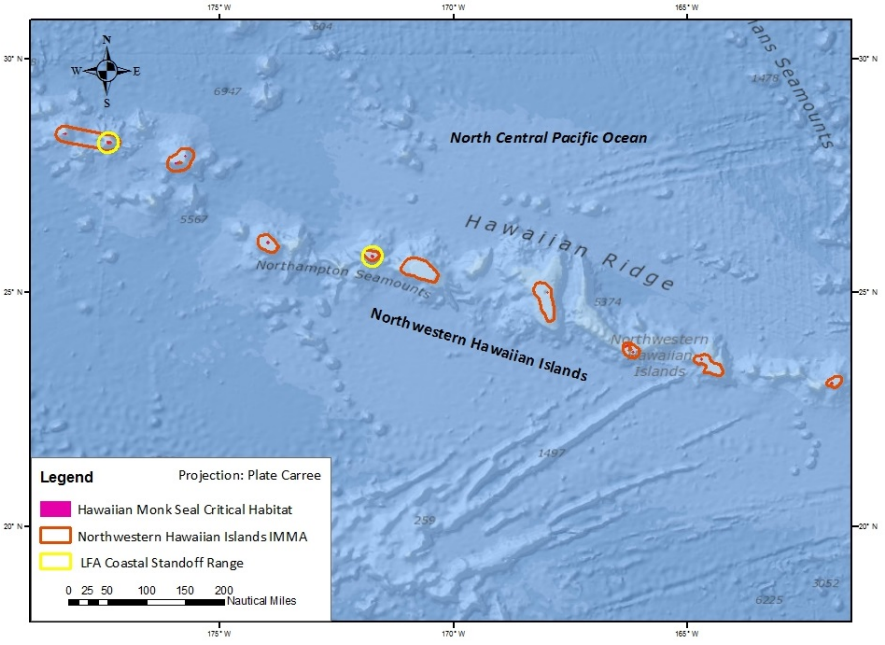
Gulfs were surveyed in the northern Sea of Okhotsk with minke whales being the most common large whale observed. In Gizhiginskaya Gulf, two juvenile bowheads were detected as were a gray female and calf. The female gray whale was photographed and matched against the Sakhalin Island catalog, which revealed that the whale had never been identified off Sakhalin. Genetic analysis revealed that the female had a rare haplotype of mitochondrial DNA found only in 6.8 percent of whales from the eastern gray whale population and not yet observed in gray whales from Sakhalin Island. The authors suggest that perhaps this sighting and other numerous reports represent a separate small feeding group of gray whales in Gizhiginskaya Gulf.

Northwestern Hawaiian Islands 10

MARINE REGION: Central North Pacific Ocean

COUNTRY: USA

SPECIES OF CONCERN: Hawaiian monk seal; spinner dolphin and other small odontocetes; humpback, minke whale



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☒ **IMMA** (NW Hawaiian Islands)
- ☐ **EBSA**
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☒ **U.S. ESA Critical Habitat** (Hawaiian monk seal)
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

Important marine mammal areas (IMMAs) are the result of a joint effort of the International Committee on Marine Mammal Protected Areas and IUCN World Commission of Protected Areas (WCPA) and Species Survival Commission (SSC). IMMAs are created to represent discrete portions of marine habitat that are important to one or more species of marine mammals; represent priority sites for marine mammal conservation (with no management implications); and merit protection and monitoring.

A significant proportion of the global population of the endangered Hawaiian monk seal occurs in the waters of the NWHI IMMA. ESA-designated critical habitat for the Hawaiian monk seal is designated in the nearshore waters of the NWHI. However, all critical habitat for the Hawaiian monk seal in the NWHI is located within the coastal standoff range for SURTASS LFA sonar.

Small and resident populations of spinner dolphins also occur in the waters of the NWHI IMMA at Kure and Midway Atoll as well as Pearl and Hermes Reef, where year-round BIAs were created to differentiate the area in which these spinner dolphin populations are found (Baird et al., 2015).

Although previously it was assumed that humpback whales may only migrate through the waters of the NWHI, visual and acoustic observations of humpback whales during winter in the islands indicate that these whales occur in these waters seasonally and may be relatively common (Johnson et al., 2007; Lammers et al., 2011). Johnson et al. (2007) modeled the available habitat in the NWHI and determined that the amount of shallow, warm-water habitat in the NWHI is almost double that available in the MHI. The sighting and acoustic data as well as the habitat suitability modeling indicate to researchers that the NWHI may be an important winter habitat for humpback whales and potentially may represent an unidentified breeding area. Current information and data are insufficient to determine whether the humpback whales occurring in the NWHI and MHI represent the same breeding stock (Bettridge et al.,2015; Lammers et al., 2011). Bettridge et al. (2015) proposed an alternative theory for the presence of humpback whales in the NWHI during winter, namely that the breeding populations in the MHI have simply expanded their range to include the NWHI. Although the specific purpose for humpbacks in the NWHI has yet to be fully ascertained, it does seem clear that the shallower habitat of the NWHI is seasonally important to the humpback whale.

NOTE: Other NWHI marine areas are also under assessment as a potential marine mammal OBIAs for SURTASS LFA sonar. Marine area #1, Papahānaumokuākea Marine National Monument, and #16, Hawaiian Monk Seal Critical Habitat, encompass much of the same geographic area and the same relevant marine mammal species as this IMMA.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside (nearly all outside CSR)

Eligible Areal Extent: 2,134.43 nmi^2 (7,320.89 km^2)

Source of Official Boundary: IUCN-Marine Mammal Protected Areas Task Force

Spatial File Type: GIS Shapefile

Spatial File Source: IUCN-Marine Mammal Protected Areas Task Force, 2017. GIS data made available by the IUCN Global Dataset of Important Marine Mammal Areas (IUCN-IMMA), July 2018. Made available under agreement on terms of use by the IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force and made available at <www.marinemammalhabitat.org/imma-eatlas>.

Date Obtained: 7/28/18

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Humpback whale

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification

☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Lammers M.O., & Munger L.M. (2016) From shrimp to whales: Biological applications of passive acoustic monitoring on a remote Pacific coral reef. Pages 61-81 in Au W., & Lammers M. (eds). *Listening in the ocean. Modern acoustics and signal processing.* New York, NY: Springer.	The authors analyzed PAM data from 2006 to 2009 at French Frigate Shoals (FFS) in the NWHI. Humpback whale songs were detected in December through April; occurrence was greater during 2008 to 2009 than 2006 to 2007, possibly reflecting an increase in whale density near FFS. The results also provide the first long-term record of minke whales in the NWHI and indicated that minke "boing" sounds were detected starting in late October, with one or two peaks in the December to March period; during March 2009, minke whale calls were present nearly every day.
Baird, R. W., Cholewiak, D., Webster, D. L., Schorr, G. S., Mahaffy, S. D., Curtice, C., . . . Van Parijs, S. M. (2015). Biologically important areas for cetaceans within U.S. waters–Hawai'i region. *Aquatic Mammals, 41*(1), 54-64. doi:10.1578/am.41.1.2015.54.	Using existing published, unpublished information, and expert judgment for U.S. Hawaii waters, 20 biologically important areas (BIAs) were identified and created for small and resident populations of odontocetes and one reproductive area for humpback whales in both the Main and Northwest Hawaiian Islands.
Lammers, M. O., Fisher-Pool, P. I., Au, W. W. L., Meyer, C. G., Wong, K. B., & Brainard, R. E. (2011). Humpback whale *Megaptera novaeangliae* song reveals wintering activity in	Seven passive acoustic recorders were deployed in the NWHI and two recorders were deployed off Oahu in the MHI to record humpback whale songs as an indicator of winter breeding activity.

the Northwestern Hawaiian Islands. *Marine Ecology Progress Series, 423*, 261-268. doi:10.3354/meps08959.	Humpback whale songs were recorded at differing schedules from June 2008 through October 2009 at the nine sites, with humpback songs found to be prevalent at Maro Reef, Lisianski Island, and French Frigate Shoals but were also recorded at Kure, Midway, Pearl, and Hermes atolls in the NWHI. The timing and quantity of songs at several of the NWHI sites were consistent with those found in the breeding areas of the MHI. These data and trends suggested to the researchers that humpbacks use the NWHI as a wintering area.
Johnston, D.W., Chapla, M. E., Williams, L. E., & Matthila, D. K. (2007). Identification of humpback whale (*Megaptera novaeangliae*) wintering habitat in the Northwestern Hawaiian Islands using spatial habitat modeling. *Endangered Species Research, 3*, 249–257. doi:10.3354/esr00049.	This study consisted on spatial habitat modeling as well as visual and acoustic surveys to determine if the NWHI were a wintering spot for humpback whales, which were previously thought to only overwinter in the MHI. Humpback whales prefer warm, shallow regions in winter months, which has been linked to reproductive status and success. Central North Pacific humpback whales' winter in the MHI with peak densities occurring in late March. This study conducted surveys from March 26 through April 12, 2007, cruising across the NWHI. During surveys, nine groups of humpbacks were detected visually. At least two of these groups had young calves present and three groups were engaged in activity consistent with breeding. Previous hypotheses were that the NWHI were used as a migratory corridor on way to wintering grounds in the MHI but migrating whales' movements are not generally restricted to shallow habitats such as those occupied during breeding periods. All observations were made in shallow regions at or within the 656-ft (200-m) isobath (shallow waters) despite considerable survey effort in deeper regions. Authors noted that no humpback whales were found at Ladd Seamount despite extensive surveys in that location. Further, results from satellite telemetry studies (Mate et al., 2007) showed that none of the tagged whales on the winter grounds in the MHI moved through the NWHI on their way back to summer foraging grounds. Instead, these whales moved either directly north or northeast toward the mainland U.S. after leaving Hawaii. Therefore, results from this study suggest that

	NWHI should now be considered wintering habitat for humpback whales. The authors also note that the amount of shallow, warm-water habitat in the NWHI is almost double that available in the MHI, indicating its importance as overwintering habitat.
Stewart, B. S., Antonelis, G. A., Baker, J. D., & Yochem, P. K. (2006). Foraging biogeography of Hawaiian monk seals in the Northwestern Hawaiian Islands. *Atoll Research Bulletin, 543*, 131-145.	Authors documented the geographic and vertical foraging patterns of 147 Hawaiian monk seals from all six NWHI breeding colonies (Kure, Midway, and Pearl & Hermes atolls, Lisianski, and Laysan islands, and French Frigate Shoals) from 1996 through 2002. The authors report that seals foraged extensively within barrier reefs of the atolls and on the leeward slopes of reefs and islands at all colony sites, with virtually all seals foraging within atoll lagoons or around island colonies where they were tagged. Seals also ranged away from these sites along the Hawaiian Islands Archipelago submarine ridge to most nearby seamounts and submerged reefs and banks. Overall, all seals remained within the US EEZ and in waters from the NWHI and exposed atolls out to 200 nmi (370 km) while foraging. Core foraging areas (i.e., 50% probability distributions) were generally centered over areas of high bathymetric relief (e.g., submerged banks, seamounts) or focal areas within atoll lagoons. When foraging around colonies, 95% of the locations were within 20.5 nmi (38 km) of the center of the atoll or island, except at French Frigate Shoals where the ranges for adult females extended up to 50 to 58 km. 75% of those locations were within 11 nmi (20 km) of the colony centers. Movement of seals among colonies is evidently limited (Harting et al., 2002). Consequently, each breeding colony has been considered to be a relatively distinct subpopulation.

Committee or Government Reports

Paper	*Synopsis*
Bettridge, S., Baker, C. S., Barlow, J., Clapham, P. J., Ford, M., Gouveia, D., Mattila, D. K., Pace, III, R. M., Rosel, P. E., Silber, G. K., & Wade, P. R. (2015). *Status review of the humpback whale (Megaptera novaeangliae) under the Endangered Species Act.*	As part of the comprehensive review of the status of humpback whales as the basis for possible revisions under the ESA, all available information and data on humpback whales were compiled by the Humpback Biological Review Team. The team

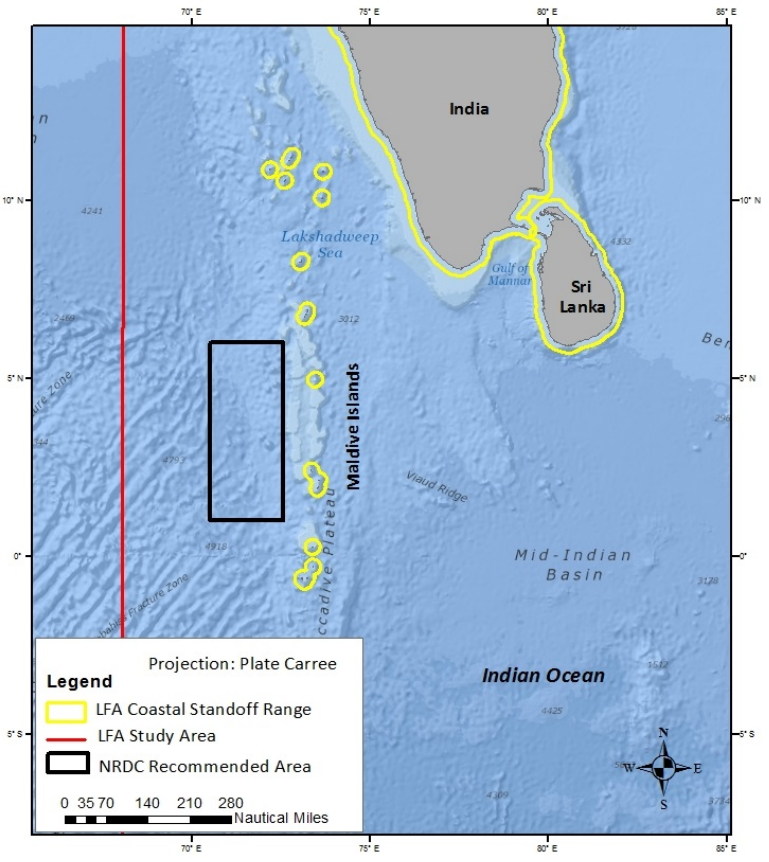
NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-540. La Jolla, CA: Southwest Fisheries Service, National Marine Fisheries Service.	differentiated the global populations of humpback whales into 15 distinct population segments (DPSs) based on the primary breeding location of the associated population. Descriptions of the breeding and foraging ranges of each DPS are included in the status review. The risk of each DPS for extinction was assessed as the subsequent basis for designation of each DPS's status under the ESA.
Stewart, B. S. (2004). *Geographic patterns of foraging dispersion of Hawaiian monk seals (Monachus schauinslandi) in the northwestern Hawaiian Islands.* NMFS-PIFSC Administrative Report H-04-05C. Pacific Islands Fishery Science Center, National Marine Fisheries Service. 25 pages.	This report provides results of recent research efforts to ascertain the habitat use and foraging ecology of Hawaiian monk seals in the NWHI. From 1996 through 2002, the movements and dive patterns of 147 Hawaiian monk seals were monitored for several months or more with data-recording, satellite-linked radio transmitters. Seals foraged extensively within the fringing atoll lagoons at French Frigate Shoals, Pearl and Hermes Reef, Midway Atoll, and Kure Atoll, and on the outer slopes of these atolls and seaward of Laysan and Lisianski Island. Seals also ranged to and evidently foraged along the submarine ridges between those atolls and island and nearby seamounts.
Stewart, B.S., & Yochem, P.K. (2004). *Use of marine habitat by Hawaiian monk seals (Monachus schauinslandii) from Laysan Island: Satellite-linked monitoring in 2001-2002*. NMFS Pacific Island Fisheries Science Center, Administrative Report H-04-02C. 131 pages.	This report presents the results of studies conducted at Laysan Island, on the second largest colony of Hawaiian monk seals, at 250 to 300 seals, from October 2001 through September 2002 to define the general geographic and vertical marine habitats used by seals when foraging. Thirty seals were captured between October 6 and 17, 2001 for biomedical sampling and deployment of tracking instrumentation. Twenty (67%) of all seals traveled to and spent substantial time foraging at Maro Reef. Ten seals traveled as far as Raita Bank to forage, including three pups. Twelve seals also foraged around the Northampton Seamounts. Over one million maximum depth dives were recorded, indicating that most dives were shallower than 40 m, though there were clearly secondary deeper modes at 60 to 80 m for juveniles and weaned pups; 120 to 140 m for adult females and weaned pups; and 250 to 350 m for adult females and juveniles.

West of Maldives 11

MARINE REGION: Central Indian Ocean

COUNTRY: Maldives

SPECIES OF CONCERN: Blue whale (pygmy), Bryde's whale



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☐ **EBSA**
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☒ **NRDC Recommendation**

AREA OVERVIEW:

Officially the Republic of Maldives, the Maldives consist of coral atolls that form a chain running north-south from about 7°N to about 1°S (Anderson et al., 2005). The chain is single in the north and south, but double in the central part of the archipelago where an "inter-atoll sea" exists with bottom depths of 2 to 500 m (6.5 to 1640 ft). Outside the atolls, the seafloor steepens quickly to depths of about 3,000 m (9,843 ft). Bays and estuaries exist within the atolls, where spinner dolphins can be found during the day within the northern Indian Ocean (Anderson et al., 2012).

The Maldives are dominated by the seasonal monsoons. The southwest monsoon occurs from about May to October, producing intense upwelling in the Arabian Sea off the coasts of Somalia and the Arabian Peninsula. Winds blow from the southwest or west, from Africa towards India. During the northeast monsoon, from about December to March, the winds die down and the intense upwelling ceases. In these months, whales disperse more widely to regions with seasonally high productivity, such as the waters west of the Maldives (Anderson et al., 2012).

Anderson et al. (2012) compiled catches, sightings, strandings, and acoustic detections of pygmy blue whales and correlated the distribution with ocean color data indicative of chlorophyll a concentrations. While there is a peak in chlorophyll a west of the Maldives in December to March, the Maldives have much lower chlorophyll values overall. The observations suggest that most blue whales pass by the

Maldives as they migrate east-west between monsoon seasons, though some animals do loiter (Anderson et al., 2012). However, the data do not suggest that the Maldives are a significant foraging ground for blue whales.

A wide diversity of cetacean species has been documented around the Maldives (Ballance et al., 2001; Branch et al., 2007). The most commonly sighted species were Risso's dolphin, pantropical spotted dolphin, spinner dolphin, and sperm whale (Clark et al., 2012). Spinner dolphins have been observed using nearshore atoll bays as daytime resting locations, then moving offshore at night to forage, as has been documented around Hawaii. Genetic studies of Bryde's whales show that a distinct population exists in the northern Indian Ocean, though insufficient samples in the Maldives preclude a definite statement about those individuals (Kershaw et al., 2013).

GEOGRAPHIC CRITERIA

Location Status: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☒ Entirely Outside
☐ Partially Outside

Eligible Areal Extent:

Source of Official Boundary:

Spatial File Type:

Spatial File Source:

Date Obtained:

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: blue (pygmy) whale, Bryde's whale

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
de Vos, A., Faux, C. E., Marthick, J., Dickinson, J., & Jarman, S. N. (2018). New determination of prey and parasite species for northern Indian Ocean blue whales. *Frontiers in Marine Science, 5*, 104. doi:10.3389/fmars.2018.00104.	This study focused on feeding behavior of blue whales using dietary DNA derived from fecal samples collected off southern Sri Lanka from January through March 2013. Unlike in other foraging areas where blue whales feed predominantly on krill, southern Sri Lankan blue whales feed on sergestid shrimp, which are found within the top 984 ft (300 m) of the water column off southern Sri Lanka.
Kershaw, F., Leslie, M. S., Collins, T., Mansur, R. M., Smith, B. D., Minton, G., . . . Rosenbaum, H. C. (2013). Population differentiation of 2 forms of Bryde's whales in the Indian and Pacific Oceans. *Journal Of Heredity, 104*(6), 755-764. doi: 10.1093/jhered/est057, 10.5061/dryad.b9q73	Phylogenetic analyses support the presence of two taxonomic units of Bryde's whales (*Balaenoptera edeni edeni* and *Balaenoptera brydei*). Three main, genetically distinct clusters are apparent for *B. e. brydei*: the northern Indian Ocean (Oman, Maldives, and Bangladesh), off Java, and the northwest Pacific. No records of *B. e. edeni* were found off the Maldives, though 11.1% and 4.4% were found in Oman and Bangladesh, respectively, with samples occurring close to shore. The small sample size off the Maldives (n=8) precludes a definitive conclusion regarding genetic differentiation, but the authors suggest a precautionary approach to include the Maldives as a separate population unit for management purposes.
Anderson, R.C., Branch, T.A., Alagiyawadu, A., Baldwin, R., & Marsac, F. (2012). Seasonal distribution, movements and taxonomic status of blue whales (*Balaenoptera musculus*) in the northern Indian Ocean. *Journal of Cetacean Research and Management, 12*(2), 203-218.	Using all available blue whale occurrence data (sightings, strandings, acoustic detections, and whaling catches) from the Northern Indian Ocean, the authors developed a hypothesis about the east-west migrational pattern of blue/pygmy blue whales in the Northern Indian Ocean. Animals appear to congregate in the Arabian Sea off the coasts of Somalia and southern Arabia during the southwest monsoon (from about May to October) where intense upwelling occurs, then blue whales disperse more widely during the northeast monsoon (December to March). Blue whales appear to pass by the north of the

	Maldives in November to January heading eastwards, returning westwards in April to May. Although most blue whales pass by the Maldives, some blue whales may loiter, since they have been observed during January to April.
Clark, R.A., Johnson, C.H., Johnson, G., Payne, R., Kerr, I., Anderson, R.C., Sattar, S.A., Godard, C.A.J., & Madsen, P.T. (2012). Cetacean sightings and acoustic detections in the offshore waters of the Maldives during the northeast monsoon seasons of 2003 and 2004. *Journal of Cetacean Research and Management, 12,* 2, 227–234.	The R/V *Odyssey* conducted visual and acoustic surveys in the northeast monsoon season of 2003 and 2004, primarily focusing on biopsy sampling of sperm whales as part of a global survey of ocean pollutants. The surveys were located in offshore and atoll slope waters. The most commonly sighted species were Risso's dolphin, pantropical spotted dolphin, spinner dolphin, and sperm whale. All other species were seen less than ten times during the two surveys. No sightings of blue whales were recorded; 8 sightings of Bryde's whales were reported. Most sperm whale sightings occurred between 0° and 3°N, 72°E and 74°E.
Stafford, K. M., Chapp, E., Bohnenstiel, D. R., & Tolstoy, M. (2011). Seasonal detection of three types of "pygmy" blue whale calls in the Indian Ocean. *Marine Mammal Science, 27*(4), 828-840. doi: 10.1111/j.1748-7692.2010.00437.x	Acoustic data from three International Monitoring System hydrophones (Diego Garcia North [DGN], Diego Garcia South [DGS], and Cape Leeuwin, Australia [CLA]) were collected from January 2002 through December 2003. Three types of blue whale calls, believed to be from separate acoustic populations of pygmy blue whales, were identified. Sri Lanka calls were detected year-round at DGS and DGN. Madagascar calls were only detected at DGN, and then for only 1.3% of the time and only during the austral winter. Australia calls were only recorded at CLA and only in the austral winter.
Branch, T. A., Stafford, K. M., Palacios, D. M., Allison, C., Bannister, J. L., Burton, C. L. K., . . . Warneke, R. M. (2007). Past and present distribution, densities and movements of blue whales *Balaenoptera musculus* in the Southern Hemisphere and northern Indian Ocean. *Mammal Review, 37*(2), 116-175.	The authors compiled catches (303,329), sightings (4,383 records of more than 8,058 whales), strandings (103), Discovery marks (2,191), and recoveries (95) of blue whales in the southern hemisphere and northern Indian Ocean. The recorded data around the Maldives were further analyzed in Anderson et al. (2012), summarized above. General distribution information is provided, but nothing specific to the Maldives.
Anderson, R. C. (2005). Observations of cetaceans in the Maldives, 1990-2002. *Journal of Cetacean Research and Management, 7*(2), 119-135.	These data were further analyzed in Anderson et al. (2012), summarized above.
Ballance, L. T., Anderson, R. C., Pitman, R. L.,	A survey was conducted in April 1998, focusing

Stafford, K., Shaan, A., Waheed, Z., & R.L. Brownell, J. (2001). Cetacean sightings around the Republic of the Maldives, April 1998. *Journal of Cetacean Research and Management, 3*(2), 213-218.	on biopsy samples of blue whales for molecular genetic analysis. Effort occurred within 50 km (27 nmi) of shore. Though blue whales were encountered rarely (n=4), at least 16 cetacean species were documented, with spinner dolphins and bottlenose dolphins recorded most often. One dense concentration of Bryde's whales was encountered in the waters between Felidhoo and Mulaku atolls.

Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
Cooke, J.G. (2018). *Balaenoptera musculus*. The IUCN red list of threatened species 2018: e.T2477A50226195. Retrieved from <http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T2477A50226195.en>.	The Committee on Taxonomy of the Society for Marine Mammalogy recognizes northern blue whale (*Balaenoptera musculus musculus*), Antarctic blue whale (*B. m. intermedia*), northern Indian Ocean blue whale (*B. m. indica*), pygmy blue whale (*B. m. brevicauda*), and Chilean blue whale (*B. m.* un-named subspecies). The number of pygmy blue whales is very uncertain but may be in the range of 2,000 to 5,000 individuals. Blue whales feed almost exclusively on euphasiids (krill), feeding both at the surface and at depths of up to 300 m (984 ft).

Surveys

Paper	*Synopsis*
Clark, R.A., Johnson, C.H., Johnson, G., Payne, R., Kerr, I., Anderson, R.C., Sattar, S.A., Godard, C.A.J., & Madsen, P.T. (2012). Cetacean sightings and acoustic detections in the offshore waters of the Maldives during the northeast monsoon seasons of 2003 and 2004. *Journal of Cetacean Research and Management, 12,* 2, 227–234.	See summary above.
Stafford, K. M., Chapp, E., Bohnenstiel, D. R., & Tolstoy, M. (2011). Seasonal detection of three types of "pygmy" blue whale calls in the Indian Ocean. *Marine Mammal Science, 27*(4), 828-840. doi: 10.1111/j.1748-7692.2010.00437.x	See summary above.
Ballance, L. T., Anderson, R. C., Pitman, R. L., Stafford, K., Shaan, A., Waheed, Z., & R.L. Brownell, J. (2001). Cetacean sightings around the Republic of the Maldives, April 1998. *Journal of Cetacean Research and Management, 3*(2), 213-	See summary above.

218.

Websites / Social Media

Website/Organization	*Synopsis*
The Whale and Dolphin Company. (2019). The very best tropical whale and dolphin watching. Retrieved from < http://www.whale-and-dolphin.com/maldives_whale_dolphin_watching.htm>.	This whale and dolphin watching company offers liveaboard cruise packages in April and November. Spinner dolphins, bottlenose dolphins, Risso's dolphins, and short-finned pilot whales are advertised as abundant. They don't see "large number of big whales," but regularly have "superb view of sperm whales, blue whales, and Bryde's whales." The company lists Bryde's whales as commonly seen and blue whales are regularly seen.

North Western Australia Shelf/Ningaloo Reef 12

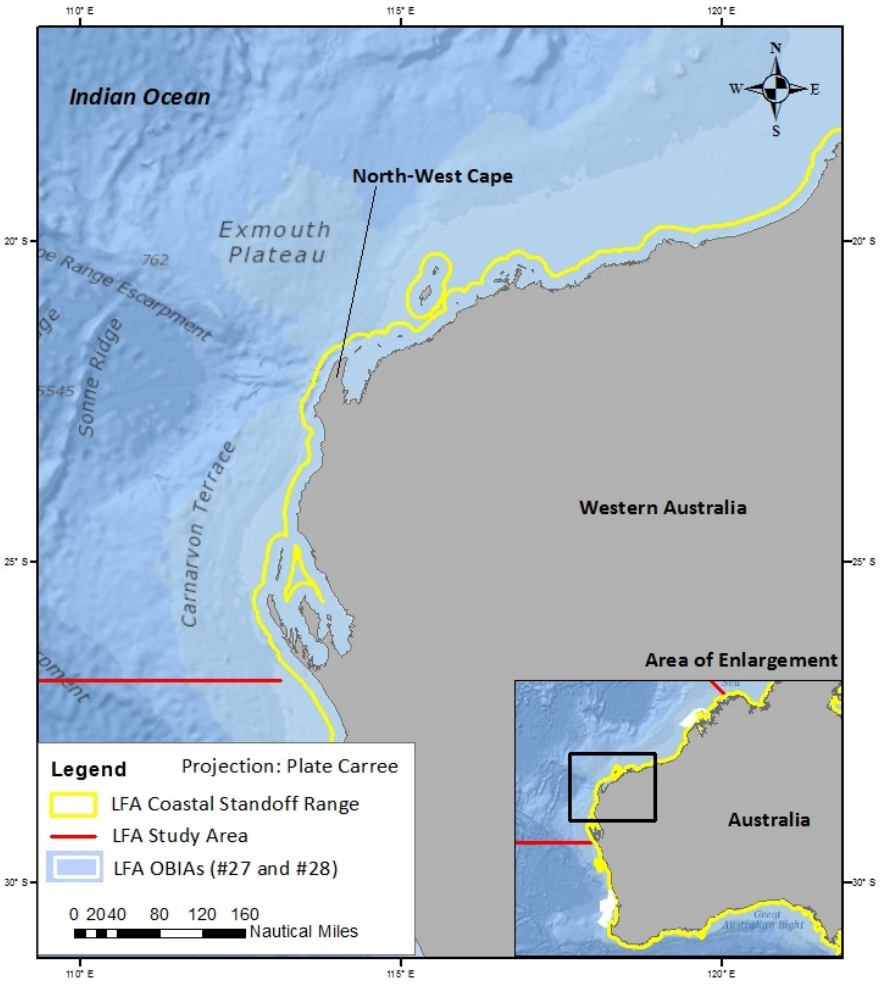
MARINE REGION: Southeast Indian Ocean

COUNTRY: Australia

SPECIES OF CONCERN: Blue (pygmy) whale, humpback whale

MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☐ **EBSA**
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☒ **NRDC Recommendation**



AREA OVERVIEW:

The oceanography of the Ningaloo region of northern Western Australia is dominated by the Leeuwin Current that drives warm, nutrient-poor surface waters south along the continental shelf during the autumn and winter. In the summer, southerly winds drive the Ningaloo Current north, creating cold water upwelling that generates primary productivity (Sleeman et al., 2007).

Pygmy blue whales, a subspecies of blue whales, inhabit the Indian Ocean, the southwest Pacific Ocean, and the eastern part of the Southern Ocean. The eastern Indian Ocean population inhabits waters west and south of Australia, occurring in two distinct feeding areas (Perth Canyon [OBIA #28] and off Southern Australia, both south of the SURTASS LFA sonar study area) during the austral summer. Satellite-tagged blue whales traveled north (March/April) from Perth Canyon within 100 km (54 nmi) of the coast until North West Cape, where they moved more offshore and traveled within 238 km (128.5 nmi) of shore (Double et al., 2014). By June, the whales were traveling through the Savu and Timor seas (outside the LFA study area). Only one whale maintained its tag through the southern migration, leaving

Indonesian waters in September and arriving at the subtropical frontal zone south of Western Australia by December, returning to the Perth Canyon area by March (Double et al. 2014). Migratory tracks converged around the North West Cape peninsula on their way north, with Ningaloo Reef exhibiting higher occupancy than the mean along the track path.

This general migration pattern is supported by acoustic recordings (Samaran et al., 2010; Gavrilov & McCauley, 2013; Samaran et al., 2013) in which Australian pygmy blue whale calls were detected at Crozet Island in the southwest Indian Ocean during January to April (Samaran et al., 2010) and southwest and northeast of Amsterdam Island in the central North Pacific during austral autumn and winter (Samaran et al., 2013). The acoustic recordings also suggest that Australian pygmy blue whales exhibit basin-scale longitudinal and latitudinal movement patterns, indicating multiple migration routes and a migratory elasticity that has been demonstrated in other blue whale populations (e.g., the eastern North Pacific, Double et al., 2014).

Humpback whales are also known to migrate along the Western Australia shelf, with calving grounds extending along the Kimberley coast between Camden Sound and Broome (15-18 °S) (OBIA #27, Camden Sound). During aerial photogrammetric research, large numbers of humpback whale calves were sighted along North West Cape (21° 47’ to 22° 43’ S), with the majority of calves (85% in 2013 and 94% in 2015) classified as neonates (Irvine et al., 2018). Almost all neonates (97% and 95.4% in 2013 and 2015, respectively) were traveling northward. Searches were conducted out to approximately 5.5 km (3 nmi) from the reef edge, with a second track along the 200 m (656 ft) depth contour, approximately 5-10 km (2.7-5.4 nmi) seaward of the reef edge. Calves were distributed along a narrow corridor that followed the contour of the seaward edge of the fringing reef, with 88% and 96% of sighting in water depths ≤ 60 m (197 ft) in 2013 and 2015, respectively. Far more groups were sighted along the trackline that followed the 200 m (656 ft) depth contour, but none of these groups contained calves. Irvine et al. (2018) suggest that the calving range extends from Camden Sound (15°S) to Point Cloates (22° 43’ S) and that Exmouth Gulf may be used as a nursery area by both young northbound calves and older southbound calves. The southbound migration is located closer to shore (within the 200 m isobaths), while the northbound migration is more dispersed in farther offshore waters.

NRDC has suggested an OBIA along the continental shelf from March to June and September to December and an OBIA for Ningaloo Reef from April to June.

NOTE: Another marine area along the coast of Western Australia is also under assessment as a potential marine mammal OBIA for SURTASS LFA sonar. Marine area #14, Western Australia (Shark Bay to Exmouth Gulf), encompasses much of the same geographic area with the same relevant marine mammal species.

GEOGRAPHIC CRITERIA

Location Status: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☒ Entirely Outside
☐ Partially Outside

Eligible Areal Extent:

Source of Official Boundary:

Spatial File Type:

Spatial File Source:

Date Obtained:

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Blue whale (pygmy) whale

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification

☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification

☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification

☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification

☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification

☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification

☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

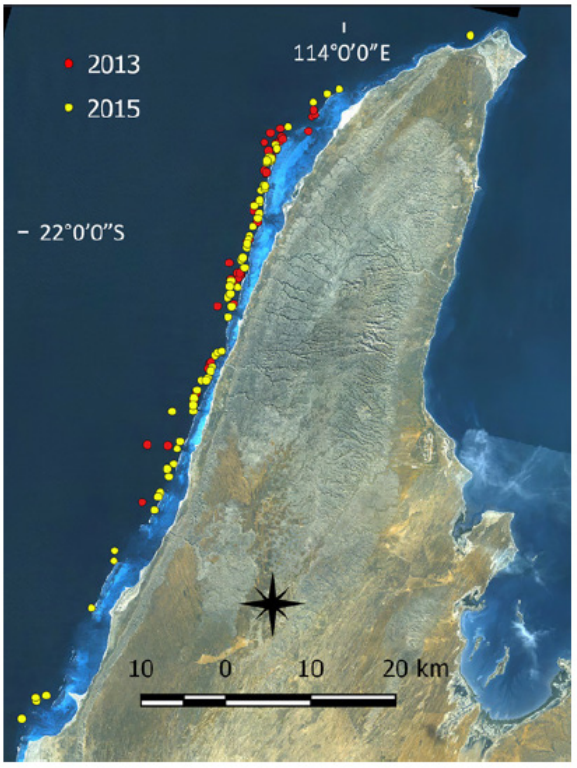
☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Irvine, L. G., Thums, M., Hanson, C. E., McMahon, C. R., & Hindell, M. A. (2018). Evidence for a widely expanded humpback whale calving range along the Western Australian coast. *Marine Mammal Science, 34*(2), 294-310. doi: 10.1111/mms.12456.	During aerial photogrammetric research, large numbers of humpback whale calves were sighted along North West Cape (21° 47’ to 22° 43’ S), with the majority of calves (85% in 2013 and 94% in 2015) classified as neonates. Almost all neonates (97% and 95.4% in 2013 and 2015, respectively) were traveling northward. Searches were conducted out to approximately 5.5 km (3 nmi) from the reef edge, with a second track along the 200 m (656 ft) depth contour, approximately 5-10 km (2.7-5.4 nmi) seaward of the reef edge. Calves were distributed along a narrow corridor that followed the contour of the seaward edge of the fringing reef, with 88% and 96% of sighting in water depths ≤ 60 m (197 ft) in 2013 and 2015, respectively. Far more groups were sighted along

the trackline that followed the 200 m (656 ft) depth contour, but none of these groups contained calves. These results indicate that the calving range extends from Camden Sound (15°S) to Point Cloates (22° 43' S) and that Exmouth Gulf may be used as a nursery area by both young northbound calves and older southbound calves. It is clear that the waters along the seaward edge of the fringing reef are important habitat for mothers and their newborn calves (Figure 6, copied below).



Double, M. C., Andrews-Goff, V., Jenner, C., Jenner, M.-N., Laverick, S. M., Branch, T. A., & Gales, N. J. (2014). Migratory movements of pygmy blue whales (*Balaenoptera musculus brevicauda*) between Australia and Indonesia as revealed by satellite telemetry. *PLoS ONE, 9*(4), e93578. doi:10.1371/journal.pone.0093578.t001.

Eleven pygmy blue whales were tagged near Perth Canyon in March and April and tracked with satellite telemetry on their northbound migration. Animals remained near the coastline (100.0 ± 1.7 km [54.0 ± 0.9 nmi]) throughout March and April until reaching the North West Cape (22.23°S, 113.96°E) where they moved farther offshore (238.0 ± 13.9 km [128.5 ± 7.5 nmi]) towards Indonesia. By June, the whales were traveling through the Savu and Timor seas (outside the LFA study area). The region around the North West Cape was an area with higher occupancy times than other regions across the duration of the tracking period. Four whales

	spent 330.3 hours in one single grid cell (100 km^2 [29.2 nmi^2]), which the authors suggest was due to migratory tracks converging around this prominent peninsula.
Pendoley, K. L., Schofield, G., Whittock, P. A., Ierodiaconou, D., & Hays, G. C. (2014). Protected species use of a coastal marine migratory corridor connecting marine protected areas. *Marine Biology, 161*(6), 1455-1466. doi: 10.1007/s00227-014-2433-7.	A coastal migratory corridor for flatback turtles was created from the tag results of 73 adult females that linked eleven Commonwealth Marine Reserves along the coast from North West Cape to Camden Sound. Humpback migratory tracks overlapped with 96% of the flatback turtle core corridor (defined by the 75% kernel density estimate [i.e., it encompasses 75% of locations]). Maximum water depth was 127 m (416.7 ft) (±20 m [±65.6 ft], range 50-127 m [164.05-416.7 ft]).and maximum distance offshore was 125 km (67.5 nmi) (±35 km [±18.9 nmi], range 36-125 km [19.4-67.5 nmi]).
Gavrilova, A. N., & McCauley, R. D. (2013). Acoustic detection and long-term monitoring of pygmy blue whales over the continental slope in southwest Australia. *J Acoust Soc Am, 134*(3), 2505-2513. doi: 10.1121/1.4816576	Nine years of continuous passive acoustic recordings at Cape Leeuwin station, Western Australia, were analyzed for pygmy blue whale calls. There was a consistent seasonal pattern with whales calling from mid-November to mid-January (presumably animals traveling south) and from early February to late-June to mid-July (animals traveling north). The detection range of pygmy blue whale calls was estimated at a maximum of 200 km (108 nmi), which is south of the LFA study area.
Samaran, F., Stafford, K. M., Branch, T. A., Gedamke, J., Royer, J.-Y., Dziak, R. P., & Guinet, C. (2013). Seasonal and geographic variation of southern blue whale subspecies in the Indian Ocean. *PLoS ONE, 8*(8), e71561. doi: 10.1371/journal.pone.0071561.	The calls of different acoustic populations of blue whales were recorded at three locations in the Indian Ocean: Madagascar Basin 593 km (320 nmi) south of La Reunion Island (26° 05’ S, 58° 03’ E), 870 km (470 nm) northeast of Amsterdam Island (31° 35’ S, 83° 14’ E), and 648 km (350 nm) southwest of Amsterdam Island (42° 59’ S, 74° 35’ E). Australian pygmy blue whale calls were detected at the Northeast Amsterdam during March-June (peak March-May) and Southwest Amsterdam sites during January-June (peak June). This pattern suggests that Australian pygmy blue whales may feed between the northern and southern subtropical fronts before moving to the northeast of the Indian Ocean basin during winter.
Salgado Kent, C., Jenner, C. U., Jenner, M. I., Bouchet, P. H., Rexstad, E. R. (2012). Southern	Aerial surveys were conducted between June and November west of North West Cape during 2000,

Hemisphere breeding stock D humpback whale population estimates from North West Cape, Western Australia. *Journal of Cetacean Research and Management, 12*(1), 29-38.	2001, 2006, 2007, and 2008, in an area where humpback whales travel within close proximity to the shore, to determine migration models. A total of eight tracks 10 km apart and taking about four hours to complete were surveyed consistently every year in a direction against that of the general whale migration during the northern migration and in the direction of the migration during the southern migration. A total of 3,127 whale detections were made during 74 surveys conducted over the five years. The number of whale detections varied substantially amongst survey days which resulted in highly variable daily abundance estimates. As a consequence of the high variability, the migration models also varied widely in how well they fit the daily estimates. Pod abundance for each flight was computed using a Horvitz Thompson like estimator and converted to an absolute measure of abundance after corrections were made for estimated mean cluster size, unsurveyed time, swimming speed and animal availability. Resulting estimates from the migration model of best fit with the most credible assumptions were 7,276 (CI = 4,993–10,167) for 2000, 12,280 (CI = 6,830–49,434) for 2001, 18,692 (CI =12,980–24,477) for 2006, 20,044 (CI = 13,815–31,646) for 2007, and 26,100 (CI = 20,152–33,272) for 2008.
Samaran, F., Adam, O., & Guinet, C. (2010). Discovery of a mid-latitude sympatric area for two Southern Hemisphere blue whale subspecies. *Endangered Species Research, 12*(2), 157-165. doi: 10.3354/esr00302.	Continuous, year-round acoustic monitoring of blue whales was conducted off the Crozet Islands (46° 25’ S, 51° 40’ E) in the southwest Indian Ocean. The detection range to vocalizing blue whales was determined to be less than 180 km (97 nmi). Australian pygmy blue whale calls were detected in austral summer/fall (January through April), suggesting basin-scale longitudinal and latitudinal movements, with a distributional range that is substantially larger than previously thought. It may be that animals are moving from east to west along the Subantarctic and Subtropical fronts of the Indian Ocean.
Sleeman, J. C., Meekan, M. G., Wilson, S. G., Jenner, C. K. S., Jenner, M. N., Boggs, G. S., . . . Bradshaw, C. J. A. (2007). Biophysical correlates of relative abundance of marine megafauna at Ningaloo Reef, Western Australia. *Marine and*	Sightings (relative biomass) from aerial surveys adjacent to Ningaloo Reef between June 2000 and April 2002 were correlated with sea surface temperature (SST), SST gradient, chlorophyll-a, bathymetry (BTH), and BTH gradient. Species

Freshwater Research, 58(7), 608-623.	were grouped by trophic guilds to include krill feeders (humpback, pygmy blue, and minke whales; filter-feeding rays; and whale sharks), fish/cephalopod feeders (dolphins and sharks), and other invertebrate/macro-algae feeders (turtles and dugongs). Pygmy blue whales were seen June to October and November 2001, and in April and May 2002. The peak of blue whale sightings in deeper waters in October and November 2001 drove the correlation results, with the krill-feeding guild found at greater relative biomass in deeper waters. The authors suggest that either krill feeders have a foraging advantage in deeper waters or insufficient data were collected to understand the underlying mechanisms of their distribution. Humpback whales were migrating through the region and none of the explanatory variables explained their sighting occurrence, as the authors expected.
Jenner, K. C. S., Jenner, M. N., & McCabe, K. A. (2001). Geographical and temporal movements of humpback whales in Western Australian waters. *Appea Journal, 38*(1), 692-707.	The migratory paths of humpback whales along the Western Australian coast lie within the continental shelf boundary or 200 m bathymetry. Major resting areas along the migratory path have been identified at Exmouth Gulf (southern migration only) and at Shark Bay. The northern endpoint of migration and resting area for reproductively active whales in the population appears to be Camden Sound in the Kimberley. A 6,750 km^2 area of the Kimberley region, inclusive of Camden Sound, has also been identified as a major calving ground. The northern and southern migratory paths have been shown to be divergent at the Perth Basin, Dampier Archipelago, and Kimberley regions. In all cases the northern migratory route is further off-shore. Northward migrating whales were within 28 km (15 nmi) of the western islands of Shark Bay. Kills plotted by the Carnarvon whaling station, on the north side of Shark Bay, show the maximum range of whales from the coast to be 74 km (40 nm) or the edge of the 200 m (656 ft) isobaths, with the great majority killed within 10 nm of the coast.

Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
Cooke, J.G. (2018). *Balaenoptera musculus*. The IUCN red list of threatened species 2018: e.T2477A50226195. <http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T2477A50226195.en>.	The Committee on Taxonomy of the Society for Marine Mammalogy recognizes northern blue whale (*Balaenoptera musculus musculus*), Antarctic blue whale (*B. m. intermedia*), northern Indian Ocean blue whale (*B. m. indica*), pygmy blue whale (*B. m. brevicauda*), and Chilean blue whale (*B. m.* un-named subspecies). The number of pygmy blue whales is very uncertain but may be in the range of 2,000 to 5,000 individuals. Blue whales feed almost exclusively on euphasiids (krill), feeding both at the surface and at depths of up to 300 m (984 ft).
Double, M. C., Jenner, K. C. S., Jenner, M.-N., Ball, I., Laverick, S., & Gales, N. (2012). *Satellite tracking of pygmy blue whales (Balaenoptera musculus brevicauda) off Western Australia.* Australian Marine Mammal Centre. 23 pages.	This study builds on Gales et al. (2010) with more satellite-tagged pygmy blue whales. Ten tags provided movement information for one to 162 days. Several animals remained near Perth Canyon/Naturaliste Plateau for over month, moving less than 50 km (27 nmi) per day. When animals began to migrate north, they increased their travel speed to 100 km (54 nmi) per day until they reach the North West Cape/Ningaloo Reef region, where they decreased to less than 50 km (27 nmi) per day again. The northern terminus of the migration was the Banda and Molucca seas in Indonesia.

Committee or Government Reports

Paper	*Synopsis*
Gales, N. J., Double, M. C., Robinson, S., Jenner, C., Jenner, M. N., King, E., . . . Paton, D. (2010). Satellite tracking of Australian humpback (*Megaptera novaeangliae*) and pygmy blue whales (*Balaenoptera musculus brevicauda*). *Report of the International Whaling Commission*, SC/62/SH21.	The authors describe the deployment of satellite tags on southbound Stock D (west Australian) humpback whales in the Kimberly region, northbound Stock E (east Australian) humpback whales, and on pygmy blue whales in the Perth Canyon off Western Australia. Forty-one tags were deployed, three on pygmy blue whales and 38 on humpback whales (23 on female humpback whales accompanied by a calf in between Camden Sound and Pender Bay, Kimberly). The tag results provide the first link between blue whales in Perth Canyon and those that occur around Indonesia (Saru and Banda seas). Furthermore, two of the four humpback whales

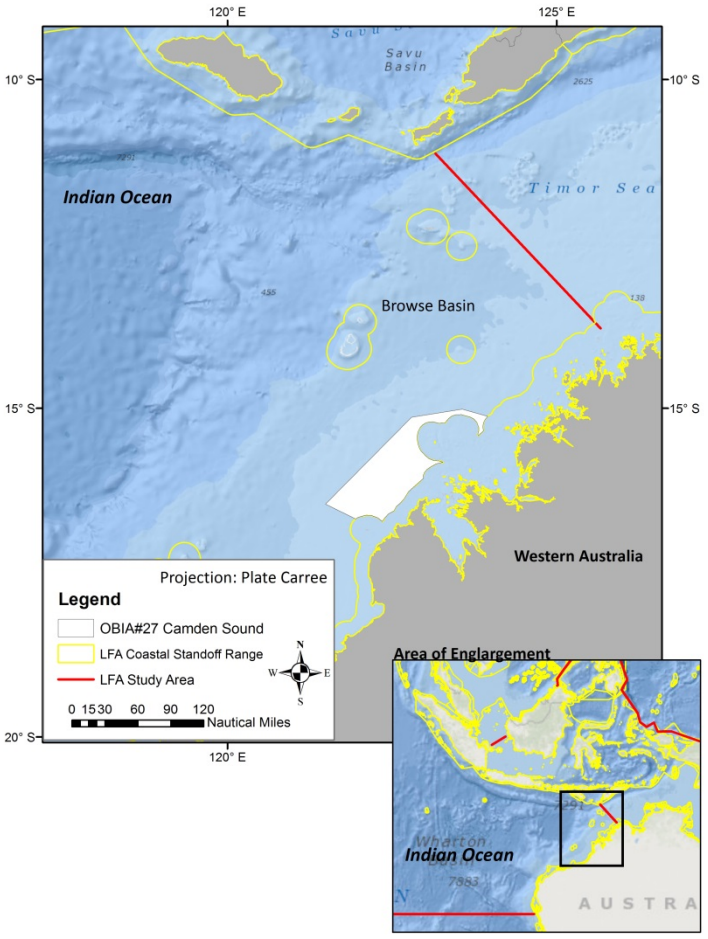
that provided location data south of Exmouth Gulf deviated from the expected migratory route close to the coast and were tracked 1,200 km (648 nmi) into the Indian Ocean, presumably to exploit temperate foraging areas.

Browse Basin 13

MARINE REGION: Southeast Indian Ocean

COUNTRY: Australia

SPECIES OF CONCERN: Blue whale (pygmy)



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☐ **EBSA**
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☒ **NRDC Recommendation**

AREA OVERVIEW:

Browse Basin, located at approximately 14°S, 121°E to 124°E, encompasses both shallow water coastal and deeper oceanic ecosystems, submerged and emergent reefs, and underwater cliffs and canyons. Two prominent physical features include Scott Reef and Browse Cliffs. Scott Reef is situated in deep water to the west of Browse Basin, with two emergent, atoll-like structures with a 2 km (1.08 nmi) passage between them that reaches depths of up to 470 m (1542 ft). Browse Cliffs is a feature at 14°15'S, 123°E that slopes steeply from a depth of 125 to 310 m (410 to 1017 ft), spanning 17 km (9.2 nmi), forming part of the Ancient Coastline (Sutton et al., In press). Sutton et al. (In press) provide the first comprehensive assessment of the cetacean species occurring in Browse Basin (with surveys in winter and spring of 2008), including migrating pygmy blue whales (2 sightings of 3 individual in austral winter, 1 sighting of 2 individuals in austral spring), humpback whales (1 sighting of 1 individual in austral winter, 3 sightings of 6 individuals in austral spring), Bryde's whales (4 sightings of 4 individuals in austral spring), and dwarf minke whales (1 sighting of 1 individual in austral winter), as well as several odontocetes (31 sightings of 404 individuals in austral winter, 83 sightings of 3103 individuals In austral spring). On October 30, 2008, two blue whales were observed in the Scott Reef Channel, then three additional blue whales were observed at the western entrance. Elevated biomass (120 kHz echosounder

backscatter data) on Scott Reef during the blue whale sightings suggested the region may provide foraging opportunities.

NRDC recommends a year-round OBIA for foraging pygmy blue whales.

GEOGRAPHIC CRITERIA

Location Status: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside

Eligible Areal Extent:

Source of Official Boundary:

Spatial File Type:

Spatial File Source:

Date Obtained:

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Blue whale (pygmy) whale

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

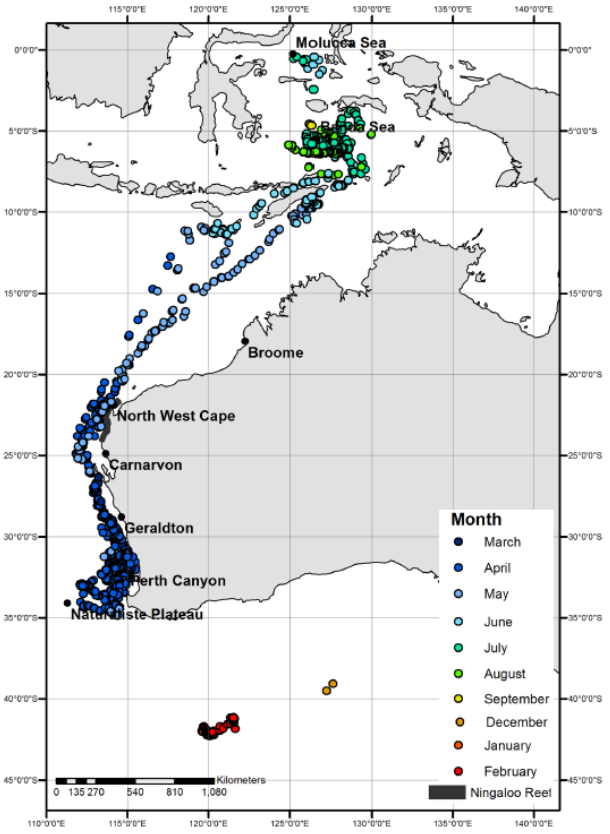
SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Sutton, A.L., Jenner, K.C.S., & Jenner, M-N. (In press). Habitat associations of cetaceans and seabirds in the tropical eastern Indian Ocean. Deep-Sea Research II: Topical Studies in Oceanography. doi:10.1016/j.dsr2.2018.06.002.	Sutton et al. (In press) provide the first comprehensive assessment of the cetacean species occurring in Browse Basin (with surveys in winter and spring of 2008), including migrating pygmy blue whales (2 sightings of 3 individual in austral winter, 1 sighting of 2 individuals in austral spring), humpback whales (1 sighting of 1 individual in austral winter, 3 sightings of 6 individuals in austral spring), Bryde's whales (4 sightings of 4 individuals in austral spring), and dwarf minke whales (1 sighting of 1 individual in austral winter), as well as a myriad of odontocetes. On October 30, 2008, two blue whales were observed in the Scott Reef Channel, then three additional blue whales were observed at the western entrance. Elevated biomass (120 kHz echosounder backscatter data) Scott Reef during the blue whale sightings suggested the region may provide foraging opportunities, though no feeding has been observed.
Double, M. C., Andrews-Goff, V., Jenner, C., Jenner, M.-N., Laverick, S. M., Branch, T. A., & Gales, N. J. (2014). Migratory movements of pygmy blue whales (*Balaenoptera musculus brevicauda*) between Australia and Indonesia as revealed by satellite telemetry. *PLoS ONE, 9*(4), e93578. doi:10.1371/journal.pone.0093578.t001.	Eleven pygmy blue whales were tagged near Perth Canyon in March and April and tracked with satellite telemetry on their northbound migration. Animals remained near the coastline (100.0 ± 1.7 km [54.0 ± 0.9 nmi]) throughout March and April until reaching the North West Cape (22.23°S, 113.96°E) where they moved farther offshore (238.0 ± 13.9 km [128.5 ± 7.5 nmi]) towards Indonesia. Their migration paths were north of Scott Reef and did not cross Browse Basin (Figure 1 below) By June, the whales were traveling through the Savu and Timor seas (outside the LFA study area).



Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
Cooke, J.G. (2018). *Balaenoptera musculus*. The IUCN red list of threatened species 2018: e.T2477A50226195. <http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T2477A50226195.en>.	The Committee on Taxonomy of the Society for Marine Mammalogy recognizes northern blue whale (*Balaenoptera musculus musculus*), Antarctic blue whale (*B. m. intermedia*), northern Indian Ocean blue whale (*B. m. indica*), pygmy blue whale (*B. m. brevicauda*), and Chilean blue whale (*B. m.* un-named subspecies). The number of pygmy blue whales is very uncertain but may be in the range of 2,000 to 5,000 individuals. Blue whales feed almost exclusively on euphasiids (krill), feeding both at the surface and at depths of up to 300 m (984 ft).
Double, M. C., Jenner, K. C. S., Jenner, M.-N., Ball, I., Laverick, S., & Gales, N. (2012). *Satellite tracking of pygmy blue whales (Balaenoptera musculus brevicauda) off Western Australia.* Australian Marine Mammal Centre. 23 pages.	This study builds on Gales et al. (2010) with more satellite-tagged pygmy blue whales. Ten tags provided movement information for one to 162 days. Several animals remained near Perth Canyon/Naturaliste Plateau for over month, moving less than 50 km (27 nmi) per day. When animals began to migrate north, they increased

	their travel speed to 100 km (54 nmi) per day until they reach the North West Cape/Ningaloo Reef region, where they decreased to less than 50 km (27 nmi) per day again. The northern terminus of the migration was the Banda and Molucca seas in Indonesia.

Committee or Government Reports

Paper	*Synopsis*
Gales, N. J., Double, M. C., Robinson, S., Jenner, C., Jenner, M. N., King, E., . . . Paton, D. (2010). Satellite tracking of Australian humpback (*Megaptera novaeangliae*) and pygmy blue whales (*Balaenoptera musculus brevicauda*). *Report of the International Whaling Commission*, SC/62/SH21.	The authors describe the deployment of satellite tags on southbound Stock D (west Australian) humpback whales in the Kimberly region, northbound Stock E (east Australian) humpback whales, and on pygmy blue whales in the Perth Canyon off Western Australia. Forty-one tags were deployed, three on pygmy blue whales and 38 on humpback whales (23 on female humpback whales accompanied by a calf in between Camden Sound and Pender Bay, Kimberly). The tag results provide the first link between blue whales in Perth Canyon and those that occur around Indonesia (Saru and Banda seas). Furthermore, two of the four humpback whales that provided location data south of Exmouth Gulf deviated from the expected migratory route close to the coast and were tracked 1,200 km (648 nmi) into the Indian Ocean, presumably to exploit temperate foraging areas.

Websites / Social Media

Website/Organization	*Synopsis*
Browse Basin, GeoScience Australia (http://www.ga.gov.au/scientific-topics/energy/province-sedimentary-basin-geology/petroleum/offshore-northwest-australia/browse)	Browse Basin is a proven hydrocarbon province, with major undeveloped gas/condensate fields in the outer and central basin and minor oil discoveries on the Basin's eastern margin.

Western Australia (Shark Bay to Exmouth Gulf) 14

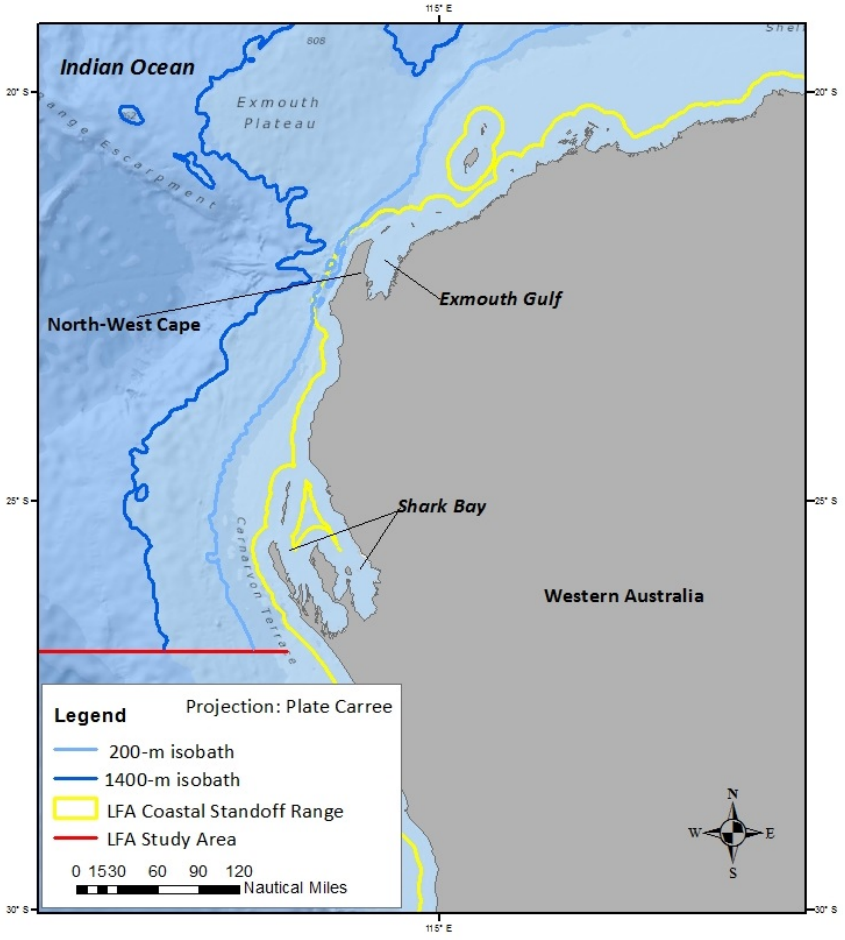
MARINE REGION: Southeast Indian Ocean

COUNTRY: Australia

SPECIES OF CONCERN: Humpback whale

MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☐ **EBSA**
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☒ **NRDC Recommendation**



AREA OVERVIEW:

Humpback whales migrate along the Western Australia shelf, with calving grounds extending along the Kimberley coast between Camden Sound and Broome (15-18 °S) (OBIA #27, Camden Sound). During aerial photogrammetric research, large numbers of humpback whale calves were sighted along North West Cape (21° 47’ to 22° 43’ S), with the majority of calves (85% in 2013 and 94% in 2015) classified as neonates (Irvine et al., 2018). Almost all neonates (97% and 95.4% in 2013 and 2015, respectively) were traveling northward. Searches were conducted out to approximately 5.5 km (3 nmi) from the reef edge, with a second track along the 200 m (656 ft) depth contour, approximately 5-10 km (2.7-5.4 nmi) seaward of the reef edge. Calves were distributed along a narrow corridor that followed the contour of the seaward edge of the fringing reef, with 88% and 96% of sighting in water depths ≤ 60 m (197 ft) in 2013 and 2015, respectively. Far more groups were sighted along the trackline that followed the 200 m (656 ft) depth contour, but none of these groups contained calves. Irvine et al. (2018) suggest that the calving range extends from Camden Sound (15°S) to Point Cloates (22° 43’ S) and that Exmouth Gulf may be used as a nursery area by both young northbound calves and older southbound calves. Jenner et al. (2001) also found that 68% of whales sighted in Exmouth Gulf were milling, not migrating. The southbound migration is located closer to shore (within the 200 m isobaths), while the northbound migration is more dispersed in farther offshore waters.

The eastern Indian Ocean population of pygmy blue whales inhabits waters west and south of Australia, occurring in two distinct feeding areas (Perth Canyon [OBIA #28] and off Southern Australia, both south of the SURTASS LFA sonar study area) during the austral summer. Satellite-tagged blue whales traveled north (March/April) from Perth Canyon within 100 km (54 nmi) of the coast until North West Cape (Double et al., 2014). Migratory tracks converged around the North West Cape peninsula on their way north, with Ningaloo Reef exhibiting higher occupancy than the mean along the track path.

NRDC has suggested an OBIA for Exmouth Gulf from July to November for resting habitat and along the Western Australian coastline out to the 200 m (656 ft) isobath from September to December for the humpback whale southbound migration and out to the 1400 m (4593 ft) isobath from May to August for the northbound migration.

NOTE: Another marine area along the coast of Western Australia is also under assessment as a potential marine mammal OBIA for SURTASS LFA sonar. Marine area #12, North Western Australia Shelf, encompasses much of the same geographic area with the same relevant marine mammal species.

GEOGRAPHIC CRITERIA

Location Status: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside

Eligible Areal Extent:

Source of Official Boundary:

Spatial File Type:

Spatial File Source:

Date Obtained:

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Humpback whale

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

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Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification

☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

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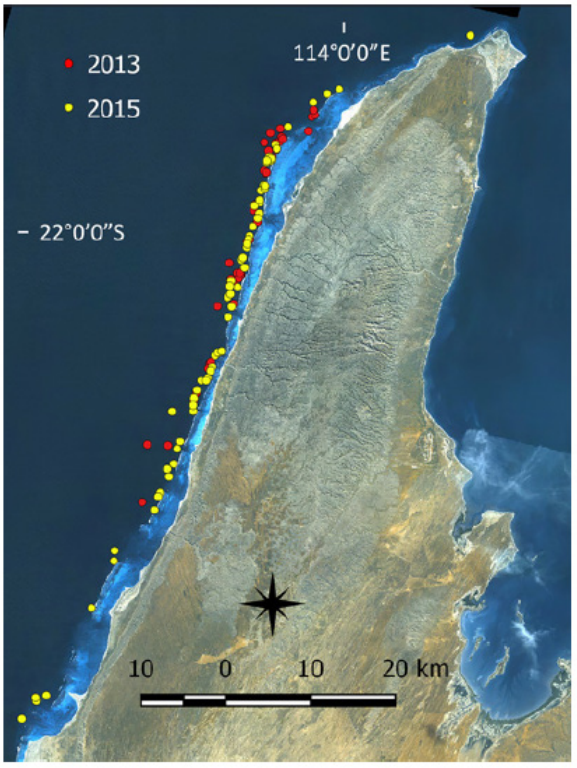
Irvine, L. G., Thums, M., Hanson, C. E., McMahon, C. R., & Hindell, M. A. (2018). Evidence for a widely expanded humpback whale calving range along the Western Australian coast. *Marine Mammal Science, 34*(2), 294-310. doi: 10.1111/mms.12456.	During aerial photogrammetric research, large numbers of humpback whale calves were sighted along North West Cape (21° 47’ to 22° 43’ S), with the majority of calves (85% in 2013 and 94% in 2015) classified as neonates. Almost all neonates (97% and 95.4% in 2013 and 2015, respectively) were traveling northward. Searches were conducted out to approximately 5.5 km (3 nmi) from the reef edge, with a second track along the 200 m (656 ft) depth contour, approximately 5-10 km (2.7-5.4 nmi) seaward of the reef edge. Calves were distributed along a narrow corridor that followed the contour of the seaward edge of the fringing reef, with 88% and 96% of sighting in water depths ≤ 60 m (197 ft) in 2013 and 2015, respectively. Far more groups were sighted along the trackline that followed the 200 m (656 ft) depth contour, but none of these groups contained calves. These results indicate that the calving range extends from Camden Sound (15°S) to Point Cloates (22° 43’ S) and that Exmouth Gulf may be used as a nursery area by both young northbound calves and older southbound calves. It is clear that the waters along the seaward edge of the fringing reef are important habitat for mothers and their newborn calves (Figure 6, copied below).



Pendoley, K. L., Schofield, G., Whittock, P. A., Ierodiaconou, D., & Hays, G. C. (2014). Protected species use of a coastal marine migratory corridor connecting marine protected areas. *Marine Biology, 161*(6), 1455-1466. doi: 10.1007/s00227-014-2433-7.	A coastal migratory corridor for flatback turtles was created from the tag results of 73 adult females that linked eleven Commonwealth Marine Reserves along the coast from North West Cape to Camden Sound. Humpback whale migratory tracks overlapped with 96% of the flatback turtle core corridor (defined by the 75% kernel density estimate [i.e., it encompasses 75% of locations]). Maximum water depth was 127 m (416.7 ft) (±20 m [±65.6 ft], range 50-127 m [164.05-416.7 ft]).and maximum distance offshore was 125 km (67.5 nmi) (±35 km [±18.9 nmi], range 36-125 km [19.4-67.5 nmi]).
Salgado Kent, C., Jenner, C. U., Jenner, M. I., Bouchet, P. H., Rexstad, E. R. (2012). Southern Hemisphere breeding stock D humpback whale population estimates from North West Cape, Western Australia. *Journal of Cetacean Research and Management, 12*(1), 29-38.	Aerial surveys were conducted between June and November west of North West Cape during 2000, 2001, 2006, 2007, and 2008, in an area where humpback whales travel within close proximity to the shore, to determine migration models. A total of eight survey tracks 10 km apart and taking about four hours to complete were surveyed consistently every year in a direction against that of the general whale migration during the northern migration and in the direction of the migration during the southern migration.

A total of 3,127 whale detections were made during 74 surveys conducted over the five years. The number of whale detections varied substantially amongst survey days which resulted in highly variable daily abundance estimates. As a consequence of the high variability, the migration models also varied widely in how well they fit the daily estimates. Pod abundance for each flight was computed using a Horvitz Thompson like estimator and converted to an absolute measure of abundance after corrections were made for estimated mean cluster size, unsurveyed time, swimming speed and animal availability. Resulting estimates from the migration model of best fit with the most credible assumptions were 7,276 (CI = 4,993–10,167) for 2000, 12,280 (CI = 6,830–49,434) for 2001, 18,692 (CI =12,980–24,477) for 2006, 20,044 (CI = 13,815–31,646) for 2007, and 26,100 (CI = 20,152–33,272) for 2008.

Jenner, K. C. S., Jenner, M. N., & McCabe, K. A. (2001). Geographical and temporal movements of humpback whales in Western Australian waters. *Appea Journal, 38*(1), 692-707.

The migratory paths of humpback whales along the Western Australian coast lie within the continental shelf boundary or 200 m (656 ft) bathymetry. Major resting areas along the migratory path have been identified at Exmouth Gulf (southern migration only) and at Shark Bay. The northern endpoint of migration and resting area for reproductively active whales in the population appears to be Camden Sound in the Kimberley. A 6,750 km^2 area of the Kimberley region, inclusive of Camden Sound, has also been identified as a major calving ground. The northern and southern migratory paths have been shown to be divergent at the Perth Basin, Dampier Archipelago, and Kimberley regions. In all cases the northern migratory route is further off-shore. Northward migrating whales were within 28 km (15 nmi) of the western islands of Shark Bay. Kills plotted by the Carnarvon whaling station (25 °S), on the north side of Shark Bay, show the maximum range of whales from the coast to be 74 km (40 nm) or the edge of the 200 m (656 ft) isobaths, with the great majority killed within 10 nm of the coast. Surveys conducted along the west coast of the Exmouth peninsula suggest that both the northbound and southbound migratory paths occur within 16.7 km (9 nmi) of the coast. Aerial surveys northeast of Exmouth Gulf found

	that the majority of humpback whales migrated south in depths of less than 200 m (656 ft). Although some animals may rest in Exmouth Gulf, others, farther offshore, continue south along the western side of Ningaloo Reef in water deeper than 50 m (164 ft). 68% of whales observed in Exmouth Gulf were milling, not migrating.

Committee or Government Reports

Paper	*Synopsis*
Bettridge, S., Baker, C. S., Barlow, J., Clapham, P. J., Ford, M., Gouveia, D., . . . Wade, P. R. (2015). Status review of the humpback whale (*Megaptera novaeangliae*) under the Endangered Species Act. NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-540: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.	The West Australia Distinct Population Segment (DPS) consists of whales whose breeding/winter range includes the West Australia coast, primarily in the Kimberley Region, migrating to Antarctica, primarily between 80°E and 110°E. The abundance in 2008 was estimated at 21,750 (95% CI = 17,550-43,000) (Hedley et al., 2009), with a population growth rate of approximately 10% annually since 1982 (Bannister, 1984; Bannister and Hedley, 2001).
Gales, N. J., Double, M. C., Robinson, S., Jenner, C., Jenner, M. N., King, E., . . . Paton, D. (2010). Satellite tracking of Australian humpback (*Megaptera novaeangliae*) and pygmy blue whales (*Balaenoptera musculus brevicauda*). *Report of the International Whaling Commission*, SC/62/SH21.	The authors describe the deployment of satellite tags on southbound Stock D (west Australian) humpback whales in the Kimberly region, northbound Stock E (east Australian) humpback whales, and on pygmy blue whales in the Perth Canyon off Western Australia. Forty-one tags were deployed, three on pygmy blue whales and 38 on humpback whales (23 on female humpback whales accompanied by a calf in between Camden Sound and Pender Bay, Kimberly). The tag results provide the first link between blue whales in Perth Canyon and those that occur around Indonesia (Saru and Banda seas). Furthermore, two of the four humpback whales that provided location data south of Exmouth Gulf deviated from the expected migratory route close to the coast and were tracked 1,200 km (648 nmi) into the Indian Ocean, presumably to exploit temperate foraging areas.

Websites / Social Media

Website/Organization	*Synopsis*
Shark Bay World Heritage Area, Western	Shark Bay was declared a World Heritage Area in

Australia (https://www.sharkbay.org/)	1991, satisfying all four criteria for natural heritage values (exceptional natural beauty, evolutionary history, ongoing processes and evolution, and most significant habitats). It consists of several parks, including Monkey Mia Reserve with bottlenose dolphins and Shark Bay with the world's largest meadows of seagrass and a population of more than 10,000 dugongs. Humpback whales visit the region each year between August and October.
Shark Bay Marine Park, Parks and Wildlife Service, Commonwealth of Western Australia (https://parks.dpaw.wa.gov.au/park/shark-bay)	Shark Bay Marine Park, covering 748,725 hectares, is known for its large marine animals, such as the famous Monkey Mia dolphins, turtles, dugongs, and sharks.
Shark Bay Dive & Marine Safaris	Maintaining the Ocean Park, an award-winning, eco-friendly aquarium, Shark Bay Dive & Marine Safaris also offer whale watching tours for humpback whales between August and October.

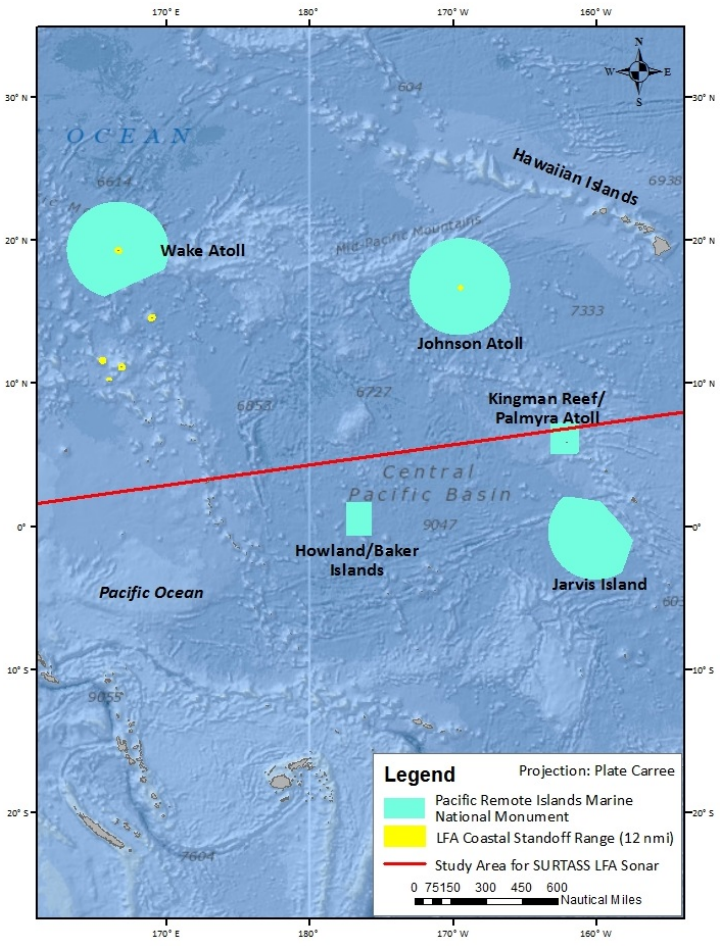
AREAS NOT FURTHER CONSIDERED—AREAS PRELIMINARILY NOT MEETING GEOGRAPHIC, LF-SENSITIVITY, OR BIOLOGICAL CRITERIA

Pacific Remote Islands Marine National Monument (Only Wake/ Johnson/Palmyra atolls and Kingman Reef Units) 15

MARINE REGION: Western North Pacific Ocean

COUNTRY: U.S.A.

SPECIES OF CONCERN: baleen, beaked, and sperm whales



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☐ **EBSA**
- ☒ **U.S. Marine National Monument**
- ☒ **Hoyt Cetacean MPA**
- ☒ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

The Pacific Remote Islands MNM encompasses seven islands and atolls in the central Pacific Ocean and consists of five areas approximately 370,000 nmi^2 (1,269,065 km^2) in size that are located to the south and west of the Hawaiian Islands. However, only a small part (2,753.37 nmi^2 [9,443.8 km^2]) of the northern end of the Kingman Reef/Palmyra Atoll Unit of this MNM is located within the study area for SURTASS LFA sonar, while neither the Howland/Baker nor Jarvis Island Units are within the study area boundary.

The Pacific Remote Islands MNM is one the largest marine protected areas in the world and is an important part of the most widespread collection of marine life on the planet under a single country's jurisdiction. This area sustains a diversity of species including corals, fish, shellfish, marine mammals, seabirds, land birds, insects, and vegetation not found anywhere else in the world. Many threatened, endangered, and depleted species thrive in the Pacific Remote Islands MNM, including dolphins and whales. However, no specific important biological behaviors of marine mammals have been characterized in these waters; however, several studies have noted the presence of the rare Deraniyagala beaked whale (Barlow et al., 2008; Baumann-Pickering et al., 2014, 2016; Dalebout, 2007; Morgan et al., 2010; USFWS, 2016).

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside (Relevant units: Wake and Johnson atolls; part of Palmyra Atoll/Kingman Reef)

Eligible Areal Extent: 261,398.11 nmi^2 (896,570.41 km^2)

Source of Official Boundary: World Database on Protected Areas (UNEP and IUCN)

Spatial File Type: GIS shapefile

Spatial File Source: World Database on Protected Areas, <https://www.protectedplanet.net/400011>

Date Obtained: 7/13/2018

LOW FREQUENCY HEARING SENSITIVITY

☐ Species:

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Baumann-Pickering, S., Trickey, J. S., Wiggins, S. M., & Oleson, E. M. (2016). Odontocete occurrence in relation to changes in	This acoustic study using HARP sensors was conducted at an unnamed seamount chain near the equator roughly 216 nmi (400 km) due south

oceanography at a remote equatorial Pacific seamount. *Marine Mammal Science, 32*(3), 805-825. doi:10.1111/mms.12299.	of Kingman Reef/Palmyra Atoll. The acoustic presence of beaked whales at this equatorial seamount site was one of the highest of all the sites monitored acoustically in the North Pacific Ocean to date. This suggests that the area is highly suitable habitat for deep-diving cetaceans. Beaked whale diel acoustic behavior indicated continuous foraging for all species except for an unknown species. Despite the region appearing to be suitable habitat for deep-diving beaked whales, and predictive models suggesting higher densities of sperm whales, sperm whales were detected on only a few occasions. There seems to be a seasonality in sperm whale occurrence based on old whaling data indicating higher numbers in autumn and possibly winter, so monitoring may not have been conducted at an optimal time to detect sperm whales.
Baumann-Pickering, S., Roch, M. A., Jr, R. L. B., Simonis, A. E., McDonald, M. A., Solsona-Berga, A., . . . Hildebrand, J. A. (2014). Spatio-temporal patterns of beaked whale echolocation signals in the North Pacific. *PLoS ONE, 9*(1), e86072. doi: 10.1371/journal.pone.0086072.	HARP sensors were deployed at 24 sites in the North Pacific Ocean including Palmyra Atoll, Kingman Reef, and Wake Atoll. The collected acoustic data showed that the highest relative daily presence of beaked whale signals occurred at Kingman Reef, followed closely by Pearl and Hermes Reef and Wake Atoll. Moderate relative presence was found at the North Shore of Palmyra Atoll and Cross Seamounts off the Hawaii Islands. No strong seasonal signals were detected in the acoustic data. The authors' noted that the Deraniyagala beaked whale had likely been visually and acoustically detected at Palmyra Atoll.
Dalebout, M. L., Baker, C. S., Steel, D., Robertson, K. M., Chivers, S. J., Perrin, W. F., . . . Schofield Jr., D. (2007). A divergent mtDNA lineage among *Mesoplodon* beaked whales: Molecular evidence for a new species in the tropical Pacific? *Marine Mammal Science, 23*(4), 954–966. doi: 10.1111/j.1748-7692.2007.00143.x.	Based on the evaluation of DNA evidence from two beaked whale skulls, one of which was collected from Palmyra Atoll, this team of scientists believe that an unnamed *Mesoplodon* beaked whale species exists in the North Pacific Ocean.

Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
Morgan, L., Chandler, W., Douce, E., Brooke, S., Guinotte, J., Myhre, S. (2010), *Research Priorities for the Pacific Remote Islands Marine National Monument*. Workshop report by Marine	Limited surveys have been conducted in the region. The Pacific Islands Cetacean Ecosystem Assessment (PICEAS) 2005 cruise surveyed the U.S. Exclusive Economic Zone (EEZ) waters

Conservation Biology Institute; April 2010. Retrieved from <https://www.researchgate.net/publication/265080606>.	surrounding Palmyra and Johnston atolls (Barlow et al. 2008). At least 21 different species of cetaceans were observed during this cruise; combining this list with other previous reported cetaceans (MCBI & EDF report 2008) brings the total number of known cetacean species to 27 for the region. The most commonly observed cetaceans in the 2005 cruise were spotted dolphins, striped dolphins, short-finned pilot whales, false killer whales, sperm whales, and bottlenose dolphins. Extrapolating from research in the main Hawaiian Islands and elsewhere in the North Pacific, it is likely that island-associated resident populations exist within the region of the Pacific Remote Islands, genetically distinct sub-populations and stocks (e.g., NMFS recognizes a separate stock of false killer whales from the main Hawaiian islands), potential critical habitat for some threatened and endangered species (e.g., humpback whales), and possibly new species (e.g., a resurrected species of beaked whale has been identified in waters surrounding Palmyra Atoll, *Mesoplodon hotaula*; Dalebout et al. 2007).

Committee or Government Reports

Paper	*Synopsis*
Barlow, J., Rankin, S., Jackson, A., & Henry, A. (2008). Marine mammal data collected during the Pacific Islands cetacean and ecosystems assessment survey (PICEAS) conducted aboard the NOAA ship *McArthur II*, July-November 2005. NOAA-TM-NMFS-SWFSC-420. La Jolla, California: National Marine Fisheries Service, Southwest Fisheries Science Center. 32 pages.	This report documents the first comprehensive survey of cetaceans in the U.S. EEZ surrounding Palmyra Atoll & Kingman Reef, the U.S. EEZ surrounding Johnston Atoll, and in the adjacent international waters south of the Hawaiian Islands. A total of 290 sightings were made during the 2005 PICEAS survey, comprised of at least 22 cetacean species. However, the authors do not discuss biological importance for any of the species detected/observed.

Surveys

Paper	*Synopsis*
Barlow, J., Rankin, S., Jackson, A., & Henry, A. (2008). Marine mammal data collected during the Pacific Islands cetacean and ecosystems assessment survey (PICEAS) conducted aboard the NOAA ship *McArthur II*, July-November 2005. NOAA-TM-NMFS-SWFSC-420. La Jolla, California:	See summary above.

National Marine Fisheries Service, Southwest Fisheries Science Center. 32 pages.

Websites / Social Media

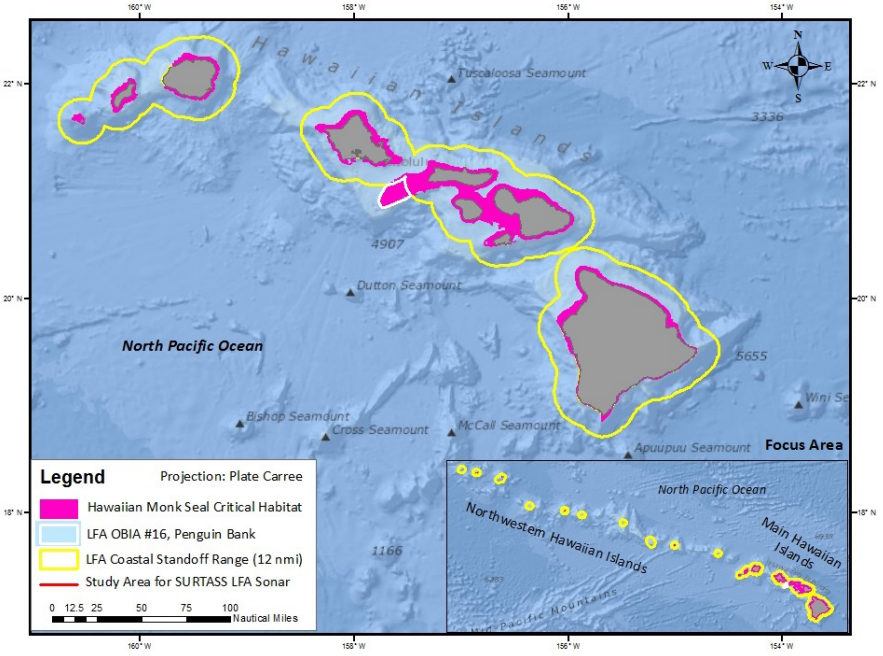
Website/Organization	*Synopsis*
U.S. Fish and Wildlife Service. (2016). Pacific Remote Islands MNM wildlife and habitat. Retrieved from <https://www.fws.gov/refuge/Pacific_Remote_Islands_Marine_National_Monument/wildlife_and_habitat/index.html>.	This site summarizes the marine mammal information for each of the seven National Wildlife Refuges (NWR) in the Pacific Islands Remote MNM. The following summarizes the marine mammal information included for each NWR that is found within the study area for SURTASS LFA sonar: • Johnston Atoll: Most marine mammals are visitors outside Johnston Atoll and occasionally to lagoon waters. Cuvier's beaked whales were sighted on numerous occasions in the early 1990s both within and outside the lagoon; there were no confirmed sightings of these rare whales in 1993, 1994, or 1995. A Cuvier's beaked whale was observed calving off the south side of Johnston Island in 1995, but no additional sightings have been documented. Hawaiian monk seals feed on fish and crustaceans from the reef and lagoon and, although able to spend long periods at sea, often haul out on sandy beaches to bask in the sun. • Kingman Reef: The Refuge supports a sizable population of bottlenose dolphins and melon-headed whales. • Palmyra Atoll: Pacific bottle-nosed dolphins, spinner dolphins, melon headed whales frequent the waters of the Refuge. • Wake Atoll: No information provided regarding marine mammals.

Hawaiian Monk Seal Critical Habitat 16

MARINE REGION: Central North Pacific Ocean

COUNTRY: U.S.A.

SPECIES OF CONCERN: Hawaiian monk seal



MARINE AREA TYPE

- ☒ **OBIA in Regulations/LOA** (#16, Penguin Bank)
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☐ **EBSA**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. Marine National Monument**
- ☐ **U.S. MPA**
- ☒ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

Critical habitat for the Hawaiian monk seal was first designated in 1988 under the ESA for 10 nearshore areas in the Northwest Hawaiian Islands (NWHI), but in 2015, the ESA-designated critical habitat was revised to extend the critical habitat boundary into the Main Hawaiian Islands (MHI). As revised, ESA-designated critical habitat for the Hawaiian monk seal includes seafloor and marine neritic and pelagic waters within 33 ft (10 m) of the seafloor from the shoreline seaward to the 628-ft (200-m) depth contour at 10 areas in the NWHI, including Kure Atoll, Midway Atoll, Pearl and Hermes Reef, Lisianski Island, Laysan Island, Maro Reef, Gardner Pinnacles, French Frigate Shoals, Necker Island, and Nihoa Island, and six areas in the MHI including Kaula Island, Niihau, Kauai, Oahu, Maui Nui (i.e., Kahoolawe, Lanai, Maui, and Molokai), and Hawaii (excluding National Security Exclusion zones off Kauai, Oahu, and Kahoolawe) (NOAA, 2015).

Certain areas have been excluded from the Hawaiian monk seal's ESA-designated critical habitat because they are managed under military Integrated Natural Resources Plans. These areas in the Hawaiian Islands include: 1) Marine Corps Base Hawaii, Oahu—a 500-yd (91 m) buffer zone in the waters surrounding the base and the Puuloa Training Facility on the Ewa coastal plain, Oahu; 2) Joint Base Pearl Harbor-Hickam, Oahu inclusive of Nimitz Beach, White Plains Beach, Naval Defensive Sea Area, Barbers Point Underwater Range, and Ewa Training Minefield; 3) Pacific Missile Range Facility, Kauai, Offshore Areas plus Kaula Island and the coastal and marine areas to the 33 ft (10-m) isobath surrounding the Island of Niihau; 4) Kingfisher Underwater Training area, off the northeast coast of Niihau; 5) Puuloa Underwater Training Range off Pearl Harbor, Oahu; and 6) Shallow Water Minefield Sonar Training Range, off the western coast of Kahoolawe in the Maui Nui area (NOAA, 2015).

The physical or biological features of the Hawaiian monk seal ESA-designated critical habitat that support the species's life history needs include 1) areas with characteristics preferred by monk seals for pupping and nursing; 2) shallow, sheltered nearshore marine areas preferred by monk seals for pupping and nursing; 3) marine areas up to 1,640 ft (500 m) in depth preferred by juvenile and adult monk seals for foraging; 4) areas with low levels of human disturbance; 5) marine areas with adequate prey quantity and quality; and 6) significant shore areas used by monk seals for hauling out, resting, or molting (NOAA 2015).

All but one small area of the ESA-designated critical habitat for the Hawaiian monk seal lies within the coastal standoff range for SURTASS LFA sonar. The only critical habitat area that extends beyond the LFA coastal standoff range and that would thus be eligible for consideration as an OBIA is the small area that extends onto Penguin Bank. However, per agreement with the State of Hawaii CZMA Program, no SURTASS LFA sonar training and testing activities would be conducted in the waters of Penguin Bank to the extent of the 600 ft (183 m) depth contour, which is also the boundary of the Penguin Bank OBIA #16.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside (only Penguin Bank area)

Eligible Areal Extent: None; per agreement with State of Hawaii, no SURTASS LFA sonar activities would be conducted on Penguin Bank to the extent of the 600 ft (183 m) depth contour, which is also the extent of the Penguin Bank OBIA (OBIA # 16).

Source of Official Boundary: Pacific Islands Regional Office Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration

Spatial File Type: GIS shapefile

Spatial File Source: Pacific Islands Regional Office Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration

Date Obtained: 10/26/2015

LOW FREQUENCY HEARING SENSITIVITY

☐ Species:

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

Committee or Government Reports

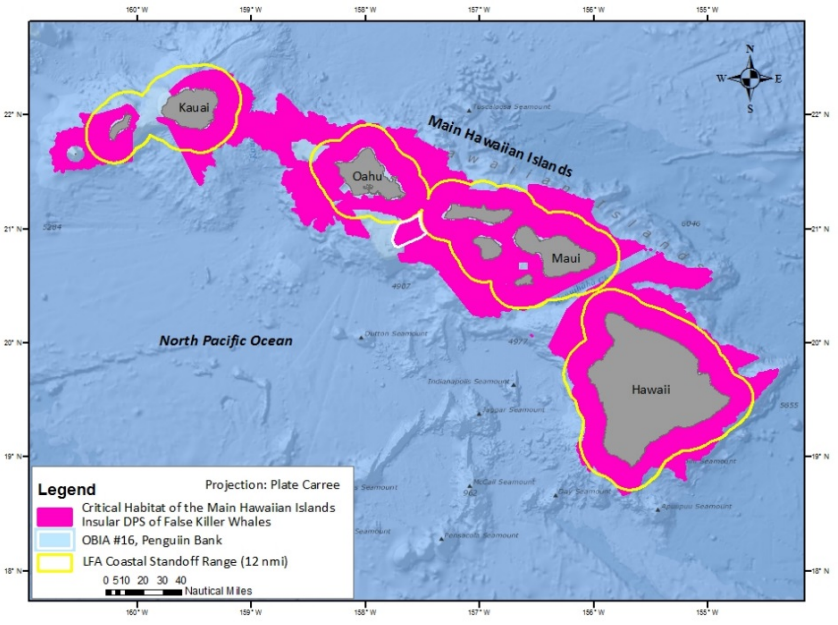
Paper	*Synopsis*
NOAA. (2015). Endangered and threatened species: Final rulemaking to revise critical habitat for Hawaiian monk seals. National Marine Fisheries Service; National Oceanic and Atmospheric Administration. *Federal Register, 80*(162), 50926-50988.	This Final Rule officially revised the critical habitat under the ESA of the Hawaiian monk seal to include the Main Hawaiian Islands. The principal constituent elements of the physical and biological features of the critical habitat are defined in this rulemaking.

Main Hawaiian Island Insular DPS of False Killer Whale Critical Habitat 17

MARINE REGION: Central North Pacific Ocean

COUNTRY: U.S.A.

SPECIES OF CONCERN: False killer whale (Main Hawaiian Islands Insular DPS)



MARINE AREA TYPE

- ☒ **OBIA in Regulations/LOA** (#16, Penguin Bank)
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☐ **EBSA**
- ☐ **U.S. Marine National Monument**
- ☒ **Hoyt Cetacean MPA** (BIAs)
- ☐ **U.S. MPA**
- ☒ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

On July 24, 2018, NMFS issued a final rule designating critical habitat under the ESA for the Main Hawaiian Island insular false killer whale (MHI IFKW) distinct population segment (DPS). Critical habitat was designated as waters from the 148- to 10,499-ft (45-m to the 3,200-m) depth contours around the MHIs from Niihau east to Hawaii, except for 14 areas including one area with two sites requested by the Bureau of Ocean Energy Management and the others requested by the Navy (NOAA, 2018). Additionally, the Ewa Training Minefield and the Naval Defensive Sea Area were precluded from designation under section 4(a)(3) of the ESA because they are managed under the Joint Base Pearl Harbor-Hickam Integrated Natural Resource Management Plan that NMFS found provides a benefit to the MHI IFKW.

The ESA-designated critical habitat area was determined to contain physical or biological features essential to the conservation of the DPS that may require special management considerations or protection, and included areas identified as high use (or high-density) areas. These high-use areas were

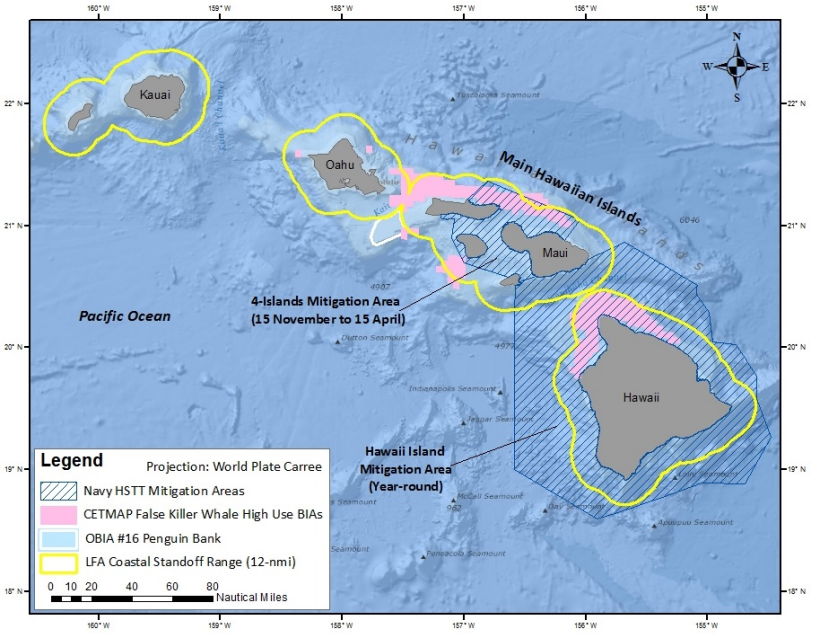
described as areas of higher conservation value where greater foraging and/or reproductive opportunities are believed to exist, or areas of concentrated travel (NOAA, 2017).

Four characteristics support the physical/biological feature of island-associated marine ESA-designated critical habitat and the false killer whale's ability to travel, forage, communicate, and move freely around and among the MHI:

- Adequate space for movement and use within the continental shelf and slope habitat;
- Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth;
- Waters free of pollutants of a type and amount harmful to MHI Insular false killer whales; and
- Underwater sound levels that would not significantly impair false killer whales' use or occupancy (NOAA, 2018).

About 40 percent of the MHI IFKW DPS' ESA-designated critical habitat lies beyond the spatial extent of the coastal standoff range for SURTASS LFA sonar. Part of the critical habitat outside the coastal standoff range is located on Penguin Bank, where the Navy has an agreement with the State of Hawaii not to conduct SURTASS LFA sonar activities in waters to the extent of the 600 ft (183 m) depth contour, which coincides with the boundary of the Penguin Bank OBIA #16 for SURTASS LFA sonar.

Baird et al. (2015) characterized biologically important areas (BIAs) of odontocetes in Hawaiian waters as part of the Cetacean Density and Distribution Mapping (CETMAP) program. Using published, unpublished, and expert opinion, Baird et al. (2015) characterized the high-use areas of the MHI IFKW population based on density of location data gleaned from satellite-tagged FKWs. These areas were first presented in Baird et al. (2012), which was used to help define the critical habitat for the MHI IFKW DPS. Some refinements were made in the gridding of the data for the BIA high-use delineation. All the Baird et al. (2015) BIAs for the MHI IFKW DPS are located inside the 3,281-ft (1,000-m) isobath; most of the BIA extent is also within the coastal standoff range for SURTASS LFA sonar (see second map figure).



GEOGRAPHIC CRITERIA

Location in LFA Study Area: Critical habitat (CH): ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): CH/BIAs/HSTT Mitigation Areas:
☐ Entirely Outside
☒ Partially Outside

Eligible Areal Extent: CH: 5,675.22 nmi^2 (19,465.44 km^2)

CETMAP BIAs: 179.28 nmi^2 (614.93 km^2)

Source of Official Boundary: CH: Pacific Islands Regional Office Protected Resources, National Marine Fisheries Service
CETMAP BIAs: Office of Science and Technology, National Marine Fisheries Service

Spatial File Type: GIS shapefiles

Spatial File Source: CH and CETMAP BIAs: Pacific Islands Regional Office Protected Resources and Office of Science and Technology, National Marine Fisheries Service, National Oceanic and Atmospheric Administration

Date Obtained: CH: 8/17/2018; CETMAP BIAs: 4/27/2015

LOW FREQUENCY HEARING SENSITIVITY

☐ Species:

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Baird, R. W., Cholewiak, D., Webster, D. L., Schorr, G. S., Mahaffy, S. D., Curtice, C., . . . Van Parijs, S. M. (2015). Biologically important areas for cetaceans within U.S. waters-Hawai'i region. *Aquatic Mammals, 41*(1), 54-64. doi: 10.1578/am.41.1.2015.54.	Eighteen species of odontocetes, including some resident populations, have been documented in Hawaiian waters based on small-boat sightings and survey effort, photo-identification, genetic analyses, and satellite tagging. The authors merged existing published and unpublished information along with scientific expertise for the Hawaii region to identify and support the delineation of Biologically Important Areas (BIAs)

	for one of the three populations of false killer whales in Hawaii waters. The MHI IFKW is more well studied than the other populations of false killer whales in Hawaiian waters and this small population has been listed as endangered under the ESA. The population consists of 151 individuals with a known range that extends from west of Ni'ihau to east of Hawaii, and as far as 66 nmi (122 km) offshore. Baird et al. (2012) identified several high use areas based on the location densities with greater than two standard deviations above the mean location density. The authors refined their methodology to one standard deviation above the mean and mapped the location density data accordingly to derive six year-round high-use BIAs for MHI IFKWs (see map figure above).
Baird, R. W., Hanson, M. B., Schorr, G. S., Webster, D. L., McSweeney, D. J., Gorgone, A. M., . . . Andrews, R. D. (2012). Range and primary habitats of Hawaiian insular false killer whales: Informing determination of critical habitat. *Endangered Species Research, 18*(1), 47-61. doi:10.3354/esr00435.	The authors assessed the population's range and heavily used habitat areas using data from 27 satellite tag deployments. Tag data were available for periods of between 13 and 105 days (median = 40.5), with 8,513 locations, 93.4 percent of which were from July to January due to seasonality bias, as virtually no information was available on spatial use during months of March through June. Three high-use areas were identified: 1) off the north half of Hawaii Island; 2) north of Maui and Molokai; and 3) southwest of Lanai. However, data was only available for 2 of the 3 main social clusters identified. Two large areas of high-use were identified, including an area off the north end of Hawaii encompassing both the windward and leeward sides of the island, and a broad area ranging from east of Oahu to north of Maui located entirely off the windward side of the islands. Assessment of the density by social clusters indicated that the area off the north end of Hawaii Island was only a high density area for individuals from one social cluster (Cluster 1), while the area off the north side of Molokai was the primary high-density area for individuals from another social cluster (Cluster 3), while individuals from Cluster 1 appeared to commonly use this area as well. Such overlap in range but differences in high-density areas is similar to what has been

	reported for pods of fish-eating killer whales from the coastal waters of Washington and British Columbia (Hauser et al 2007). The differences in high density areas for Clusters 1 and 3 suggest that high-density areas for Cluster 2 are likely not reflected in this analysis and more work is needed to identify the high-density area for this social cluster. Most of the high-density areas are no the windward, rather than on the leeward side of the islands, even though on average individuals spent approximately the same amount of time on the leeward sides. Higher density areas were on average shallower, closer to shore, and with gentler slopes than lower density areas. Available evidence suggests that false killer whales feed throughout their range, as foraging and feeding behavior were documented in virtually all the long-duration encounters the authors had with this population. However, the authors suggest that, given the amount of time the whales spent in the high-density areas, and the frequency at which false killer whales are observed feeding during encounters, the high-density areas represent particularly important feeding areas.

Committee or Government Reports

Paper	*Synopsis*
Department of the Navy (DoN). (2018). Hawaii-Southern California training and testing environmental impact statement/overseas environmental impact statement (EIS/OEIS). Naval Facilities Engineering Command, Pacific, Pearl Harbor, HI. Retrieved from <https://www.hstteis.com/Documents/2018-Hawaii-Southern-California-Training-and-Testing-Final-EIS-OEIS/Final-EIS-OEIS>.	The Navy's HSTT EIS/OEIS evaluates the potential environmental impacts of conducting training and testing activities after December 2018 in the Hawaii-Southern California Training and Testing Study Area (Study Area). The Study Area is made up of air and sea space off Southern California, around the Hawaiian Islands, and the transit corridor that connects the two areas. The Navy considered three alternatives: no action; a representative (not maximum) year of new and ongoing training and testing representing the natural fluctuation of training cycles and deployment schedules that generally limit the maximum level of training from occurring year after year in any five-year period, with some unit-level training being conducted using synthetic means (e.g., simulators) and that some unit-level

	active sonar training will be completed through other training exercises; and the maximum number of new and ongoing training and testing activities that could occur within a given year with the maximum level of activity occurring every year over any five-year period.
National Oceanic and Atmospheric Administration (NOAA). (2018). Endangered and threatened wildlife and plants: Final rulemaking to designate critical habitat for the Main Hawaiian Islands insular false killer whale distinct population segment; Final rule. National Marine Fisheries Service, National Oceanic and Atmospheric Administration. *Federal Register, 83*(142), 35062-35095.	The Final Rule officially designated the critical habitat under the ESA of the Main Hawaiian Islands Insular DPS of false killer whales. The principal component elements of the physical and biological features of the critical habitat were defined.
National Marine Fisheries Service. (2017). Final biological report: Designation of critical habitat for the endangered Main Hawaiian Islands insular false killer whale distinct population segment. Prepared by Pacific Islands Regional Office, Protected Resources Division, Honolulu, Hawaii. Retrieved from <https://www.fisheries.noaa.gov/resource/document/biological-report-designation-critical-habitat-endangered-main-hawaiian>.	The physical and biological feature essential to conservation of the MHI IFKW (essential feature) is island-associated marine habitat, including adequate space for movement and use; prey species of sufficient quantity, quality, and availability; waters free of harmful pollutants; and sound levels that would not significantly impair use of occupancy (which include sounds that fall within their best hearing range and are chronic or frequently occurring within the critical habitat). MHI IFKWs are found in waters surrounding each of the MHI (Niihau to Hawaii). At the time of their ESA listing (2012), their range was described consistent with the MMPA description as nearshore of the MHIs out to 140 km. However, new satellite tracking data have since proved this description of the range to be more restricted, especially on the windward sides of the islands (Bradford et al., 2015). NMFS revised the range in the 2015 stock assessment report (Caretta et al., 2016) in accordance with review and reevaluation of satellite tracking data. MHI IFKWs show less offshore movement on the windward sides (maximum of 51.4 km from shore) than on the leeward sides (maximum distance of 115 km from shore) and have seasonal bias. MHI IFKWs circumnavigate the islands and quickly move throughout their range (Baird et al., 2008; 2012). One individual was shown to move from Hawaii to Maui to Lanai to Oahu to Molokai,

covering a minimum distance of 449 km over a 96-hour period (Baird et al., 2010; Oleson et al., 2010). Tracking data show that IFKWs spend equal amounts of time on both the leeward and windward sides of the islands but exhibit greater offshore movements on the leeward sides. The water depths range between 45 and 3,200 m, a depth range that incorporates the majority of the tracking locations of MHI IFKWs and the essential features of the critical habitat.

Baird et al. (2012) described three areas of high use by the MHI IFKWs: the north side of the island of Hawaii (both east and west sides), a broad area extending from north of Maui to northwest of Molokai, and a small area to the southwest of Lanai.

Bradford, A.L., Oleson, E.M., Baird, R.W., Boggs, C.H., Forney, K.A., & Young, N.C. (2015). Revised stock boundaries for false killer whales in Hawaiian waters. NOAA Technical Memorandum NMFS-PIFSC-47. Pacific Islands Fishery Science Center, National Marine Fishery Center. Retrieved from <https://www.pifsc.noaa.gov/library/pubs/tech/NOAA_Tech_Memo_PIFSC_47.pdf>.

The MHI IFKW stock boundary was changed from a uniform 140-km radius around the MHI to a minimum convex polygon bounded around a 72-km radius of the MHI, resulting in a boundary shape that reflects greater offshore use in the leeward portion of the MHI.

Telemetry data through 2010 show three social groups (Clusters 1, 2, and 3) make up this stock and they appear to differ in their spatial use, although Clusters 1 and 3 share a common high-use area (or “hotspot”) off the northern coasts of Moloka’I and Maui (Baird et al., 2012). No individuals were tagged from Cluster 2, so their locations are unknown although they are seen more often than expected off Hawaii Island and less than expected off Oahu and Maui.

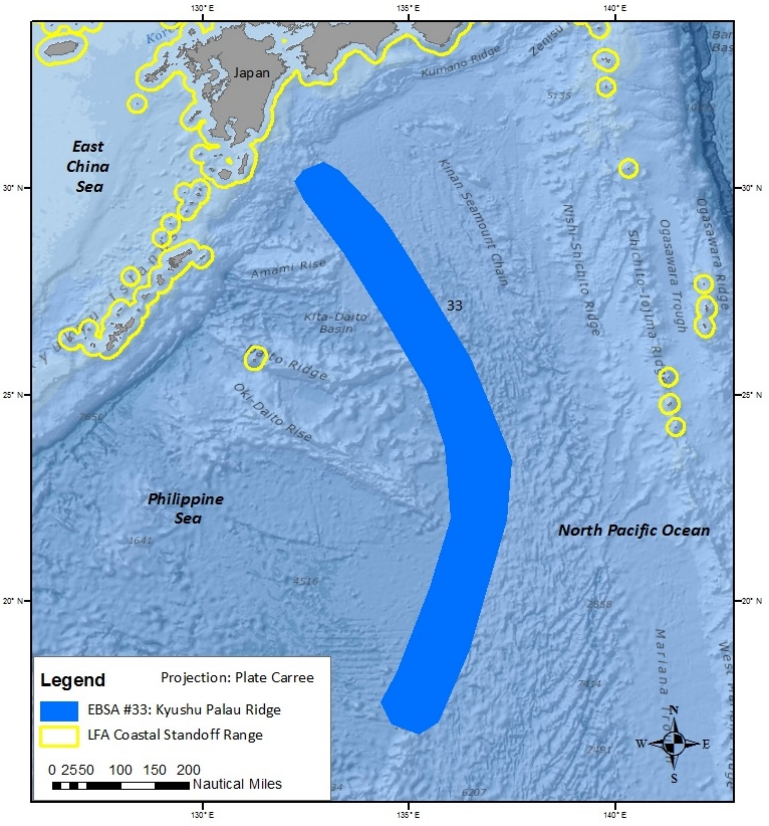
This effort was solely to determine stock boundaries, and not biologically important areas. The authors acknowledge that stock boundaries developed were not empirically driven but were determined using the best available scientific information. The revised stock boundaries developed reflect the full range of each stock and are associated with the average density estimate. However, the “hot spot” area off the northern coasts of Moloka’I and Maui indicate an area of higher density.

Kyushu Palau Ridge 18

MARINE REGION: Western North Pacific Ocean

COUNTRY: NA

SPECIES OF CONCERN: Sperm whale



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☒ **EBSA** (EA #33)
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

The Kyushu-Palau Ridge is a 1620-nmi (3000-km) long seafloor feature that extends from Kyushu, Japan in the north to Palau in the south and consists of a chain of extinct volcanos, or seamounts. The Kuroshio Current influences much of the area, and when the warm water surface current hits the seamount chain, localized upwelling results with the more productive waters surrounding the seamounts. Fish diversity, in particular, is high in this region, and includes many unique deep-sea species and the discovery of the spawning area of the commercially important Japanese conger along the Kyushu-Palau Ridge (UNEP CBD, 2017e).

Only three sperm whales have been observed along the axis of the Kyushu-Palau Ridge, and those records are whaling records from the late 1700s to the early 1900s; the only other OBIS-SEAMAP data for the ridge area are rare sea turtle occurrences (Halpin et al., 2009). Thus, this marine area has no known nor apparent biological importance to any marine mammal species.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☒ Entirely Outside

☐ Partially Outside

Eligible Areal Extent: 71,472.64 nmi^2 (245,144.28 km^2)

Source of Official Boundary: UNEP Convention of Biological Diversity

Spatial File Type: GIS Shapefile

Spatial File Source: UNEP Convention of Biological Diversity
(/api/v2013/documents/64021521-8B63-37FC-7D6A-E6C220345C90/attachments/EA_33_EBSA.zip)

Date Obtained: 4/7/2018

LOW FREQUENCY HEARING SENSITIVITY

☐ Species:

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD (NONE RECOMMENDED)

☐ Year-round ☐ Seasonal Period (Months Annually):

Subject Matter Experts / e-NGO Reports / Regional Expertise

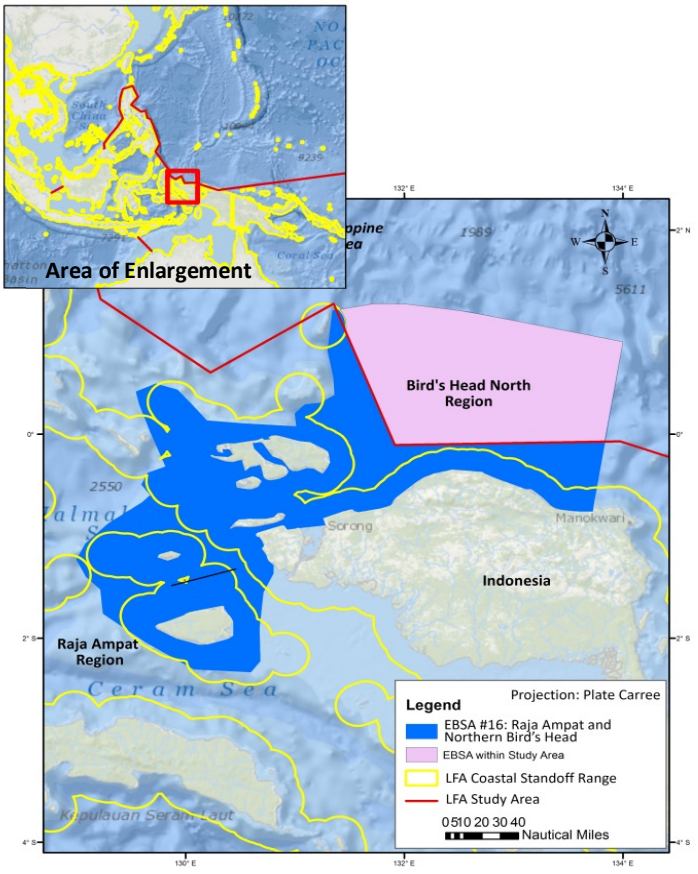
Paper	*Synopsis*
Halpin, P.N., A.J. Read, E. Fujioka, B.D. Best, B. Donnelly, L.J. Hazen, C. Kot, K. Urian, E. LaBrecque, A. Dimatteo, J. Cleary, C. Good, L.B. Crowder, & K.D. Hyrenbach. (2009). OBIS-SEAMAP: The world data center for marine mammal, sea bird, and sea turtle distributions. *Oceanography, 22*(2), 104-115.	Database of available megavertebrate global data, including historical data.

Raja Ampat and Northern Bird's Head 19

MARINE REGION: Western North Pacific Ocean

COUNTRY: Indonesia

SPECIES OF CONCERN: Bryde's, false killer, killer, and sperm whales; as well as dolphins (Indo Pacific humpback, pantropical spotted, Fraser's)



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☒ **EBSA** (EA #16)
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

The Raja Ampat and Northern Bird's Head marine area is part of the Bismarck Solomon Seas Ecoregion and contains a high diversity of coral, reef fishes, and habitat types. The Bird's Head Seascape Region is a large area of West Papua, Indonesia. Raja Ampat consists of four main islands and hundreds of other small islands, including critical nesting and feeding habitats and migration routes for various threatened species, such as sea turtles and cetaceans (UNEP CBD, 2017f). Only a small portion of the Bird's Head Seascape Region occurs within the SURTASS LFA sonar study area.

Sixteen species of marine mammals (15 cetaceans and the dugong) have been reported in the waters of the Bird's Head Seascape (Borsa and Nugroho, 2010; Mangubhai et al., 2012, Kahn, 2015; Rudolph et al., 1997). Ender et al. (2014) reported only 13 species of cetaceans in Raga Ampat waters, based on 2006 to 2011 aerial and boat surveys, not including the blue whale or dugong. Kahn (2015) noted that the dugong and blue whale occurred only rarely in the waters of Raja Ampat during his 2011 to 2016 sighting

surveys, with the blue whale having been observed only once in five field seasons and the dugong observed in only three field seasons. The January and September 2006 aerial survey observations of marine mammals in the Raja Ampat region were all reported in the waters of the straits (>1,640 ft [500 m]) between the closely grouped islands or clustered in the insular shelf waters (Ender et al, 2014; Wilson et al., 2010). Ender et al. (2014) noted that highest cetacean diversity occurred in January to February, May, and October to November. Ender et al. (2014) and Wilson et al. (2010) suggested that Dampier and Sagewin straits may function as migratory corridors for cetaceans migrating between the western Pacific and eastern Indian oceans. Only a very minute area of any surveyed region occurs within the study area for SURTASS LFA sonar, based on the cited literature. The straits of the Raga Ampat waters occur within the coastal standoff range, so there is limited potential habitat for cetacean species.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside (partially in study area/CSR)

Eligible Areal Extent: 10,103.98 nmi^2 (34,655.69 km^2)

Source of Official Boundary: UNEP Convention of Biological Diversity

Spatial File Type: GIS shapefile

Spatial File Source: UNEP Convention of Biological Diversity
(/api/v2013/documents/68A3E020-B97B-E4C0-3CE5-564C40845E94/attachments/EA_16_EBSA.zip)

Date Obtained: 7/17/2018

LOW FREQUENCY HEARING SENSITIVITY

☒ Species: Bryde's and sperm whales

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD (NOT RECOMMENDED)

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Ender, A.I., Muhajir, Mangubhai, S., Wilson, J.R., Purwanto, & Muljadi, A. (2014). Cetaceans in the global centre of marine biodiversity. *Marine Biodiversity Records, 7*, e18. doi:10.1017/s1755267214000207.	Incidental sightings of marine mammals during coastal resources' aerial surveys in 2006 (January and September) and boat-based surveys of coral reefs in 2006 to 2011 in Raja Ampat in the Bird's Head Seascape, Indonesia. The surveys documented the spatial and temporal distribution of cetaceans in central and southern Raja Ampat. Six whale (Bryde's, sperm, pygmy killer, false killer, killer, and short-finned pilot whales) and seven dolphin (spinner, common and Indo-Pacific bottlenose, Fraser's, Risso's, pantropical spotted, and Indo-Pacific humpback dolphins) species were documented in these waters. More than three times the number of cetaceans were observed during the January aerial surveys than in the September surveys. Short-finned pilot whales and common bottlenose dolphins were the most commonly sighted species during the boat surveys. The Bryde's whale was the most commonly sighted of the large whales (19.6 percent). The highest cetacean diversity and abundances were recorded in the waters of Dampier and Sagewin straits and in Kofiau Marine Protected Area. The authors suggest that Dampier and Sagewin straits are cetacean migration corridors between the western Pacific and Indian oceans, although no evidence beyond the higher abundances in the straits is put forward to support this theory. The authors also note that seasonal upwelling and nutrient rich waters in the region may provide important foraging grounds for resident and migrating cetaceans.
Mangubhai, S., Erdmann, M.V., Wilson, J.R., Huffard, C.L., Ballamu, F., Hidayat, N.I., Hitipeuw, C., Lazuardi, M.E., Mahajir, Pada, D., Purba, G., Rotinsulu, C., Rumetna, L., Sumolang, K., & Wen,	The Bird's Head Seascape located in eastern Indonesia is the global epicenter of tropical shallow water marine biodiversity with over 600 species of corals and 1,638 species of coral reef

W. (2012). Papuan Bird's Head Seascape: Emerging threats and challenges in the center of marine biodiversity. *Marine Pollution Bulletin, 64*, 2279-2295.	fishes. The Seascape also includes critical habitats for globally threatened marine species, including sea turtles and cetaceans. This paper states the area contains a high diversity and healthy population of cetacean species and references Tomascik et al., 1997 and Rudolf et al., 1997. The authors state migratory species such as baleen and sperm whales are sighted annually in Dampier and Sagewin straits in Raja Ampat (Wilson et al., 2010a, TNC/CI, unpublished data). The authors also state that frequent year-round sightings of Bryde's whales from Raja Ampat south to Bintuni Bay (Kahn et al., 2006) and Triton Bay suggest resident populations (Kahn, 2009). These areas, however, are not within the study area for SURTASS LFA sonar.
Borsa, P., & Nugroho, D. A. (2010). Spinner dolphin (*Stenella longirostris*) and other cetaceans in Raja Ampat waters, West Papua. *Marine Biodiversity Records, 3*, e49. doi:10.1017/s175526721000045x.	Ship surveys of cetaceans were conducted during November and December 2007 in the waters of Raja Ampat, Indonesia. Six cetacean species were observed during these surveys, with the pelagic spinner dolphin being the most commonly observed cetacean species. The five sperm whales reported during the surveys were detected in Dampier Strait waters deeper than 1,903 ft (580 m). The authors suggested that the waters of Raja Ampat, at least during the November to December period, are a foraging area for various cetacean species that occur in relatively high densities.
Rudolph, P., Smeenk, C., & Leatherwood, S. (1997). Preliminary checklist of Cetacea in the Indonesian Archipelago and adjacent waters. *Zoologische Verhandelingen, 312*, 1-48.	The authors state sperm whales were hunted by whalers during the 19th century, particularly in the deeper waters in the eastern part of the archipelago (Beale, 1839; Townsend, 1935; Barnes, 1991). Although reports have been published on individual species or groups of species occurring in Indonesian waters, no comprehensive accounts of this area's diverse and rich cetacean fauna exist. Furthermore, much information has remained unpublished and exists only in difficult to obtain "grey" literature or in researchers' field notes. This paper summarizes information on the distribution, movements, abundance, and seasonality of cetaceans known to occur in Indonesian waters (here defined as the marine waters from 6° N to 10° S and 95° to 142° E) from

	data in scientific literature, preserved in scientific collections, and from unpublished field notes by the authors and other workers. The authors were unable to verify all published records and often had to rely on the authors' and correspondents' identifications. The authors state there are reports of the occurrence of large male sperm whales off the village of Lamalera (Lembata, Savu Sea), which would indicate that the region is a breeding ground (Fuchs, 1978, cited from Hembree, 1980). Sperm whales are found in these waters year-round, but nothing is known about the relationship of this population with other stocks. The passages between the Lesser Sunda Islands are supposed to be a migration route of sperm whales between the Indian and Pacific oceans (Rice, 1989). Fishermen from Lamalera revealed that blue whales are also seen throughout the year, with a peak abundance in April and May. Blue whales are regularly observed around Komodo Island (UNEP/IUCN, 1988). None of these areas, however, are within the SURTASS LFA sonar study area. Other than the above examples, the authors mainly present information on presence of marine mammals and do not identify other areas of high density or areas of biological importance for marine mammals within the SURTASS LFA sonar study area.

Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
Kahn, B. (2015). Marine mammal species diversity in Raja Ampat. Retrieved from <https://apex-environmental.com/marine-mammals-raja-ampat/>.	Basic overview of the research B. Kahn has conducted on marine mammals in the Raja Ampat region and the 16 species he has observed, along with a table of the species occurrences over the last five field seasons (2011 through 2015). Kahn noted that he has observed no additional species since 2013 and that his species list doesn't include the Indo-Pacific humpbacked dolphin because he doesn't typically work in the interior island waters where that species occurs. He only observed a blue whale during the 2013 field season and dugong were observed only during three field seasons.

Wilson, J., Rotinsulu, C., Muljadi, A., Wen, W., Barmawi, M., & Mandagi, S. (2010*). Spatial and temporal patterns in marine resource use in Raja Amput region from aerial surveys 2006*. Report No 3/10. Marine Program, Asia Pacific Conservation Region. The Nature Conservancy, Bali, Indonesia.	Aerial surveys of island coastal resources, including marine mammals, were conducted in January and September 2006 in the waters of Raja Ampat. It was not possible to identify all marine mammals to species. The authors note the appearance of seasonality to marine mammal sightings, stating whales and dolphins were significantly more abundant in January compared to September. The authors state that most sightings were between Sorong and Salawati Island, in Dampier Strait, and around Kofiau Island, all of which are outside the LFA study area. Dugongs were widely distributed around all the islands surveyed and were observed in equal numbers during both months surveyed.

Committee or Government Reports

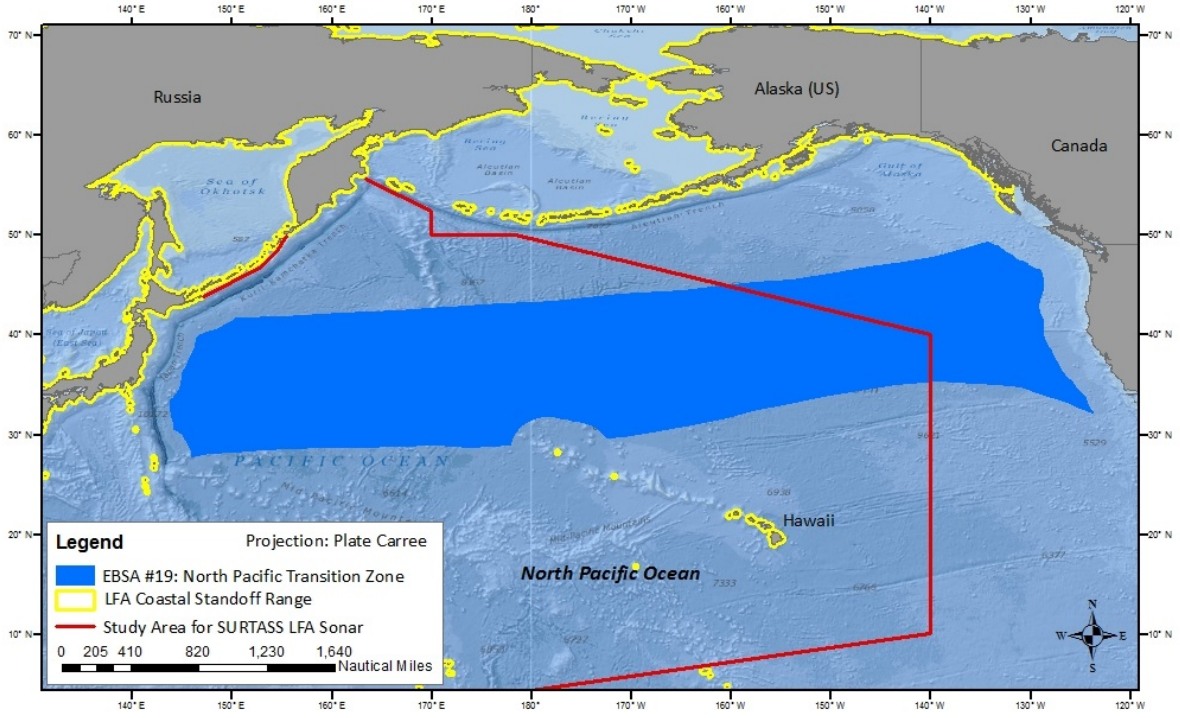
Paper	*Synopsis*
UNEP CBD. (2017f). Ecologically or biologically significant areas: Raja Ampat and Northern Bird's Head. Retrieved from <https://chm.cbd.int/pdf/documents/marineEbsa/237857/1>.	Overview of EBSA information collected on this area along with the criteria for designation. Raja Ampat and Northern Bird's Head are regarded as among the six globally important areas within the Bismarck Solomon Seas Ecoregion. The Bird's Head Seascape and Raga Ampat areas are important biodiversity hotspots, encompassing a high diversity of geographical features, habitats, and marine species, including 600 coral species and 1,638 reef fish species. Northern Bird's Head has the largest nesting aggregation of the endangered leatherback turtles in the Pacific region. Surveys and reports around the Bird's Head Seascape suggest that this region is a cetacean hotspot that supports a high diversity of cetacean species, including Bryde's, false killer, killer, and sperm whales, and Indo Pacific humpback, pan tropical spotted, and Fraser's dolphins. Aerial surveys revealed the wide distribution of dugongs.

Surveys

Paper	*Synopsis*
Wilson et al., 2010	See summary above.
Ender et al., 2014	See summary above.

North Pacific Transition Zone 20

MARINE REGION: North Pacific Ocean



COUNTRY: NA

SPECIES OF CONCERN: Northern elephant seal

MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☒ **EBSA** (NP #19)
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

The North Pacific Transition Zone (NPTZ) is a unique oceanographic feature within the circulation system of the North Pacific Ocean, but it is not, however, globally unique nor is it a rare habitat (UNEP CBD, 2016d). The NPTZ is a 4,860-nmi (9,000-km) wide oceanographic feature of the upper water column that is bounded to the north and south by thermohaline (temperature/salinity) fronts (Subarctic and Subtropical Frontal Zones). Located within this wide north-south gradient of the NPTZ is the Transition

Zone Chlorophyll Front (TZCF), which is a front or boundary where the surface chlorophyll a concentration[1] abruptly changes due to the mixing of nutrient-rich polar and nutrient-poor subtropical water masses. The TZCF migrates seasonally and interannually by as much 540 nmi (1,000 km) north and south, with a latitudinal minimum in January to February and maximum in July to August (Polovina et al., 2001). Consequently, the boundaries of the NPTZ move seasonally, with the latitudinal extent varying seasonally between 28° to 34°N and 40° to 43°N, extending further south during winter (UNEP CBD, 2016d). Thus, the NPTZ is the area between the southern and northern extremes of the TZCF and is basically the region between two spatial extremes, cold, nutrient-rich polar water to the north and warm, nutrient-poor subtropical water to the south.

At the TZCF, in addition to the mixing of nutrient concentrations, phytoplankton communities from polar and subtropical waters also mix. This rich phytoplankton concentration attracts zooplankton and species such as fish and squid that feed on plankton. These species are aggregated at the TZCF boundary, attracting predators, including apex predators such elephant seals. This highly persistent, productive habitat of the NPTZ is not only a foraging area, where predators and prey are aggregated, but also is a migratory corridor for species such as bluefin tuna and loggerhead turtles that move east and west across the North Pacific Ocean (UNEP CBD, 2016d).

Although a large amount of research has been conducted on the importance of the NPTZ, especially most recently with top trophic predators, only a limited number of pinniped species have been shown to have any correlation with this feature. The one pinniped for which the most research has been conducted that shows the most affinity to the NPTZ is the northern elephant seal (Harrison, 2012; Simmons et al., 2010). Le Boeuf et al. (2000) reported that only female northern elephant seals fed extensively, although not exclusively, in the waters of the NPTZ, while males moved directly to the waters of the western Aleutian Islands to forage. Harrison (2012) and Robinson et al. (2012) showed that female elephant seals have a strong affinity to the NPTZ during the summer and autumn but that they remain in more northerly waters when the NPTZ and TZCF migrate south (up to 540 nmi [1,000 km]) in the winter. Robinson et al. (2012) reported that the female elephant seals do not appear to track surface features such as the TZCF but instead use the boundaries of oceanic gyres during their two seasonal migrational journeys to foraging grounds since the boundaries of these features do not move and remain stable across seasons and years.

The TZCF is also important to the survival of Hawaiian monk seal pups in the northern atolls of the NWHI (Polovina et al., 2015). Hawaiian monk seals do not move to or within the TZCF but respond to the interannual variation of the southernmost position of the front when it reaches the northernmost atolls of the archipelago (Baker et al., 2007). Specifically, Baker et al. (2007) found a statistically significant correlation between the survival through age 4 of more than 300 monk seals at the most northerly atolls during 1984 to 2004 and the southernmost (winter) position of the 64° F (18° C) isotherm, which served as a proxy for the TZCF years prior to the advent of remotely-sensed ocean color data. The Hawaiian monk seal pup survival rate was poor during winters when the TZCF remained north of the atolls. Baker et al. (2007) concluded that variation in ocean productivity may mediate prey availability in monk seal foraging habitat and consequently influence juvenile survival in the northern portion of their range.

Satellite-tagging of a rehabilitated Guadalupe fur seal released on the California coast showed that the seal traveled thousands of miles to forage in the waters of NPTZ, which was the first documentation of this foraging behavior in the NPTZ for the Guadalupe fur seal (Marine Mammal Center, 2014).

1 Chlorophyll a concentration is an indicator of the level of primary productivity; chlorophyll a concentrations and primary productivity would be much higher in nutrient-rich colder polar waters than in subtropical waters.

NOTE: Another marine area in the western North Pacific is also under assessment as a potential marine mammal OBIA for SURTASS LFA sonar. Marine area #25, Polar/Kuroshio Extension Front, encompasses much of the same geographic area.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible (majority inside study area) ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☒ Entirely Outside
☐ Partially Outside

Eligible Areal Extent: 4,311,064.75 nmi^2 (14,107,417.24 km^2)

Source of Official Boundary: UNEP Convention of Biological Diversity

Spatial File Type: GIS shapefile

Spatial File Source: UNEP Convention of Biological Diversity,
</api/v2013/documents/6F9DF7CF-33A6-D981-C9A3-71E065B96AD2/attachments/NP_19_EBSA-GIS%20shapefile.zip)>

Date Obtained: 5/7/2018

LOW FREQUENCY HEARING SENSITIVITY

☐ Species:

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD (NONE RECOMMENDED)

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Polovina, J.J., Howell, E.A., Kobayashi, D.A., & Seki, M.P. (2015). The Transition Zone Chlorophyll Front updated: Advances from a decade of research. *Progress in Oceanography, 150*, 79-85.	The TZCF was first described 15 years ago based on the empirical association between the apparent habitat of loggerhead sea turtles and albacore tuna and the basin-wide chlorophyll front observed with remotely sensed ocean color data. Subsequent research has provided evidence that the TZCF is an indicator of a dynamic ocean feature with important physical and biological characteristics. In the summer, the TZCF is located at the southern boundary of the subarctic gyre while its position in the winter and spring is defined by the extent of the southward transport of surface nutrients. Although the TZCF is defined as the dynamic boundary between low and high surface chlorophyll, it is also a boundary between subtropical and subarctic phytoplankton communities and is also characterized as supporting enhanced phytoplankton net community production throughout its seasonal migration. Lastly, the TZCF is important to the growth rate of neon flying squid and to the survival of monk seal pups in the NWHI.
Robinson, P. W., Costa, D. P., Crocker, D. E., Gallo-Reynoso, J. P., Champagne, C. D., Fowler, M. A., . . . Yoda, K. (2012). Foraging behavior and success of a mesopelagic predator in the northeast Pacific Ocean: Insights from a data-rich species, the northern elephant seal. *PLoS ONE, 7*(5), e36728. doi:10.1371/journal.pone.0036728.	Diving, tracking, foraging success, and natality data for 297 adult female northern elephant seal migrations were collected from 2004 to 2010. During the longer post-molting migration, individual energy gain rates were significant predictors of pregnancy. At sea, seals focused their foraging effort along a narrow band corresponding to the boundary between the sub-arctic and sub-tropical gyres. Elephant seals target the gyre-gyre boundary throughout the year rather than follow the southward winter migration of surface features, such as the Transition Zone Chlorophyll Front. Female elephant seals show a strong affinity to the TZCF during much of the summer and autumn, but the seals remain in northern waters while the TZCF migrates up to 1,000 km southward during the winter. The gyre-gyre boundary remains quite stable across seasons and years. The elephant seals appear to utilize the gyre-gyre-boundary

	during both migrations rather than track surface features such as the TZCF.
Simmons, S.E., Crocker, D.E., Hassrick, J L., Kuhn, C.E., Robinson, P.W., Tremblay, Y., & Costa, D.P. (2010). Climate-scale hydrographic features related to foraging success in a capital breeder, the northern elephant seal *Mirounga angustirostris*. *Endangered Species Research, 10*: 233-243.	Satellite telemetry from 75 adult female northern elephant seals and point measurements of foraging success (energy/mass gain) were used to examine habitat selection at large temporal and spatial scales in the North Pacific Ocean. Elephant seals spend up to 10 months per year ranging widely across the Pacific searching for food. Two areas of the North Pacific Ocean were used to examine elephant seal foraging success and energy gain: Transition Zone and the Subarctic Gyre. Underlying differences in prey composition and/or distribution may drive the differences seen in searching behavior and foraging success of elephant seals at large scales. By linking searching behavior to measures of foraging success, such as mass/energy gain, we can ascertain the ecological significance of selected habitat and better understand potential impacts of climate change. Our study revealed that the seals showed comparable levels of foraging success across both migrations and in all ecoregions. The variability was greater in the mass gain during foraging migrations to the Subarctic Gyre than to the Transition Zone. Foraging success was notably greater than measured in previous studies.
Baker, J. D., Polovina, J. J., & Howell, E. A. (2007). Effect of variable oceanic productivity on the survival of an upper trophic predator, the Hawaiian monk seal *Monachus schauinslandi*. *Marine Ecology Progress Series, 346*, 277-283.	The Hawaiian monk seal population is declining, and low juvenile survival due to prey limitation is believed to be a primary cause. We analyzed the relationship of the survival of more than 3,000 monk seals during 1984 to 2004 to the southernmost latitude of the 18°C isotherm (a proxy for the TZCF). We found a statistically significant nonlinear relationship between the winter position of the TZCF and survival of monk seals through 4 years of age at the most northerly atolls. When the front remained farther north, survival was poorer. The relationship was strongest following a 1- or 2-year lag, perhaps indicating the time required for enhanced productivity to influence the food web and improve the seals' prey base. No such relationship was found at subpopulations located farther south or among adult animals at any site. Variation in ocean productivity may mediate prey

	availability in monk seal foraging habitat and consequently influence juvenile survival in the northern portion of their range.
Le Boeuf, B. J., Crocker, D. E., Costa, D. P., Blackwell, S. B., Webb, P. M., & Houser, D. S. (2000). Foraging ecology of northern elephant seals. *Ecological Monographs, 70*(3), 353-382.	This study reviewed diving and foraging behavior, foraging locations, and distribution of the northern elephant seal by sex to determine if sexual segregation was occurring during foraging during their two annual migrations into the North Pacific Ocean. Daily movements of 27 adult males and 20 adult females, during 56 migrations from Año Nuevo, CA were monitored by data from satellite tags and from recovered time-depth-speed recorders. Pronounced sex differences were found in foraging location and foraging pattern. Females range widely over deep water, apparently foraging on patchily distributed, vertically migrating, pelagic prey, whereas males forage along the continental margin at the distal end of their migration in a manner consistent with feeding on benthic prey.

Committee or Government Reports

Paper	*Synopsis*
UNEP CBD. (2016d). Ecologically or biologically significant areas: North Pacific transition zone. Retrieved from <https://chm.cbd.int/pdf/documents/marineEbsa/204130/2>.	Overview of EBSA information collected on this marine area along with the criteria justification for designation. The North Pacific Transition Zone is an oceanographic feature that includes the Transition Zone Chlorophyll Front and is of special importance to the biology of many species in the North Pacific Ocean. The North Pacific Transition Zone is a 4,860-nmi (9000-km) wide upper water column oceanographic feature bounded to the north and south by thermohaline fronts. These fronts form the boundaries to this highly productive habitat where prey and predators, including top trophic (apex) predators, aggregate. In addition to providing key North Pacific foraging areas, the feature also serves as a migratory corridor for species such as bluefin tuna and loggerhead sea turtles.

Theses/Dissertations

Paper	*Synopsis*
Harrison, A.-L. (2012). *A synthesis of marine predator migrations, distribution, species overlap,*	

and use of Pacific Ocean Exclusive Economic Zones. Ph.D. dissertation, University of California at Santa Cruz.

Websites / Social Media

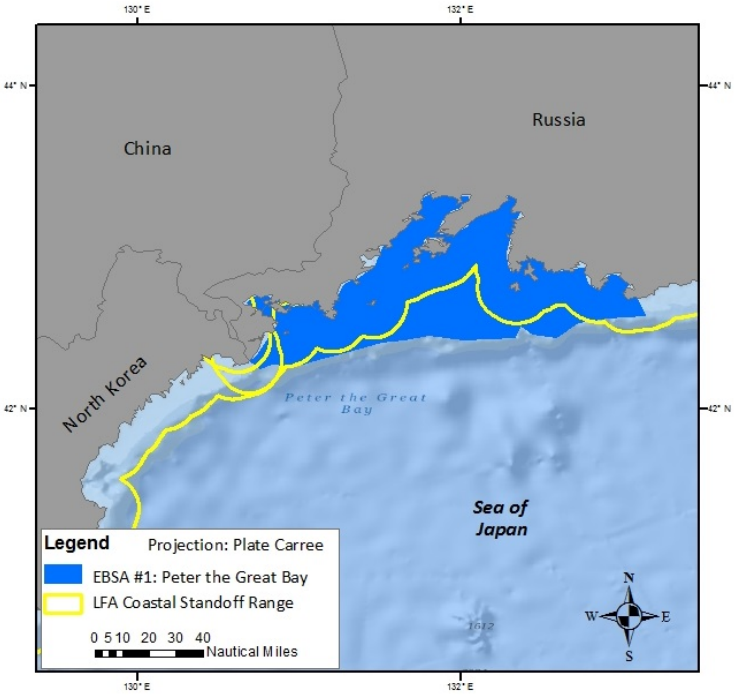
Website/Organization	*Synopsis*
Marine Mammal Center. (2014). Satellite-tagged Guadalupe fur seal Sterling Archer heads straight for a seafood buffet. Retrieved from <http://www.marinemammalcenter.org/about-us/News-Room/2014-news-archives/sterling-archer.html>.	Story about a rehabilitated Guadalupe fur seal that was satellite-tagging before being released on the coast of California near San Francisco. Unlike the other released and tagged Guadalupe fur seals, this fur seal did not travel south to their principal rookery on Guadalupe Island, Mexico as had other tagged and released Guadalupe fur seals. This tagged seal traveled west to thousands of miles to the waters of the North Pacific Transition Zone, presumably to forage. This was the first documentation of this species' relationship to this oceanographic feature.

Peter the Great Bay 21

MARINE REGION: Sea of Japan

COUNTRY: Russia

SPECIES OF CONCERN: Spotted seal[2]



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☒ **EBSA** (NP #1)
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

Peter the Great Bay is an embayment of the western Sea of Japan along the coast of Russia comprised of three smaller bays (Amur, Ussuri, and Posieta), This area is located at the biogeographic boundary between temperate and subtropical regimes, and thus is characterized by a mixture of temperate and subtropical fauna and relatively high biodiversity (UNEP CBD, 2016).

Spotted seals from the Southern DPS occur year-round in Peter the Great Bay (Boveng, 2016, Nesterenko and Katin, 2010). The Southern DPS of spotted seals, which consists of breeding concentrations in the Yellow Sea and Peter the Great Bay, is listed as threatened under the ESA and depleted under the MMPA (Boveng et al., 2009). Nesterenko and Katin (2008) reported that as many as

2 In the feature area detail description of the UNEP CBD (2016) summary of the Peter the Great Bay EBSA, the only information on potentially occurring marine mammals is presented as "…large rookeries of ringed seal (about 2500 individuals) are situated in the area". Unlike all other supporting EBSA documentation provided by UNEP CBD, the literature citations to support the provided biological and physical information for Peter the Great EBSA are in Russian, and therefore cannot be verified. We believe that the inclusion of ringed seals in the Peter the Great Bay is an error as Peter the Great Bay is beyond the southern range of this species and no other occurrences of this species are known in the literature for this region. Moreover, colonies of spotted seals are known to occur in this bay and its associated embayments (Amur, Ussuri, and Posieta), with an estimated abundance of 2,500 individuals (Nesterenko and Katin, 2008, 2015). We believe that the marine mammal species that should have been referenced for this EBSA was the spotted seal, which is what we have evaluated accordingly for the Peter the Great EBSA.

450 spotted seals remain in Peter the Great Bay during summer, with some of the spotted seals from Peter the Great Bay migrating northward to the waters off Hokkaido, Japan. Nesterenko and Katin (2015) reported that a high percentage of immature spotted seals migrate out of the bay northward. Trukin and Mizuno (2002) reported that during winter, spotted seals congregated in the ice-covered waters of Peter the Great Bay, avoiding the open waters of the nearby coast of Russia, but in summer and fall, the pattern reversed with fewer spotted seals occurring with Peter the Great Bay and more seals hauling out along the shores of nearby Primorye, Russia. Pupping begins in January, followed soon after by molting, and by May, many seals have molted and begin dispersing throughout the bay and northward (Nesterenko and Katin, 2010). Unlike in the northern parts of their range, spotted seals in Peter the Great Bay do not reproduce on ice floes but instead, uniquely breed on island locations, principally in the Rimsky-Korsakov Archipelago (Nesterenko and Katin, 2010, 2015). Trukhin (2018) recently reported that the growth of the spotted seal population in Peter the Great Bay is considered stable, with the population estimated to consist of a seasonal maximum of 3,000 to 3,200 individuals in 2014 to 2015, including 660 to 750 pups born annually.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside

Eligible Areal Extent: 874.70 nmi^2 (3,000.13 km^2)

Source of Official Boundary: UNEP Convention of Biological Diversity

Spatial File Type: GIS shapefile

Spatial File Source: UNEP Convention of Biological Diversity;
</api/v2013/documents/89E24077-6311-490A-398D-5CAE7699E53D/attachments/NP_1_EBSA-GIS%20shapefile.zip>

Date Obtained: 7/7/2018

LOW FREQUENCY HEARING SENSITIVITY

☐ Species:

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification

☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD (NOT RECOMMENDED)

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Trukhin, A.M. (2018). Monitoring of the spotted seal *(Phoca largha)* in the Far Eastern Marine Reserve. Pages 187 to 191 in *Marine mammals of the Holoarctic*. Volume 2. Collection of scientific papers after the 10th International Conference, Arkhangelsk, Russia, 2018.	The Far Eastern Marine Reserve was established in the waters of Peter the Great Bay in 1978, which includes the Rimsky-Korsakov Archipelago, where the principal breeding rookeries of the spotted seal in Peter the Great Bay. Prior to 1996, the breeding sites of spotted seals in Peter Great Bay were not known. Subsequent tagging studies were the basis for the discovery that a significant part of the spotted seal population in the bay, including young-of-year, moved out of the bay at the end of the reproductive and molting period, moving northward to the Sea of Okhotsk as far as Sakhalin and the northeastern shores of Hokkaido, Japan. In 2014 to 2015, the author began renewed population studies of spotted seals in the reserve to determine the status of the current population. The growth rate of the population has been stable, with the population estimated to include 3,000 to 3,200 individuals with an annual production of 660 to 750 pups for 2014 to 2015. Trukhin noted that when he began the spotted seal studies in 1998, their goal had been to tag 200 seal pups, but they could not locate that number to tag. In 2014 to 2016, however, they tagged over 200 pups within four days, clearly showing the increased population of spotted seals in the bay. Trukhin estimates that the bay habitats are sufficient to sustain the current population level and growth rate of spotted seals.
Nesterenko, V.A., & Katin, I.O. (2015). Use of space by immature spotted seals (*Phoca largha*) in Peter the Great Bay (Sea of Japan) breeding area. *Russian Journal of Theriology, 14*,2, 163-170.	The breeding population of spotted seals in Peter the Great Bay is the smallest and is uniquely characterized by coastal reproduction, where spotted seals breed on islands rather than solely on ice floes as do the other breeding populations of spotted seals. Many spotted seals remain in Peter the Great Bay throughout the year and

remain connected with the coastal areas.

In 2009, 170 pups were hot-branded, and their movements followed year-round through 2012. Half of the branded seals were re-sighted at least once during that period, with 34 being re-sighted two to three times. At least once in the 2010 to 2012 period, 99 of the branded seals were observed in Peter the Great Bay, while 71 of the branded seals were never observed again after branding.

In summer, most immature seals migrate from Peter the Great Bay, but some never leave the bay. Upon returning to the bay the following season, the branded seals used different haulout space than as pups and interacted differently with other seals. The seals in the bay continuously moved from one haulout to another, joining any group of seals with no agonistic behavior. This rotational use of space allows members of a colony to maintain maximum level of contact, which the authors term “social panmixia”.

Nesterenko, V. A., & Katin, I. O. (2010). Cycle of transformation of the spotted seal (*Phoca largha*, Pallas, 1811) onshore associations in Peter the Great Bay of the Sea of Japan. *Russian Journal of Marine Biology, 36*(1), 47-55. doi:10.1134/s1063074010010062.

In Peter the Great Bay, the spotted seal is associated with island haulout sites year-round and forms four types of onshore associations (preliminary, reproductive, molting, and rehabilitative) over an annual period that correspond with phases in the seal’s life cycle.

Spotted seal abundance in the bay begins increasing in October annually, followed by the formation of onshore associations (OAs). The first type of OA formed is the preliminary association, which is formed by the combination of migrant seals returning to the bay and those seals that remained resident in the bay, aggregating at the same haulout locations to form large groups of seals of all age-groups and sexes. This OA lasts through January. Reproductive OAs commence in mid-January and last until mid-April, or about 12 weeks, and are located at different haulout sites in the bay. Reproductive OAs are formed by pregnant females, rutting males, and newborn pups. In February, molting associations begin to form by seals that did not participate in mating or reproduction and occupy the same haulouts as did the preliminary OAs. In March as ice cover

	breaks up in the bay and seals that have completed their reproductive associations move to the molting groups, and number of seals in the associations rapidly increases. The molting OAs include seals of all age groups and sexes. By late May, the abundance of the molting abundances rapidly decreases as many seals migrate out of the bay and spread along the coast. Following the completion of molting and migration, the nearly 500 spotted seals that remain in the bay form rehabilitative associations that functions primary as a rest and restorative period. The seals that remain in Peter the Great Bay appear to prefer reef types of haulouts, which likely provide the greatest safety from predators. The number of resident seals in these groups number from 5 to 10, remaining stable throughout the remainder of the season, and includes all age groups and both sexes.
Nesterenko, V.A., & Katin, I.O. (2008). The spotted seal (*Phoca largha*) in the south of the range: The results and problems of research. Pages 386 to 389 in *Marine mammals of the Holoarctic—Collection of scientific papers after the 5th International Conference, Odessa, Ukraine, 2008*.	Spotted seals in Peter the Great Bay are composed of a resident population and a migrating population, with the resident population comprising about 450 seals that disperse throughout the bay and along the Russian coast north of the bay. The migrating population disperse northward as far as Hokkaido, Japan. Surveys of seals in the bay during winter reveal that the population consists of 2,500 individuals with at least 300 pups born annually. Spotted seals in the bay are associated with shore ice but never have been observed breeding on the ice. Thirty-seven haulouts have been identified in the bay that are distinguishable as one of three geomorphological types: beach (spit or sand bars), bay, and reef. The authors noted that four types of onshore associations form among spotted seals groups during the annual cycle in Peter the Great Bay: preliminary, breeding, molting, and resting. These onshore associations are characterized by a specific composition and number of seals marked by a cyclic redistribution of seals with some of the associations temporally but not spatially overlapping.
Trukhin, A. M., & Mizuno, A. W. (2002).	Aerial, boat, and land-based surveys of spotted

Distribution and abundance of the largha seal (*Phoca largha* Pall.) on the coast of Primorye Region (Russia): A literature review and survey report. *Mammal Study, 27*, 1-14.	seals in Peter the Great Bay and the surrounding coastal region of Primorye province, Russia along the Sea of Japan were conducted from 1985 through 1999. Spotted seals in Peter the Great Bay breed from mid-January through early April, which is earlier than in the Sea of Okhotsk. The spatial and temporal distribution of spotted seals in Peter the Great Bay in winter depends upon ice conditions. In years when ice cover in the bay is significant, spotted seals are widespread throughout the bay system. However, in years when ice cover is minimal, spotted seals are only narrowly distributed in Amur Bay (northwestern Peter the Great Bay). Seal distribution in the bay was correlated with the location of the ice edge. Seals begin to aggregate in increasing numbers as breeding season approached, with the most dense aggregations occurring during the height of breeding season. Seals aggregated on ice floes for molting, post-breeding, but as the ice dissipated in late February to March, more seals move to shore haulouts to molt. Although some spotted seals do haul out along the coast of the Sea of Japan, the vast majority of spotted seals occupy Peter the Great Bay. Some spotted seals remain year-round in Peter the Great Bay but tagging of some seals revealed that they migrated as far north as Hokkaido, Japan or the Sea of Okhotsk after the molting period.

Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
Boveng, P. (2016). *Phoca largha. The IUCN red list of threatened species 2016*: e.T17023A45229806. Retrieved from <http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T17023A45229806.en>.	IUCN Red List review of the spotted seal including its known distributional range, habitat and ecology, populations, abundances, and threats. Overall the species is listed as least concern on the IUCN Red List of Threatened Species, indicating that overall it is an abundant species with no evidence of recent declines. Overexploitation of prey fishes, particularly in the Sea of Okhotsk and the Bering Sea, pose the largest threat to spotted seals.

Committee or Government Reports

Paper	*Synopsis*
UNEP CBD. (2016). Ecologically or biologically	Overview of EBSA information collected on this

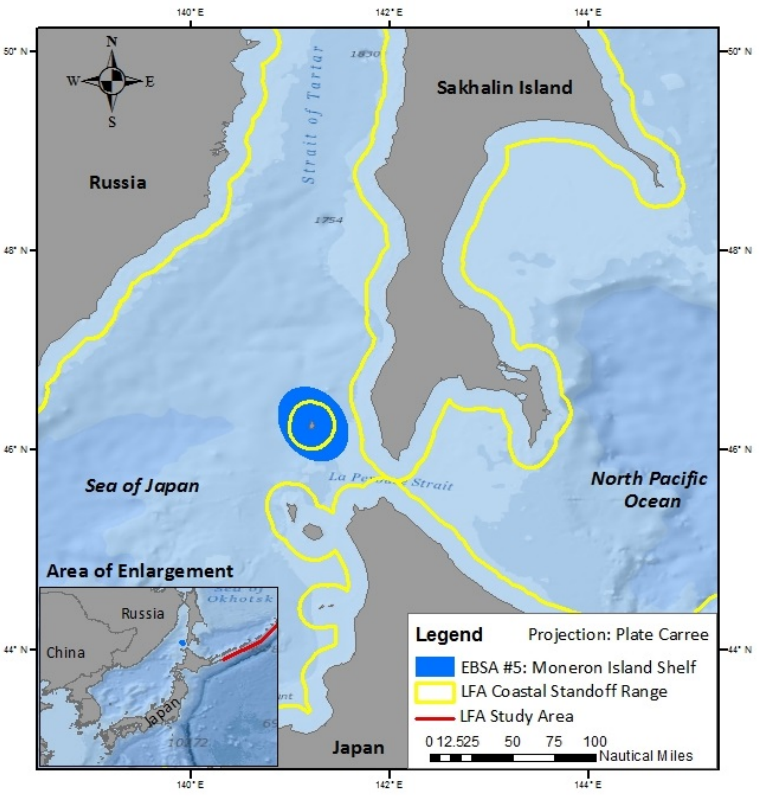
significant areas: Peter the Great Bay. Retrieved from <https://chm.cbd.int/pdf/documents/marineEbsa/204109/2>.	marine area along with the criteria justification for designation. Area is characterized by high biodiversity due to the mixture of temperate and subtropical species as two biogeographic regimes intersect in this area. The area exhibits unique benthic communities and is a spawning area for one species of salmon. Large rookeries of spotted seals (incorrectly identified as ringed seals, whose range does not extend this far south) occur in the bay with a population of about 2500 seals. The area is important to birds as it is a stopover on the East Asian-Australasian Flyway. Northern limit of three shark species and spawning ground for one of these shark species.
Boveng, P.L., Bengtson, J.L., Buckley, T.W., Cameron, M.F., Dahle, S.P., Kelly, B.P., Megrey, B.A., Overland, J.E., & Williamson, N.J. (2009). *Status review of the spotted seal (Phoca largha).* NOAA Technical Memorandum NMFS-AFSC-200. National Marine Fisheries Service, Alaska Fisheries Science Center. 169 pages.	The best available data at the time on the status of spotted seal populations and threats to their existence. The species is divided into three DPSs: the Bering Sea, Okhotsk, and Southern DPSs, of which only the Southern DPS is listed under the ESA as threatened. Spotted seals are primarily associated with sea ice during its whelping, nursing, mating, and pelage molt periods, though in some places these functions take place on shore. These functions occur earliest (January to April) in the Yellow Sea, and latest (April to June) in the Bering Sea. Shifting ice conditions, however, may cause a change in habitat use for spotted seals, as has already occurred for the Southern DPS, where breeding now takes place ashore on rocks and small islands. However, scientists speculate that breeding in non-preferred and scarce habitat in the southern part of the species' range and reduced prey populations in the Yellow Sea likely pose a threat to the continued existence of the Southern DPS.

Moneron Island Shelf 22

MARINE REGION: Sea of Japan/Strait of Tartar

COUNTRY: Russia

SPECIES OF CONCERN: Steller sea lion



MARINE AREA TYPE

- ☒ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☒ **EBSA** (NP #5)
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

This insular shelf area surrounding Moneron Island, which lies at the conjunction of the northern Sea of Japan and the Strait of Tartar just southwest of the southwestern tip of Sakhalin Island, is noted for its biological diversity, particularly its benthic biota (UNEP CBD, 2016a). This diversity is due to the influence of the northward flowing warm-water Tsushima Current, which causes localized upwelling and increased nutrient concentrations.

Two haulouts and one small rookery of Steller sea lions are located on Moneron Island, which is the southernmost Russian rookery, and where 26 pups were first counted in 2006 (Burkanov and Loughlin, 2007; Trukhin, 2009). Only two counts of Steller sea lions on Moneron Island are known, with the 1997 count recording 465 sea lions while only 2 sea lions were recorded in 1983 (Burkanov and Loughlin, 2007). Travel Russia (2017) report an abundance of 300 to 350 sea lions with residency from the end of February through May. Reputedly a rookery of bearded seals is also found on Moneron Island (UNEP CBD, 2016a), but no supporting information is available. Trukhin (2009) reported bearded seal haulouts only in the northern Sea of Okhotsk, Sakhalin and Shantar Islands; no reports of a bearded seal rookery on Moneron Island was documented. Travel Russia (2017) reports that up to 1,000 breeding seals migrate to the coast of Moneron Island at the end of December and in early spring; no species of seals are identified nor whether these numbers and information represent two seal species.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☒ Partially Outside

Eligible Areal Extent: 818.69 nmi^2 (2,808.04 km^2)

Source of Official Boundary: UNEP Convention of Biological Diversity

Spatial File Type: GIS shapefile

Spatial File Source: UNEP Convention of Biological Diversity;
</api/v2013/documents/D8C7AC8F-7B15-D07F-726E-78A0B43BB489/attachments/NP_5_EBSA-GIS%20shapefile.zip>

Date Obtained: 5/7/18

LOW FREQUENCY HEARING SENSITIVITY

☐ Species:

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD (NA)

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Trukhin, A.M. (2009). Current status of pinnipeds in the Sea of Okhotsk. Pages 82-89 in M. Kashiwai & G.A. Kantakov, Eds. *PICES Scientific Report No.*	Seven species of pinnipeds occur in the Sea of Okhotsk, including two Otariids (Steller sea lion and northern fur seal) and five Phocids (bearded,

36—Proceedings of the Fourth Workshop on the Okhotsk Sea and Adjacent Areas. North Pacific Marine Science Organization (PICES), Sidney, B.C., Canada.

ringed, spotted, harbor, and ribbon seals). Until 1994, commercial ship-based harvest of all but the harbor seal ended. The last aerial survey of the true seals was conducted in 1990 when harvests were still being conducted, when the populations were estimated to include: 710 ringed, 562 ribbon, 178 spotted, and 95 bearded seals. Fur seals are apparently still harvested.

When the paper was written, 14 Steller sea lion rookeries existed in Russia, with only three rookeries found outside the Sea of Okhotsk, including one at Moneron Island. The only rookery with an increasing population of Steller sea lions is off the eastern Sakhalin Island at Tyuleny Island.

Four northern fur seal rookeries exist in Russian waters, one in the Commander Islands, two in the Kuril Islands, and one on Tyuleny Island in the Sea of Okhotsk. Even though fur seals are still harvested, the population on Tyuleny Island still showed a small increase in population. All the Russian fur seals winter in waters of central Sea of Japan on Yamato Bank or in the waters off western Japan.

Bearded seals were little harvested during the prime sealing years, so their population numbers were little impacted by exploitation. This species is currently harvested in small numbers in the northern Sea of Okhotsk. Trukhin reported haulouts from the northern sea and from Sakhalin and Shantar Islands. Ringed seals are the most numerous and widely distributed seal in the Sea of Okhotsk, with the largest population found in the western part of the sea.

Two separate populations of spotted seals are formed in the Sea of Okhotsk, spatially segregated in the northern sea and eastern Sakhalin Island. Both populations total 20,000 individuals. Within the Sea of Okhotsk, harbor seals are found only in the Kuril Islands, with an uneven distribution and small population of only about 3,000 individuals. The ribbon seal is the least studied of all the seals in the Sea of Okhotsk, but the largest populations are found along eastern Sakhalin Island and in the northern sea on Kashevarov Bank. After reproduction, this

	seal moves into deep, pelagic waters. Trukhin noted that ice coverage in the Sea of Okhotsk has been impacted by global warming and although the total impact in the ice-seals is not fully known, the distributions and migrations of seals in the northern Sea of Okhotsk have been affected by late ice formation in the autumn and early breakup in spring.
Burkanov, V.N., & Loughlin, T.R. (2007). Distribution and abundance of Steller sea lions, *Eumetopias jubatus*, on the Asian coast, 1720's–2005. *Marine Fisheries Review, 67*, 2, 1-62.	Published and archived records for the past 250 years of Steller sea lions were reviewed to determine the occurrence and abundance of the species along the Asian coast from the Bering Strait to the Korean Peninsula. Over the past 50 years, the northern extent of the Steller sea lion has not changed, but the southern extent has moved northward by ~300 to 500 nmi (500 to 900 km). The number of animals and their distribution has changed on the Commander Islands, Kuril Islands, and Kamchatka Peninsula. No changes in the number of rookeries occurred in the northern Sea of Okhotsk, but a new rookery was established at Tuleny Island on the eastern coast of Sakhalin Island. Present estimated abundance of Steller sea lions in Asia is about 16,000 individuals (including about 5,000 pups), about half of which occur in the Kuril Islands. There were no rookeries on the Commander Islands, but by 1977, a rookery was established, but abundance declined. Steller sea lion abundances declined drastically in Kamchatka, Kuril Islands, and the northern Sea of Okhotsk as well. Numbers at Tuleny Island have increased, however, since establishment of a rookery there during 1983–2005 and by immigration from other sites. Steller sea lions were first observed on Moneron Island in the early 20th century and two haulout sites on the island were identified in 1997. A small rookery of Steller sea lions is located on Moneron Island, which is the southernmost Russian rookery, and where some 26 pups were first observed in 2006.

Committee or Government Reports

Paper	*Synopsis*
UNEP CBD. (2016a.). Ecologically or biologically	Overview of EBSA information collected on this

significant areas: Moneron Island shelf. Retrieved from <https://chm.cbd.int/pdf/documents/marineEbsa/204113/2>.

marine area along with the criteria justification for designation. All supporting literature is listed in Russian. No citations given in text for Steller sea lion or bearded seal rookery information.

Websites / Social Media

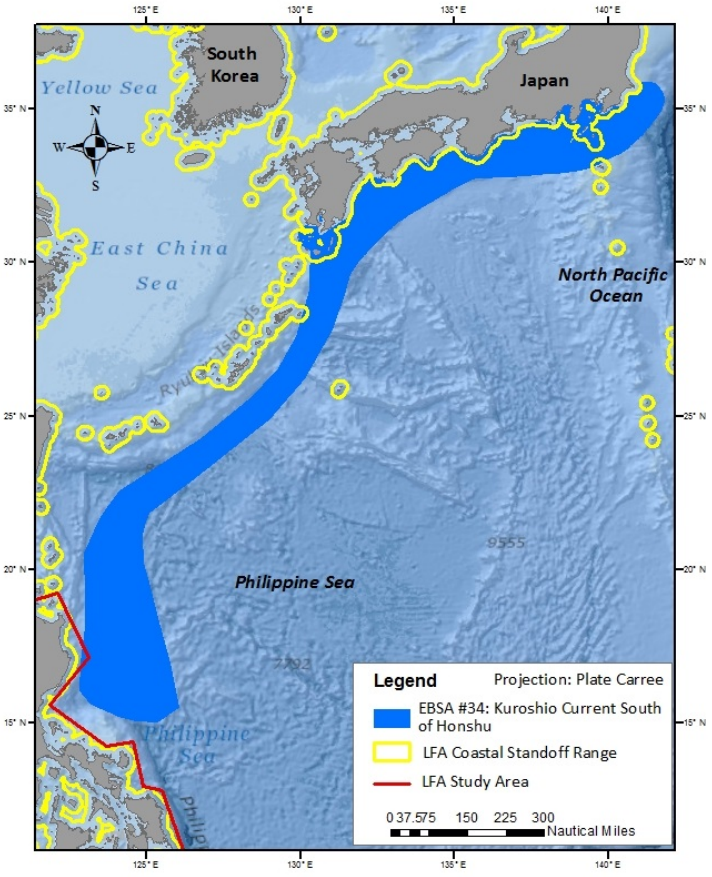
Website/Organization	*Synopsis*
Travel Russia. (2017). Moneron Island. Retrieved from <https://eng.russia.travel/objects/284306/>.	Description of Moneron Island as a tourist destination and cultural or natural sites of interest. Sea lions and seals have breeding grounds on the coast of the island, with the largest sea lion population (300 to 350 individuals) located near the south/south-west coast of the island from the end of February until May. Up to 1000 seals visit their breeding grounds in the early spring and at the end of December.

Kuroshio Current South of Honshu 23

MARINE REGION: Western North Pacific Ocean

COUNTRY: Off Japan and Philippines

SPECIES OF CONCERN: Finless porpoise



MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☒ **EBSA** (EA #34)
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☐ **NRDC Recommendation**

AREA OVERVIEW:

This marine area is dominated by the subtropical waters of the Kuroshio Current as the Current sweeps along the southern reaches of the Ryukyu Islands and roughly parallel to the coasts of Kyushu, Shikoku, and Honshu islands, Japan until it is deflected eastward from land off Honshu to become the Kuroshio Extension Current. UNEP CBD (2017h) notes that this EBSA includes the reproductive area for the finless porpoise, but this species typically only occurs in coastal waters <164 ft (50 m) in depth (Wang and Reeves, 2017). No information about the breeding area, especially in offshore waters, of the finless porpoise could be located. No occurrence data of baleen whales coincides with this EBSA, and although rare historical whaling records of sperm whales coincide with the location of the EBSA, current sightings do not occur in sufficient density to suggest a correlation (Halpin et al., 2009).

GEOGRAPHIC CRITERIA

Location in LFA Study Area: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside ☒ Partially Outside

Eligible Areal Extent: 147,451.3 nmi^2 (505,743.8 km^2)

Source of Official Boundary: UNEP Convention of Biological Diversity

Spatial File Type: GIS shapefile

Spatial File Source: UNEP Convention of Biological Diversity (/api/v2013/documents/204D44FA-6596-F868-8B53-4D8372447AB3/attachments/EA_34_EBSA.zip)

Date Obtained: 5/7/2018

LOW FREQUENCY HEARING SENSITIVITY

☐ Species:

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☒ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
Wang, J.Y., & Reeves, R. (2017). *Neophocaena asiaeorientalis. The IUCN red list of threatened species 2017*: e.T41754A50381766. Retrieved from <http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T41754A50381766.en>.	Description of the distribution, status, taxonomy, populations, abundances, and threat of finless porpoises. Two subpopulations exist, the Yangtze finless porpoise in China, and East Asian finless porpoise that occurs principally from Taiwan Strait through the East China Sea north to the Bohai/Yellow Sea in China and the waters of Korea and Japan. This species is found in waters <164 ft (50 m), especially in inshore waters and in the Inshore Sea of Japan. No information on the reproductive grounds of this species is included.

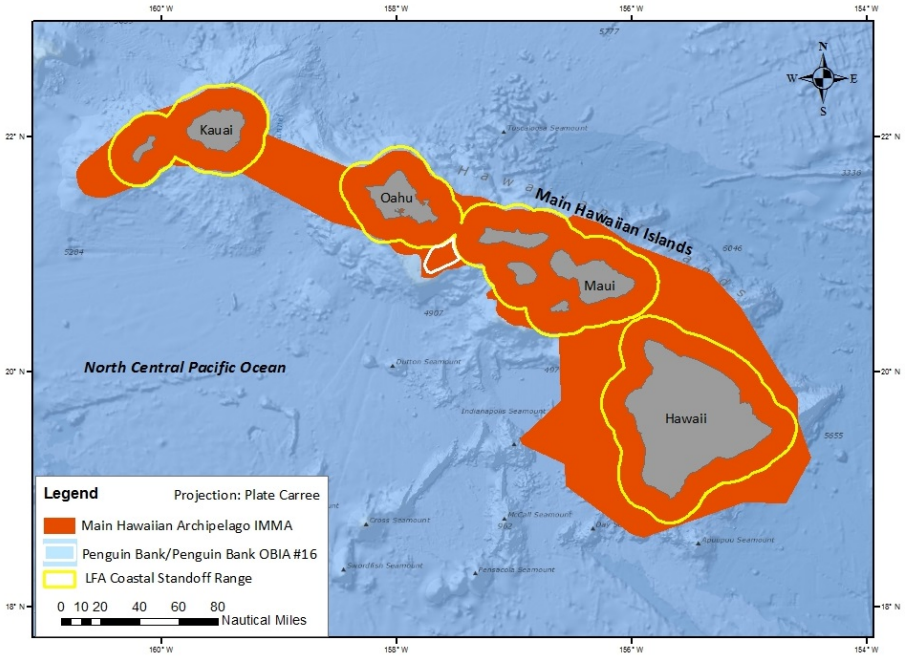
Halpin, P.N., A.J. Read, E. Fujioka, B.D. Best, B. Donnelly, L.J. Hazen, C. Kot, K. Urian, E. LaBrecque, A. Dimatteo, J. Cleary, C. Good, L.B. Crowder, & K.D. Hyrenbach. (2009). OBIS-SEAMAP: The world data center for marine mammal, sea bird, and sea turtle distributions. *Oceanography, 22*(2), 104-115.	Database of available megavertebrate global data, including historical data.

Committee or Government Reports

Paper	*Synopsis*
UNEP CBD. (2017h). Ecologically or biologically significant areas: Kuroshio Current south of Honshu. Retrieved from <https://chm.cbd.int/pdf/documents/marineEbsa/237877/1>.	Overview of EBSA information collected on this marine area along with the criteria justification for designation. This EBSA includes is influenced by the subtropical waters of the Kuroshio Current that sweeps past the Philippines northward along the southern coast of Kyushu, Shikoku. and Honshu islands, Japan before deflecting out to sea. This area is used as a reproductive area of finless porpoise.

Main Hawaiian Archipelago 24

MARINE REGION: Central North Pacific Ocean



COUNTRY: USA

SPECIES OF CONCERN: Humpback whale; Hawaiian monk seal; false killer, pygmy killer, short-finned pilot, dwarf sperm, Blainville's beaked, Cuvier's beaked, and melon-headed whales; common bottlenose, pantropical spotted, rough-toothed, and spinner dolphins

MARINE AREA TYPE

☒ **OBIA in Regulations/LOA** (OBIA #16, Penguin Bank)

☐ **Mission Blue Hope Spot**

☐ **Pew Ocean Legacy Site**

☐ **IUCN Green List Site**

☒ **IMMA** (Main Hawaiian Archipelago)

☐ **EBSA**

☐ **U.S. Marine National Monument**

☐ **Hoyt Cetacean MPA**

☐ **U.S. MPA**

☒ **U.S. ESA Critical Habitat** (Hawaiian monk seal; Main Hawaiian Islands DPS of false killer whales)

☐ **NRDC Recommendation**

AREA OVERVIEW:

IMMAs are the result of a joint effort of the International Committee on Marine Mammal Protected Areas and IUCN World Commission of Protected Areas (WCPA) and Species Survival Commission (SSC). IMMAs are created to represent discrete portions of marine habitat that are important to one or more species of marine mammals; represent priority sites for marine mammal conservation (with no management implications); and merit protection and monitoring.

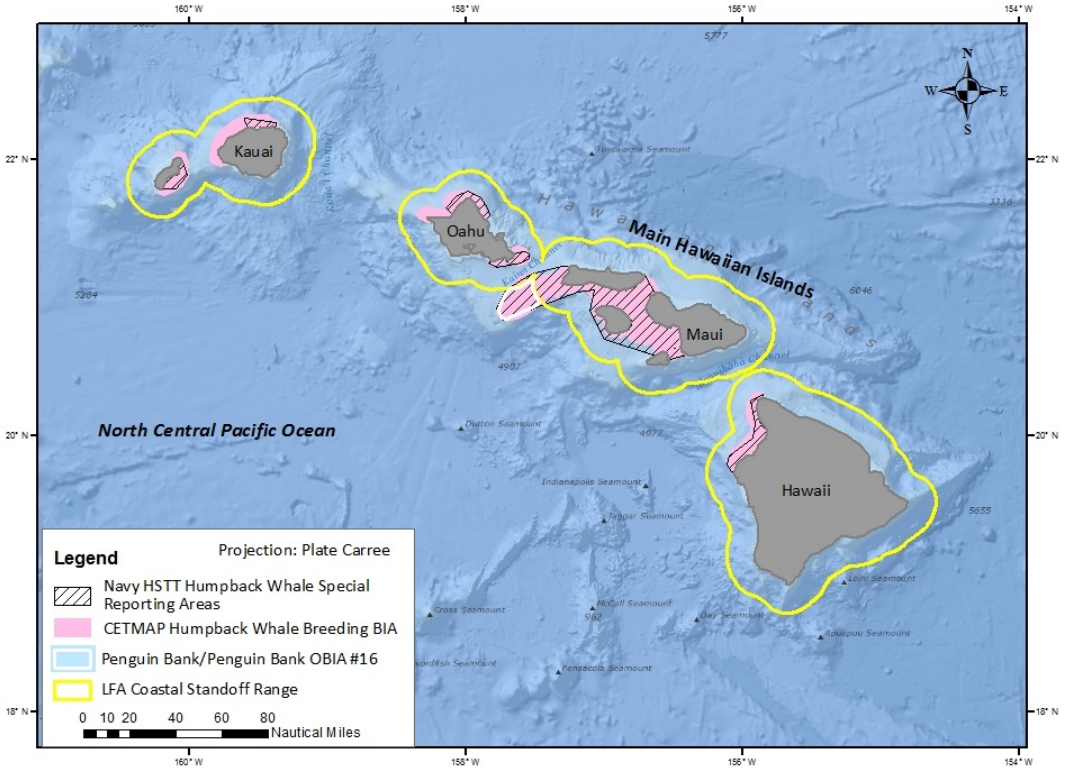
The Main Hawaiian Archipelago IMMA is biologically important for multiple species of marine mammals:

- Small, resident populations recognized as BIAs—beaked whales (Cuvier's and Blainville's), spinner, pantropical spotted, rough-toothed, and common bottlenose dolphins; pygmy killer, dwarf sperm, short-finned pilot, and melon-headed whales
- Species or population vulnerability—false killer whales (Main Hawaiian Islands Insular DPS of false killer whales is listed as endangered)
- Seasonal reproductive areas for humpback whales
- Diversity—evidence of resident population of at least 12 species of marine mammals in the MHI (Marine Mammal Protected Areas Task Force, 2019).

Humpback whales migrate seasonally to the MHI, where the largest humpback breeding and calving ground in the North Pacific Ocean is located. The breeding and calving grounds are within the SURTASS LFA sonar coastal standoff range or are enclosed within OBIA #16, Penguin Bank. Humpbacks that occur in the MHI are part of the Hawaii DPS, which are not listed under the ESA (Bettridge et al., 2015). More than half the population of the Hawaii DPS migrates during winter to the MHI (Baird et al., 2015). Although never witnessed, breeding and calving are assumed to occur somewhere in the waters of the MHI, with behaviors related to courtship and mating having been documented (National Geographic, 2018; Silvers, 1997). Humpback whales begin arriving as early as October in Hawaiian waters and remain through May or early June, with the peak density of whales occurring in January through March (Herman and Antinoja, 1977).

Most humpbacks in the MHIs occur in waters 600 ft (183 m) especially in the waters of Maui, Molokaʻi, Lānaʻi, and Kahoʻolawe and Penguin Bank, with breeding female humpbacks and female humpbacks with calves generally prefer coastal waters and shallow (<65 ft [20 m]) banks adjoining the MHI (Craig and Herman, 2000; Herman, 1979; Smultea, 1994). Female-calf pairs have been observed in nearshore waters of several MHI localities and within 0.3 nmi (0.5 km) of the shoreline along the coast of West Maui (Glocker-Ferrari and Ferrari, 1990). Subsequent accounts of habitat use by female-calf pairs indicated some dispersal from the Maui shoreline between 1980 and 1984 to those 1.6 to 2.2 nmi (3 to 4 km) Hawaii implemented the current wintertime ban on small watercraft in near-shore waters. Likewise, Cartwright et al. (2012) found that the preferred regions for female-calf pairs in the waters of Au'au Chanel between the islands of Maui and Lanai were between 131 to 197 ft (40 to 60 m) in depth with regions of rugged bottom topography located between 2.2 to 3.2 nmi (4 to 6 km) from a small boat harbor (Lahaina Harbor). Females with calves also appear to prefer certain regions over others, with nearly 75 percent of all calves observed some seasons are observed in the 4-Island region compared to only 11 percent in Hawaii waters (Craig and Herman, 2000). However, Pack et al. (2017) found that both calf age and size influence habitat choice by mother-calf pairs in their breeding grounds, with the movement of the mothers and their maturing calves into deeper waters with more rugged sea floor topography appears to be part of a continuum of behavioral changes as the whales prepare to migrate from the breeding grounds.

Baird et al. (2015) characterized BIAs of odontocetes and mysticetes in Hawaiian waters as part of the CETMAP program. Using published, unpublished, and expert opinion, Baird et al. (2015) characterized one humpback whale reproductive area in the MHI based on high densities of humpback whales from February through March. The entire extent of the humpback whale BIA, except that located on Penguin Bank, is within the coastal standoff range for SURTASS LFA sonar (see second map figure below). Not only is Penguin Bank an existing OBIA for humpback whales wherein LFA sonar would not be operated such that received levels >180 dB would enter the waters within 0.54 nmi (1 km) of the Penguin Bank OBIA from November through April annually, but the Navy has an agreement with the State of Hawaii to not operate LFA sonar on Penguin Bank, as defined by the 600-ft (183-m) depth contour.



The Navy's Hawaii Range Complex, which is part of the Navy's HSTT study area, overlaps with the central North Pacific part of the study area for SURTASS LFA sonar. In the HSTT study area, the Navy applies both procedural and geographic mitigation measures (DoN, 2018). These mitigation areas have been designed to benefit particular species and/or stocks of marine mammals and may include the application of mitigation measures year-round or seasonally, depending on the unique characteristics of the area. One of the mitigation geographic mitigation measures for the HSTT study area are Humpback Whale Special Reporting Areas (see map figure above), which encompasses the Hawaiian Islands Humpback Whale National Marine Sanctuary plus a 2.7-nmi (5-km) buffer around the sanctuary, excluding the Pacific Missile Range Facility. The Humpback Whale National Marine Sanctuary, which includes Penguin Bank, was established in the MHI principally to protect the key North Pacific humpback whale breeding/calving/nursery ground. Overall, this mitigation measure is designed to avoid or reduce potential impacts from mid-frequency active sonar and explosives within the mitigation area on humpback whales. The Navy would continue to report the total hours of surface ship hull-mounted mid-frequency active sonar it uses in the Humpback Whale Special Reporting Areas from December 15

through April 15, which would aid the Navy and NMFS in analyzing the effectiveness of mitigation in these areas during the adaptive management process.

NOTE: Other MHI marine areas are also under assessment as potential marine mammal OBIAs for SURTASS LFA sonar. Marine areas #16 (Hawaiian Monk Seal Critical Habitat) and #17 (Main Hawaiian Island Insular DPS of False Killer Whale Critical Habitat) encompasses much of the same geographic area with the same relevant marine mammal species as the MH Archipelago IMMA.

GEOGRAPHIC CRITERIA

Location in LFA Study Area: IMMA: ☒ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): IMMA: ☐ Entirely Outside ☒ Partially Outside

Eligible Areal Extent: 8,366.76 nmi^2 (28,697.20 km^2)

Source of Official Boundary: IMMA: IUCN-Marine Mammal Protected Areas Task Force
CETMAP BIAs: Office of Science and Technology, National Marine Fisheries Service
Navy Hawaii Mitigation Areas: DoN (2018)

Spatial File Type: GIS Shapefiles

Spatial File Source: IMMA: IUCN-Marine Mammal Protected Areas Task Force, 2017. GIS data made available by the IUCN Global Dataset of Important Marine Mammal Areas (IUCN-IMMA), July 2018. Made available under agreement on terms of use by the IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force and made available at <www.marinemammalhabitat.org/imma-eatlas>.
CETMAP BIAs: Office of Science and Technology, National Marine Fisheries Service, National Oceanic and Atmospheric Administration
Navy Hawaii Mitigation Areas: DoN (2018)

Date Obtained: IMMA: 7/28/18; CETMAP BIAs: 4/27/2015; Navy Hawaii Humpback Reporting Areas: 10/30/18

LOW FREQUENCY HEARING SENSITIVITY

☐ Species:

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification

☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Pack, A. A., Herman, L. M., Craig, A. S., Spitz, S. S., Waterman, J. O., Herman, E. Y. K., . . . Lowe, C. (2017). Habitat preferences by individual humpback whale mothers in the Hawaiian breeding grounds vary with the age and size of their calves. *Animal Behaviour, 133*, 131e144. doi:10.1016/j.anbehav.2017.09.012.	This study investigated whether calf age and calf size influenced habitat choice by humpback whale mother-calf pairs in their Hawaiian breeding grounds. During 1997 to 2008, we conducted focal follows of mother-calf pairs. Across 72 mother-calf pairs re-sighted over various intervals within a breeding season, the magnitude of depth change between initial and final sightings increased significantly with re-sighting interval. Although no preference for sea-bed terrain type by mother-calf pairs existed at their initial sighting, by their final re-sighting, there was a preference for rugged terrain. Thus, both calf age and size influence habitat choice by mother-calf pairs in their breeding grounds. The movement of mothers and their maturing calves into deeper waters where they favor rugged sea-bed terrain appears to be part of a suite of behavioral changes during the pre-migratory phase of residency in the breeding grounds.
Baird, R. W., Cholewiak, D., Webster, D. L., Schorr, G. S., Mahaffy, S. D., Curtice, C., . . . Van Parijs, S. M. (2015). Biologically important areas for cetaceans within U.S. waters–Hawai'i region. *Aquatic Mammals, 41*(1), 54-64. doi:10.1578/am.41.1.2015.54.	Using existing published, unpublished information, and expert judgment for U.S. Hawaii waters, 20 biologically important areas (BIAs) were identified and created for small and resident populations of odontocetes and one reproductive area for humpback whales in both the Main and Northwest Hawaiian Islands.
Cartwright, R., Gillespie, B., Labonte, K., Mangold, T., Venema, A., Eden, K., & Sullivan, M. (2012). Between a rock and a hard place: Habitat selection in female-calf humpback whale (*Megaptera novaeangliae*) pairs on the Hawaiian breeding grounds. *PLoS ONE, 7*(5), e38004.	The Au'au Channel between the islands of Maui and Lanai, Hawaii comprises critical breeding habitat for humpback whales of the Central North Pacific stock. However, these waters are also the focus of local eco-tourism and whale watching vessels. Our study focused on the

doi:10.1371/journal.pone.0038004.

current trends in habitat preference in female-calf humpback whale pairs within this region, focusing specifically on the busy, eastern portions of the channel. Our study revealed that while mysticete female-calf pairs on breeding grounds typically favor shallow, inshore waters, female-calf pairs in the Au'au Channel avoided shallow waters (,20 m) and regions within 2 km of the shoreline. Preferred regions for female-calf pairs comprised water depths between 40–60 m, regions of rugged bottom topography and regions that lay between 4 and 6 km from a small boat harbor (Lahaina Harbor), and only minimal evidence of typical patterns of stratification or segregation according to group composition. Our study suggests that within the Hawaiian Islands, maternal females alter their use of habitat according to locally varying pressures.

Craig, A. S., & Herman, L. M. (2000). Habitat preferences of female humpback whales *Megaptera novaeangliae* in the Hawaiian Islands are associated with reproductive status. *Marine Ecology Progress Series, 193*, 209-216.

Photographs of humpback whales, including 63 females, sighted in at least two years with at least one calf, were taken in waters off Maui and Hawaii between 1977 and 1994. Calves formed a significantly larger proportion of the population off Maui than off Hawaii. The overall proportion of calves to all whales identified (crude birth rate) was 0.099 off Maui and 0.061 off Hawaii. Also, considering only females seen in more than one year, the number of calves per female per year (calving rate) was 0.71 off Maui and 0.52 off Hawaii. Females sighted at both Maui and Hawaii in different years were with a calf significantly more often in Maui waters than in Hawaii waters. We concluded that habitat utilization by females varied between Maui and Hawaii, appearing to depend in part upon reproductive status.

Silvers, L. E., Atkinson, S., Iwasa, M., Combelles, C., & Salden, D. R. (1997). A large placenta encountered in the Hawaiian winter grounds of the humpback whale, *Megaptera novaeangliae*. *Marine Mammal Science, 13*(4), 711-716.

Copulation has not been witnessed in humpback whales, but behaviors consistent with courtship and mating have been documented. Neither has a birth of a humpback whale been witnessed. In January 1994, a whale-watching captain observed what he believed to be a humpback whale giving birth on known breeding and calving grounds of h humpback whales in Hawaii. The solitary whale thrashed at the surface, dove for an extended time, and resurfaced with a very small calf. The captain noticed what appeared to be a large placenta in the water after the female surfaced

	with the calf. The whale-watch boat was able to obtain pieces of the placenta before it sank. The tissue was frozen in seawater and sent for analysis. The photographic and biochemical analysis of the tissue proved that it was a placenta, and the estimated size and structure of the material suggested that it is consistent with that of an animal as large as a humpback whale and may well have resulted from the birth of a humpback whale calf.
Smultea, M. A. (1994). Segregation by humpback whale (*Megaptera novaeangliae*) cows with a calf in coastal habitat near the island of Hawaii. *Canadian Journal of Zoology, 72*, 805-811.	Humpback whales were tracked from the shore of Hawaii during the winter 1988 and 1989. The temporal and spatial distributions of whales differed with group size and composition. During afternoon hours, groups containing a calf occurred in water significantly shallower and nearer to shore than did groups without a calf. Late in the breeding season, the same segregation pattern occurred throughout the day. Distances between groups was greatest for those groups with calves. The number of whales observed per hour peaked during mid-February. Adults without a calf may use deep water to facilitate breeding behavior, while maternal females may use shallower water to avoid harassment and injury to calves from sexually active males, harsh sea conditions, or predators. The predominance of cows with a calf in coastal habitats increases their exposure to expanding human-related development and aquatic activities.
Glockner-Ferrari, D. A., & Ferrari, M. J. (1990). Reproduction in the humpback whale (*Megaptera novaeangliae*) in Hawaiian waters, 1975-1988: The life history, reproductive rates and behavior of known individuals identified through surface and underwater photography. *Reports of the International Whaling Commission* (Special Issue 12), 161-169.	A photo study of humpback whales off the west coast of Maui was conducted from 1975 to 1988. Using both underwater and surface photos, 584 adult and 268 calves were identified, and re-sighting histories compiled. Intervals between the first and last sightings ranged from 1 to 13 years. Of 34 re-sighted females, 31 produced more than one calf. Of the calves, 53 percent were male, and 47 percent were female. One male calf was re-sighted when he was 6, 7, and 10 years of age. The occurrence of mother-calf pairs in the nearshore waters decreased in the period from 1977 to 1988.
Herman, L. M. (1979). Humpback whales in Hawaiian waters: A study in historical ecology.	Historical evidence suggests that humpback whales have only populated their winter

Pacific Science, 33(1), 1-15.	Hawaiian breeding and calving habitat over the last 200 years and were unknown to the Hawaiians before 1778. Possible mechanisms for the presumptive recent invasion include dispersion from other areas, accelerated by chronic whaling pressure, and long-term changes in locations of major North Pacific water masses affecting preferred surface temperature characteristics. Short-term localized changes in preferred sites within the Hawaiian habitat have occurred over the last 125 years in response to shore-based whaling activities, disturbances to the marine environment during World War II, and offshore effects due to development following statehood on Oahu after 1959. The major habitat shift to Hawaiian waters and the various localized site movements and alterations are seen as adaptive responses of humpback to important changes in their physical environment.
Herman, L. M., & Antinoja, R. C. (1977). Humpback whales in the Hawaiian breeding waters: Population and pod characteristics. *Scientific Reports of the Whales Research Institute, 29*, 59-85.	Aerial, shipboard, and underwater observations of humpback whale breeding were made from February to April 1976 in Hawaiian waters. Humpbacks were found around all the MHI, almost always within the 100 fathom (600 ft) contour, with the bulk of the population (200 to 250 animals) concentrated in regions having the greatest contiguous extent of such water. Breeding and calf rearing were not confined to any given area. The birth rate was estimated as less than 10 percent, a low figure of some concern. Coloration characteristics of the Hawaii population differed considerably from the eastern North Pacific population of humpback whales, suggesting little genetic exchange with that group. Approximately 18 percent of the whales were solitary when observed; the remainder were in pods of 2 to 9 whales. Overall there were considerably fewer singletons and considerably larger-sized pods than has been observed in feeding-ground aggregations. A calf was typically found in a multiple-whale pod, consisting of the mother and, most frequently, one other adult " escort" whale. The escort seemed to serve a protective function. Most of the pods were swimming in fairly regular formations in apparent

	local migratory movements. Milling pods, with animals contacting one another, or engaging in other behaviors seemingly consistent with sexual courtship or advertisement, was observed in 16 percent of the cases.

Committee or Government Reports

Paper	*Synopsis*
Marine Mammal Protected Areas Task Force. (2019). Main Hawaiian Archipelago IMMA. Retrieved from <https://www.marinemammalhabitat.org/portfolio-item/main-hawaiian-archipelago/>.	Brief description of criteria for this IMMA and supporting scientific literature.
Department of the Navy (DoN). (2018). Hawaii-Southern California training and testing environmental impact statement/overseas environmental impact statement (EIS/OEIS). Naval Facilities Engineering Command, Pacific, Pearl Harbor, HI. Retrieved from <https://www.hstteis.com/Documents/2018-Hawaii-Southern-California-Training-and-Testing-Final-EIS-OEIS/Final-EIS-OEIS>.	The Navy's HSTT EIS/OEIS evaluates the potential environmental impacts of conducting training and testing activities after December 2018 in the Hawaii-Southern California Training and Testing Study Area (Study Area). The Study Area is made up of air and sea space off Southern California, around the Hawaiian Islands, and the transit corridor that connects the two areas. The Navy considered three alternatives: no action; a representative (not maximum) year of new and ongoing training and testing representing the natural fluctuation of training cycles and deployment schedules that generally limit the maximum level of training from occurring year after year in any five-year period, with the some unit-level training being conducted using synthetic means (e.g., simulators) and that some unit-level active sonar training will be completed through other training exercises; and the maximum number of new and ongoing training and testing activities that could occur within a given year with that maximum level of activity occurring every year over any five-year period.
Bettridge, S., Baker, C. S., Barlow, J., Clapham, P. J., Ford, M., Gouveia, D., Mattila, D. K., Pace, III, R. M., Rosel, P. E., Silber, G. K., & Wade, P. R. (2015). *Status review of the humpback whale (Megaptera novaeangliae) under the Endangered Species Act.* NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-540. La Jolla, CA: Southwest Fisheries Service, National Marine Fisheries Service.	As part of the comprehensive review of the status of humpback whales as the basis for possible revisions under the ESA, all available information and data on humpback whales were compiled by the Humpback Biological Review Team. The team differentiated the global populations of humpback whales into 15 distinct population segments (DPSs) based on the primary breeding location of the associated population.

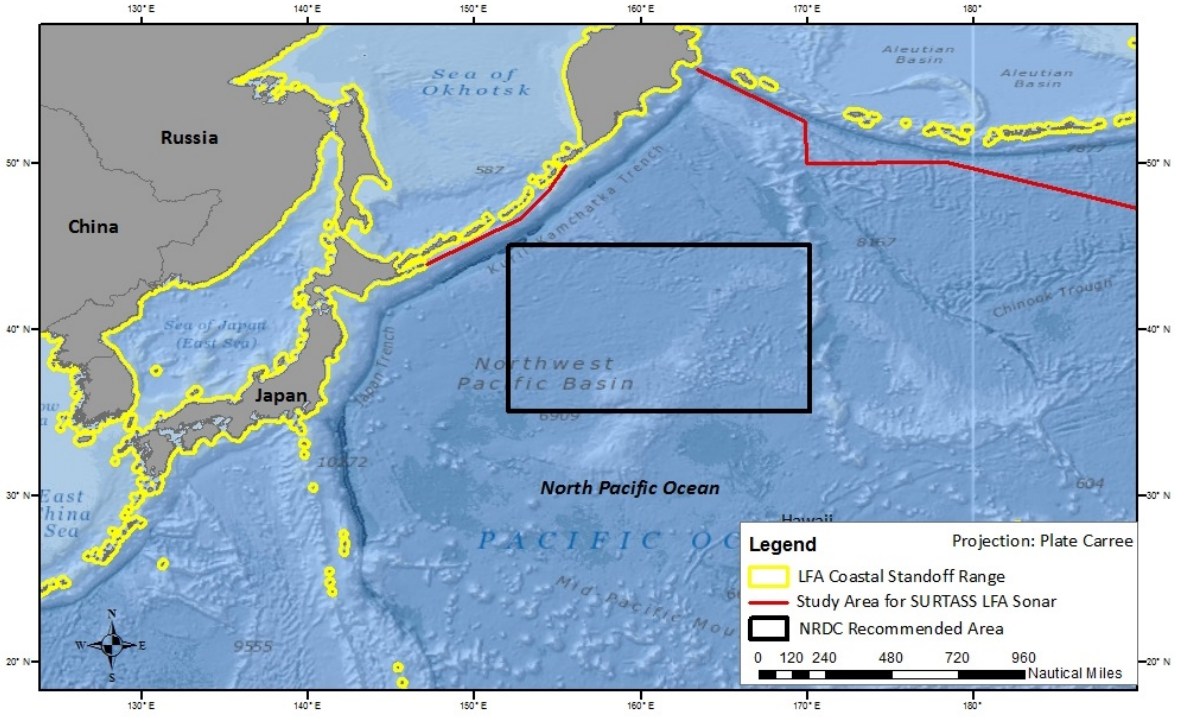
	Descriptions of the breeding and foraging ranges of each DPS are included in the status review. The risk of each DPS for extinction was assessed as the subsequent basis for designation of each DPS's status under the ESA.

Websites / Social Media

Website/Organization	*Synopsis*
National Geographic. (2018). How does a humpback give birth? These explorers plan to solve the mystery. Retrieved from <https://news.nationalgeographic.com/2018/04/humpback-whale-birth-documentary-rare-animals-spd/>.	This project sponsored by National Geographic aims to film something no one has observed nor captured on camera: a humpback whale birth. The filmmakers are working in Hawaii during winter when humpback whales are in their breeding and calving grounds in waters of the Hawaiian Island Humpback Whale National Marine Sanctuary searching for female humpback about to give birth, although they don't know what to look for, since that behavior hasn't been documented. The filmmakers were unsuccessful in 2018 finding a female giving birth but will continue searching.

Polar/Kuroshio Extension Fronts 25

MARINE REGION: North Pacific Ocean



COUNTRY: NA

SPECIES OF CONCERN: Sei whale

MARINE AREA TYPE

- ☐ **OBIA in Regulations/LOA**
- ☐ **Mission Blue Hope Spot**
- ☐ **Pew Ocean Legacy Site**
- ☐ **IUCN Green List Site**
- ☐ **IMMA**
- ☐ **EBSA**
- ☐ **U.S. Marine National Monument**
- ☐ **Hoyt Cetacean MPA**
- ☐ **U.S. MPA**
- ☐ **U.S. ESA Critical Habitat**
- ☒ **NRDC Recommendation**

AREA OVERVIEW:

There are three major ocean fronts in the western North Pacific, the Polar Front that occurs roughly parallel to 45°N, the Subarctic Front at approximately 40°N, and the Kuroshio Extension Front at approximately 35°N. The region being considered for an OBIA (35°N to 45°N, 152°E to 170°E) represents a transition zone between subtropical waters to the south and subarctic waters to the north, generally consistent with the North Pacific Transition Zone EBSA. Within this wide north-south gradient is the Transition Zone Chlorophyll Front (TZCF), which is a front or boundary where the surface chlorophyll a concentration[3] abruptly changes due to the mixing of nutrient-rich polar and nutrient-poor subtropical water masses. The TZCF migrates seasonally and interannually by as much 540 nmi (1,000 km) north and south, with a latitudinal minimum in January to February and maximum in July to August (Polovina et al., 2001). Consequently, the boundaries of the NPTZ move seasonally, with the latitudinal extent varying seasonally between 28° to 34°N and 40° to 43°N, extending further south during winter (UNEP CBD, 2016d). Thus, similar to the North Pacific Transition Zone, this region lies between two spatial extremes, cold, nutrient-rich polar water to the north and warm, nutrient-poor subtropical water to the south.

At the TZCF, in addition to the mixing of nutrient concentrations, phytoplankton communities from polar and subtropical waters also mix. This rich phytoplankton concentration attracts zooplankton and species such as fish and squid that feed on plankton. These species are aggregated at the TZCF boundary, attracting predators, including apex predators such elephant seals. This highly persistent, productive habitat is not only a foraging area where predators and prey are aggregated, but also is a migratory corridor for species such as bluefin tuna and loggerhead turtles that move east and west across the North Pacific Ocean (UNEP CBD, 2016d).

Research efforts have focused on sei whales to identify environmental factors that define habitat features. Sighting survey data from July in the years 2000 to 2007 were analyzed in relation to the distances from the Polar Front, Subarctic Front, and Kuroshio Extension Front (Murase et al., 2014). Sei whales were found in higher densities from 250 to 350 km north and from 100 to 200 km south of the Subarctic Front. The authors suggest that the bimodal distribution of higher abundances might reflect annual changes in their environment at varying spatial scales. This study focused on macro scale (months and 1,000s of km) to meso scale (days to weeks over 100s of km) distributions; the authors suggest that macro to nano scale studies are needed to understand the spatial distribution of sei whales.

To investigate sei whale diving behavior at smaller spatial scales, Ishii et al. (2017) attached acoustic time-depth recorders to two sei whales in the western North Pacific. The sei whales were found to dive to depths of approximately 40 m (131 ft) during the day. Many of the daytime dives were classified as U-shaped dives, which the authors suggest are foraging dives since the dives went to depths that correlated with the highest amounts of acoustic backscatter. The authors suggest that sei whales use oceanographic features such as sea surface temperature (SST) to find mesoscale regions (100s km) (Sasaki et al., 2013), then search within those regions for microscale (10s km), high-density prey fields.

Similar heterogeneity in sei whale distribution has been found in the North Atlantic (Skov et al., 2008). It appears as if sei whale utilize fine-scale frontal processes that interact with the seafloor topography, where consistent flow gradients results in patterns of increased primary and secondary productivity. The persistence of such features, as well as the association of sei whales, needs to be investigated further. Furthermore, Sasaki et al. (2013) found distinct and separate habitats for sei and Bryde's whales in the western North Pacific, both habitats which appears to migrate seasonally with SST.

3 Chlorophyll a concentration is an indicator of the level of primary productivity; chlorophyll a concentrations and primary productivity would be much higher in nutrient-rich colder polar waters than in subtropical waters.

NOTE: Another marine area in the western North Pacific is also under assessment as a potential marine mammal OBIA for SURTASS LFA sonar. Marine area #20, North Pacific Transition Zone, encompasses much of the same geographic area.

GEOGRAPHIC CRITERIA

Location Status: ☐ Eligible ☐ Not Eligible

Relation to LFA Coastal Standoff Range (12 nmi from emergent land): ☐ Entirely Outside
☐ Partially Outside

Eligible Areal Extent:

Source of Official Boundary:

Spatial File Type:

Spatial File Source:

Date Obtained: 2/2/2016

LOW FREQUENCY HEARING SENSITIVITY

☐ Species:

BIOLOGICAL CRITERIA

High Density: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Breeding / Calving: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Migration: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Foraging: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Distinct Small Population: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

Critical Habitat: ☐ Eligible; sufficient data, adequate justification
☐ Not Eligible; not relevant, insufficient data

SEASONAL EFFECTIVE PERIOD

☐ Year-round ☐ Seasonal Period (Months Annually):

SUPPORTING DOCUMENTATION

Peer Reviewed Articles

Paper	*Synopsis*
Hakamada, T., Matsuoka, K., Murase, H., & Kitakado, T. (2017). Estimation of the abundance of the sei whale *Balaenoptera borealis* in the central and eastern North Pacific in summer using sighting data from 2010 to 2012. *Fisheries Science, 83*(6), 887-895. doi: 10.1007/s12562-017-1121-1	Sighting survey for sei whales in the central and eastern North Pacific (40°N to Alaska coast, 170°E to 135°W), July to August, 2010 to 2012. Spatial distribution of sei whale sightings was heterogeneous, similar to other studies in the North Pacific and North Atlantic. Abundance estimate was 29,632 sei whales (CV=0.242), which should be added to survey in the western North Pacific (5,086 whales, CV=0.38) for a total North Pacific population estimate of 34,718 sei whales.
Ishii, M., Murase, H., Fukuda, Y., Sawada, K., Sasakura, T., Tamura, T., . . . Mitani, Y. (2017). Diving behavior of sei whales *Balaenoptera borealis* relative to the vertical distribution of their potential prey. *Mammal Study, 42*(4), 191–199. doi:10.3106/041.042.0403.	Acoustic time-depth recorders were attached to two sei whales in August 2013 in the western North Pacific (around 45°N, 157°E). An echosounder and trawl and plankton net sampling were used to infer the prey field. The sei whales were found to dive to depths of approximately 40 m (131 ft) during the day. Many of the daytime dives were classified as U-shaped dives, which the authors suggest are foraging dives since the dives went to depths that correlated with the highest amounts of acoustic backscatter. The authors suggest that sei whales use oceanographic features such as sea surface temperature (SST) to find mesoscale regions (100s km), then search within those regions for microscale (10s km), high-density prey fields.
Murase, H., Hakamada, T., Matsuoka, K., Nishiwaki, S., Inagake, D., Okazaki, M., . . . Kitakado, T. (2014). Distribution of sei whales (*Balaenoptera borealis*) in the subarctic–subtropical transition area of the western North Pacific in relation to oceanic fronts. *Deep Sea Research Part II: Topical Studies in Oceanography, 107*, 22-28. doi:10.1016/j.dsr2.2014.05.002.	Sei whale sighting survey data and oceanographic observations in July 2000 to 2007 were modeled to investigate the relationship between sei whale distribution and the distances from the Polar Front, Subarctic Front, and Kuroshio Extension Front. Sei whales were found in higher densities from 250 to 350 km north and from 100 to 200 km south of the Subarctic Front. The authors suggest that the bimodal distribution of higher abundances might reflect annual changes in their environment at varying spatial scales. This study focused on macro scale (months and 1,000s of km) to meso scale (days to weeks over 100s of km) distributions; the authors suggest that macro to nano scale studies are needed to understand the spatial distribution of sei whales.
Sasaki, H., Murase, H., Kiwada, H., Matsuoka, K.,	Sighting survey results from May to August of

Mitani, Y., & Saitoh, S.-i. (2013). Habitat differentiation between sei (*Balaenoptera borealis*) and Bryde's whales (*B. brydei*) in the western North Pacific. *Fisheries Oceanography, 22*(6), 496–508. doi:10.1111/fog.12037.	2004 and 2005 were correlated with environmental covariates to predict suitable habitat for sei and Bryde's whales in the western North Pacific. SST was the dominant factor for both species, but habitats were clearly distinct and separate, with sei whales found in colder waters than Bryde's whales. Suitable habitat for sei whales was located north of that for Bryde's whales, and habitats for both species shifted northward as the season progressed, at different rates in 2004 than in 2005.
Baumgartner, M. F., & Fratantoni, D. M. (2008). Diel periodicity in both sei whale vocalization rates and the vertical migration of their copepod prey observed from ocean gliders. *Limnology and Oceanography, 53*(5, Part 2), 2197-2209.	This study correlated sei whale vocalization rates with acoustic backscatter in the Gulf of Maine. The acoustic backscatter showed strong diel periodicity that correlated with the vertical migration of the calanoid copepod (*Calanus finmarchicus*) from deep depths during the day to shallow depths at night. Sei whale vocalizations also show diel periodicity, with more vocalizations during the day. The authors suggest that sei whales increase their social interactions during the day when foraging is more difficult or less efficient, and feed on the shallow, near-surface aggregations at night.
Skov, H., T. Gunnlaugsson, W.P. Budgell, J. Horne, L. Nøttestad, E. Olsen, H. Søiland, G. Vı´kingsson, and G. Waring. (2008). Small-scale spatial variability of sperm and sei whales in relation to oceanographic and topographic features along the Mid-Atlantic Ridge. *Deep Sea Research II, 55*, 254-268.	Sighting surveys for sei and sperm whales along the Mid-Atlantic Ridge were correlated with 3D concurrent oceanographic data to determine covariates of habitat suitability. Sperm and sei whale sightings were segregated, with sperm whales being found mainly over the top of the MAR and sei whales mainly over the slopes. These results point to the significance of interactions between seabed topography and surface and subsurface flow gradients as key habitat drivers. Whales were aggregated within fine-scale regions (30-80 km [16-43 nmi]) where frontal processes interacted with topography. Thus, habitat suitability will be influenced by persistent of these flow features over space and time.

Subject Matter Experts / e-NGO Reports / Regional Expertise

Paper	*Synopsis*
Cooke, J.G. (2018a). *Balaenoptera borealis*. The IUCN red list of threatened species 2018:e.T2475A130482064. Retrieved from	Sei whales are found in temperate to subpolar, offshore waters of the North Atlantic, North Pacific, and Southern oceans, displaying seasonal

<http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T2475A130482064.en>.	migrations from high latitude summer feeding grounds to low latitude winter regions. Though sei whales feed on a variety of prey species, they tend to concentrate their foraging on one species at a time.
Kanda, N., Bando, T., Matsuoka, K., Murase, H., Kishiro, T., Pastene, L. A., & Ohsumi, S. (2015). *A review of the genetic and non-genetic information provides support for a hypothesis of a single stock of sei whales in the North Pacific*. Paper SC/66a/IA/9 presented to the International Whaling Commission Scientific Committee. 18 pages.	Summary of existing studies on the stock structure of sei whales in the North Pacific Ocean using all available data. Mark-recapture data indicated that sei whales from the same breeding area distribute widely in the feeding area over almost the entire North Pacific Ocean Although historical whaling catch data show heterogeneous distribution of sei whales, genetic evidence indicate no temporal or spatial genetic differences among all sei whales in the entire North Pacific. The heterogeneous catch distribution appeared to reflect non-random operations of commercial whaling as well as patchy distribution of sei whale prey species. Overall, based on the series of the available evidence, we propose a single stock hypothesis for sei whales in the North Pacific.

Committee or Government Reports

Paper	*Synopsis*
UNEP CBD. (2016d). Ecologically or biologically significant areas: North Pacific transition zone. Retrieved from <https://chm.cbd.int/pdf/documents/marineEbsa/204130/2>.	Overview of EBSA information collected on this marine area along with the criteria justification for designation. The North Pacific Transition Zone is an oceanographic feature that includes the Transition Zone Chlorophyll Front and is of special importance to the biology of many species in the North Pacific Ocean. The North Pacific Transition Zone is a 4,860-nmi (9000-km) wide upper water column oceanographic feature bounded to the north and south by thermohaline fronts. These fronts form the boundaries to this highly productive habitat where prey and predators, including top trophic (apex) predators, aggregate. In addition to providing key North Pacific foraging areas, the feature also serves as a migratory corridor for species such as bluefin tuna and loggerhead sea turtles.

Surveys

Paper	*Synopsis*
Hakamada, T., Matsuoka, K., Murase, H., & Kitakado, T. (2017). Estimation of the abundance of the sei whale *Balaenoptera borealis* in the central and eastern North Pacific in summer using sighting data from 2010 to 2012. *Fisheries Science, 83*(6), 887-895. doi: 10.1007/s12562-017-1121-1	See summary above.