



## **ANNUAL REPORT NUMBER 4**

**UNDER THE NATIONAL MARINE FISHERIES SERVICE  
15 AUGUST 2015 LETTERS OF AUTHORIZATION AND  
2012 FINAL RULE—TAKING MARINE MAMMALS INCIDENTAL TO U.S.  
SURVEILLANCE TOWED ARRAY SENSOR SYSTEM LOW FREQUENCY  
ACTIVE (SURTASS LFA) SONAR ONBOARD USNS VICTORIOUS (T-AGOS  
19), USNS ABLE (T-AGOS 20), USNS EFFECTIVE (T-AGOS 21), AND USNS  
IMPECCABLE (T-AGOS 23)**



**DEPARTMENT OF THE NAVY  
CHIEF OF NAVAL OPERATIONS**

**OCTOBER 2016**

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## LIST OF ACRONYMS AND ABBREVIATIONS

μ	micro
CFR	Code of Federal Regulations
CLFA	Compact Low Frequency Active
CNO	Chief of Naval Operations
CNP	Central North Pacific
dB	decibel(s)
dB re 1 μPa @ 1 m	decibel(s) relative to one microPascal at one meter from center of acoustic source
DoN	Department of the Navy
ECS	East China Sea
EIS	Environmental Impact Statement
EO	Executive Order
EOG	Executive Oversight Group
ESA	Endangered Species Act
ft	foot/feet
HF	high frequency
HF/M3	High Frequency Marine Mammal Monitoring (sonar)
HLA	horizontal line array
hr	hour(s)
Hz	Hertz
IA	Inshore Archipelago
ITS	incidental take statement
km	kilometer(s)
kph	kilometer(s) per hour
kt	knot(s)
LF	low frequency
LFA	Low Frequency Active
LOA	Letter of Authorization
m	meter(s)
M3	Marine Mammal Monitoring
MILCREW	military crew
min	minute(s)
MMPA	Marine Mammal Protection Act

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NEPA	National Environmental Policy Act
nmi	nautical mile(s)
NMFS	National Marine Fisheries Service
NP	North Pacific
OBIA	Offshore Biologically Important Area
OEIS	Overseas Environmental Impact Statement
OIC	Officer in Charge
Pa	Pascal
RL	received level
rms	root mean square
ROD	Record of Decision
SAG	Scientific Advisory Group
SCS	South China Sea
sec	second(s)
SEIS/SOEIS	Supplemental Environmental Impact Statement/Supplemental Overseas Environmental Impact Statement
SEL	sound exposure level
SL	source level
SOJ	Sea of Japan
SPE	single ping equivalent
SPL	sound pressure level
SURTASS	Surveillance Towed Array Sensor System
T-AGOS	Tactical Auxiliary General Ocean Surveillance (vessel)
U.S.	United States of America
U.S.C.	United States Code
USNS	United States Naval Ship
WNP	Western North Pacific
yd	yard(s)

## **1 PURPOSE**

As a requirement of the Marine Mammal Protection Act (MMPA) Final Rule (50 CFR 218 Subpart X) and the annual Letters of Authorization (NOAA, 2015; Appendix A) for Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar, this annual report provides an unclassified summary of SURTASS LFA<sup>1</sup> sonar operations onboard the United States Naval Ship (USNS) VICTORIOUS (Tactical Auxiliary General Ocean Surveillance [T-AGOS] 19) (Figure 1), USNS ABLE (T-AGOS 20), USNS EFFECTIVE (T-AGOS 21), and USNS IMPECCABLE (T-AGOS 23) for the annual effective period 15 August 2015 through 14 August 2016. This annual report has been prepared in accordance with the requirements of the MMPA Final Rule 50 CFR § 218.236(b) (NOAA, 2012), Condition 13(f) of the annual Letters of Authorization (LOAs) (Appendix A), and Condition 6 of the Incidental Take Statement (ITS) (NMFS, 2015) for SURTASS LFA sonar issued by the National Marine Fisheries Service (NMFS).



**Figure 1. SURTASS LFA Sonar Vessel, USNS VICTORIOUS (T-AGOS 19).**

The annual report's purpose is to provide NMFS:

1. An unclassified summary of the SURTASS LFA sonar operations over the annual effective period and synopses the quarterly mission reports,
2. Estimates of the percentages of marine mammals stocks affected by SURTASS LFA sonar transmissions from all SURTASS LFA sonar vessels during the annual effective period,
3. Analysis of the effectiveness of the mitigation measures employed for SURTASS LFA sonar,

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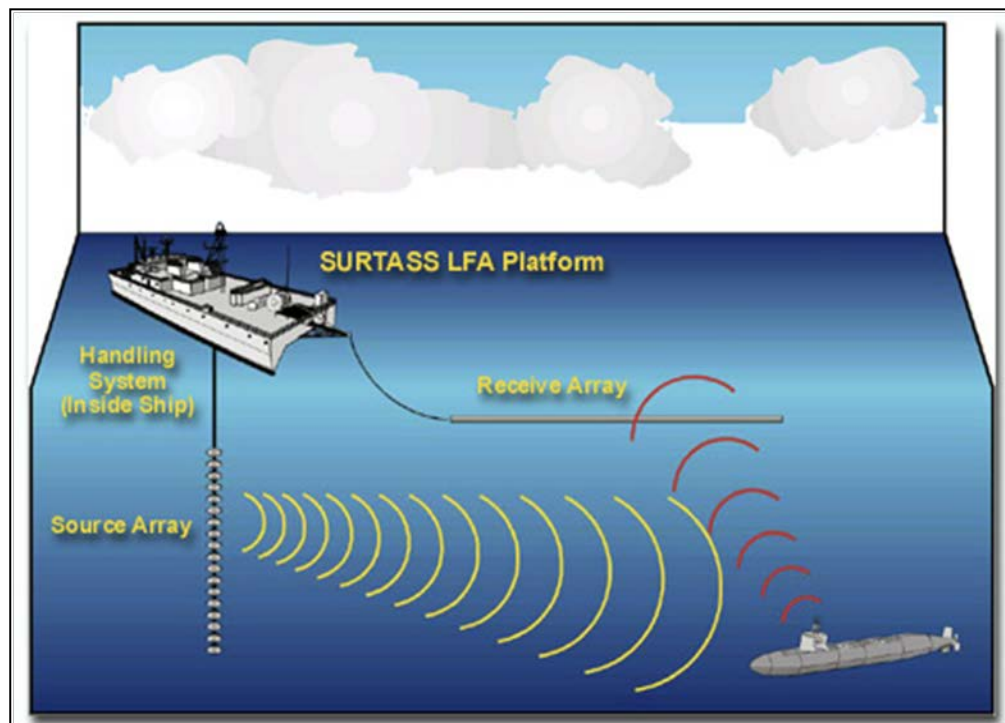
1 In this annual report, "SURTASS LFA sonar systems" refers to both the LFA and compact LFA (CLFA) systems, each having similar acoustic transmission characteristics.

4. Assessment of any discernible long-term effects and estimated cumulative impacts on marine mammals associated with operation of SURTASS LFA sonar.

This report demonstrates the Navy's conformance to the Conditions of the annual LOAs under the MMPA (Appendix A) as well as the Terms and Conditions of the ITS under the Endangered Species Act (ESA) (NMFS, 2015) for employment of SURTASS LFA sonar in authorized areas of the western and central North Pacific Ocean.

## **2 SURTASS LFA SONAR SYSTEM**

The SURTASS LFA sonar system is comprised of a passive acoustic component, SURTASS, and an active sonar component, LFA (Figure 2). SURTASS is the passive or sound-receiving component that receives sound signals on a series of hydrophones mounted together to form a horizontal line array (HLA). The HLA is towed behind a SURTASS LFA sonar vessel, which travels at a speed of about 3 knots (kt) (5.6 kilometers per hour [kph]) when towing the SURTASS LFA sonar system.



**Figure 2. SURTASS LFA Sonar System.**

The LFA sonar source is a vertical line array (VLA), composed of up to 18 source projectors, that is suspended beneath the SURTASS LFA sonar vessel. The LFA source operates within the frequency range of 100 to 500 Hertz (Hz) with each individual source projector transmitting signals with a source level (SL) of approximately 215 decibels relative to 1 microPascal at a reference of 1 meter (dB re 1  $\mu$ Pa @ 1 m) (root mean square [rms]) or less. The typical LFA sonar signal is not transmitted as a constant tone but is instead transmitted as various waveforms that fluctuate in frequency and duration. A wavetrain or ping is a complete sequence of sonar sound transmissions. These sonar pings have durations of 6 to 100

seconds (sec), with an average duration of 60 sec but no more than a duration of 10 sec at any single frequency. The time between sonar ping transmissions is typically 6 to 15 minutes. The average duty cycle (ratio of sound “on” time to total time) is less than 20 percent, with a typical duty cycle, based on LFA operational parameters since 2003, ranging nominally between 7.5 to 10 percent.

A detailed description of the passive (SURTASS) and active (LFA) components and operating characteristics of the SURTASS LFA sonar system may be found in the 2012 Supplemental Environmental Impact Statement/Overseas Supplemental Environmental Impact Statement (SEIS/SOEIS) (DoN, 2012) or the 2016 Draft SEIS/SOEIS (DoN, 2016) for SURTASS LFA sonar

### References to Underwater Sound Levels

- References to underwater sound pressure level (SPL) in this annual report are values given in decibels (dBs), and are assumed to be standardized at 1 microPascal at 1 m (root mean square) (dB re 1  $\mu$ Pa at 1 m [rms]) for source level (SL) and dB re 1  $\mu$ Pa (rms) for received level (RL), unless otherwise stated (Urlick, 1983; ANSI, 2006).
- In this report, underwater sound exposure level (SEL) is a measure of energy, specifically the squared instantaneous pressure integrated over time; the appropriate units for SEL are dB re 1  $\mu$ Pa<sup>2</sup>-sec (Urlick, 1983; ANSI, 2006; Southall et al., 2007).
- The term “Single Ping Equivalent” (SPE) used herein is an intermediate calculation for input to the risk continuum used in the acoustic impact analysis for SURTASS LFA sonar. SPE accounts for the energy of all LFA sonar transmissions that a modeled animal (“animat”) receives during a 24-hr period of a SURTASS LFA sonar mission as well as an approximation of the manner in which the effect of repeated exposures accumulate. As such, the SPE metric incorporates both physics and biology. Calculating the potential risk from exposure to SURTASS LFA sonar is a complex process and the reader is referred to Appendix C (DoN, 2012) for details. SPE levels will be expressed as “dB SPE” in this document, as they have been presented in preceding environmental compliance documentation for SURTASS LFA sonar.

## 3 OPERATIONAL REQUIREMENTS

The Navy is authorized to operate SURTASS LFA sonar during routine training, testing, and military operations such that underwater sound transmitted by SURTASS LFA sonar systems is between 100 and 500 Hz with a SL of no more than 215 dB re 1  $\mu$ Pa @ 1 m (rms) for each of the 18 LFA sonar projectors and a maximum duty cycle of 20 percent. Each SURTASS LFA sonar vessel is authorized to transmit up to 432 hours (hr) per annual period.

Under the NMFS 2012 MMPA Final Rule (50 CFR Part 218, Subpart X), the Navy is authorized to conduct routine SURTASS LFA sonar training, testing, and military operations in the oceanic areas of the Pacific, Atlantic, and Indian Oceans, and the Mediterranean Sea. Additionally, the Navy does not conduct SURTASS LFA sonar operations in polar waters. Taking of marine mammals is authorized for non-lethal Level A and Level B harassment within 11 geographic mission areas of the western and central North Pacific Ocean (Table 1), but takes by Level B incidental harassment cannot exceed 12 percent of any

**Table 1. SURTASS LFA Sonar Mission Areas in the Western and Central North Pacific Ocean.**

<i>Mission Area Number</i>	<i>SURTASS LFA Mission Area</i>
<b><i>Western North Pacific Ocean</i></b>	
1	East of Japan
2	North Philippine Sea
3	West Philippine Sea
4	Offshore Guam
5	Sea of Japan
6	East China Sea
7	South China Sea
8	Offshore Japan (25° to 40° N)
9	Offshore Japan (10° to 25° N)
<b><i>Central North Pacific Ocean</i></b>	
10	Hawaii North
11	Hawaii South

marine mammal stock per annual period (LOAs Condition 6). Transmission of SURTASS LFA sonar is restricted in certain geographic areas including the coastal standoff range, offshore biologically important areas (OBIAs), and known human diver locations, wherein the sound field generated by LFA sonar cannot exceed specific received levels. SURTASS LFA sonar transmissions will not exceed 180 dB re 1  $\mu$ Pa (rms) within 12 nautical miles (nmi) (22 kilometers [km]) of all land masses with a coastline (regardless of size and including islands) (i.e., coastal standoff range; LOA Condition 8(h)(i)) or within 0.54 nmi (1 km) of the outer perimeter of any OBIA (LOA Condition 8h(ii)). In addition, the received sonar sound field at recreational dive sites cannot exceed 145 dB re 1  $\mu$ Pa (rms).

Mitigation monitoring measures include visual, passive acoustic, and active acoustic (high frequency marine mammal monitoring [HF/M3] sonar) monitoring to prevent injury to marine mammals or sea turtles when SURTASS LFA sonar is transmitting. These monitoring mitigation measures provide the means to detect marine mammals or sea turtles within proximity to the transmitting LFA sonar (i.e., in the mitigation zone for SURTASS LFA sonar) so that the LFA sonar transmissions can be delayed or suspended to prevent any marine mammal being subjected to a sound pressure level (SPL) of 180 dB re 1  $\mu$ Pa (rms) or greater. Additional details of the comprehensive program of preventative measures for SURTASS LFA sonar follow.

#### **4 MITIGATION REQUIREMENTS**

Mitigation protocols, operational restrictions, and mitigation monitoring requirements under which the Navy is authorized to operate SURTASS LFA sonar were set forth in the 2012 Record of Decision (ROD; DoD, 2012), MMPA Final Rule (NOAA, 2012), and in the annual LOAs (Appendix A). The goal of the complete suite of mitigation and monitoring measures required for the employment of SURTASS LFA sonar are to minimize, to the greatest extent practicable, adverse impacts on marine mammal species, stocks, or their habitat. These objectives are met through geographical restrictions on LFA sonar



employment; maintenance of a mitigation and buffer zone around the transmitting LFA sonar source; monitoring by visual (daylight hours only), passive acoustics, and active acoustics whenever LFA sonar is transmitting; ramp-up procedures for the HF/M3 sonar system; suspension or delay of LFA sonar transmissions when marine mammals or sea turtles are detected in the mitigation or buffer zones; and mission planning.

#### **4.1 GEOGRAPHIC RESTRICTIONS**

As previously noted, geographic restrictions for the use of SURTASS LFA sonar require that the RL of the sound field transmitted by LFA sonar remain below 180 dB re 1  $\mu$ Pa (rms) in the coastal standoff range for SURTASS LFA sonar, which is at distances of 12 nmi (22 km) of any land, including islands, and within 0.54 nmi (1 km) from the outer perimeter of designated OBIAs for SURTASS LFA sonar (Table 2). OBIAs are areas of the world's oceans that are located outside the coastal standoff range where marine mammals aggregate to conduct biologically important activities such as breeding/calving, foraging, or migration. In the 2012 SEIS/SOEIS (DoN, 2012) and the 2012 MMPA Final Rule (NOAA, 2012), Navy and NMFS, respectively, designated 22 OBIAs for SURTASS LFA sonar (Table 2). During military operations, however, SURTASS LFA sonar transmissions may exceed 180 dB re 1  $\mu$ Pa (rms) within the boundaries of SURTASS LFA sonar OBIAs when: 1) operationally necessary to continue tracking an existing underwater contact; or 2) operationally necessary to detect a new underwater contact within the OBIA (50 CFR 218.234(g)(1) and LOA Condition 8h(i)).

Only one of the 22 OBIAs for SURTASS LFA sonar is located in proximity to the Navy's 2015 to 2016 mission areas (Table 1). OBIA 16, Hawaiian Islands Humpback Whale National Marine Sanctuary, Penguin Bank, with the effective period of important biological activity occurring from November through April, annually, is located in the Hawaii South mission area for SURTASS LFA sonar. However, no SURTASS LFA sonar missions occurred in the Hawaii North or South mission areas during the 2015 to 2016 LOA effective period.

#### **4.2 MITIGATION AND BUFFER ZONE**

The mitigation zone for SURTASS LFA sonar encompasses an ocean volume ensonified to a RL greater than 180 dB re 1  $\mu$ Pa (rms) by LFA sonar transmissions. Based on spherical spreading, this zone will vary between the nominal horizontal ranges of 0.40 to 0.54 nmi (0.75 to 1.0 km) over a depth of approximately 285 to 515 feet (ft) (87 to 157 meters [m]) from the LFA sonar source array, with the center of the LFA sonar source array located at an approximate depth of 400 ft (122 m) below the sea surface. Under rare environmental conditions (e.g., strong acoustic duct), this range could be somewhat greater than 0.54 nmi (1 km). Knowledge of local environmental conditions (such as sound speed profiles [depth versus sound speed] and sea state) that affect sound propagation is critical to maintaining the appropriate mitigation zone distance.

To determine the distance to the 180-dB rms isopleth (radius of the LFA mitigation zone) from the LFA sonar source, local environmental data and underwater acoustic prediction models are used to determine the propagation of the LFA sonar signal in real-time. These sound field estimates are completed prior to and during LFA sonar transmissions. The propagation of the LFA sound field is updated at least every 12 hours, if not more frequently as meteorological or oceanographic (environmental) conditions vary (LOA Condition 8[c]). If the sound field analysis indicates that the distance to the 180-dB re 1  $\mu$ Pa isopleth (i.e., radius of the mitigation zone) has changed, the Officer in Charge (OIC) of the military crew (MILCREW) aboard the SURTASS LFA sonar vessels notifies the

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**Table 2. SURTASS LFA Sonar Offshore Biologically Important Areas (OBIA) for Marine Mammals and their Period of Effectiveness.**

<i>OBIA Number</i>	<i>OBIA</i>	<i>Period of Effectiveness</i>
1	Georges Bank	Year-round
2	Roseway Basin Right Whale Conservation Area	June through December, annually
3	Great South Channel, U.S. Gulf of Maine, and Stellwagen Bank NMS	January 1 to November 14, annually
4	Southeastern U.S. Right Whale Seasonal Habitat	November 15 to April 15, annually
5	North Pacific Right Whale Critical Habitat	March through August, annually
6	Navidad Bank	December through April, annually
7	Coastal waters of Gabon, Congo and Equatorial Guinea	June through October, annually
8	Patagonian Shelf Break	Year-round
9	Southern Right Whale Seasonal Habitat	May through December, annually
10	Central California National Marine Sanctuaries	June through November, annually
11	Antarctic Convergence	October through March, annually
12	Piltun and Chayvo Offshore Feeding Grounds in the Sea of Okhotsk	June through November, annually
13	Coastal waters off Madagascar	July through September, annually for humpback whale breeding and November through December, annually for migrating blue whales
14	Madagascar Plateau, Madagascar Ridge, and Walters Shoal	November through December, annually
15	Ligurian-Corsican-Provencal Basin and Western Pelagos Sanctuary in the Mediterranean Sea	July to August, annually
16	Hawaiian Islands Humpback Whale NMS and Penguin Bank	November through April, annually
17	Costa Rica Dome	Year-round
18	Great Barrier Reef between 16° S and 21° S	May through September, annually
19	Bonney Upwelling off the southern coast of Australia	December through May, annually
20	Northern Bay of Bengal and Head of Swatch-of-No-Ground	Year-round
21	Olympic Coast NMS, The Prairie, Barkley Canyon, and Nitnat Canyon	Olympic NMS: December, January, March, and May, annually The Prairie, Barkley Canyon, and Nitnat Canyon: June through September, annually
22	Abrolhos Bank	August through November, annually

pertinent crewmembers conducting visual and acoustic mitigation monitoring so that their monitoring procedures incorporate the correct mitigation zone distance.

To minimize further the potential for injury to marine mammals, per the 2012 MMPA Final Rule and annual LOAs, NMFS requires an additional 0.54-nmi (1-km) buffer zone that is added to the LFA mitigation zone. Thus, the mitigation zone plus the buffer zone is monitored for marine mammal or sea turtle presence during LFA sonar transmissions, and if a marine mammal or turtle is detected, LFA sonar transmissions are suspended or delayed. While the implementation of this additional buffer zone has proven to be practicable under current operations, the Navy's analysis indicates that adverse impacts below 180-dB re 1  $\mu$ Pa (rms) RL were not minimized appreciably (DoN, 2007).

### **4.3 RAMP-UP PROCEDURES FOR HF/M3 SONAR**

Prior to transmission of SURTASS LFA sonar for any purpose, the power level of the HF/M3 sonar system is to be ramped up over a period of no less 5 minutes from the maximum starting SL of 180 dB re 1  $\mu$ Pa @ 1 m (rms) (SPL) in 10-dB increments until the operating level is attained. This ramp-up of the HF/M3 sonar system ensures that there are no inadvertent exposures of marine mammal or sea turtles close to the SURTASS LFA sonar vessel to RLs greater or equal to 180 dB re 1  $\mu$ Pa (rms) from the HF/M3 sonar. This ramp-up procedure is to be conducted at least 30 minutes prior to any SURTASS LFA sonar transmission, prior to LFA sonar calibrations or testing that are not part of regular LFA sonar transmissions, and any time the HF/M3 sonar has been powered down for more than two minutes.

If a marine mammal is detected during the ramp-up procedure, the SPL of the HF/M3 sonar is not to be increased. Once marine mammals are no longer detected by visual or passive acoustic monitoring, the HF/M3 ramp-up process may resume.

### **4.4 SUSPENSION OR DELAY OF SURTASS LFA SONAR SIGNALS**

If a marine mammal is detected within the mitigation and buffer zones, SURTASS LFA sonar transmissions are to be immediately suspended or delayed. LFA sonar transmissions may resume/commence when there have been no further detections within the LFA mitigation and buffer zones of a marine mammal or sea turtle for 15 minutes.

### **4.5 MISSION PLANNING**

The Navy must ensure that no more 12 percent of any marine mammal stock is taken by MMPA Level B harassment during the annual LOA period. To accomplish this requirement, the Navy coordinates the mission planning for the SURTASS LFA sonar vessels and mission areas in which they operate and maintains a running total of the percentage of each marine mammal stock taken by MMPA Level B harassment by all LFA sonar operations of all four SURTASS LFA sonar vessels.

### **4.6 MITIGATION MONITORING TO PREVENT INJURY TO MARINE ANIMALS**

The purpose of mitigation monitoring is to ensure, to the greatest extent practicable, that no marine mammal is subjected to a sound pressure level of 180 dB re 1  $\mu$ Pa (rms) or greater. In accordance with the Navy's 2012 ROD (DoD, 2012), 2012 MMPA Final Rule (50 CFR §218.235) (NOAA, 2012), and LOA conditions 9 and 10, three types of mitigation monitoring (Table 3) are conducted onboard LFA sonar vessels when SURTASS LFA sonar is transmitting:

- **Visual monitoring** from the bridge of the SURTASS LFA sonar vessel during daylight hours by personnel trained to detect and identify marine mammals using standard (7x) binoculars and the naked eye;

**Table 3. Summary of Mitigation Monitoring Measures to Prevent Injury to Marine Mammals Whenever SURTASS LFA Sonar is Transmitting.**

<i>Mitigation Monitoring Measure</i>	<i>Criteria</i>	<i>Actions</i>
Visual Monitoring	Potentially affected species near the vessel but outside the LFA mitigation zone plus 1-km (0.54-nmi) buffer zone	MILCREW OIC notified and animals tracked for possible intersection with mitigation/buffer zone
	Potentially affected species sighted inside the LFA mitigation zone plus 1-km (0.54-nmi) buffer zone	SURTASS LFA sonar transmissions delayed/suspended
Passive Acoustic Monitoring	Marine mammal species detected in the LFA mitigation zone plus 1-km (0.54-nmi) buffer zone	MILCREW OIC notified; SURTASS LFA sonar transmissions delayed/suspended
Active Acoustic (HF/M3) Monitoring	Contact detected and determined to have a track that would pass within the LFA mitigation zone plus 1-km (0.54-nmi) buffer zone	MILCREW OIC notified and animals tracked for possible intersection with mitigation/buffer zone
	Potentially affected species detected inside the LFA mitigation zone plus 1-km (0.54-nmi) buffer zone	SURTASS LFA sonar transmissions delayed/suspended

- **Passive acoustic monitoring** using the passive low-frequency (LF) SURTASS array to listen for sounds generated by marine mammals as an indicator of their presence; and
- **Active acoustic monitoring** using the HF/M3 sonar, which is a Navy-developed, enhanced HF commercial sonar used to detect, locate, and track marine mammals (and sometimes sea turtles).

Monitoring must commence at least 30 minutes before the first SURTASS LFA sonar transmissions, continue between sonar transmissions (pings), and persist until 15 minutes after the completion of SURTASS LFA sonar transmissions (or 30 minutes after sunset for visual monitoring) or until such time as marine mammals showing abnormal behavioral patterns return to normal or conditions prevent continued observations.

Additionally, marine mammal biologists qualified in conducting visual at-sea monitoring for marine mammals are to train the personnel of SURTASS LFA sonar vessels designated to conduct visual monitoring. These crewmembers are to be trained in conducting at-sea visual monitoring and in effectively communicating information about their visual detections within their command structure.

## **5 MONITORING AND REPORTING REQUIREMENTS**

### **5.1 MONITORING**

In addition to designating qualified personnel to conduct the mitigation, monitoring, and reporting required by the MMPA rulemaking and annual LOAs for SURTASS LFA sonar employment, the Navy also cooperates with NMFS and other Federal agencies in monitoring the impacts potentially associated with SURTASS LFA sonar activities. Further, the Navy is tasked with conducting four types of monitoring actions designed to increase the knowledge of affected marine mammal species or their environment.

**5.1.1 Consider Monitor and Research Recommendations on Beaked Whales and/or Harbor Porpoises**

To increase understanding of how harbor porpoises and beaked whale species might respond behaviorally and physiologically when exposed to SURTASS LFA sonar transmissions, the 2012 MMPA rulemaking for SURTASS LFA sonar employment (NOAA, 2012) charged the Navy with assessing different types of monitoring and research that might address this goal. The Navy was to convene a Scientific Advisory Group (SAG) of recognized scientific subject matter experts to identify feasible monitoring and/or research options the Navy could implement to assess the potential for effects from SURTASS LFA sonar on beaked whales or harbor porpoises. The SAG recommendations are considered independent scientific findings that are fully accessible to the public. Following the Navy's receipt of the SAG research or monitoring recommendations, per the MMPA Final Rule, the Navy is to prepare a plan of action outlining their strategy for implementing the SAG's recommendations or describe, in writing, why none of the SAG's recommendations are feasible and meet with NMFS to discuss any other potential options (NOAA, 2012). Per condition 12(a) of the 2015 to 2016 LOAs for SURTASS LFA sonar, the Navy is to consider the recommendations on the different types of monitoring/research that may increase the understanding of the potential effects of SURTASS LFA sonar transmissions on beaked whales and/or harbor porpoises.

**5.1.2 Marine Mammal Monitoring (M3) Program**

Condition 12b of the LOAs for SURTASS LFA sonar requires the Navy to continue to assess data acquired and compiled by the Marine Mammal Monitoring (M3) program and work toward making some portion of that data, after appropriate security reviews, available to scientists with appropriate clearances. Any portions of the analyses conducted by these scientists based on the M3 data that are determined to be unclassified after appropriate security reviews are to be made publicly available. The Navy's M3 program entails the use of Navy static and mobile passive acoustic systems to detect, identify, and track marine mammal species and the movements of individuals or groups of cetaceans, often over long periods.

**5.1.3 Passive Acoustic Monitoring**

Since the SURTASS component is such an effective passive acoustic monitoring system, NMFS has requested as a condition of the annual LOAs (Condition 12[c]) that the Navy continue to explore the feasibility to use the SURTASS towed HLA with other Navy assets or range monitoring programs to augment the collection of data on marine mammal vocalizations prior to, during, or after Navy exercises.

**5.1.4 Ambient Noise Monitoring**

Ambient noise is the typical or persistent background noise that is present in the marine environment. Ambient noise is broadband in all frequencies and directional both horizontally and vertically. Under LOA condition 12(d), the Navy is to continue collecting data on ambient underwater noise and explore the feasibility of declassifying and archiving the data for future incorporation into oceanic underwater noise budgets and databases.

**5.1.5 Stranding Network Monitoring**

The Navy must ensure that its at-sea SURTASS LFA sonar operations are monitored for injured or disabled marine mammals and that the principal marine mammal stranding networks and media are monitored for correlative strandings that overlap in time and space with SURTASS LFA sonar operations.

## **5.2 REPORTING REQUIREMENTS**

During routine training, testing, and military operations of SURTASS LFA sonar, technical and environmental data are collected and recorded, including data on visual and acoustic monitoring, ocean environmental measurements, and sonar transmission data. As stipulated in the MMPA Final Rule and LOAs, the following reporting for SURTASS LFA sonar is required as part of the Navy's authorizations:

- Quarterly classified and unclassified mission reports for each SURTASS LFA sonar vessel must be submitted within 30 days following the end of each quarter beginning on the date of the LOA's effectiveness. Even if no missions were conducted by a vessel, a report of negative activity must be submitted. Dates, times, and locations of each SURTASS LFA sonar mission will be included in the classified quarterly mission reports, while information on LFA sonar transmissions, including the number of times the sonar transmissions were suspended or delayed due to mitigation protocol procedures, will be included in both the unclassified and classified mission reports. The distance from the LFA sonar array to the 180 dB re 1  $\mu$ Pa (rms) isopleth is also to be noted. Additionally, any detection of marine mammals, including their range and bearing to the SURTASS LFA sonar vessel will be reported. Incidental take estimates of marine mammals possibly exposed to the duration of the each mission's LFA sonar transmissions that quarter are to be detailed in the report as well as the running total of affected stock percentages over the annual period.
- An annual report, which is the unclassified summary of all quarterly reports, is to be submitted to NMFS 45 days after the expiration of the LOAs. In addition to the summary of all annual LFA sonar operations, the annual report should include the Navy's estimates of the marine mammal stocks affected by all SURTASS LFA sonar vessel operations for the annual effective LOA period, summary of the mitigation effectiveness, and an assessment of any long-term or discernable cumulative effects associated with exposure of marine mammals to SURTASS LFA sonar transmissions.
- A final comprehensive report, which is an unclassified assessment of any impacts of SURTASS LFA sonar on marine mammal stocks during the 5-year period of the MMPA regulations, is submitted to NMFS at least 240 days prior to expiration of the MMPA Final Rule regulations. The final comprehensive report for the current Final Rule period is due to NMFS in December 2016.
- Research action plan that outlines the Navy's strategy for implementing recommendations on beaked whales and/or harbor porpoise research on the effects of exposure to SURTASS LFA sonar is to be submitted to NMFS. However, if such research is not feasible/or is unlikely to increase the understanding of the potential effects of SURTASS LFA sonar transmissions on beaked whales and/or harbor porpoises, written documentation describing the reasons for this decision will be submitted to NMFS, to be followed by a meeting with NMFS to discuss any other potential options.
- Status update provided as part of the Navy's LOAs application on its efforts to assess the data collected by the M3 program and its progress toward making some portion of that data, after appropriate security reviews, available to scientists with appropriate clearances.

## **6 SUMMARY OF SURTASS LFA SONAR OPERATIONS FROM 2015 TO 2016**

Per 50 CFR § 218.236(b) and Condition 13(f) of the LOAs, this annual report is the unclassified summary of the Navy's SURTASS LFA sonar operations for the period from 15 August 2015 through 14 August 2016 under the fourth year LOAs for the USNS VICTORIOUS, USNS ABLE, USNS EFFECTIVE, and USNS IMPECCABLE. During this reporting period, the four vessels conducted a total of 13 at-sea missions in three of the Navy's northwestern Pacific Ocean mission areas for SURTASS LFA. This annual report



details the three missions conducted by the USNS VICTORIOUS (T-AGOS 19), three missions conducted by the USNS ABLE (T-AGOS 20), six missions conducted by the USNS EFFECTIVE (T-AGOS 21), and one mission conducted by the USNS IMPECCABLE (T-AGOS 23) during the 2015 to 2016 reporting period (Table 4). In total, during this fourth annual reporting period under the MMPA five-year Rule for SURTASS LFA sonar, the Navy conducted the 13 SURTASS LFA sonar missions over 31.1 days, during which 52.6 hr of LFA sonar transmissions were broadcast. These 52.6 hr were less than the number of transmit hours authorized for the four SURTASS LFA sonar vessels during the 2015 to 2016 annual period. During the 52.6 hr of LFA sonar transmissions, and in accordance with the mitigation monitoring protocol for SURTASS LFA sonar, LFA sonar transmissions were suspended or delayed 29 times due to nine visual, three passive acoustic, and 28 active acoustic (HF/M3) detections of possible marine mammals or sea turtles in the LFA mitigation plus buffer zones (Table 4). During all 2015 to 2016 LFA sonar missions, 212 additional suspensions or delays of LFA sonar transmissions resulted from non-mitigation related causes. Further, 47 passive acoustic detections of marine mammal vocalizations were detected but were evaluated to have been located beyond (outside) the LFA mitigation and buffer zones. Forty-six of the 47 passive acoustic detections outside the mitigation/buffer zones were identified as Bryde's whales, while one passive acoustic detection was identified as a possible blue whale.

### **6.1 USNS VICTORIOUS MISSION SUMMARIES**

The USNS VICTORIOUS (T-AGOS 19) conducted SURTASS LFA sonar missions during one quarter, Quarter 3, of the annual period; negative reports were submitted for the VICTORIOUS for all other quarters. During the third quarter (February 15 to May 14) of the 2015 to 2016 LOA reporting period, the USNS VICTORIOUS completed three missions during which LFA sonar was transmitted for 6.9 hr over 6.9 mission days (Table 4). During these three missions, four visual, no passive acoustic, and seven active acoustic (HF/M3) detections of marine animals were made, resulting in eight suspensions or delays of LFA sonar transmissions, per mitigation monitoring protocol. Three of the four visual detections were identified only as marine mammals or possible marine mammals and occurred in conjunction with HF/M3 detections. One of the visual detections, which resulted in a shutdown/delay of LFA sonar transmissions, was identified as a whale with a range of 1,000 yards (0.9 km) and bearing of 028R. Additionally, passive acoustic monitoring detected four marine mammal vocalizations that were evaluated to be outside the mitigation and buffer zones for LFA sonar but that were identified as Bryde's whales. LFA sonar transmissions were suspended/delayed 24 times during the missions for non-mitigation monitoring causes.

### **6.2 USNS ABLE MISSION SUMMARIES**

The USNS ABLE (T-AGOS 20) conducted a total of three SURTASS LFA sonar missions during the first and last quarters of the 2015 to 2016 annual reporting period, with no (negative) activity having been reported for Quarters 2 and 3. During Quarter 1, the USNS ABLE conducted two sonar missions over 3.3 days during which LFA sonar was transmitted for a total of 7.7 hr. No visual, passive acoustic, or active acoustic detections of possible marine animals were made in the LFA mitigation or buffer zones during these two first quarter missions. Thus, no delays/suspensions of LFA sonar transmissions resulted due to mitigation monitoring protocols. LFA sonar transmissions, however, were delayed/suspended a total of 50 times during the Quarter 1 missions due to non-mitigation protocol factors.

The USNS ABLE also conducted one at-sea mission during Quarter 4, which encompassed 3.3 days and resulted in 6.6 hr of LFA sonar transmissions. The ABLE reported no visual, passive acoustic, or active acoustic detections of marine animals during this mission, with no shutdowns or delays of LFA sonar

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**Table 4. Summary of SURTASS LFA Sonar Operations and Mitigation Monitoring Results for the LOA Annual Reporting Period 15 August 2015 through 14 August 2016 for All Vessels.**

<i>LFA Vessel</i>	<i>Number Total Annual Missions</i>	<i>Total Mission Duration (days)</i>	<i>Total LFA Sonar Transmissions (hours)</i>	<i>Number Visual Detections</i>	<i>Number Passive Acoustic Detections</i>	<i>Number Passive Acoustic Detections Outside Mitigation/ Buffer Zones</i>	<i>Number Active Acoustic (HF/M3) Detections</i>	<i>Number LFA Sonar Suspensions/ Delays Per Mitigation Protocol</i>	<i>Number LFA Sonar Suspensions/D elays Due to Non-Mitigation Factors</i>
USNS VICTORIOUS (T-AGOS 19)	3	6.9	6.9	4	0	4	7	8	24
USNS ABLE (T-AGOS 20)	3	6.6	14.3	0	0	0	0	0	84
USNS EFFECTIVE (T-AGOS 21)	6	16.7	28.8	5	3	42	21	21	46
USNS IMPECCABLE (T-AGOS 23)	1	0.9	2.6	0	0	1	0	0	58
<b>ANNUAL TOTALS</b>	<b>13</b>	<b>31.1</b>	<b>52.6</b>	<b>9</b>	<b>3</b>	<b>47</b>	<b>28</b>	<b>29</b>	<b>212</b>

transmissions due to mitigation monitoring protocol. However, LFA sonar transmissions were suspended/delayed 34 times during the mission due to non-mitigation monitoring related causes.

For the 2015 to 2016 LOA reporting period, the USNS ABLE conducted three at-sea missions in the western North Pacific Ocean that totaled 6.6 days over which LFA sonar was transmitted for a total of 14.3 hr. No visual, passive acoustic, or active acoustic detections of marine mammals or sea turtles were made during the ABLE's three missions, and LFA sonar was thus not suspended or delayed per mitigation monitoring requirements.

### 6.3 USNS EFFECTIVE MISSION SUMMARIES

Six at-sea missions were completed by the USNS EFFECTIVE (T-AGOS 21) during Quarters 2, 3, and 4 of the 2015 to 2016 LOA reporting period in the western North Pacific Ocean. One negative activity report was submitted for the USNS EFFECTIVE during the first quarter of the reporting period. The EFFECTIVE's six missions were conducted over a total of 16.7 days during which LFA sonar was transmitted for 28.8 hr total (Table 4). The USNS EFFECTIVE conducted one mission over 2.96 days during the second quarter of the 2015 to 2016 reporting period, with 6.9 hr of LFA sonar transmissions. One visual, two passive acoustic, and four active acoustic (HF/M3 sonar) detections of marine animals were reported within the LFA mitigation and buffer zones during this Quarter 1 mission, resulting in four suspensions or delays of LFA sonar transmissions per mitigation monitoring protocol. The one visual detection was identified as whales and was reported off the EFFECTIVE's stern at a range and bearing of 500 yards (yd) (457 m) and 090R to 180R. One of the two passive acoustic detections within the mitigation/buffer zone for SURTASS LFA sonar was evaluated to be a Bryde's whale vocalization, detected at a bearing of 255R. Four passive acoustic detections of marine mammal vocalizations judged to be outside (beyond) the SURTASS LFA sonar mitigation/buffer zones were identified as Bryde's whales. Additionally, LFA sonar transmissions were delayed or suspended 12 times during the mission due to non-mitigation related causes.

During Quarter 3, the USNS EFFECTIVE conducted two at-sea sonar missions over a total of 7.4 days during which LFA sonar was transmitted for a total of 14.58 hr. Two visual, one passive acoustic, and 14 active acoustic (HF/M3 sonar) detections of marine animals were reported within the LFA mitigation and buffer zones during the two missions. These detections, per the mitigation/monitoring protocol for SURTASS LFA sonar, resulted in 14 suspensions/delays of LFA sonar transmissions. All visual detections occurred during the first of the EFFECTIVE's Quarter 3 missions. The first visual detection was identified as a possible black fin at the sea surface accompanied by splashing at a bearing of 172R and a range of 1,148 yd (1,050 m), and LFA sonar transmissions were suspended/delayed for this visual detection. The second visual detection was of a marine mammal sighted at a distance of 2 nmi (3.7 km) and bearing of 059T, which was just beyond the extent of the mitigation and buffer zones. Shortly after this detection, a marine mammal was sighted off the starboard side of the ship at a range of 1.5 nmi (2.8 km), just outside the extent of the mitigation/buffer zones. A passive acoustic detection was made concurrently with this third visual marine mammal detection. LFA sonar transmissions were not suspended for these two visual detections, as they were evaluated to be outside the mitigation/buffer zones. The fourth visual detection was identified as dolphins near the ship's bow, which resulted in the suspension of LFA sonar transmissions. During the second of the EFFECTIVE's Quarter 2 missions, 38 passive acoustic detections of marine mammal vocalizations judged to be outside (beyond) the range of the SURTASS LFA sonar mitigation/buffer zones were identified as Bryde's whales. By associating the times and bearings of these Bryde's whale detections, the Navy estimated that these passive acoustic detections outside the mitigation/buffer zones likely represent the tracking of 15 individual Bryde's whales and/or groups of Bryde's whales over about a three-day period. Additionally, LFA sonar transmissions were

suspended/delayed 15 times during the Quarter 2 missions due to reasons not related to mitigation monitoring.

In the last quarter of the 2015 to 2016 LOA period, the USNS EFFECTIVE conducted three at-sea sonar missions over 6.3 days during which LFA sonar was transmitted for a total of 7.35 hours. No visual or passive acoustic detections were reported, but three active acoustic (HF/M3) detections resulted in three suspensions/delays of LFA sonar transmissions during the three missions. Visual observers reported sighting a large school of silver fish at the sea surface during the first EFFECTIVE Quarter 3 mission. Additionally, LFA sonar transmissions were suspended/delayed 18 times during the missions due to non-mitigation monitoring related causes.

#### **6.4 USNS IMPECCABLE MISSION SUMMARIES**

Throughout the 2015 to 2016 LOA effective period, the USNS IMPECCABLE (T-AGOS 23) conducted one mission during Quarter 4, having reported negative activity for Quarters 1 through 3. The IMPECCABLE's one mission was conducted over 0.9 days, with a total of 2.6 hr of LFA sonar having been transmitted. Since no visual, passive acoustic, or active acoustic (HF/M3) detections resulted during the mission, LFA sonar transmissions were neither suspended nor delayed. However, passive acoustics detected a possible blue whale that was evaluated to be outside the SURTASS LFA mitigation and buffer zones. Additionally, LFA sonar transmissions were suspended/delayed 58 times during the missions due to non-mitigation monitoring related causes.

### **7 ANNUAL TRAINING**

#### **7.1 VISUAL OBSERVER TRAINING**

In compliance with the regulations of the MMPA Final Rule (50 CFR 216 Subpart Q) and annual LOAs for SURTASS LFA sonar employment, marine mammal biologists qualified in conducting at-sea visual monitoring of marine mammals from surface vessels are to conduct training of the civilian crew members designated as lookouts to conduct at-sea visual monitoring aboard the SURTASS LFA sonar vessels.

The visual monitoring training consists of three training modules: 1) monitoring component that covers the requirements and fundamentals of at-sea visual monitoring for marine species specified under permits for LFA sonar; 2) a marine mammal identification component that describes basic information about the potentially occurring species and characteristics to identify them at sea; and 3) a short quiz of the materials covered during the training to determine the retention level of the trainees.

Although visual observer trainings by a qualified marine mammal biologist were planned during the 2015 to 2016 LOA period, the complexity of the required overseas logistics and scheduling precluded their occurrence. Plans for scheduling trainings of the visual observer crewmembers are underway, with the goal of training crewmembers in the early part of the second quarter of the 2016 to 2017 LOA period.

#### **7.2 PASSIVE ACOUSTIC TRAINING**

The 2015 to 2016 LOAs and ITS under which the Navy is authorized to conduct LFA sonar operations aboard USNS VICTORIOUS, USNS ABLE, USNS EFFECTIVE, and USNS IMPECCABLE stipulate the conditions governing the sonar's operation. One of the mitigation monitoring conditions requires the Navy to use the passive SURTASS to listen for vocalizing marine mammals. To meet this requirement, by direction of CNO Undersea Capabilities Branch (N2/N6F24), a senior marine acoustician and a senior marine

mammal biologist from Marine Acoustics, Inc. conducted two passive acoustic trainings during the 2015 to 2016 LOA effective period of the MILCREWs that conduct passive acoustic monitoring as part of their duties as sonar operators onboard the USNS VICTORIOUS, ABLE, EFFECTIVE, and IMPECCABLE during SURTASS LFA sonar missions. Additionally, the MILCREW of the USNS LOYAL, an USNS T-AGOS vessel that is not outfitted with SURTASS LFA sonar, was also trained to increase their ability as sonar operators to distinguish biological sounds from those of mission-directed sounds.

The passive acoustic trainings consisted of a classified presentation that covered the following topics: 1) an introductory component that covered the requirements of passive acoustic monitoring for marine species specified under permits for SURTASS LFA sonar employment; 2) a marine mammal identification component that described basic information about the primary marine mammal species they may detect on SURTASS and species-specific characteristics for visual identification on spectrograms during passive acoustic monitoring; and 3) recommended sonar display parameters to facilitate the detection and identification of marine mammal species.

The introductory component included an overview of the reasons why mitigation monitoring of marine species is conducted during SURTASS LFA sonar transmissions, the monitoring requirements and procedures per the LOAs and ITS permits, and the importance of this task to the Navy's continued ability to operate SURTASS LFA sonar. The other types of mitigation monitoring required during SURTASS LFA sonar operations, that is, visual monitoring and active acoustic monitoring with the HF/M3 sonar were also discussed. Passive acoustic reporting procedures were reviewed, including an explanation of how the information the MILCREW collects is reported to other Navy organizations and ultimately to NMFS.

The marine mammal identification component of the trainings included basic information about the species of marine mammals that could be detected by the SURTASS passive array. The migratory and vocalization behavior of each those marine mammal species was described, as well as key features of exemplar spectrograms used to identify each species. The parameters of the sonar displays were discussed, with recommended settings to aid with classifying detected biological signals to a specific marine mammal species. Many of the settings used by M3 acousticians when reviewing data from Navy fixed and mobile (i.e., SURTASS) arrays for marine mammal vocalizations are different from those typically used for mission-directed sonar operations.

Passive acoustic monitoring crews from the VICTORIOUS, ABLE, EFFECTIVE, and IMPECCABLE have been made aware of their mitigation monitoring and reporting duties and responsibilities when SURTASS LFA sonar is transmitting and the importance of their role in the Navy's continuing ability to operate SURTASS LFA sonar. The MILCREWs that conduct passive acoustic monitoring as part of their duties as sonar operators have expanded their awareness of the methods for detecting and identifying biological sounds from those of mission-directed importance.

## 8 ESTIMATES OF AFFECTED MARINE MAMMAL STOCKS

In its annual LOAs applications, the Navy provided estimates of the percentage of marine mammal stocks potentially affected during a proposed nominal number of missions in specific mission areas requested for SURTASS LFA sonar employment during the August 2015 to 2016 LOA period. These estimates were based on a number of SURTASS LFA sonar missions estimated to occur in the mission areas in which SURTASS LFA sonar may have operated over the 2015 to 2016 period.

As part of each quarterly report, the Navy re-estimated the percentage of marine mammal stocks and the number of marine mammals in each stock that were affected by the actual number of LFA sonar hours transmitted during each quarter by each SURTASS LFA sonar vessel that conducted at-sea sonar

missions during the quarter. Additionally, the Navy provided the running total of the estimated percentage of each marine mammal stock and number of marine mammals in that stock that were affected by LFA sonar transmissions over the annual LOA period, to ensure that no more than 12 percent of any marine mammal stock were taken incidentally to SURTASS LFA sonar operations.

In this annual report, the Navy provides post-mission summaries detailing quarterly and annually estimated percentages of the marine mammal stocks and number of marine mammals in each stock incidentally harassed based upon predictive modeling of the actual number of LFA sonar hours transmitted by each of the four SURTASS LFA sonar vessels (Table 5). Per LOAs Condition 13(e), this information has been submitted to NMFS as quarterly reports following the end of each quarter of the August 2015 to 2016 reporting period. The predictive modeling was based on seasons, location of the missions, LFA sonar characteristics, length of sonar exposure (i.e., actual LFA sonar transmit hours), oceanographic/environmental conditions, and animal demographics (abundances and density estimates) for each of the four SURTASS LFA sonar vessels that transmitted LFA sonar during the August 2015 to 2016 LOA effective period. An overview of the methodology, criteria, and thresholds used for the predictive modeling of the acoustic impact and sonar risk assessment and resulting computation of the incidental harassment estimates detailed herein may be found in the SURTASS LFA sonar Final SEIS/SOEIS (DoN, 2012).

### **8.1 POST-MISSION ESTIMATES OF POTENTIALLY AFFECTED MARINE MAMMAL STOCKS**

Overall mission planning during the annual period of the LOAs was fundamentally based on national security and operational anti-submarine warfare requirements as well as the need for incidental harassment associated with exposures of 120 to 180 dB SPE of any one stock of marine mammals to remain under 12 percent annually. Thus, mission planning for each quarter of the annual LOA period considered the running total estimated percentage of affected marine mammal stocks so that no more than 12 percent of any marine mammal stock would be taken by MMPA Level B harassment annually by all SURTASS LFA sonar vessels combined (LOA Condition 6). The same analysis methodology and population data (densities and abundances) were utilized to compute both pre- and post-mission take estimates (DoN, 2015). Since Omura's whales are not an authorized species under the Final MMPA Rule for SURTASS LFA sonar, the takes estimate values for Omura's whales that occur in some mission areas for SURTASS LFA sonar are combined with the closely related Bryde's whale.

During the August 2015 through August 2016 LOA period, the highest post-mission percentage of any marine mammal stock predicted to be taken resulting from exposures of 120 to 180 dB SPE transmissions for all SURTASS LFA sonar vessels combined during the 13 LFA sonar missions and 52.6 hr of LFA sonar transmissions was estimated as 6.4 percent or 59 common minke whales in the Western North Pacific (WNP) J stock (Table 5), which was well below the 12% cap per stock on Level B harassment. The WNP stock of humpback whales was the second highest take percentage, at 2.89 percent, or 27 whales, based on actual LFA sonar transmit hours for 13 at-sea sonar missions (Table 5). The highest estimated number of affected marine mammals from all LFA sonar transmissions during the annual LOA period was 5,515 long-beaked common dolphins of the WNP stock (Table 5). The percentage and number of animals in any marine mammal stocks affected by LFA sonar transmissions at RLs  $\geq 180$  dB (rms) (with mitigation) from all vessels during the annual reporting period were 0% and 0 marine mammals, respectively, with the application of mitigation measures.



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**Table 5. Total Annual and Quarterly Summary of Post-Mission Percentages of Affected Marine Mammal Stocks and Number of Marine Mammals Resulting from 13 LFA Sonar Missions and 52.6 Hours of LFA Sonar Transmissions Conducted by Four SURTASS LFA Sonar Vessels for the LOA Reporting Period 15 August 2015 through 14 August 2016 (ESA-Listed Marine Mammal Species Highlighted).**

All Affected Marine Mammal Species/Species Groups	Number Marine Mammals in Stock	Stock Name <sup>2</sup>	120 to 180 dB SPE										≥180 dB (rms) (with Mitigation)	
			Quarter 1 (August to November)—All Vessels		Quarter 2 (November to February)—All Vessels		Quarter 3 (February to May)—All Vessels		Quarter 4 (May to August)—All Vessels		Annual Total— All Vessels		Annual Total— All Vessels	
			Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected
Mysticetes														
Blue whale	9,250	CNP	0.0008%	1	0.0015%	1	0.0008%	1			0.0031%	3	0.0000%	0
Bryde's whale <sup>3</sup>	20,501	WNP	0.0882%	12	0.0857%	10	0.1815%	23	0.1654%	20	0.5208%	65	0.0000%	0
Common minke whale	25,049	WNP "O"	0.2476%	63	0.2405%	61	0.4274%	108	0.3546%	90	1.2701%	322	0.0000%	0
Common minke whale	893	WNP "J"					4.5031%	42	1.8720%	17	6.3751%	59	0.0000%	0
Fin whale	9,250	WNP			0.0296%	3	0.0627%	7	0.0193%	2	0.1116%	12	0.0000%	0
Humpback whale	1,107	WNP	0.5783%	7	1.1010%	13	0.6090%	7			2.2883%	27	0.0000%	0
North Pacific right whale	922	WNP					0.0461%	3			0.0461%	3	0.0000%	0
Western North Pacific gray whale	140	WNP			0.0163%	1	0.0416%	2			0.0579%	3	0.0000%	0
Odontocetes														
Blainville's beaked whale	8,032	WNP	0.0609%	6	0.0390%	4	0.1021%	10	0.0891%	9	0.2911%	29	0.0000%	0
Common bottlenose dolphin	168,791	WNP offshore	0.0673%	115	0.0773%	131	0.0427%	73	0.0914%	156	0.2788%	475	0.0000%	0
Common bottlenose dolphin	105,138	IA					0.0088%	10	0.0045%	5	0.0134%	15	0.0000%	0
Cuvier's beaked whale	90,725	WNP	0.0583%	54	0.0373%	34	0.0249%	24	0.0586%	14	0.1791%	126	0.0000%	0
Deraniyagala beaked whale	22,799	NP					0.0284%	8			0.0284%	8	0.0000%	0
False killer whale	16,668	WNP	0.1483%	26	0.1596%	27	0.0883%	15	0.1467%	46	0.5428%	114	0.0000%	0
False killer whale	9,777	IA					0.1439%	15	0.0654%	8	0.2093%	23	0.0000%	0
Fraser's dolphin	220,789	WNP	0.0272%	61	0.0249%	55	0.0578%	130	0.0458%	98	0.1556%	344	0.0000%	0
Ginkgo-toothed beaked whale	22,799	NP	0.0215%	6	0.0137%	4	0.0360%	10	0.0275%	13	0.0987%	33	0.0000%	0
Killer whale	12,256	WNP	0.0063%	2	0.0067%	1	0.0131%	3	0.1258%	327	0.1519%	333	0.0000%	0
Kogia spp.	350,553	WNP	0.0093%	33	0.0071%	25	0.0101%	36	0.0208%	25	0.0473%	119	0.0000%	0
Long-beaked common dolphin	279,182	WNP	0.3536%	988	0.3336%	932	0.7548%	2,109	0.5638%	1486	2.0057%	5,515	0.0000%	0
Longman's beaked whale	4,571	WNP	0.0535%	4	0.0343%	2	0.0898%	5	0.0725%	41	0.2501%	52	0.0000%	0
Melon-headed whale	36,770	WNP	0.0992%	38	0.1068%	40	0.2066%	77	0.1745%	64	0.5871%	219	0.0000%	0
Pacific white-sided dolphin	931,000	WNP			0.0114%	107	0.0063%	59			0.0178%	166	0.0000%	0
Pantropical spotted dolphin	438,064	WNP	0.0217%	97	0.0276%	122	0.0622%	171	0.0856%	172	0.1972%	562	0.0000%	0
Pygmy killer whale	30,214	WNP	0.0592%	18	0.0637%	20	0.0411%	14	0.0707%	39	0.2348%	91	0.0000%	0
Risso's dolphin	83,289	WNP	0.1299%	109	0.1001%	84	0.0554%	47	0.1585%	119	0.4438%	359	0.0000%	0
Risso's dolphin	83,289	IA					0.1954%	164	0.0843%	72	0.2797%	236	0.0000%	0
Rough-toothed dolphin	145,729	WNP	0.0432%	64	0.0344%	51	0.0324%	49	0.0402%	63	0.1503%	227	0.0000%	0
Short-beaked common dolphin	3,286,163	WNP	0.0416%	480	0.0138%	452	0.0076%	250			0.0630%	1,182	0.0000%	0
Short-finned pilot whale	53,608	WNP	0.2459%	133	0.2315%	125	0.1627%	89	0.1338%	112	0.7739%	459	0.0000%	0
Sperm whale	102,112	NP	0.0097%	11	0.0084%	9	0.0188%	20	0.0137%	15	0.0506%	55	0.0000%	0
Spinner dolphin	1,015,059	WNP	0.0006%	7	0.0007%	8	0.0010%	13	0.0008%	9	0.0032%	37	0.0000%	0
Striped dolphin	570,038	WNP	0.0401%	230	0.0510%	291	0.0282%	161	0.0189%	108	0.1382%	790	0.0000%	0
Striped dolphin	570,038	IA					0.0076%	45	0.0032%	19	0.0108%	64	0.0000%	0

<sup>3</sup>Bryde's whale take values are inclusive of takes for Bryde's plus Omura's whales.

**8.1.1 Post-Mission Estimates of Affected Marine Mammal Stocks by USNS VICTORIOUS (T-AGOS 19) Sonar Transmissions**

The 6.9 hr of LFA sonar transmitted during the three missions the USNS VICTORIOUS conducted from 15 August 2015 through 14 August 2016 affected a maximum estimated 0.79 percent of the WNP J stock of common minke whales, or 8 whales, at exposures of 120 to 180 dB SPE (Table 6). The largest number of marine mammals in any stock estimated to be affected at exposures of 120 to 180 dB SPE by the VICTORIOUS' LFA sonar transmissions was 796 long-beaked common dolphins in the WNP stock. The greatest percentage of species listed under the Endangered Species Act (ESA) was 0.61 percent of the WNP humpback whale stock. Exposures at RLs of  $\geq 180$  dB (rms) SPE were estimated as 0.0 percent for all marine mammal stocks with the application of mitigation measures (Table 6).

**8.1.2 Post-Mission Estimates of Potentially Affected Marine Mammal Stocks by USNS ABLE (T-AGOS 20) Sonar Transmissions**

During the 2015 to 2016 LOA effective period, the USNS ABLE conducted three at-sea missions during which 14.3 hr of LFA sonar were transmitted. The highest estimated percentage of any marine mammal stock affected at exposures of 120 to 180 dB SPE by all the ABLE's LFA sonar transmissions throughout the 2015 to 2016 annual reporting period was 0.64 percent of the WNP stock of long-beaked common dolphins, or 1,798 dolphins out of a stock estimated at 279,182 individuals (Table 7); this was also the largest number of animals affected by the ABLE's LFA sonar transmissions. The highest estimated percentage of ESA-listed marine mammals affected at exposures of 120 to 180 dB SPE was 0.58 percent of the WNP stock of humpback whales. With the application of mitigation measures, exposures at RLs of  $\geq 180$  dB (rms) were estimated as 0.0 percent for all marine mammal stocks (Table 7).

**8.1.3 Post-Mission Estimates of Potentially Affected Marine Mammal Stocks by USNS EFFECTIVE (T-AGOS 21) Sonar Transmissions**

The USNS EFFECTIVE's six missions conducted over the 2015 to 2016 annual LOA period entailed 28.8 hr of LFA sonar transmissions, which affected an estimated 5.6 percent of the WNP J stock of common minke whales (or 51 whales) at exposures of 120 to 180 dB SPE (Table 8). The largest estimated percentage of ESA-listed stocks affected at exposures of 120 to 180 dB SPE, 1.1 percent, or 13 whales by the ABLE's LFA sonar transmission was to the WNP stock of humpback whales. An estimated 2,907 dolphins in the WNP stock of 279,182 long-beaked common dolphins were affected by exposures of 120 to 180 dB SPE. Exposures at RLs of  $\geq 180$  dB (rms) were estimated as 0.0 percent for all marine mammal stocks with mitigation applied (Table 8).

**8.1.4 USNS IMPECCABLE (T-AGOS 23) Post-Mission Estimates of Potentially Affected Marine Mammal Stocks**

Completing one mission during the 2015 to 2016 LOA period, the USNS IMPECCABLE was responsible for transmitting 2.6 hr of LFA sonar, which affected an estimated maximum of 0.12 percent of long-beaked common dolphins in the WNP stock at exposures of 120 to 180 dB SPE (Table 9). This stock of long-beaked common dolphins also had the greatest estimated number of marine mammals, 325 dolphins, affected at exposures of 120 to 180 dB SPE. The highest estimated percentage of an ESA-listed stock affected by exposures of 120 to 180 dB SPE during the IMPECCABLE's one mission, 0.003 percent, was the NP stock of sperm whales, which was also the only ESA-listed stock potentially occurring in the mission area in which the IMPECCABLE operated during the fourth quarter. Marine mammal exposures at RLs of  $\geq 180$  dB (rms) were estimated as 0.0 percent with the application of mitigation measures (Table 9).

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**Table 6. Post-mission quarterly and total annual estimates of the percentages of marine mammal stocks and the associated number of marine mammals affected by the three LFA sonar missions and 6.9 sonar hours transmitted by the USNS VICTORIOUS (T-AGOS 19) in the northwestern Pacific Ocean during the LOA reporting period from August 2015 to August 2016. ESA-listed marine mammals highlighted.**

Marine Mammal Species/Species Groups	Number Animals in Stock	Stock Name	120 to 180 dB SPE										≥180 dB (rms) (with Mitigation)	
			Quarter 1 (August to November)		Quarter 2 (November to February)		Quarter 3 (February to May)		Quarter 4 (May to August)		Total Annual		Total for Quarter and Annual Period	
			Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected
Mysticetes														
Blue whale	9,250	CNP					0.0008%	1			0.0008%	1	0.0000%	0
Bryde's whale*	20,501	WNP					0.0709%	10			0.0709%	10	0.0000%	0
Common minke whale	25,049	WNP "O"					0.1847%	47			0.1847%	47	0.0000%	0
Common minke whale	893	WNP "J"					0.7896%	8			0.7896%	8	0.0000%	0
Fin whale	9,250	WNP					0.0245%	3			0.0245%	3	0.0000%	0
Humpback whale	1,107	WNP					0.6090%	7			0.6090%	7	0.0000%	0
North Pacific right whale	922	WNP					0.0155%	2			0.0155%	2	0.0000%	0
Western North Pacific gray whale	140	WNP					0.0073%	1			0.0073%	1	0.0000%	0
Odontocetes														
Blainville's beaked	8,032	WNP					0.0357%	4			0.0357%	4	0.0000%	0
Common bottlenose dolphin	168,791	WNP					0.0427%	73			0.0427%	73	0.0000%	0
Common bottlenose dolphin	105,138	IA					0.0015%	2			0.0015%	2	0.0000%	0
Cuvier's beaked whale	90,725	WNP					0.0214%	20			0.0214%	20	0.0000%	0
Deraniyagala beaked whale	22,799	NP					0.0050%	2			0.0050%	2	0.0000%	0
False killer whale	16,668	WNP					0.0883%	15			0.0883%	15	0.0000%	0
False killer whale	9,777	IA					0.0252%	3			0.0252%	3	0.0000%	0
Fraser's dolphin	220,789	WNP					0.0215%	49			0.0215%	49	0.0000%	0
Gingko-toothed beaked whale	22,799	NP					0.0126%	4			0.0126%	4	0.0000%	0
Killer whale	12,256	WNP					0.0054%	2			0.0054%	2	0.0000%	0
Kogia spp.	350,553	WNP					0.0050%	18			0.0050%	18	0.0000%	0
Long-beaked common dolphin	279,182	WNP					0.2845%	796			0.2845%	796	0.0000%	0
Longman's beaked whale	4,571	WNP					0.0314%	2			0.0314%	2	0.0000%	0
Melon-headed whale	36,770	WNP					0.0849%	32			0.0849%	32	0.0000%	0
Pacific white-sided dolphin	931,000	WNP					0.0063%	59			0.0063%	59	0.0000%	0
Pantropical spotted dolphin	438,064	WNP					0.0235%	86			0.0235%	86	0.0000%	0
Pygmy killer whale	30,214	WNP					0.0363%	12			0.0363%	12	0.0000%	0
Risso's dolphin	83,289	WNP					0.0554%	47			0.0554%	47	0.0000%	0
Risso's dolphin	83,289	IA					0.0343%	29			0.0343%	29	0.0000%	0
Rough-toothed dolphin	145,729	WNP					0.0214%	32			0.0214%	32	0.0000%	0
Short-beaked common dolphin	3,286,163	WNP					0.0076%	250			0.0076%	250	0.0000%	0
Short-finned pilot whale	53,608	WNP					0.1341%	73			0.1341%	73	0.0000%	0
Sperm whale	102,112	NP					0.0071%	8			0.0071%	8	0.0000%	0
Spinner dolphin	1,015,059	WNP					0.0005%	7			0.0005%	7	0.0000%	0
Striped dolphin	570,038	WNP					0.0282%	161			0.0282%	161	0.0000%	0
Striped dolphin	570,038	IA					0.0013%	8			0.0013%	8	0.0000%	0
			No T-AGOS 19 Missions—Negative Activity Report		No T-AGOS 19 Missions—Negative Activity Report				No T-AGOS 19 Missions—Negative Activity Report					
*Bryde's whale take values includes those for Omura's whales.														

\*Bryde's whale take values includes those for Omura's whales.

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**Table 7. Post-mission quarterly and total annual estimates of the percentages of marine mammal stocks and the associated number of marine mammals affected by the three LFA sonar missions and 14.3 sonar hours transmitted by the USNS ABLE (T-AGOS 20) in the northwestern Pacific Ocean during the LOA reporting period from August 2015 to August 2016. ESA-listed marine mammals highlighted.**

Marine Mammal Species/Species Groups	Number Animals in Stock	Stock Name	120 to 180 dB SPE										≥180 dB (rms) (with Mitigation)	
			Quarter 1 (August to November)		Quarter 2 (November to February)		Quarter 3 (February to May)		Quarter 4 (May to August)		Total Annual		Total for Quarter and Annual Period	
			Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected
Mysticetes														
Blue whale	9,250	CNP	0.0008%	1							0.0008%	1	0.0000%	0
Bryde's whale*	20,501	WNP	0.0882%	12					0.0783%	9	0.1665%	21	0.0000%	0
Common minke whale	25,049	WNP "O"	0.2476%	63					0.1658%	42	0.4134%	105	0.0000%	0
Humpback whale	1,107	WNP	0.5783%	7							0.5783%	7	0.0000%	0
Odontocetes														
Blainville's beaked	8,032	WNP	0.0609%	6					0.0397%	4	0.1006%	10	0.0000%	0
Common bottlenose dolphin	168,791	WNP	0.0673%	115					0.0653%	111	0.1326%	226	0.0000%	0
Cuvier's beaked whale	90,725	WNP	0.0583%	54					0.0021%	2	0.0604%	56	0.0000%	0
False killer whale	16,668	WNP	0.1483%	26					0.1366%	23	0.2849%	49	0.0000%	0
Fraser's dolphin	220,789	WNP	0.0272%	61					0.0252%	56	0.0524%	117	0.0000%	0
Gingko-toothed beaked whale	22,799	NP	0.0215%	6					0.0140%	4	0.0355%	10	0.0000%	0
Killer whale	12,256	WNP	0.0063%	2					0.0058%	1	0.0121%	3	0.0000%	0
Kogia spp.	350,553	WNP	0.0093%	33					0.0042%	15	0.0135%	48	0.0000%	0
Long-beaked common dolphin	279,182	WNP	0.3536%	988					0.2901%	810	0.6437%	1,798	0.0000%	0
Longman's beaked whale	4,571	WNP	0.0535%	4					0.0349%	2	0.0884%	6	0.0000%	0
Melon-headed whale	36,770	WNP	0.0992%	38					0.0914%	34	0.1906%	72	0.0000%	0
Pantropical spotted dolphin	438,064	WNP	0.0217%	97					0.0206%	91	0.0423%	188	0.0000%	0
Pygmy killer whale	30,214	WNP	0.0592%	18					0.0545%	17	0.1137%	35	0.0000%	0
Risso's dolphin	83,289	WNP	0.1299%	109					0.1137%	95	0.2436%	204	0.0000%	0
Rough-toothed dolphin	145,729	WNP	0.0432%	64					0.0345%	51	0.0777%	115	0.0000%	0
Short-beaked common dolphin	3,286,163	WNP	0.0416%	480							0.0416%	480		
Short-finned pilot whale	53,608	WNP	0.2459%	133					0.1118%	60	0.3577%	193	0.0000%	0
Sperm whale	102,112	NP	0.0097%	11					0.0078%	8	0.0175%	19	0.0000%	0
Spinner dolphin	1,015,059	WNP	0.0006%	7					0.0005%	6	0.0011%	13	0.0000%	0
Striped dolphin	570,038	WNP	0.0401%	230					0.0189%	108	0.0590%	338	0.0000%	0
					No T-AGOS 20 Missions-Negative Activity Report		No T-AGOS 20 Missions-Negative Activity Report							

\*Bryde's whale take values includes those for Omura's whales.

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**Table 8. Post-mission quarterly and total annual estimates of the percentages of marine mammal stocks and the associated number of marine mammals affected by the six LFA sonar missions and 28.8 sonar hours transmitted by the USNS EFFECTIVE (T-AGOS 21) in the northwestern Pacific Ocean during the LOA reporting period from August 2015 to August 2016. ESA-listed marine mammals highlighted.**

Marine Mammal Species/Species Groups	Number Animals in Stock	Stock Name	120 to 180 dB SPE											≥180 dB (rms) (with Mitigation)	
			Quarter 1 (August to November)		Quarter 2 (November to February)		Quarter 3 (February to May)		Quarter 4 (May to August)		Total Annual		Total for Quarter and Annual Period		
			Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	
Mysticetes															
Blue whale	9,250	CNP			0.0015%	1						0.0015%	1	0.0000%	0
Bryde's whale*	20,501	WNP			0.0857%	10	0.1106%	13	0.0557%	7		0.2520%	30	0.0000%	0
Common minke whale	25,049	WNP "O"			0.2405%	61	0.2427%	61	0.1224%	31		0.6056%	153	0.0000%	0
Common minke whale	893	WNP "J"					3.7135%	34	1.8720%	17		5.5855%	51	0.0000%	0
Fin whale	9,250	WNP			0.0296%	3	0.0382%	4	0.0193%	2		0.0871%	9	0.0000%	0
Humpback whale	1,107	WNP			1.1010%	13						1.1010%	13	0.0000%	0
North Pacific right whale	922	WNP			0.0163%	1	0.0306%	1				0.0469%	2	0.0000%	0
Western North Pacific gray whale	140	WNP					0.0343%	1				0.0343%	1	0.0000%	0
Odontocetes															
Blainville's beaked whale	8,032	WNP			0.0390%	4	0.0664%	6	0.0335%	3		0.1389%	13	0.0000%	0
Common bottlenose dolphin	168,791	WNP			0.0773%	131						0.0773%	131	0.0000%	0
Common bottlenose dolphin	105,138	IA					0.0073%	8	0.0037%	4		0.0110%	12	0.0000%	0
Cuvier's beaked whale	90,725	WNP			0.0373%	34	0.0035%	4	0.0018%	2		0.0426%	40	0.0000%	0
Deraniyagala beaked whale	22,799	NP					0.0234%	6	0.0118%	3		0.0352%	9	0.0000%	0
False killer whale	16,668	WNP			0.1596%	27						0.1596%	27	0.0000%	0
False killer whale	9,777	IA					0.1187%	12	0.0598%	6		0.1785%	18	0.0000%	0
Fraser's dolphin	220,789	WNP			0.0249%	55	0.0363%	81	0.0183%	41		0.0795%	177	0.0000%	0
Gingko-toothed beaked whale	22,799	NP			0.0137%	4	0.0234%	6	0.0118%	3		0.0489%	13	0.0000%	0
Killer whale	12,256	WNP			0.0067%	1	0.0077%	1	0.0039%	1		0.0183%	3	0.0000%	0
Kogia spp.	350,553	WNP			0.0071%	25	0.0051%	18	0.0026%	9		0.0148%	52	0.0000%	0
Long-beaked common dolphin	279,182	WNP			0.3336%	932	0.4703%	1,313	0.2371%	662		1.0410%	2,907	0.0000%	0
Longman's beaked whale	4,571	WNP			0.0343%	2	0.0584%	3	0.0294%	2		0.1221%	7	0.0000%	0
Melon-headed whale	36,770	WNP			0.1068%	40	0.1217%	45	0.0613%	23		0.2898%	108	0.0000%	0
Pacific white-sided dolphin	931,000	WNP			0.0114%	107						0.0114%	107	0.0000%	0
Pantropical spotted dolphin	438,064	WNP			0.0276%	122	0.0387%	85	0.0195%	43		0.0858%	250	0.0000%	0
Pygmy killer whale	30,214	WNP			0.0637%	20	0.0048%	2	0.0024%	1		0.0709%	23	0.0000%	0
Risso's dolphin	83,289	WNP			0.1001%	84						0.1001%	84	0.0000%	0
Risso's dolphin	83,289	IA					0.1611%	135	0.0812%	68		0.2423%	203	0.0000%	0
Rough-toothed dolphin	145,729	WNP			0.0344%	51	0.0110%	17	0.0055%	9		0.0509%	77	0.0000%	0
Short-beaked common dolphin	3,286,163	WNP			0.0138%	452						0.0138%	452	0.0000%	0
Short-finned pilot whale	53,608	WNP			0.2315%	125	0.0286%	16	0.0144%	8		0.2745%	149	0.0000%	0
Sperm whale	102,112	NP			0.0084%	9	0.0117%	12	0.0059%	7		0.0260%	28	0.0000%	0
Spinner dolphin	1,015,059	WNP			0.0007%	8	0.0005%	6	0.0003%	3		0.0016%	17	0.0000%	0
Striped dolphin	570,038	WNP			0.0510%	291						0.0510%	291	0.0000%	0
Striped dolphin	570,038	IA					0.0063%	37	0.0032%	19		0.0095%	56	0.0000%	0
			No T-AGOS 21 Missions-Negative Activity Report												
*Bryde's whale take values are inclusive of takes for Bryde's plus Omura's whales.															

\*Bryde's whale take values are inclusive of takes for Bryde's plus Omura's whales.

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**Table 9. Post-mission quarterly and total annual estimates of the percentages of marine mammal stocks and the associated number of marine mammals affected by the one LFA sonar mission and 2.6 sonar hours transmitted by the USNS IMPECCABLE (T-AGOS 23) in the northwestern Pacific Ocean during the LOA reporting period from August 2015 to August 2016. ESA-listed marine mammals highlighted.**

Marine Mammal Species/Species Groups	Number Animals in Stock	Stock Name	120 to 180 dB SPE										≥180 dB (rms) (with Mitigation)	
			Quarter 1 (August to November)		Quarter 2 (November to February)		Quarter 3 (February to May)		Quarter 4 (May to August)		Total Annual		Total for Quarter and Annual Period	
			Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected	Percent Stock Affected	Number Animals Affected
Mysticetes														
Bryde's whale*	20,501	WNP							0.0314%	4	0.0314%	4	0.0000%	0
Common minke whale	25,049	WNP "O"							0.0664%	17	0.0664%	17	0.0000%	0
Odontocetes														
Blainville's beaked	8,032	WNP							0.0159%	2	0.0159%	2	0.0000%	0
Common bottlenose dolphin	168,791	WNP							0.0261%	45	0.0261%	45	0.0000%	0
Cuvier's beaked whale	90,725	WNP							0.0008%	1	0.0008%	1	0.0000%	0
False killer whale	16,668	WNP							0.0547%	10	0.0547%	10	0.0000%	0
Fraser's dolphin	220,789	WNP							0.0101%	23	0.0101%	23	0.0000%	0
Ginkgo-toothed beaked whale	22,799	NP							0.0056%	2	0.0056%	2	0.0000%	0
Killer whale	12,256	WNP							0.0023%	1	0.0023%	1	0.0000%	0
Kogia spp.	350,553	WNP							0.0017%	6	0.0017%	6	0.0000%	0
Long-beaked common dolphin	279,182	WNP							0.1161%	325	0.1161%	325	0.0000%	0
Longman's beaked whale	4,571	WNP							0.0140%	1	0.0140%	1	0.0000%	0
Melon-headed whale	36,770	WNP							0.0366%	14	0.0366%	14	0.0000%	0
Pantropical spotted dolphin	438,064	WNP							0.0082%	37	0.0082%	37	0.0000%	0
Pygmy killer whale	30,214	WNP							0.0218%	7	0.0218%	7	0.0000%	0
Risso's dolphin	83,289	WNP							0.0455%	38	0.0455%	38	0.0000%	0
Rough-toothed dolphin	145,729	WNP							0.0138%	21	0.0138%	21	0.0000%	0
Short-finned pilot whale	53,608	WNP							0.0448%	24	0.0448%	24	0.0000%	0
Sperm whale	102,112	NP							0.0031%	4	0.0031%	4	0.0000%	0
Spinner dolphin	1,015,059	WNP							0.0002%	3	0.0002%	3	0.0000%	0
Striped dolphin	570,038	WNP							0.0076%	44	0.0076%	44	0.0000%	0
			No T-AGOS 23 Missions—Negative Activity Report		No T-AGOS 23 Missions—Negative Activity Report		No T-AGOS 23 Missions—Negative Activity Report							

\*Bryde's whale take values includes those for Omura's whales.



## **8.2 SUMMARY OF AFFECTED MARINE MAMMAL SPECIES AND STOCKS**

The post-operational incidental harassment estimates (Tables 5 through 9) for SURTASS LFA sonar transmissions during the 2015 to 2016 annual LOA period demonstrate that 0.0 percent marine mammals from any stocks in the western North Pacific Ocean were exposed to RLs at or above 180 dB (rms) (with mitigation applied). The highest overall percentage of any marine mammal stock exposed at 120 to 180 dB from all SURTASS LFA vessel transmissions during the 13 total missions conducted over the annual LOA reporting period by all SURTASS LFA sonar vessels was estimated as 6.4% for the WNP J stock of common minke whales, which represented 59 affected common minke whales (Table 5). The post-operational estimates are, therefore, significantly below the 12% limit for any marine mammal stock under conditions of the 2015 to 2016 LOAs and the MMPA Final Rule (77 FR 50290) (NOAA, 2012). In addition, no marine mammal stranding events associated with the times and/or locations of SURTASS LFA sonar missions were reported during this annual LOA period. Last, no apparent avoidance reactions by or acute effects to threatened or endangered species were observed in response to exposure from SURTASS LFA sonar transmissions.

Since the incidental harassment of marine mammals associated with exposure to SURTASS LFA sonar transmissions that occurred during this LOA reporting period are consistent with the incidental harassment estimates predicted in the Navy's 2015 to 2016 LOAs application, the Navy's conclusion about the potential effect on marine mammal stocks from exposure to SURTASS LFA transmissions is unchanged. That is, while behavioral responses or Level B incidental harassment may occur, the incidental taking of marine mammals by the employment of SURTASS LFA sonar in the western North Pacific Ocean had a negligible impact on the affected marine mammal stocks or species of marine mammals.

## **9 SUMMARY OF MONITORING AND REPORTING FOR LOA PERIOD AUGUST 2015 TO AUGUST 2016**

### **9.1 2014 TO 2015 STATUS ON POTENTIAL RESEARCH ON THE EFFECTS OF SURTASS LFA SONAR ON BEAKED WHALES AND/OR HARBOR PORPOISES**

Following the submittal of the Scientific Advisory Group (SAG) report, the Navy twice convened the EOG, composed of Navy and NMFS personnel as well as a representative of the Marine Mammal Commission. The purpose of the EOG is to provide the Navy with: 1) independent, objective review of the SAG's findings, 2) research guidance and prioritization, and 3) final recommendations to the Navy and NMFS on research efforts to ascertain effects of exposure to SURTASS LFA sonar specifically addressing beaked whale species and harbor porpoises. The members of the EOG recommended additional lower-cost research and monitoring studies based on existing occurrence and underwater acoustic vocalization data. One of the first efforts the EOG recommended was determining if any overlap existed between the geographic locations of possible SURTASS LFA sonar operations and the geographic range of harbor porpoises, since harbor porpoises typically occur in cold-temperate and sub-arctic coastal waters. Examination of this overlap is in progress but has proven to be more geospatially complex to depict accurately the possible bathymetric extents of harbor porpoises in various global regions.

### **9.2 STRANDING INCIDENT MONITORING**

Per conditions of the LOAs and rulemaking for SURTASS LFA sonar, the Navy is responsible for systematically observing SURTASS LFA sonar operations for injured or disabled marine mammals and monitoring the principal marine mammal stranding networks and other media to correlate analysis of

any whale strandings that could potentially be associated with SURTASS LFA sonar operations. Additionally, the Navy must notify NMFS immediately, or as soon as clearance procedures allow, if an injured, stranded, or dead marine mammal is found during, shortly after, and in the vicinity of any SURTASS LFA operations or anytime an injured, stranded, or dead marine mammal is found.

No injured or disabled marine mammals were observed during any of the 13 at-sea sonar missions this annual LOA period. Monitoring of all available media and known stranding databases was conducted for strandings in the western North Pacific Ocean in which the Navy conducted LFA sonar missions during the annual period. Strandings were monitored by e-news alerts notifying the Navy and NMFS in real-time of stranding events, via social media for domestic and international stranding organizations, and by searching available stranding networks for relevant regional information. From 15 August 2015 through 14 August 2016, numerous individual marine mammal strandings were reported in or adjacent to SURTASS LFA sonar mission areas in the western North Pacific Ocean in which SURTASS LFA sonar at-sea missions were conducted. No mass strandings of marine mammals occurred anywhere near the vicinity where SURTASS LFA sonar missions were conducted. No SURTASS LFA sonar operations could be correlated spatially or temporally to any of the strandings reported in the western North Pacific during the annual reporting period from August 2015 through August 2016. No SURTASS LFA sonar operations occurred in the Hawaiian missions areas during these periods. From the commencement of SURTASS LFA sonar use in 2002 through the present, neither LFA sonar nor operation of T-AGOS vessels has been associated with any mass or individual strandings of marine mammals.

### **9.3 PASSIVE ACOUSTIC DATA**

SURTASS LFA sonar's M3 program uses the Navy's fixed and mobile passive acoustic monitoring systems to enhance the Navy's collection of long-term data on individual and population levels of acoustically active marine mammals, principally baleen whales.

#### **9.3.1 Status of M3 Marine Mammal Vocalization Data Sharing**

At present, the M3 program's data are classified, as are the data reports created by M3 analysts, due to the inclusion of sensitive national security information. In the past, however, researchers have based unclassified research and the resulting scientific papers on information from classified M3 program data or other Navy passive acoustic assets.

The Navy (OPNAV N2/N6F24) continues to assess and analyze M3 data collected from Navy passive acoustic monitoring systems and is working toward making some portion of that data, after appropriate security reviews, available to scientists with appropriate clearances and ultimately to the public. Progress has been achieved on addressing security concerns for the declassification of the results of a specific marine mammal dataset. A scientific paper has been prepared using this dataset as its basis and is in the final review stages before being submitted to a prominent, peer-reviewed scientific journal.

#### **9.3.2 Western North Pacific Gray Whale Vocalization Data**

The Navy recently authorized the release of M3 program information on the critically endangered Western North Pacific gray whale to researchers participating in discussions with the International Union for Conservation of Nature (IUCN) and the International Whaling Commission; this gray whale information is detailed herein. Little is known about the location of the Western North Pacific gray whale's breeding or calving grounds or the fall and winter distribution once the whales leave their summer foraging grounds in the Sea of Okhotsk near Sakhalin Island. The historical range of the Western North Pacific gray whale extended from Russian waters (Sea of Okhotsk and Pacific waters off

Kamchatka Peninsula) southward to the tropical waters of southeastern China, but only a part of this range appears to be occupied presently (Jefferson et al., 2015; Jones and Swartz, 2009). Some evidence suggests that Western North Pacific gray whales migrate in fall through the East China Sea into the South China, or at least as far south as Hainan Island in the Gulf of Tonkin off southeastern most China (Jones and Swartz, 2009).

In early fall 2011, a SURTASS LFA sonar vessel detected a unique acoustic signature with the passive SURTASS array during a mission in the East China Sea. The acoustic detection was recorded and analyzed by M3 program acousticians, who determined that the origin of the acoustic signature was most likely Western North Pacific gray whales. Since the original 2011 detection, the M3 program has regularly detected gray whale vocalizations in the East China Sea that are characterized by a 55 Hz frequency sweep. SURTASS LFA sonar vessels have detected these 55-Hz sweeps only in the shallow water of the East China Sea from fall through spring (i.e., September through March). The vocalization signals are further characterized as pulses of short duration (one second), often emitted in pairs or triplets, an inter-sweep interval of approximately three or four seconds, with a pattern of multiple harmonics (first harmonic very weak but the second and third harmonics typically are the strongest), and a limited detection range. Vocalizations from up to 11 individual Western North Pacific gray whales have been detected over two to three-hour periods. Normally the vocalizations have been identified from slowly moving single whales or from small groups of two to three whales as they migrate south in fall and north in spring.

### **9.4 AUGMENTING MARINE MAMMAL MONITORING WITH SURTASS PASSIVE SONAR**

In recognition of the monitoring value of the SURTASS passive towed HLA, the Navy is exploring the feasibility of coordinating with other Navy fleet assets to use the SURTASS passive sonar to augment the collection of data on marine mammal vocalizations during Navy exercises and/or as an adjunct to Navy range monitoring programs. The goal would be to determine the extent, if any, of changes in marine mammal vocalizations that could have been caused by SURTASS LFA sonar or other Navy underwater acoustic systems during the exercise. Collection of such passive acoustic data would directly contribute to our knowledge of marine mammals' occurrences and responses, but would also most importantly augment the data available from the Low Frequency Sound Scientific Research Program on the potential responses of baleen whales to LF underwater sound. Such calibrated and validated data would be valuable not only to the Navy but would also potentially be useful to inform NMFS' environmental compliance assessment of underwater LF sonar systems.

For the SURTASS passive HLA to be used in Navy exercises or as an adjunct to range monitoring programs, long-term, detailed planning and a comprehensive data collection and analysis plan would be required that would have to mesh with existing or scheduled operational planning for Navy exercises or range monitoring efforts. One fundamental challenge to using one of the SURTASS LFA sonar vessels in any Navy exercise or range monitoring effort is removal of one of these surveillance assets from its national security mission. Other challenges in using the SURTASS system for monitoring of marine mammals during Navy exercises or range monitoring include:

- Scheduling of assets: availability of a SURTASS LFA sonar vessel to participate in the exercise, time for a T-AGOS vessel to transit to and from the exercise or range location (due to the vessel's travel speed), and the time for pre- and post- exercise data collection and analysis of marine mammal vocalizations.

- Budgetary constraints: additional Navy budget allocations required for a T-AGOS ship to transit to and from the exercise location, additional time at sea for the SURTASS LFA sonar vessel to participate in the exercise including collecting data before and after the exercise for data calibration, and additional labor effort to process the collected data.
- Potential for qualified, professional marine mammal observers to be onboard the SURTASS LFA sonar vessel during the data collection efforts. This poses a challenge since there is typically little available space on the T-AGOS vessels for additional riders, and any observers would need to possess appropriate security clearances.
- Security measures: protocols would need to be developed to ensure that the marine mammal vocalization data collected onboard the SURTASS LFA sonar vessel, or any other data collected during the exercise, can be scrubbed of any potentially classified information, such that the marine mammal data can be unclassified for processing and analysis by other scientists.
- Reconciling the potential behavioral responses of marine mammals associated with SURTASS LFA sonar transmissions versus other Navy underwater sound sources (e.g., mid-frequency active sonars).
- Accounting for other variables that may cause a change in marine mammals' vocalization output; this would be a task for a scientific team made up of marine biologists, LFA sonar operators, and oceanographic experts.

Despite these challenges, the Navy is exploring and evaluating the budgetary and logistical constraints to make this goal achievable, although it is likely to be several annual cycles before such a goal can be achieved due to the nature of forward budgetary planning.

### 9.5 AMBIENT NOISE DATA

As a condition of the annual LOAs, the Navy was to continue collecting ambient noise data and explore the feasibility of declassifying and archiving the ambient noise data for incorporation into appropriate efforts that are assessing ocean-noise budgets. The Navy acknowledges the value of the ambient noise data it routinely collects and continues to explore and discuss the feasibility of declassifying portions of these data after all related security concerns have been resolved. SURTASS LFA sonar's M3 program is working to compile information on the ambient noise data that have been collected from various systems as a starting point for further discussions on data dissemination, either at a classified or unclassified level.

### 9.6 ADAPTIVE MANAGEMENT

Since the understanding of the potential effects of SURTASS LFA sonar on marine mammals is continuing to evolve, the MMPA Final Rule (NOAA, 2012) provided the adaptive management mechanism by which NMFS can modify or augment existing mitigation or monitoring measures, after consultation with the Navy, if doing so will have a reasonable likelihood of more effectively accomplishing the mitigation and monitoring objectives (50 CFR 218.241). During the 2015 to 2016 LOA reporting period, the Navy and NMFS determined no adaptive management meetings were needed, since the Navy and NMFS met numerous times during the preparation of the Navy's DSEIS/SOEIS (DoN, 2016), for which NMFS is a cooperating agency. Those meetings included discussion of potential SEIS/SOEIS alternatives, OBIAs, and the acoustic thresholds for impact analysis. The Navy and NMFS are currently exploring the possibility of conducting an adaptive management meeting during the winter of 2016 to 2017.

## **10 MITIGATION EFFECTIVENESS**

LOA Condition 13(f)(iii) requires an analysis of the effectiveness of the mitigation measures associated with the authorized operation of SURTASS LFA sonar with recommendations for improvement, where applicable. The implementation of the required mitigation measures to minimize, to the greatest extent practicable, adverse impacts to marine mammals proved to be very effective during the 2015 to 2016 LOA period. During SURTASS LFA sonar transmissions in the 2015 to 2016 reporting period, the radial distance of the LFA mitigation zone or the distance to the 180-dB isopleth, was typically about 1,000 yd (0.9 km), which in combination with the 1094 yd (1-km) required buffer zone, resulted in an approximate 2,094 yd (1.9 km) monitoring radius around the LFA sonar vessels and transmitting LFA sonar system. This distance did vary nominally throughout the annual period with the varying oceanographic and environmental conditions of the mission areas in which LFA sonar operations were conducted.

Throughout the 13 LFA sonar missions conducted in 2015 to 2016, nine visual detections of whales, dolphins, and a black fin unidentifiable to species resulted from efforts of the civilian lookouts onboard the SURTASS LFA sonar vessels. The MILCREW and system engineers monitored the SURTASS passive sonar system for marine mammal vocalizations. Three marine mammal vocalizations were detected on passive sonar within the mitigation/buffer zones close to the LFA sonar system, but just as importantly, the SURTASS passive system detected 47 marine mammal vocalizations beyond the mitigation/buffer zone, with all but one of the vocalizations being identified as Bryde's whales, with the remainder identified as a possible blue whale. This large number of passive acoustic detections and identification to species of the marine mammal vocalizations captured by the SURTASS passive system demonstrated the monitoring capability of the SURTASS system to detect the near and far presence of marine mammals, and more importantly, added valuable distributional information about Bryde's whales occurrence to knowledge of this species in the western North Pacific Ocean. The HF/M3 sonar systems were operated continuously during LFA sonar transmissions in accordance with MMPA Final Rule requirements and LOA Conditions 8(e) and 9(c) (Appendix A). Twenty-eight active acoustic (HF/M3 sonar) detections were reported during the 13 missions of the four SURTASS LFA sonar vessels during the 2015 to 2016 LOA period. Per the mitigation protocol, and in conjunction with the nine visual, three passive acoustic, and 28 active acoustic (HF/M3) detections resulted in 29 suspensions or delays of LFA sonar transmissions during the 13 LFA sonar missions.

The HF/M3 sonar system proved to be the most effective of the mitigation monitoring measures to detect possible marine animals in proximity to the transmitting LFA sonar array. The effectiveness of the HF/M3 sonar system to monitor and detect marine mammals has been described in previous Navy documentation (DoN, 2001; Ellison and Stein (1999/2001)). No new information is available to alter the conclusions about the effectiveness of the HF/M3 sonar system to detect marine mammals. The Navy's testing and analysis of the HF/M3 sonar system's capabilities indicated that the system substantially increased the probability of detecting a marine mammal within the LFA mitigation zone and provides a superior monitoring capability, especially for medium- to large-sized marine mammals to a distance of 1.1 to 1.3 nmi (2 to 2.5 km) from the system (DoN, 2001). Additionally, qualitative and quantitative assessments of the HF/M3 system's ability to detect marine mammals of various sizes were verified in 170 hr of at-sea testing. The sea testing of the HF/M3 sonar system demonstrated that several detections of a marine mammal by the HF/M3 sonar system would occur before a marine mammal entered the LFA mitigation zone (DoN, 2001). Ellison and Stein (2001) reported that the detection

probability would be near 100% for a medium-sized (~33 ft [10 m]) marine mammal swimming towards the system.

During the LOA reporting period of 15 August 2015 through 14 August 2016, all mitigation measure and monitoring required by the LOAs, MMPA Final Rule, and Navy directives were strictly adhered to and conducted in accordance with the protocols specified in those requirements. In examining the results of the mitigation monitoring procedures during this annual LOA reporting period, in addition to the results of the previous fourteen years of SURTASS LFA sonar operations, the Navy has concluded that the mitigation measures/mitigation monitoring have been implemented properly, and accordingly, have successfully minimized the potential adverse effects of SURTASS LFA sonar to marine mammals to greatest extent practicable. This conclusion is supported by documentation that no known mortality or injury to marine mammals has occurred over this period. The Navy will continue its commitment to training the crews of the SURTASS LFA sonar vessels in the proper and effective implementation of the mitigation protocols.

### 11 ASSESSMENT OF LONG-TERM EFFECTS AND ESTIMATED CUMULATIVE IMPACTS

The Navy's conclusion that its operation of SURTASS LFA sonar had a negligible impact on affected marine mammal stocks or species of marine mammals in the western North Pacific Ocean during the 2015 to 2016 LOA effective period was consistent with previous assessments of its impacts on regional stocks of marine mammals. Likewise, the Navy's assessment of the long-term effects and estimated cumulative impacts from employment of SURTASS LFA sonar has not changed from previous conclusions. That is, cumulative impacts from the operation of up to four SURTASS LFA sonar systems are not a reasonably foreseeable significant adverse impact on marine mammals.

The greatest cumulative impact associated with the employment of SURTASS LFA sonar in combination with other known current or planned maritime activities is the increase in the ambient noise environment, whether on a transient basis from sonar and seismic sound transmissions or a more persistent basis from ship traffic. The operation of four SURTASS LFA sonar systems do not add appreciably to the underwater ambient noise environment in the 100 to 500 Hz frequency band to which marine mammal stocks are exposed, and the impact on the overall noise levels in the ocean is minimal. This is because SURTASS LFA sonar systems are active or transmitting for such a small amount of overall time (i.e., no more than a 20 percent duty cycle, which means that the sonar is off and not transmitting for 80 percent of the time) during a mission and for such a small percentage of the annual period. The Navy was permitted a total of 1,728 hr of LFA sonar transmit time for all four SURTASS LFA sonar vessels per annual LOA period but transmitted fewer hours for all vessels during the 2015 to 2016 annual period. In most of the ocean, the 10 to 500 Hz portion of the ambient noise spectrum is dominated by anthropogenic noise sources, particularly from shipping and seismic exploration (airguns). Commercial shipping is the most common source of LF noise in the ocean and its impact on the ambient noise environment is basin-wide (Hildebrand, 2009). Although seismic exploration is not extensive in the western North Pacific Ocean, commercial maritime traffic is.

Although the total number of sea-going commercial ships around the world is difficult to quantify, both the carrying capacity and number of ships has increased significantly over the last several decades. Tournadre (2014) estimated that between 1992 and 2002, maritime ship traffic increased by 60 percent, averaging about 6 percent per year, with the largest increases in maritime traffic occurring in the Indian Ocean and South China and East China seas. If the Navy were to operate its SURTASS LFA sonar systems at the fully permitted level of 1,728 hr per year and at an 20 percent duty cycle, the contribution to the



LF ambient noise environment from the operation of LFA sonar would be comparable to the noise generated by approximately 22 million ship-days per year by the world's commercial shipping industry (Hildebrand, 2005). Considering the total acoustic energy output of individual sources in calculating an annual noise energy budget in energy units of Joules, commercial supertankers were estimated to contribute  $3.7 \times 10^{12}$  Joules of acoustic energy into the marine environment each year (Joules/year [yr]); seismic airguns were estimated to contribute  $3.9 \times 10^{13}$  Joules/yr; mid-frequency military sonar was estimated to contribute  $2.6 \times 10^{13}$  Joules/yr; and each LFA sonar vessel operating at 432 hr/yr was estimated to contribute  $1.7 \times 10^{11}$  Joules/yr (Hildebrand, 2005). The percentage of the total anthropogenic acoustic energy budget added by each LFA source is estimated to be 0.25 percent when these anthropogenic sources are considered together (Hildebrand, 2005). Therefore, within the existing ocean environment, the potential for accumulation of noise due to the intermittent operation of SURTASS LFA sonar is considered negligible (DoN, 2012). Further, the potential impacts associated with the combined LF sound generated by LFA sonar, seismic exploration, and shipping are most likely to be behavioral in nature, likely to be temporary effects, comparatively short in duration, relatively infrequent, and not of the type or severity that would be expected to be additive for the small portion of the marine mammal stocks and species likely to be exposed either annually or in the reasonably foreseeable future.

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**APPENDIX A:**

**EXEMPLAR<sup>2</sup> LETTER OF AUTHORIZATION (LOA) GOVERNING THE  
TAKING OF MARINE MAMMALS INCIDENTAL TO THE U.S. NAVY'S  
OPERATION OF SURVEILLANCE TOWED ARRAY SENSOR SYSTEM LOW  
FREQUENCY ACTIVE (SURTASS LFA) SONAR ONBOARD THE USNS  
VICTORIOUS (T-AGOS 19), AUGUST 15, 2015 THROUGH AUGUST 14,  
2016**

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<sup>2</sup> Only the LOA for the USNS VICTORIOUS (T-AGOS 19) is included herein. The LOAs for the USNS ABLE, USNS EFFECTIVE, and USNS IMPECCABLE are exactly the same as the LOA for the VICTORIOUS, with only the ship's names changing in each LOA.

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UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
Silver Spring, MD 20910

DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NATIONAL MARINE FISHERIES SERVICE

LETTER OF AUTHORIZATION

The Chief of Naval Operations, Department of the Navy, 2000 Navy Pentagon, Washington, D.C. 20350-2000, and individuals operating under his authority (*i.e.*, Navy), are authorized to take marine mammals incidental to Navy operation of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar in accordance with 50 CFR Part 218, Subpart X—Taking of Marine Mammals Incidental to Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar subject to the provisions of the Marine Mammal Protection Act (16 U.S.C. 1361 *et seq.*; MMPA) and the following Conditions:

1. This Authorization is valid for the period August 15, 2015, through August 14, 2016.
2. This Authorization is valid only for the unintentional taking of the species of marine mammals identified in 50 CFR § 218.230(b) and Condition 5 of this Authorization governing the taking of these animals incidental to the activity specified in Condition 3. This authorization shall be valid only for takes consistent with the provisions in 50 CFR § 218.232 and the terms of this Authorization as specified herein.
3. This Authorization is valid only for activities associated with the routine training, testing, and military operations of SURTASS LFA sonar onboard the United States Naval Ship (USNS) VICTORIOUS (T-AGOS 19). The sound signals transmitted by the SURTASS LFA sonar source must be between 100 and 500 Hertz (Hz) with a source level for each of the 18 projectors of no more than 215 decibels (dB) re: 1 micro Pascal ( $\mu\text{Pa}$ ) at 1 meter (m) (root mean square (rms) and a maximum duty cycle of 20 percent.
4. This Authorization, combined with Authorizations for the USNS ABLE (T-AGOS 20), USNS EFFECTIVE (T-AGOS 21), and USNS IMPECCABLE (T-AGOS 23), is valid for an estimated total of 20 nominal active sonar missions among the four SURTASS LFA sonar vessels (or equivalent number of shorter missions but shall not exceed a total of 432 hours of sonar transmit time per vessel during the period of this Authorization's effectiveness) within the following areas:
  - (a) Up to 16 nominal missions in the northwestern Pacific Ocean, which includes the following mission areas: east of Japan; the north Philippine Sea; the west Philippine Sea; offshore Guam; the Sea of Japan; the East China Sea; the South China Sea; and offshore Japan (25° to 40° N and 10° to 25° N).
  - (b) Up to 4 nominal missions in the north-central Pacific Ocean that includes the Hawaii North and Hawaii South mission areas.



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## SPECIES AUTHORIZED AND LEVEL OF TAKE

5. The incidental take of marine mammals under the activity identified in Conditions 3 and 4 of this Authorization is limited to the following species:
  - (a) **Mysticetes:** blue whale (*Balaenoptera musculus*), Bryde's whale (*Balaenoptera edeni*), fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), common minke whale (*Balaenoptera acutorostrata*), north Pacific right whale (*Eubalena japonica*), sei whale (*Balaenoptera borealis*), and Western North Pacific gray whale (*Eschrichtius robustus*).
  - (b) **Odontocetes:** Baird's beaked whale (*Berardius bairdii*), Blainville's beaked whale (*Mesoplodon densirostris*), common bottlenose dolphin (*Tursiops truncatus*), Cuvier's beaked whale (*Ziphius cavirostris*), Dall's porpoise (*Phocoenoides dalli*), dwarf sperm (*Kogia simus*), false killer whale (*Pseudorca crassidens*), Fraser's dolphin (*Lagenodelphis hosei*), ginkgo-toothed beaked whale (*Mesoplodon ginkgodens*), Hubbs' beaked whale (*Mesoplodon carhubbsi*), killer whale (*Orca orcinus*), *Kogia* spp., Longman's beaked whale (*Indopacetus pacificus*), melon-headed whale (*Peponocephala electra*), *Mesoplodon* spp., Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), pantropical spotted dolphin (*Stenella attenuata*), pygmy killer whale (*Feresa attenuata*), pygmy sperm whales (*K. breviceps*), Risso's dolphin (*Grampus griseus*), rough-toothed dolphin (*Steno bredanensis*), short-beaked common dolphin (*Delphinus delphis*), short-finned pilot whale (*Globicephala macrorhynchus*), sperm whale (*Physeter macrocephalus*), spinner dolphin (*Stenella longirostris*), Stejneger's beaked whale (*Mesoplodon stejnegeri*), and striped dolphin (*Stenella coeruleoalba*).
  - (c) **Pinnipeds:** Hawaiian monk seal (*Monachus shauinslandi*) and spotted seal (*Phoca largha*).
6. The taking of marine mammals by the Holder of this Authorization is limited to the incidental taking of marine mammal species identified in Condition 5 by Level A and Level B harassment (as defined in the MMPA and 50 CFR § 216.3) within those areas authorized under Condition 4. The take, by Level B harassment, that occurs during the year covered by this Authorization may not exceed 12 percent of any marine mammal stock listed in Condition 5 (see Condition 8j and Tables 2 – 12 of Attachment 2). The take by Level A harassment may not exceed the numbers specified for each category in Table 1 of Attachment 2 for the total effective period of the regulations at 50 CFR Part 218, Subpart X.
7. Taking of marine mammal species not listed under Condition 5 by harassment, injury, or mortality or the taking by mortality of any marine mammal species listed under Condition 5 is prohibited.

## MITIGATION

8. The Holder of this Authorization, and any individuals operating under his authority, must conduct the activity identified in 50 CFR § 218.230 and Condition 3 of this Authorization in a manner that minimizes, to the greatest extent practicable, adverse impacts on marine mammals, their habitats, and the availability of marine mammals for subsistence uses.

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When conducting operations identified in 50 CFR § 218.230, the following mitigation measures must be implemented:

- (a) The Holder of this Authorization, and any individuals operating under his authority, must not transmit the SURTASS LFA sonar signal at a frequency greater than 500 Hz.
- (b) Through mitigation described under 50 CFR § 218.234 and Condition 9 (Mitigation Monitoring) of this Authorization, the Holder of this Authorization and any individuals operating under his authority must ensure, to the greatest extent practicable, that no marine mammal is subjected to a sound pressure level of 180 dB re: 1  $\mu$ Pa (rms) or greater.
- (c) **LFA Sonar Mitigation Zone:** Prior to commencing and during SURTASS LFA sonar transmissions, the Holder of this Authorization will use near real-time environmental data and underwater acoustic prediction models to determine the propagation of the SURTASS LFA sonar signals in the mission area. The Holder must determine the distance from the SURTASS LFA sonar source to the 180-dB re: 1  $\mu$ Pa (rms) isopleth (*i.e.*, the LFA sonar mitigation zone) to comply with Condition 8(b).
  - (i) The Holder will update these sound field estimates every 12 hours or more frequently depending upon changing meteorological or oceanographic conditions.
- (d) **Additional 1-Kilometer (km) Buffer Zone:** The Holder of this Authorization will establish a 1-km buffer zone around the LFA sonar mitigation zone.
- (e) **Ramp-Up Procedures for the HF/M3 System:** The Holder of this Letter of Authorization and any individuals operating under his authority, will ramp up the High Frequency / Marine Mammal Monitoring (HF/M3) active sonar referenced in 50 CFR § 218.234 from a power level beginning at a maximum source sound pressure level of 180 dB re: 1  $\mu$ Pa @ 1 m (rms) in 10-dB increments to operating levels over a period of no less than five minutes:
  - (i) At least 30 minutes prior to any SURTASS LFA sonar transmission;
  - (ii) Prior to any SURTASS LFA sonar calibrations or testing that are not part of regular SURTASS LFA sonar transmissions described in 50 CFR § 218.230; and
  - (iii) Anytime after individuals have powered down the HF/M3 active sonar source for more than two minutes.

Once HF/M3 operators detect a marine mammal, they will not increase the HF/M3 active sonar system's sound pressure level. Resumption of the ramp-up of HF/M3 sonar system would not occur until marine mammals are no longer detected by the HF/M3 active sonar system, passive acoustic monitoring, or visual monitoring described in Condition 9.
- (f) **Suspension/Delay for SURTASS LFA Sonar Transmissions:** If the Holder of this Authorization, and any individuals operating under his authority, detects a marine mammal through monitoring required under 50 CFR § 218.235 and Condition 9 within either the

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LFA sonar mitigation zone or the 1-km buffer zone, the Holder will immediately suspend or delay SURTASS LFA sonar transmissions.

- (g) **Resumption of SURTASS LFA Sonar Transmissions:** The Holder of this Authorization and any individuals operating under his authority may resume/commence SURTASS LFA sonar transmissions 15 minutes after:
- (i) All marine mammals have left the area of the LFA sonar mitigation zone and the 1-km buffer zone; and/or
  - (ii) There is no further detection of any marine mammal within the LFA sonar mitigation zone plus the 1-km buffer zone as determined by the passive or active acoustic or visual monitoring protocols described in 50 CFR § 218.235 and Condition 9.
- (h) **Geographic Restrictions:** The Holder of this Authorization and any individuals operating under his authority will not operate SURTASS LFA sonar such that the SURTASS LFA sonar sound field exceeds 180 dB re: 1  $\mu$ Pa (rms):
- (i) At a distance of less than or equal to 22 km (14 miles (mi); 12 nautical miles (nmi)) from any coastline, including offshore islands.
  - (ii) At a distance of less than 1 km (0.62 mi; 0.54 nmi) seaward of the outer perimeter of any Offshore Biologically Important Area (OBIA) for marine mammals designated in 50 CFR § 218.234(f)(2) and described in Condition 8(h)(iii) during the period specified.
  - (iii) The OBIA's for marine mammals (with specified periods of effectiveness) for SURTASS LFA sonar routine training, testing, and military operations are:

OBIA	Period of Effectiveness
Georges Bank	Year-round
Roseway Basin Right Whale Conservation Area	June through December, annually
Great South Channel, U.S. Gulf of Maine, and Stellwagen Bank National Marine Sanctuary (NMS)	January 1 to November 14, annually
Southeastern U.S. Right Whale Seasonal Habitat	November 15 to April 15, annually
North Pacific Right Whale Critical Habitat	March through August, annually
Silver Bank and Navidad Bank	December through April, annually
Coastal waters of Gabon, Congo, and Equatorial Guinea	June through October, annually
Patagonian Shelf Break	Year-round
Southern Right Whale Seasonal Habitat	May through December, annually
Central California NMSs	June through November, annually
Antarctic Convergence Zone	October through March, annually
Piltun and Chayvo offshore feeding grounds in the Sea of Okhotsk	June through November, annually

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Coastal waters off Madagascar	July through September, annually for humpback whale breeding and November through December, annually for migrating blue whales.
Madagascar Plateau, Madagascar Ridge, and Walters Shoal	November through December, annually
Ligurian-Corsican-Provencal Basin and Western Pelagos Sanctuary in the Mediterranean Sea	July to August, annually
Hawaiian Islands Humpback Whale NMS and Penguin Bank	November through April, annually
Costa Rica Dome	Year-round
Great Barrier Reef Between 16° S and 21° S	May through September, annually
Bonney Upwelling on the southern coast of Australia	December through May, annually
Northern Bay of Bengal and Head of Swatch-of-No-Ground	Year-round
Olympic Coast NMS and Prairie, Barkley Canyon, and Nitnat Canyon	Olympic NMS: December, January, March, and May, annually  The Prairie, Barkley Canyon, and Nitnat Canyon: June through September, annually
Abrolhos Bank	August through November

Note: See § 218.234(f)(2) and Attachment 1 for geographic coordinate information.

- (i) **Operational Exception for SURTASS LFA Sound Field in OBIA:** During military operations, SURTASS LFA sonar transmissions may exceed 180 dB re: 1  $\mu$ Pa (rms) within the boundaries of an OBIA, including operating within an OBIA, when the Holder of this Authorization determines that it is: 1) operationally necessary to continue tracking an existing underwater contact; or 2) operationally necessary to detect a new underwater contact within the OBIA. This exception does not apply to routine training and testing with the SURTASS LFA sonar systems.
- (j) **Mission Planning:** The Holder of this Authorization must maintain a running calculation/estimation of takes of each species and stocks over the effective period of these regulations. The Holder of this Authorization will plan all SURTASS LFA sonar missions to ensure that no more than 12 percent of any marine mammal stock listed in 50 CFR § 218.230(b)(1) through (3) would be taken by Level B harassment annually. This annual per-stock cap of 12 percent applies regardless of the number of SURTASS LFA sonar vessels operating. The Holder of this Authorization must coordinate with the Holder of the Letters of Authorization issued to the USNS ABLE, USNS EFFECTIVE, and the USNS IMPECCABLE, to ensure that this condition is met for all vessels combined.

#### MITIGATION MONITORING

9. The Holder of this Authorization, and any individuals operating under his authority, must:

- (a) Perform the following for visual mitigation monitoring:

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- (i) Marine mammal biologists qualified in conducting at-sea marine mammal visual monitoring from surface vessels will train and qualify designated ship personnel as lookouts to conduct at-sea visual monitoring.
    - (ii) Marine mammal biologists will train the lookouts in the most effective means to ensure quick and effective communication within the ship's command structure to facilitate implementation of protective measures if they observe marine mammals.
    - (iii) Conduct visual monitoring from the ship's bridge during daylight hours (30 minutes before sunrise until 30 minutes after sunset) during operations that employ SURTASS LFA sonar in the active mode. Maintain a topside watch with standard binoculars (7x) and with the naked eye.
  - (b) Perform the following for passive acoustic mitigation monitoring:
    - (i) Use the low frequency, passive SURTASS sonar system to listen for vocalizing marine mammals.
  - (c) Perform the following for active acoustic mitigation monitoring:
    - (i) Use the HF/M3 active sonar to locate and track marine mammals in relation to the SURTASS LFA sonar vessel and the sound field produced by the SURTASS LFA sonar source array, subject to the ramp-up requirements in § 218.234(e) and Condition 8(e).
10. Mitigation monitoring under Conditions 9(a), (b), and (c) must:
- (a) Commence at least 30 minutes before the first SURTASS LFA sonar transmission (30 minutes before sunrise for visual monitoring);
  - (b) Continue between sonar transmissions (pings); and
  - (c) Continue either at least 15 minutes after completion of SURTASS LFA sonar transmission operations (30 minutes after sunset for visual monitoring) or if marine mammals are showing abnormal behavioral patterns, for a period of time until behavior patterns return to normal or conditions prevent continued observations.

**MONITORING**

11. The Holder of this Authorization and any individuals operating under his authority for activities described in 50 CFR § 218.230 must:
- (a) Cooperate with NMFS and any other federal agency for monitoring the impacts of the activity on marine mammals; and
  - (b) Designate qualified on-site individuals to conduct the mitigation, monitoring, and reporting activities specified in this Letter of Authorization.
12. The Holder of this Authorization and any individuals operating under his authority will conduct all monitoring required under the Letter of Authorization to increase knowledge of the affected marine mammal species. The Holder of this Authorization must:

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- (a) Consider recommendations on the different types of monitoring/research that could increase the understanding of the potential effects of SURTASS LFA sonar transmissions on beaked whales and/or harbor porpoises.
- (b) Continue to assess data from the Navy Marine Mammal Monitoring (M3) program and work toward making some portion of that data, after appropriate security reviews, available to scientists with appropriate clearances. Any portions of the analyses conducted by these scientists based on these data that are determined to be unclassified after appropriate security reviews should be made publicly available.
- (c) Continue to explore the feasibility of coordinating with other Navy fleet assets and/or range monitoring programs to include the use of SURTASS passive sonar (towed horizontal line array) to augment the collection of marine mammal vocalizations before, during, and after designated exercises.
- (d) Continue to collect ambient noise data and explore the feasibility of declassifying and archiving the ambient noise data for incorporation into appropriate ocean noise research efforts.

**REPORTING**

13. The Holder of this Authorization and any individuals operating under his authority must:


- (a) Draft a plan of action outlining a strategy for implementing recommendations on beaked whales and/or harbor porpoise research; or describe in writing why such research is not feasible/or is unlikely to increase the understanding of the potential effects of SURTASS LFA sonar transmissions on beaked whales and/or harbor porpoises, to be followed by a meeting with NMFS to discuss any other potential options.
- (b) Provide a status update to NMFS when the Holder submits the next annual application for Authorizations on efforts to assess the data collected by the Marine Mammal Monitoring (M3) program and progress toward making some portion of that data, after appropriate security reviews, available to scientists with appropriate clearances.
- (c) Systematically observe SURTASS LFA sonar operations for injured or disabled marine mammals and monitor the principal marine mammal stranding networks and other media to correlate analysis of any whale strandings that could potentially be associated with SURTASS LFA sonar operations. The Holder and any individuals operating under his authority shall:
  - (i) Ensure that NMFS is notified immediately, or as soon as clearance procedures allow, if an injured, stranded, or dead marine mammal is observed during or shortly after and in the vicinity of any SURTASS LFA sonar operations. The Holder will report the incident to the Chief, Permits and Conservation Division, Office of Protected Resources, NMFS, at 301-427-8401 and/or by email to Jolie.Harrison@noaa.gov and Jeannine.Cody@noaa.gov.
  - (ii) Provide NMFS with species or description of the animal(s), the condition of the animal(s) (including carcass condition if the animal is dead), location, time of first discovery, observed behaviors (if alive), and photo or video (if available).

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- (iii) In the event that an injured, stranded, or dead marine mammal is observed by the Holder and any individuals operating under his authority not in conjunction with SURTASS LFA sonar operations, the Holder and any individuals operating under his authority, will report the same information to NMFS as listed above as soon as operationally feasible and clearance procedures allow.
- (d) In the event of a ship strike by the SURTASS LFA sonar vessel, at any time or place, the Holder and any individuals operating under his authority, must:
  - (i) Immediately, or as soon as clearance procedures allow, report to NMFS the species identification (if known), the size and length of the animal, location (lat/long) of the animal (or the strike if the animal has disappeared), whether the animal is alive or dead (or unknown), including an estimate of its injury status if alive (injured but alive, injured and moving, unknown, etc.).
  - (ii) Report the incident to the Chief, Permits and Conservation Division, Office of Protected Resources, NMFS, at 301-427-8401 and/or by email to Jolie.Harrison@noaa.gov and Jeannine.Cody@noaa.gov.
  - (iii) Report as soon as feasible to the NMFS the vessel's name, class/type, and length, as well as operational status, speed and vessel heading.
  - (iv) Provide NMFS a photo or video of the struck animal, if equipment is available.
- (e) Submit classified and unclassified quarterly mission reports to the Director, Office of Protected Resources, NMFS no later than 30 days after the end of each quarter, beginning on the date of effectiveness of a Letter of Authorization. Each quarterly mission report will include summaries of all active-mode sonar missions completed during that quarter. At a minimum, each classified mission report must contain the following information:
  - (i) Dates, times, and location of each vessel during each mission.
  - (ii) Information on sonar transmissions during each mission and records of any delays or suspensions.
  - (iii) Location of the SURTASS LFA sonar mitigation and buffer zones in relation to the LFA sonar array.
  - (iv) Marine mammal observations including animal type and/or species, number of animals sighted, date and time of observations, type of detection (visual, passive acoustic, HF/M3 sonar), bearing and range from vessel, abnormal behavior (if any), and remarks/narrative (as necessary).
  - (v) The report will include the Navy's estimates of the percentages of marine mammal stocks affected (both for the quarter and cumulatively for the year covered by the Authorization) by SURTASS LFA sonar operations (both within and outside the LFA sonar mitigation and buffer zones), using predictive modeling based on mission locations, dates/times of operations, system characteristics, LFA sonar transmission durations, oceanographic environmental conditions, and animal demographics.

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- (vi) If no SURTASS LFA sonar missions are completed during a quarter, a report of negative activity will be provided.
- (f) Submit an annual, unclassified report to the Director, Office of Protected Resources, NMFS, no later than 45 days after expiration of this Authorization. At a minimum, the annual report will contain the following:
  - (i) An unclassified summary of the year's quarterly reports.
  - (ii) The Navy's estimates of the percentages of marine mammal stocks affected by SURTASS LFA sonar operations (both within and outside the LFA sonar mitigation and buffer zones), using predictive modeling based on mission locations, dates/times of operations, system characteristics, LFA sonar transmission durations, oceanographic environmental conditions, and animal demographics.
  - (iii) An analysis of the effectiveness of the mitigation measures with recommendations for improvements, where applicable.
  - (iv) An assessment of any long-term effects from SURTASS LFA sonar operations.
  - (v) Any discernible or estimated cumulative impacts from SURTASS LFA sonar operations.
- 14. The Holder of this Authorization must comply with the Terms and Conditions of the Incidental Take Statement corresponding to the Endangered Species Act Biological Opinion issued to the Navy and the National Marine Fisheries Service's Office of Protected Resources, Permits and Conservation Division.
- 15. A copy of this Authorization must be in the possession of the Officer in Charge of the Military Crew (MILCREW) onboard the USNS VICTORIOUS to conduct the activity under the authority of this Letter of Authorization and Incidental Take Statement.

  
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Donna S. Wieting, Director  
Office of Protected Resources  
National Marine Fisheries Service

AUG 04 2015

\_\_\_\_\_  
Date



Attachment 1 – Table 1. OBIA Coordinates and Periods of Effectiveness.

Name of Area	Location of Area	Months of Importance/ Periods of Effectiveness
Georges Bank	40°00'N, 72°30'W 39°37'N, 72°09'W 39°54'N, 71°43'W 40°02'N, 71°20'W 40°08'N, 71°01'W 40°04'N, 70°44'W 40°00'N, 69°24'W 40°16'N, 68°27'W 40°34'N, 67°13'W 41°00'N, 66°24'W 41°52'N, 65°47'W 42°20'N, 66°06'W 42°18'N, 67°23'W	Year-round
Roseway Basin Right Whale Conservation Area	43°05'N, 65°40'W 43°05'N, 65°03'W 42°45'N, 65°40'W 42°45'N, 65°03'W	June through December, annually
Great South Channel, U.S. Gulf of Maine, and Stellwagen Bank National Marine Sanctuary (NMS)	41°00.000'N, 69°05.000'W 42°09.000'N, 67°08.400'W 42°53.436'N, 67°43.873'W 44°12.541'N, 67°16.847'W 44°14.911'N, 67°08.936'W 44°21.538'N, 67°03.663'W 44°26.736'N, 67°09.596'W 44°16.805'N, 67°27.394'W 44°11.118'N, 67°56.398'W 43°59.240'N, 68°08.263'W 43°36.800'N, 68°46.496'W 43°33.925'N, 69°19.455'W 43°32.008'N, 69°44.504'W 43°21.922'N, 70°06.257'W 43°04.084'N, 70°21.418'W 42°51.982'N, 70°31.965'W 42°45.187'N, 70°23.396'W 42°39.068'N, 70°30.188'W 42°32.892'N, 70°35.873'W 42°07.748'N, 70°28.257'W 42°05.592'N, 70°02.136'W 42°03.664'N, 69°44.000'W 41°40.000'N, 69°45.000'W	January 1 to November 14, annually
Southeastern U.S. Right Whale Seasonal Habitat	Critical Habitat Boundaries are coastal waters between 31°15' N and 30°15'N from the coast out 15 nautical miles (nmi); and the coastal waters between 30°15' N and 28°00'N from the coast out 5 nmi (50 CFR §226.13(c)).  OBIA Boundaries are coastal waters between 31°15'N and 30°15'N from 12 to 15 nmi.	November 15 to April 15, annually
North Pacific Right Whale Critical Habitat	57°03'N, 153°00'W 57°18'N, 151°30'W 57°00'N, 151°30'W 56°45'N, 153°00'W (50 CFR §226.215)	March through August, annually



# ANNUAL REPORT NO. 4: NAVY OPERATION OF SURTASS LFA SONAR 2015 TO 2016

Name of Area	Location of Area	Months of Importance/ Periods of Effectiveness
Silver Bank and Navidad Bank	<p>Silver Bank:  20° 38.899'N, 69° 23.640'W  20° 55.706'N, 69° 57.984'W  20° 25.221'N, 70° 00.387'W  20° 12.833'N, 69° 40.604'W  20° 13.918'N, 69° 31.518'W  20° 28.680'N, 69° 31.900'W</p> <p>Navidad Bank:  20° 15.596'N, 68° 47.967'W  20° 11.971'N, 68° 54.810'W  19° 52.514'N, 69° 00.443'W  19° 54.957'N, 68° 51.430'W  19° 51.513'N, 68° 41.399'W</p>	December through April, annually
Coastal waters of Gabon, Congo and Equatorial Guinea	An exclusion zone following the 500-m isobath extending from 3°31.055'N, 9°12.226'E in the north offshore of Malabo southward to 8°57.470'S, 12°55.873'E offshore of Luanda.	June through October, annually
Patagonian Shelf Break	Between 200- and 2,000-m isobaths and the following latitudes: 35°00'S, 39°00'S, 40°40'S, 42°30'S, 46°00'S, 48°50'S.	Year-round
Southern Right Whale Seasonal Habitat	Coastal waters between 42°00'S and 43°00'S from 12 to 15 nmi including the enclosed bays of Golfo Nuevo, Golfo San Jose, and San Matias. Golfos San Jose and San Nuevo are within 22 km (14 mi; 12 nmi) coastal exclusion zone.	May through December, annually
Central California National Marine Sanctuaries	Single stratum boundary created from the Cordell Bank (15 CFR 922.10), Gulf of the Farallones (15 CFR 922.80), and Monterey Bay (15 CFR 922.30) NMS legal boundaries. Monterey Bay NMS includes the Davidson Seamount Management Zone.	June through November, annually
Antarctic Convergence Zone	30°E to 80°E, 45°S 80°E to 150°E, 55°S 150°E to 50°W, 60°S 50°W to 30°E, 50°S	October through March, annually

# ANNUAL REPORT NO. 4: NAVY OPERATION OF SURTASS LFA SONAR 2015 TO 2016

Name of Area	Location of Area	Months of Importance/ Periods of Effectiveness
Piltun and Chayvo offshore feeding grounds in the Sea of Okhotsk	54°09.436'N, 143°47.408'E 54°09.436'N, 143°17.354'E 54°01.161'N, 143°17.354'E 53°53.580'N, 143°13.398'E 53°26.963'N, 143°28.230'E 53°07.013'N, 143°35.481'E 52°48.705'N, 143°38.447'E 52°32.077'N, 143°37.788'E 52°21.605'N, 143°34.163'E 52°09.470'N, 143°26.582'E 51°57.686'N, 143°30.208'E 51°36.033'N, 143°42.794'E 51°08.082'N, 143°51.301'E 51°08.082'N, 144°16.742'E 51°24.514'N, 144°11.139'E 51°48.116'N, 144°10.809'E 52°03.194'N, 144°20.363'E 52°23.235'N, 144°10.150'E 52°28.674'N, 144°12.787'E 52°42.523'N, 144°10.150'E 53°12.972'N, 143°55.648'E 53°18.505'N, 143°56.637'E 53°23.041'N, 143°53.011'E 53°28.250'N, 143°53.341'E 53°44.039'N, 143°49.056'E 53°53.207'N, 143°50.045'E 53°59.819'N, 143°48.067'E	June through November, annually
Coastal waters off Madagascar	16°03'55.04"S, 50°27'12.59"E 16°12'23.03"S, 51°03'37.38"E 24°30'45.06"S, 48°26'00.94"E 24°15'28.07"S, 47°46'51.16"E 22°18'00.74"S, 48°14'13.52"E 20°52'24.12"S, 48°43'13.49"E 19°22'33.24"S, 49°15'45.47"E 18°29'46.08"S, 49°37'32.25"E 17°38'27.89"S, 49°44'27.17"E 17°24'39.12"S, 49°39'17.03"E 17°19'35.34"S, 49°54'23.82"E 16°45'41.71"S, 50°15'56.35"E	July through September, annually for humpback whale breeding and November through December, annually for migrating blue whales.
Madagascar Plateau, Madagascar Ridge, and Walters Shoal	25°55'20.00"S, 44°05'15.45"E 25°46'31.36"S, 47°22'35.90"E 27°02'37.71"S, 48°03'31.08"E 35°13'51.37"S, 46°26'19.98"E 35°14'28.59"S, 42°35'49.20"E 31°36'57.96"S, 42°37'49.35"E 27°41'11.21"S, 44°30'11.01"E	November through December, annually

# ANNUAL REPORT NO. 4: NAVY OPERATION OF SURTASS LFA SONAR 2015 TO 2016

Name of Area	Location of Area	Months of Importance/ Periods of Effectiveness
Ligurian-Corsican-Provençal Basin and Western Pelagos Sanctuary in the Mediterranean Sea	42°50.271'N, 06°31.883'E 42°55.603'N, 06°43.418'E 43°04.374'N, 06°52.165'E 43°12.600'N, 07°10.440'E 43°21.720'N, 07°19.380'E 43°30.600'N, 07°32.220'E 43°33.900'N, 07°49.920'E 43°36.420'N, 08°05.580'E 43°42.600'N, 08°22.140'E 43°50.880'N, 08°34.500'E 43°58.560'N, 08°47.700'E 43°59.040'N, 08°56.040'E 43°57.047'N, 09°03.540'E 43°52.260'N, 09°08.520'E 43°47.580'N, 09°13.500'E 43°36.060'N, 09°16.620'E 43°28.440'N, 09°05.820'E 43°21.360'N, 09°02.100'E 43°16.020'N, 08°57.240'E 43°04.440'N, 08°47.580'E 42°54.900'N, 08°35.400'E 42°45.900'N, 08°27.540'E 42°36.060'N, 08°22.020'E 42°22.620'N, 08°15.849'E 42°07.202'N, 08°17.174'E 41°52.800'N, 08°15.720'E 41°39.780'N, 08°05.280'E 41°28.200'N, 08°51.600'E 42°57.060'N, 06°19.860'E	July to August, annually
Hawaiian Islands Humpback Whale NMS and Penguin Bank	21°10'02.179"N, 157°30'58.217"W 21°09'46.815"N, 157°30'22.367"W 21°06'39.882"N, 157°31'00.778"W 21°02'51.976"N, 157°30'30.049"W 20°59'52.725"N, 157°29'28.591"W 20°58'05.174"N, 157°27'35.919"W 20°55'49.456"N, 157°30'58.217"W 20°50'44.729"N, 157°42'42.418"W 20°51'02.654"N, 157°44'45.333"W 20°53'56.784"N, 157°46'04.716"W 20°56'32.988"N, 157°45'33.987"W 21°01'27.472"N, 157°43'10.586"W 21°05'20.499"N, 157°39'27.802"W 21°10'02.179"N, 157°30'58.217"W	November through April, annually
Costa Rica Dome	Centered at 9°N and 88°W	Year-round

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Name of Area	Location of Area	Months of Importance/ Periods of Effectiveness
Great Barrier Reef Between 16° S and 21° S	16°01.829'S, 145°38.783'E 15°52.215'S, 146°20.936'E 17°28.354'S, 146°59.392'E 20°16.228'S, 151°39.674'E 20°58.381'S, 150°30.897'E 20°17.007'S, 149°38.247'E 20°10.941'S, 149°18.247'E 20°02.403'S, 149°12.623'E 19°53.287'S, 149°03.986'E 19°49.866'S, 148°52.135'E 19°53.287'S, 148°44.302'E 19°47.965'S, 148°36.870'E 19°47.205'S, 148°26.024'E 19°19.978'S, 147°39.626'E 19°14.065'S, 147°37.014'E 19°08.913'S, 147°31.993'E 19°05.667'S, 147°24.160'E 19°07.576'S, 147°18.134'E 18°51.718'S, 146°51.219'E 18°44.258'S, 146°54.031'E 18°37.175'S, 146°51.420'E 18°31.620'S, 146°43.385'E 18°27.595'S, 146°40.573'E 17°36.676'S, 146°20.488'E 17°20.484'S, 146°16.671'E 17°07.745'S, 146°13.056'E 16°49.769'S, 146°11.047'E 16°41.835'S, 146°03.817'E 16°39.706'S, 145°54.979'E	May through September, annually
Bonney Upwelling on the west coast of Australia	37°12'20.036"S, 139°31'17.703"E 37°37'33.815"S, 139°42'42.508"E 38°10'36.144"S, 140°22'57.345"E 38°44'50.558"S, 141°33'50.342"E 39°07'04.125"S, 141°11'00.733"E 37°28'33.179"S, 139°10'52.263"E	December through May, annually
Northern Bay of Bengal and Head of Swath-of-No-Ground	20°59.735'N, 89°07.675'E 20°55.494'N, 89°09.484'E 20°52.883'N, 89°12.704'E 20°55.275'N, 89°18.133'E 21°04.558'N, 89°25.294'E 21°12.655'N, 89°25.354'E 21°13.279'N, 89°16.833'E 21°06.347'N, 89°15.011'E	Year-round
Olympic Coast NMS and Prairie, Barkley Canyon, and Nitnat Canyon	Boundaries within 23 nmi (26.5 m; 42.6 km) of the coast from 47°07' N to 48°30' N latitude 48°30'01.995"N, 125°58'38.786"W 48°16'55.605"N, 125°38'52.052"W 48°23'07.353"N, 125°17'10.935"W 48°12'38.241"N, 125°16'42.339"W 47°58'20.361"N, 125°31'14.517"W 47°58'20.361"N, 126°06'16.322"W 48°09'46.665"N, 126°25'48.758"W	Olympic NMS: December, January, March, and May, annually  The Prairie, Barkley Canyon, and Nitnat Canyon: June through September, annually

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Name of Area	Location of Area	Months of Importance/ Periods of Effectiveness
Abrolhos Bank	16°35'34.909"S, 38°52'30.455"W 16°35'31.619"S, 38°43'41.069"W 16°40'00.131"S, 37°23'52.492"W 19°30'59.069"S, 37°23'52.446"W 19°30'59.974"S, 39°33'38.351"W 19°20'24.752"S, 39°30'33.03"W 18°52'16.884"S, 39°32'31.789"W 18°45'09.937"S, 39°32'27.709"W 18°30'59.345"S, 39°30'59.669"W 18°27'28.985"S, 39°30'13.453"W 18°17'30.429"S, 39°26'21.073"W 18°07'43.518"S, 39°19'52.924"W 18°09'24.931"S, 39°16'24.913"W 18°10'04.585"S, 39°12'30.425"W 18°10'20.682"S, 38°39'06.185"W 18°08'50.404"S, 38°35'00.059"W 18°06'05.466"S, 38°31'41.385"W 18°02'09.399"S, 38°29'26.179"W 17°58'01.372"S, 38°28'45.409"W 17°53'58.883"S, 38°29'34.612"W 16°48'58.768"S, 38°55'23.768"W 16°43'15.682"S, 38°53'40.007"W	August through November, annually

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**Attachment 2 – Authorized Take Estimates by Mission Area**

The Holder of this Authorization must maintain a running calculation/estimation of takes of each species/stock over the effective period of this Authorization. The take, by Level B harassment, that occurs during the year covered by this Authorization may not exceed 12 percent of any marine mammal stock listed in the following tables.

The Holder of this Authorization must also coordinate with the Holder of the Letter of Authorization issued to the USNS ABLE, the USNS EFFECTIVE, and the USNS IMPECCABLE, to ensure that these conditions are met for all vessels combined.

**Table 1. Number of cetaceans and pinnipeds authorized to be taken by Level A harassment for all SURTASS LFA sonar operations over the 5-year rulemaking period.**

Category	Requested Take Authorization Level A harassment
Mysticetes	No more than 6 over the course of the regulations.
Odontocetes	No more than 25 over the course of the regulations.
Pinnipeds	No more than 25 over the course of the regulations.

**Tables 2-12. Number of marine mammals estimated to be taken by Level B harassment for all SURTASS LFA sonar operations during the annual LOA effective period in each of the Navy's requested mission areas.**

The number of marine mammals authorized to be taken is based on the estimated percentage of the species' stock affected by a nominal number of SURTASS LFA sonar missions per mission area.

<b>Table 2. Mission Area 1 - East of Japan</b>	
Animal	Estimated Number of Animals Estimated Take by Level B Harassment
Bryde's whale	13
Common minke whale	52
Fin whale	3
North Pacific right whale	1
Sei whale	13
Baird's beaked whale	57
Common bottlenose dolphin	181
Cuvier's beaked whale	50
False killer whale	48
Ginkgo-toothed beaked whale	8
Harbor porpoise	358
Hubbs' beaked whale	8
Killer whale	2
<i>Kogia</i> spp.	50
Pacific white-sided dolphin	57
Pantropical spotted dolphin	151
Pygmy killer whale	28
Risso's dolphin	154
Rough-toothed dolphin	91
Short-beaked common dolphin	1245
Short-finned pilot whale	158
Sperm whale	15
Spinner dolphin	5
Striped dolphin	65

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**Table 3. Mission Area 2 – North Philippine Sea**

Animal	Estimated Number of Animals Estimated Take by Level B Harassment
Blue whale	2
Bryde's whale	52
Common minke whale	321
Fin whale	11
Humpback whale	45
North Pacific right whale	2
Blainville's beaked whale	22
Common bottlenose dolphin	662
Cuvier's beaked whale	221
False killer whale	135
Fraser's dolphin	307
Ginkgo-toothed beaked whale	22
Killer whale	6
<i>Kogia</i> spp.	146
Long-beaked common dolphin	4,962
Longman's beaked whale	11
Melon-headed whale	198
Pacific white-sided dolphin	358
Pantropical spotted dolphin	569
Pygmy killer whale	98
Risso's dolphin	491
Rough-toothed dolphin	295
Short-beaked common dolphin	2409
Short-finned pilot whale	692
Sperm whale	48
Spinner dolphin	36
Striped dolphin	1,366

**Table 4. Mission Area 3 – West Philippine Sea**

Animal	Estimated Number of Animals Estimated Take by Level B Harassment
Blue whale	2
Bryde's whale	50
Common minke whale	234
Fin whale	5
Humpback whale	45
Blainville's beaked whale	20
Common bottlenose dolphin	652
Cuvier's beaked whale	12
False killer whale	131
Fraser's dolphin	294
Ginkgo-toothed beaked whale	20
Killer whale	6
<i>Kogia</i> spp.	83
Long-beaked common dolphin	4,559
Longman's beaked whale	11
Melon-headed whale	193
Pantropical spotted dolphin	498

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Pygmy killer whale	95
Risso's dolphin	504
Rough-toothed dolphin	269
Short-finned pilot whale	329
Sperm whale	46
Spinner dolphin	31
Striped dolphin	597

**Table 5. Mission Area 4 - Offshore Guam**

Animal	Estimated Number of Animals Estimated Take by Level B Harassment
Blue whale	2
Bryde's whale	15
Common minke whale	8
Fin whale	2
Humpback whale	11
Sei whale	6
Blainville's beaked whale	39
Common bottlenose dolphin	53
Cuvier's beaked whale	31
Dwarf sperm whale	226
False killer whale	25
Fraser's dolphin	167
Ginkgo-toothed beaked whale	74
Killer whale	5
Longman's beaked whale	55
Melon-headed whale	96
Pantropical spotted dolphin	289
Pygmy killer whale	5
Pygmy sperm whale	93
Risso's dolphin	100
Rough-toothed dolphin	82
Short-finned pilot whale	122
Sperm whale	36
Spinner dolphin	11
Striped dolphin	80

**Table 6. Mission Area 5 - Sea of Japan**

Animal	Estimated Number of Animals Estimated Take by Level B Harassment
Bryde's whale	8
Common minke whale O stock	18
Common minke whale J stock	8
Fin whale	46
North Pacific right whale	1
Western North Pacific gray whale	2
Baird's beaked whale	12
Common bottlenose dolphin	21
Cuvier's beaked whale	113
Dall's porpoise	767
False killer whale	78

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Harbor porpoise	176
Killer whale	4
<i>Kogia</i> spp.	50
Long-beaked common dolphin	3,467
Pacific white-sided dolphin	29
Risso's dolphin	242
Rough-toothed dolphin	33
Short-beaked common dolphin	2,575
Short-finned pilot whale	43
Sperm whale	63
Spinner dolphin	5
Stejneger's beaked whale	19
Striped dolphin	73
Spotted seal	2

Table 7. Mission Area 6 - East China Sea	
Animal	Estimated Number of Animals Estimated Take by Level B Harassment
Bryde's whale	10
Common minke whale O stock	99
Common minke whale J stock	41
Fin whale	5
North Pacific right whale	1
Western North Pacific gray whale	1
Blainville's beaked whale	9
Common bottlenose dolphin	28
Cuvier's beaked whale	6
False killer whale	20
Fraser's dolphin	140
Ginkgo-toothed beaked whale	9
Killer whale	2
<i>Kogia</i> spp.	31
Long-beaked common dolphin	1,988
Longman's beaked whale	5
Melon-headed whale	76
Pacific white-sided dolphin	43
Pantropical spotted dolphin	196
Pygmy killer whale	3
Risso's dolphin	228
Rough-toothed dolphin	53
Short-beaked common dolphin	792
Short-finned pilot whale	30
Sperm whale	18
Spinner dolphin	12
Striped dolphin	84

**Table 8. Mission Area 7 - South China Sea**

Animal	Estimated Number of Animals Estimated Take by Level B Harassment
Bryde's whale	11
Common minke whale O stock	53
Common minke whale J stock	29
Fin whale	4
North Pacific right whale	1
Western North Pacific gray whale	1
Blainville's beaked whale	5
Common bottlenose dolphin	7
Cuvier's beaked whale	3
False killer whale	11
Fraser's dolphin	70
Ginkgo-toothed beaked whale	10
Killer whale	1
<i>Kogia</i> spp.	16
Long-beaked common dolphin	1,135
Longman's beaked whale	3
Melon-headed whale	39
Pantropical spotted dolphin	74
Pygmy killer whale	2
Risso's dolphin	116
Rough-toothed dolphin	14
Short-finned pilot whale	14
Sperm whale	11
Spinner dolphin	5
Striped dolphin	32

**Table 9. Mission Area 8 - Offshore Japan (25-40° N)**

Animal	Estimated Number of Animals Estimated Take by Level B Harassment
Bryde's whale	14
Common minke whale	14
Fin whale	6
Sei whale	10
Baird's beaked whale	2
Blainville's beaked whale	8
Common bottlenose dolphin	15
Cuvier's beaked whale	42
Dwarf sperm whale	88
False killer whale	74
Hubbs' beaked whale	6
Killer whale	2
Longman's beaked whale	4
Melon-headed whale	55
<i>Mesoplodon</i> spp.	6
Pacific white-sided dolphin	117
Pantropical spotted dolphin	175
Pygmy killer whale	2
Pygmy sperm whale	36
Risso's dolphin	9

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Rough-toothed dolphin	27
Short-beaked common dolphin	1,835
Short-finned pilot whale	48
Sperm whale	23
Spinner dolphin	29
Striped dolphin	91
Hawaiian monk seal	1

Table 10. Mission Area 9 - Offshore Japan (10-25° N)	
Animal	Estimated Number of Animals Estimated Take by Level B Harassment
Blue whale	1
Bryde's whale	9
Fin whale	1
Sei whale	4
Blainville's beaked whale	7
Common bottlenose dolphin	11
Cuvier's beaked whale	35
Dwarf sperm whale	57
False killer whale	8
Fraser's dolphin	32
Ginkgo-toothed beaked whale	18
Killer whale	2
Longman's beaked whale	3
Melon-headed whale	36
Pantropical spotted dolphin	144
Pygmy killer whale	1
Pygmy sperm whale	24
Risso's dolphin	6
Rough-toothed dolphin	24
Short-finned pilot whale	27
Sperm whale	24
Spinner dolphin	24
Striped dolphin	74



Table 11. Mission Area 10 - Hawaii North	
Animal	Estimated Number of Animals Estimated Take by Level B Harassment
Blue whale	1
Bryde's whale	16
Common minke whale	6
Fin whale	1
Humpback whale	25
Sei whale	3
Blainville's beaked whale	25
Common bottlenose dolphin-Hawaii Pelagic	70
Common bottlenose dolphin-Kauai/Niihau	2
Common bottlenose dolphin-Oahu	2
Common bottlenose dolphin-4-Islands	2
Common bottlenose dolphin-Hawaii Island	2
Cuvier's beaked whale	21
Dwarf sperm whale	224
False killer whale-Hawaii Pelagic	20
False killer whale-Main Hawaiian Islands	3
False killer whale-Northwestern Hawaiian	4
Fraser's dolphin	158
Killer whale	2
Longman's beaked whale	47
Melon-headed whale-Hawaiian Islands	39
Melon-headed whale-Kohala Resident	2
Pantropical spotted dolphin-Hawaii Pelagic	154
Pantropical spotted dolphin-Hawaii Island	5
Pantropical spotted dolphin-Oahu	6
Pantropical spotted dolphin-4-Islands	8
Pygmy killer whale	45
Pygmy sperm whale	91
Risso's dolphin	88
Rough-toothed dolphin	60
Short-finned pilot whale	146
Sperm whale	34
Spinner dolphin-Hawaii Pelagic	20
Spinner dolphin-Hawaii Island	2
Spinner dolphin-Oahu/4-Islands	13
Spinner dolphin-Kauai/Niihau	2
Spinner dolphin-Kure/Midway Atoll	2
Spinner dolphin-Pearl and Hermes Reef	2
Striped dolphin	192
Hawaiian monk seal	4

Table 12. Mission Area 11 - Hawaii South	
Animal	Estimated Number of Animals Estimated Take by Level B Harassment
Blue whale	2
Bryde's whale	11
Common minke whale	9
Fin whale	2
Humpback whale	29
Sci whale	4
Blainville's beaked whale	23
Common bottlenose dolphin-Hawaii Pelagic	59
Common bottlenose dolphin-Kauai/Niihau	2
Common bottlenose dolphin-Oahu	2
Common bottlenose dolphin-4-Islands	2
Common bottlenose dolphin-Hawaii Island	2
Cuvier's beaked whale	18
Dwarf sperm whale	194
Ginkgo-toothed beaked whale	22
False killer whale-Main Hawaiian Islands	2
False killer whale-Hawaii Pelagic	16
Fraser's dolphin	186
Killer whale	2
Longman's beaked whale	43
Melon-headed whale-Hawaiian Islands	31
Melon-headed whale-Kohala Resident	2
Pantropical spotted dolphin-Hawaii Pelagic	140
Pantropical spotted dolphin-Hawaii Island	2
Pantropical spotted dolphin-Oahu	2
Pantropical spotted dolphin-4-Islands	2
Pygmy killer whale	37
Pygmy sperm whale	80
Risso's dolphin	78
Rough-toothed dolphin	68
Short-finned pilot whale	122
Sperm whale	29
Spinner dolphin-Hawaii Pelagic	18
Spinner dolphin-Hawaii Island	2
Spinner dolphin-Oahu/4-Islands	3
Spinner dolphin-Kauai/Niihau	2
Striped dolphin	175
Hawaiian monk seal	4



**APPENDIX B:**  
**MARINE MAMMAL DENSITIES AND ABUNDANCES BY**  
**MISSION AREA**

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**Appendix Table B. Density and Abundance Estimates for the Marine Mammal Stocks and Distinct Population Segments (DPSs) Occurring in the Three Northwestern Pacific Ocean Mission Areas in Which SURTASS LFA Sonar was Operated During the August 2015 Through August 2016 Effective Period. These Same Density and Abundance Estimates were Used to Estimate the Pre-Mission (DoN, 2015) and Post-Mission Affected Marine Mammals. ESA-Listed Species Highlighted. Abundance and Density References are Provided after the Table.**

Marine Mammal Species Name	Stock Name <sup>3</sup>	Stock / Abundance (animals)	Stock / Abundance Reference(s)	Density (animals per km <sup>2</sup> )				Density Reference(s)
				Winter	Spring	Summer	Fall	
Blue whale	CNP	9,250	1, 2, 3	0.0001	0.0001		0.0001	1, 4, 5, 6
Bryde's whale	WNP	20,501	7	0.0006	0.0006	0.0006	0.0006	8
Common minke whale	WNP "O"	25,049	9	0.0044 <sup>4</sup>	0.0044	0.0044	0.0044	9
				0.0033	0.0033	0.0033	0.0033	
Common minke whale	WNP "J"	893	10	0.0018	0.0018	0.0018	0.0018	9
Fin whale	WNP	9,250	1, 11	0.0002	0.0002	0.0002	0.0002	1
Humpback whale	WNP stock/DPS	1,107	12	0.0009	0.0009	Ⓟ <sup>5</sup>	0.0009	6, 13
North Pacific right whale	WNP	922	14	0.0001	0.0001	Ⓟ		Ⓟ <sup>6</sup>
Omura's whale	WNP	1,800	15	0.0001	0.0001	0.0001	0.0001	16
Western North Pacific gray whale	WNP stock/DPS	121	17	0.0001	0.0001	Ⓟ	0.0001	Ⓟ
Blainville's beaked whale	WNP	8,032	4, 5	0.0005	0.0005	0.0005	0.0005	4, 5
Common bottlenose dolphin	WNP	168,791	18	0.0146	0.0146	0.0146	0.0146	18
	IA	105,138	19	0.0008	0.0008	0.0008	0.0008	20
Cuvier's beaked whale	WNP	90,725	4, 5	0.0003	0.0003	0.0003	0.0003	4, 5

<sup>3</sup> NP=North Pacific; WNP=Western North Pacific; CNP=Central North Pacific; IA=Inshore Archipelago

<sup>4</sup> Since LFA sonar missions occurred in the same mission area but during multiple seasons, some species have multiple densities presented to represent the densities over the annual period in which missions occurred. The appropriate seasonal density was used to derive take estimates for these species.

<sup>5</sup> The Ⓟ symbol in the density column indicates that while the marine mammal stock or DPS occurs in the mission area, it is not expected to occur during the season modeled. If a reference is provided, it was included because it describes the seasonal occurrence of the species.

<sup>6</sup> The Ⓟ symbol indicates that no density was available for this species and thus no density reference(s); if a species is expected to occur during the modeled season, however, a density was necessary to compute takes, so the lowest value possible (0.00001) was assigned to the data-sparse species for the purpose of acoustic effects estimation.

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**Appendix Table B. Density and Abundance Estimates for the Marine Mammal Stocks and Distinct Population Segments (DPSs) Occurring in the Three Northwestern Pacific Ocean Mission Areas in Which SURTASS LFA Sonar was Operated During the August 2015 Through August 2016 Effective Period. These Same Density and Abundance Estimates were Used to Estimate the Pre-Mission (DoN, 2015) and Post-Mission Affected Marine Mammals. ESA-Listed Species Highlighted. Abundance and Density References are Provided after the Table.**

Marine Mammal Species Name	Stock Name <sup>3</sup>	Stock / Abundance (animals)	Stock / Abundance Reference(s)	Density (animals per km <sup>2</sup> )				Density Reference(s)
				Winter	Spring	Summer	Fall	
				0.0054	0.0054	0.0054	0.0054	
Deraniyagala's beaked whale	NP	22,799	4, 5, 21	0.0005	0.0005	0.0005	0.0005	4, 5
False killer whale	WNP Pelagic	16,668	18	0.0029	0.0029	0.0029	0.0029	18
	IA	9,777	19	0.0011	0.0011	0.0011	0.0011	22
Fraser's dolphin	WNP	220,789	4, 5	0.0069	0.0069	0.0069	0.0069	23
Ginkgo-toothed beaked whale	NP	22,799	4, 5	0.0005	0.0005	0.0005	0.0005	4, 5
Killer whale	WNP	12,256	4, 5	0.0001	0.0001	0.0001	0.0001	20
<i>Kogia</i> spp.	WNP	350,553	4, 5	0.0031	0.0031	0.0031	0.0031	4, 5
				0.0017	0.0017	0.0017	0.0017	
Long-beaked common dolphin	WNP	279,182	24	0.1158	0.1158	0.1158	0.1158	24
Longman's beaked whale	WNP	4,571	23	0.0003	0.0003	0.0003	0.0003	20
Melon-headed whale	WNP	36,770	4, 5	0.0043	0.0043	0.0043	0.0043	22
Pacific white-sided dolphin	WNP	931,000	25	0.0119	0.0119	⌀	⌀	4, 5
Pantropical spotted dolphin	WNP	438,064	18	0.0137	0.0137	0.0137	0.0137	18
	IA	219,032		0.0137	0.0137	0.0137	0.0137	
Pygmy killer whale	WNP	30,214	4, 5	0.0001	0.0001	0.0001	0.0001	22
			4, 5	0.0021	0.0021	0.0021	0.0021	4, 5
Risso's dolphin	WNP	83,289	18	0.0106	0.0106	0.0106	0.0106	18
	IA	83,289	18	0.0106	0.0106	0.0106	0.0106	18
Rough-toothed dolphin	WNP	145,729	4, 5	0.0059	0.0059	0.0059	0.0059	4, 5
			4, 5	0.0026	0.0026	0.0026	0.0026	23
Short-beaked common dolphin	WNP	3,286,163	4, 5	0.0562	0.0562	0.0562	0.0562	4, 5

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**Appendix Table B. Density and Abundance Estimates for the Marine Mammal Stocks and Distinct Population Segments (DPSs) Occurring in the Three Northwestern Pacific Ocean Mission Areas in Which SURTASS LFA Sonar was Operated During the August 2015 Through August 2016 Effective Period. These Same Density and Abundance Estimates were Used to Estimate the Pre-Mission (DoN, 2015) and Post-Mission Affected Marine Mammals. ESA-Listed Species Highlighted. Abundance and Density References are Provided after the Table.**

Marine Mammal Species Name	Stock Name <sup>3</sup>	Stock / Abundance (animals)	Stock / Abundance Reference(s)	Density (animals per km <sup>2</sup> )				Density Reference(s)
				Winter	Spring	Summer	Fall	
Short-finned pilot whale	WNP	53,608	18	0.0153	0.0153	0.0153	0.0153	18
				0.0076	0.0076	0.0076	0.0076	
				0.0016	0.0016	0.0016	0.0016	
Sperm whale	NP	102,112	26	0.0012	0.0012	0.0012	0.0012	22
Spinner dolphin	WNP	1,015,059	4, 5	0.0008	0.0008	0.0008	0.0008	27
Striped dolphin	WNP	570,038	18	0.0164	0.0164	0.0164	0.0164	18
Striped dolphin (Continued)	WNP	570,038	18	0.0329	0.0329	0.0329	0.0329	18
	IA	570,038	18	0.0058	0.0058	0.0058	0.0058	20

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