encompassing the Ten Thousand Islands. All captured sawfish are also authorized to be handled, measured, tagged, sampled, and released alive. Tagging methods include rototags (fin dart tags, Passive Integrated Transponder (PIT) tags, acoustic tags (transmitters), Pop-Up Archival transmitting (PAT) tags, and Smart Position Only Transmitting (SPOT) tags. Sampling methods also include taking a small genetic tissue fin clip and blood sample. Additionally, dead sawfish acquired through strandings or through law enforcement confiscations are sampled for scientific purposes.

However, to increase tag retention and provide less invasive tagging techniques, the applicant has now been authorized to replace plastic rototags used to secure VEMCO acoustic transmitters with neoprene clasp tags; and nylon umbrella darts used to secure PAT tags will be replaced with dorsal fin harnesses. Additionally, SPOT tags will now be excluded as a tagging method. Better data collection using these modified tagging methods could provide increased insight into habitat usage pattern and accomplish actions items identified in the recovery plan for the species.

Issuance of this permit modification, as required by the ESA, was based on a finding that such permit (1) was applied for in good faith, (2) will not operate to the disadvantage of such endangered or threatened species, and (3) is consistent with the purposes and policies set forth in section 2 of the ESA.

Dated: July 26, 2011.

**P. Michael Paine,**

*Acting Chief, Permits, Conservation and Education Division, Office of Protected Resources, National Marine Fisheries Service.*

[FR Doc. 2011–19258 Filed 7–28–11; 8:45 am]

**BILLING CODE 3510–22–P**

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## DEPARTMENT OF COMMERCE

## National Oceanic and Atmospheric Administration

**RIN 0648–XA507**

## Takes of Marine Mammals Incidental to Specified Activities; Low-Energy Marine Geophysical Survey in the Western Tropical Pacific Ocean, November to December, 2011

**AGENCY:** National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

**ACTION:** Notice; proposed Incidental Harassment Authorization; request for comments.

**SUMMARY:** NMFS has received an application from the Scripps Institution of Oceanography (SIO) for an Incidental Harassment Authorization (IHA) to take marine mammals, by harassment, incidental to conducting a low-energy marine geophysical (*i.e.,* seismic) survey in the western tropical Pacific Ocean, November to December, 2011. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an IHA to SIO to incidentally harass, by Level B harassment only, 19 species of marine mammals during the specified activity.

**DATES:** Comments and information must be received no later than August 29, 2011.

**ADDRESSES:** Comments on the application should be addressed to P. Michael Payne, Chief, Permits, Conservation and Education Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910. The mailbox address for providing e-mail comments is *ITP.Goldstein@noaa.gov.* NMFS is not responsible for e-mail comments sent to addresses other than the one provided here. Comments sent via e-mail, including all attachments, must not exceed a 10-megabyte file size.

All comments received are a part of the public record and will generally be posted to *http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications* without change. All Personal Identifying Information (for example, name, address, *etc.*) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

A copy of the application containing a list of the references used in this document may be obtained by writing to the above address, telephoning the contact listed here (see **FOR FURTHER INFORMATION CONTACT**) or visiting the Internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications.*

The National Science Foundation (NSF) has prepared a draft ''Environmental Assessment of a Marine Geophysical Survey by the R/V *Thompson* in the western tropical Pacific Ocean November–December 2011 (EA).'' The draft EA incorporates an ''Environmental Assessment of a Low-Energy Marine Geophysical Survey by the R/V *Thompson* in the Western Tropical Pacific Ocean, November–December 2011,'' prepared by LGL Ltd., Environmental Research Associates (LGL), on behalf of NSF and SIO, which is also available at the same Internet address. Documents cited in this notice may be viewed, by appointment, during regular business hours, at the aforementioned address.

**FOR FURTHER INFORMATION CONTACT:** Howard Goldstein or Jolie Harrison, Office of Protected Resources, NMFS, 301–427–8401.

**SUPPLEMENTARY INFORMATION:**

### Background

Section 101(a)(5)(D) of the MMPA (16 U.S.C. 1371 (a)(5)(D)) directs the Secretary of Commerce (Secretary) to authorize, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by United States citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

Authorization for the incidental taking of small numbers of marine mammals shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). The authorization must set forth the permissible methods of taking, other means of effecting the least practicable adverse impact on the species or stock and its habitat, and requirements pertaining to the mitigation, monitoring and reporting of such takings. NMFS has defined ''negligible impact'' in 50 CFR 216.103 as ''* * * an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.''

Section 101(a)(5)(D) of the MMPA established an expedited process by which citizens of the United States can apply for an authorization to incidentally take small numbers of marine mammals by harassment. Section 101(a)(5)(D) of the MMPA establishes a 45-day time limit for NMFS' review of an application followed by a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of small numbers of marine mammals. Within 45 days of the close of the public comment period, NMFS must either issue or deny the authorization.

Except with respect to certain activities not pertinent here, the MMPA defines ''harassment'' as:

any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

**Summary of Request**

NMFS received an application on June 14, 2011, from SIO for the taking by harassment, of marine mammals, incidental to conducting a low-energy marine seismic survey in the western tropical Pacific Ocean. SIO, a part of the University of California, in collaboration with University of Washington (UW), Woods Hole Oceanographic Institution (WHOI), Texas A&M University (TAMU), and Kutztown University, plans to conduct a magnetic and seismic study of the Hawaiian Jurassic crust onboard an oceanographic research vessel in the western tropical Pacific Ocean north of the Marshall Islands for approximately 32 days. The survey will use a pair of Generator Injector (GI) airguns each with a discharge volume of 105 cubic inches ($in^3$). SIO plans to conduct the proposed survey from approximately November 5 to December 17, 2011. The proposed seismic survey will be conducted partly in international waters and partly in the Exclusive Economic Zone (EEZ) of Wake Island (U.S.), and possibly in the EEZ of the Republic of the Marshall Islands.

SIO plans to use one source vessel, the R/V *Thomas G. Thompson* (*Thompson*) and a seismic airgun array to collect seismic reflection and refraction profiles from the Hawaiian Jurassic crust in the western tropical Pacific Ocean. In addition to the proposed operations of the seismic airgun array, SIO intends to operate a multibeam echosounder (MBES) and a sub-bottom profiler (SBP) continuously throughout the survey.

Acoustic stimuli (*i.e.,* increased underwater sound) generated during the operation of the seismic airgun array may have the potential to cause a short-term behavioral disturbance for marine mammals in the survey area. This is the principal means of marine mammal taking associated with these activities and SIO has requested an authorization to take 19 species of marine mammals by Level B harassment. Take is not expected to result from the use of the MBES or SBP, for reasons discussed in this notice; nor is take expected to result from collision with the vessel because it is a single vessel moving at a relatively slow speed during seismic acquisition within the survey, for a relatively short period of time (approximately 39 days). It is likely that any marine mammal would be able to avoid the vessel.

**Description of the Proposed Specified Activity**

SIO's proposed seismic survey in the western tropical Pacific Ocean, as part of an integrated magnetic and seismic study of the Hawaiian Jurassic crust, will take place for approximately 32 days in November to December, 2011 (see Figure 1 of the IHA application). The proposed seismic survey will take place in water depths ranging from approximately 2,000 to 6,000 meters (m) (6,561.7 to 19,685 feet [ft]) and consist of approximately 1,600 kilometers (km) (863.9 nautical miles [nmi]) of transect lines in the study area. The survey will take place in the area 13° to 23° North, 158° to 172° East, just north of the Marshall Islands. The project is scheduled to occur from approximately November 5 to December 17, 2011. Some minor deviation from these dates is possible, depending on logistics and weather.

The goal of the proposed research is to define the global nature and significance of variations in intensity and direction of the Earth's magnetic field during the Jurassic time period (approximately 145 to 180 million years ago), which appears to have been a period of sustained low intensity and rapid directional changes or polarity reversals compared to other periods in Earth's magnetic field history. Access to Jurassic-aged crust with good magnetic signals is very limited, with the best continuous records in ocean crust, but only one area of the ocean floor has been measured to date: the western Pacific Japanese magnetic lineations. To properly assess the global significance of the variations and to eliminate local crustal and tectonic complications, it is necessary to measure Jurassic magnetic signals in a different area of the world. The proposed study will attempt to verify the unusual behavior of the Jurassic geomagnetic field and test whether it was behaving in a globally coherent way by conducting a near-bottom marine magnetic field survey of Pacific Hawaiian Jurassic crust located between Hawaii and Guam.

Widespread, younger, Cretaceous-aged (65 to 140 million years ago) volcanism overprinted much of the western Pacific, so it is important to know the extent of Cretaceous-aged volcanic crust. This will be assessed by carrying out a seismic reflection and refraction survey of the Hawaiian Jurassic crust. First, the autonomous underwater vehicle (AUV) *Sentry* and a simultaneously deployed deep-towed magnetometer system will acquire two parallel profiles of the near-bottom crustal magnetic field 10 km (5.4 nmi) apart and approximately 800 km (432 nmi) long. More information on the AUV *Sentry* is available at *http://www.whoi.edu/page.do?pid=38098.* Second, the seismic survey will be conducted using airguns, a hydrophone streamer, and sonobuoys directly over the same profile as the AUV magnetic survey.

The survey will involve one source vessel, the *Thompson.* For the seismic component of the research program, the *Thompson* will deploy an array of two low-energy Sercel Generator Injector (GI) airguns as an energy source (each with a discharge volume of 105 $in^3$) at a tow depth of 3 m (9.8 ft). The acoustic receiving system will consist of an 800 m (2,624.7 ft), 48 channel hydrophone streamer and directional, passive sonobuoys. Over the course of the seismic operations, 50 Ultra Electronics AN/SSQ–53D(3) directional, passive sonobuoys will be deployed from the vessel. The sonobuoys consist of a hydrophone, electronics, and a radio transmitter. As the airgun is towed along the survey lines, the hydrophone streamer and sonobuoys will receive the returning acoustic signals and transfer the data to the on-board processing system. The seismic signal is measured by the sonobuoy's hydrophone and transmitted by radio back to the source vessel. The sonobuoys are expendable, and after a pre-determined time (usually eight hours), they self-scuttle and sink to the ocean bottom.

The survey lines will be within the area enclosed by red lines in Figure 1 of the IHA application, but the exact locations of the survey lines will be determined during transit after observing the location of the appropriate magnetic lineation by surface-towed magnetometer. Magnetic and seismic data acquisition will alternate on a daily basis; seismic surveys will take place while the AUV used to collect magnetic data is on deck to recharge its batteries. In addition to the operations of the airgun array, a Kongsberg EM300 MBES and ODEC Bathy-2000 SBP will also be operated from the *Thompson* continuously throughout the cruise. There will be additional seismic operations associated with equipment testing, start-up, and possible line changes or repeat coverage of any areas where initial data quality is sub-standard. In SIO's calculations, 25% has been added for those contingency operations.

All planned geophysical data acquisition activities will be conducted by technicians provided by SIO, with on-board assistance by the scientists who have proposed the study. The Principal Investigators are Drs. Masako Tominaga, Maurice A. Tivey, Daniel Lizarralde of WHOI, William W. Sager of TAMU, and Adrienne Oakley of Kutztown University. The vessel will be self-contained, and the crew will live aboard the vessel for the entire cruise.

*Vessel Specifications*

The *Thompson* is operated by the University of Washington under a charter agreement with the U.S. Office of Naval Research. The title of the vessel is held by the U.S. Navy. The *Thompson* will tow the two GI airgun array, as well as the hydrophone streamer, along predetermined lines.

The vessel has a length of 83.5 m (274 ft); a beam of 16 m (52.5 ft), and a full load draft of 5.8 m (19 ft). It is equipped with twin 360° azimuth stern thrusters each powered by a 3,000 horsepower (hp) DC motor and a water-jet bow thruster powered by a 1,600 hp DC motor. The motors are driven by up to three 1,500 kiloWatt (kW) and three 715 kW generators; normal operations use two 1,500 kW and one 750 kW generator, but this changes with ship speed, sea state, and other variables. An operations speed of 7.4 km/hour (hr) (4 knots [kt]) will be used during seismic acquisition. When not towing seismic survey gear, the *Thompson* cruises at 22 km/hr (12 kt) and has a maximum speed of 26.9 km/hr (14.5 kt). The *Thompson* has a range of 24,400 km (13,175 nmi) (the distance the vessel can travel without refueling).

The vessel will also serve as a platform for which vessel-based Protected Species Observers (PSOs) will watch for marine mammals before and during the proposed airgun operations.

**Acoustic Source Specifications**

*Seismic Airguns*

The *Thompson* will deploy and tow an array consisting of a pair of 45 to 105 $in^3$ Sercel GI airgun and a streamer containing hydrophones along predetermined lines. Seismic pulses will be emitted at intervals of five or ten seconds (s). At speeds of approximately 7.4 km/hr, the five to ten s spacing corresponds to shot intervals of approximately 10 to 20 m (32.8 to 65.6 ft).

The generator chamber of each GI airgun, the one responsible for introducing the sound pulse into the ocean, is either 45 $in^3$ or 105 $in^3$, depending on how it is configured. The injector chamber injects air into the previously-generated bubble to maintain its shape, and does not introduce more sound into the water. The two GI airguns will be towed 8 m (26.2 ft) apart side-by-side, 21 m (68.9 ft) behind the Thompson, at a depth of 3 m (9.8 ft). Depending on the configuration, the total effective volume will be 90 $in^3$ or 210 $in^3$. As a precautionary measure, SIO assumes that the larger volume will be used.

As the GI airguns are towed along the survey lines, the towed hydrophone array in the streamer and the sonobuoys receive the reflected signals and transfer the data to the on-board processing system. Given the relatively short streamer length behind the vessel, the turning rate of the vessel while the gear is deployed is much higher than the limit of five degrees per minute for a seismic vessel towing a streamer of more typical length (much greater than 1 km [0.5 nmi]). Thus maneuverability of the vessel is not limited much during operations.

*Metrics Used in This Document*

This section includes a brief explanation of the sound measurements frequently used in the discussions of acoustic effects in this document. Sound pressure is the sound force per unit area, and is usually measured in micropascals (μPa), where 1 pascal (Pa) is the pressure resulting from a force of one newton exerted over an area of one square meter. Sound pressure level (SPL) is expressed as the ratio of a measured sound pressure and a reference level. The commonly used reference pressure level in underwater acoustics is 1 μPa, and the units for SPLs are dB re: 1 μPa. SPL (in decibels [dB]) = 20 log (pressure/reference pressure).

SPL is an instantaneous measurement and can be expressed as the peak, the peak-peak (p-p), or the root mean square (rms). Root mean square, which is the square root of the arithmetic average of the squared instantaneous pressure values, is typically used in discussions of the effects of sounds on vertebrates and all references to SPL in this document refer to the root mean square unless otherwise noted. SPL does not take the duration of a sound into account.

*Characteristics of the Airgun Pulses*

Airguns function by venting high-pressure air into the water which creates an air bubble. The pressure signature of an individual airgun consists of a sharp rise and then fall in pressure, followed by several positive and negative pressure excursions caused by the oscillation of the resulting air bubble. The oscillation of the air bubble transmits sounds downward through the seafloor and the amount of sound transmitted in the near horizontal directions is reduced. However, the airgun array also emits sounds that travel horizontally toward non-target areas.

The nominal downward-directed source levels of the airgun arrays used by SIO on the *Thompson* do not represent actual sound levels that can be measured at any location in the water. Rather they represent the level that would be found 1 m (3.3 ft) from a hypothetical point source emitting the same total amount of sound as is emitted by the combined GI airguns. The actual received level at any location in the water near the GI airguns will not exceed the source level of the strongest individual source. In this case, that will be about 234.4 dB re 1 μPam peak, or 239.8 dB re 1 μPam peak-to-peak. However, the difference between rms and peak or peak-to-peak values for a given pulse depends on the frequency content and duration of the pulse, among other factors.

Accordingly, Lamont-Doherty Earth Observatory of Columbia University (L–DEO) has predicted the received sound levels in relation to distance and direction from the two GI airgun array. A detailed description of L–DEO's modeling for marine seismic source arrays for species mitigation is provided in Appendix A of SIO's EA. These are the nominal source levels applicable to downward propagation. The effective source levels for horizontal propagation are lower than those for downward propagation when the source consists of numerous airguns spaced apart from one another.

Appendix A of SIO's EA discusses the characteristics of the airgun pulses. NMFS refers the reviewers to the application and EA documents for additional information.

*Predicted Sound Levels for the Airguns*

Received sound levels have been modeled by L–DEO for a number of airgun configurations, including two 105 $in^3$ GI airguns, in relation to distance and direction from the airguns (see Figure 2 of the IHA application). The model does not allow for bottom interactions, and is most directly applicable to deep water. Based on the modeling, estimates of the maximum distances from the GI airguns where sound levels of 190, 180, and 160 dB re 1 μPa (rms) are predicted to be received in deep water are shown in Table 1 (see Table 1 of the IHA application).

Empirical data concerning the 190, 180, and 160 dB (rms) distances were acquired for various airgun arrays based on measurements during the acoustic verification studies conducted by L–DEO in the northern GOM in 2003 (Tolstoy *et al.,* 2004) and 2007 to 2008 (Tolstoy *et al.,* 2009). Results of the 36 airgun array are not relevant for the two GI airguns to be used in the proposed survey. The empirical data for the 6, 10, 12, and 20 airgun arrays indicate that, for deep water, the L–DEO model tends to overestimate the received sound levels at a given distance (Tolstoy *et al.,* 2004). Measurements were not made for the two GI airgun array in deep water, however, SIO proposes to use the EZ predicted by L–DEO's model for the proposed GI airgun operations in deep water, although they are likely conservative given the empirical proposed GI airgun operations in deep water. Using the L–DEO model, Table 1 (below) shows the distances at which three rms sound levels are expected to be received from the two GI airgun array. The 180 and 190 dB re 1 μPa (rms) distances are the safety criteria for potential Level A harassment as specified by NMFS (2000) and are applicable to cetaceans and pinnipeds, respectively. If marine mammals are detected within or about to enter the appropriate EZ, the airguns will be shut-down immediately.

Table 1 summarizes the predicted distances at which sound levels (160, 180, and 190 dB [rms]) are expected to be received from the two GI airgun array operating in deep water depths.

TABLE 1—DISTANCES TO WHICH SOUND LEVELS ≥ 190, 180, AND 160 dB RE 1 μPa (RMS) COULD BE RECEIVED IN DEEP WATER DURING THE PROPOSED SEISMIC SURVEY IN THE WESTERN TROPICAL PACIFIC OCEAN, NOVEMBER TO DECEMBER, 2011. DISTANCES ARE BASED ON MODEL RESULTS PROVIDED BY L–DEO.

| Source and volume | Tow depth (m) | Water depth (m) | Predicted RMS radii distances (m) | | |
|---|---|---|---|---|---|
| | | | 190 dB | 180 dB | 160 dB |
| Two GI airguns (105 in$^3$) | 3 | Deep (> 1,000) | 20 | 70 | 670 |

*MBES*

The *Thompson* will operate a Kongsberg EM 300 MBES concurrently during airgun operations to map characteristics of the ocean floor. The MBES has a hull-mounted transducer within a transducer pod that is located amidships. The system's normal operating frequency is approximately 30 kHz. The transmit fan-beam is split into either three or nine narrower beam sectors with independent active steering to correct for vessel yaw. Angular coverage is 36° (in Extra Deep Mode, for use in water depths 3,000 to 6,000 m [9,842.5 to 19,685 ft]) or 150° (in shallower water). The total angular coverage of 36° to 150° consists of the three or nine beams transmitted sequentially at each ping. Except in very deep water where the total beam is 36° × 1°, the composite fan beam is 150° × 1°, 150° × 2° or 150° × 4° depending on water depth. The nine beams making up the composite fan will overlap slightly if the vessel yaw is less than the fore-aft width of the beam (1, 2, or 4°, respectively). Achievable swath width on a flat bottom will normally be approximately five times the water depth. The maximum source level is 237 dB re 1 μPam (rms) (Hammerstad, 2005). In deep water (500 to 3,000 m [1,640.4 to 9,842.5 ft]), a pulse length of 5 milliseconds (ms) is normally used, and the ping rate is mainly limited by the round trip travel time in the water.

*SBP*

The *Thompson* will also operate an Ocean Data Equipment Corporation Bathy-2000 SBP continuously throughout the cruise simultaneously with the MBES to map and provide information about the sedimentary features and bottom topography. The SBP has a maximum 7 kilowatt (kW) transmit capacity into the underhull array. The energy from the SBP is directed downward from a 3 kHz transducer in the transducer array mounted in the hull of the vessel. Pulse duration ranges from 1.5 to 24 ms and the interval between pulses is controlled automatically by the system or manually by an operator depending on water depth and reflectivity of the bottom sediments. The system produces one sound pulse and then waits for its return before transmitting again. The swept (chirp) frequency ranges from 6 to 35 kHz. The maximum source output downward is 221 dB re 1 μPam (rms), but in practice, the system is rarely operated above 80% power level.

NMFS expects that acoustic stimuli resulting from the proposed operation of the two GI airgun array has the potential to harass marine mammals, incidental to the conduct of the proposed seismic survey. NMFS expects these disturbances to be temporary and result, at worst, in a temporary modification in behavior and/or low-level physiological effects (Level B harassment) of small numbers of certain species of marine mammals. NMFS does not expect that the movement of the *Thompson,* during the conduct of the seismic survey, has the potential to harass marine mammals because of the relatively slow operation speed of the vessel (7.4 km/hr or 4 kt) during seismic acquisition.

**Description of the Proposed Dates, Duration, and Specified Geographic Region**

The *Thompson* is expected to depart Honolulu, Hawaii, on November 5, 2011 and spend approximately 7 days in transit to the proposed survey area, 32 days alternating between acquiring magnetic and seismic data, and approximately 3 days in transit, arriving at Apra Harbor, Guam, on December 17, 2011. Seismic operations will be conducted for a total of approximately 16 days. Some minor deviation from this schedule is possible, depending on logistics and weather. The survey will encompass the area approximately 13° to 23° North, approximately 158° to 172° East, just north of the Marshall Islands (see Figure 1 of the IHA application). Water depths in the survey area generally range from approximately 2,000 to 6,000 m (6,561.7 to 19,685 ft); Wake Island is included in the survey area. The seismic survey will be conducted partly in international waters and partly in the EEZ of Wake Island (U.S.), and possibly in the EEZ of the Republic of the Marshall Islands.

**Description of the Marine Mammals in the Area of the Proposed Specified Activity**

Twenty-six marine mammal species (19 odontocetes, 6 mysticetes, and one pinniped) are known to or could occur in the Marshall Islands Marine Eco-region (MIME) study area. Several of these species are listed as endangered under the U.S. Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*), including the humpback (*Megaptera novaeangliae*), sei (*Balaenoptera borealis*), fin (*Balaenoptera physalus*), blue (*Balaenoptera musculus*), and sperm (*Physeter macrocephalus*) whales, as well as the Hawaiian monk seal (*Monachus schauinslandi*). The North Pacific right whale (*Eubalaena japonica*), listed as endangered under the ESA, was historically distributed throughout the North Pacific Ocean north of 35° North and occasionally occurred as far south as 20° North. Whaling records indicate that the MIME was not part of its range (Townsend, 1935).

The dugong (*Dugong dugon*), also listed as endangered under the ESA, is distributed in shallow coastal waters throughout most of the Indo-Pacific region between approximately 27° North and South of the equator (Marsh, 2008). Its historical range extended to the Marshall Islands (Nair *et al.,* 1975). However, the dugong is declining or extinct in at least one third of its range and no long occurs in the MIME (Marsh, 2008). The dugong is managed by the U.S. Fish and Wildlife Service (USFWS) and is not considered further in this analysis; all others are managed by NMFS.

The marine mammals that occur in the proposed survey area belong to three taxonomic groups: odontocetes (toothed cetaceans, such as dolphins), mysticetes (baleen whales), and pinnipeds (seals, sea lions, and walrus). Cetaceans are the subject of the IHA application to NMFS.

Table 2 (below) presents information on the abundance, distribution, population status, conservation status, and density of the marine mammals that may occur in the proposed survey area during November to December, 2011.

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Table 2. The habitat, regional abundance, and conservation status of marine mammals that may occur in or near the proposed seismic survey area in the western tropical Pacific Ocean. [See text and Tables 2 to 3 in SIO's application for further details.]

| Species | Habitat | Regional Abundance[4] | ESA[1] | MMPA[2] | Density (#/1,000 $km^2$) CNMI, Hawaii, and Mean[3] |
|---|---|---|---|---|---|
| Mysticetes | | | | | |
| Humpback whale (*Megaptera novaeangliae*) | Mainly nearshore waters, banks | 20,800[5] | EN | D | 0<br>0<br>0 |
| Minke whale (*Balaenoptera acutorostrata*) | Pelagic and coastal | 25,000[6] | NL | NC | 0<br>0<br>0 |
| Bryde's whale (*Balaenoptera edeni*) | Pelagic and coastal | 20,000 to 30,000 | NL | NC | 0.41<br>0.21<br>0.3 |
| Sei whale (*Balaenoptera borealis*) | Primarily offshore, pelagic | 7,260 to 12,620[9] | EN | D | 0.29<br>0<br>0.13 |
| Fin whale (*Balaenoptera physalus*) | Continental slope, mostly pelagic | 13,620 to 18,680[9] | EN | D | 0<br>0<br>0 |
| Blue whale (*Balaneoptera musculus*) | Pelagic, shelf, coastal | NA | EN | D | 0<br>0<br>0 |
| Odontocetes | | | | | |
| Sperm whale (*Physeter macrocephalus*) | Pelagic and deep seas | 29,674[10] | EN | D | 1.23<br>3.03<br>2.22 |
| Pygmy sperm whale (*Kogia breviceps*) | Deep waters off the shelf | NA | NL | NC | 0<br>3.19<br>1.76 |
| Dwarf sperm whale (*Kogia sima*) | Deep waters off the shelf | 11,200 | NL | NC | 0<br>7.82<br>4.30 |
| Cuvier's beaked whale (*Ziphius cavirostris*) | Pelagic | 20,000 | NL | NC | 0<br>6.80<br>3.74 |
| Longman's beaked whale (*Indopacetus pacificus*) | Deep water | NA | NL | NC | 0<br>0.45<br>0.25 |
| Blainville's beaked whale (*Mesoplodon densirostris*) | Pelagic | 25,300[11] | NL | NC | 0<br>1.28<br>0.7 |

| Species | Habitat | Regional Abundance[4] | ESA[1] | MMPA[2] | Density (#/1,000 km$^2$) CNMI, Hawaii, and Mean[3] |
|---|---|---|---|---|---|
| Ginkgo-toothed beaked whale (*Mesoplodon ginkgodens*) | Pelagic | NA | NL | NC | 0<br>0<br>0 |
| Rough-toothed dolphin (*Steno bredanensis*) | Deep water | 146,000 | NL | | 0.29<br>3.12<br>1.85 |
| Common bottlenose dolphin (*Tursiops truncatus*) | Coastal and oceanic, shelf break | 243,500 | NL | NC | 0.21<br>1.23<br>0.77 |
| Pantropical spotted dolphin (*Stenella attenuata*) | Coastal and pelagic | 800,000[12] | NL | NC | 22.6<br>2.10<br>11.32 |
| Spinner dolphin (*Stenella longirostris*) | Coastal and pelagic | 800,000[13] | NL | NC | 3.14<br>0.83<br>1.87 |
| Striped dolphin (*Stenella coeruleoalba*) | Off of continental shelf | 1,000,000[14] | NL | NC | 6.16<br>5.57<br>5.84 |
| Fraser's dolphin (*Lagenodelphis hosei*) | Deep water | 289,000 | NL | NC | 0<br>4.57<br>2.51 |
| Risso's dolphin (*Grampus griseus*) | Deep waters, seamounts | 176,000 | NL | NC | 0<br>0.83<br>0.46 |
| Melon-headed whale (*Peponocephala electra*) | Oceanic | 45,000 | NL | NC | 4.28<br>1.32<br>2.67 |
| Pygmy killer whale (*Feresa attenuata*) | Deep, pantropical waters | 39,000 | NL | NC | 0.14<br>0<br>0.06 |
| False killer whale (*Pseudorca crassidens*) | Pelagic | 40,000 | NL<br>Proposed EN – Insular Hawaiian | NC | 1.11<br>0.11<br>0.57 |
| Killer whale (*Orcinus orca*) | Pelagic, shelf, coastal | 8,500 | NL | NC | 0<br>0.16<br>0.09 |
| Short-finned pilot whale (*Globicephala macrorhynchus*) | Pelagic, shelf, coastal | 500,000[14] | NL | NC | 1.59<br>2.54<br>2.11 |
| Pinnipeds | | | | | |

| Species | Habitat | Regional Abundance[4] | ESA[1] | MMPA[2] | Density (#/1,000 km$^2$) CNMI, Hawaii, and Mean[3] |
|---|---|---|---|---|---|
| Hawaiian monk seal (*Monachus schauinslandi*) | Coastal and pelagic | 1,129[15] | EN | D | NA |

N.A. Not available or not assessed.
[1] U.S. Endangered Species Act: EN = Endangered, T = Threatened, NL = Not listed.
[2] U.S. Marine Mammal Protection Act: D = Depleted, NC = Not Classified.
[3] CNMI, Hawaii, and mean density estimates as listed in Table 3 of the application.
[4] Eastern Tropical Pacific in 1986 to 1990 (Wade and Gerrodette, 1993) unless otherwise indicated.
[5] North Pacific (Barlow *et al*., 2009).
[6] Northwest Pacific and Okhotsk Sea (IWC, 2007a).
[7] North Pacific (Jefferson *et al*., 2008).
[8] North Pacific (Tillman, 1977).
[9] North Pacific (Ohsumi and Wada, 1974).
[10] Western North Pacific (Whitehead, 2002a).
[11] Eastern Tropical Pacific (ETP); all *Mesoplodon* spp. (Wade and Gerrodette, 1993).
[12] Western/Southern Offshore Stock in ETP in 2000 (Jefferson *et al*., 2008).
[13] ETP in 2000 (Jefferson *et al*., 2008).
[14] ETP (Jefferson *et al*., 2008).
[15] Entire species (Caretta *et al*., 2010).

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Refer to Section III and IV of SIO's application for detailed information regarding the abundance and distribution, population status, and life history and behavior of these species and their occurrence in the proposed project area. The application also presents how SIO calculated the estimated densities for the marine mammals in the proposed survey area. NMFS has reviewed these data and determined them to be the best available scientific information for the purposes of the proposed IHA.

## Potential Effects on Marine Mammals

Acoustic stimuli generated by the operation of the airguns, which introduce sound into the marine environment, may have the potential to cause Level B harassment of marine mammals in the proposed survey area. The effects of sounds from airgun operations might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, temporary or permanent hearing impairment, or non-auditory physical or physiological effects (Richardson *et al.,* 1995; Gordon *et al.,* 2004; Nowacek *et al.,* 2007; Southall *et al.,* 2007).

Permanent hearing impairment, in the unlikely event that it occurred, would constitute injury, but temporary threshold shift (TTS) is not an injury (Southall *et al.,* 2007). Although the possibility cannot be entirely excluded, it is unlikely that the proposed project would result in any cases of temporary or permanent hearing impairment, or any significant non-auditory physical or physiological effects. Based on the available data and studies described here, some behavioral disturbance is expected, but NMFS expects the disturbance to be localized and short-term.

*Tolerance to Sound*

Studies on marine mammals' tolerance to sound in the natural environment are relatively rare. Richardson *et al.* (1995) defines tolerance as the occurrence of marine mammals in areas where they are exposed to human activities or man-made noise. In many cases, tolerance develops by the animal habituating to the stimulus (*i.e.,* the gradual waning of responses to a repeated or ongoing stimulus) (Richardson, *et al.,* 1995; Thorpe, 1963), but because of ecological or physiological requirements, many marine animals may need to remain in areas where they are exposed to chronic stimuli (Richardson, *et al.,* 1995).

Numerous studies have shown that pulsed sounds from airguns are often readily detectable in the water at distances of many kilometers. Malme *et al.,* (1985) studied the responses of humpback whales on their summer feeding grounds in southeast Alaska to seismic pulses from a airgun with a total volume of 100 in$^3$. They noted that the whales did not exhibit persistent avoidance when exposed to the airgun and concluded that there was no clear evidence of avoidance, despite the possibility of subtle effects, at received levels up to 172 dB re 1 μPa.

Weir (2008) observed marine mammal responses to seismic pulses from a 24 airgun array firing a total volume of either 5,085 in$^3$ or 3,147 in$^3$ in Angolan waters between August 2004 and May 2005. She recorded a total of 207 sightings of humpback whales (n = 66), sperm whales (n = 124), and Atlantic spotted dolphins (n = 17) and reported that there were no significant differences in encounter rates (sightings/hr) for humpback and sperm whales according to the airgun array's operational status (*i.e.,* active versus silent).

*Masking of Natural Sounds*

The term masking refers to the inability of a subject to recognize the occurrence of an acoustic stimulus as a result of the interference of another acoustic stimulus (Clark *et al.,* 2009). Introduced underwater sound may, through masking, reduce the effective communication distance of a marine mammal species if the frequency of the source is close to that used as a signal by the marine mammal, and if the anthropogenic sound is present for a significant fraction of the time (Richardson *et al.,* 1995).

Masking effects of pulsed sounds (even from large arrays of airguns) on marine mammal calls and other natural sounds are expected to be limited. Because of the intermittent nature and low duty cycle of seismic airgun pulses, animals can emit and receive sounds in the relatively quiet intervals between pulses. However, in some situations, reverberation occurs for much or the entire interval between pulses (*e.g.,* Simard *et al.,* 2005; Clark and Gagnon, 2006) which could mask calls. Some baleen and toothed whales are known to continue calling in the presence of seismic pulses, and their calls can usually be heard between the seismic pulses (*e.g.,* Richardson *et al.,* 1986; McDonald *et al.,* 1995; Greene *et al.,* 1999; Nieukirk *et al.,* 2004; Smultea *et al.,* 2004; Holst *et al.,* 2005a, b, 2006; and Dunn and Hernandez, 2009). However, Clark and Gagnon (2006) reported that fin whales in the northeast Pacific Ocean went silent for an extended period starting soon after the onset of a seismic survey in the area. Similarly, there has been one report that sperm whales ceased calling when exposed to pulses from a very distant seismic ship (Bowles *et al.,* 1994). However, more recent studies found that they continued calling in the presence of seismic pulses (Madsen *et al.,* 2002; Tyack *et al.,* 2003; Smultea *et al.,* 2004; Holst *et al.,* 2006; and Jochens *et al.,* 2008). Dolphins and porpoises commonly are heard calling while airguns are operating (*e.g.,* Gordon *et al.,* 2004; Smultea *et al.,* 2004; Holst *et al.,* 2005a, b; and Potter *et al.,* 2007). The sounds important to small odontocetes are predominantly at much higher frequencies than are the dominant components of airgun sounds, thus limiting the potential for masking.

In general, NMFS expects the masking effects of seismic pulses to be minor, given the normally intermittent nature of seismic pulses. Refer to Appendix A(4) of SIO's EA for a more detailed discussion of masking effects on marine mammals.

*Behavioral Disturbance*

Disturbance includes a variety of effects, including subtle to conspicuous changes in behavior, movement, and displacement. Reactions to sound, if any, depend on species, state of maturity, experience, current activity, reproductive state, time of day, and many other factors (Richardson *et al.,* 1995; Wartzok *et al.,* 2004; Southall *et al.,* 2007; Weilgart, 2007). If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.,* Lusseau and Bejder, 2007; Weilgart, 2007). Given the many uncertainties in predicting the quantity and types of impacts of noise on marine mammals, it is common practice to estimate how many mammals would be present within a particular distance of industrial activities and/or exposed to a particular level of industrial sound. In most cases, this approach likely overestimates the numbers of marine mammals that would be affected in some biologically-important manner.

The sound criteria used to estimate how many marine mammals might be disturbed to some biologically-important degree by a seismic program are based primarily on behavioral observations of a few species. Scientists have conducted detailed studies on humpback, gray, bowhead (*Balaena mysticetus*), and sperm whales, and on ringed seals (*Phoca hispida*). Less detailed data are available for some other species of baleen whales, small toothed whales, and sea otters, but for many species there are no data on responses to marine seismic surveys.

*Baleen Whales*—Baleen whales generally tend to avoid operating airguns, but avoidance radii are quite variable (reviewed in Richardson *et al.,* 1995). Whales are often reported to show no overt reactions to pulses from large arrays of airguns at distances beyond a few kms, even though the airgun pulses remain well above ambient noise levels out to much longer distances. However, as reviewed in Appendix A (5) of SIO's EA, baleen whales exposed to strong noise pulses from airguns often react by deviating from their normal migration route and/or interrupting their feeding and moving away. In the cases of migrating gray and bowhead whales, the observed changes in behavior appeared to be of little or no biological consequence to the animals (Richardson, *et al.,* 1995). They simply avoided the sound source by displacing their migration route to varying degrees, but within the natural boundaries of the migration corridors.

Studies of gray, bowhead, and humpback whales have shown that seismic pulses with received levels of 160 to 170 dB re 1 μPa (rms) seem to cause obvious avoidance behavior in a substantial fraction of the animals exposed (Malme *et al.,* 1986, 1988; Richardson *et al.,* 1995). In many areas, seismic pulses from large arrays of airguns diminish to those levels at distances ranging from 4.5 to 14.5 km (2.4 to 7.8 nmi) from the source. A substantial proportion of the baleen whales within those distances may show avoidance or other strong behavioral reactions to the airgun array. Subtle behavioral changes sometimes become evident at somewhat lower received levels, and studies summarized in Appendix A (5) of SIO's EA have shown that some species of baleen whales, notably bowhead and humpback whales, at times, show strong avoidance at received levels lower than 160 to 170 dB re 1 μPa (rms).

McCauley *et al.* (1998, 2000a) studied the responses of humpback whales off western Australia to a full-scale seismic survey with a 16 airgun array (2,678 $in^3$) and to a single airgun (20 $in^3$) with source level of 227 dB re 1 μPa (p-p). In the 1998 study, they documented that avoidance reactions began at five to eight km (2.7 to 4.3 nmi) from the array, and that those reactions kept most pods approximately three to four km from the operating seismic boat. In the 2000 study, they noted localized displacement during migration of four to five km by traveling pods and seven to 12 km (6.5 nmi) by more sensitive resting pods of cow-calf pairs. Avoidance distances with respect to the single airgun were smaller but consistent with the results from the full array in terms of the received sound levels. The mean received level for initial avoidance of an approaching airgun was 140 dB re 1 μPa (rms) for humpback pods containing females, and at the mean closest point of approach distance the received level was 143 dB re 1 μPa (rms). The initial avoidance response generally occurred at distances of five to eight km from the airgun array and two km from the single airgun. However, some individual humpback whales, especially males, approached within distances of 100 to 400 m (328 to 1,312 ft), where the maximum received level was 179 dB re 1 μPa (rms).

Data collected by observers during several seismic surveys in the Northwest Atlantic showed that sighting rates of humpback whales were significantly greater during non-seismic periods compared with periods when a full array was operating (Moulton and Holst, 2010). In addition, humpback whales were more likely to swim away and less likely to swim towards a vessel during seismic vs. non-seismic periods (Moulton and Holst, 2010).

Humpback whales on their summer feeding grounds in southeast Alaska did not exhibit persistent avoidance when exposed to seismic pulses from a 1.64–L (100 $in^3$) airgun (Malme *et al.,* 1985). Some humpbacks seemed ''startled'' at received levels of 150 to 169 dB re 1 μPa. Malme *et al.* (1985) concluded that there was no clear evidence of avoidance, despite the possibility of subtle effects, at received levels up to

172 dB re 1 μPa (rms). However, Moulton and Holst (2010) reported that humpback whales monitored during seismic surveys in the Northwest Atlantic had lower sighting rates and were most often seen swimming away from the vessel during seismic periods compared with periods when airguns were silent.

Studies have suggested that south Atlantic humpback whales wintering off Brazil may be displaced or even strand upon exposure to seismic surveys (Engel *et al.,* 2004). The evidence for this was circumstantial and subject to alternative explanations (IAGC, 2004). Also, the evidence was not consistent with subsequent results from the same area of Brazil (Parente *et al.,* 2006), or with direct studies of humpbacks exposed to seismic surveys in other areas and seasons. After allowance for data from subsequent years, there was no observable direct correlation between strandings and seismic surveys (IWC, 2007:236).

There are no data on reactions of right whales to seismic surveys, but results from the closely-related bowhead whale show that their responsiveness can be quite variable depending on their activity (migrating versus feeding). Bowhead whales migrating west across the Alaskan Beaufort Sea in autumn, in particular, are unusually responsive, with substantial avoidance occurring out to distances of 20 to 30 km (10.8 to 16.2 nmi) from a medium-sized airgun source at received sound levels of around 120 to 130 dB re 1 μPa (Miller *et al.,* 1999; Richardson *et al.,* 1999; see Appendix A (5) of SIO's EA). However, more recent research on bowhead whales (Miller *et al.,* 2005; Harris *et al.,* 2007) corroborates earlier evidence that, during the summer feeding season, bowheads are not as sensitive to seismic sources. Nonetheless, subtle but statistically significant changes in surfacing–respiration–dive cycles were evident upon statistical analysis (Richardson *et al.,* 1986). In the summer, bowheads typically begin to show avoidance reactions at received levels of about 152 to 178 dB re 1 μPa (Richardson *et al.,* 1986, 1995; Ljungblad *et al.,* 1988; Miller *et al.,* 2005).

Reactions of migrating and feeding (but not wintering) gray whales to seismic surveys have been studied. Malme *et al.* (1986, 1988) studied the responses of feeding eastern Pacific gray whales to pulses from a single 100 in$^3$ airgun off St. Lawrence Island in the northern Bering Sea. They estimated, based on small sample sizes, that 50 percent of feeding gray whales stopped feeding at an average received pressure level of 173 dB re 1 μPa on an (approximate) rms basis, and that 10 percent of feeding whales interrupted feeding at received levels of 163 dB re 1 μPa (rms). Those findings were generally consistent with the results of experiments conducted on larger numbers of gray whales that were migrating along the California coast (Malme *et al.,* 1984; Malme and Miles, 1985), and western Pacific gray whales feeding off Sakhalin Island, Russia (Wursig *et al.,* 1999; Gailey *et al.,* 2007; Johnson *et al.,* 2007; Yazvenko *et al.,* 2007a, b), along with data on gray whales off British Columbia (Bain and Williams, 2006).

Various species of *Balaenoptera* (blue, sei, fin, and minke whales) have occasionally been seen in areas ensonified by airgun pulses (Stone, 2003; MacLean and Haley, 2004; Stone and Tasker, 2006), and calls from blue and fin whales have been localized in areas with airgun operations (*e.g.,* McDonald *et al.,* 1995; Dunn and Hernandez, 2009; Castellote *et al.,* 2010). Sightings by observers on seismic vessels off the United Kingdom from 1997 to 2000 suggest that, during times of good sightability, sighting rates for mysticetes (mainly fin and sei whales) were similar when large arrays of airguns were shooting vs. silent (Stone, 2003; Stone and Tasker, 2006). However, these whales tended to exhibit localized avoidance, remaining significantly further (on average) from the airgun array during seismic operations compared with non-seismic periods (Stone and Tasker, 2006). Castellote *et al.* (2010) reported that singing fin whales in the Mediterranean moved away from an operating airgun array.

Ship-based monitoring studies of baleen whales (including blue, fin, sei, minke, and humpback whales) in the Northwest Atlantic found that overall, this group had lower sighting rates during seismic vs. non-seismic periods (Moulton and Holst, 2010). Baleen whales as a group were also seen significantly farther from the vessel during seismic compared with non-seismic periods, and they were more often seen to be swimming away from the operating seismic vessel (Moulton and Holst, 2010). Blue and minke whales were initially sighted significantly farther from the vessel during seismic operations compared to non-seismic periods; the same trend was observed for fin whales (Moulton and Holst, 2010). Minke whales were most often observed to be swimming away from the vessel when seismic operations were underway (Moulton and Holst, 2010).

Data on short-term reactions by cetaceans to impulsive noises are not necessarily indicative of long-term or biologically significant effects. It is not known whether impulsive sounds affect reproductive rate or distribution and habitat use in subsequent days or years. However, gray whales have continued to migrate annually along the west coast of North America with substantial increases in the population over recent years, despite intermittent seismic exploration (and much ship traffic) in that area for decades (Appendix A in Malme *et al.,* 1984; Richardson *et al.,* 1995; Allen and Angliss, 2010). The western Pacific gray whale population did not seem affected by a seismic survey in its feeding ground during a previous year (Johnson *et al.,* 2007). Similarly, bowhead whales have continued to travel to the eastern Beaufort Sea each summer, and their numbers have increased notably, despite seismic exploration in their summer and autumn range for many years (Richardson *et al.,* 1987; Allen and Angliss, 2010).

*Toothed Whales*—Little systematic information is available about reactions of toothed whales to noise pulses. Few studies similar to the more extensive baleen whale/seismic pulse work summarized above and (in more detail) in Appendix A of SIO's EA have been reported for toothed whales. However, there are recent systematic studies on sperm whales (*e.g.,* Gordon *et al.,* 2006; Madsen *et al.,* 2006; Winsor and Mate, 2006; Jochens *et al.,* 2008; Miller *et al.,* 2009). There is an increasing amount of information about responses of various odontocetes to seismic surveys based on monitoring studies (*e.g.,* Stone, 2003; Smultea *et al.,* 2004; Moulton and Miller, 2005; Bain and Williams, 2006; Holst *et al.,* 2006; Stone and Tasker, 2006; Potter *et al.,* 2007; Hauser *et al.,* 2008; Holst and Smultea, 2008; Weir, 2008; Barkaszi *et al.,* 2009; Richardson *et al.,* 2009; Moulton and Holst, 2010).

Seismic operators and marine mammal observers on seismic vessels regularly see dolphins and other small toothed whales near operating airgun arrays, but in general there is a tendency for most delphinids to show some avoidance of operating seismic vessels (*e.g.,* Goold, 1996a, b, c; Calambokidis and Osmek, 1998; Stone, 2003; Moulton and Miller, 2005; Holst *et al.,* 2006; Stone and Tasker, 2006; Weir, 2008; Richardson *et al.,* 2009; Barkaszi *et al.,* 2009; Moulton and Holst, 2010). Some dolphins seem to be attracted to the seismic vessel and floats, and some ride the bow wave of the seismic vessel even when large arrays of airguns are firing (*e.g.,* Moulton and Miller, 2005).

Nonetheless, small toothed whales more often tend to head away, or to maintain a somewhat greater distance from the vessel, when a large array of airguns is operating than when it is silent (*e.g.,* Stone and Tasker, 2006; Weir, 2008; Barry *et al.,* 2010; Moulton and Holst, 2010). In most cases, the avoidance radii for delphinids appear to be small, on the order of one km or less, and some individuals show no apparent avoidance. The beluga whale (*Delphinapterus leucas*) is a species that (at least at times) shows long-distance avoidance of seismic vessels. Aerial surveys conducted in the southeastern Beaufort Sea during summer found that sighting rates of beluga whales were significantly lower at distances 10 to 20 km compared with 20 to 30 km from an operating airgun array, and observers on seismic boats in that area rarely see belugas (Miller *et al.,* 2005; Harris *et al.,* 2007).

Captive bottlenose dolphins (*Tursiops truncatus*) and beluga whales exhibited changes in behavior when exposed to strong pulsed sounds similar in duration to those typically used in seismic surveys (Finneran *et al.,* 2000, 2002, 2005). However, the animals tolerated high received levels of sound before exhibiting aversive behaviors.

Results for porpoises depend on species. The limited available data suggest that harbor porpoises show stronger avoidance of seismic operations than do Dall's porpoises (Stone, 2003; MacLean and Koski, 2005; Bain and Williams, 2006; Stone and Tasker, 2006). Dall's porpoises seem relatively tolerant of airgun operations (MacLean and Koski, 2005; Bain and Williams, 2006), although they too have been observed to avoid large arrays of operating airguns (Calambokidis and Osmek, 1998; Bain and Williams, 2006). This apparent difference in responsiveness of these two porpoise species is consistent with their relative responsiveness to boat traffic and some other acoustic sources (Richardson *et al.,* 1995; Southall *et al.,* 2007).

Most studies of sperm whales exposed to airgun sounds indicate that the sperm whale shows considerable tolerance of airgun pulses (*e.g.,* Stone, 2003; Moulton *et al.,* 2005, 2006a; Stone and Tasker, 2006; Weir, 2008). In most cases the whales do not show strong avoidance, and they continue to call (see Appendix A of SIO's EA for review). However, controlled exposure experiments in the GOM indicate that foraging behavior was altered upon exposure to airgun sound (Jochens *et al.,* 2008; Miller *et al.,* 2009; Tyack, 2009).

There are almost no specific data on the behavioral reactions of beaked whales to seismic surveys. However, some northern bottlenose whales (*Hyperoodon ampullatus*) remained in the general area and continued to produce high-frequency clicks when exposed to sound pulses from distant seismic surveys (Gosselin and Lawson, 2004; Laurinolli and Cochrane, 2005; Simard *et al.,* 2005). Most beaked whales tend to avoid approaching vessels of other types (*e.g.,* Wursig *et al.,* 1998). They may also dive for an extended period when approached by a vessel (*e.g.,* Kasuya, 1986), although it is uncertain how much longer such dives may be as compared to dives by undisturbed beaked whales, which also are often quite long (Baird *et al.,* 2006; Tyack *et al.,* 2006). Based on a single observation, Aguilar-Soto *et al.* (2006) suggested that foraging efficiency of Cuvier's beaked whales may be reduced by close approach of vessels. In any event, it is likely that most beaked whales would also show strong avoidance of an approaching seismic vessel, although this has not been documented explicitly. In fact, Moulton and Holst (2010) reported 15 sightings of beaked whales during seismic studies in the Northwest Atlantic; seven of those sightings were made at times when at least one airgun was operating. There was little evidence to indicate that beaked whale behavior was affected by airgun operations; sighting rates and distances were similar during seismic and non-seismic periods (Moulton and Holst, 2010).

There are increasing indications that some beaked whales tend to strand when naval exercises involving mid-frequency sonar operation are ongoing nearby (*e.g.,* Simmonds and Lopez-Jurado, 1991; Frantzis, 1998; NOAA and USN, 2001; Jepson *et al.,* 2003; Hildebrand, 2005; Barlow and Gisiner, 2006; see also the Stranding and Mortality section in this notice). These strandings are apparently a disturbance response, although auditory or other injuries or other physiological effects may also be involved. Whether beaked whales would ever react similarly to seismic surveys is unknown. Seismic survey sounds are quite different from those of the sonar in operation during the above-cited incidents.

Odontocete reactions to large arrays of airguns are variable and, at least for delphinids and Dall's porpoises, seem to be confined to a smaller radius than has been observed for the more responsive of the mysticetes, belugas, and harbor porpoises (Appendix A of SIO's EA).

*Pinnipeds*—Pinnipeds are not likely to show a strong avoidance reaction to the airgun array. Visual monitoring from seismic vessels has shown only slight (if any) avoidance of airguns by pinnipeds, and only slight (if any) changes in behavior, see Appendix A(5) of SIO's EA. In the Beaufort Sea, some ringed seals avoided an area of 100 m to (at most) a few hundred meters around seismic vessels, but many seals remained within 100 to 200 m (328 to 656 ft) of the trackline as the operating airgun array passed by (*e.g.,* Harris *et al.,* 2001; Moulton and Lawson, 2002; Miller *et al.,* 2005). Ringed seal sightings averaged somewhat farther away from the seismic vessel when the airguns were operating than when they were not, but the difference was small (Moulton and Lawson, 2002). Similarly, in Puget Sound, sighting distances for harbor seals and California sea lions tended to be larger when airguns were operating (Calambokidis and Osmek, 1998). Previous telemetry work suggests that avoidance and other behavioral reactions may be stronger than evident to date from visual studies (Thompson *et al.,* 1998).

*Hearing Impairment and Other Physical Effects*

Exposure to high intensity sound for a sufficient duration may result in auditory effects such as a noise-induced threshold shift—an increase in the auditory threshold after exposure to noise (Finneran, Carder, Schlundt, and Ridgway, 2005). Factors that influence the amount of threshold shift include the amplitude, duration, frequency content, temporal pattern, and energy distribution of noise exposure. The magnitude of hearing threshold shift normally decreases over time following cessation of the noise exposure. The amount of threshold shift just after exposure is called the initial threshold shift. If the threshold shift eventually returns to zero (*i.e.,* the threshold returns to the pre-exposure value), it is called temporary threshold shift (TTS) (Southall *et al.,* 2007).

Researchers have studied TTS in certain captive odontocetes and pinnipeds exposed to strong sounds (reviewed in Southall *et al.,* 2007). However, there has been no specific documentation of TTS let alone permanent hearing damage, *i.e.,* permanent threshold shift (PTS), in free-ranging marine mammals exposed to sequences of airgun pulses during realistic field conditions.

*Temporary Threshold Shift*—TTS is the mildest form of hearing impairment that can occur during exposure to a strong sound (Kryter, 1985). While experiencing TTS, the hearing threshold rises and a sound must be stronger in order to be heard. At least in terrestrial mammals, TTS can last from minutes or hours to (in cases of strong TTS) days. For sound exposures at or somewhat above the TTS threshold, hearing sensitivity in both terrestrial and marine mammals recovers rapidly after exposure to the noise ends. Few data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals, and none of the published data concern TTS elicited by exposure to multiple pulses of sound. Available data on TTS in marine mammals are summarized in Southall *et al.* (2007). Table 1 (above) presents the distances from the *Thompson's* airguns at which the received energy level (per pulse, flat-weighted) would be expected to be greater than or equal to 190 dB re 1 μPa (rms).

Researchers have derived TTS information for odontocetes from studies on the bottlenose dolphin and beluga. For the one harbor porpoise tested, the received level of airgun sound that elicited onset of TTS was lower (Lucke *et al.,* 2009). If these results from a single animal are representative, it is inappropriate to assume that onset of TTS occurs at similar received levels in all odontocetes (*cf.* Southall *et al.,* 2007). Some cetaceans apparently can incur TTS at considerably lower sound exposures than are necessary to elicit TTS in the beluga or bottlenose dolphin.

For baleen whales, there are no data, direct or indirect, on levels or properties of sound that are required to induce TTS. The frequencies to which baleen whales are most sensitive are assumed to be lower than those to which odontocetes are most sensitive, and natural background noise levels at those low frequencies tend to be higher. As a result, auditory thresholds of baleen whales within their frequency band of best hearing are believed to be higher (less sensitive) than are those of odontocetes at their best frequencies (Clark and Ellison, 2004). From this, it is suspected that received levels causing TTS onset may also be higher in baleen whales (Southall *et al.,* 2007). For this proposed study, SIO expects no cases of TTS given the low abundance of baleen whales in the proposed survey area at the time of the proposed survey, and the strong likelihood that baleen whales would avoid the approaching airguns (or vessel) before being exposed to levels high enough for TTS to occur.

In pinnipeds, TTS thresholds associated with exposure to brief pulses (single or multiple) of underwater sound have not been measured. Initial evidence from more prolonged (non-pulse) exposures suggested that some pinnipeds (harbor seals in particular) incur TTS at somewhat lower received levels than do small odontocetes exposed for similar durations (Kastak *et al.,* 1999, 2005; Ketten *et al.,* 2001). The TTS threshold for pulsed sounds has been indirectly estimated as being an SEL of approximately 171 dB re 1 $\mu Pa^2 \cdot s$ (Southall *et al.,* 2007) which would be equivalent to a single pulse with a received level of approximately 181 to 186 dB re 1 μPa (rms), or a series of pulses for which the highest rms values are a few dB lower. Corresponding values for California sea lions and northern elephant seals are likely to be higher (Kastak *et al.,* 2005).

To avoid the potential for injury, NMFS (1995, 2000) concluded that cetaceans should not be exposed to pulsed underwater noise at received levels exceeding 180 dB re 1 μPa (rms) and pinnipeds should not be exposed to pulsed underwater noise at received levels exceeding 190 dB re 1 μPa (rms). NMFS believes that to avoid the potential for permanent physiological damage (Level A harassment), cetaceans should not be exposed to pulsed underwater noise at received levels exceeding 180 dB re 1 μPa (rms) and pinnipeds should not be exposed to pulsed underwater noise at received levels exceeding 190 dB re 1 μPa (rms). The 180 dB and 190 dB levels are the shutdown criterion applicable to cetaceans and pinnipeds, respectively, as specified by NMFS (2000); these levels were used to establish the EZs. NMFS also assumes that marine mammals exposed to levels exceeding 160 dB re 1 μPa (rms) may experience Level B harassment.

*Permanent Threshold Shift*—When PTS occurs, there is physical damage to the sound receptors in the ear. In severe cases, there can be total or partial deafness, whereas in other cases, the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter, 1985). There is no specific evidence that exposure to pulses of airgun sound can cause PTS in any marine mammal, even with large arrays of airguns. However, given the possibility that mammals close to an airgun array might incur at least mild TTS, there has been further speculation about the possibility that some individuals occurring very close to airguns might incur PTS (*e.g.,* Richardson *et al.,* 1995, p. 372*ff;* Gedamke *et al.,* 2008). Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage, but repeated or (in some cases) single exposures to a level well above that causing TTS onset might elicit PTS.

Relationships between TTS and PTS thresholds have not been studied in marine mammals, but are assumed to be similar to those in humans and other terrestrial mammals. PTS might occur at a received sound level at least several dBs above that inducing mild TTS if the animal were exposed to strong sound pulses with rapid rise time—see Appendix A (6) of SIO's EA. Based on data from terrestrial mammals, a precautionary assumption is that the PTS threshold for impulse sounds (such as airgun pulses as received close to the source) is at least 6 dB higher than the TTS threshold on a peak-pressure basis, and probably greater than six dB (Southall *et al.,* 2007).

Given the higher level of sound necessary to cause PTS as compared with TTS, it is considerably less likely that PTS would occur. Baleen whales generally avoid the immediate area around operating seismic vessels, as do some other marine mammals.

*Stranding and Mortality*—Marine mammals close to underwater detonations of high explosives can be killed or severely injured, and the auditory organs are especially susceptible to injury (Ketten *et al.,* 1993; Ketten, 1995). However, explosives are no longer used for marine waters for commercial seismic surveys or (with rare exceptions) for seismic research; they have been replaced entirely by airguns or related non-explosive pulse generators. Airgun pulses are less energetic and have slower rise times, and there is no specific evidence that they can cause serious injury, death, or stranding even in the case of large airgun arrays. However, the association of strandings of beaked whales with naval exercises involving mid-frequency active sonar and, in one case, an L–DEO seismic survey (Malakoff, 2002; Cox *et al.,* 2006), has raised the possibility that beaked whales exposed to strong ''pulsed'' sounds may be especially susceptible to injury and/or behavioral reactions that can lead to stranding (*e.g.,* Hildebrand, 2005; Southall *et al.,* 2007). Appendix A (6) of SIO's EA provides additional details.

Specific sound-related processes that lead to strandings and mortality are not well documented, but may include:

(1) Swimming in avoidance of a sound into shallow water;

(2) A change in behavior (such as a change in diving behavior) that might contribute to tissue damage, gas bubble formation, hypoxia, cardiac arrhythmia, hypertensive hemorrhage or other forms of trauma;

(3) A physiological change such as a vestibular response leading to a behavioral change or stress-induced hemorrhagic diathesis, leading in turn to tissue damage; and

(4) Tissue damage directly from sound exposure, such as through acoustically-mediated bubble formation and growth or acoustic resonance of tissues. Some of these mechanisms are unlikely to apply in the case of impulse sounds. However, there are indications that gas-bubble disease (analogous to ''the bends''), induced in supersaturated tissue by a behavioral response to acoustic exposure, could be a pathologic mechanism for the strandings and mortality of some deep-diving cetaceans exposed to sonar. However, the evidence for this remains circumstantial and associated with exposure to naval mid-frequency sonar, not seismic surveys (Cox *et al.,* 2006; Southall *et al.,* 2007).

Seismic pulses and mid-frequency sonar signals are quite different, and some mechanisms by which sonar sounds have been hypothesized to affect beaked whales are unlikely to apply to airgun pulses. Sounds produced by airgun arrays are broadband impulses with most of the energy below one kHz. Typical military mid-frequency sonar emits non-impulse sounds at frequencies of two to 10 kHz, generally with a relatively narrow bandwidth at any one time. A further difference between seismic surveys and naval exercises is that naval exercises can involve sound sources on more than one vessel. Thus, it is not appropriate to assume that there is a direct connection between the effects of military sonar and seismic surveys on marine mammals. However, evidence that sonar signals can, in special circumstances, lead (at least indirectly) to physical damage and mortality (*e.g.,* Balcomb and Claridge, 2001; NOAA and USN, 2001; Jepson *et al.,* 2003; Fernández *et al.,* 2004, 2005; Hildebrand 2005; Cox *et al.,* 2006) suggests that caution is warranted when dealing with exposure of marine mammals to any high-intensity ''pulsed'' sound.

There is no conclusive evidence of cetacean strandings or deaths at sea as a result of exposure to seismic surveys, but a few cases of strandings in the general area where a seismic survey was ongoing have led to speculation concerning a possible link between seismic surveys and strandings. Suggestions that there was a link between seismic surveys and strandings of humpback whales in Brazil (Engel *et al.,* 2004) were not well founded (IAGC, 2004; IWC, 2007). In September 2002, there was a stranding of two Cuvier's beaked whales (*Ziphius cavirostris*) in the Gulf of California, Mexico, when the L–DEO vessel R/V *Maurice Ewing* was operating a 20 airgun (8,490 $in^3$) array in the general area. The link between the stranding and the seismic surveys was inconclusive and not based on any physical evidence (Hogarth, 2002; Yoder, 2002). Nonetheless, the Gulf of California incident plus the beaked whale strandings near naval exercises involving use of mid-frequency sonar suggests a need for caution in conducting seismic surveys in areas occupied by beaked whales until more is known about effects of seismic surveys on those species (Hildebrand, 2005). No injuries of beaked whales are anticipated during the proposed study because of:

(1) The high likelihood that any beaked whales nearby would avoid the approaching vessel before being exposed to high sound levels, and

(2) Differences between the sound sources operated by SIO and those involved in the naval exercises associated with strandings.

*Non-auditory Physiological Effects*—Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, bubble formation, resonance, and other types of organ or tissue damage (Cox *et al.,* 2006; Southall *et al.,* 2007). Studies examining such effects are limited. However, resonance effects (Gentry, 2002) and direct noise-induced bubble formations (Crum *et al.,* 2005) are implausible in the case of exposure to an impulsive broadband source like an airgun array. If seismic surveys disrupt diving patterns of deep-diving species, this might perhaps result in bubble formation and a form of the bends, as speculated to occur in beaked whales exposed to sonar. However, there is no specific evidence of this upon exposure to airgun pulses.

In general, very little is known about the potential for seismic survey sounds (or other types of strong underwater sounds) to cause non-auditory physical effects in marine mammals. Such effects, if they occur at all, would presumably be limited to short distances and to activities that extend over a prolonged period. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall *et al.,* 2007), or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. Marine mammals that show behavioral avoidance of seismic vessels, including most baleen whales and some odontocetes, are especially unlikely to incur non-auditory physical effects.

*Potential Effects of Other Acoustic Devices*

MBES

SIO will operate the Kongsberg EM 300 MBES from the source vessel during the planned study. Sounds from the MBES are very short pulses, occurring for five ms once every five to 20 s, depending on water depth. Most of the energy in the sound pulses emitted by this MBES is at frequencies near 30 kHz, and the maximum source level is 237 dB re 1 μPa (rms). The beam is narrow (1°) in fore-aft extent and wide (36°) in the cross-track extent. Each ping consists of nine (in water greater than 1,000 m deep) or three (in water less than 1,000 m deep) successive fan-shaped transmissions (segments) at different cross-track angles. Any given mammal at depth near the trackline would be in the main beam for only one or two of the nine segments. Also, marine mammals that encounter the Kongsberg EM 300 are unlikely to be subjected to repeated pulses because of the narrow fore-aft width of the beam and will receive only limited amounts of pulse energy because of the short pulses. Animals close to the ship (where the beam is narrowest) are especially unlikely to be ensonified for more than one five ms pulse (or two pings if in the overlap area). Similarly, Kremser *et al.* (2005) noted that the probability of a cetacean swimming through the area of exposure when an MBES emits a pulse is small. The animal would have to pass the transducer at close range and be swimming at speeds similar to the vessel in order to receive the multiple pulses that might result in sufficient exposure to cause TTS.

Navy sonars that have been linked to avoidance reactions and stranding of cetaceans: (1) Generally have longer pulse duration than the Kongsberg EM 300; and (2) are often directed close to horizontally versus more downward for the MBES. The area of possible influence of the MBES is much smaller—a narrow band below the source vessel. Also, the duration of exposure for a given marine mammal can be much longer for naval sonar. During SIO's operations, the individual pulses will be very short, and a given mammal would not receive many of the downward-directed pulses as the vessel passes by. Possible effects of an MBES on marine mammals are outlined below.

*Masking*—Marine mammal communications will not be masked appreciably by the MBES signals given the low duty cycle of the echosounder and the brief period when an individual mammal is likely to be within its beam. Furthermore, in the case of baleen whales, the MBES signals (12 kHz) do not overlap with the predominant frequencies in the calls, which would avoid any significant masking.

*Behavioral Responses*—Behavioral reactions of free-ranging marine mammals to sonars, echosounders, and other sound sources appear to vary by species and circumstance. Observed reactions have included silencing and dispersal by sperm whales (Watkins *et al.,* 1985), increased vocalizations and no dispersal by pilot whales (*Globicephala melas*) (Rendell and Gordon, 1999), and the previously-mentioned beachings by beaked whales. During exposure to a 21 to 25 kHz ''whale-finding'' sonar with a source level of 215 dB re 1 µPa, gray whales reacted by orienting slightly away from the source and being deflected from their course by approximately 200 m (Frankel, 2005). When a 38 kHz echosounder and a 150 kHz acoustic Doppler current profiler were transmitting during studies in the Eastern Tropical Pacific, baleen whales showed no significant responses, while spotted and spinner dolphins were detected slightly more often and beaked whales less often during visual surveys (Gerrodette and Pettis, 2005).

Captive bottlenose dolphins and a beluga whale exhibited changes in behavior when exposed to 1 s tonal signals at frequencies similar to those that will be emitted by the MBES used by SIO, and to shorter broadband pulsed signals. Behavioral changes typically involved what appeared to be deliberate attempts to avoid the sound exposure (Schlundt *et al.,* 2000; Finneran *et al.,* 2002; Finneran and Schlundt, 2004). The relevance of those data to free-ranging odontocetes is uncertain, and in any case, the test sounds were quite different in duration as compared with those from an MBES.

Very few data are available on the reactions of pinnipeds to echosounder sounds at frequencies similar to those used during seismic operations. Hastie and Janik (2007) conducted a series of behavioral response tests on two captive gray seals to determine their reactions to underwater operation of a 375 kHz multibeam imaging echosounder that included significant signal components down to 6 kHz. Results indicated that the two seals reacted to the signal by significantly increasing their dive durations. Because of the likely brevity of exposure to the MBES sounds, pinniped reactions are expected to be limited to startle or otherwise brief responses of no lasting consequences to the animals.

*Hearing Impairment and Other Physical Effects*—Given recent stranding events that have been associated with the operation of naval sonar, there is concern that mid-frequency sonar sounds can cause serious impacts to marine mammals (see above). However, the MBES proposed for use by SIO is quite different than sonar used for Navy operations. Pulse duration of the MBES is very short relative to the naval sonar. Also, at any given location, an individual marine mammal would be in the beam of the MBES for much less time given the generally downward orientation of the beam and its narrow fore-aft beamwidth; Navy sonar often uses near-horizontally-directed sound. Those factors would all reduce the sound energy received from the MBES rather drastically relative to that from naval sonar.

NMFS believes that the brief exposure of marine mammals to one pulse, or small numbers of signals, from the MBES is not likely to result in the harassment of marine mammals.

SBP

SIO will also operate a SBP from the source vessel during the proposed survey. Sounds from the SBP are very short pulses, occurring for up to 25 ms once every three to eight s. Most of the energy in the sound pulses emitted by the SBP is at three to six kHz, and the beam is directed downward. The SBP on the *Thompson* has a maximum source level of 211 dB re 1 µPa (rms).

Kremser *et al.* (2005) noted that the probability of a cetacean swimming through the area of exposure when a bottom profiler emits a pulse is small—even for an SBP more powerful than that on the *Thompson*—if the animal was in the area, it would have to pass the transducer at close range in order to be subjected to sound levels that could cause TTS.

*Masking*—Marine mammal communications will not be masked appreciably by the SBP signals given the directionality of the signal and the brief period when an individual mammal is likely to be within its beam. Furthermore, in the case of most baleen whales, the SBP signals do not overlap with the predominant frequencies in the calls, which would avoid significant masking.

*Behavioral Responses*—Marine mammal behavioral reactions to other pulsed sound sources are discussed above, and responses to the SBP are likely to be similar to those for other pulsed sources if received at the same levels. However, the pulsed signals from the SBP are considerably weaker than those from the MBES. Therefore, behavioral responses are not expected unless marine mammals are very close to the source.

*Hearing Impairment and Other Physical Effects*—It is unlikely that the SBP produces pulse levels strong enough to cause hearing impairment or other physical injuries even in an animal that is (briefly) in a position near the source. The SBP is usually operated simultaneously with other higher-power acoustic sources, including airguns. Many marine mammals will move away in response to the approaching higher-power sources or the vessel itself before the mammals would be close enough for there to be any possibility of effects from the less intense sounds from the SBP.

The potential effects to marine mammals described in this section of the document do not take into consideration the proposed monitoring and mitigation measures described later in this document (see the ''Proposed Mitigation'' and ''Proposed Monitoring and Reporting'' sections) which, as noted are designed to effect the least practicable adverse impact on affected marine mammal species and stocks.

**Anticipated Effects on Marine Mammal Habitat**

The proposed seismic survey will not result in any permanent impact on habitats used by the marine mammals in the proposed survey area, including the food sources they use (*i.e.* fish and invertebrates), and there will be no physical damage to any habitat. While it is anticipated that the specified activity may result in marine mammals avoiding certain areas due to temporary ensonification, this impact to habitat is temporary and reversible and was considered in further detail earlier in this document, as behavioral modification. The main impact associated with the proposed activity will be temporarily elevated noise levels and the associated direct effects on marine mammals, previously discussed in this notice.

**Anticipated Effects on Fish**

One reason for the adoption of airguns as the standard energy source for marine seismic surveys is that, unlike explosives, they have not been associated with large-scale fish kills. However, existing information on the impacts of seismic surveys on marine fish populations is limited (see Appendix C of SIO's EA). There are three types of potential effects of exposure to seismic surveys: (1) Pathological, (2) physiological, and (3) behavioral. Pathological effects involve lethal and temporary or permanent sub-lethal injury. Physiological effects involve temporary and permanent primary and secondary stress responses, such as changes in levels of enzymes and proteins. Behavioral effects refer to temporary and (if they occur) permanent changes in exhibited behavior (*e.g.,* startle and avoidance behavior). The three categories are interrelated in complex ways. For example, it is possible that certain physiological and behavioral changes could potentially lead to an ultimate pathological effect on individuals (*i.e.,* mortality).

The specific received sound levels at which permanent adverse effects to fish potentially could occur are little studied and largely unknown. Furthermore, the available information on the impacts of seismic surveys on marine fish is from studies of individuals or portions of a population; there have been no studies at the population scale. The studies of individual fish have often been on caged fish that were exposed to airgun pulses in situations not representative of an actual seismic survey. Thus, available information provides limited insight on possible real-world effects at the ocean or population scale. This makes drawing conclusions about impacts on fish problematic because ultimately, the most important aspect of potential impacts relates to how exposure to seismic survey sound affects marine fish populations and their viability, including their availability to fisheries.

Hastings and Popper (2005), Popper (2009), and Popper and Hastings (2009a,b) provided recent critical reviews of the known effects of sound on fish. The following sections provide a general synopsis of the available information on the effects of exposure to seismic and other anthropogenic sound as relevant to fish. The information comprises results from scientific studies of varying degrees of rigor plus some anecdotal information. Some of the data sources may have serious shortcomings in methods, analysis, interpretation, and reproducibility that must be considered when interpreting their results (see Hastings and Popper, 2005). Potential adverse effects of the program's sound sources on marine fish are noted.

*Pathological Effects*—The potential for pathological damage to hearing structures in fish depends on the energy level of the received sound and the physiology and hearing capability of the species in question (see Appendix C of SIO's EA). For a given sound to result in hearing loss, the sound must exceed, by some substantial amount, the hearing threshold of the fish for that sound (Popper, 2005). The consequences of temporary or permanent hearing loss in individual fish on a fish population are unknown; however, they likely depend on the number of individuals affected and whether critical behaviors involving sound (*e.g.,* predator avoidance, prey capture, orientation and navigation, reproduction, *etc.*) are adversely affected.

Little is known about the mechanisms and characteristics of damage to fish that may be inflicted by exposure to seismic survey sounds. Few data have been presented in the peer-reviewed scientific literature. As far as SIO and NMFS know, there are only two papers with proper experimental methods, controls, and careful pathological investigation implicating sounds produced by actual seismic survey airguns in causing adverse anatomical effects. One such study indicated anatomical damage, and the second indicated TTS in fish hearing. The anatomical case is McCauley *et al.* (2003), who found that exposure to airgun sound caused observable anatomical damage to the auditory maculae of pink snapper (*Pagrus auratus*). This damage in the ears had not been repaired in fish sacrificed and examined almost two months after exposure. On the other hand, Popper *et al.* (2005) documented only TTS (as determined by auditory brainstem response) in two of three fish species from the Mackenzie River Delta. This study found that broad whitefish (*Coregonus nasus*) exposed to five airgun shots were not significantly different from those of controls. During both studies, the repetitive exposure to sound was greater than would have occurred during a typical seismic survey. However, the substantial low-frequency energy produced by the airguns [less than 400 Hz in the study by McCauley *et al.* (2003) and less than approximately 200 Hz in Popper *et al.* (2005)] likely did not propagate to the fish because the water in the study areas was very shallow (approximately nine m in the former case and less than two m in the latter). Water depth sets a lower limit on the lowest sound frequency that will propagate (the ''cutoff frequency'') at about one-quarter wavelength (Urick, 1983; Rogers and Cox, 1988).

Wardle *et al.* (2001) suggested that in water, acute injury and death of organisms exposed to seismic energy depends primarily on two features of the sound source: (1) The received peak pressure and (2) the time required for the pressure to rise and decay. Generally, as received pressure increases, the period for the pressure to rise and decay decreases, and the chance of acute pathological effects increases. According to Buchanan *et al.* (2004), for the types of seismic airguns and arrays involved with the proposed program, the pathological (mortality) zone for fish would be expected to be within a few meters of the seismic source. Numerous other studies provide examples of no fish mortality upon exposure to seismic sources (Falk and Lawrence, 1973; Holliday *et al.,* 1987; La Bella *et al.,* 1996; Santulli *et al.,* 1999; McCauley *et al.,* 2000a,b, 2003; Bjarti, 2002; Thomsen, 2002; Hassel *et al.,* 2003; Popper *et al.,* 2005; Boeger *et al.,* 2006).

Some studies have reported, some equivocally, that mortality of fish, fish eggs, or larvae can occur close to seismic sources (Kostyuchenko, 1973; Dalen and Knutsen, 1986; Booman *et al.,* 1996; Dalen *et al.,* 1996). Some of the reports claimed seismic effects from treatments quite different from actual seismic survey sounds or even reasonable surrogates. However, Payne *et al.* (2009) reported no statistical differences in mortality/morbidity between control and exposed groups of capelin eggs or monkfish larvae. Saetre and Ona (1996) applied a 'worst-case scenario' mathematical model to investigate the effects of seismic energy on fish eggs and larvae. They concluded that mortality rates caused by exposure to seismic surveys are so low, as compared to natural mortality rates, that the impact of seismic surveying on recruitment to a fish stock must be regarded as insignificant.

*Physiological Effects*—Physiological effects refer to cellular and/or biochemical responses of fish to acoustic stress. Such stress potentially could affect fish populations by increasing mortality or reducing reproductive success. Primary and secondary stress responses of fish after exposure to seismic survey sound appear to be temporary in all studies done to date (Sverdrup *et al.,* 1994; Santulli *et al.,* 1999; McCauley *et al.,* 2000a,b). The periods necessary for the biochemical changes to return to normal are variable and depend on numerous aspects of the biology of the species and of the sound stimulus (see Appendix C of SIO's EA).

*Behavioral Effects*—Behavioral effects include changes in the distribution, migration, mating, and catchability of fish populations. Studies investigating the possible effects of sound (including seismic survey sound) on fish behavior have been conducted on both uncaged and caged individuals (*e.g.,* Chapman and Hawkins, 1969; Pearson *et al.,* 1992; Santulli *et al.,* 1999; Wardle *et al.,* 2001; Hassel *et al.,* 2003). Typically, in these studies fish exhibited a sharp ''startle'' response at the onset of a sound followed by habituation and a return to normal behavior after the sound ceased.

There is general concern about potential adverse effects of seismic operations on fisheries, namely a potential reduction in the ''catchability'' of fish involved in fisheries. Although reduced catch rates have founded by other sources of disturbance (Dalen and Raknes, 1985; Dalen and Knutsen, 1986; Lokkeborg, 1991; Skalski *et al.,* 1992; Engas *et al.,* 1996). In other airgun experiments, there was no change in catch per unit effort of fish when airgun pulses were emitted, particularly in the immediate vicinity of the seismic survey (Pickett *et al.,* 1994; La Bella *et al.,* 1996). For some species, reductions in catch may have resulted from a change in behavior of the fish, *e.g.,* a change in vertical or horizontal distribution, as reported in Slotte *et al.* (2004).

In general, any adverse effects on fish behavior or fisheries attributable to seismic testing may depend on the species in question and the nature of the fishery (season, duration, fishing method). They may also depend on the age of the fish, its motivational state, its size, and numerous other factors that are difficult, if not impossible, to quantify at this point, given such limited data on effects of airguns on fish, particularly under realistic at-sea conditions.

*Anticipated Effects on Invertebrates*

The existing body of information on the impacts of seismic survey sound on marine invertebrates is very limited. However, there is some unpublished and very limited evidence of the potential for adverse effects on invertebrates, thereby justifying further discussion and analysis of this issue. The three types of potential effects of exposure to seismic surveys on marine invertebrates are pathological, physiological, and behavioral. Based on the physical structure of their sensory organs, marine invertebrates appear to be specialized to respond to particle displacement components of an impinging sound field and not to the pressure component (Popper *et al.,* 2001; see also Appendix D of SIO's EA).

The only information available on the impacts of seismic surveys on marine invertebrates involves studies of individuals; there have been no studies at the population scale. Thus, available information provides limited insight on possible real-world effects at the regional or ocean scale. The most important aspect of potential impacts concerns how exposure to seismic survey sound ultimately affects invertebrate populations and their viability, including availability to fisheries.

Literature reviews of the effects of seismic and other underwater sound on invertebrates were provided by Moriyasu *et al.* (2004) and Payne *et al.* (2008). The following sections provide a synopsis of available information on the effects of exposure to seismic survey sound on species of decapod crustaceans and cephalopods, the two taxonomic groups of invertebrates on which most such studies have been conducted. The available information is from studies with variable degrees of scientific soundness and from anecdotal information. A more detailed review of the literature on the effects of seismic survey sound on invertebrates is provided in Appendix D of SIO's EA.

*Pathological Effects*—In water, lethal and sub-lethal injury to organisms exposed to seismic survey sound appears to depend on at least two features of the sound source: (1) The received peak pressure; and (2) the time required for the pressure to rise and decay. Generally, as received pressure increases, the period for the pressure to rise and decay decreases, and the chance of acute pathological effects increases. For the type of airgun array planned for the proposed program, the pathological (mortality) zone for crustaceans and cephalopods is expected to be within a few meters of the seismic source, at most; however, very few specific data are available on levels of seismic signals that might damage these animals. This premise is based on the peak pressure and rise/decay time characteristics of seismic airgun arrays currently in use around the world.

Some studies have suggested that seismic survey sound has a limited pathological impact on early developmental stages of crustaceans (Pearson *et al*., 1994; Christian *et al*., 2003; DFO, 2004). However, the impacts appear to be either temporary or insignificant compared to what occurs under natural conditions. Controlled field experiments on adult crustaceans (Christian *et al*., 2003, 2004; DFO, 2004) and adult cephalopods (McCauley *et al*., 2000a,b) exposed to seismic survey sound have not resulted in any significant pathological impacts on the animals. It has been suggested that exposure to commercial seismic survey activities has injured giant squid (Guerra *et al*., 2004), but the article provides little evidence to support this claim. Recent work by Andre *et al.* (2011) purports to present the first morphological and ultrastructural evidence of massive acoustic trauma (*i.e.*, permanent and substantial alterations of statocyst sensory hair cells) in four cephalopod species subjected to low-frequency sound. The cephalopods, primarily cuttlefish, were exposed to continuous 50 to 400 Hz sinusoidal wave sweeps (100% duty cycle and 1 s sweep period) for two hours while captive in relatively small tanks (one 2,000 liter [L, 2m$^3$] and one 200 L [0.2 m$^3$] tank), and reported morphological and ultrastructural evidence of massive acoustic trauma (*i.e.*, permanent and substantial alterations of statocyst sensory hair cells). The received SPL was reported as 157±5 dB re 1 μPa, with peak levels at 175 dB re 1 μPa. As in the McCauley *et al.* (2003) paper on sensory hair cell damage in pink snapper as a result of exposure to seismic sound, the cephalopods were subjected to higher sound levels than they would be under natural conditions, and they were unable to swim away from the sound source.

*Physiological Effects*—Physiological effects refer mainly to biochemical responses by marine invertebrates to acoustic stress. Such stress potentially could affect invertebrate populations by increasing mortality or reducing reproductive success. Primary and secondary stress responses (*i.e.,* changes in haemolymph levels of enzymes, proteins, *etc.*) of crustaceans have been noted several days or months after exposure to seismic survey sounds (Payne *et al.,* 2007). The periods necessary for these biochemical changes to return to normal are variable and depend on numerous aspects of the biology of the species and of the sound stimulus.

*Behavioral Effects*—There is increasing interest in assessing the possible direct and indirect effects of seismic and other sounds on invertebrate behavior, particularly in relation to the consequences for fisheries. Changes in behavior could potentially affect such aspects as reproductive success, distribution, susceptibility to predation, and catchability by fisheries. Studies investigating the possible behavioral effects of exposure to seismic survey sound on crustaceans and cephalopods have been conducted on both uncaged and caged animals. In some cases, invertebrates exhibited startle responses (*e.g.*, squid in McCauley *et al*., 2000a,b). In other cases, no behavioral impacts were noted (*e.g.*, crustaceans in Christian *et al*., 2003, 2004; DFO 2004). There have been anecdotal reports of reduced catch rates of shrimp shortly after exposure to seismic surveys; however, other studies have not observed any significant changes in shrimp catch rate (Andriguetto-Filho *et al.*, 2005). Similarly, Parry and Gason

(2006) did not find any evidence that lobster catch rates were affected by seismic surveys. Any adverse effects on crustacean and cephalopod behavior or fisheries attributable to seismic survey sound depend on the species in question and the nature of the fishery (season, duration, fishing method).

**Proposed Mitigation**

In order to issue an Incidental Take Authorization (ITA) under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and the availability of such species or stock for taking for certain subsistence uses.

SIO has based the mitigation measures described herein, to be implemented for the proposed seismic survey, on the following:

(1) Protocols used during previous SIO seismic research cruises as approved by NMFS;

(2) Previous IHA applications and IHAs approved and authorized by NMFS; and

(3) Recommended best practices in Richardson *et al.* (1995), Pierson *et al.* (1998), and Weir and Dolman, (2007).

To reduce the potential for disturbance from acoustic stimuli associated with the activities, SIO and/or its designees has proposed to implement the following mitigation measures for marine mammals:

(1) Proposed exclusion zones;
(2) Speed or course alteration;
(3) Shut-down procedures; and
(4) Ramp-up procedures.

*Proposed Exclusion Zones*—Received sound levels have been modeled by L–DEO for a number of airgun configurations, including two 105 $in^3$ GI airguns, in relation to distance and direction from the airguns (see Figure 2 of the IHA application). The model does not allow for bottom interactions, and is most directly applicable to deep water. Based on the modeling, estimates of the maximum distances from the source where sound levels are predicted to be 190, 180, and 160 dB re 1 μPa (rms) in deep water were determined (see Table 1 above).

Empirical data concerning the 190, 180, and 160 dB (rms) distances were acquired for various airgun arrays based on measurements during the acoustic verification studies conducted by L–DEO in the northern GOM in 2003 (Tolstoy *et al.*, 2004) and 2007 to 2008 (Tolstoy *et al.*, 2009). Results of the 36 airgun array are not relevant for the two GI airguns to be used in the proposed survey. The empirical data for the 6, 10, 12, and 20 airgun arrays indicate that, for deep water, the L–DEO model tends to overestimate the received sound levels at a given distance (Tolstoy *et al.*, 2004). Measurements were not made for the two GI airgun array in deep water, however, SIO proposes to use the EZ predicted by L–DEO's model for the proposed GI airgun operations in deep water, although they are likely conservative give the empirical results for the other arrays.

The 180 and 190 dB radii are shut-down criteria applicable to cetaceans and pinnipeds, respectively, as specified by NMFS (2000); these levels were used to establish the EZs. If the PSO detects marine mammal(s) within or about to enter the appropriate EZ, the airguns will be shut-down, immediately.

*Speed or Course Alteration*—If a marine mammal is detected outside the EZ an, based on its position and the relative motion, is likely to enter the EZ, the vessel's speed and/or direct course could be changed. This would be done if operationally practicable while minimizing the effect on the planned science objectives. The activities and movements of the marine mammal (relative to the seismic vessel) will then be closely monitored to determine whether the animal is approaching the applicable EZ. If the animal appears likely to enter the EZ, further mitigative actions will be taken, *i.e.*, either further course alterations or a shut-down of the seismic source. Typically, during seismic operations, the source vessel is unable to change speed or course and one or more alternative mitigation measures will need to be implemented.

*Shut-down Procedures*—SIO will shut down the operating airgun(s) if a marine mammal is seen outside the EZ for the airgun(s), and if the vessel's speed and/or course cannot be changed to avoid having the animal enter the EZ, the seismic source will be shut-down before the animal is within the EZ. If a marine mammal is already within the EZ when first detected, the seismic source will be shut-down immediately.

Following a shut-down, SIO will not resume airgun activity until the marine mammal has cleared the EZ. SIO will consider the animal to have cleared the EZ if:

• A PSO has visually observed the animal leave the EZ, or

• A PSO has not sighted the animal within the EZ for 15 min for species with shorter dive durations (*i.e.*, small odontocetes or pinnipeds), or 30 min for species with longer dive durations (*i.e.*, mysticetes and large odontocetes, including sperm, killer, and beaked whales).

*Ramp-up Procedures*—SIO will follow a ramp-up procedure when the airgun array begins operating after a specified period without airgun operations or when a shut-down has exceeded that period. SIO proposes that, for the present cruise, this period would be approximately 15 min. SIO has used similar periods (approximately 15 min) during previous SIO surveys.

Ramp-up will begin with a single GI airgun (105 $in^3$). The second GI airgun (105 $in^3$) will be added after five min. During ramp-up, the Protected Species Observers (PSOs) will monitor the EZ, and if marine mammals are sighted, SIO will implement a shut-down as though both GI airguns were operational.

If the complete EZ has not been visible for at least 30 min prior to the start of operations in either daylight or nighttime, SIO will not commence the ramp-up. If one airgun has operated, ramp-up to full power will be permissible at night or in poor visibility, on the assumption that marine mammals will be alerted to the approaching seismic vessel by the sounds from the single airgun and could move away if they choose. A ramp-up from a shut-down may occur at night, but only where the EZ is small enough to be visible. SIO will not initiate a ramp-up of the airguns if a marine mammal is sighted within or near the applicable EZs during the day or close to the vessel at night.

NMFS has carefully evaluated the applicant's proposed mitigation measures and has considered a range of other measures in the context of ensuring that NMFS prescribes the means of effecting the least practicable adverse impact on the affected marine mammal species and stocks and their habitat. NMFS's evaluation of potential measures included consideration of the following factors in relation to one another:

(1) The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals;

(2) The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and

(3) The practicability of the measure for applicant implementation.

Based on NMFS's evaluation of the applicant's proposed measures, as well as other measures considered by NMFS or recommended by the public, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable adverse impacts on marine mammal species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

**Proposed Monitoring and Reporting**

In order to issue an ITA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth ''requirements pertaining to the monitoring and reporting of such taking.'' The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for IHAs must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the action area.

*Monitoring*

SIO proposes to sponsor marine mammal monitoring during the proposed project, in order to implement the proposed mitigation measures that require real-time monitoring, and to satisfy the anticipated monitoring requirements of the IHA. SIO's proposed Monitoring Plan is described below this section. SIO understands that this monitoring plan will be subject to review by NMFS, and that refinements may be required. The monitoring work described here has been planned as a self-contained project independent of any other related monitoring projects that may be occurring simultaneously in the same regions. SIO is prepared to discuss coordination of its monitoring program with any related work that might be done by other groups insofar as this is practical and desirable.

*Vessel-Based Visual Monitoring*

PSOs will be based aboard the seismic source vessel and will watch for marine mammals near the vessel during daytime airgun operations and during any ramp-ups at night. PSOs will also watch for marine mammals near the seismic vessel for at least 30 min prior to the ramp-up of airgun operations after an extended shut-down (*i.e.*, greater than approximately 15 min for this proposed cruise). When feasible, PSOs will conduct observations during daytime periods when the seismic system is not operating for comparison of sighting rates and behavior with and without airgun operations and between acquisition periods. Based on PSO observations, the airguns will be shut-down when marine mammals are observed within or about to enter a designated EZ. The EZ is a region in which a possibility exists of adverse effects on animal hearing or other physical effects.

During seismic operations in the western tropical Pacific Ocean, at least three PSOs will be based aboard the *Thompson*. SIO will appoint the PSOs with NMFS's concurrence. At least one PSO will monitor the EZs during seismic operations. Observations will take place during ongoing daytime operations and nighttime ramp-ups of the airguns. PSO(s) will be on duty in shifts of duration no longer than 4 hr. The vessel crew will also be instructed to assist in detecting marine mammals.

The *Thompson* is a suitable platform for marine mammal observations. Two locations are likely as observation stations onboard the *Thompson*. At one station on the bridge, the eye level will be approximately 13.8 m (45.3 ft) above sea level and the location will give the PSO a good view around the entire vessel (*i.e.*, 310° for one PSO and a full 360° when two PSOs are stationed at different vantage points). A second observation site is the 03 deck where the PSOs eye level will be 10.8 m (35.4 ft) above sea level. The 03 deck offers a view of 330° for the two PSOs.

During daytime, the PSVOs will scan the area around the vessel systematically with reticle binoculars (*e.g.*, 7 × 50 Fujinon), Big-eye binoculars (25 × 150), optical range finders and with the naked eye. During darkness, night vision devices (NVDs) will be available, when required. The PSOs will be in wireless communication with the vessel's officers on the bridge and scientists in the vessel's operations laboratory, so they can advise promptly of the need for avoidance maneuvers or seismic source shut-down. When marine mammals are detected within or about to enter the designated EZ, the airguns will immediately be shut-down if necessary. The PSO(s) will continue to maintain watch to determine when the animal(s) are outside the EZ by visual confirmation. Airgun operations will not resume until the animal is confirmed to have left the EZ, or if not observed after 15 min for species with shorter dive durations (small odontocetes and pinnipeds) or 30 min for species with longer dive durations (mysticetes and large odontocetes, including sperm, killer, and beaked whales).

*PSO Data and Documentation*

PSOs will record data to estimate the numbers of marine mammals exposed to various received sound levels and to document apparent disturbance reactions or lack thereof. Data will be used to estimate numbers of animals potentially 'taken' by harassment (as defined in the MMPA). They will also provide information needed to order a shut-down of the airguns when a marine mammal is within or near the EZ. Observations will also be made during daytime periods when the *Thompson* is underway without seismic operations (*i.e.*, transits to, from, and through the study area) to collect baseline biological data.

When a sighting is made, the following information about the sighting will be recorded:

1. Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from seismic vessel, sighting cue, apparent reaction to the airguns or vessel (*e.g.*, none, avoidance, approach, paralleling, *etc.*), and behavioral pace.
2. Time, location, heading, speed, activity of the vessel, Beaufort sea state, visibility, and sun glare.

The data listed under (2) will also be recorded at the start and end of each observation watch, and during a watch whenever there is a change in one or more of the variables.

All observations as well as information regarding shut-downs of the seismic source, will be recorded in a standardized format. The data accuracy will be verified by the PSOs at sea, and preliminary reports will be prepared during the field program and summaries forwarded to the operating institution's shore facility and to NSF weekly or more frequently.

Vessel-based observations by the PSO will provide:

1. The basis for real-time mitigation (airgun shut-down).
2. Information needed to estimate the number of marine mammals potentially taken by harassment, which must be reported to NMFS.
3. Data on the occurrence, distribution, and activities of marine mammals in the area where the seismic study is conducted.
4. Information to compare the distance and distribution of marine mammals relative to the source vessel at times with and without seismic activity.
5. Data on the behavior and movement patterns of marine mammals seen at times with and without seismic activity.

SIO will submit a report to NMFS and NSF within 90 days after the end of the cruise. The report will describe the operations that were conducted and sightings of marine mammals near the operations. The report will provide full documentation of methods, results, and interpretation pertaining to all monitoring. The 90-day report will summarize the dates and locations of seismic operations, and all marine mammal sightings (dates, times, locations, activities, associated seismic survey activities). The report will also include estimates of the number and nature of exposures that could result in potential ''takes'' of marine mammals by harassment or in other ways.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this IHA, such as an injury (Level A harassment), serious injury or mortality (*e.g.*, ship-strike, gear interaction, and/or entanglement), SIO will immediately cease the specified activities and immediately report the incident to the Chief of the Permits, Conservation, and Education Division, Office of Protected Resources, NMFS at 301–427–8401 and/or by e-mail to *Michael.Payne@noaa.gov* and *Howard.Goldstein@noaa.gov*, and the NMFS Pacific Islands Regional Office Stranding Coordinator at 808–944–2269 (*David.Schofield@noaa.gov*). The report must include the following information:

- Time, date, and location (latitude/longitude) of the incident;
- Name and type of vessel involved;
- Vessel's speed during and leading up to the incident;
- Description of the incident;
- Status of all sound source use in the 24 hours preceding the incident;
- Water depth;
- Environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS shall work with SIO to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. SIO may not resume their activities until notified by NMFS via letter or e-mail, or telephone.

In the event that SIO discovers an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (*i.e.*, in less than a moderate state of decomposition as described in the next paragraph), SIO will immediately report the incident to the Chief of the Permits, Conservation, and Education Division, Office of Protected Resources, NMFS, at 301–427–8401, and/or by e-mail to *Michael.Payne@noaa.gov* and *Howard.Goldstein@noaa.gov*, and the NMFS Pacific Islands Regional Office (808–944–2269) and/or by e-mail to the Pacific Islands Regional Stranding Coordinator (*David.Schofield@noaa.gov*). The report must include the same information identified in the paragraph above. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with SIO to determine whether modifications in the activities are appropriate.

In the event that SIO discovers an injured or dead marine mammal, and the lead PSO determines that the injury or death is not associated with or related to the activities authorized in the IHA (*e.g.*, previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), SIO will report the incident to the Chief of the Permits, Conservation, and Education Division, Office of Protected Resources, NMFS, at 301–427–8401, and/or by e-mail to *Michael.Payne@noaa.gov* and *Howard.Goldstein@noaa.gov*, and the NMFS Pacific Islands Regional Office (808–944–2269), and/or by e-mail to the Pacific Islands Regional Stranding Coordinator (*David.Schofield@noaa.gov*), within 24 hours of discovery. SIO will provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network.

## Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, the MMPA defines ''harassment'' as:

> any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Only take by Level B harassment is anticipated and proposed to be authorized as a result of the proposed marine geophysical survey in the western tropical Pacific Ocean. Acoustic stimuli (*i.e.*, increased underwater sound) generated during the operation of the seismic airgun array may have the potential to cause marine mammals in the survey area to be exposed to sounds at or greater than 160 dB or cause temporary, short-term changes in behavior. There is no evidence that the planned activities could result in injury, serious injury, or mortality within the specified geographic area for which SIO seeks the IHA. The required mitigation and monitoring measures will minimize any potential risk for injury, serious injury, or mortality.

The following sections describe SIO's methods to estimate take by incidental harassment and present the applicant's estimates of the numbers of marine mammals that could be affected during the proposed seismic program. The estimates are based on a consideration of the number of marine mammals that could be disturbed appreciably by operations with the two GI airgun array to be used during approximately 1,600 km of survey lines in the western tropical Pacific Ocean.

SIO assumes that, during simultaneous operations of the airgun array and the other sources, any marine mammals close enough to be affected by the MBES and SBP would already be affected by the airguns. However, whether or not the airguns are operating simultaneously with the other sources, marine mammals are expected to exhibit no more than short-term and inconsequential responses to the MBES and SBP given their characteristics (*e.g.*, narrow, downward-directed beam) and other considerations described previously. Such reactions are not considered to constitute ''taking'' (NMFS, 2001). Therefore, SIO provides no additional allowance for animals that could be affected by sound sources other than airguns.

Extensive systematic ship-based surveys have been conducted by NMFS Southwest Fisheries Science Center (SWFSC) for marine mammals in the eastern, but not the western tropical Pacific Ocean. A systematic vessel-based marine mammal survey was conducted approximately 2,500 km (1,349.9 nmi) west of the proposed survey area in the Commonwealth of the Northern Mariana Islands (CNMI) for the U.S. Navy during January to April, 2007 (SRS–Parsons *et al.*, 2007; Fulling *et al.*, in press). The cruise area was defined by the boundaries 10° to 18° North, 142° to 148° East, encompassing an area approximately 585,000 $km^2$ (170,558.7 $nmi^2$) including the islands of Guam and the southern CNMI. The survey was conducted using standard line-transect protocols developed by NMFS SWFSC. Observers visually surveyed 11,033 km (5,957.3 nmi) of trackline, mostly in high sea states (88% of the time in Beaufort Sea states four to six). Another survey was conducted by SWFSC approximately 3,500 km (1,889.8 nmi) east of the proposed survey area in the EEZ around Hawaii during August to November, 2002;

survey effort was 3,550 km (1,916.8 nmi) in the ''Main Island stratum,'' which had a surface area of 2,240,024 $km^2$ (653086.5 $nmi^2$) (Barlow, 2006).

SIO used densities that were the effort-weighted means for the CNMI (Fulling *et al.*, in press) and the outer EEZ stratum of Hawaii (Barlow, 2006). The densities had been corrected, by the original authors, for trackline detection probability bias, and for data from Hawaii, for availability bias. Trackline detection probability bias is associated with diminishing sightability with increasing lateral distance from the trackline, and is measured by $f(0)$. Availability bias refers to the fact that there is less-than-100% probability of sighting an animal that is present along the survey trackline $f(0)$, and it is measured by g(0). Fulling *et al.* (in press) did not correct the CNMI densities for availability bias (*i.e.*, it was assumed that g(0)=1), which resulted in underestimates of density. The densities are given in Table 3 of SIO's IHA application.

There is some uncertainty about the representativeness of the data and the assumptions used in the calculations, for example:

(1) The timing of most of the surveys was different, the CNMI survey was from January to April, the Hawaii survey was from August to November, and the proposed SIO survey is from November to December;

(2) Locations were also different, with the proposed survey area approximately 2,500 km east of the CNMI and approximately 3,500 km west of Hawaii; and

(3) Most of the Marianas survey was in high sea states that would have prevented detection of many marine mammals, especially cryptic species such as beaked whales and *Kogia* spp.

However, the approach used here is believed to be the best available approach.

SIO's estimates of exposures to various sound levels assume that the proposed surveys will be fully completed; in fact, the ensonified areas calculated using the planned number of line-km have been increased by 25% to accommodate turns, lines that may need to be repeated, equipment testing, *etc.* As is typical during offshore ship surveys, inclement weather and equipment malfunctions are likely to cause delays and may limit the number of useful line-kilometers of seismic operations that can be undertaken. Furthermore, any marine mammal sightings within or near the designated EZs will result in the shut-down of seismic operations as a mitigation measure. Thus, the following estimates of the numbers of marine mammals potentially exposed to sound levels of 160 dB re 1 μPa (rms) are precautionary and probably overestimate the actual numbers of marine mammals that might be involved. These estimates also assume that there will be no weather, equipment, or mitigation delays, which is highly unlikely.

SIO estimated the number of different individuals that may be exposed to airgun sounds with received levels greater than or equal to 160 dB re 1 μPa (rms) on one or more occasions by considering the total marine area that would be within the 160 dB radius around the operating airgun array on at least one occasion, along with the expected density of marine mammals in the area. The proposed seismic lines do not run parallel to each other in close proximity and the ensonified areas do not overlap, thus an individual mammal that was stationary would be exposed once during the proposed survey.

The numbers of different individuals potentially exposed to greater than or equal to 160 dB (rms) were calculated by multiplying the expected species density times the anticipated area to be ensonified. The area was determined by entering the planned survey lines into a MapInfo GIS, using the GIS to identify the relevant areas by ''drawing'' the applicable 160 dB buffer (see Table 1 of the IHA application) around each seismic line, and then calculating the total area within the buffers. For this survey, there were no areas of overlap because of crossing lines.

Applying the approach described above, approximately 2,144 $km^2$ (625.1 $nmi^2$) (approximately 2,680 $km^2$ [781.4 $nmi^2$] including the 25% contingency) would be within the 160 dB isopleth on one or more occasions during the proposed survey. Because this approach does not allow for turnover in the marine mammal populations in the study area during the course of the survey, the actual number of individuals exposed could be underestimated, although the conservative (*i.e.,* probably overestimated) line-kilometer distances used to calculate the area may offset this. Also, the approach assumes that no cetaceans will move away from or toward the trackline as the *Thompson* approaches in response to increasing sound levels prior to the time the levels reach 160 dB. Another way of interpreting the estimates that follow is that they represent the number of individuals that are expected (in the absence of a seismic program) to occur in the waters that will be exposed to greater than or equal to 160 dB re 1 μPa (rms).

Table 3 (Table 4 of the IHA application) shows the estimates of the number of different individual marine mammals that potentially could be exposed to greater than or equal to 160 dB re 1 μPa (rms) during the seismic survey if no animals moved away from the survey vessel. The requested take authorization is given in Table 3 (below; the far right column of Table 4 of the IHA application). For ESA listed species, the requested take authorization has been increased to the mean group size in the CNMI (Fulling *et al.,* in press) for the particular species in cases where the calculated number of individuals exposed was between 0.05 and the mean group size (*i.e.,* for the sei whale). For species not listed under the ESA that could occur in the study area, the requested take authorization has been increased to the mean group size in the CNMI (Fulling *et al.,* in press) or, for species not sighted in the CNMI survey, Hawaii (Barlow, 2006) for the particular species in cases where the calculated number of individuals exposed was between 1 and the mean group size.

The estimate of the number of individual cetaceans that could be exposed to seismic sounds with received levels greater than or equal to 160 dB re 1 μPa (rms) during the proposed survey is 118 (see Table 4 of the IHA application). That total includes 1 Bryde's whale, 6 sperm whales, 5 pygmy sperm whales, 12 dwarf sperm whales, 10 Cuvier's beaked whales, 1 Longman's beaked whale, 2 Blainville's beaked whales, 5 rough-toothed dolphins, 2 bottlenose dolphins, 30 pantropical spotted dolphins, 5 spinner dolphins, 16 striped dolphins, 7 Fraser's dolphins, 1 Risso's dolphin, 7 melon-headed whales, 2 false killer whales, and 6 short-finned pilot whales which would represent less than 0.01%, 0.02%, NA, less than 0.01%, 0.05%, NA, less than 0.01%, less than 0.01%, less than 0.01%, less than 0.01%, less than 0.01%, less than 0.01%, less than 0.01%, less than 0.01%, 0.02%, less than 0.01%, and less than 0.01% of the regional populations, respectively. Most (68.6%) of the cetaceans potentially exposed are delphinids; pantropical spotted, striped, and Fraser's dolphins are estimated to be the most common species in the proposed study area.

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Table 3. Estimates of the possible numbers of marine mammals exposed to different sound levels ≥160 dB during SIO's proposed seismic survey in the western tropical Pacific Ocean during November to December, 2011.

| Species | Estimated Number of Individuals Exposed to Sound Levels ≥ 160 dB re 1 µPa[1] | Requested Take Authorization | Approximate Percent of Regional Population[2] |
|---|---|---|---|
| Mysticetes | | | |
| Humpback whale | 0 | 0 | 0 |
| Minke whale | 0 | 0 | 0 |
| Bryde's whale | 1 | 1[3] | <0.01 |
| Sei whale | 0 | 1[3] | <,0.01 |
| Fin whale | 0 | 0 | 0 |
| Blue whale | 0 | 0 | 0 |
| Odontocetes | | | |
| Sperm whale | 6 | 6 | 0.02 |
| Pygmy sperm whale | 5 | 5 | NA |
| Dwarf sperm whale | 12 | 12 | <0.01 |
| Cuvier's beaked whale | 10 | 10 | 0.05 |
| Longman's beaked whale | 1 | 18 | NA |
| Blainville's beaked whale | 2 | 2 | <0.01 |
| Ginkgo-toothed beaked whale | 0 | 0 | 0 |
| Rough-toothed dolphin | 5 | 9[3] | <0.01 |
| Bottlenose dolphin | 2 | 2[3] | <0.01 |
| Pantropical spotted dolphin | 30 | 64[3] | <0.01 |
| Spinner dolphin | 5 | 98[3] | <0.01 |
| Striped dolphin | 16 | 27[3] | <0.01 |
| Fraser's dolphin | 7 | 182[4] | <0.01 |
| Risso's dolphin | 1 | 15[4] | <0.01 |
| Melon-headed whale | 7 | 95[3] | 0.02 |
| Pygmy killer whale | 0 | 0 | 0 |
| False killer whale | 2 | 10[3] | <0.01 |
| Killer whale | 0 | 7[4] | <0.01 |
| Short-finned pilot whale | 6 | 18[3] | <0.01 |
| Pinnipeds | | | |
| Hawaiian monk seal | 0 | 0 | 0 |

[1] Estimates are based on densities from Table 2 (Table 3 of the IHA application) and ensonified areas (including 25% contingency) for 160 dB of 2,680 $km^2$.
[2] Regional population size estimates are from Table 2 (see Table 2 of the IHA application); NA means not available.
[3] Increased to mean group size in the CNMI (Fulling et al. in press).
[4] Increased to mean group size in Hawaii (Barlow, 2006).

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## Encouraging and Coordinating Research

SIO and NSF will coordinate the planned marine mammal monitoring program associated with the seismic survey in the western tropical Pacific Ocean with any parties that may have or express an interest in the proposed seismic survey. UW will work with the U.S. Department of State to obtain the necessary approvals for operating in the foreign EEZ of the Republic of the Marshall Islands.

## Negligible Impact and Small Numbers Analysis and Determination

NMFS has defined ''negligible impact'' in 50 CFR 216.103 as ''* * * an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.'' In making a negligible impact determination, NMFS evaluated factors such as:

(1) The number of anticipated injuries, serious injuries, or mortalities;

(2) The number, nature, and intensity, and duration of Level B harassment (all relatively limited);

(3) The context in which the takes occur (*i.e.,* impacts to areas of significance, impacts to local populations, and cumulative impacts when taking into account successive/contemporaneous actions when added to baseline data);

(4) The status of stock or species of marine mammals (*i.e.,* depleted, not depleted, decreasing, increasing, stable, and impact relative to the size of the population);

(5) Impacts on habitat affecting rates of recruitment/survival; and

(6) The effectiveness of monitoring and mitigation measures (*i.e.,* the manner and degree in which the measure is likely to reduce adverse impacts to marine mammals, the likely effectiveness of the measures, and the practicability of implementation).

For reasons stated previously in this document, the specified activities associated with the marine seismic survey are not likely to cause PTS, or other non-auditory injury, serious injury, or death because:

(1) The likelihood that, given sufficient notice through relatively slow ship speed, marine mammals are expected to move away from a noise source that is annoying prior to its becoming potentially injurious;

(2) The potential for temporary or permanent hearing impairment is relatively low and would likely be avoided through the incorporation of the required monitoring and mitigation measures (described above);

(3) The fact that pinnipeds would have to be closer than 20 m (65.6 ft) in deep water when the two GI airgun array is in use at 3 m (9.8 ft) tow depth from the vessel to be exposed to levels of sound believed to have even a minimal chance of causing PTS;

(4) The fact that cetaceans would have to be closer than 70 m (229.7 ft) in deep water when the two GI airgun array is in 3 m tow depth from the vessel to be exposed to levels of sound believed to have even a minimal chance of causing PTS; and

(5) The likelihood that marine mammal detection ability by trained PSOs is high at close proximity to the vessel.

No injuries, serious injuries, or mortalities are anticipated to occur as a result of SIO's planned marine seismic survey, and none are authorized by NMFS. Only short-term, behavioral disturbance is anticipated to occur due to the brief and sporadic duration of the survey activities. Table 3 in this document outlines the number of Level B harassment takes that are anticipated as a result of the activities. Due to the nature, degree, and context of Level B (behavioral) harassment anticipated and described (see Potential Effects on Marine Mammals section above) in this notice, the activity is not expected to impact rates of recruitment or survival for any affected species or stock.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (*i.e.,* 24 hr cycle). Behavioral reactions to noise exposure (such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.,* 2007). While seismic operations are anticipated to occur on consecutive days, the entire duration of the survey is not expected to last more than 32 days and the *Thompson* will be continuously moving along planned tracklines. Therefore, the seismic survey will be increasing sound levels in the marine environment surrounding the vessel for several weeks in the study area. Of the 26 marine mammal species under NMFS jurisdiction that are known to or likely to occur in the study area, six are listed as threatened or endangered under the ESA: humpback, sei, fin, blue, sperm, and Hawaiian monk seals. These species are also considered depleted under the MMPA. The Hawaiian monk seal population has generally been decreasing (the main Hawaiian islands population appears to be increasing). There is generally insufficient data to determine population trends for the other depleted species in the study area. To protect these animals (and other marine mammals in the study area), SIO must cease or reduce airgun operations if animals enter designated zones. No injury, serious injury, or mortality is expected to occur and due to the nature, degree, and context of the Level B harassment anticipated, the activity is not expected to impact rates of recruitment or survival.

As mentioned previously, NMFS estimates that 19 species of marine mammals under its jurisdiction could be potentially affected by Level B harassment over the course of the proposed IHA. For each species, these numbers are small (each less than one percent) relative to the regional population size. The population estimates for the marine mammal species that may be taken by harassment were provided in Table 2 of this document.

NMFS's practice has been to apply the 160 dB re 1 μPa (rms) received level threshold for underwater impulse sound levels to determine whether take by Level B harassment occurs. Southall *et al.* (2007) provide a severity scale for ranking observed behavioral responses of both free-ranging marine mammals and laboratory subjects to various types of anthropogenic sound (see Table 4 in Southall *et al.* [2007]).

NMFS has preliminarily determined, provided that the aforementioned mitigation and monitoring measures are implemented, that the impact of conducting a marine geophysical survey in the western tropical Pacific Ocean, November to December, 2011, may result, at worst, in a temporary modification in behavior and/or low-level physiological effects (Level B harassment) of small numbers of certain species of marine mammals. See Table 3 (above) for the requested authorized take numbers of cetaceans.

While behavioral modifications, including temporarily vacating the area during the operation of the airgun(s), may be made by these species to avoid the resultant acoustic disturbance, the availability of alternate areas within these areas and the short and sporadic duration of the research activities, have led NMFS to preliminary determine that this action will have a negligible impact on the species in the specified geographic region.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the mitigation and monitoring measures, NMFS preliminarily finds that SIO's planned research activities, will result in the incidental take of small numbers of marine mammals, by Level B harassment only, and that the total taking from the marine seismic survey will have a negligible impact on the affected species or stocks of marine mammals; and that impacts to affected species or stocks of marine mammals have been mitigated to the lowest level practicable.

## Impact on Availability of Affected Species or Stock for Taking for Subsistence Uses

Section 101(a)(5)(D) also requires NMFS to determine that the authorization will not have an unmitigable adverse effect on the availability of marine mammal species or stocks for subsistence use. There are no relevant subsistence uses of marine mammals in the study area (offshore waters of the western tropical Pacific Ocean) that implicate MMPA section 101(a)(5)(D).

## Endangered Species Act

Of the species of marine mammals that may occur in the proposed survey area, several are listed as endangered under the ESA, including the humpback, sei, fin, blue, and sperm whales, as well as the Hawaiian monk seal. Under section 7 of the ESA, NSF has initiated formal consultation with the NMFS, Office of Protected Resources, Endangered Species Division, on this proposed seismic survey. NMFS's Office of Protected Resources, Permits, Conservation and Education Division, has initiated formal consultation under Section 7 of the ESA with NMFS's Office of Protected Resources, Endangered Species Division, to obtain a Biological Opinion evaluating the effects of issuing the IHA on threatened and endangered marine mammals and, if appropriate, authorizing incidental take. NMFS will conclude formal section 7 consultation prior to making a determination on whether or not to issue the IHA. If the IHA is issued, NSF and SIO, in addition to the mitigation and monitoring requirements included in the IHA, will be required to comply with the Terms and Conditions of the Incidental Take Statement corresponding to NMFS's Biological Opinion issued to both NSF and NMFS's Office of Protected Resources.

**National Environmental Policy Act (NEPA)**

With its complete application, NSF and SIO provided NMFS a draft EA analyzing the direct, indirect, and cumulative environmental impacts of the proposed specified activities on marine mammals including those listed as threatened or endangered under the ESA. The draft EA, prepared by NSF incorporates a document prepared by LGL on behalf of NSF and SIO. It is entitled ''Environmental Assessment of a Low-Energy Marine Geophysical Survey by the R/V *Thompson* in the Western Tropical Pacific Ocean, November–December 2011.'' Prior to making a final decision on the SIO application, NMFS will either prepare an independent EA, or, after review and evaluation of the SIO EA for consistency with the regulations published by the Council of Environmental Quality (CEQ) and NOAA Administrative Order 216–6, Environmental Review Procedures for Implementing the National Environmental Policy Act, adopt the NSF EA and make a decision of whether or not to issue a Finding of No Significant Impact (FONSI).

**Proposed Authorization**

NMFS proposes to issue an IHA to SIO for conducting a marine geophysical survey in the western tropical Pacific Ocean, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. The duration of the IHA would not exceed one year from the date of its issuance.

**Information Solicited**

NMFS requests interested persons to submit comments and information concerning this proposed project and NMFS's preliminary determination of issuing an IHA (see **ADDRESSES**). Concurrent with the publication of this notice in the **Federal Register**, NMFS is forwarding copies of this application to the Marine Mammal Commission and its Committee of Scientific Advisors.

Dated: July 25, 2011.

**Helen M. Golde,**

*Deputy Director, Office of Protected Resources, National Marine Fisheries Service.*

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**BILLING CODE 3510–22–P**

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## DEPARTMENT OF COMMERCE

### United States Patent and Trademark Office

### Fastener Quality Act Insignia Recordal Process

**ACTION:** Proposed collection; comment request.

**SUMMARY:** The United States Patent and Trademark Office (USPTO), as part of its continuing effort to reduce paperwork and respondent burden, invites the general public and other Federal agencies to take this opportunity to comment on the continuing information collection, as required by the Paperwork Reduction Act of 1995, Public Law 104–13 (44 U.S.C. 3506(c)(2)(A)).

**DATES:** Written comments must be submitted on or before September 27, 2011.

**ADDRESSES:** You may submit comments by any of the following methods:

- *E-mail: InformationCollection@uspto.gov.* Include ''0651–0028 comment'' in the subject line of the message.
- *Mail:* Susan K. Fawcett, Records Officer, Office of the Chief Information Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313–1450.
- *Federal Rulemaking Portal: http://www.regulations.gov.*

**FOR FURTHER INFORMATION CONTACT:** Requests for additional information should be directed to the attention of Catherine Cain, Attorney Advisor, Office of the Commissioner for Trademarks, United States Patent and Trademark Office, P.O. Box 1451, Alexandria, VA 22313–1451, by telephone at 571–272–8946, or by e-mail to *Catherine.Cain@uspto.gov.* Additional information about this collection is also available at *http://www.reginfo.gov* under ''Information Collection Review.''

**SUPPLEMENTARY INFORMATION:**

**I. Abstract**

Under Section 5 of the Fastener Quality Act of 1999 (FQA), 15 U.S.C. 5401 *et seq.,* certain industrial fasteners must bear an insignia identifying the manufacturer. It is also mandatory for manufacturers of fasteners covered by the FQA to submit an application to the United Stated Patent and Trademark Office (USPTO) for recordal of the insignia on the Fastener Insignia Register.

The procedures for the recordal of fastener insignia under the FQA are set forth in 15 CFR 280.300 *et seq.* The purpose of requiring both the insignia and the recordation is to ensure that certain fasteners can be traced to their manufacturers and to protect against the sale of mismarked, misrepresented, or counterfeit fasteners.

The insignia may be either a unique alphanumeric designation that the USPTO will issue upon request or a trademark that is registered at the USPTO or is the subject of an application to obtain a registration. After a manufacturer submits a complete application for recordal, the USPTO issues a Certificate of Recordal. These certificates remain active for five years. Applications to renew the certificates must be filed within six months of the expiration date or, upon payment of an additional surcharge, within six months following the expiration date.

If a recorded alphanumeric designation is assigned by the manufacturer, the designation becomes ''inactive,'' and the new owner must submit an application to reactivate the designation within six months of the date of assignment. If the recordal is based on a trademark application or registration, and that registration is assigned, the recordal becomes ''inactive'' and cannot be reactivated. Instead, the new owner of the trademark application or registration must apply for a new recordal. Manufacturers who record insignia must notify the USPTO of any changes of address.

This information collection includes one form, the Application for Recordal of Insignia or Renewal/Reactivation of Recordal Under the Fastener Quality Act (PTO–1611), which provides manufacturers with a convenient way to