

Response: NMFS believes that a 30-minute pre-ramp-up monitoring period is sufficient considering that the ramp-up period will increase Sound Pressure Level (SPL) at a rate no greater than 6 dB per 5-minutes for a ramp-up duration of approximately 25 min for the 20-gun array and a total monitoring period of approximately 55 minutes. Also, while some whale species may dive for up to 45 minutes, it is unlikely that the ship's bridge watch would miss a large whale surfacing from its previous dive if it is within a mile or two of the vessel.

Comment 3: The **Federal Register** notice for the proposed IHA and the applicant's request notes that there are several species of beaked whales in the proposed survey area, but the notice does not indicate that additional caution with respect to these species may be necessary or propose any post-survey monitoring of the sort that would be needed to detect animals that may have been taken other than by harassment.

Response: NMFS shares the Commission's concern regarding the possible relationship between low-frequency seismic survey transmissions and the beaked whale strandings in the Gulf of California. However, beaked whales in the Gulf of Mexico have been exposed to seismic noise for several decades, yet mass stranding events do not appear in the stranding record. Therefore, NMFS believes that additional factors probably also influence whether beaked whales will be affected in ways other than the expected reaction of vacating the immediate vicinity of the noise, similar to the reactions of other marine mammal species. For LDEO's survey near Bermuda, NMFS has decided to include additional monitoring requirements within the IHA (see Monitoring below).

Mitigation

For the seismic operations in the Bermuda Rise area in 2003, LDEO will use two different configurations of a 20-airgun array. The airguns comprising these arrays will be spread out horizontally, so that the energy from the arrays will be directed mostly downward.

The sound pressure fields were modeled by LDEO in relation to distance and direction from the standard and augmented 20-gun arrays as shown in Figures 5 and 6 of the application, respectively (LDEO Bermuda 2003). Since the sound pressure fields around both configurations of the 20-gun array are similar, the marine mammal safety radii for the augmented 20-gun array will be used for the duration of the cruise. The

radius around the augmented 20-gun array where the received level would be 180 dB re 1 μ Pa (rms) (the current level established for onset of Level A harassment of cetaceans) is estimated as 925 m (3035 ft). The radius around the augmented 20-gun array where the received level would be 190 dB re 1 μ Pa (rms), (the current level established for onset of Level A harassment of pinnipeds), is estimated as 300 m (984 ft). A calibration study was conducted prior to these surveys to determine the actual radii corresponding to each sound level. These actual radii will be used to define the safety radii to be used for this study. Until then, or if those measurements appear defective, LDEO will use a precautionary 1.5 times the modeled 180- (cetaceans) and 190- (pinnipeds) dB radii as the safety radii.

The directional nature of the airgun array to be used in this project is an important mitigating factor, resulting in lower sound levels at any given horizontal distance than would be expected at that distance if the source were omnidirectional with the stated nominal source level. Because the actual seismic source is a distributed sound source rather than a single point source, the highest sound levels measurable at any location in the water will be less than the nominal source level.

The following mitigation measures, as well as marine mammal monitoring, will be adopted during the Bermuda seismic survey program, provided that doing so will not compromise operational safety requirements: (1) Speed or course alteration; (2) power-down procedures; (3) shut-down procedures; and (4) ramp-up procedures.

Course Alteration

If a marine mammal is detected outside the appropriate safety radius and, based on its position and the relative bearing, is likely to enter the safety radius, the vessel's speed and/or direct course will be changed in a manner that also minimizes the effect to the planned science objectives. The marine mammal activities and movements relative to the seismic vessel will be closely monitored to ensure that the marine mammal does not approach or enter the safety radius. If the mammal appears likely to enter the safety radius, further mitigative actions will be taken, i.e., either further course alterations or power- or shut-down of the airguns.

Power-down and Shut-down Procedures

Airgun operations will be powered- or shut-down immediately when cetaceans or pinnipeds are seen within or about to enter the appropriate 180-dB (rms) or

190-dB (rms) safety radius. If a marine mammal is detected outside the safety radius but is likely to enter it, and if the vessel's course and/or speed cannot be changed to avoid having the marine mammal enter the safety radius, the airguns will be powered-down before the mammal is within the safety radius. If a mammal is already within the safety radius when first detected, the airguns will be powered-down immediately. If a marine mammal is seen within the appropriate safety radius of the array while the guns are powered-down, airgun operations will be shut-down. A power-down involves decreasing the number of airguns in use such that the radius of the 180-dB zone is decreased to the extent that marine mammals are not in the safety radii. A power-down may also occur when the vessel is moving from one seismic line to another. For the power-down procedure, one airgun (either 80 or 145 in³) will be operated during the interruption of seismic survey. Airgun activity (after both power-down and shut-down procedures) will not resume until the marine mammal has cleared the safety radius. The animal has cleared the safety radius if it is visually observed to have left the safety radius, or if it has not been seen within the radius for 15 min (small odontocetes and pinnipeds) or 30 min (mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm and beaked whales).

If a cetacean is detected close to the airgun array during a power-down, modeled safety radii for a single gun will be maintained. If the standard 20-gun array is used, the single gun that will be firing is 80 in³, and for the augmented array, it is 145 in³. The safety radii for the larger 145 in³ gun will be used for mitigation purposes. Since no calibrations have been done to confirm the modeled safety radii for this single gun, conservative (1.5 times the safety radius) radii will be used: 48 m or 158 ft (the conservative radius is 72 m or 236 ft) for cetaceans, and 17 m or 56 ft (the conservative radius is 26 m or 85 ft) for pinnipeds.

Ramp-up Procedure

LDEO will employ a ramp-up procedure when commencing operations using the 20-gun array. Ramp-up will begin with the smallest gun in the array (80 in³ for the standard array and 145 in³ for the augmented array), and guns will be added in a sequence such that the source level of the array will increase at a rate no greater than 6 dB per 5-minute period over a total duration of about 25 minutes. This ramp-up procedure will