

be followed when the airgun array begins operating after a specified-duration period without airgun operations. Under normal operational conditions (vessel speed of about 4 knots or 7.4 km/hr), the *Maurice Ewing* would travel 900 m (2953 ft) in about 7 minutes and a ramp-up will be required after a power-down or shut-down period lasting 7 minutes or longer if the *Ewing* tows a 20-airgun array. If the towing speed is reduced to 3 knots or less, a ramp-up will be required after a "no shooting" period lasting 10 minutes or longer. Based on the same calculation, a ramp-up procedure will be required after a 6 minute period if the speed of the source vessel was 5 knots. During the ramp-up procedures, the safety zone for the full-gun array will be maintained.

Ramp-up will not occur if the safety radius has not been visible for at least 30 min prior to the start of operations in either daylight or nighttime. If the airguns are started up at night, two marine mammal observers will monitor for marine mammals near the source vessel for 30 minutes prior to start up of airgun operations and during the subsequent ramp-up procedures. If the safety radius has not been visible for that 30 minute period (e.g., during darkness or fog), ramp-up will not commence unless one airgun with an SPL of at least 180 dB has been maintained during the interruption of seismic activity. Therefore, it is likely that the 20-gun array will not be ramped up from a shut-down at night or in thick fog, since the safety radii for this array will not be visible during those conditions.

Monitoring and Reporting

LDEO will conduct marine mammal monitoring of its seismic survey near Bermuda in order to verify that the taking of marine mammals, by harassment, incidental to conducting the seismic survey will have a negligible impact on marine mammal stocks and to ensure that these harassment takings are at the lowest level practicable.

Marine Mammal Monitoring

At least two vessel-based observers dedicated to marine mammal observations within the vicinity of the array will be stationed aboard LDEO's seismic survey vessel for the seismic survey near Bermuda. One or two marine mammal observers aboard the seismic vessel will search for and observe marine mammals whenever seismic operations are in progress during daylight hours, and if feasible, during periods without seismic activity. Airgun operations will be suspended

when marine mammals are observed within, or about to enter, designated safety radii, where there is a possibility of Level A harassment. The observers will watch for marine mammals from the highest practical vantagepoint on the vessel, which is either the bridge or the flying bridge. On the *R/V Maurice Ewing*, the observer's eye level will be approximately 11 m (36 ft) above sea level when stationed on the bridge, allowing for good visibility within a 210° arc for each observer. If observers are stationed on the flying bridge, the eye level will be 14.4 m (47.2 ft) above sea level.

The observer(s) will systematically scan the area around the vessel with 7 X 50 Fujinon reticle binoculars or with the naked eye during the daytime. At night, night vision equipment will be available (ITT F500 Series Generation 3 binocular image intensifier or equivalent). Laser rangefinding binoculars (Leica LRF 1200 laser rangefinder or equivalent) will be available to assist with distance estimation. At least two observers will be based aboard the vessel, and at least one will be an experienced marine mammal observer. Observers will be appointed by LDEO with NMFS concurrence. Observers will be on duty in shifts of duration no longer than 4 hours.

Two vessel-based observers will monitor for marine mammals near and in the safety radii for at least 30 minutes prior to and during all daylight airgun operations including ramp-ups, after an extended shut-down, and during any nighttime startups of the airguns. Use of two simultaneous observers will increase the proportion of the marine mammals present near the source vessel that are detected. Observers will not be required to be on duty during ongoing seismic operations at night; bridge personnel will watch for marine mammals during this period and will call for the airguns to be powered-down if marine mammals are observed in or about to enter the safety radii. LDEO bridge personnel will also assist in detecting marine mammals and implementing mitigation requirements whenever possible (they will be given instruction on how to do so), especially during ongoing operations at night. At least one marine mammal observer will be on "standby" at night, in case bridge personnel see a marine mammal. An image-intensifier night-vision device (NVD) will be available for use at night. As discussed earlier, ramp-up will not occur if the safety radius has not been visible for at least 30 min prior to the start of operations in either daylight or nighttime. If the airguns are started up

at night, two marine mammal observers will monitor for marine mammals near the source vessel for 30 minutes prior to start up using NVDs. The 30-minute observation period is only required prior to commencing seismic operations following a shut-down of the 20-gun array for more than 1 hour. After 30 minutes of observation, the ramp-up procedure will be followed.

In addition to the vessel-based visual monitoring of marine mammals, LDEO will implement a monitoring program, with approval from NMFS, to detect, to the greatest extent practicable, any marine mammal/sea turtle stranding that may result from this activity. The monitoring program will contain the following elements: (1) aerial or terrestrial monitoring of all beaches shoreward to the *Ewing's* trackline; (2) the availability on a 24-hour basis of at least one veterinarian trained in conducting necropsies; (3) establishment of a communications network with one or more marine mammal veterinarians, beach monitors and the Bermuda Biological Station; and (4) an established protocol for conducting necropsies and securing labs for proper analysis, ensuring site security and the preservation, storage and transport of biological samples.

Reporting

When a marine mammal sighting occurs, 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 seismic vessel (e.g., none, avoidance, approach, paralleling, etc.), and behavioral pace; and (2) time, location, heading, speed, activity of the vessel (shooting or not), sea state, visibility, cloud cover, 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 mammal observations and airgun shutdowns will be recorded in a standardized format. Data will be entered into a custom database using a laptop computer when observers are off-duty. The accuracy of the data entry will be verified by computerized validity data checks as the data are entered and by subsequent manual checking of the database. These procedures will allow initial summaries of data to be prepared during and shortly after the field program, and will facilitate transfer of the data to statistical, graphical or other