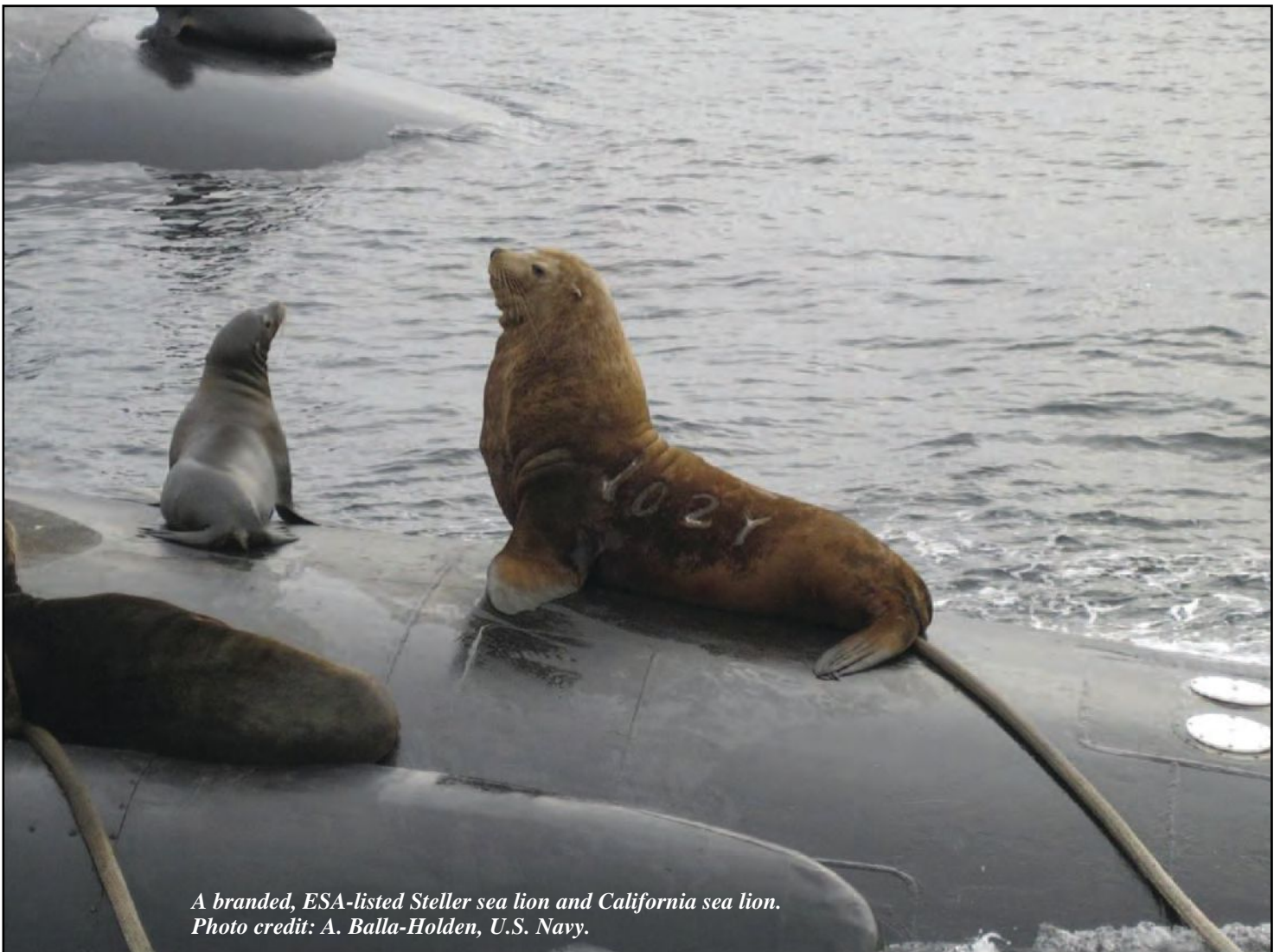


In-Water Biological and Acoustic Monitoring for the U.S. Navy's Test Pile Program

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*A branded, ESA-listed Steller sea lion and California sea lion.
Photo credit: A. Balla-Holden, U.S. Navy.*

Background

HDR, Inc. provided comprehensive monitoring services for an in-water pile driving construction project at Naval Base Kitsap Bangor, Washington. Using highly trained marine species observers, field technicians, and acousticians, we ensured client compliance in the face of complex regulatory requirements.

Monitoring and Observation Are Essential

Noise-related disturbance of protected marine species during in-water construction is a topic of concern for government agencies, industry representatives, scientists, and regulators and is the subject of increasing regulatory attention. Comprehensive biological and hydroacoustic monitoring using highly trained observers are essential elements in ensuring client compliance in the face of complex and often rigorous regulatory requirements. An example of HDR's contribution in this area is the intensive biological and acoustic monitoring conducted for a large-scale, in-water pile driving project (the Test Pile Program or "TPP") at Bangor. The TPP was conducted at Bangor waterfront, located in the Hood Canal in Kitsap County, Washington, which is located approximately 20 mi due west of Seattle. NBK Bangor is a secured military base and provides support to U.S. Navy submarines and other U.S. Navy Fleet assets. The Bangor waterfront and adjacent areas in the Hood Canal are restricted to the general public, and HDR's close coordination with client representatives, military personnel, and construction contractors was key to the success of this monitoring effort. HDR enacted complex and intensive monitoring plans in and around restricted areas and worked closely with the Navy to ensure all monitoring personnel complied with rigorous on-site security protocols. A suite of mitigation measures was employed for the project. These measures included maintenance of exclusion/shut-down zones during construction, use of a bubble curtain to attenuate sound from both impact and vibratory pile driving, and the use of "soft start" procedures. The soft start is intended to provide a "warning" to wildlife and an opportunity for animals to leave the area prior to pile driving onset. Monitoring and mitigation was conducted for marine mammals, including the Endangered Species Act (ESA)-listed Steller sea lion, fish, and seabirds, including the threatened Marbled

Murrelet, which forages in coastal areas in the Northwest U.S. and Alaska.

Compliance and Science

The goal of the TPP was not to build a particular structure, but rather to acquire site-specific data to better understand sound propagation from in-water construction and establish acoustic thresholds corresponding to harassment and injury zones for cetaceans, pinnipeds, fish, and seabirds. Hood Canal is a fjord with complex bathymetry, including relatively deep waters in the main channel and considerable slope adjacent to shorelines. At the Bangor waterfront, 29 steel piles of varying sizes were installed and removed using both vibratory and impact hammers. Underwater measurements were conducted at as many as six different locations ranging from 10-m to more than 7,000-m from the test pile to provide a better understanding of how sound propagates underwater at this location. Sea lions often come out of the water to rest ("haul out") on various structures at the Bangor waterfront, including the waterfront port security barrier fence and on submarines docked at Navy



A Marbled Murrelet. Photo credit: National Digital Library of the US Fish and Wildlife Service.

piers. Therefore, airborne noise monitoring was conducted to measure potential effects on hauled-out pinnipeds and seabirds resting in the water.

Construction was suspended on a fairly regular basis to accommodate on-base operations. On these non-construction days, the HDR monitoring team, at the Navy's direction, conducted dedicated, systematic surveys for marine mammals and Marbled Murrelets throughout Hood Canal and in adjacent Dabob Bay. The goal of these systematic surveys was to collect baseline data on abundance, density, and habitat use of marine species within the action area and adjacent waters. These data added substantial value to the project by improving general knowledge of the marine species in the region and by providing the client with critical information needed for future consultations and region-specific environmental impact statements.



California sea lions hauled out on U.S. Navy submarines at Naval Base Kitsap waterfront. Photo credit: A. Balla-Holden, U.S. Navy.

Monitoring Plans

To help the Navy maintain regulatory compliance under the ESA and the Marine Mammal Protection Act (MMPA), the HDR monitoring team (in cooperation with Hart Crowser, Inc. and Illingworth and Rodkin, Inc.) conducted visual monitoring for marine mammals and seabirds using vessel- and land-based platforms at varying distances from the construction site. Airborne and hydroacoustic monitoring was also employed to evaluate the effectiveness of noise attenuation techniques. Monitoring plans for marine mammals, Marbled Murrelets, and acoustic data collection were developed by the Navy and approved by the regulatory agencies (National Marine Fisheries Service [NMFS] and U.S.

Fish and Wildlife Service). Monitoring plans included the following objectives:

- Comply with the requirements of the ESA Section 7 consultation and MMPA Incidental Harassment Authorization issued to the U.S. Navy for the TPP.
- Record the presence, location, and behavior of both marine mammals and Marbled Murrelets in relation to pile-driving activity.
- Avoid the injury of marine mammals and Marbled Murrelets from pile-driving noise by communicating immediately with the construction contractor and initiating construction shutdown procedures if animals entered the shutdown zone(s).
- Calculate acoustic spreading loss/sound propagation rates to establish acoustic thresholds corresponding to harassment and injury zones for cetaceans, pinnipeds, fish, and seabirds.
- Use underwater noise measurements to assess the effectiveness of bubble curtain use in reducing underwater noise from pile driving.

Project Accomplishments

- Estimated the number of animals potentially disturbed (Level-B “takes”) relative to *in-situ* source-level sound measurements in comparison with modeled sound propagation levels, recorded animal positions and the distance to established noise thresholds corresponding to harassment and injury zones for cetaceans, pinnipeds, fish, and seabirds. No injury (Level-A “takes”) occurred on the project.
- At the request of the NMFS, HDR scientists extrapolated potential takes of unobserved animals by using species-specific density estimates derived from systematic baseline surveys and, in doing, so provided conservative take estimates still well within permitted limits.
- The HDR on-site monitoring team successfully managed emergent situations, including the unseasonably early arrival of ESA-listed Steller sea lions in the project area. HDR quickly put additional dedicated monitors in place to halt construction if any Steller sea lions approached the water and, in doing so, ensured Navy compliance and successfully avoided any permit violations.