

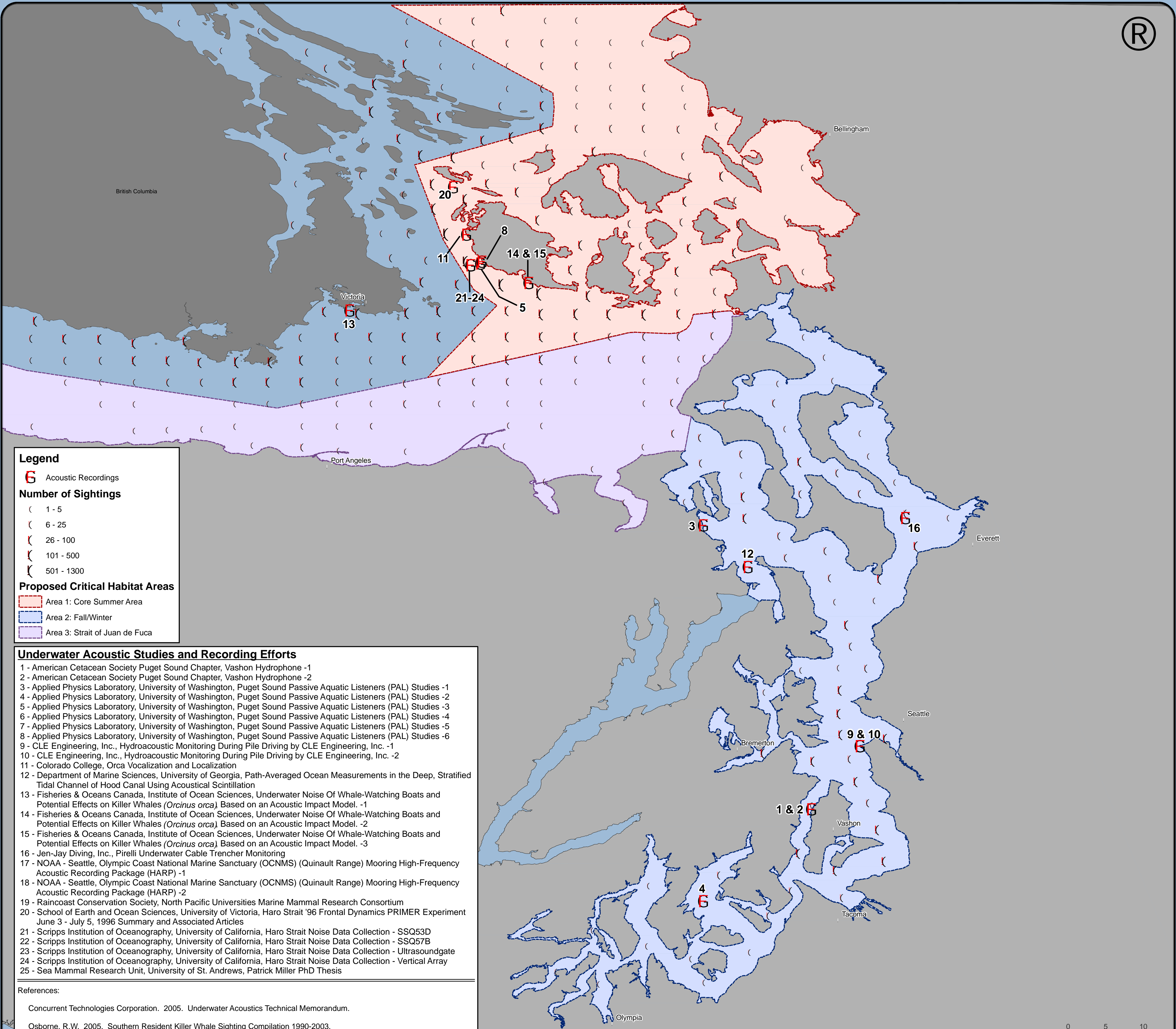
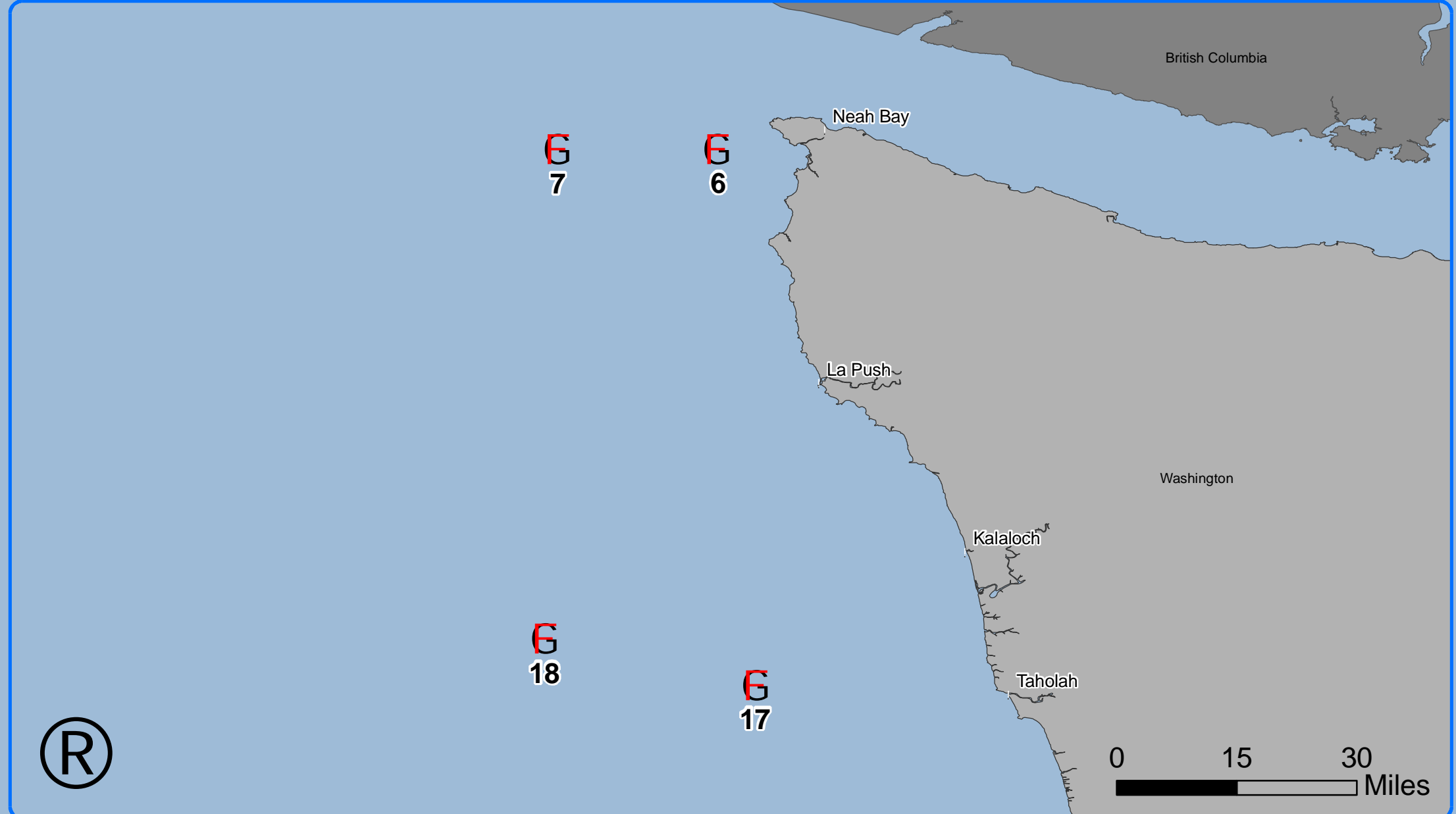
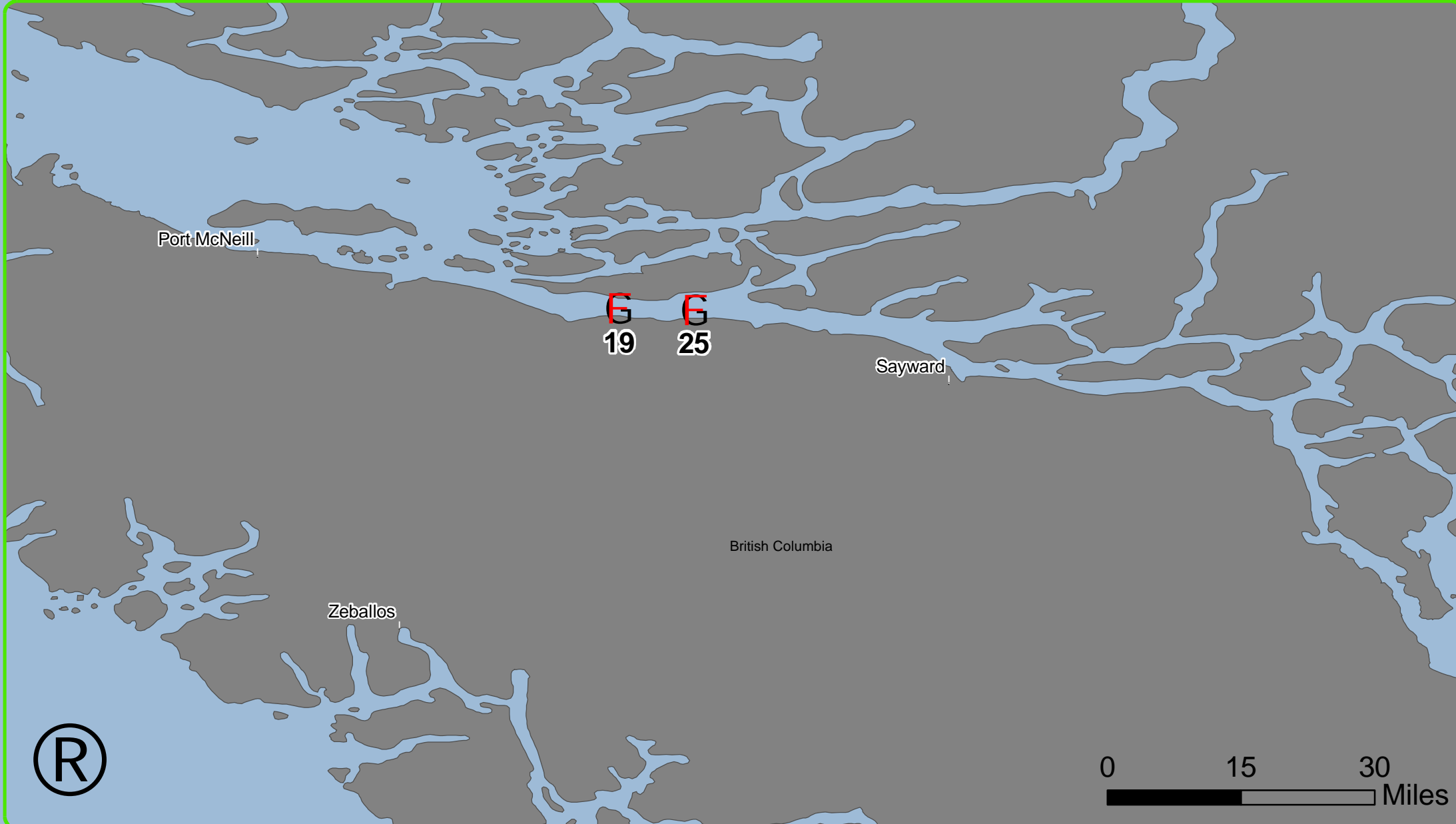
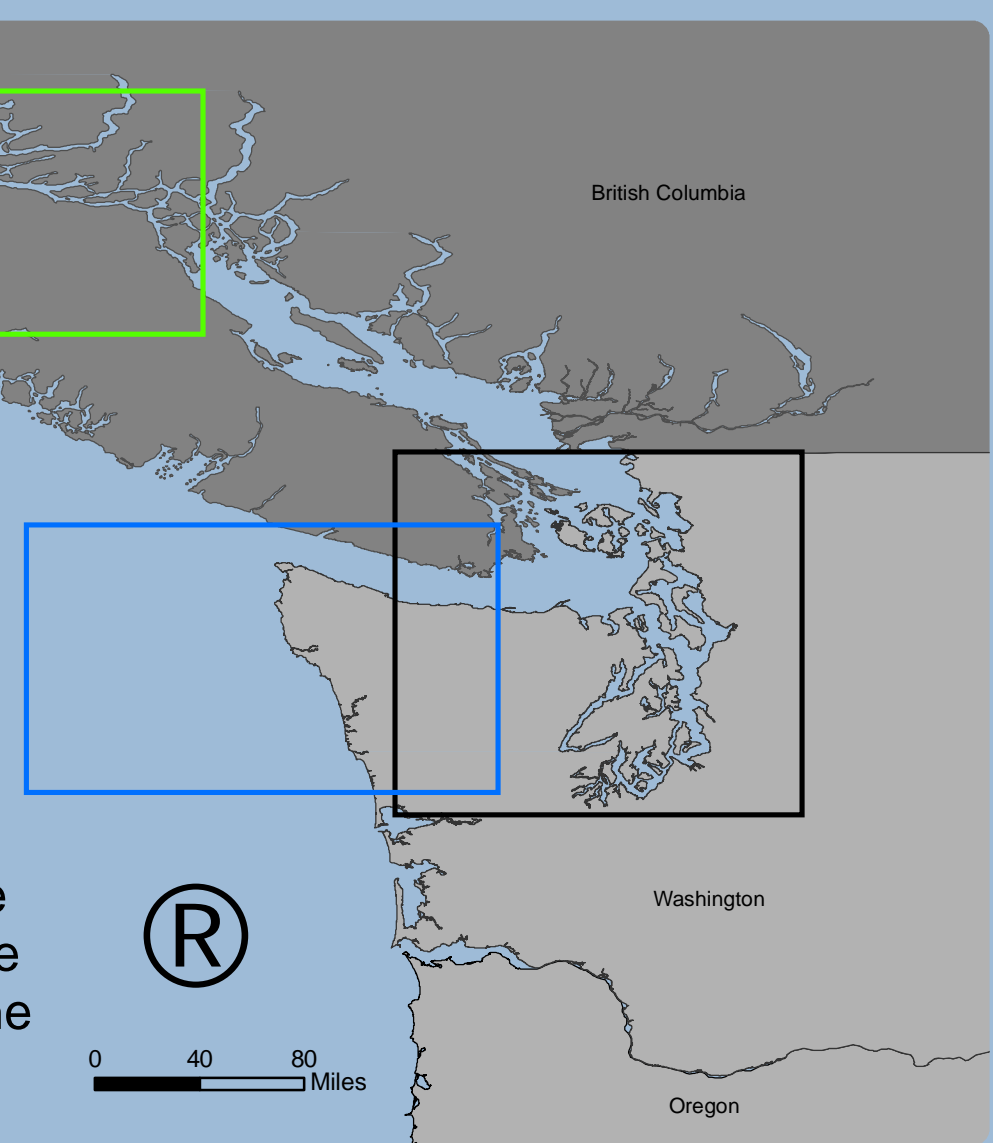
Underwater Acoustic Studies and Recording Efforts in the Range of the Eastern North Pacific Southern Resident Killer Whales



The National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (Fisheries) has determined that noise from anthropogenic activities is a potential threat to restoring the Southern Residents to an optimal sustainable population. NOAA Fisheries identified 59 underwater acoustic studies and recording efforts within the range of the Southern Residents. Specific data collection locations were available for only 25 of these 59 studies and recording efforts. This map illustrates the location of these 25 studies and recording efforts relative to killer whale sighting data, provided by The Whale Museum, and proposed critical habitat areas for the Southern Residents.

In 1978, The Whale Museum in Friday Harbor, Washington, began managing the Whale Hotline public sighting network. The purpose of the network was to track killer whale (*Orcinus orca*) sightings in Washington State. The Whale Museum has received an average of 400 to 1,000 calls per year reporting sightings of marine mammals and has maintained an archived database of these sighting data until the present. The Whale Museum data are predominantly opportunistic sightings from a variety of sources (public reports, commercial whalewatching industry pager system, Soundwatch, Lime Kiln State Park land-based observations, and independent researcher reports). The Whale Museum personnel match the location data from each of the sighting reports to The Whale Museum's historic quadrant system. Sightings are displayed as points that represent the center of each quadrant (Osborne 2005).

The Whale Museum prepared for NOAA a compilation and summary of its available historical killer whale sighting data from 1990 through 2003, the "Southern Resident Killer Whale Sighting Compilation 1990-2003." The dataset does not account for level of observation effort by season or location. The 1990-2003 Whale Museum dataset is, however, the most comprehensive long-term data available to evaluate broad scale habitat use by Southern Residents in inland waters at this time (total number of sighting records = 22,509). NOAA limited its analysis of the dataset to one sighting per quadrant per day to reduce the bias introduced by multiple sightings of the same whales in the same location on the same day (total number of unique sightings = 11,836).



Legend

Acoustic Recordings

Number of Sightings

- (1 - 5
- (6 - 25
- (26 - 100
- (101 - 500
- (501 - 1300

Proposed Critical Habitat Areas

- Area 1: Core Summer Area
- Area 2: Fall/Winter
- Area 3: Strait of Juan de Fuca

- Underwater Acoustic Studies and Recording Efforts**
- 1 - American Cetacean Society Puget Sound Chapter, Vashon Hydrophone -1
 - 2 - American Cetacean Society Puget Sound Chapter, Vashon Hydrophone -2
 - 3 - Applied Physics Laboratory, University of Washington, Puget Sound Passive Aquatic Listeners (PAL) Studies -1
 - 4 - Applied Physics Laboratory, University of Washington, Puget Sound Passive Aquatic Listeners (PAL) Studies -2
 - 5 - Applied Physics Laboratory, University of Washington, Puget Sound Passive Aquatic Listeners (PAL) Studies -3
 - 6 - Applied Physics Laboratory, University of Washington, Puget Sound Passive Aquatic Listeners (PAL) Studies -4
 - 7 - Applied Physics Laboratory, University of Washington, Puget Sound Passive Aquatic Listeners (PAL) Studies -5
 - 8 - Applied Physics Laboratory, University of Washington, Puget Sound Passive Aquatic Listeners (PAL) Studies -6
 - 9 - CLE Engineering, Inc., Hydroacoustic Monitoring During Pile Driving by CLE Engineering, Inc. -1
 - 10 - CLE Engineering, Inc., Hydroacoustic Monitoring During Pile Driving by CLE Engineering, Inc. -2
 - 11 - Colorado College, Orca Vocalization and Localization
 - 12 - Department of Marine Sciences, University of Georgia, Path-Averaged Ocean Measurements in the Deep, Stratified Tidal Channel of Hood Canal Using Acoustical Scintillation
 - 13 - Fisheries & Oceans Canada, Institute of Ocean Sciences, Underwater Noise Of Whale-Watching Boats and Potential Effects on Killer Whales (*Orcinus orca*) Based on an Acoustic Impact Model. -1
 - 14 - Fisheries & Oceans Canada, Institute of Ocean Sciences, Underwater Noise Of Whale-Watching Boats and Potential Effects on Killer Whales (*Orcinus orca*) Based on an Acoustic Impact Model. -2
 - 15 - Fisheries & Oceans Canada, Institute of Ocean Sciences, Underwater Noise Of Whale-Watching Boats and Potential Effects on Killer Whales (*Orcinus orca*) Based on an Acoustic Impact Model. -3
 - 16 - Jen-Jay Diving, Inc., Pirelli Underwater Cable Trencher Monitoring
 - 17 - NOAA - Seattle, Olympic Coast National Marine Sanctuary (OCNMS) (Quinault Range) Mooring High-Frequency Acoustic Recording Package (HARP) -1
 - 18 - NOAA - Seattle, Olympic Coast National Marine Sanctuary (OCNMS) (Quinault Range) Mooring High-Frequency Acoustic Recording Package (HARP) -2
 - 19 - Raincoast Conservation Society, North Pacific Universities Marine Mammal Research Consortium
 - 20 - School of Earth and Ocean Sciences, University of Victoria, Haro Strait '96 Frontal Dynamics PRIMER Experiment June 3 - July 5, 1996 Summary and Associated Articles
 - 21 - Scripps Institution of Oceanography, University of California, Haro Strait Noise Data Collection - SSQ53D
 - 22 - Scripps Institution of Oceanography, University of California, Haro Strait Noise Data Collection - SSQ57B
 - 23 - Scripps Institution of Oceanography, University of California, Haro Strait Noise Data Collection - Ultrasoundgate
 - 24 - Scripps Institution of Oceanography, University of California, Haro Strait Noise Data Collection - Vertical Array
 - 25 - Sea Mammal Research Unit, University of St. Andrews, Patrick Miller PhD Thesis

References:

Concurrent Technologies Corporation. 2005. Underwater Acoustics Technical Memorandum.

Osborne, R.W. 2005. Southern Resident Killer Whale Sighting Compilation 1990-2003.