

# **UNDERWATER NOISE, MARINE SPECIES PROTECTION, AND IMPLICATIONS FOR MARINE SURVEYS**

Presenter: Denise Toombs

Company: ERM

## Presenter Profile

Ms. Denise Toombs is a Partner at ERM with over 25 years of experience in environmental permitting and impact assessment. She has extensive experience in subsea cable projects and recently managed an impact assessment of a proposed high-energy seismic survey. Ms. Toombs is based in California.



- Denise Toombs
- Partner
- Email: [denise.toombs@erm.com](mailto:denise.toombs@erm.com)

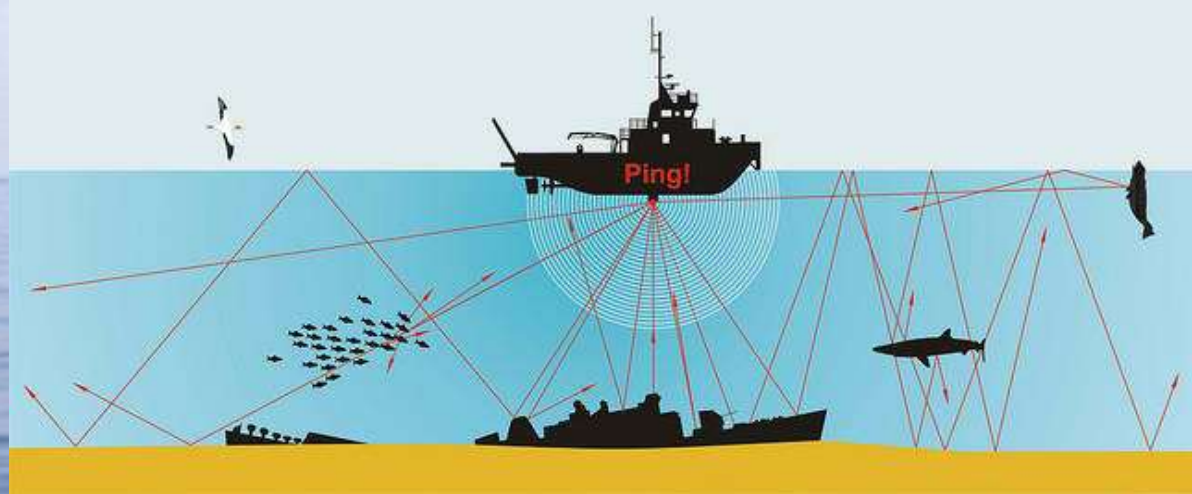
# Agenda

1. OVERVIEW
2. UNDERWATER NOISE SOURCES
3. EFFECTS OF NOISE ON MARINE SPECIES
4. PROTECTIVE MEASURES
5. RECENT DEVELOPMENTS AFFECTING SURVEYS
6. QUESTIONS AND ANSWERS

# Overview

The ocean is a busy and noisy place, increasing concern about the effects on marine species.

Presentation focuses on trends potentially affecting marine operations for subsea cables.

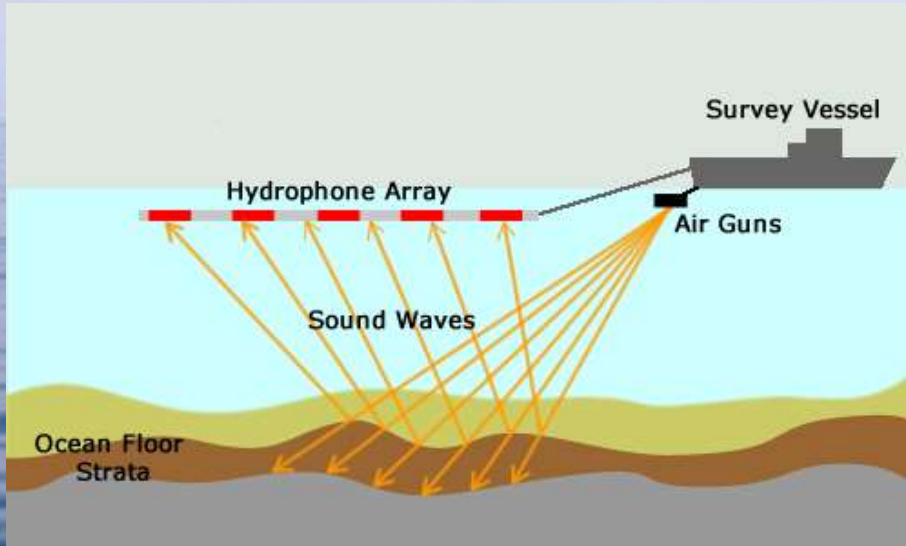




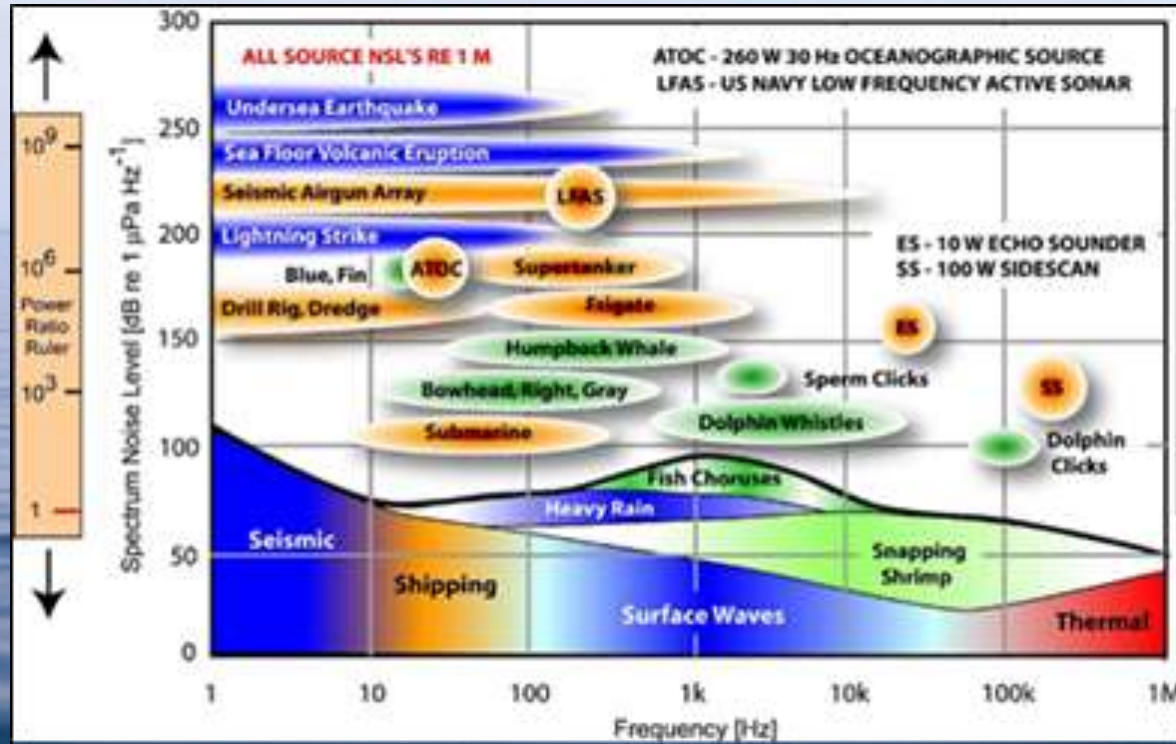
# Underwater Noise Sources

Examples of anthropogenic noise:

- Vessel traffic
- Development:
  - Pile driving
  - Drilling
- Survey instrumentation:
  - Airguns (high-energy seismic)
  - Multi-beam echosounders
  - Sub-bottom profilers
  - Sonar



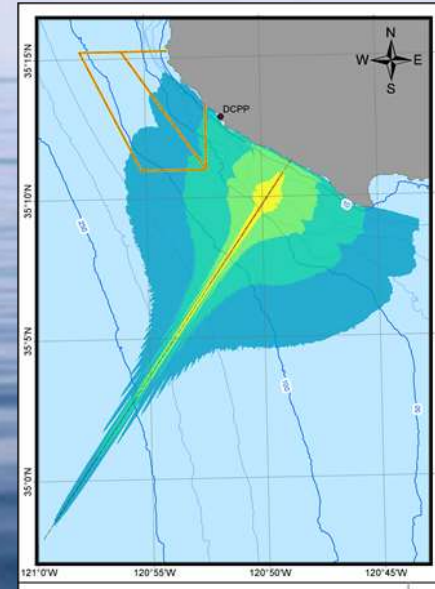
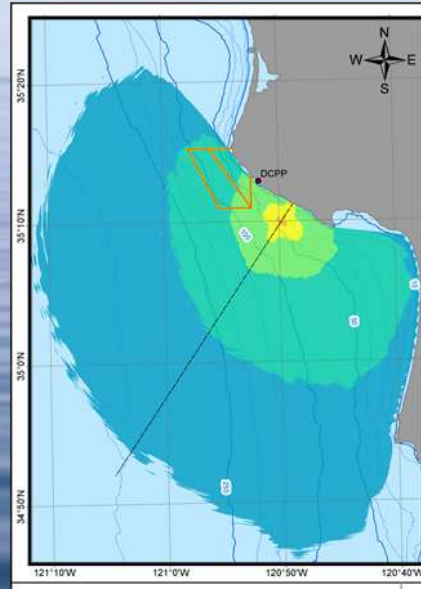
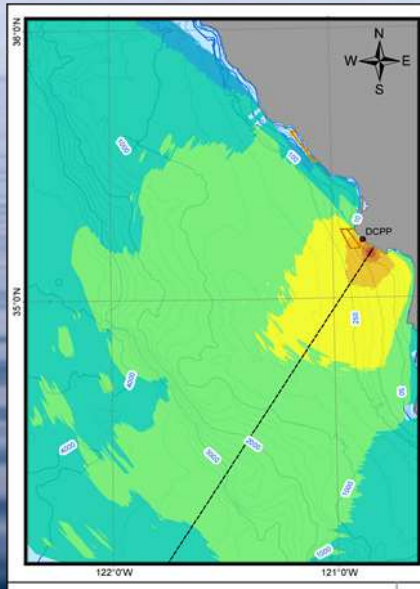
# Underwater Noise Sources, cont'd



Source: Robinson 2005, as cited in California State Lands Commission 2012

## Underwater Noise Sources, cont'd

Examples of modeled sound fields for seismic survey noise sources:  
Airgun array, sub-bottom profiler, multibeam echosounder



# Effects of Noise on Marine Species

Effects on marine mammals include:

- Masking (reduction in hearing attributable to ambient noise);
- Behavioral disturbance;
- Temporary and/or permanent hearing loss; and
- Other physiological effects (e.g., stress or immune response).





# Effects of Noise on Marine Species



Similar effects observed in other marine species, but fewer data are available:

- Fish (adults and juveniles)
- Fish larvae
- Invertebrates

# Effects of Noise on Marine Species

Noise affects marine mammals differently, depending on a number of factors. One factor is what frequencies can be heard by a given species.

Functional Hearing Group	Estimated Auditory Bandwidth	Genera Represented
Low-frequency cetaceans	7 Hz to 22 kHz	Mysticetes (baleen) (13 species/subspecies)
Mid-frequency cetaceans	150 Hz to 160 kHz	Odontocetes (57 species/subspecies)
High-frequency cetaceans	200 Hz to 180 kHz	Odontocetes (20 species/subspecies)
Pinnipeds in water	75 Hz to 75 kHz	All (41 species/subspecies)
Pinnipeds in air	75 Hz to 30 kHz	Same species as pinnipeds in water

*Source: Adapted from Southall et al 2007*

# Protective Measures

Examples of protective measures for seismic surveys, pile driving:

- Exclusion zones
- Mammal observers
- Passive acoustic monitoring
- Aerial surveys
- Seasonal restrictions
- Bubble curtains



Source: pge.com

# Requirements, Developments Affecting Surveys

## Selected US Survey-Related Permits

US Agency	Requirement	Note
<b>NOAA</b>	Incidental Harassment Authorization	Authorization to conduct activity that may adversely affect marine species
<b>BOEM</b>	Shallow Hazard Survey	Guidelines for surveys in federal lease blocks
<b>USACE</b>	Permit for Surveys	Sampling activity
<b>California SLC</b>	Geophysical Permit	Permit to conduct surveys in CA waters (e.g., side scan)

Most surveys for cable routing and burial inspection currently require minimal or no environmental approvals, as compared to cable installations

NOAA	National Oceanic and Atmospheric Administration
BOEM	Bureau of Ocean Energy Management
USACE	US Army Corps of Engineers
CSLC	California State Lands Commission



# Requirements, Developments Affecting Surveys

California State Lands Commission is renewing its Low-Energy Geophysical Permit Program

- Required for side-scan and related surveys in California waters
- State preparing environmental analysis to address survey impacts “programmatically,” and develop standardized mitigations/conditions for the permit program
- Will consider ocean acoustics and effects of anthropogenic sound on marine biological resources
- Acknowledges importance of surveys and study objectives, including fiber optic cable surveys



# Requirements, Developments Affecting Surveys

Events or concerns likely to be raised during review:

- Recent uproar over proposed (and denied) high-energy seismic surveys – public may confuse low- and high-energy techniques and issues
- Consideration of echosounders and sub-bottom profilers (equipment widely used) in analysis
- Incidents involving survey vessels in California waters: blue whale strike (fatal), reported conflict with commercial fishing, claims that notifications are not consistently enforced



# Requirements, Developments Affecting Surveys

## Possible survey requirements\*

- More stringent notification requirements and enforcement
- Marine mammal observers, plans (and/or clarification of guidelines)
- Seasonal restrictions (whale migration)
- Compensation for commercial fishing disruption

\* *Based on public concerns, trends in noise issues. Comments above not attributed to the California State Lands Commission.*





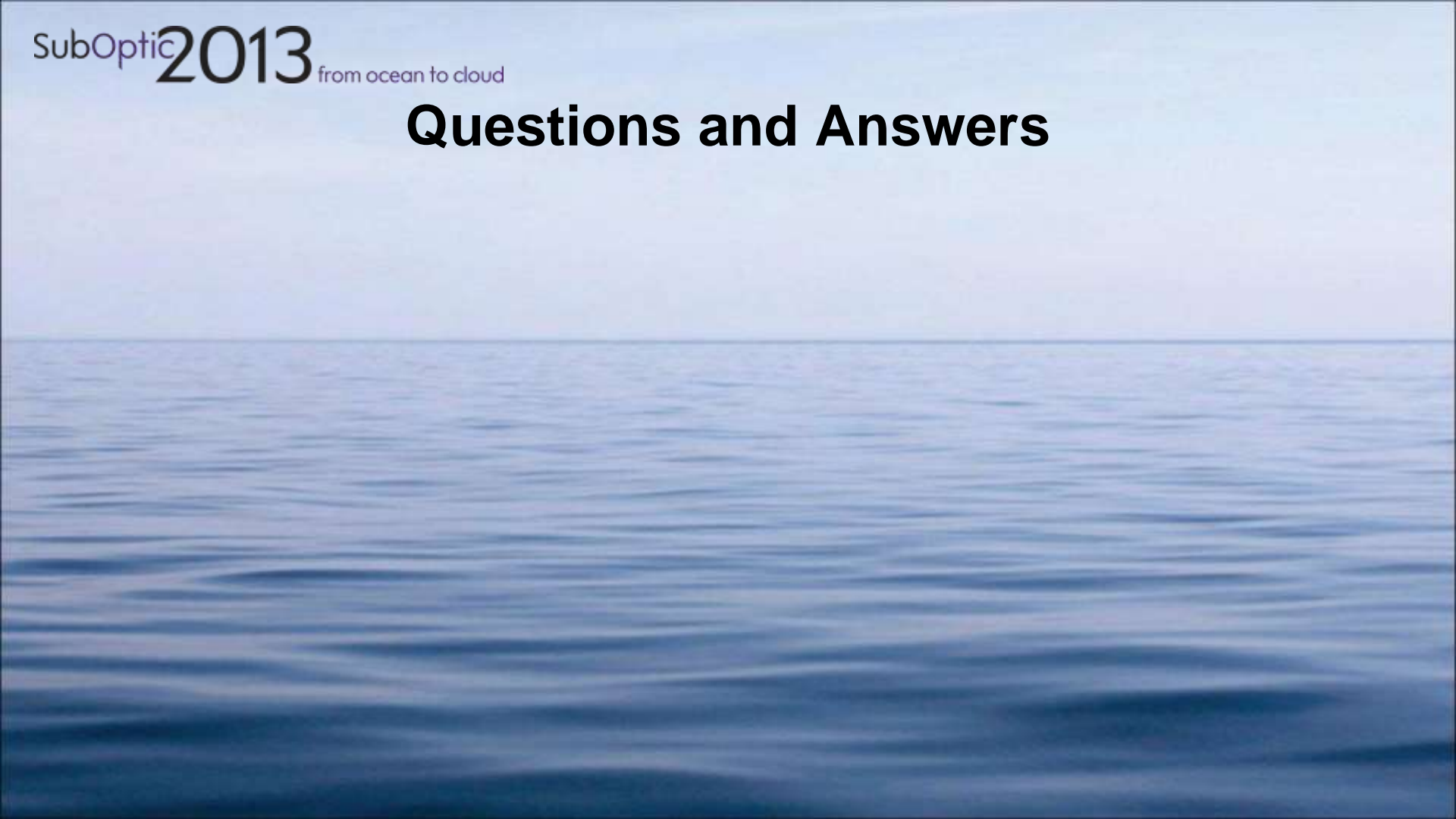
## Conclusions

- The effects of noise sources on marine species are of great concern, and the subject of numerous studies around the globe.
- Noise sources from activities such as high-energy seismic surveys and pile driving are currently managed through guidelines, standards, and thresholds set by governments and organizations. Some guidelines are under review.
- Equipment used in surveys for the cable industry also generate noise, and these sources are also being reviewed. California's Geophysical Permit Program review is a development to watch.




SubOptic 2013 from ocean to cloud

# Questions and Answers



# SubOptic 2013

[www.suboptic.org](http://www.suboptic.org)

Hosted by  
Alcatel-Lucent 

Enabling Global Communications

from ocean to cloud

Paris  
22-25 April 2013

The 8<sup>th</sup> International Conference & Convention  
on Undersea Telecommunications