

# Addressing Seismic Testing Impacts in Monterey Bay National Marine Sanctuary

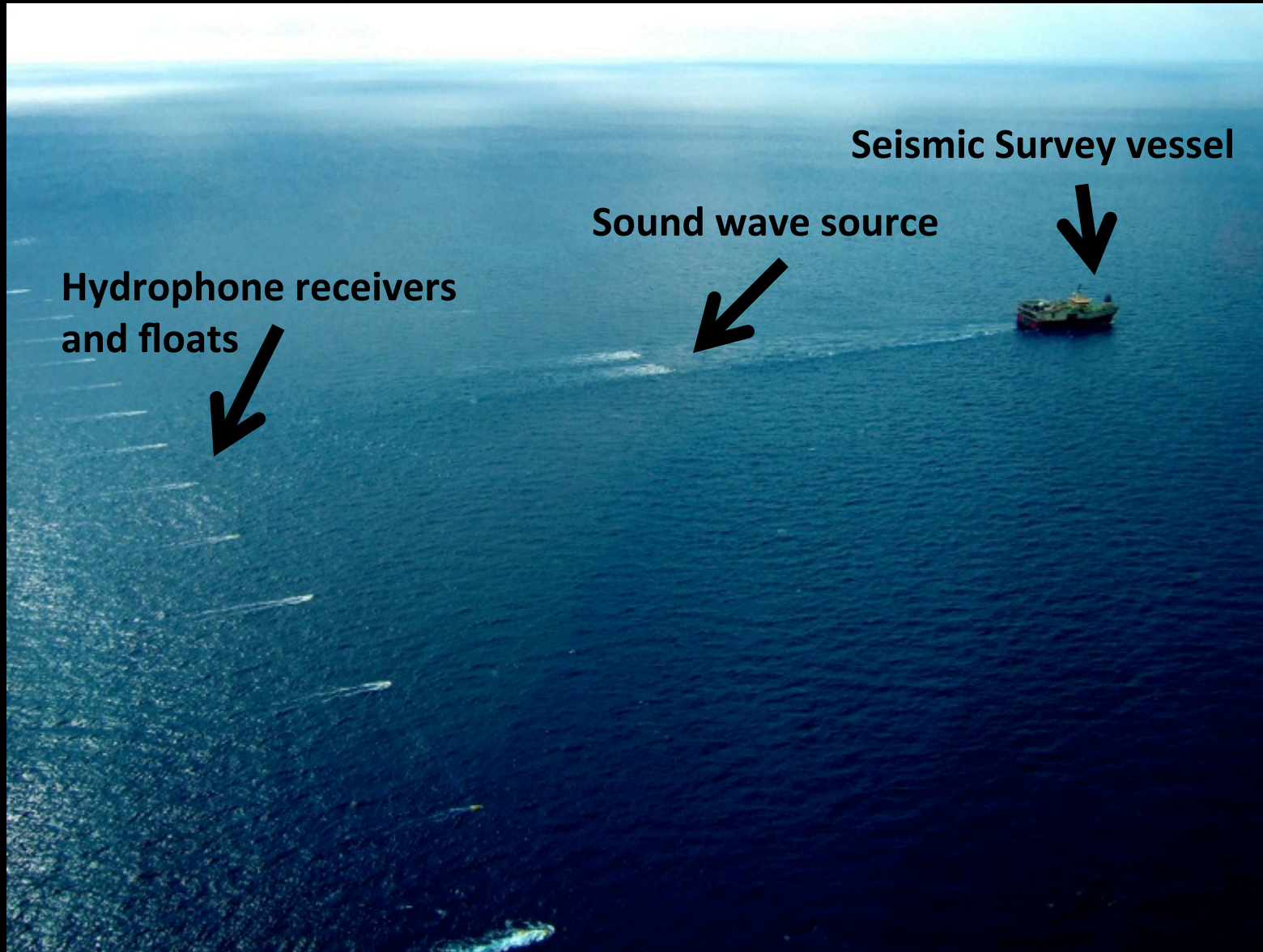


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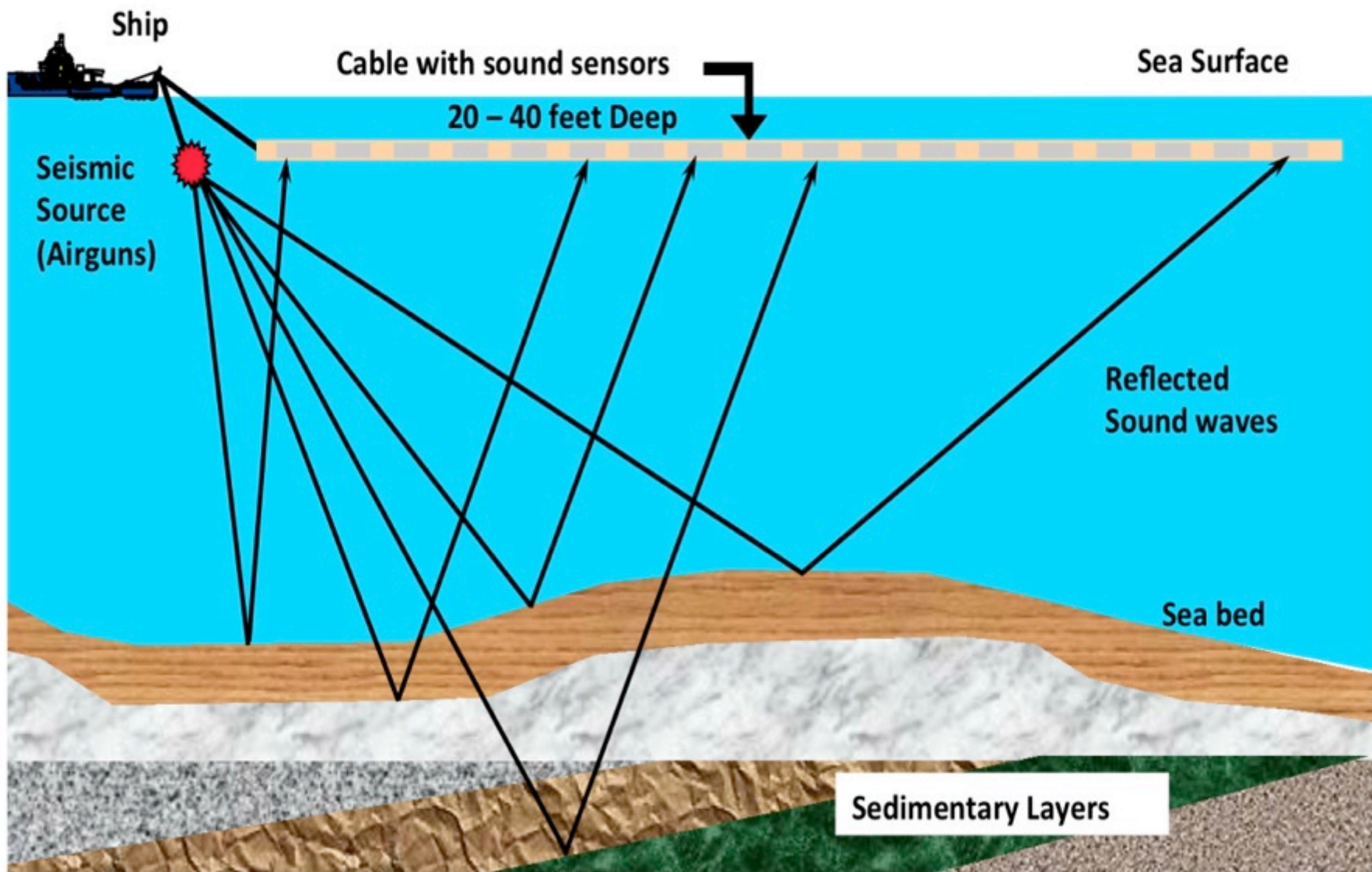
# MBNMS has a history with acoustics

- ATOC (late 90s) – Submarine cable moved due to concerns with acoustic impacts
- SURTASS LFA Sonar (2001) – Navy foreign submarine detection – moved offshore
- Outer Continental Shelf (OCS) inventory (proposed seismic testing) in 2005
  - Joint MBNMS/GFNMS SAC resolution that Sanctuaries should be excluded from testing
- Management Plan: Marine Mammal, Seabird, and Turtle Disturbance Action Plan: Strategy MMST-6 Assess Impacts from Acoustics
- Diablo Canyon PG&E proposal in 2012
  - SAC voiced widespread concerns in Oct 2012 (Michel letter)
  - Denied by CA Coastal Commission: “significant and unavoidable impacts to marine resources”
- The Sanctuary has authority to actively regulate noise, but thus far has not exercised this authority.

# 3D seismic: bird's-eye view







# Not all Seismic Testing is the Same

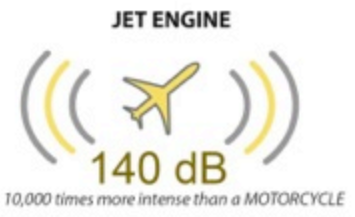
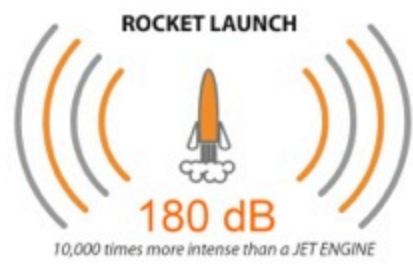
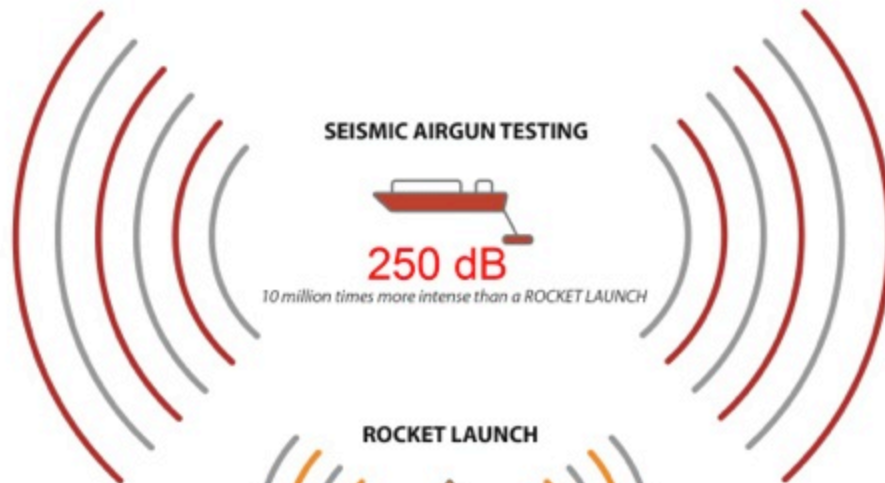
## **“High-energy”**

- Petroleum/mineral exploration, PG&E proposal at Diablo Canyon
- Multiple airguns  
volume: 4,000-7,000 cubic inches
- Severe impacts to marine life well documented

## **“Low-energy”**

- Environmental mapping, hazard surveys, sediment studies, academic studies
- Single airguns:  
volume: 1-30 cubic inches
- Impacts variable and less certain

## HOW LOUD IT IS



dB = decibel, a unit used to measure the intensity of sound

# Seismic airgun explosion



Large airgun arrays inject extremely high-pressure ( $> 250$  dB) acoustic impulses into the ocean

# Acoustic Reliant Marine Mammals of Monterey Bay



Use acoustics to obtain prey, navigate, and find each other



- Humpback Whale
  - Grey Whale
  - Blue Whale
  - Killer Whale
- Harbor Porpoise
- Common Dolphin



- Pacific White Sided Dolphin
- Northern Right Whale Dolphin

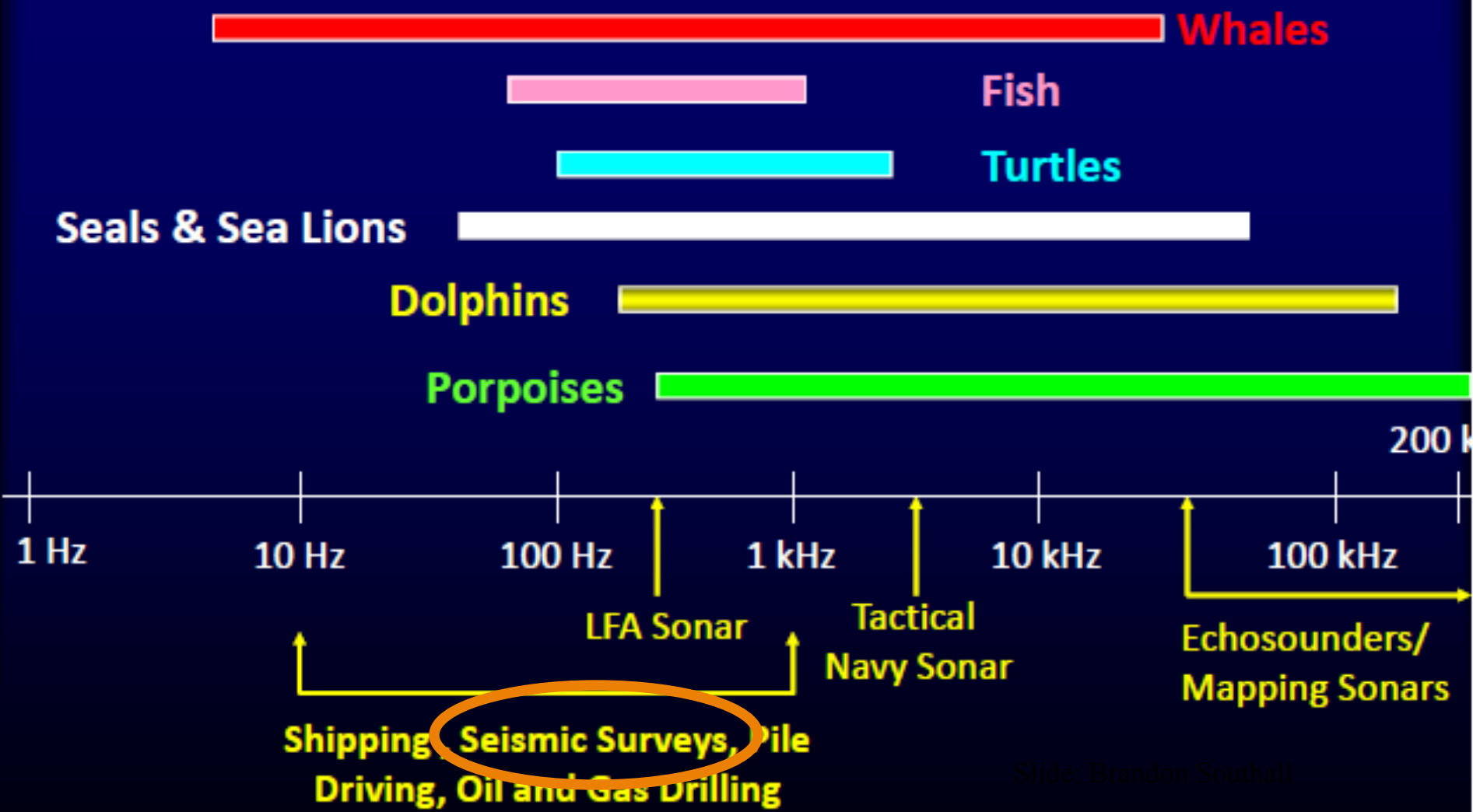


- Sperm Whale
- California Sea Lion
  - Harbor Seal
- Steller Sea Lion





# Frequency Relationships Between Marine Animal Hearing and Human Noise Sources



## Monterey Bay harbor porpoise: “scared bunnies” of the sea

Monterey Bay and Morro Bay populations are genetically distinct stocks with highly restricted ranges – displacement could impair their ability to find adequate prey



**Kastelein et al. (2005)**: captive study, showing harbor porpoises strongly avoiding tonal sound at received levels well below 120 decibels

**Bain and Williams (2006)**: found harbor porpoises swimming away from airgun survey at least as far as 80 km from the source (i.e., the furthest distance observed by the investigators)

**Lucke et al. (2009)**: found that airguns induced hearing loss (threshold shift) in harbor porpoise at far lower levels than observed in any other studied species



**Peru, February 7, 2012.**

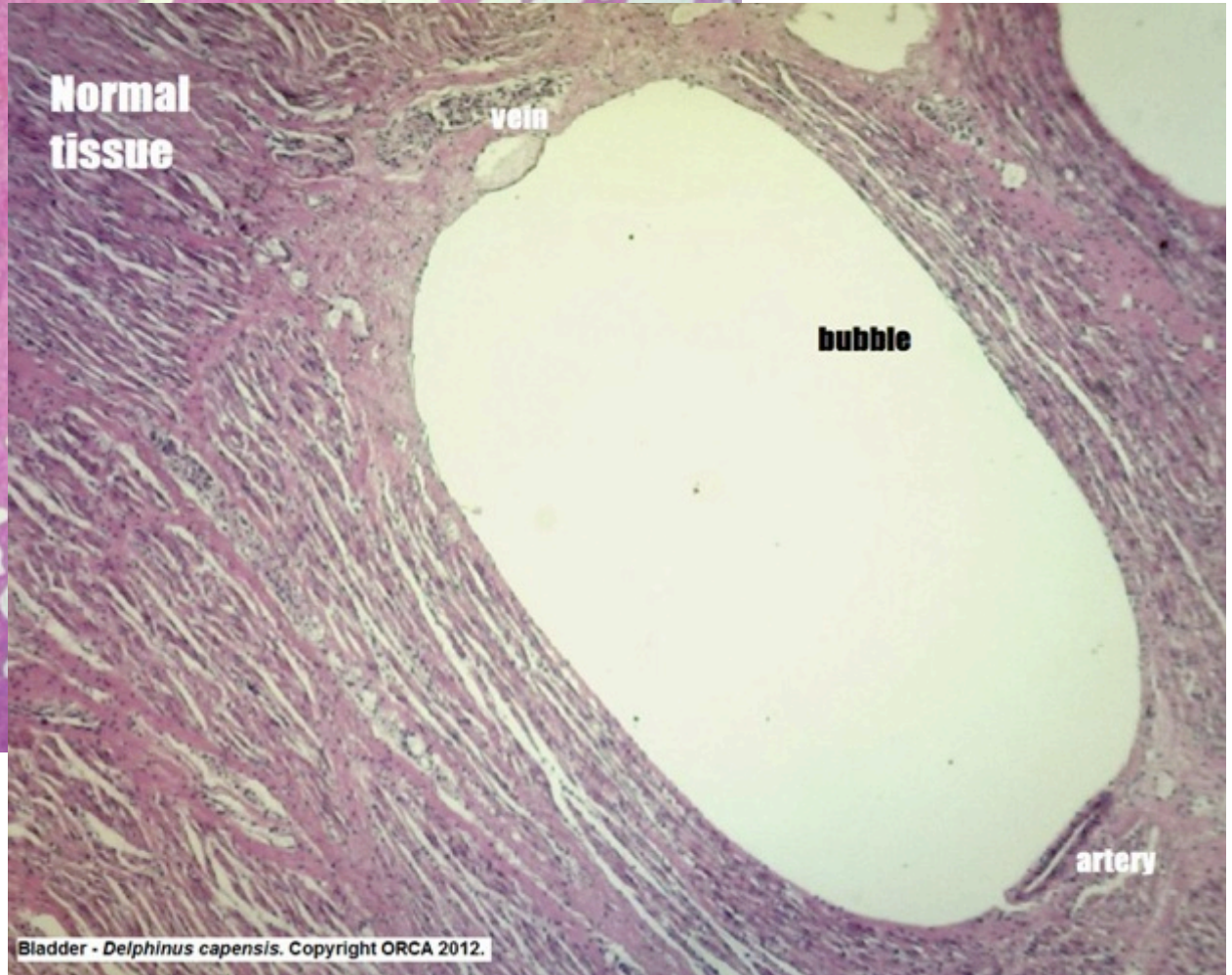
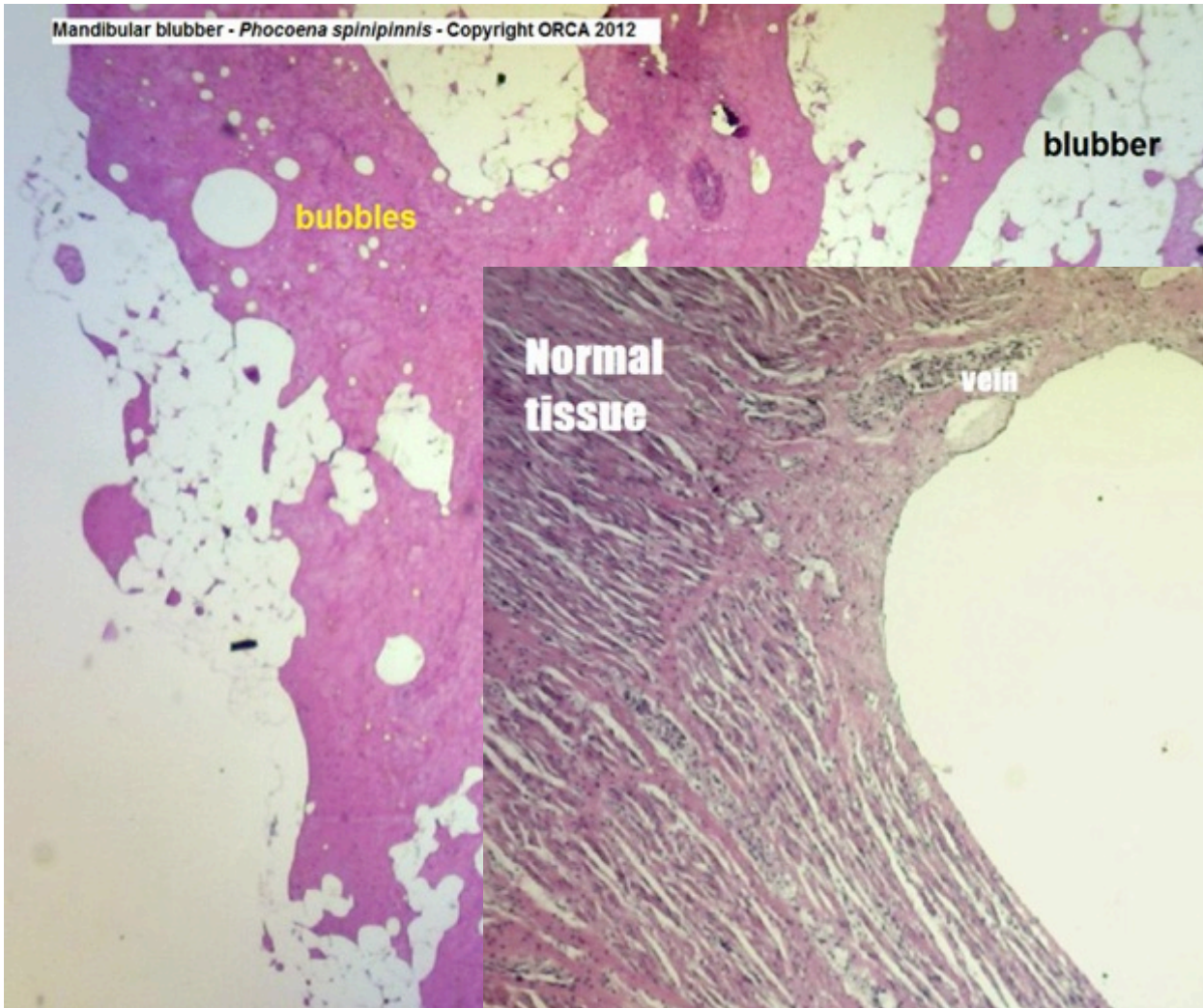
**Hundreds of dolphin carcasses washed ashore along an 85-mile stretch of beach**

Seismic surveys were conducted offshore between February 7<sup>th</sup> and April 8<sup>th</sup>. Dr. Yaipan-Llanos first noticed the carcasses on February 7<sup>th</sup> and he collected his first samples to study on February 12<sup>th</sup>.

Found bubbles in the organs and tissues of the dolphin carcasses; normally caused by surfacing too quickly.



Mandibular blubber - *Phocoena spinipinnis* - Copyright ORCA 2012



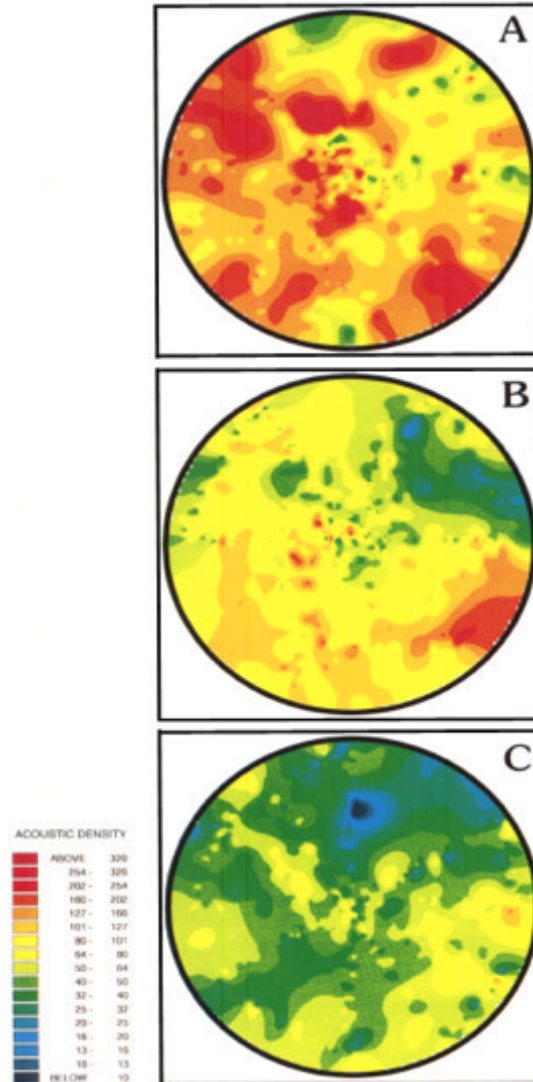
Bladder - *Delphinus capensis*. Copyright ORCA 2012.



# Direct impacts on fisheries

- Fishermen in various parts of the world have reported loss in catch rates when seismic testing in region (McCauley et al. 2000)
- These complaints have been tested and effects documented in a number of studies involving North Atlantic species (cod, haddock, herring, whiting) and rockfish

Acoustic densities of cod and haddock

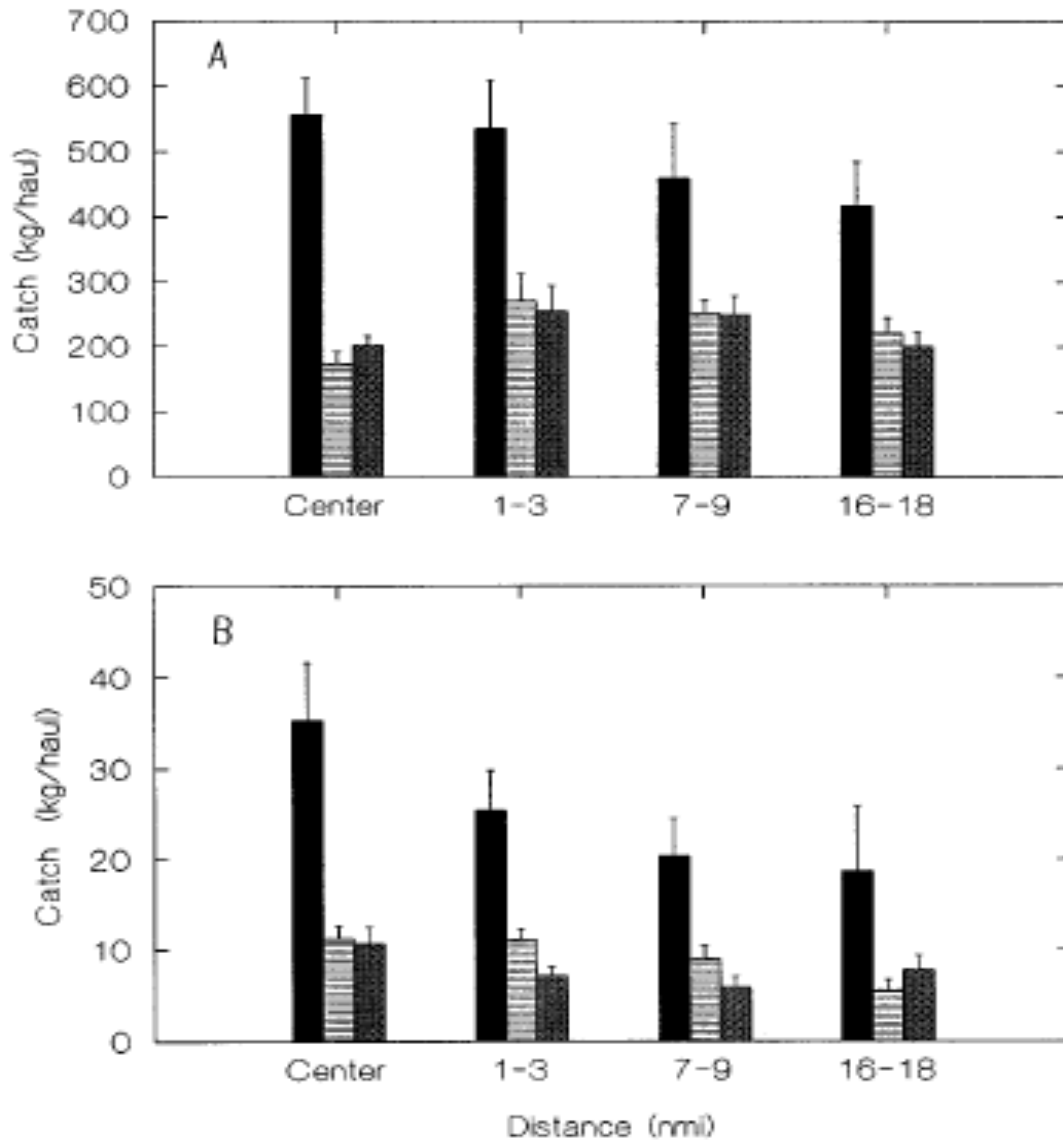


...before shooting

...during shooting

...and after shooting

# Direct impacts on fisheries



Average trawl catch rates of cod and haddock

Before seismic (solid), during seismic (striped), and after seismic (gray),

Measured by distance in nautical miles from the shooting area.

Diameter of study area was 40 x 40 nautical miles, with the seismic survey at the center.

### 3 Main Concerns of High-Energy Airgun Seismic Surveying in MBNMS

***1.) Airgun pulses cause temporary or permanent hearing loss in some animals, condemning them to death from starvation or stranding.***

***2.) The airgun pulses travel very far, which can mask vital communication for marine mammals.***

***3.) Commercial and recreational fish species are highly vulnerable to seismic airguns which can result in loss of catch.***

# NOAA is currently preparing Marine Mammal Acoustic Guidelines

- Noise exposure thresholds and behavior response zones
  - E.g., Whether seismic testing is close enough to a Sanctuary to trigger NMSA consultation
- Public review draft delayed; won't be released for several months
- Sanctuary may consider weighing in on the guidelines



# Proposed Resolution

1. Support a ban on the “worst of the worst” seismic airguns known to have devastating impacts to Sanctuary resources

Key Question:

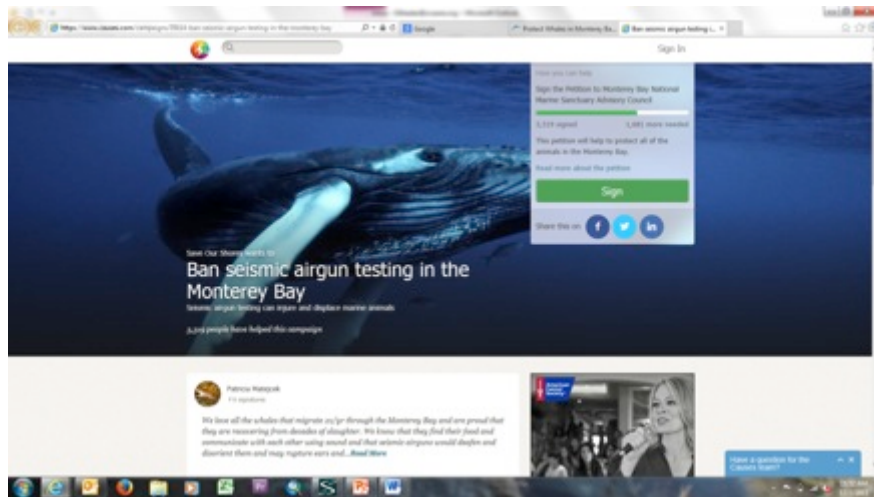
- Keep language general, e.g., “high-energy” or
- Specify numeric threshold, e.g., “100 cubic inches, 150 decibels”

2. Weigh in on use of airguns outside Sanctuary boundaries

3. Better understand and characterize other types of seismic testing and manage as appropriate

# Overwhelming Public Response

**31,810** US residents have asked the MBNMS SAC to Adopt the Seismic Resolution



Action Alerts by Save Our Shores and Oceana

# An Opportunity to Take a Stand

Common ground: Seismic testing would impact wide suite of Sanctuary stakeholders

Seismic testing is emerging ocean threat of national significance

Now is the time to be proactive and deliberate rather than reactive

Resolution is based on well-documented science and has broad public support

