POSSIBLE USE OF SONAR TO PROTECT LARGE AQUATIC ANIMALS IN THE VICINITY OF CLAM SHELL DREDGING OPERATIONS

Dredged Material Assessment and Management Seminar
May 24-26, 2011
PRESENTATION OUTLINE

POTENTIAL USE OF SONAR TO PROTECT LARGE AQUATIC ANIMALS IN THE VICINITY OF CLAM SHELL DREDGING OPERATIONS

PART 1
Sonar Demonstration at Canaveral Harbor
Presented by Paul Stodola, SAJ USACE

PART 2
ERDC – Investigation of Emerging Technologies for Protection of Mobile Aquatic Species
Presented by Doug Clarke, ERDC
Canaveral Harbor
Brevard County, Florida
Manatee Populations in Canaveral Harbor

Manatee Herd Near Lock

Radio-tagged Manatees

Banana River

Lock

Atlantic Ocean
Standard Manatee Protection Measures include:

- Reminders that manatees may be present
- Civil and Criminal Penalties
- Vessel/Boat Operation (i.e. no wake speed, 4 foot bumpers on vessels)
- Siltation Barriers (avoid entanglements)
- Manatee protection zone - mandatory equipment stoppage
- Manatee Signs
- Reporting requirements for collisions
- Dedicated manatee observer for clamshell operations
New Manatee Protection Measures for Clamshell Operations

- Controlled descent of clamshell bucket
- Two nighttime observers
- Adequate illumination and line of sight
- Increased nighttime manatee protection zone
- No nighttime clamshell dredging at agreed upon locations
- Mandatory use of night vision technology (surface detection)
- Jacksonville District has agreed to investigate sonar

SONAR PROVIDES SURFACE TO BOTTOM DETECTION EVEN IN WATERS OF POOR VISIBILITY
Manatee As An Acoustic Target

Manatee Lungs

- Approximately 100 to 120 cm in length
- 6 to 10 cm in height and 20 to 30 cm in width
- Very little fat on a manatee, making the lungs the primary acoustic target

Both the lungs and diaphragm of a manatee extend the length of the body cavity and are oriented in the same horizontal plane as the manatee in the water.
ACTIVE SONAR DETECTION CAPABILITIES

- **Alert:** early warning; initial detection at +200 meters
- **Lock on tracking to dredge operator**
- **Continuous update**
- **Activate display for visual identification**

4 companies provided active sonar demonstrations.
One company provided a passive sonar demonstration.
Active and Passive Sonar Demonstration Sites

Each Company had 3 Days to Demonstrate its Technology

Day 1: Canaveral Lock

Days 2 and 3: Canaveral Harbor
Day 1: Lock Area

Large number of manatees known to frequent area - testing for detection of live manatees using both active and passive sonar
Days 2 and 3: Harbor Area

Testing for detection of surrogates and live manatees - using both active and passive sonar - during clamshell operations.

- Passive surrogates: recorded manatee vocalizations
- Active surrogates: physical objects (radar deflector, styrofoam)
Hydrophone (sound sensor) is lowered off of pontoon or barge to detect manatee sounds.

Transducer, lowered off of pontoon or barge, emits sound waves and receives returning sound energy (echoes).

Signal Processing Hardware receives sound information.

Sound information is translated into sonar imagery.

Computer control station processes signal information from transducer, resulting in the sonar imagery.

PASSIVE SONAR

ACTIVE SONAR
Deployment of Active Sonar Transducers off of Barge
Passive Sonar
Conclusions

Manatees do not emit unique sounds often enough for passive sonar to detect their presence consistently.
Active Sonar
Conclusions

- Active sonar shows potential for reliably detecting manatees on a consistent basis, but with challenges to overcome:
  
  - Air bubbles generated by clamshell operations present challenges to manatee detection
  
  - Interpretation of imagery can be difficult without classification software
  
  - Need an adequate field of detection using multiple transducers

![Sonar Deployed](image1.png)

![Air Bubbles Block Detection](image2.png)
Active Sonar Classification Using Key Parameters (Target Strength)
Active Sonar has great potential for detecting large aquatic animals prior to blasting.
Part 2

Investigation of Emerging Technologies for Protection of Mobile Aquatic Species

Presented by Doug Clarke, ERDC