

POTENTIAL USE OF SONAR TO PROTECT LARGE AQUATIC ANIMALS IN THE VICINITY OF CLAMSHELL 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 CLAMSHELL 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

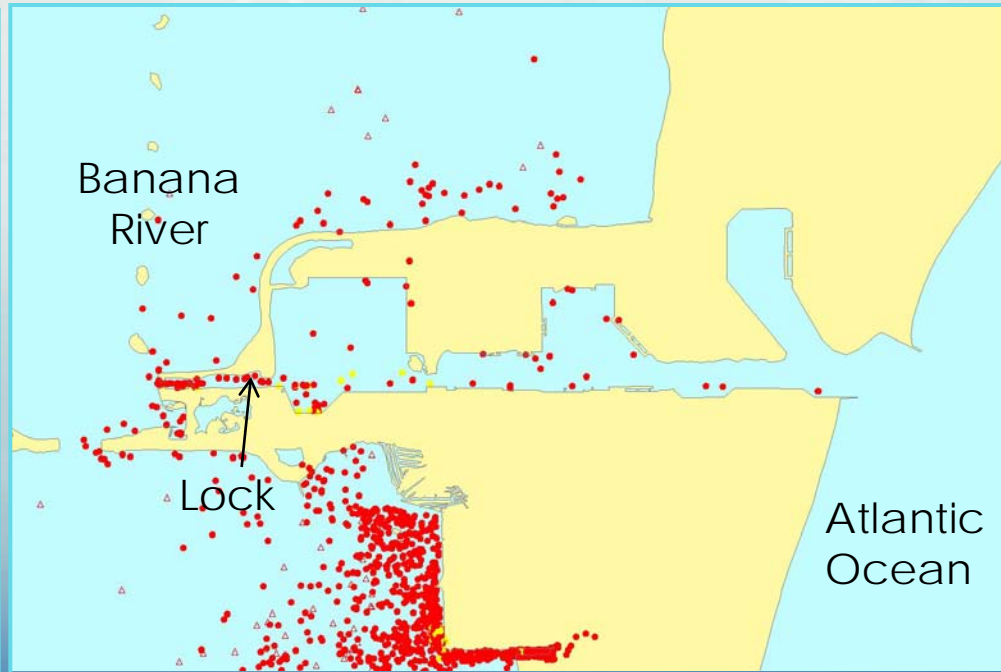
Brevard County, Florida



Manatee Populations in Canaveral Harbor



Manatee Herd Near Lock



Radio-tagged Manatees



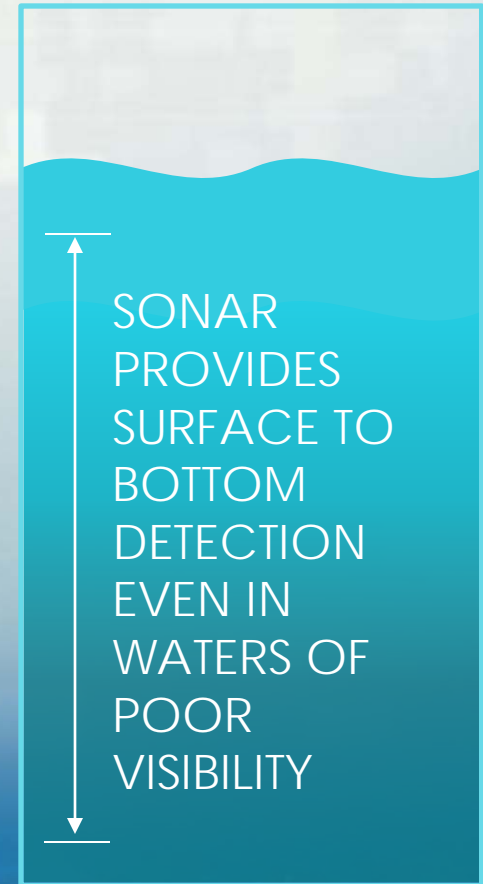
Standard Manatee Protection Measures *include*

- 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

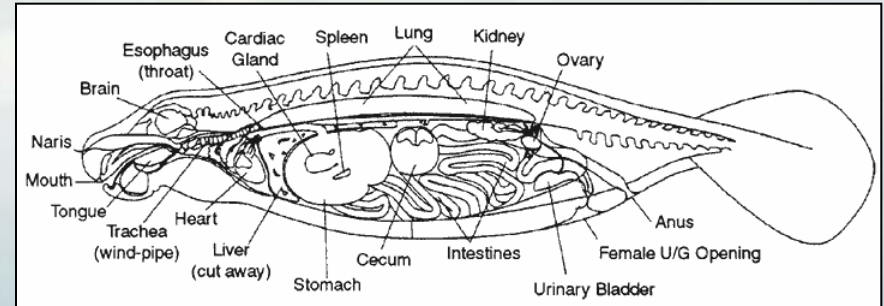


Manatee As An Acoustic Target

Manatee Lungs



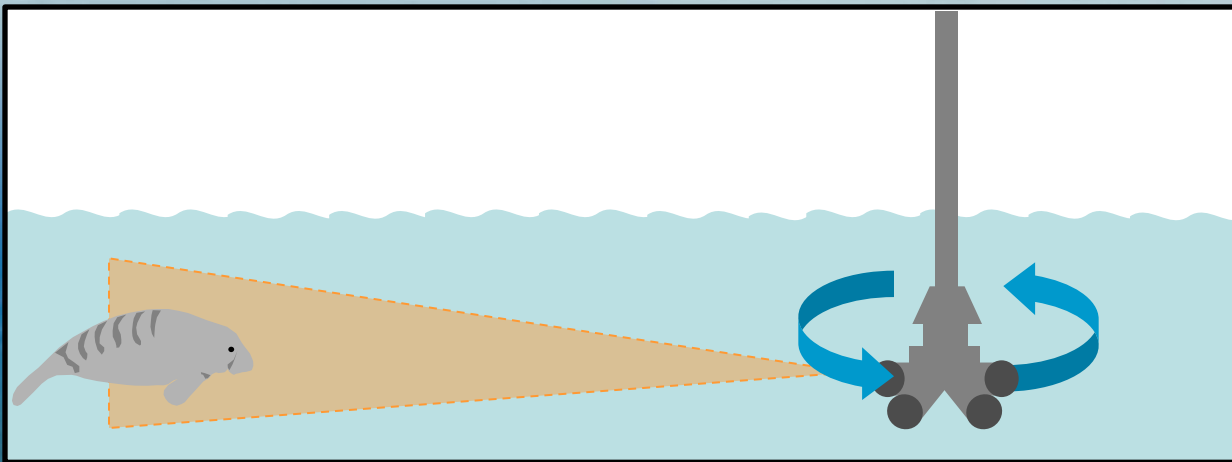
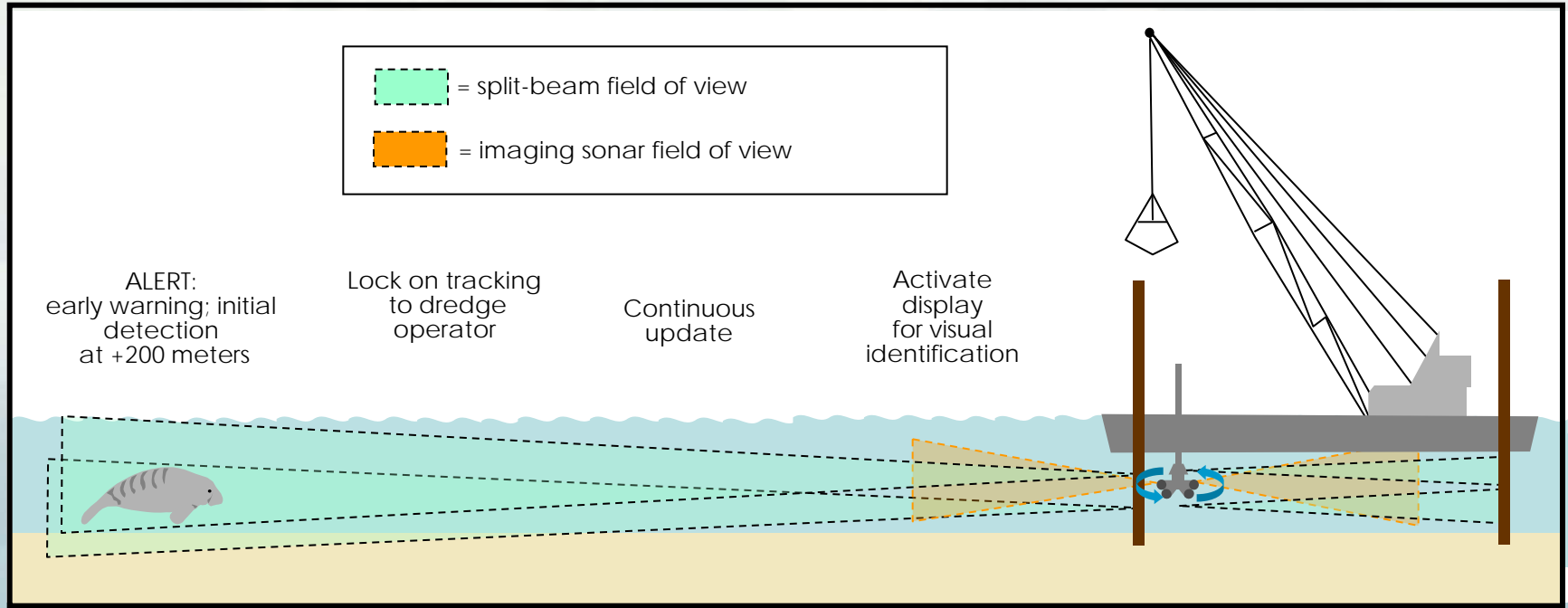
- Approximately 100 to 120 cm in length
- 6 to 10 cm in height and 20 to 30 cm in width
- Very little fat on a manatee, making the lungs the primary acoustic target



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

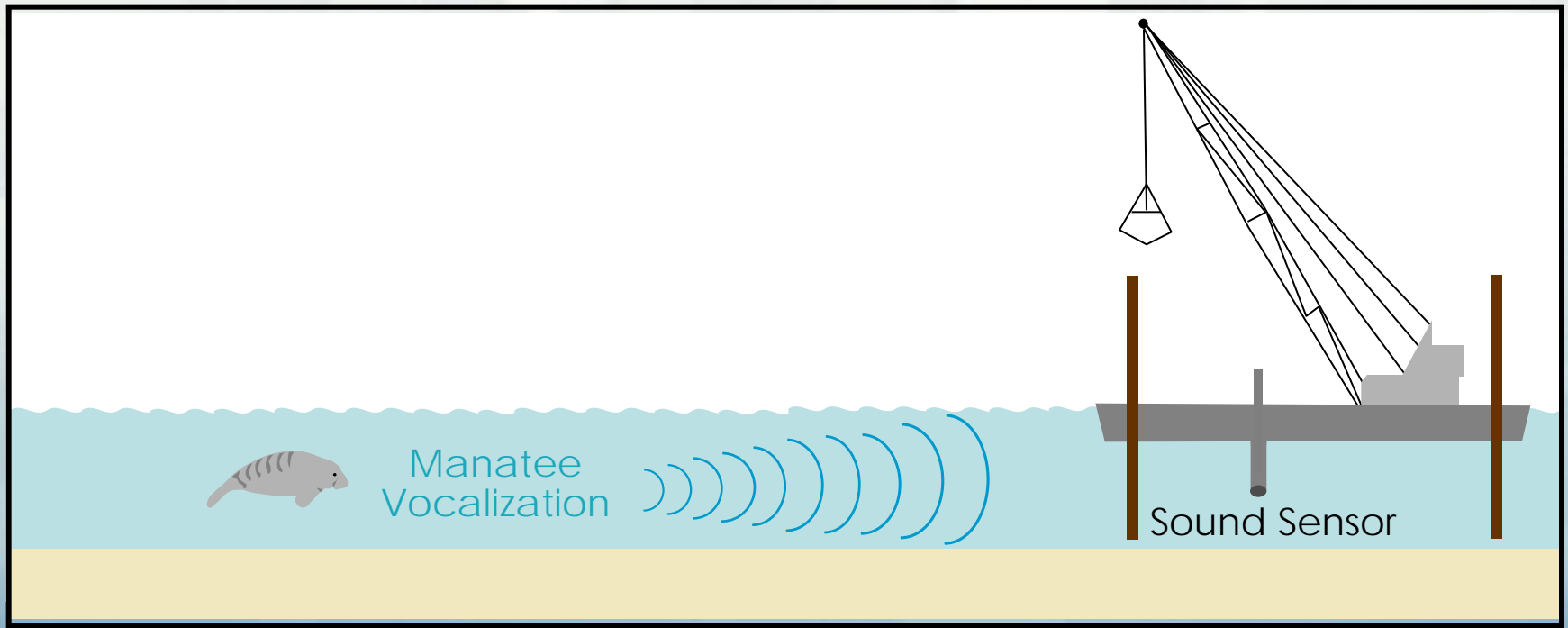


ACTIVE SONAR DETECTION CAPABILITIES



4 companies
provided
active sonar
demonstrations

PASSIVE SONAR DETECTION CAPABILITIES



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

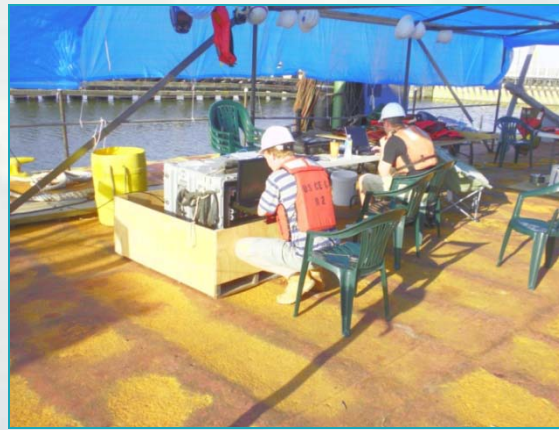


Testing for detection of surrogates and live manatees - using both active and passive sonar – during clamshell operations

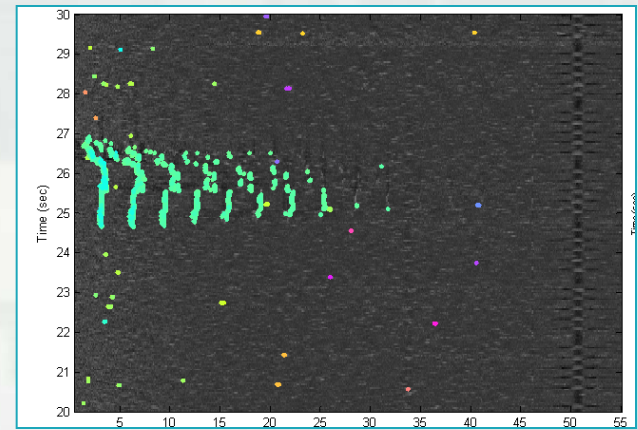
Passive surrogates: recorded manatee vocalizations

Active surrogates: physical objects (radar deflector; styrofoam)

Hydrophone
(sound sensor) is lowered
off of pontoon or barge
to detect manatee sounds



Signal Processing Hardware
receives sound information



Sound information is translated
into sonar imagery

PASSIVE SONAR

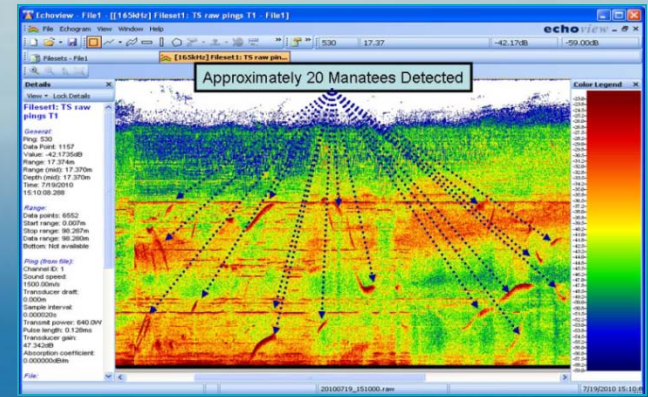
ACTIVE SONAR

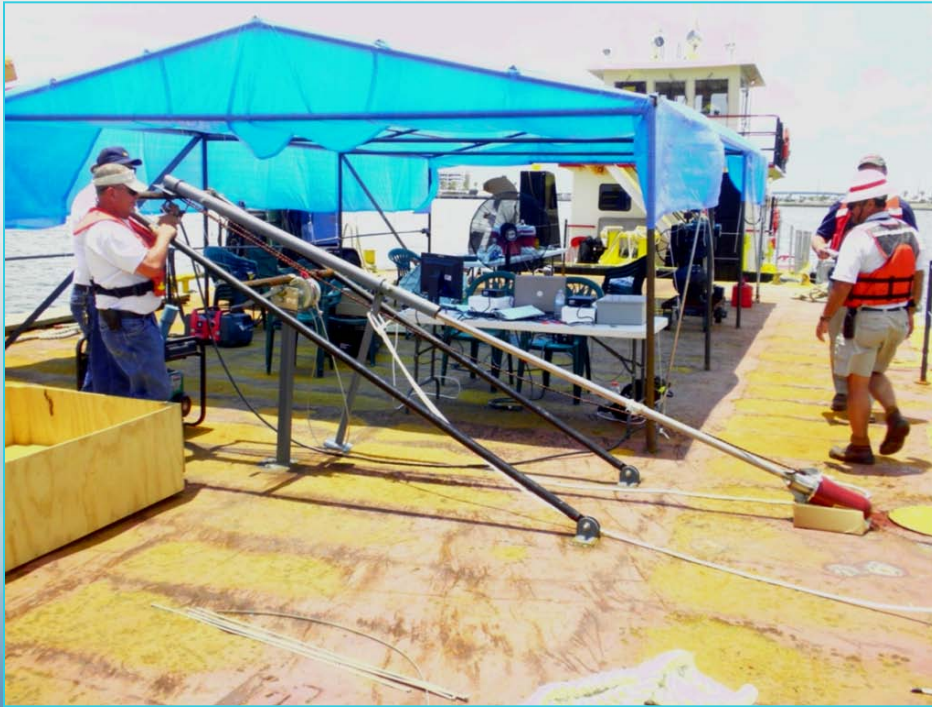


Transducer, lowered off of
pontoon or barge, emits sound
waves and receives returning
sound energy (echoes)



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





Deployment of Active Sonar Transducers off of Barge



Passive Sonar Conclusions



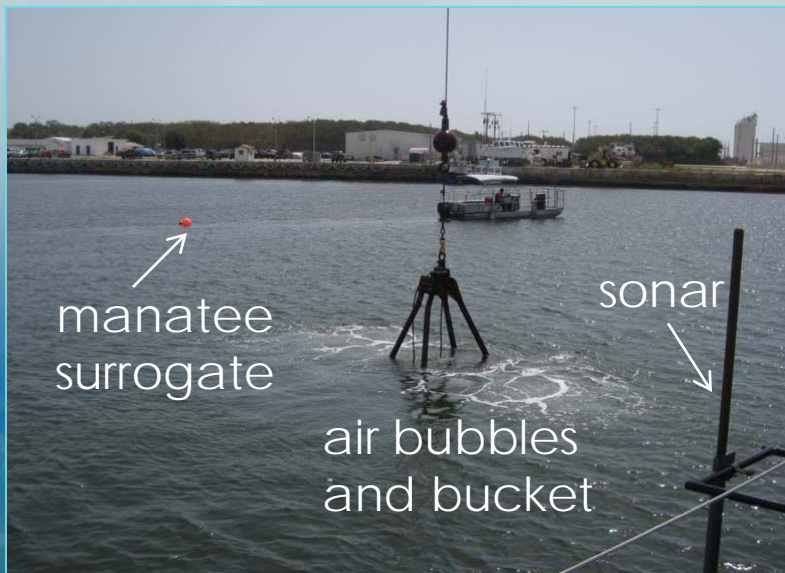
Manatees do not
emit unique sounds
often enough for
passive sonar to
detect their
presence
consistently



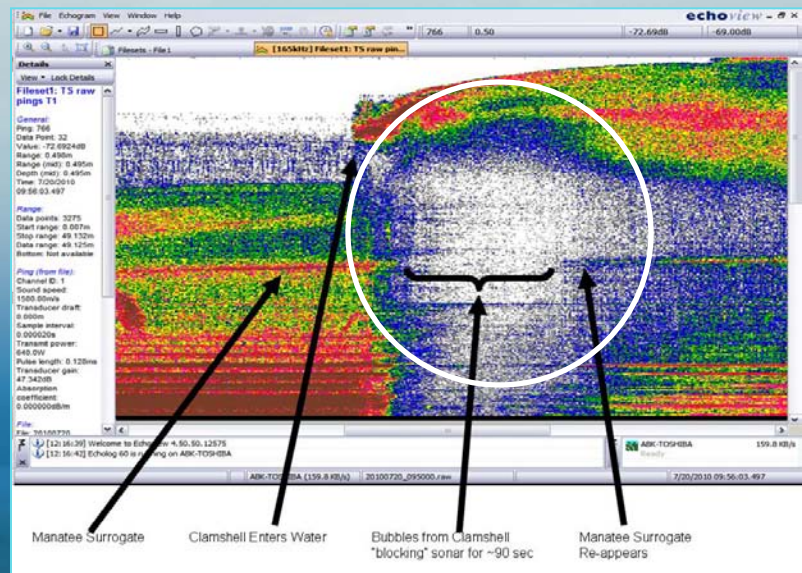
Active Sonar

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



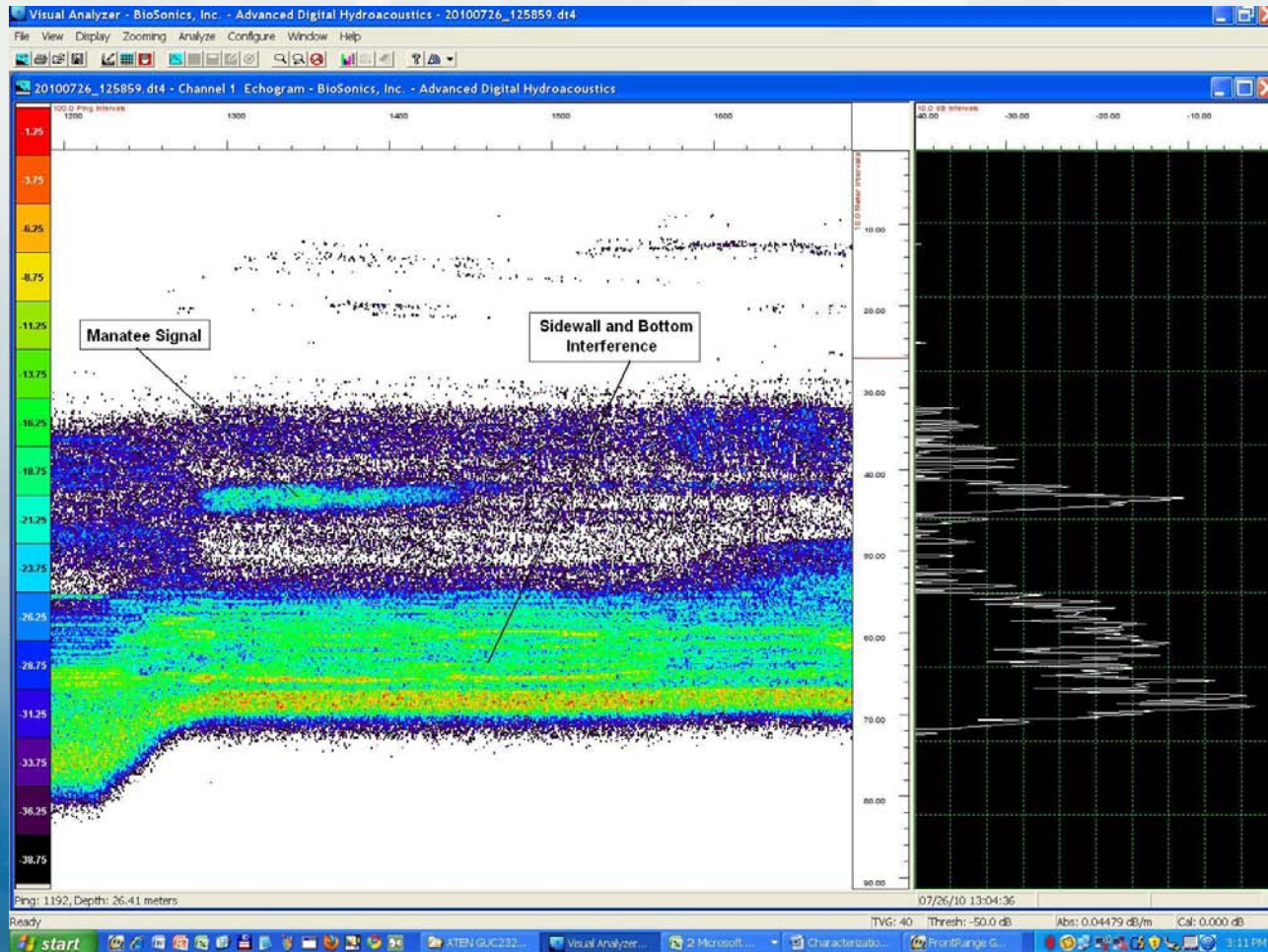
Sonar Deployed



Air Bubbles Block Detection

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

