

DOER: Emerging Technologies for Detection of Mobile Aquatic Species

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Goal

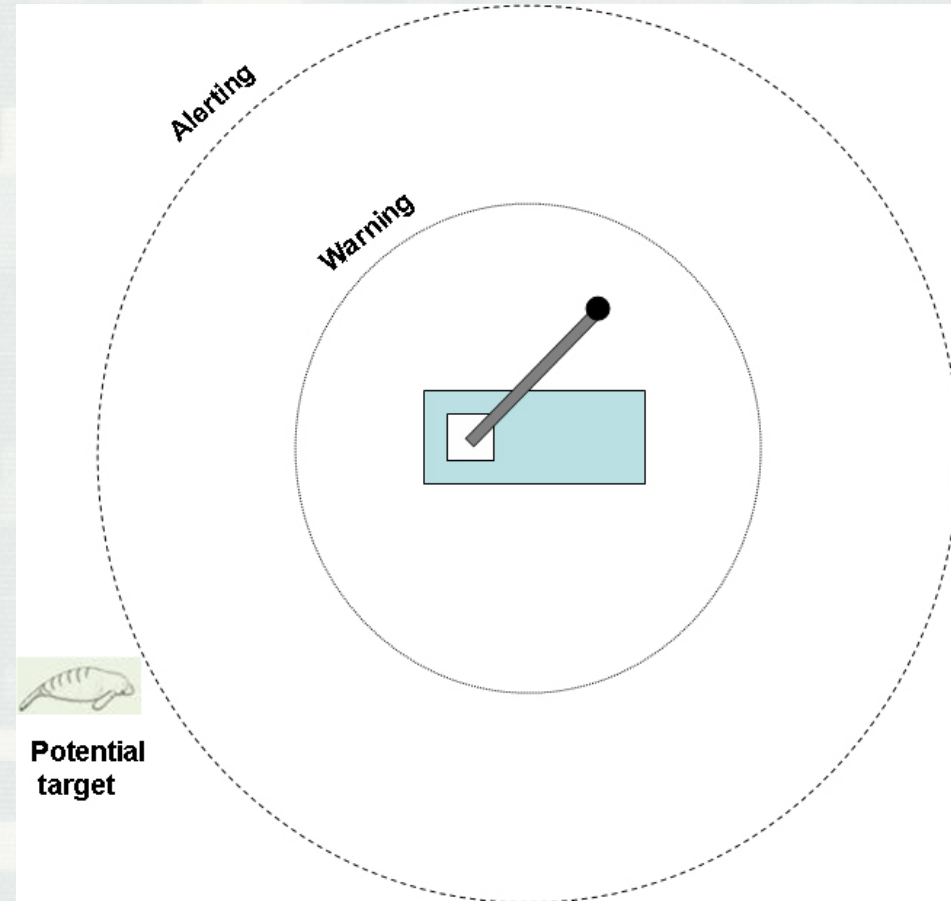
Develop and demonstrate a sensor-based system capable of detecting, tracking, and classifying multiple species of mobile aquatic animals and providing real-time warning to dredge operator when animal comes within a critical distance.



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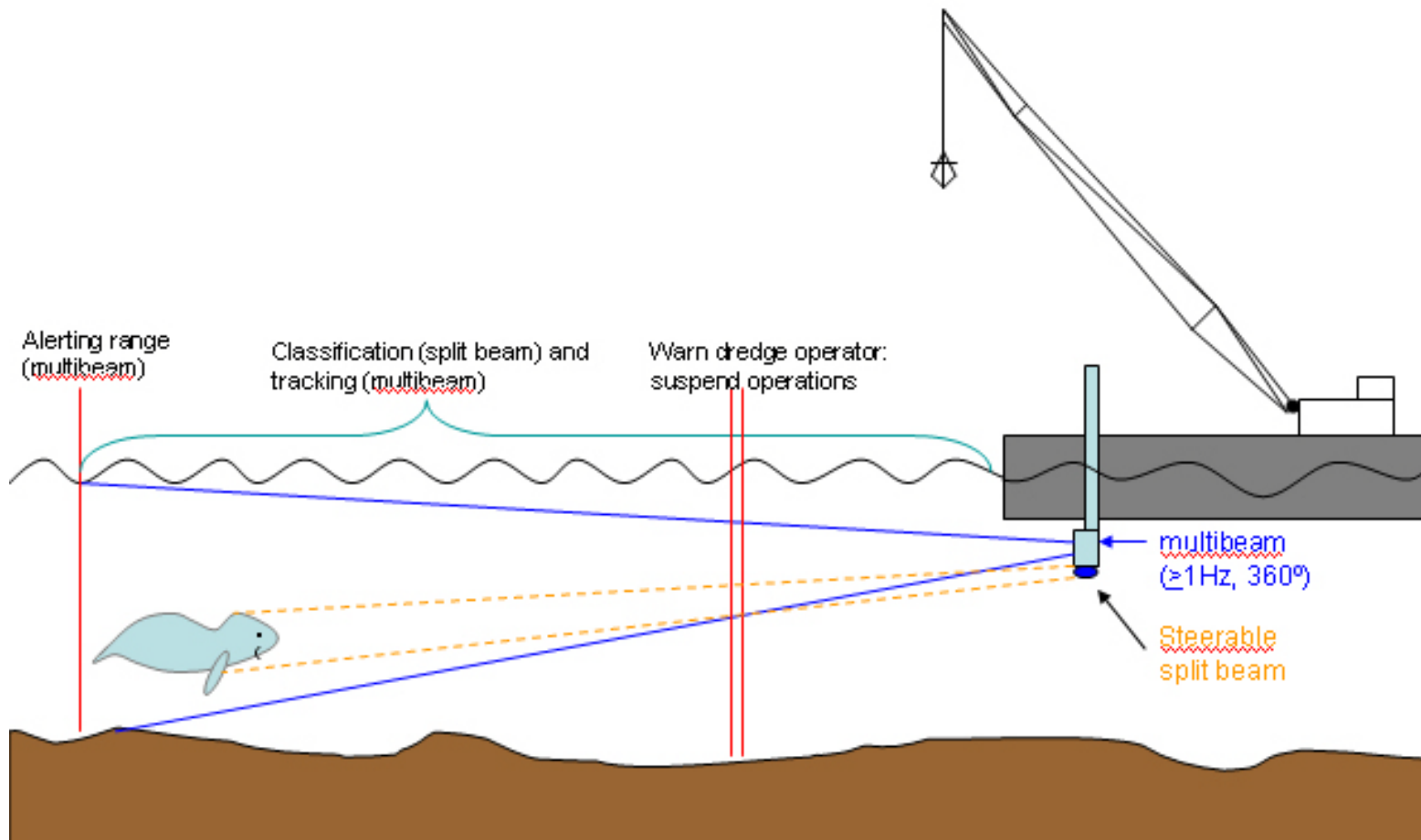
Real-time Functional Requirements

- 1) **Alerting:** Rapidly updated (≥ 1 Hz) detection and tracking of potential targets entering a circle (~100m?) around dredge
- 2) **Classifying:** Classify candidate targets detected in Alerting stage to determine target type (manatee, fish, dolphin, turtle, boat, clutter, etc)
- 3) **Warning:** Warn dredge operator when tracked target is high valued species and crosses within warning range (30m?) of dredge (bucket, cutter head, etc).



Technical Approach

Integrate commercially available multibeam echosounder (alerting) and mechanically steered split beam echosounder (classification) with custom software to develop acoustic-based warning system



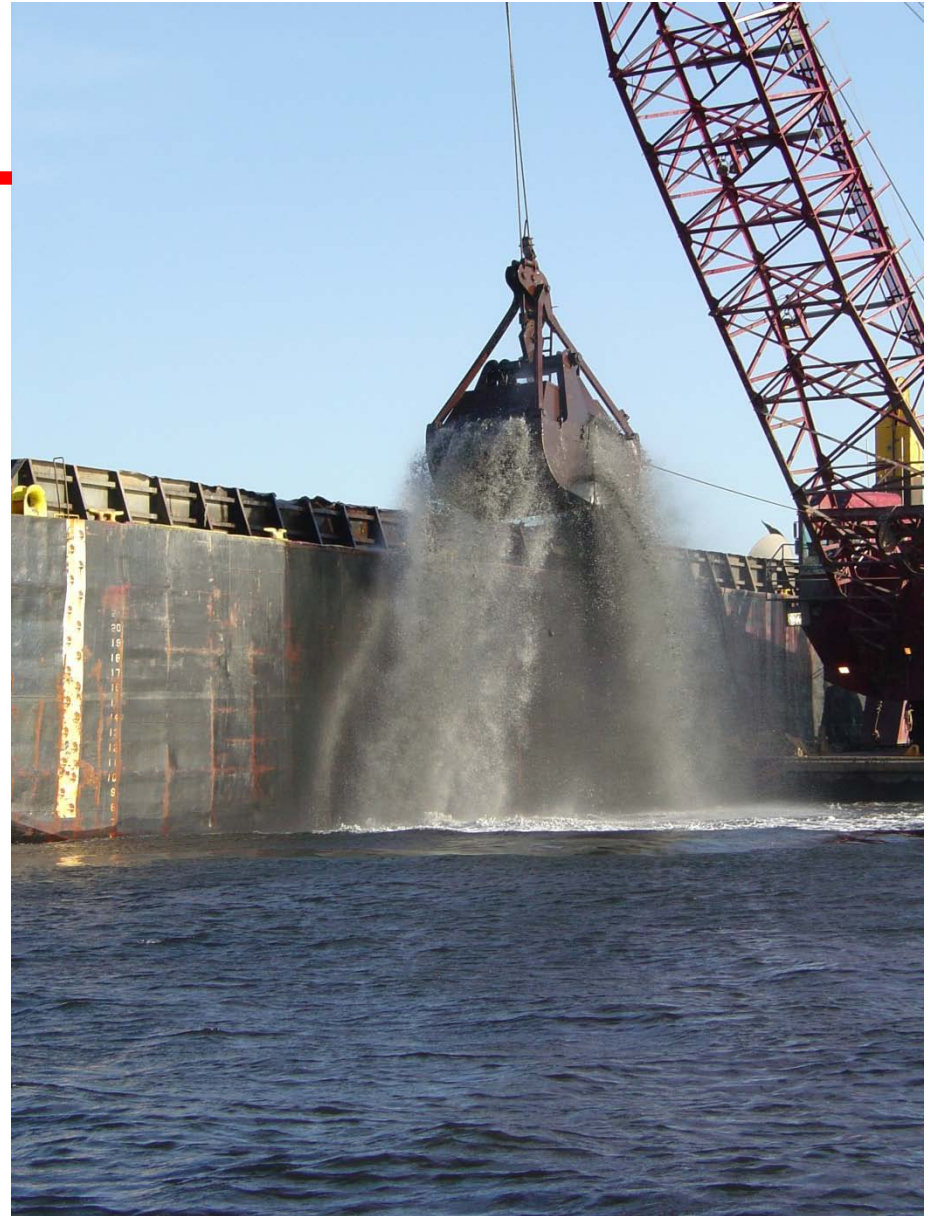
Operational System Development

- Requirements
 - ▶ Rapid updating ($>0.2\text{Hz}$) of positions of large targets within 100m, 360 degrees
 - ▶ Real-time classification and tracking in alert mode
 - ▶ Automated archival of target recording
 - ▶ Automated warning of operator when large target enters critical zone (perhaps 15 m)



CHALLENGES TO SYSTEM INTEGRATION

- **Masking of target signal by bubble curtain generated by operating bucket**
- **Maintenance/repair needs of a 24/7 real-time system**



26 cu yd closed bucket



Current Findings and Technical Issues to Investigate

- Bubble curtain of 1.5 CY bucket generated minimal and very short-term obscuration
- Split beam technology demonstrated potential for satisfactory classification
- Split beam technology too slow for alerting function
- Investigate multibeam technology for alerting function
- Investigate obscuration of target signals by bubble screen generated by a large bucket (25 - 36 CY) during real dredging operation



Plan Forward

- Measurements of acoustic screening of large operating bucket dredge (measurement of acoustic surrogate with single-beam echo sounder) - FY11
- Test prototype system against surrogates under simulated operational conditions – FY12
- Demonstration of system under full operational conditions – FY13

