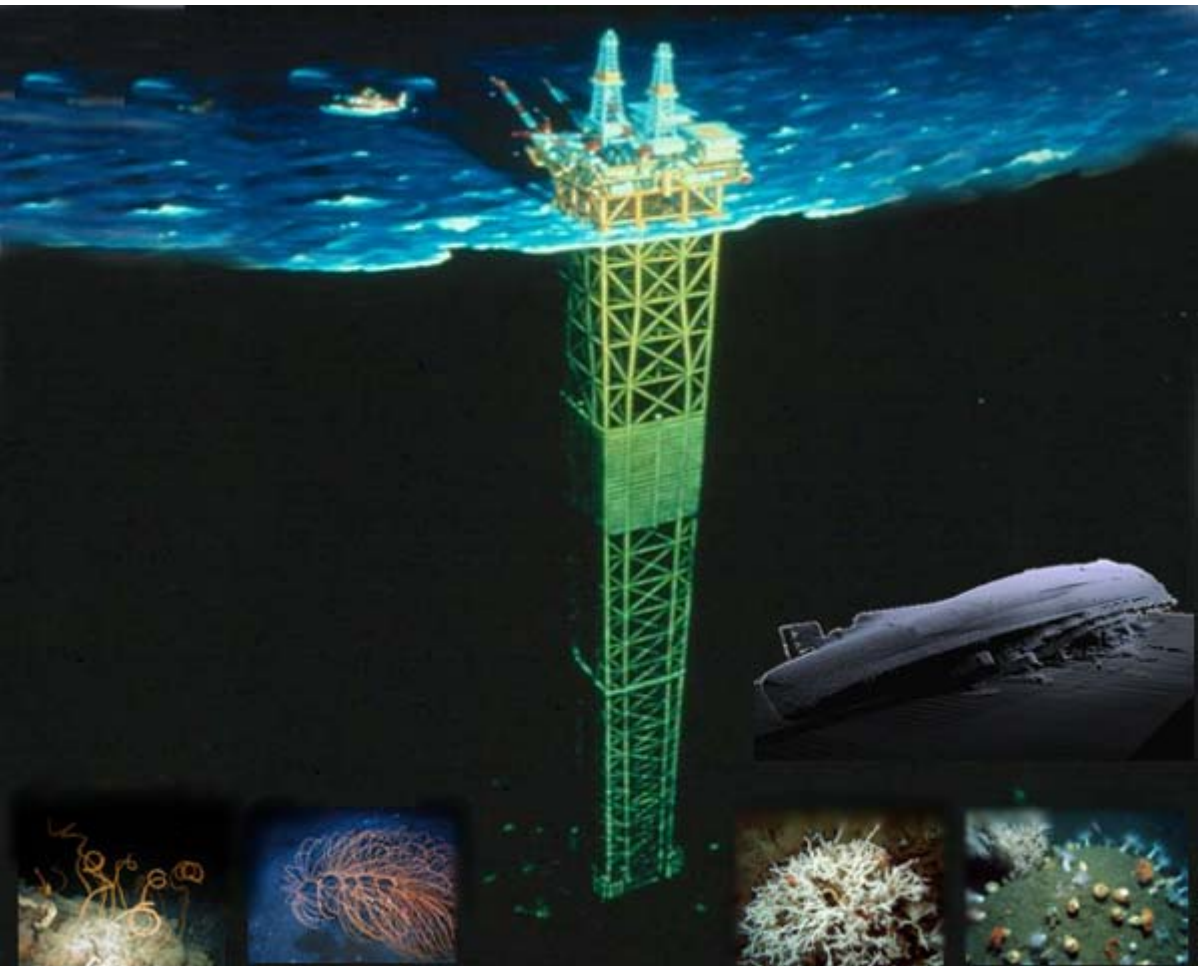
Deepwater Program

Exploration and Research of Northern Gulf of Mexico Deepwater Natural and Artificial Hard Bottom Habitats with Emphasis on Coral Communities: Reef, Rigs and Wrecks – Lophelia II



James M. Brooks

TDI-Brooks International Inc.

College Station, Texas

2009 ITM Presentation Outline
MMS Lophelia II

- **Introduction and Project Overview: New MMS/NOAA OER Study "Lophelia II"** ***Exploration and Research of Northern Gulf of Mexico Deepwater Natural and Artificial Hard Bottom Habitats with Emphasis on Coral Communities: Reefs, Rigs and Wrecks –*** Jim Brooks, TDI-Brooks International Inc.

- **Lophelia II: Preliminary Biological Findings from 2008 ROV Dives –** Peter Etnoyer, TAMUCC

- **Lophelia II: Preliminary Archeological Findings from 2008 ROV Dives –** Jack Irion, MMS

Program Objectives

Obtain robust predictive capability for the occurrence of rich hardground coral communities in the deep Gulf of Mexico

- Discover and describe new locations > 300 m with extensive coral community development including *Lophelia pertusa*
- Gain a more comprehensive understanding of process that control the occurrence and distribution of *Lophelia* and other coral communities (<300m) through both laboratory and field data collection
- Document and understand the relationship between coral communities on artificial and natural substrates with respect to community composition and function, phylogeographic and population genetics, and growth rates of key foundation species

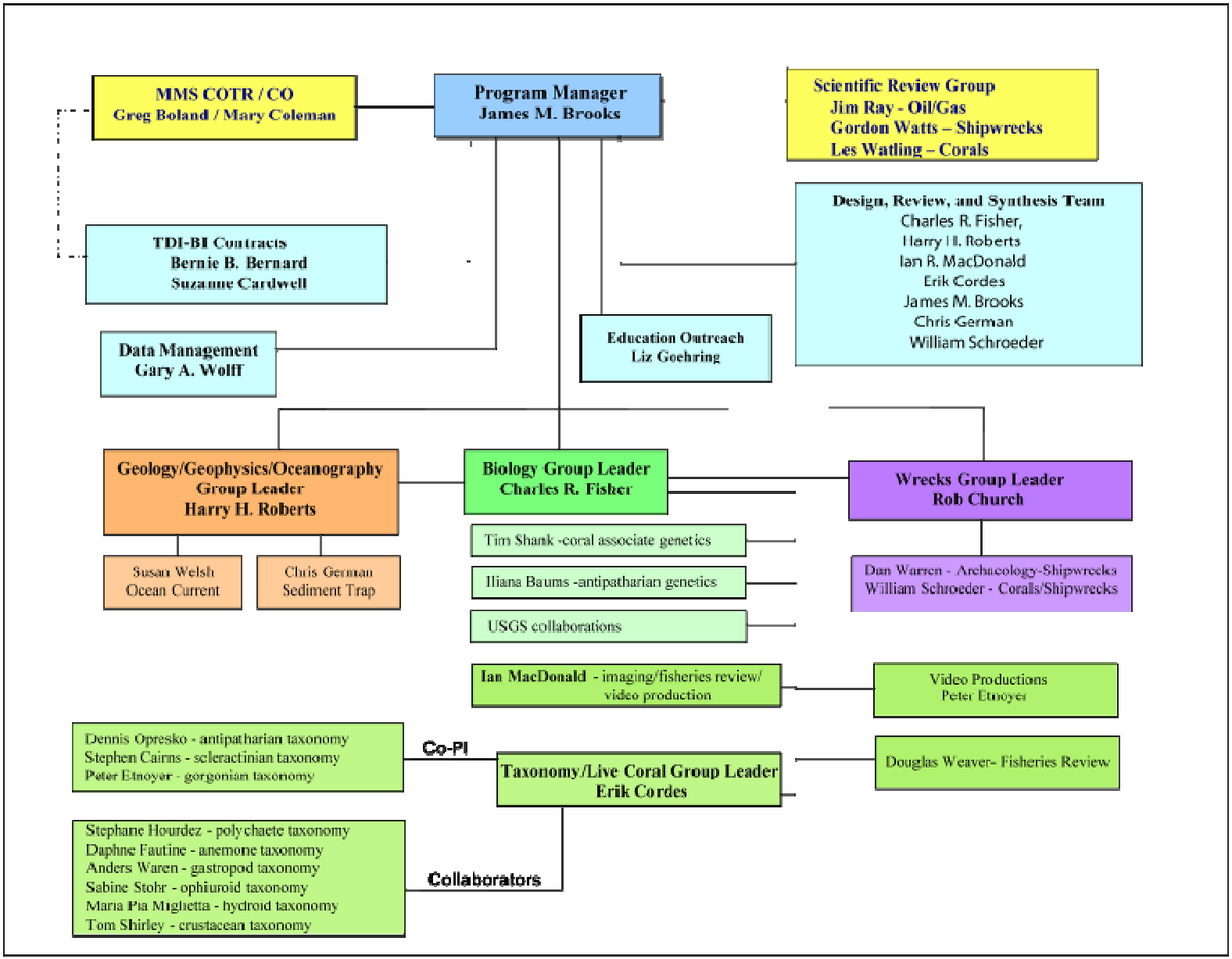
Program Objectives – Biological Objectives

- To discover and characterize new sites
  - Characterize key sites at the largest scale with HR bathymetry, SSS, 3-D seismic data and current models
  - Characterize the coral density at the 10 to 100-m scale with randomized photo transects and general site descriptions
  - Characterize the community composition at the 1 to 10 m scale at significant coral sites (man-made and natural) with analysis of close-up imagery, replicate photomosaics and quantitative community collections
- Analyze connectivity among man-made & natural sites with comparative community, phylogeographic and population genetic analysis
- Compare the structure, species richness and diversity of communities tightly associated with *Lophelia* at man-made and natural sites
- Experimentally determine the tolerance and growth response of *Lophelia* to temperature, pH/alkalinity, dissolved oxygen and current.
- Characterize and constrain growth rates of key species of colonial cnidarinans (pioneer colonies) using analysis of images on man-made structures of known age
- Characterize key variables (temperature, currents, larval seasonal distribution development and sediment quality) at sites with the most significant coral communities over one year at 2–4 sites

Program Objectives – Other Objectives

- Historical shipwreck component. Study of up to six (6) shipwrecks to determine identity, site boundaries, National Register eligibility, preservation state and stability, associated biological communities and artificial reef effects.
  - ➢ Determine rate of deterioration of test coupons at platforms or shipwrecks
- Coordination with USCG
- Deepwater commercial fisheries review that impact hardbottom communities

Program Organization



Lophelia II – Cruise 1

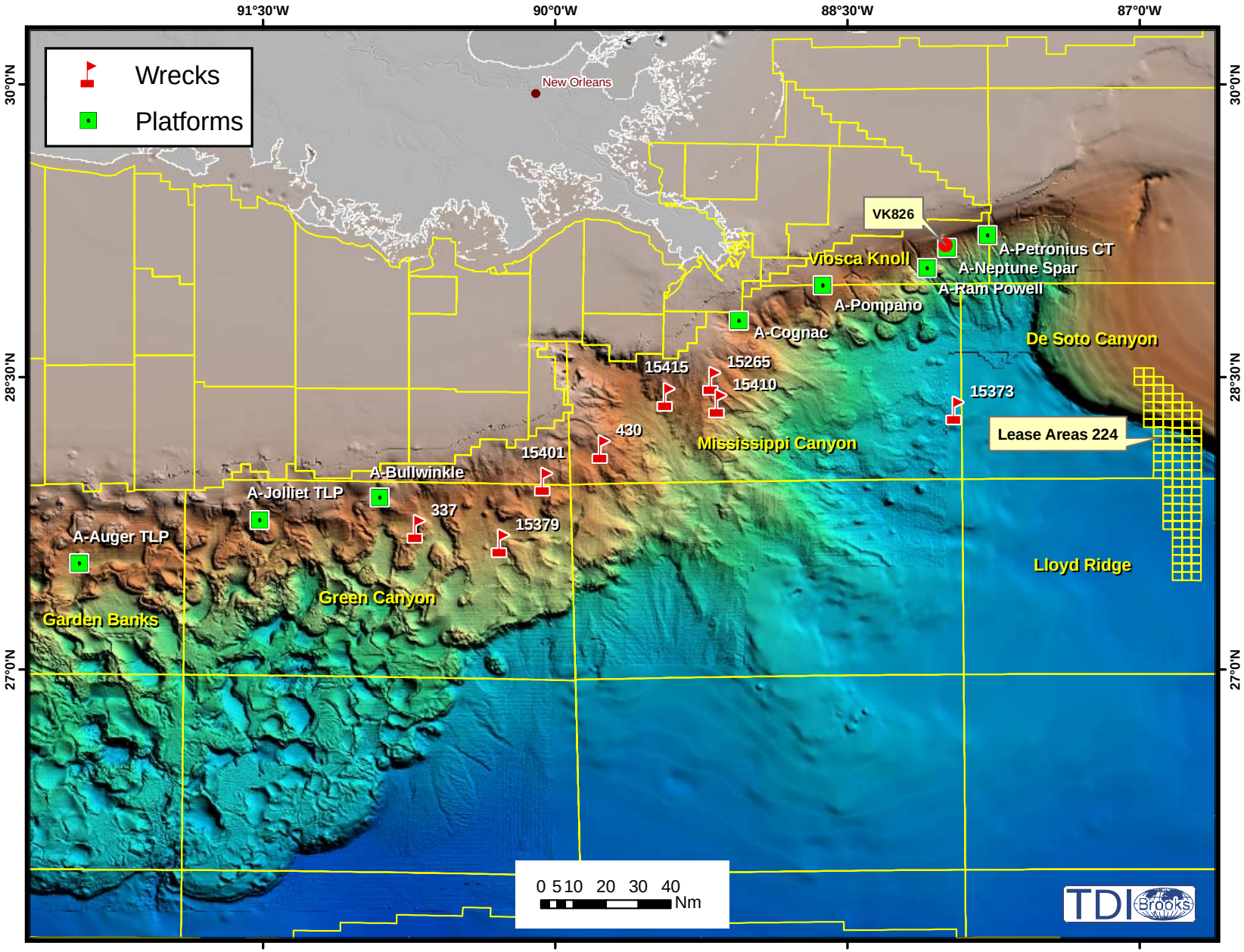
5 September–2 October 2008

Primary Objective

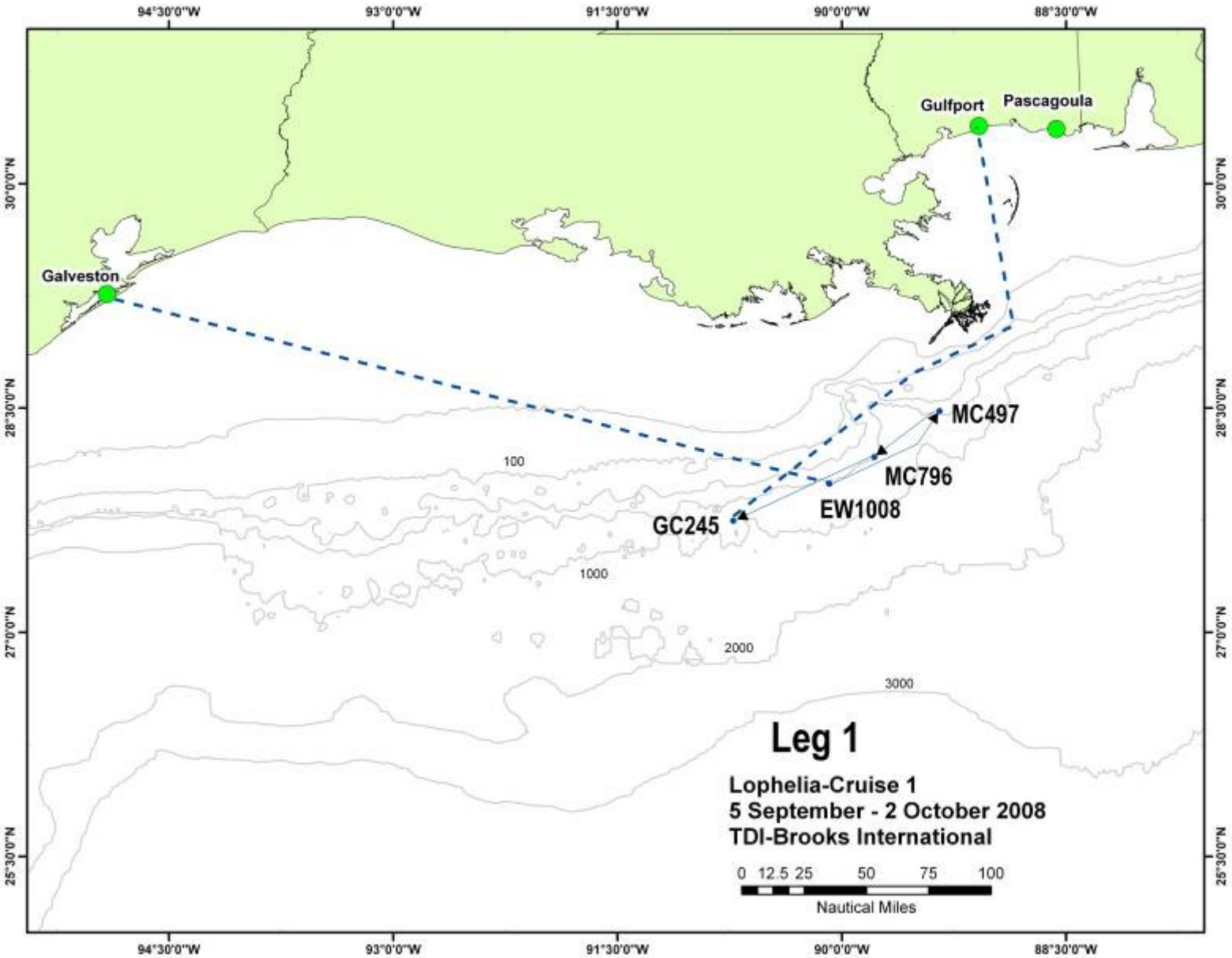
Conduct a reconnaissance of shipwreck sites and site reconnaissance of potential new hardground communities

- Conducted on NOAA research vessel *Nancy Foster*
- Mobilized and embarked from Galveston, Texas
- **Leg 1** 5–13 September 2008
- Staged in Gulfport, Mississippi, for the second leg
- **Leg 2** 20 September–2 October 2008
- Demobilized in Pascagoula, Mississippi

Cruise 1 – Sites of Interest



Cruise 1 Leg 1

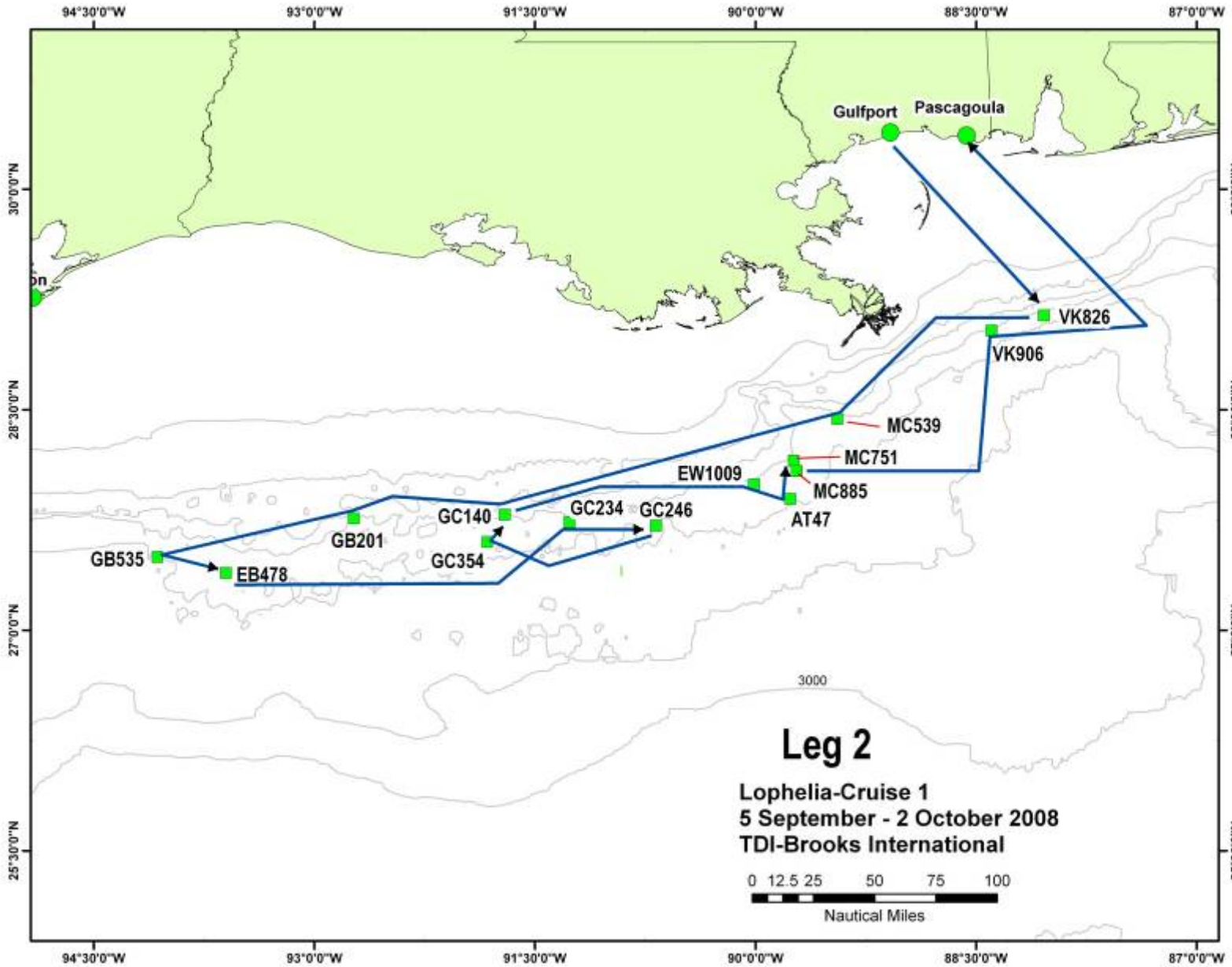


Cruise 1 – Summary

Leg 1

- Ewing Banks Wreck site confirmed historic 19th century shipwreck site
- More *Lophelia* on Ewing Banks Wreck than any other 19th century wooden wreck known in the Gulf of Mexico
- Many of the wreck's attributes, such as the lack of cargo, rigging or machinery, make it an intriguing mystery
- Identity of *Gulfoil* was confirmed and substantial coral colonies were documented
- *Lophelia* coverage at *Gulfoil* may be more substantial than that documented at *Gulfpenn* in 2004
- The dive on *Gulfpenn* allowed the identification of the stern section of the tanker
- Microbial experiment placed on the site in 2004 was reexamined
- Temperature logger was placed on *Gulfpenn* 's bow

Cruise 1 Leg 2



Cruise 1 – Summary

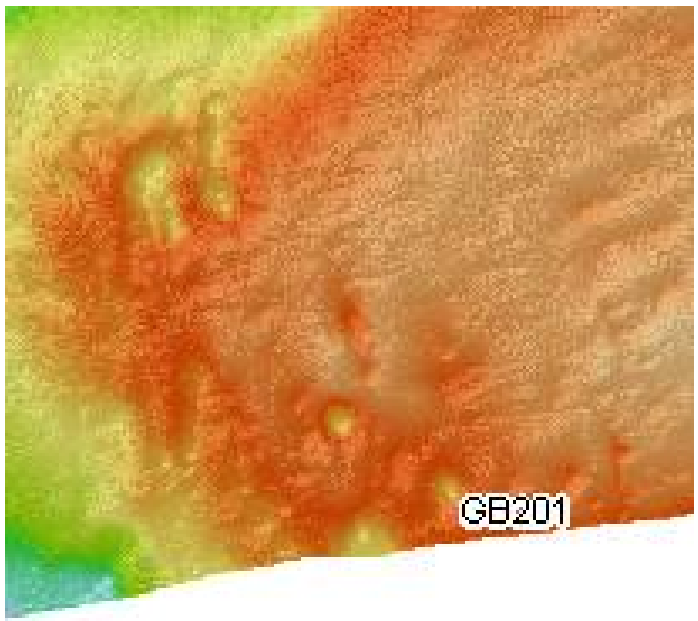
Leg 2

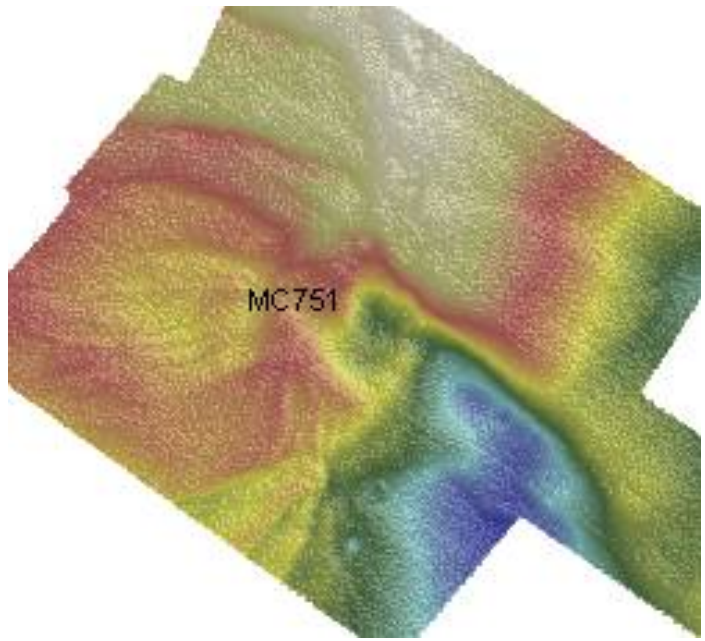
- Multibeam data was collected at 13 sites
- 10 lowerings of the ROV were completed over eight different sites
  - 50 hours total bottom time
  - CTD data collected during each lowering
  - 61 biological and geological samples obtained
- Five sites with adequate visual surveys
  - MC 751 (8 hrs) high abundance of live *Lophelia pertusa*
    - good candidate for future work
  - GC 140 (17 hrs) high diversity of gorgonians and antipatharians
  - GC 234 (5 hrs) discovered new area of *Lophelia pertusa* colonization north of previous site
  - VK 906 (10 hrs) coral mounds south of previously explored area
  - GB 201 (9 hrs) hard grounds covered in sediment, very low coral abundance
    - Eliminated as a potential site

Cruise 1 – Summary

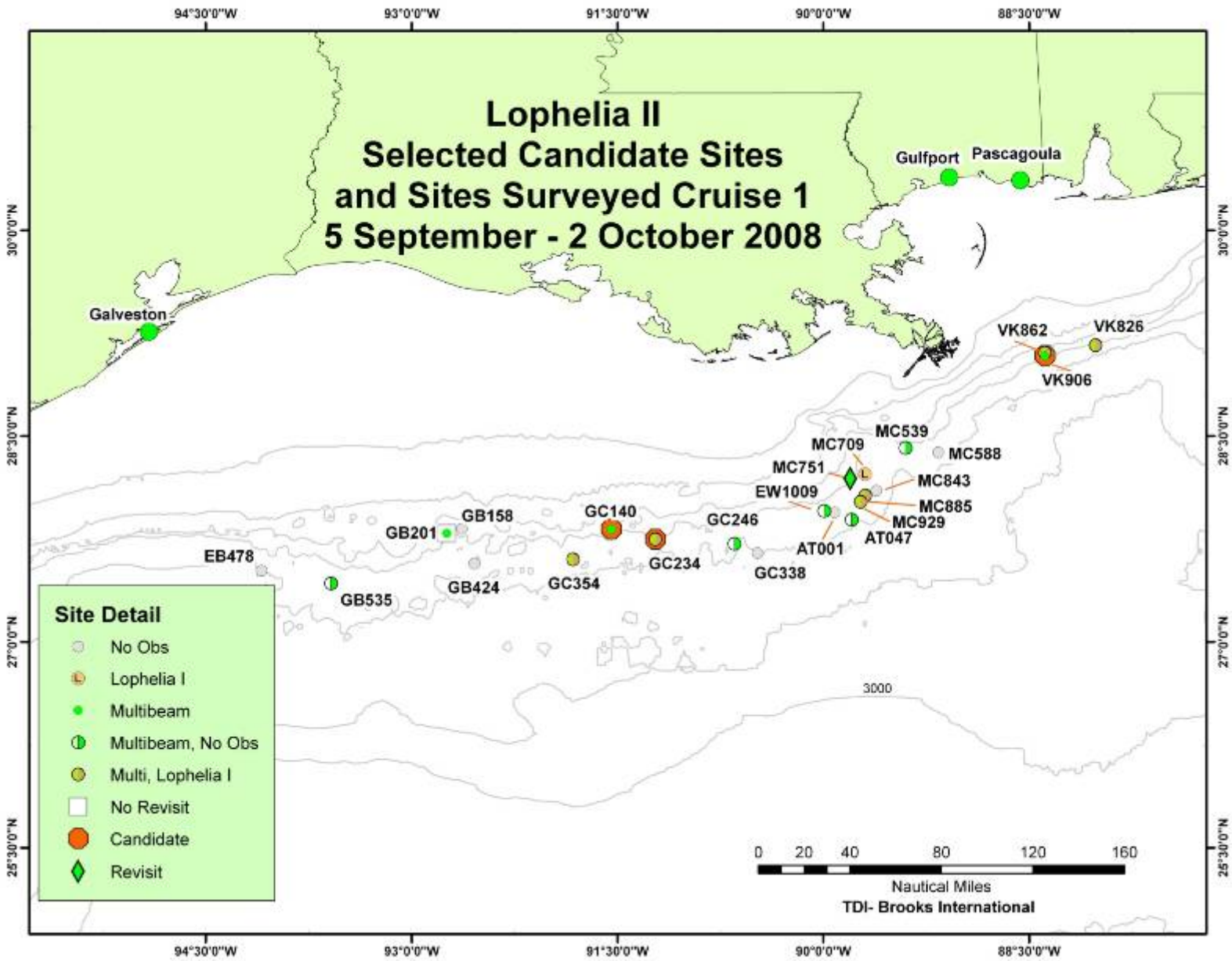
Leg 2

- New factors for site selection
  - Presence of pockmarks in multibeam and on seafloor likely contribute to sedimentation and reduce coral survivorship (GB201)
  - Low relief sites potentially suitable if other conduit for sediment removal is present (MC751)





Characterization of Selected Sites



Field Sampling Plan

Second Site Reconnaissance Cruise – June 2009

R/V BROOKS McCALL

WHOI's-AUV SENTRY

Field Sampling Plan

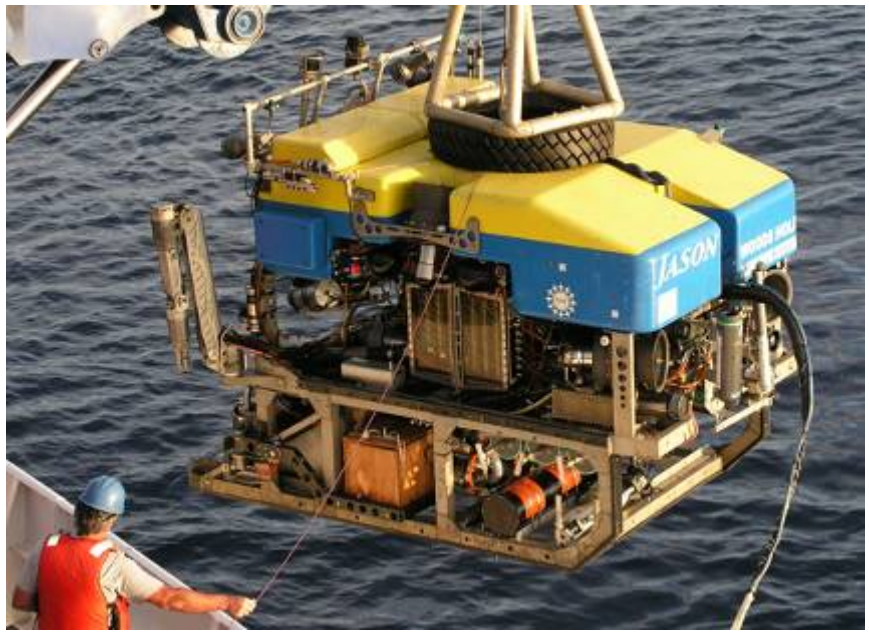
Second Site Reconnaissance Cruise – June 2009

R/V BROOKS McCALL and WHOI's-AUV SENTRY

- Cruise Duration: 10–14 days
- Somewhat similar activities as Cruise 1
- Survey remaining sites from Cruise 1 list
- Focus on site recon of unexplored sites and wrecks
- Increased sample capabilities greater than 1,000-m in such sites as GC-852 and other areas
- Based on data collection during the first two cruises, the key sites (both natural and artificial) for in-depth study during the subsequent cruises will be identified

Third and Fourth Cruises – ROV

- Cruise 3: August–September 2009: NOAA Ship *Ron Brown* and *Jason II*
- Anticipate about 20+ dive days in 2009 and 2010 with Jason II or equivalent.
- Sites selected from first and second reconnaissance cruises, plus other known sites (VK826 & GC852)
- Compromise the intensive *in situ* field work (time lapsed cameras, sediment traps, current meters, temperature recorders, quantitative collections of corals, population genetics, coral sedimen tcollections, live corals collections, faunal inventories).
- Visit 6–7 sites with extensive collections at potentially three (3) sites.
- Some wreck and platform works as well.



Field Sampling Plan

- Oil Platform ROV Survey Effort
  - At least six (6) platforms to be selected for live coral colonization surveys/sampling
  - Arrangements will be made with operators to use their ROV which may include mounting our own digital cameras
  - Selected in areas of special interest to our studies of population connectivity amount known and potential deep coral communities
  - Represent a range of ages in order to generate a range of growth rates for pioneer colonies

Preliminary Schedule for 2009

- Quarterly Status Letter – March 2009
- Cruise 2 Plans to MMS – March 2009
- Cruise 2 – April – May 2009
- Cruise 2 Report – June 2009
- Quarterly Status Letter – June 2009
- Interim Report on Deepwater Commercial Fishing Activities in the Gulf of Mexico – August 2009