

# GULF

SERPENT IN THE GULF OF MEXICO



# SERPENT

SCIENTIFIC AND ENVIRONMENTAL ROV PARTNERSHIP  
USING EXISTING INDUSTRIAL TECHNOLOGY

**An Academic-Industrial Partnership to Explore Life in the Deep Gulf of Mexico**

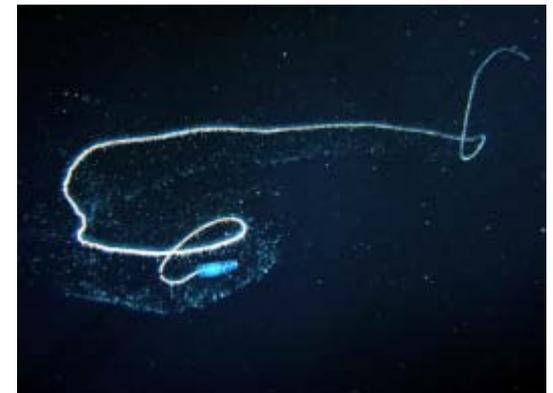


## Mark C. Benfield

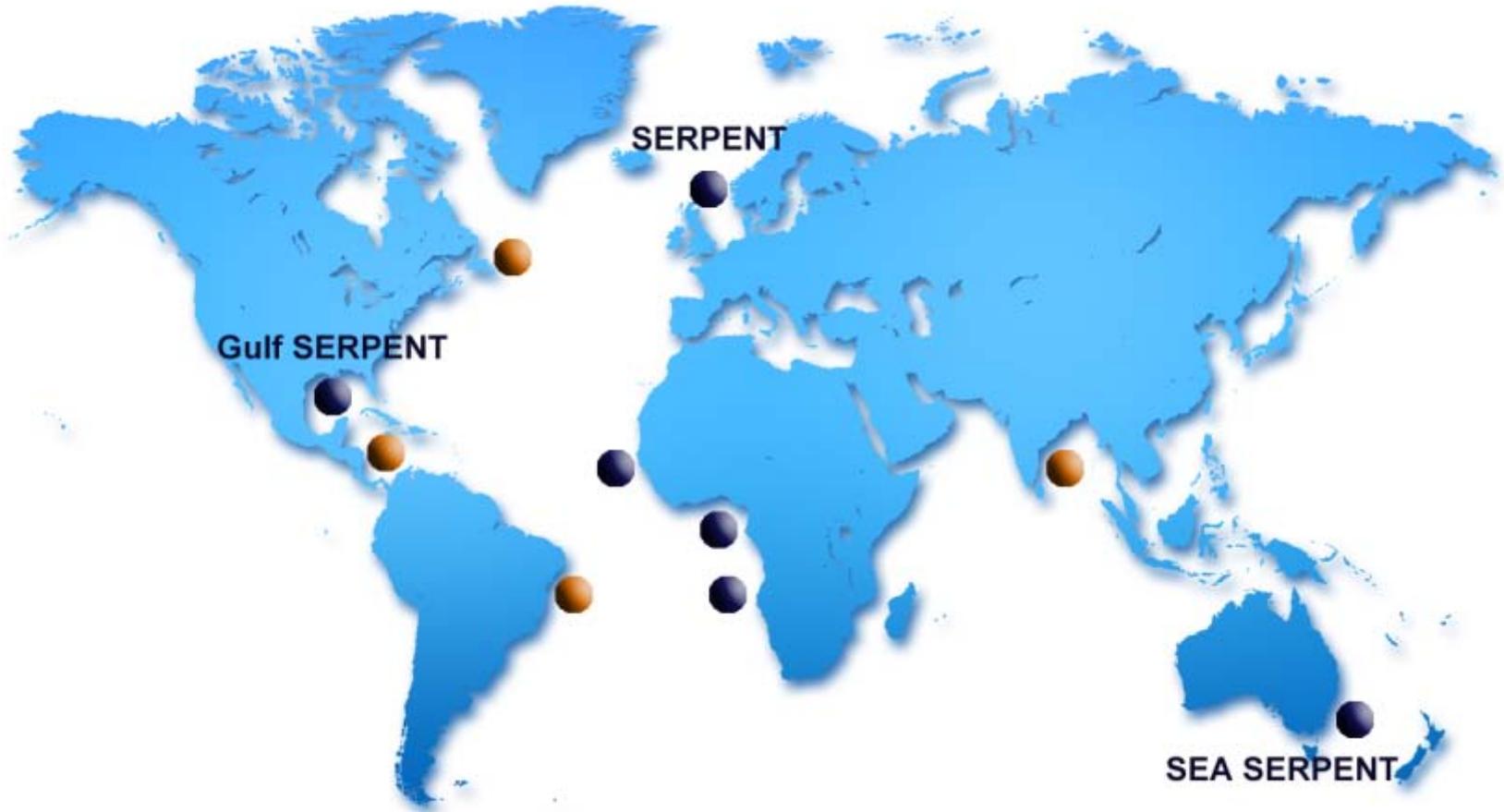
Louisiana State University  
Oceanography and Coastal Sciences

# What Is SERPENT?

- Global partnership between the oil and gas industry and academia
- ROVs and other instrumentation to conduct research
- Operational stand-by time
- Observations and experiments
- Pure and applied research



# SERPENT Projects



# Rationale

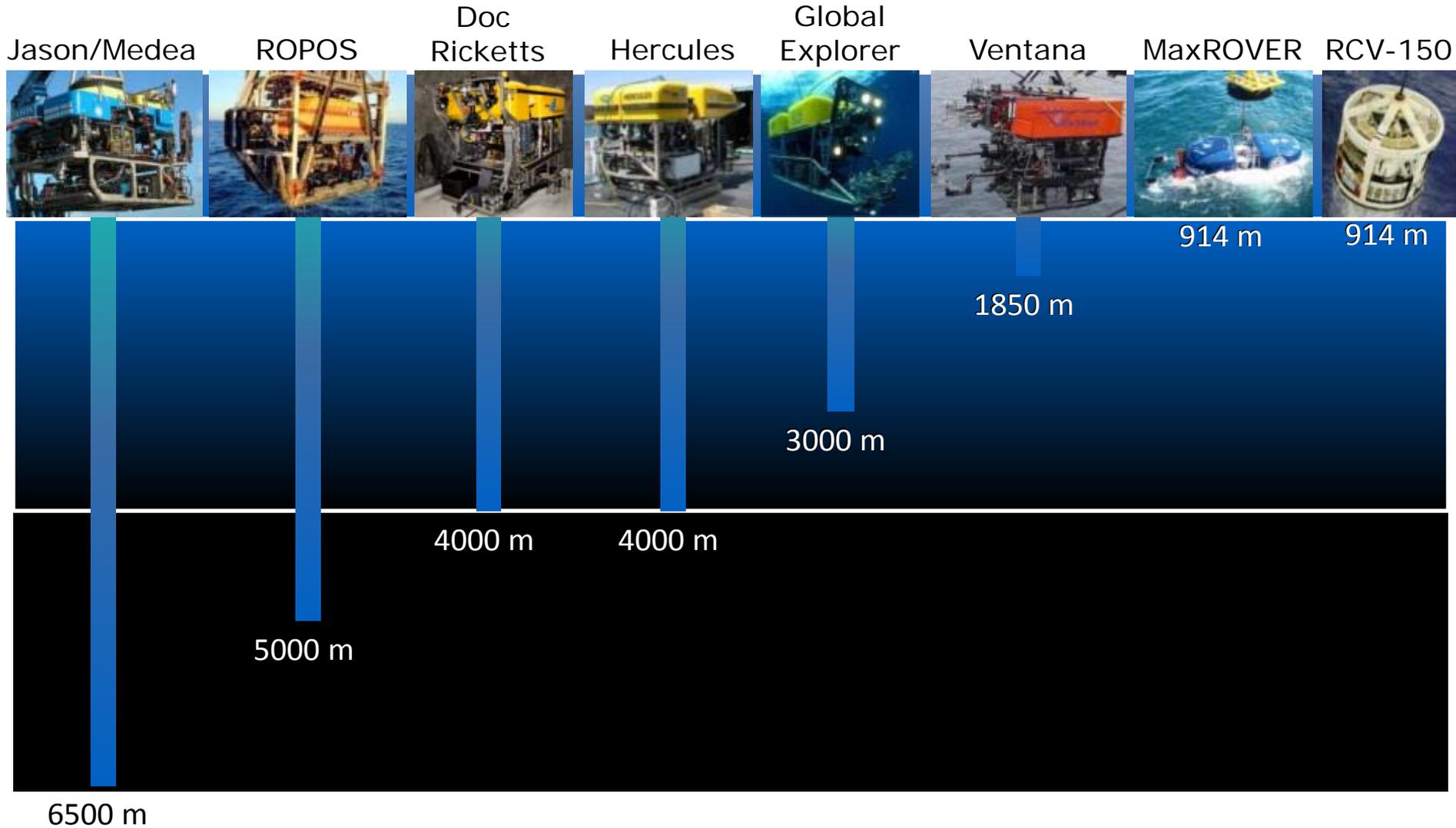


Image Credits: Jason (WHOI), ROPOS (CSSF), Doc Ricketts & Ventana (MBARI), Hercules (NOAA), Global Explorer (Deep Sea Systems), MaxROVER (NURP), RCV-150 (NOAA).

# Oil and Gas ROVs



Innovator 4K



Innovator



Millennium/  
Magnum



Hercules



Centurion  
QX200



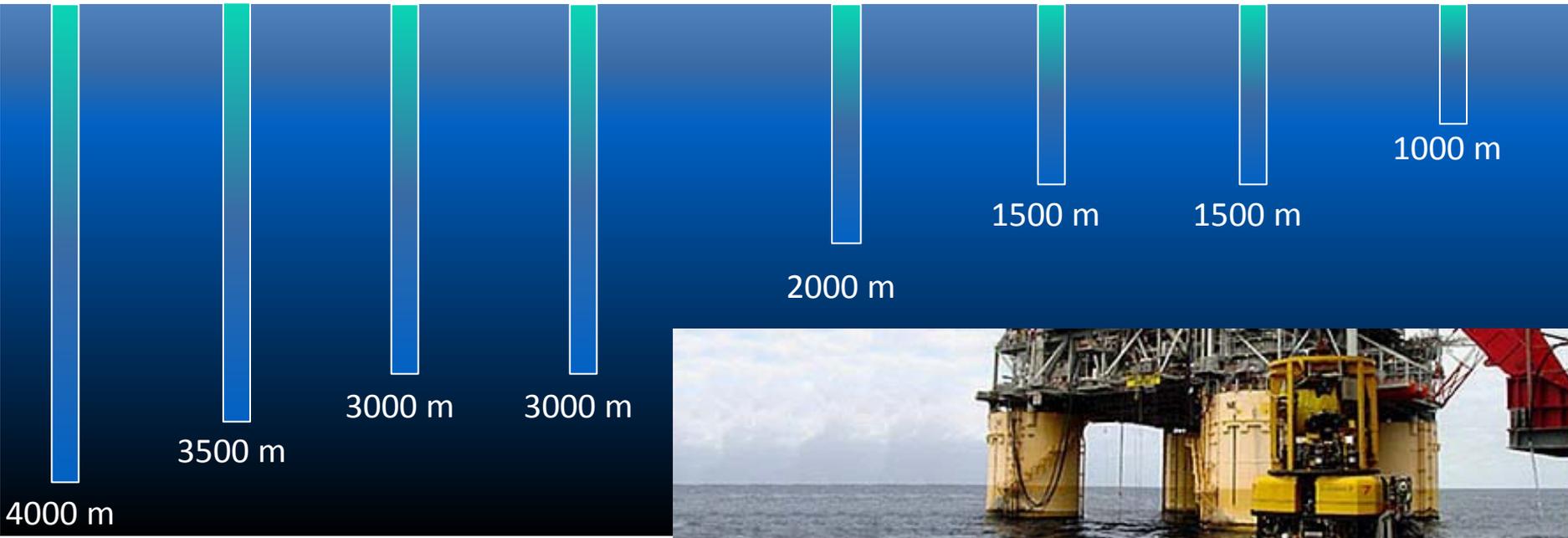
Centurion  
HD



Pioneer  
HD



Pioneer  
HD



# Extended Presence in the Sea



Image Credit: New York Times/Transocean

# GOM Exploration and Production Sites



# Project Objectives

- Deep-sea biological observation system
- Mesopelagic and bathypelagic plankton and nekton
  - What organisms are present?
  - Where do they occur (lat, lon, depth)?
  - When do they occur?
  - What are they doing?





# Educational Opportunities



# Educational Opportunities



# What About Industry?

- Reinforce the 'E' in the HSE message



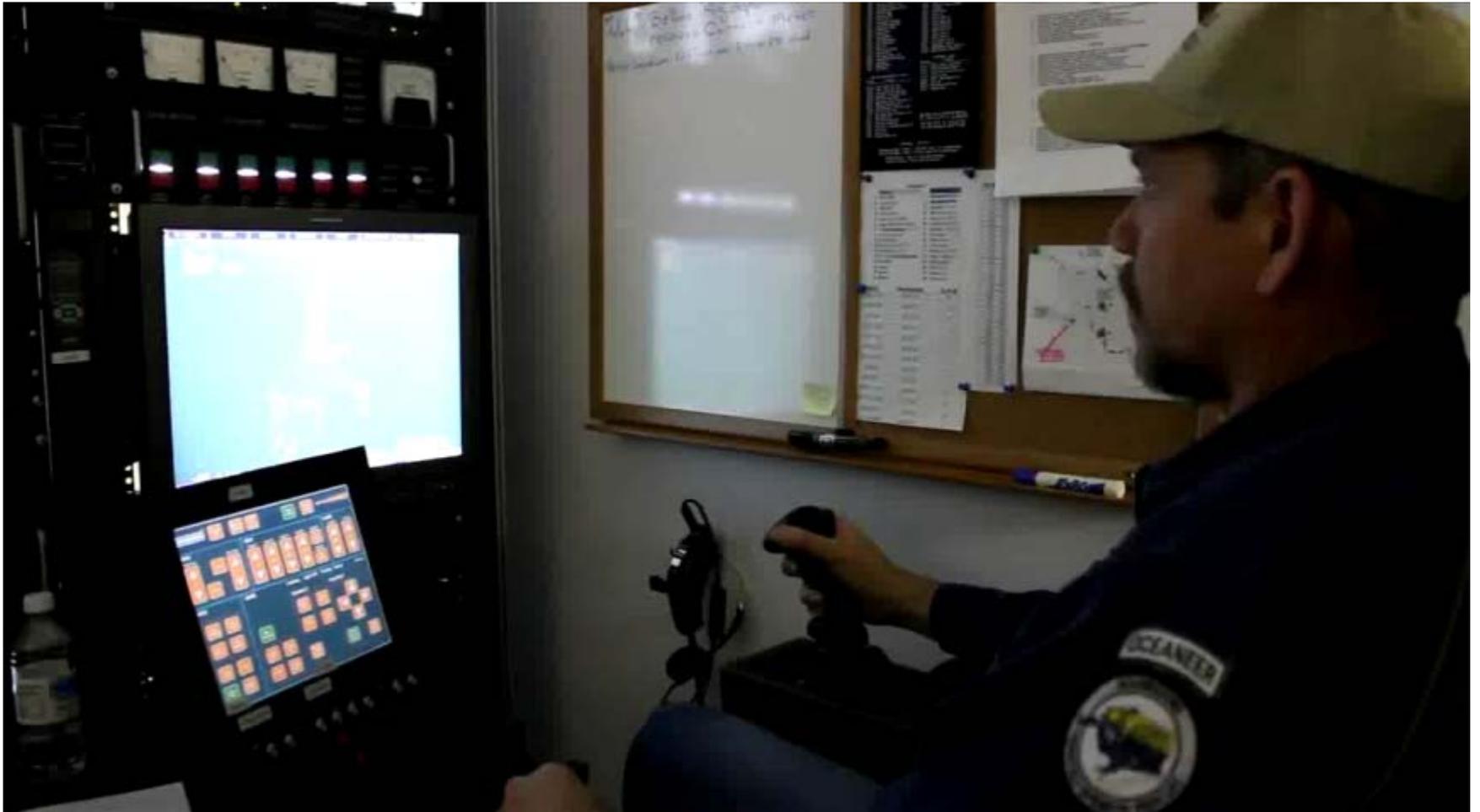
# Industry Benefits: Corporate Image

- Demonstrate corporate commitment to the environment, to the public, and to shareholders



# Value to Industry

- Better pilots for SERPENT = better pilots for drilling



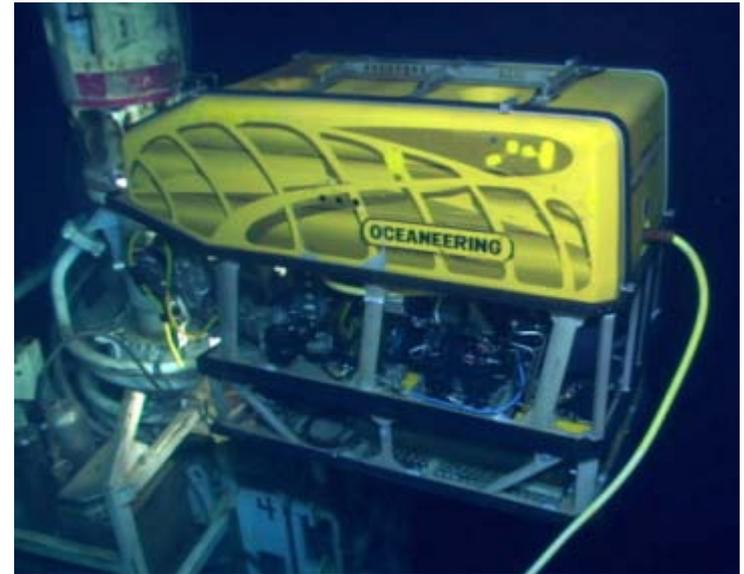
# Critical Pre-Impact/Post-Impact

- What were conditions like prior to drilling?
- Seafloor and water column conditions prior to an incident

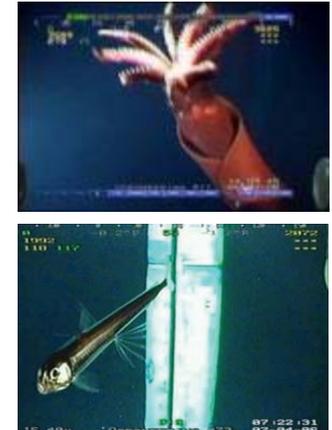


# SERPENT Surveys

- Post-riser inspection surveys
- Dedicated surveys
- Opportunistic observations



# Operations



**DATABASE**  
 ID, Date, Time,  
 Depth, Lat, Lon,  
 Temperature,  
 Other Metadata



Department of Oceanography and Coastal Sciences  
**Zooplankton Ecology Laboratory**  
 Home | People | Facilities | Research | Teaching | Publications | Gulf Stream | SERPENT | Lab Area & Info | 504-388-1300

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**SERPENT**  
 scientific and environmental research using existing industrial technology

Innovative to the Gulf Stream Project (SERPENT) is an innovative, global partnership between academia and the petroleum industry. The project is unique - jointly owned/operated with access to the offshore facilities and sophisticated scientific control systems (SCS) that industry uses to work in the deep sea. Access is provided when the SERPENT observation is needed with their primary industrial interest.

In the Gulf of Mexico, we're focusing on the waters that lie in the meso-depths (200 - 1000m) and bathy-depths (1000 - 4000m) zones. The region mostly consists with our industrial partners' O&G and SERPENT. The SERPENT (Scientific and Environmental Research Partnership) and the operation of the offshore rigs, and again when they work (Operations, Operations, Operations). Funding for the project comes from the following sources: SERPENT with financial support from the O&G.

wellconnected

**Gulf Stream Project and SERPENT team up to Operate in the Deep Sea**

The Gulf Stream Project (SERPENT) is an innovative, global partnership between academia and the petroleum industry. The project is unique - jointly owned/operated with access to the offshore facilities and sophisticated scientific control systems (SCS) that industry uses to work in the deep sea. Access is provided when the SERPENT observation is needed with their primary industrial interest.

NOTE

**THE SECOND REPORT OF A SLEEPER SHARK (SOMNUSUS SP.) FROM THE BATHYPHELIC WATERS OF THE NORTHERN GULF OF MEXICO**

Mark C. Reifel, Bruce A. Thompson, and John H. Curtiss

Some polar and cold temperate fishes commonly found over a broad depth range in high latitude waters may occur within a narrower and deeper depth range at lower latitudes. This variant of Regener's rule (Cortes, 1986) may explain why some deep-sea sleeper sharks throughout the world occur at high latitudes but are typically observed in mesopelagic or bathypelagic waters at more southern latitudes. For example, the Pacific sleeper shark *Somnus pacificus* Regener and Schroeder, 1941 has been reported near the surface in Alaskan waters (Hight, 1979), at depths of 200 to over 3000 m off California (Elliott et al., 1987), and at 10 below 2000 m off southern California and Baja California, Mexico (Drazen and Schwartzman, 1977).

Documenting the presence of large animals such as sharks at great depths in offshore Direct Observations using towed and autonomous submersibles has revealed the presence of many poorly documented, deep-water marine taxa. However, the numbers of such vehicles routinely available to the academic community and the petroleum industry have resulted in increased exploration and production activities in the waters of the outer continental shelf and slope. The numbers of remotely operated vehicles (ROVs) employed by the petroleum industry that routinely operate to depths of 2000 m or greater exceed the size of the scientific ROV fleet by orders of magnitude. Recognition of the potential capabilities of these industrial ROVs to conduct scientific observations has motivated the SERPENT Project scientific environment. Acquisition of the potential capabilities of these industrial ROVs to conduct scientific observations has motivated the SERPENT Project scientific environment. Acquisition of the potential capabilities of these industrial ROVs to conduct scientific observations has motivated the SERPENT Project scientific environment.

A participant of the SERPENT project who are documenting planktonic and benthic organisms in the northern Gulf of Mexico, we herein report observations of a large sleeper shark in the bathypelagic waters of the northern Gulf of Mexico.

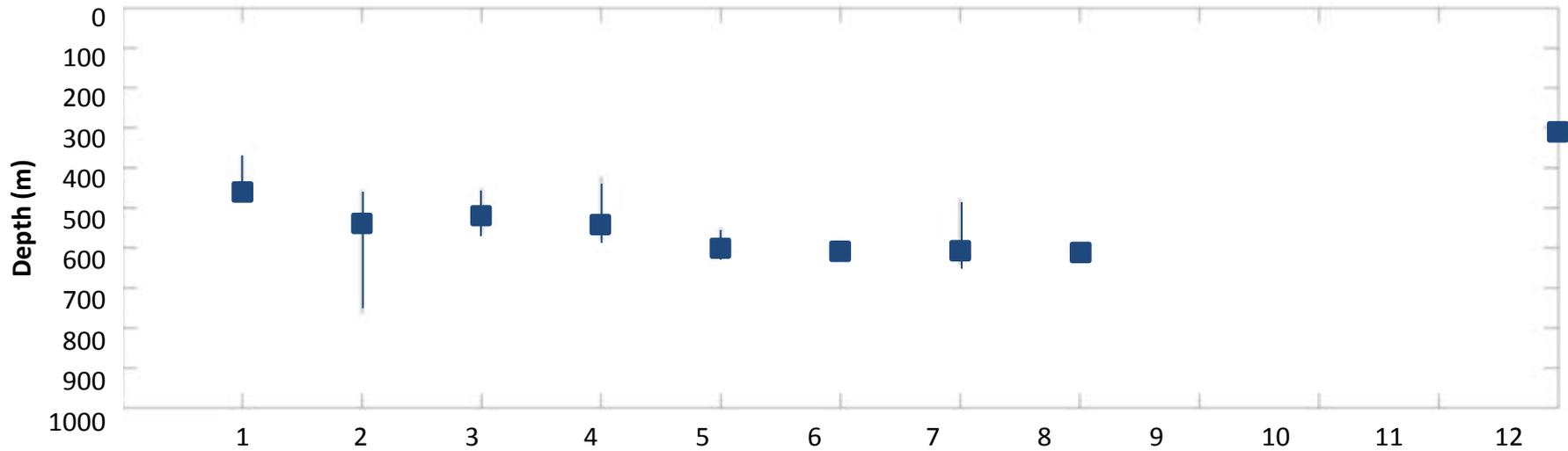
Methods

On 11 August 2006, a remotely operated vehicle (ROV) operated by Oceanographic Inc., was performing surveys near the field of blocks 207 and 208 in the northern Gulf of Mexico. A large shark at a depth of 1837 m (bottom depth, 1836 m). Water temperature at the depth measured was 12.1°C and the salinity was 35.7. The ROV recorded 1.6 color images while the shark was visible, during which time it approached the ROV twice before departing. The footage was sent to LSU via SERPENT's color video stream and was subsequently decompressed and saved using QuickTime Pro version 7.0. A series of representative images were generated from the video stream processing software. Information of the shark's location and time of day is provided in the accompanying figures. The shark was the second specimen (Yule et al., 2004; Compagno et al., 2005; Bates et al., 2007).

# Long-term Database



# Long-Term Database



# Opportunistic Observations



# Data Mining





# Results: Manefish (*Paracaristius* sp.)

- Poorly studied, infrequently sampled mesopelagic fishes
- Best video observations of this little-known species to date



Benfield et al. 2009

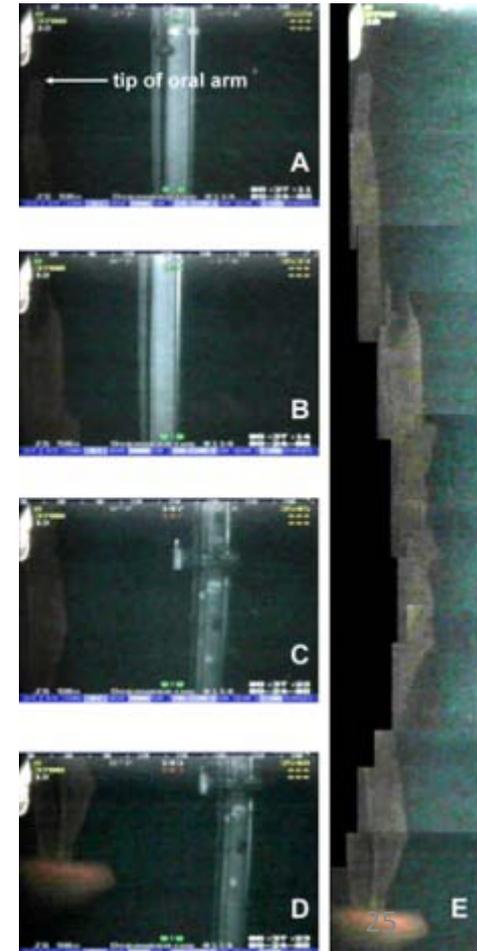
# Results: *Stygiomedusa gigantea*

- First records of *Stygiomedusa gigantea* from GOM
- Four observations: Discoverer Deep Seas, GSF Explorer, Thunder Horse, Development Driller I

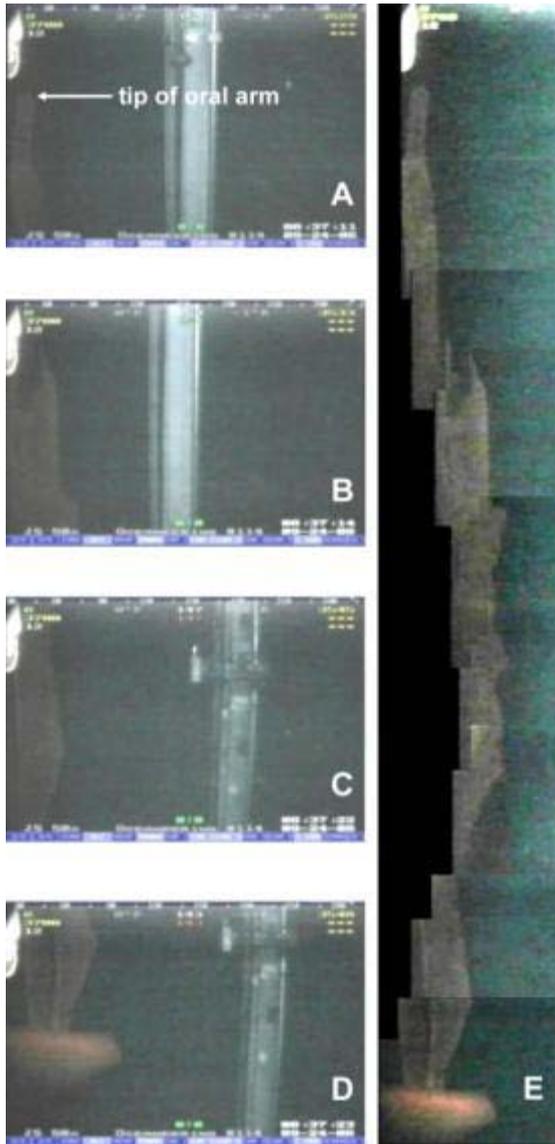


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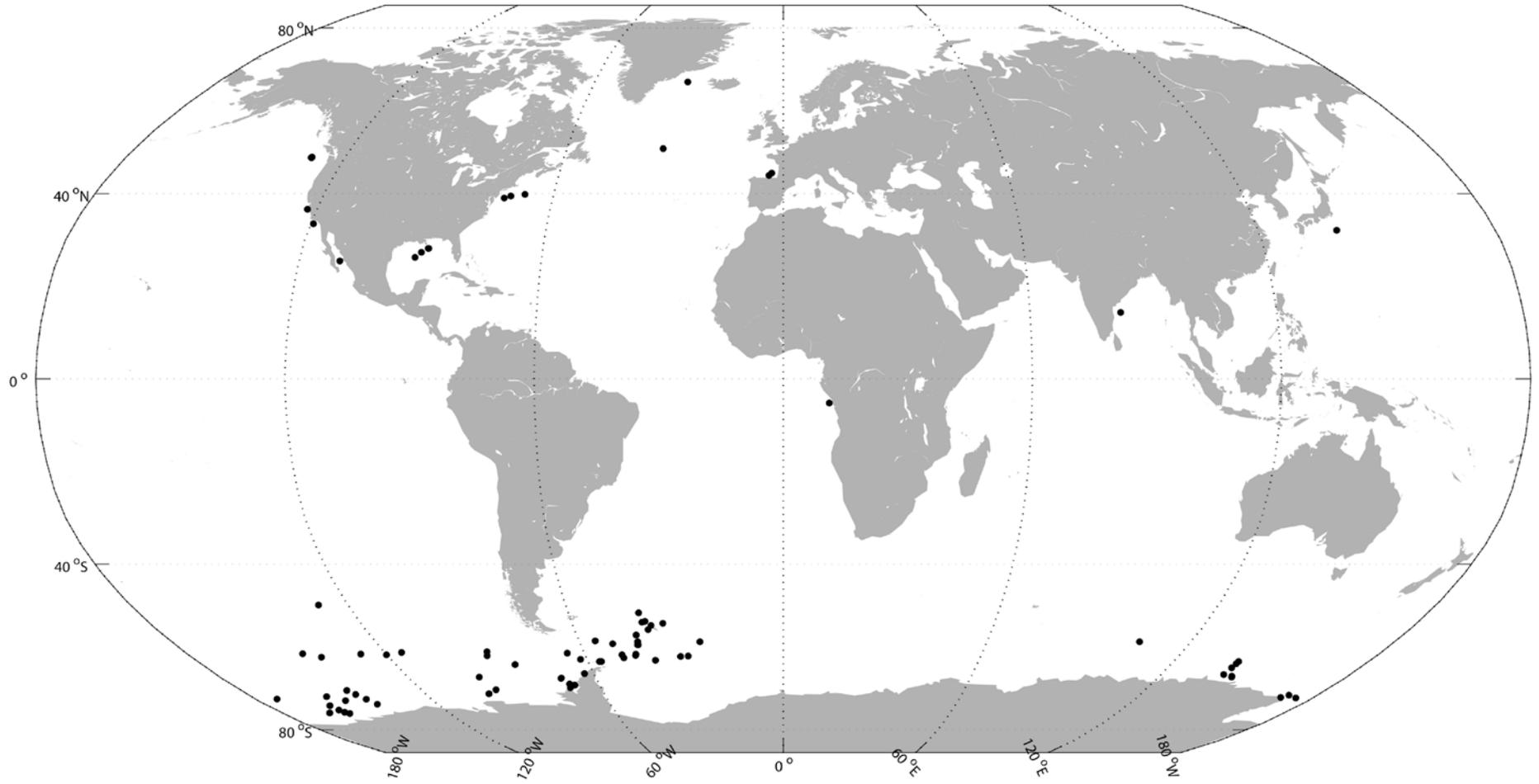


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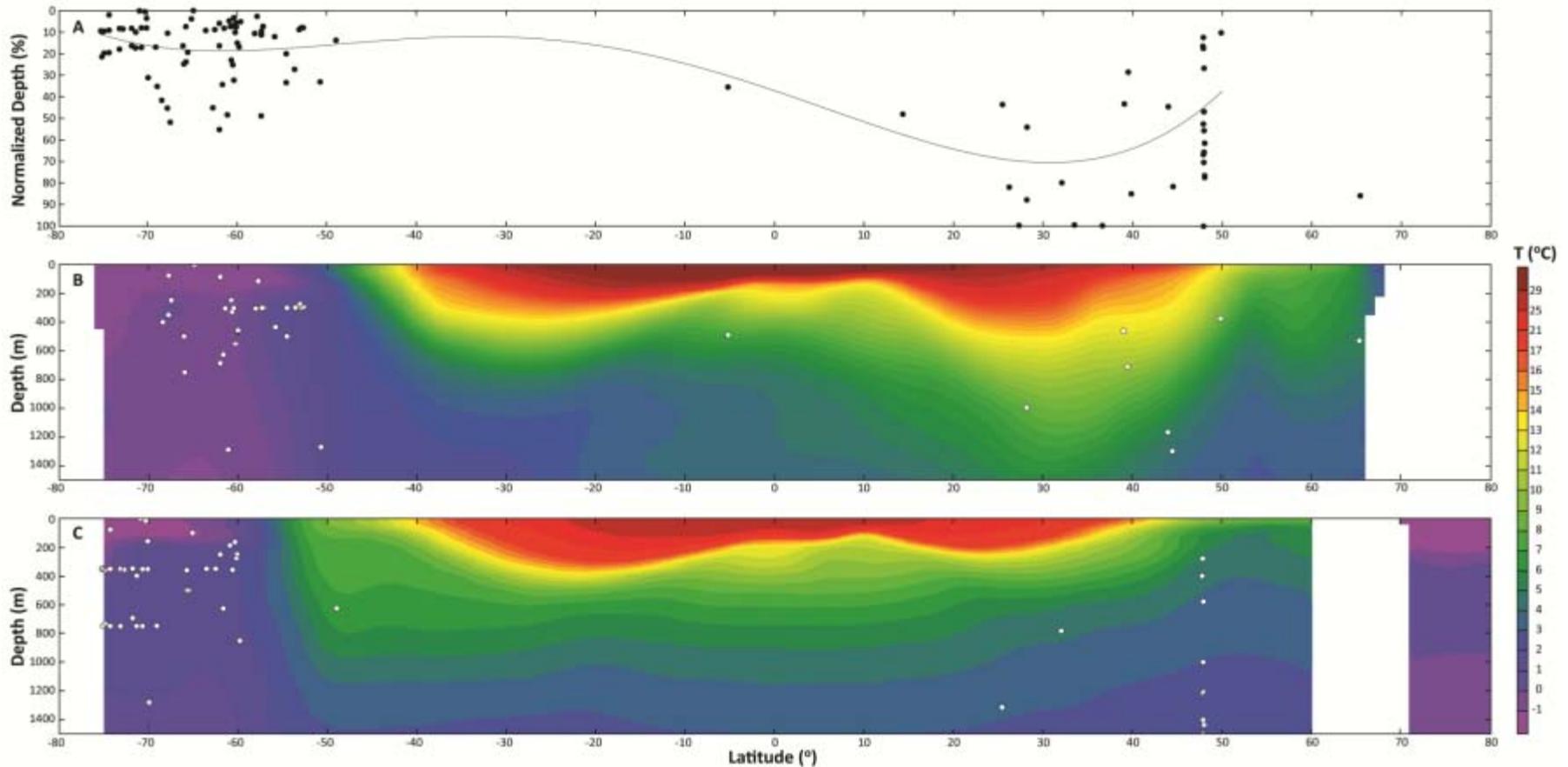
Benfield and Graham 2010

# Results: *Stygiomedusa gigantea*



Benfield and Graham 2010

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Benfield and Graham 2010

# Results: *Regalecus glesne* (oarfish)

- Largest marine teleost



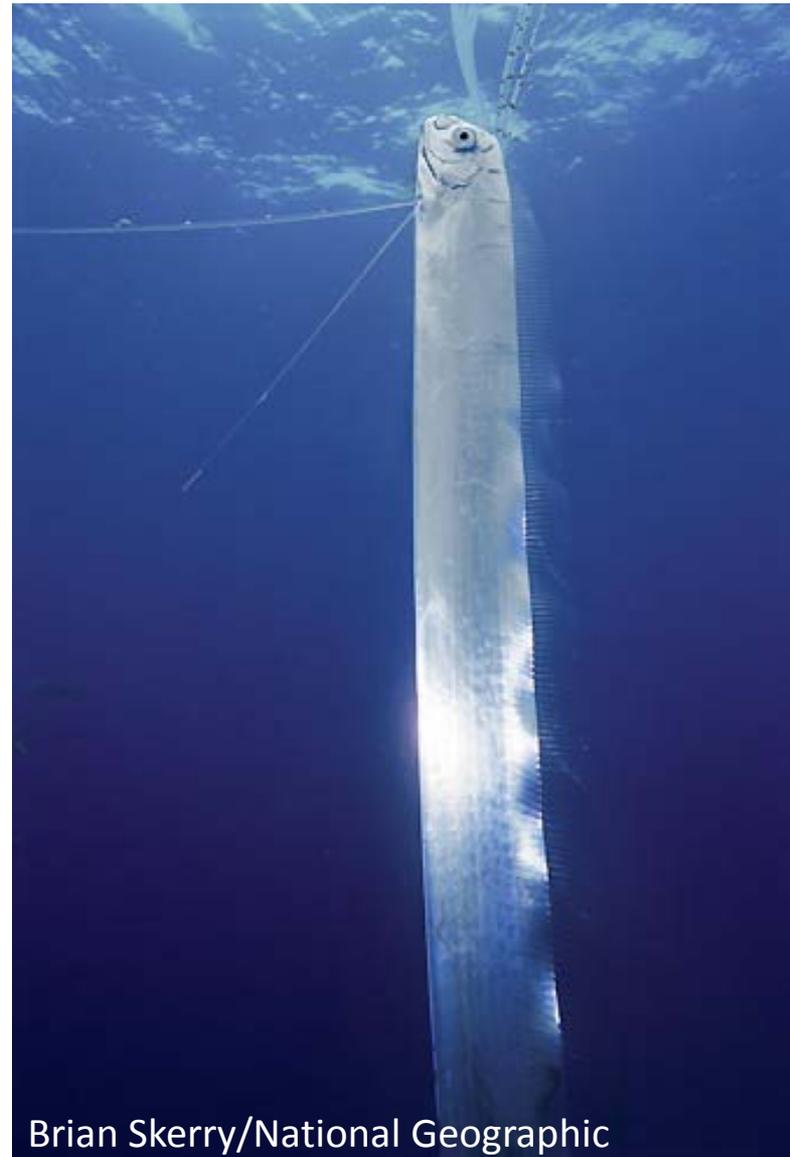
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- Inhabits epipelagic and mesopelagic



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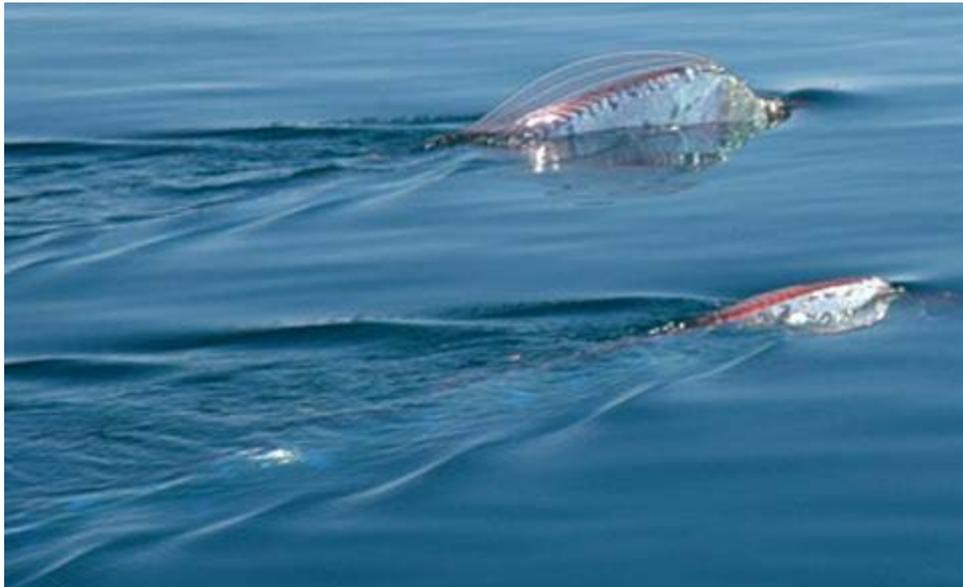
- Largest marine teleost
- Inhabits epipelagic and mesopelagic
- Healthy individuals rarely observed



Brian Skerry/National Geographic

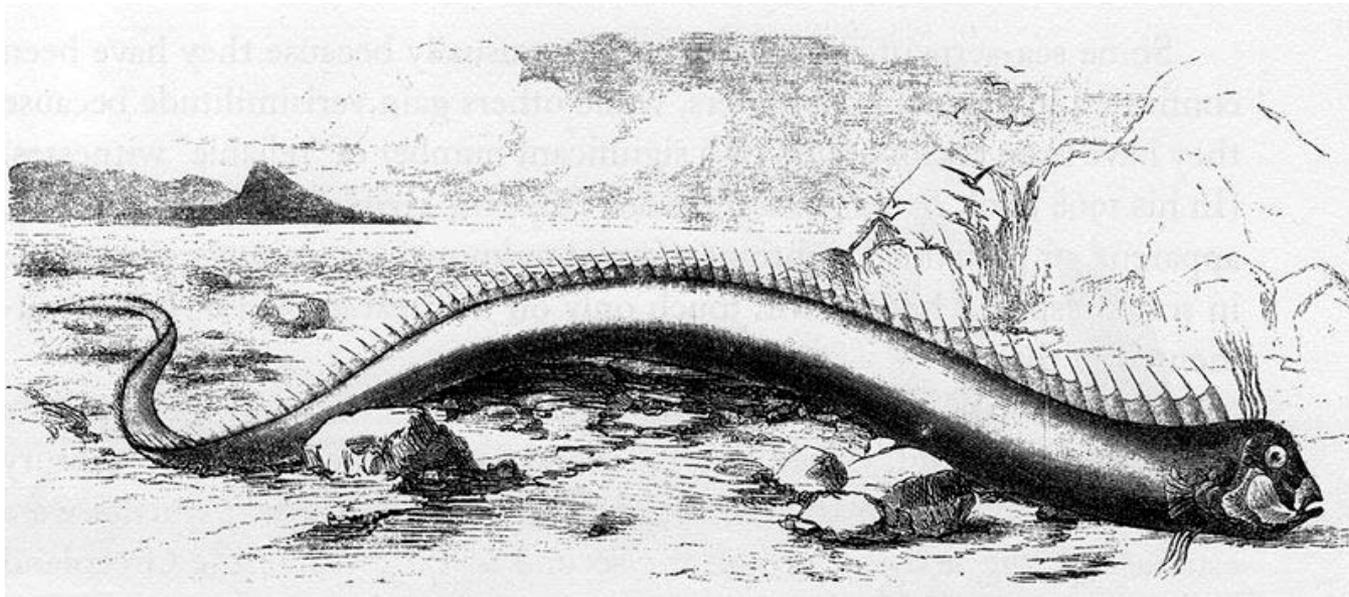
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- Inhabits epipelagic and mesopelagic
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- Encounters with dead or dying animals near shore relatively frequent



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Harpers Weekly 1860

# Oarfish

Date: 07/10/08 I-19 PORT Time: 09:45:03  
Heading 239

# Oarfish

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**Giant bizarre deep sea fish filmed in Gulf of Mexico**

By Jody Bourton  
Earth News reporter

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Guidance: This video has no sound Altitude: 000.0

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An oarfish filmed for the first time in the deep

**Extraordinary footage of a rarely seen giant deep sea fish has been captured by scientists.**

Using a remotely operated vehicle, they caught a rare glimpse of the huge oarfish, perhaps the first sighting of the fish in its natural setting.

Discovery News Videos: **Earth: Bizarre Giant Fish Filmed**



**Earth: Bizarre Giant Fish Filmed**

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A huge oarfish was caught on camera in the Gulf of Mexico recently, giving scientists a rare glimpse of the bizarre fish in its native deep sea habitat. Researcher Mark Benfield describes the fish, a likely inspiration for the sea serpent myth.

**Added:** Feb 8, 2010  
**Views:** 12982 Views  
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THE VINE

## Sea Serpent Of The Day

Bradford Phumer February 9, 2010 | 1:15 pm [SHARE](#) [FB](#) [TW](#) [PR](#) [Print](#)

Where do sea serpents come from? Legend and myth, of course. But many scientists think the giant oarfish, which can grow up to 55 feet in length, has been the main inspiration for all those myths over the years. A few oarfish corpses in various unsavory states have washed up on shore over the years, including a 16-footer that was the inspiration for [this Harper's Weekly](#) sketch titled "Monsters of the Sea." But no one's ever seen an oarfish swimming in the wild, at least until now. Here's the video:



The fish was **recently caught** swimming beneath a drilling rig in the Gulf of Mexico—the camera was provided by oil companies and run by marine scientists. The collaboration, appropriately enough, is called the Serpent project.

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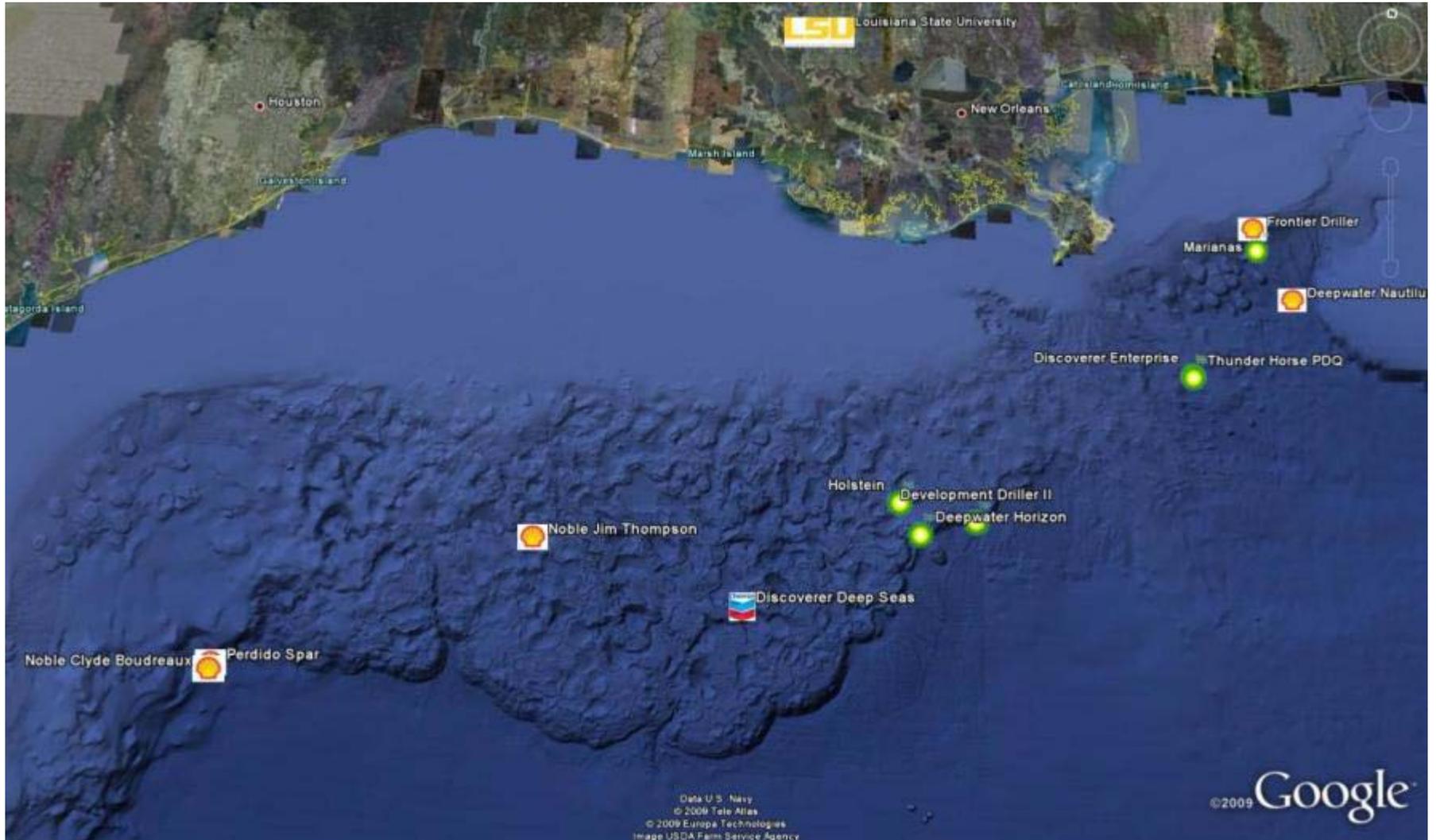
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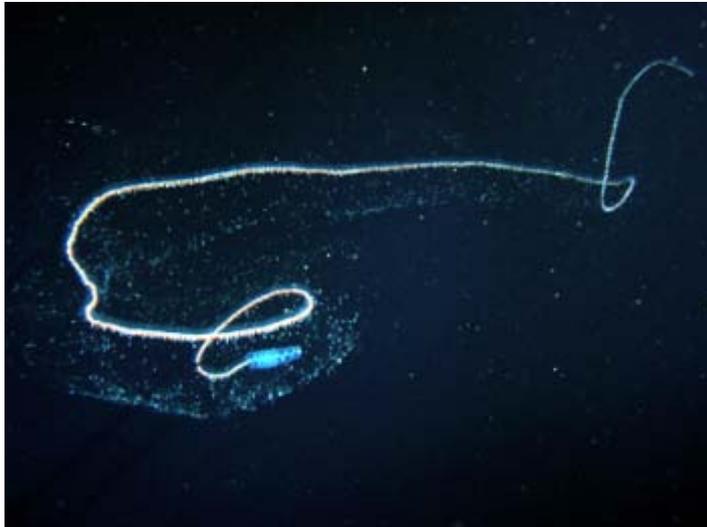
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# Gulf SERPENT Sites 2009



# New Technologies

- HD video
- Digital stills camera
- Animal collection system
- Navigation system



# HD Video



# Still Camera System











# At this moment ...

- LSU Technician just back from the DD3 revisiting surveys around MC252
- Site visit to Thunder Horse tomorrow



Stuart Cook aboard the DD3 03/07/11

# Acknowledgments

- BOEMRE: James Sinclair, Greg Boland
- BP: (Terry Rooney, Melissa Simpson, Virginia Park), Shell, Chevron, Oceaneering, Saipem-America, Subsea7
- Global Marine, MV Olympic Challenger ROV teams
- Future Partners: Petrobras, Nexen, Pacific Drilling

# References

- Benfield, M.C., J.H. Caruso, and K.J. Sulak. 2009. *In situ* video observations of two manefishes (Perciformes: Caristiidae) in the mesopelagic zone of the northern Gulf of Mexico. *Copeia*, 2009(4):637–641.
- Benfield, M.C. 2010. *Stygiomedusa gigantea*: A giant deep sea jellyfish. *Global Marine Environment*, 11:22 – 25.
- Benfield, M.C. and W.M. Graham. 2010. *In situ* observations of *Stygiomedusa gigantea* in the Gulf of Mexico with a review of its global distribution and habitat. *Journal of the Marine Biological Association of the United Kingdom* 90(4).