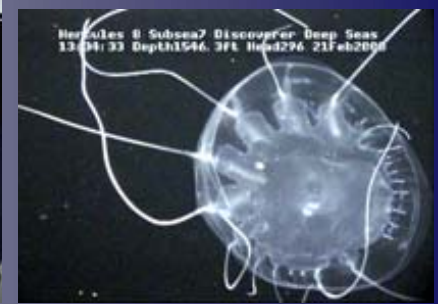


The SERPENT Project

An Innovative Industrial – Academic Partnership

Mark Benfield (Louisiana State University)



SERPENT

- A global partnership
- Industrial ROVs and facilities for scientific research
- Time-available basis – no additional cost to industry



SERPENT scientific and environmental
rov partnership using existing
industrial technology

Value to Industry

- Reinforce the 'E' in the HSE message



Value to Industry

- Reinforce the 'E' in the HSE message
- Opportunity to showcase corporate commitment to the environment



Value to Industry

- Reinforce the 'E' in the HSE message
- Opportunity to showcase corporate commitment to the environment
- Training for ROV pilots



Value to Academia

- Access to a limited resource – deep submergence ROVs



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- Access to a limited resource – deep submergence ROVs
- Access to the sea – deepwater sites for months to years



Value to Academia

- Access to a limited resource – deep submergence ROVs
- Access to the sea – deepwater sites for months to years
- Scientific discovery



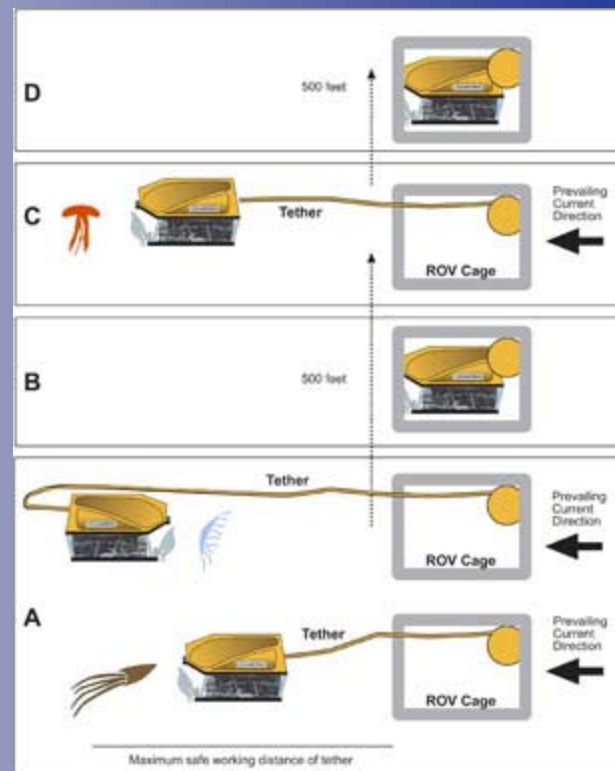
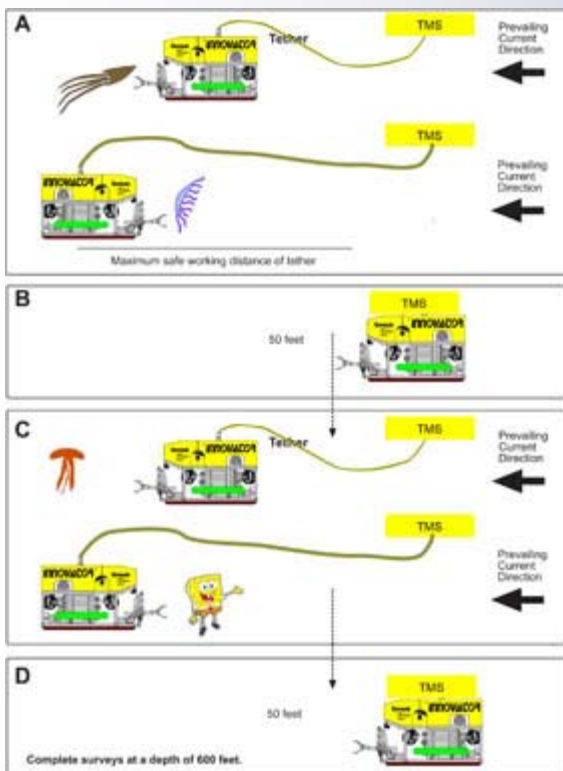
Value to Academia

- Access to a limited resource – deep submergence ROVs
- Access to the sea – deepwater sites for months to years
- Scientific discovery
- Educational opportunities



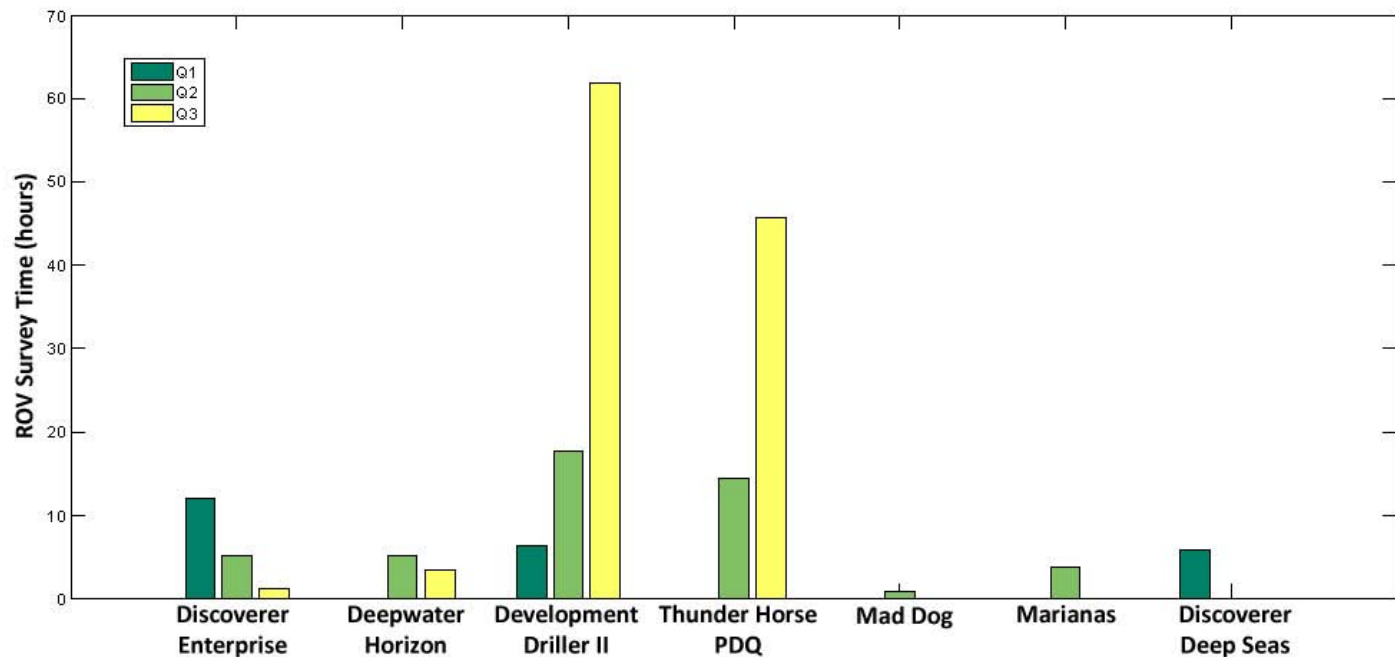
How Does it Work?

- Survey protocols developed in concert with ROV team



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- SERPENT surveys become part of the routine



How Does it Work?

- Survey protocols developed in concert with ROV team
- SERPENT surveys become part of the routine
- Feedback to offshore personnel



SERPENT Research at Discoverer Enterprise

The SERPENT Project is a unique partnership between universities and the petroleum industry that uses your industrial remotely operated vehicles (ROVs) to study life in the deep sea.

It's a win-win situation. Oceanographers gain access to highly capable ROVs aboard stable facilities that remain in the same location for extended periods. This gives us a chance to assemble a complete picture of marine life in the deepwater region of the Gulf of Mexico.

SERPENT demonstrates the industry's commitment to the environment. ROV pilots benefit from additional training opportunities. SERPENT finds are shared with the rig community to emphasize the unique marine community that exists below you. SERPENT only uses the ROV's when they are not tasked by drilling so there's no additional cost to the industry.

In the Gulf of Mexico, SERPENT research is coordinated by Louisiana State University. Our focus is on the animals that swim and drift through the deepwaters of the Gulf. With funding from MMS, our partnership with BP is establishing a network of oceanographic observatories beginning with Discoverer Enterprise, Mad Dog, and Thunder Horse PDQ.

How does it work? ROV teams conduct surveys for SERPENT when time permits. Video are sent to LSU where organisms are identified. Expert marine biologists from around the world provide detailed identifications. Each observation is then entered into a database containing information about the date, time, location, depth, temperature, and behavior. Over time we will assemble a picture of where, when, and under what conditions each organism is found.

Meet Some Marine Life From Your Neighborhood ...

It's a strange world down below the ship. These animals have been observed during recent dives with the MillenniumTM ROV.

Larvaceans These animals consist of a tubular, like organism that secretes a complex mucous "house". It filters water through the house and consumes what collects in it. When the house is clogged it abandons it. The abandoned houses (two right frames) are very fragile.

Ctenophores Also called comb-jellies, these fragile animals propel themselves using 8 bands of hairs that beat to produce a current. Most do not sting, instead they capture food with sticky tentacles or netlike if whole. This one's called *Beroë* (pronounced *ber-oh-ee*).

Mystery Squid? Once-in-a-while the ROV finds something that leaves us perplexed. This may be some kind of squid. Whatever it is, it has long tentacles, moves very quickly, and doesn't hang around for long. We'll figure out what it is next time we see it!

Waa This is probably the southern (shortfin) squid (*Illex coindetii*). They occur from the surface down to about 3000 feet. In other areas, similar squids are harvested for human consumption. There may be prey for larger fish and marine mammals.

Octopus-like This large squid who's name (pronounced *oct-oh-poh-ee*) is a mollusk predator that feeds on fish and invertebrates. In fact, it likely is an important part of the diet of sperm whales. This one certainly wasn't *Loligo*-like.

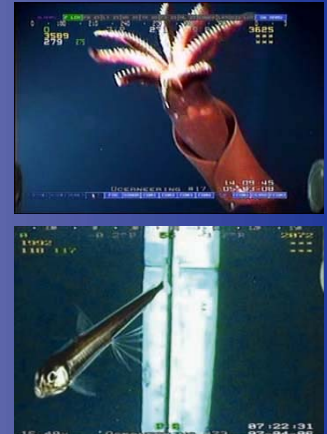
Sperm Whale Few people realize that about 3000 sperm whales inhabit the northeastern Gulf of Mexico. These large mammals spend their days diving into the deep to hunt squid and other organisms. This one was particularly interesting to the ROV!



SERPENT  **LSU** **MMS** **Transocean**

Learn more about the SERPENT Project by visiting our website: www.serpentproject.com

Operations



Department of Oceanography and Coastal Sciences
Zooplankton Ecology Laboratory
 LSU
 Louisiana State University

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Welcome to the Gulf SERPENT Project. SERPENT is an innovative, global partnership between academia and the petroleum industry. The concept is simple – provide oceanographers with access to the offshore facilities and sophisticated workclass remotely operated vehicles (ROVs) that industry uses to work in the deep sea. Access is provided when the ROV event operators teamed with their primary industrial mission.

In the Gulf of Mexico, we're focusing on the animals that live in the mesopelagic (200 - 1500m) and bathypelagic (1000 - 4000m) zones. Our team works closely with our industrial partners (BP and Chevron); the ROV companies (C/Oceanoseis, Saigona/Oceanic, Subsea7) and the operators of the drillships, rigs, and spars where they work (Transocean, Diamond-Drill, Frelto). Funding for the project comes from the [Marine Management Center](#) with in-kind support (ROV time) from BP.

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wellconnected

Gulf SERPENT BP and LSU Team up to Open a Window into the Deep-Sea

It's a goal by the oceanographer to study the deep-sea life through the 200-foot barrier that separates the surface and the deep. The Gulf SERPENT project is a partnership between Louisiana State University and BP to study the deep-sea life through the 200-foot barrier that separates the surface and the deep. The Gulf SERPENT project is a partnership between Louisiana State University and BP to study the deep-sea life through the 200-foot barrier that separates the surface and the deep.

NOTE

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

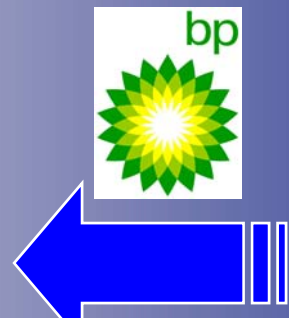
Mark C. Benfield, Bruce A. Thompson, and John H. Curran

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 in lower latitudes. This notion of Rapoport's rule (Rapoport, 1968) may explain why some sleeper shark (Somnus) occur throughout the water column at high latitudes but are typically observed in mesopelagic or bathypelagic waters at more southern latitudes. For example, the Pacific sleeper shark *Somnus pacificus* Bigelow and Schroeder, 1948 has been reported near the surface in Alaskan waters (Bigelow, 1970), at depths of 200 to 300 m just off California (Chen et al., 1985), and at or below 2000 m off western California and Baja California, Mexico (Drazen and Schroeder, 1977). Documenting the presence of large animals such as sharks at great depths is difficult. Direct observations using manned and unmanned submersibles have revealed the presence of many poorly documented, deep water marine taxa. However, the numbers of such vehicles routinely available to the academic community and capable of working below 1000 m are inadequate to provide more than a glimpse of life at great depths. Fortunately, advances in underwater technology associated with 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) deployed by the petroleum industry that routinely operate to depths of 1000 m or greater exceed the use of the research ROV fleet by orders of magnitude. Recognition of the potential capabilities of these industrial ROVs to conduct scientific observations has resulted in the SERPENT Project scientific environment-ROV partnership using existing industrial technology, which brings academic and industrial groups together to explore the ocean.

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 15 August 2006, a remotely operated vehicle (ROV) operated by Oceanoseis, was performing routine work in the Gulf of Mexico (27°06'N, 93°52'W) when encountered a large shark at a depth of 1821 m (bottom depth 1846 m). Water temperature at this depth measured at 17.2°C under vehicle, near 14°C. The ROV encountered and video footage while the shark was visible, during which time we approached the ROV (via both departing and approaching) at 1.5 m/sec using a 1000 m depth-rated ROV. The shark was encountered at a depth of 1821 m, 1.5 m from the ROV. The shark was encountered at a depth of 1821 m, 1.5 m from the ROV. The shark was encountered at a depth of 1821 m, 1.5 m from the ROV.



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

Future Outlook

- Looking for new partners
- High – definition cameras



SERPENT scientific and environmental
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Future Outlook

- Looking for new partners
- High – definition cameras
- Gulf SERPENT: a long-term, deep-sea biological observation system



Acknowledgements

- Minerals Management Service
- BP
- Chevron
- Oceaneering®
- Saipem-America
- Subsea7
- SERPENT – UK

<http://zooplankton.lsu.edu/serpent.htm>
<http://www.serpentproject.com>

