

**Changes in Coastal Fish
Communities Following
Deepwater Horizon Oil Spill**

John F. Valentine
Dauphin Island Sea Lab

Dispersant Application



U.S. Coast Guard

SURFACE

5,000' BELOW



MSU SKANDI NEPTUNE Subsea 7
E: 1202819.57 Nr: 103 15/07/10
D: 4887.3 Alt: 11:16:45
Herc 19: Dispersant Hdg: 40.49

Gulf-wide Oil Coverage Led to Dire Predictions about Health of Marine Food Web

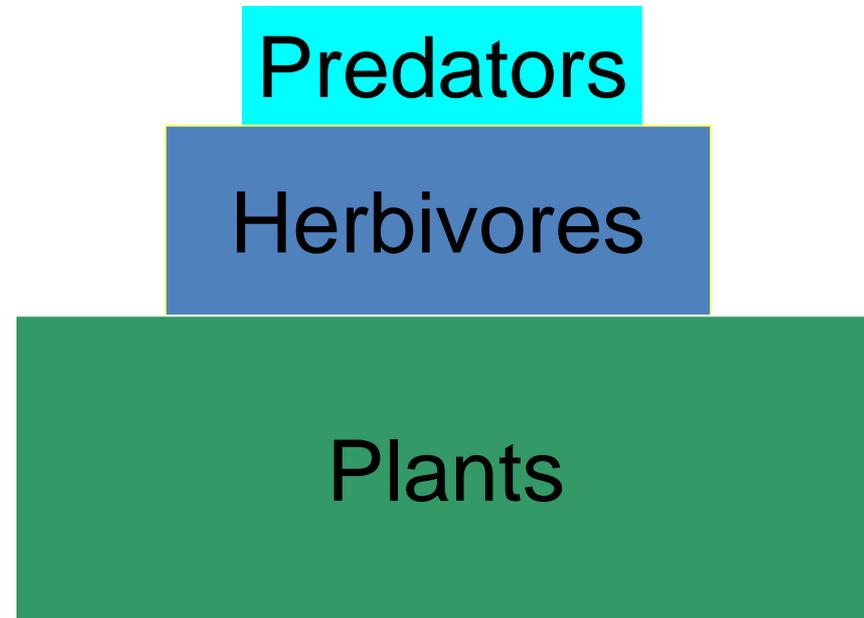


The Hypothesized Impacts on the Gulf of Mexico Food Web

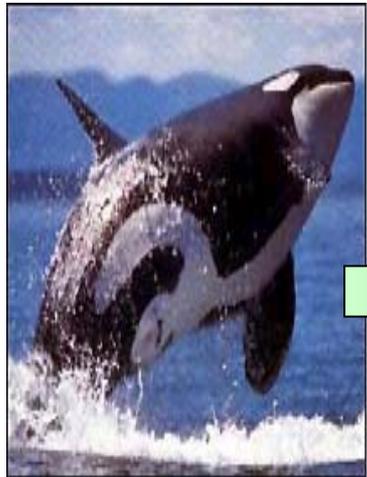
- **Herbivore and predator density decreased substantially**



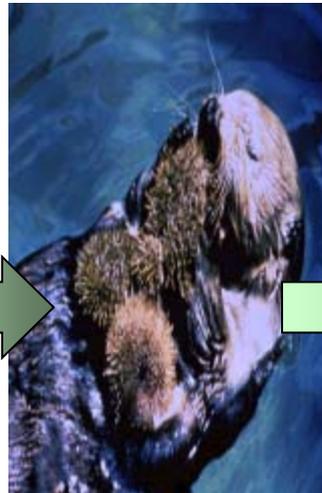
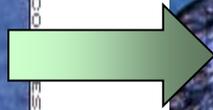
Oil and dispersants disrupted the base of the Gulf food web directly via toxicity or indirectly via the induction of large areas of hypoxia. Since primary production forms the template upon which all food web interaction is based (the bottom-up view of the world), strong negative cascading effects extended upward



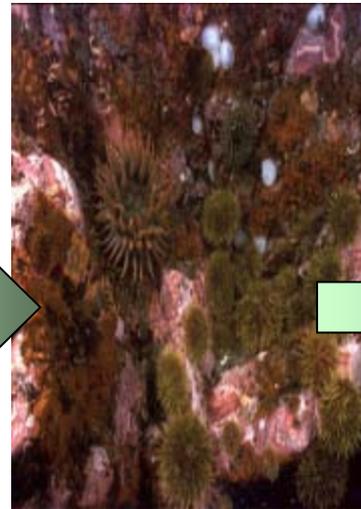
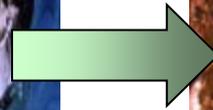
Significance of Reduced Consumer Control in Marine Food Webs: Example from a Natural Predator Addition



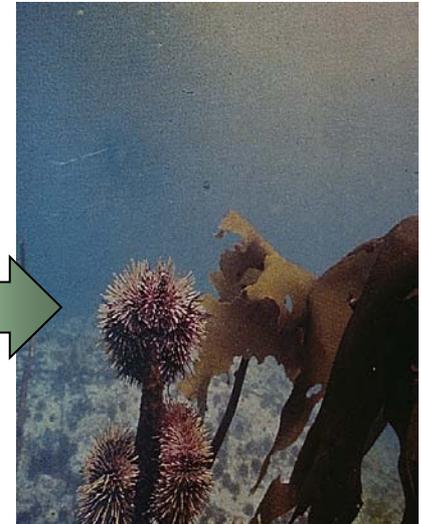
Inshore migration of killer whales



Reduced otter density

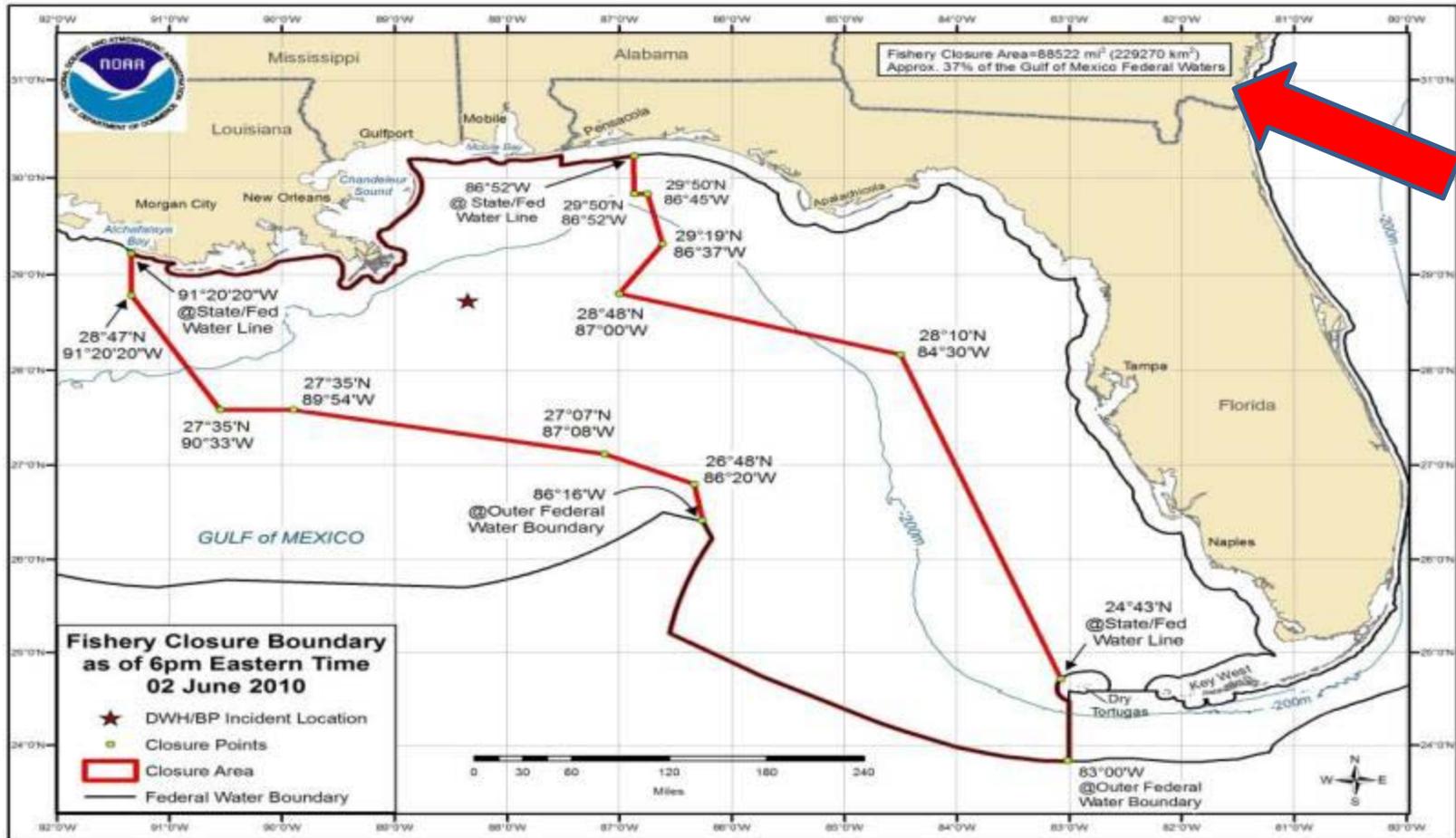


Increased urchin density



Reduce kelp density

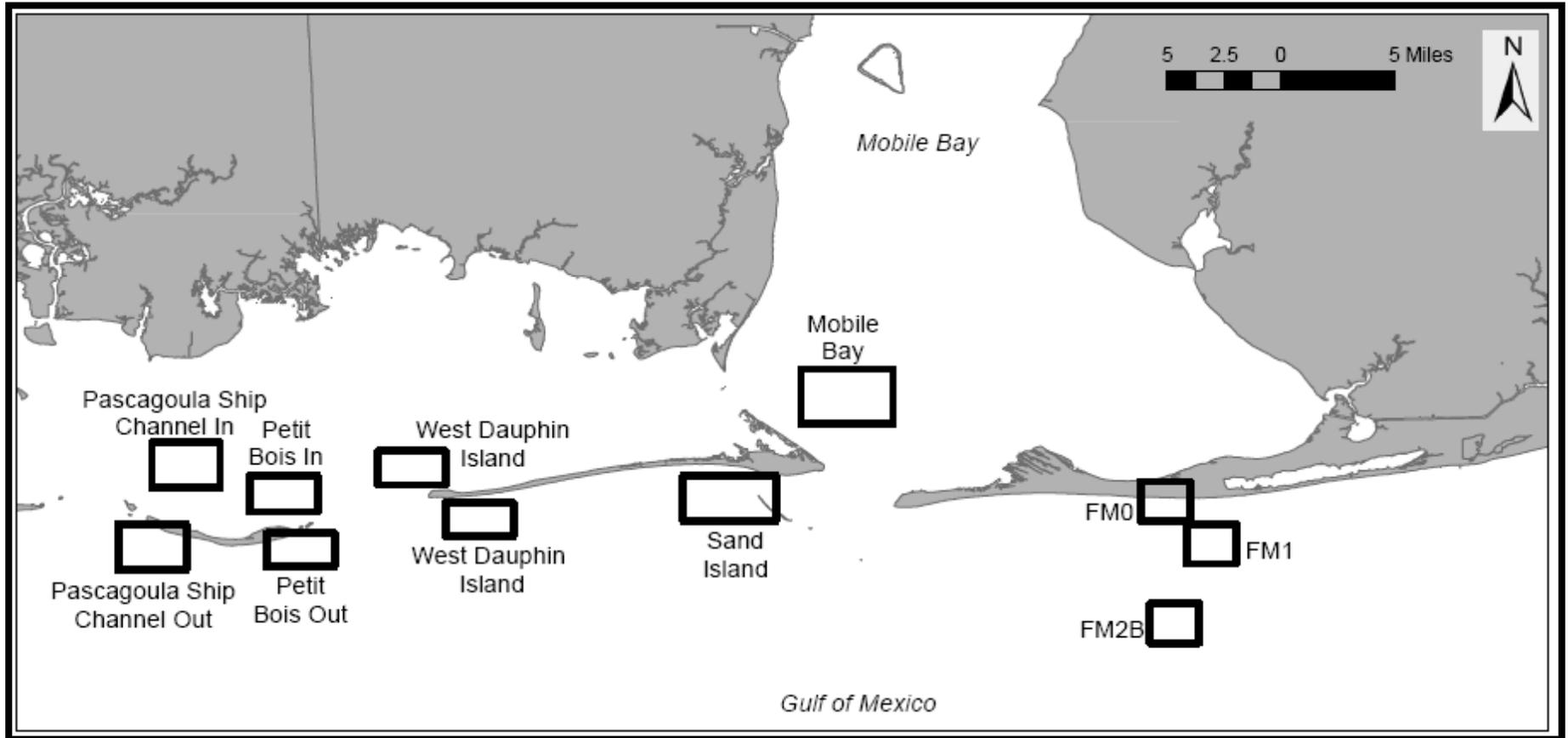
Ecosystem-wide Fishing Closure



Fishing Cessation Can Also Alter Food Web Structure!

- In 76 studies of reserves around the world, densities of fish increased in 69% of the reserves, average body size increased in 88% of reserves, and biomass increased in 92% of reserves**
- In Looe Key, Florida snapper density nearly doubled and that of grunts more than quadrupled after fishing was closed for only two years**

Study Sites: Demersal Fishes



Methods

- Fishes/macroinvertebrates collected using a 12.8m trawl
 - Before oil reached coastal AL waters (April–June)
 - After oil was identified in the area (August–October)
- 30-minute trawls
 - Catch standardized to CPUE
- Fishes were identified upon collection or returned to DISL for identification
 - Total length measured on 10 randomly selected individuals of each species
 - Biomass estimates attained using portable spring scales



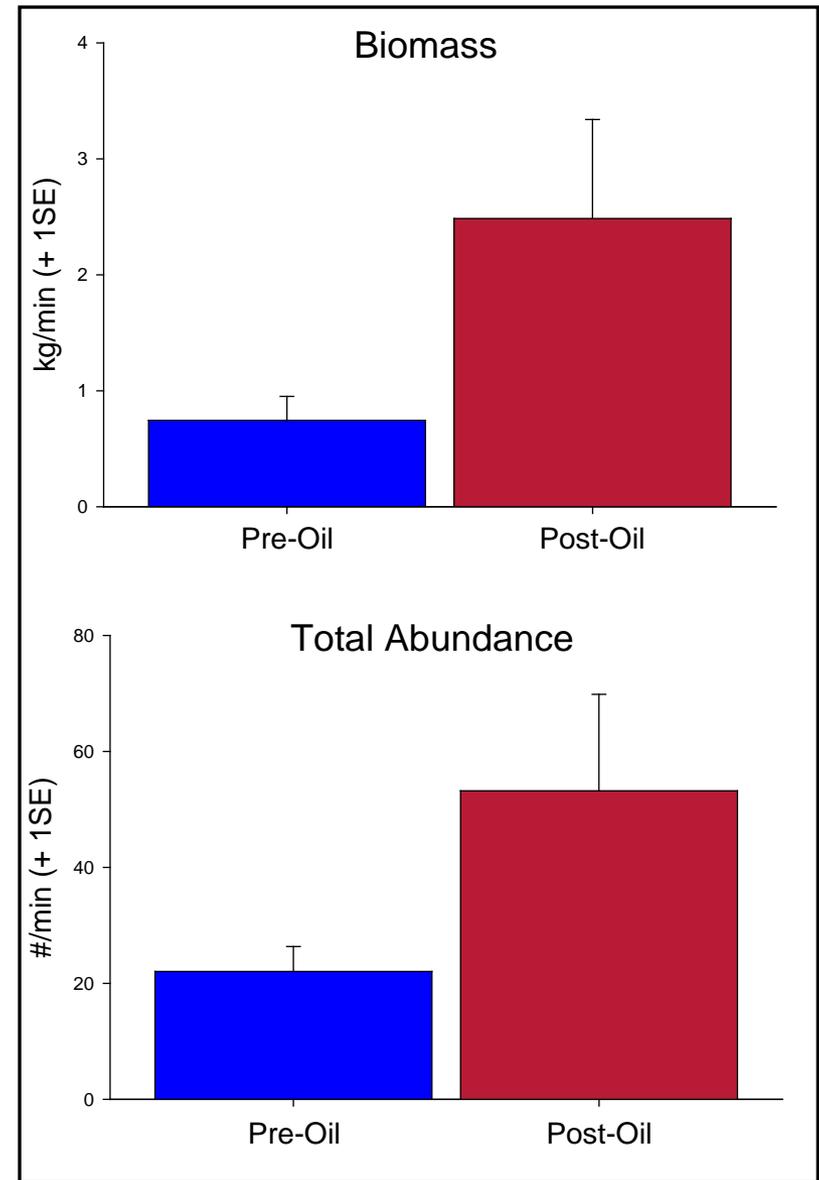
R/V Alabama Discovery

Predictions Not Met by the Facts



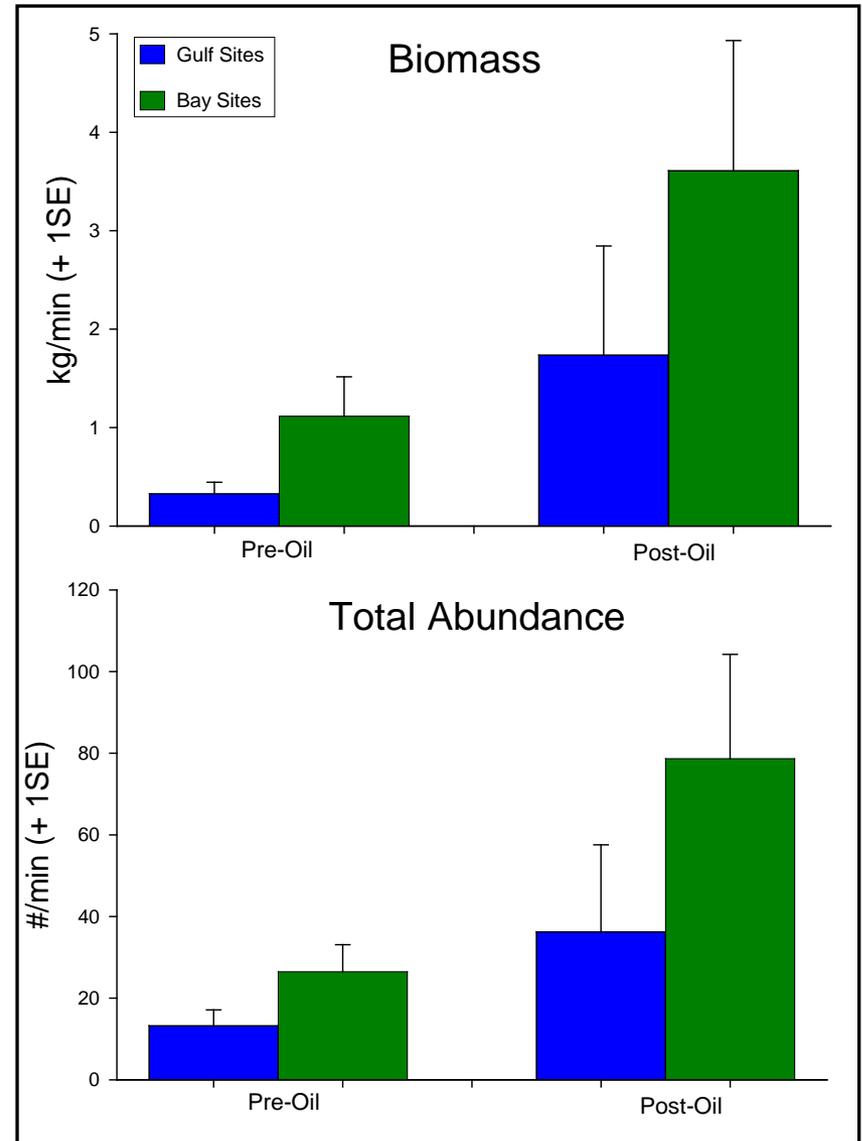
Post-spill Increases in Biomass and Abundance

- **Biomass ($p=0.042$) and abundance ($p=0.049$) increased significantly after the spill**
- **Pre-spill: 57 species**
Post-spill: 74 species



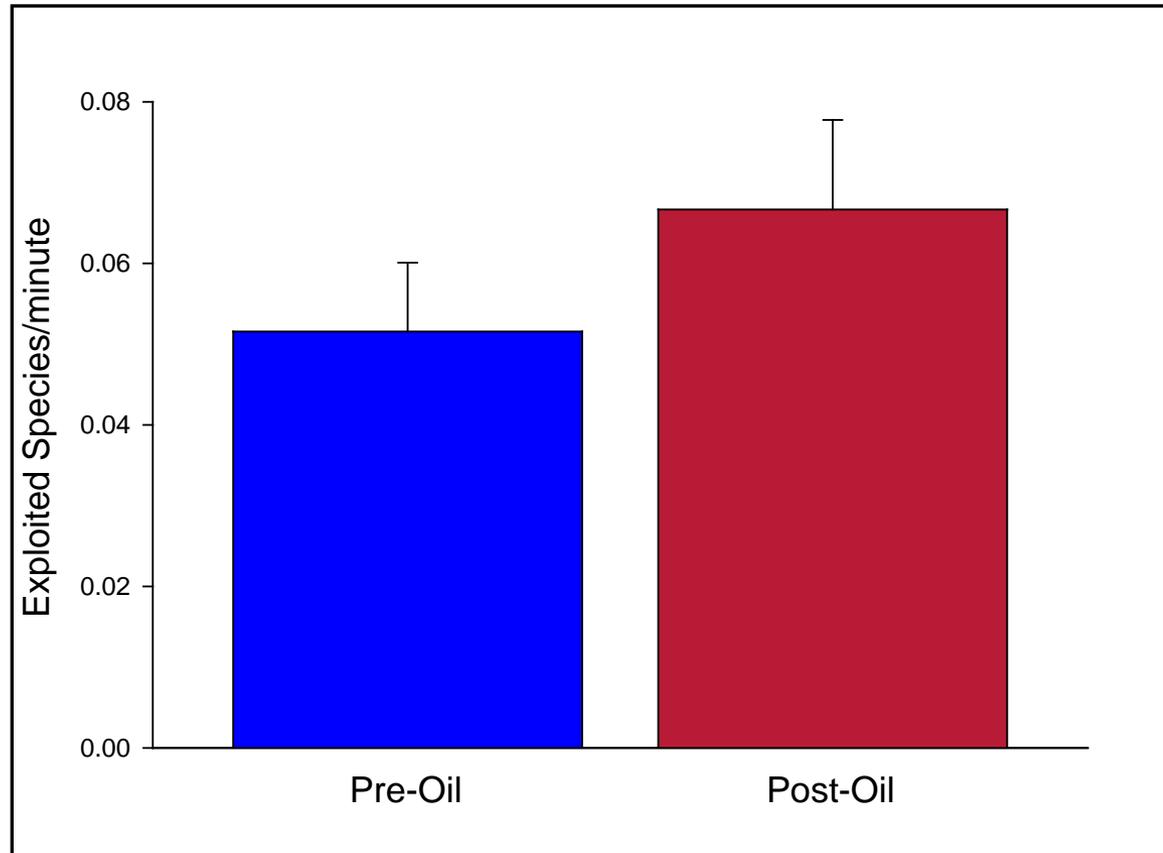
Gulf vs. Bay Sites

- **This increase was seen at both Gulf and Bay sampling sites**
 - **Indicates ecosystem-wide response**



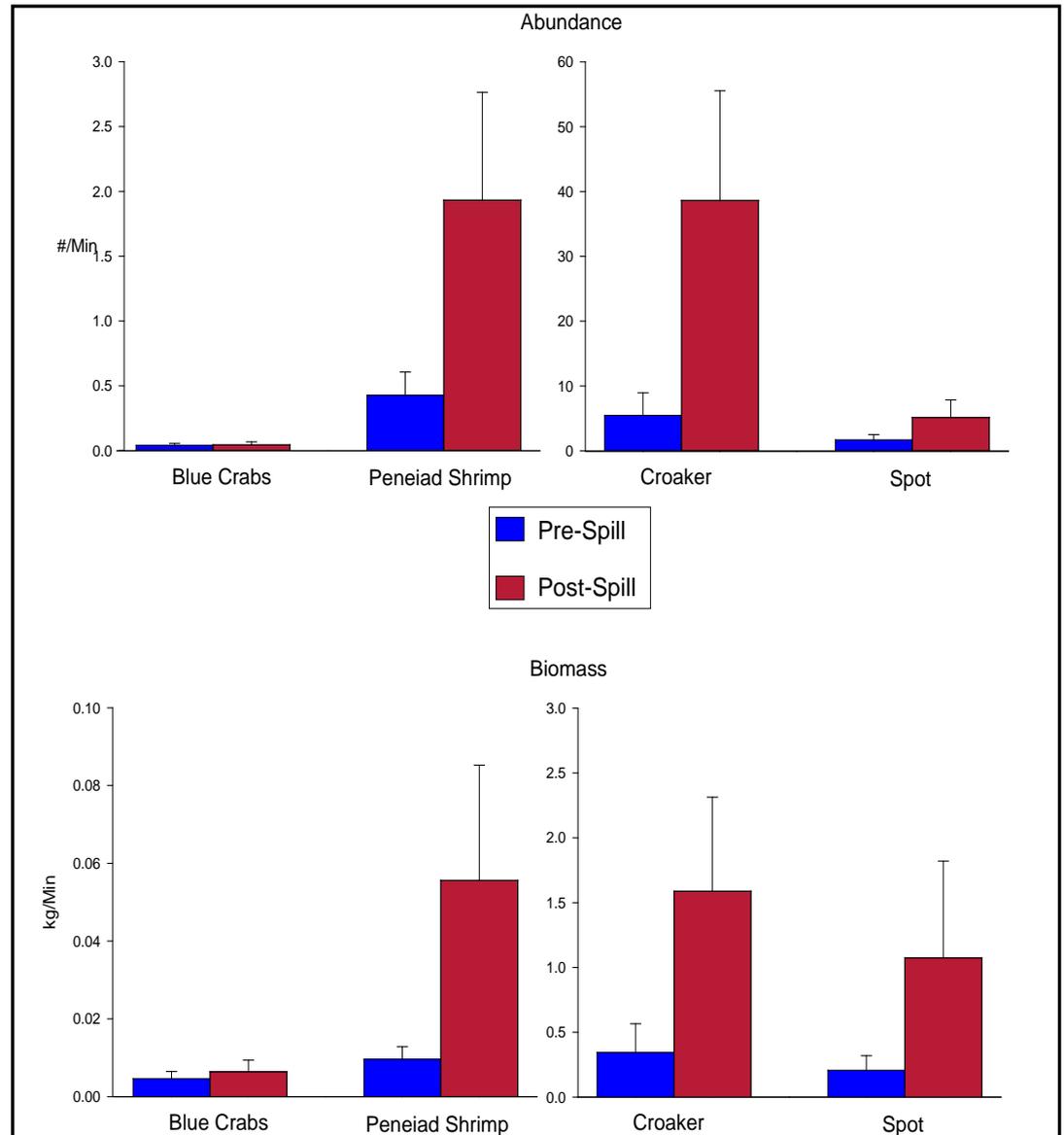
Exploited Species

- **Although more exploited species were captured after the spill,**
- **No significant difference was detected ($p=0.288$)**



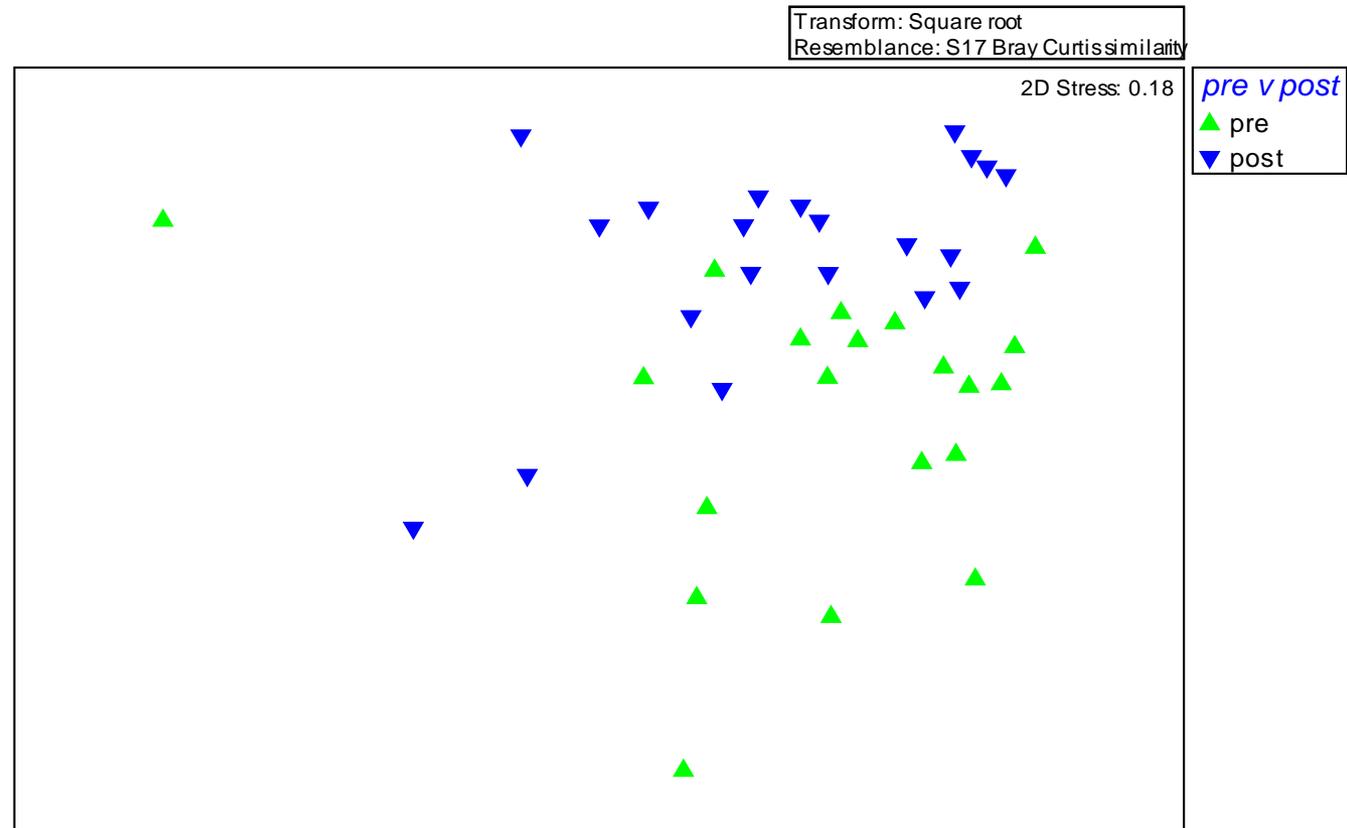
Fish Food Increased, Too!

- Although shrimp increased approximately 4x, the 8x increase in croaker was much greater



Shifts in Community Structure

- **Significant differences in pre- and post-spill communities detected (ANOSIM; $p \leq 0.001$)**



Take-Home Message

- **It will be tough to evaluate the impacts of the oil and dispersants without evaluating the impacts of government management actions as well!**

Questions?

**Additional Information
on Research at
the Dauphin Island
Sea Lab**

www.disl.org

