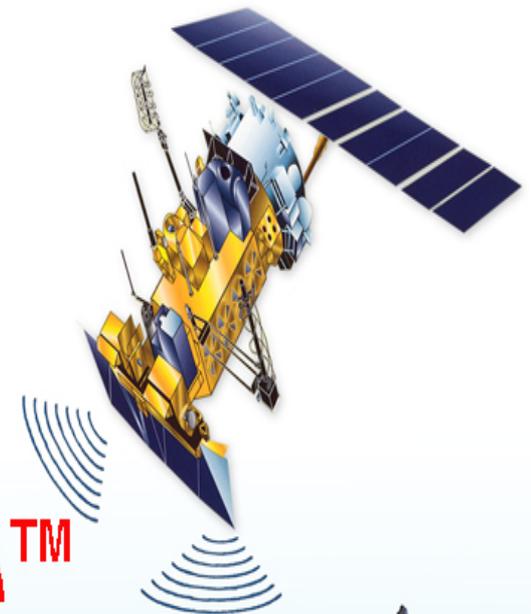




# ROFFS™



**ROFFER'S OCEAN FISHING FORECASTING SERVICE, INC.**

# Next Steps

- **Begin to identify opportunities for coordination and collaboration across disciplines to address the priority needs.**
  - **Who will make it happen?**
  - **How do we get there?**

**Must be made a priority.**

**Must reprogram resources!**

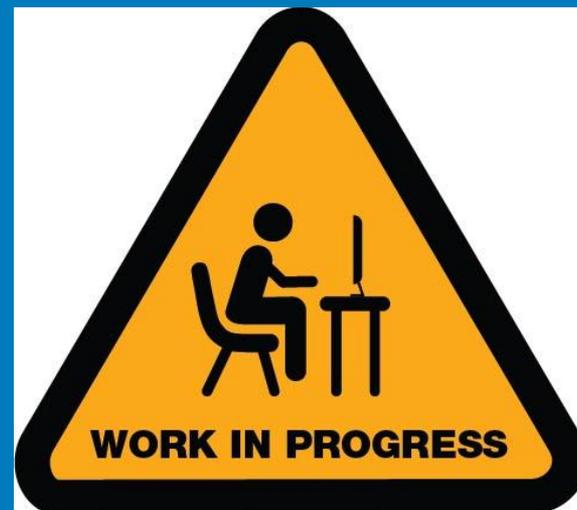
**\$\$\$\$ & People**



# Priorities Review

- What are the science information needs to inform management?
  - Research needs
  - Monitoring needs

**Non-prioritized list  
to follow**



# Monitoring

- **More biological information that is integrated with physical and socio-economic data**
  - **Better catch information (all fisheries)**
    - including GPS location, species caught and released, landed
    - techniques used
  - **Fishing communities**
    - Census type approach
    - Pricing, costs, sales,



# Monitoring



- To allow us to follow the habitat changes and changes in catchability (availability and vulnerability)
- Climate/environmental monitoring
  - 4D T°, S%, O<sub>2</sub>, chloro., turbidity, pH
  - Estuaries to open ocean, shelf break
- New emphasis on acoustic (passive & active), video/photos, tagging, autonomous vessels (above and below)



Phytoplankton and zooplankton surveys in addition to important ichthyoplankton

# Monitoring

- Hot spot areas for spawning and nurseries, estuarine to oceanic
- Observations
  - fishermen - collaborative work based
  - citizen science
- All stressors are important
  - Physiological condition monitoring
- Species trophodynamics & biodiversity
  - Species – species interactions
- Forage



# Monitoring

- Leverage existing infrastructure
- What obs. are important to fishermen
- To provide initialization and assimilation data to models (physical, biogeochemical)
- Protected species monitoring is different
- Use organisms as data collectors
- Resiliency
  - Marine resources and fisheries/communities



# Monitoring

- Remote sensing
  - Satellites, autonomous vessels (above and below: aircraft, auvs)
- Leverage existing
  - OSSI
  - Hypothesis driven
- Climate scale time series
- Fishery independent monitoring



# Research

- Integration of environmental (climate) variables into stock assessment
- Preferred habitat tolerance thresholds
- Uncertainty
- Develop ecosystem analyses and seasonal summaries
- Socio-economic related to resiliency
- Integrated interdisciplinary research
  - Across state and regional management zone



# Research



- **Integrated ecosystem models**
  - **Habitat models**
  - **Biogeochemical models**
  - **Seasonal to climate scale forecasts**
- **Data accessibility best practices**
- **Communication of data**
  - **From <->fishermen <-> management**
- **Coping mechanisms of risk and reality**
- **Recruitment phrenology**



# Research

- **MPA utility & connectivity**
- **Vulnerability analyses**
  - **Different types including objective scoring**
  - **Standardization**
- **Gulf Stream system**
- **Functional relationships between organism and ecosystem**
- **Physiologically based**



# Research

- **Landscape to sea scape**
- **All climate variables**
  - **Precipitation – drought +, +, +, +, +...**
- **Forage species**
  - **Not just \$ value based**
  - **Ecosystem service based**
- **Episodic events to climate scale**
- **Fishing gear**

**Genetics and climate**



# Time and Space Scales

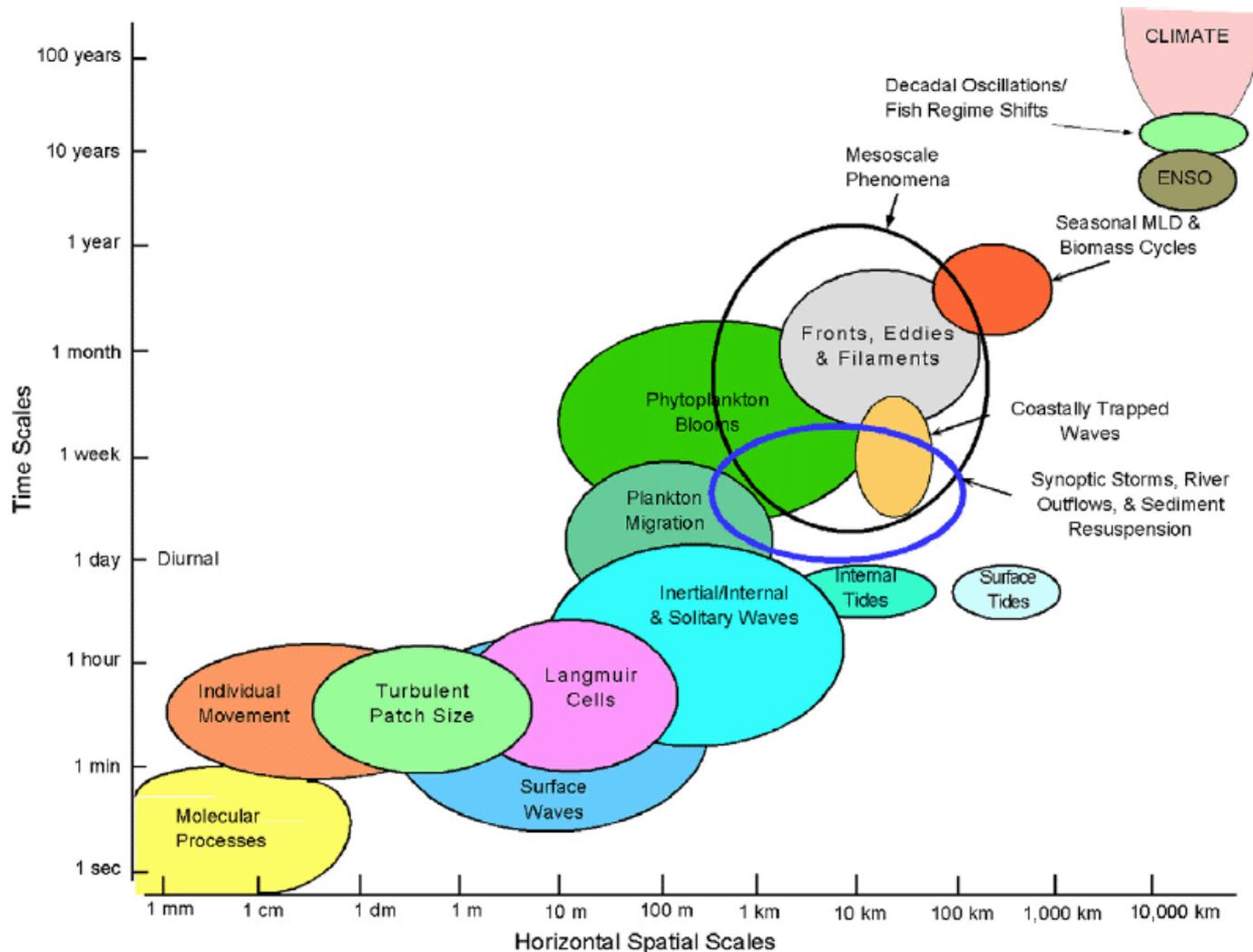
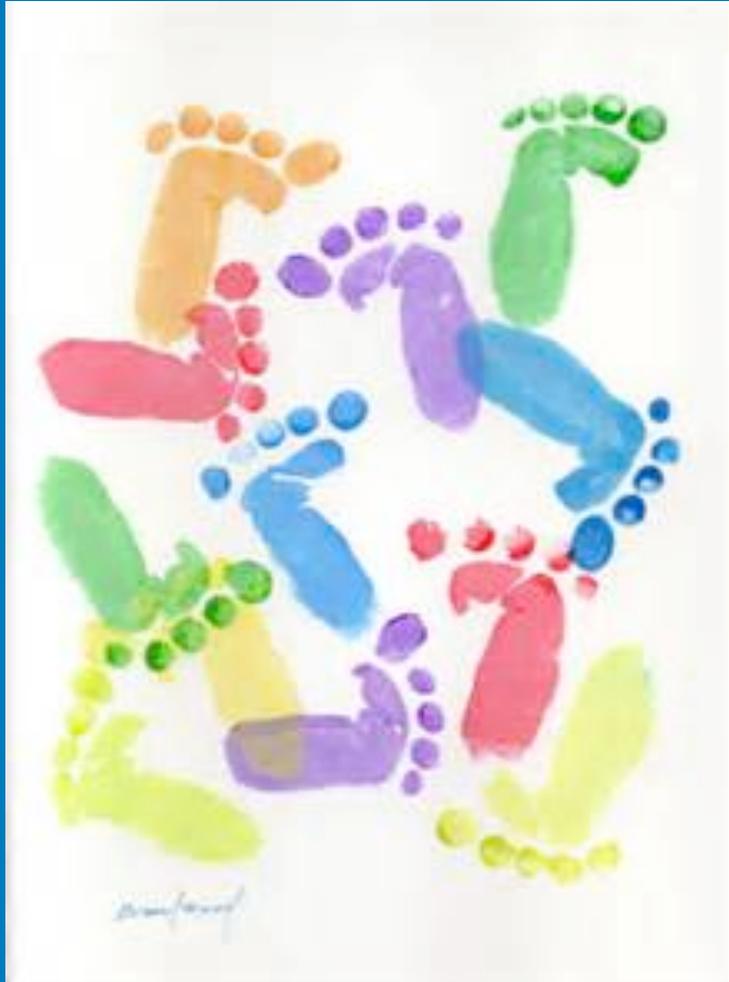


Fig. 1. Time-horizontal spatial scale diagram illustrating the range of scales over which environmental variability and biological processes occur and interact. Source: Dickey (2003) In Stock et al., 2011 Prog. Ocean. 88:1-27.



# Next Steps



## ➤ Final report

- **Prioritized list of science needs**
  - **Research and monitoring**
- **Abstracts of talks**
  - **Links to presentations**
- **Summary of dialogues**
  - **Note takers and wall bullets**
- **Vulnerability literature review**
  - **In some form**



# What Else?

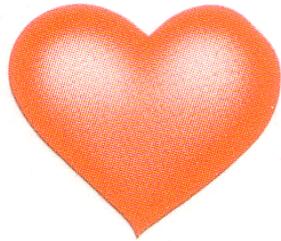
➤ **Timeline**

➤ **Form:**

- **Tech. Report?**
- **“Conference Proceedings”**



# Thank You





- **1: need for more and better biological monitoring**
- **2: need better, i.e., higher resolution catch data**
- **3: need better integration of physical and biological and socio-economic data**
- **4: need cross regional and multi-regional analyses.**
- **5: need for more citizen science**
- **6: need to understand Sargassum episodes**
- **7: Are static MPA's useful under changing environmental conditions. Potential spawning reserves.**



- 8: Changes are happening: how do forecast future habitat conditions, to prepare to take advantage in terms of rebuilding scheme timetables, avoid losing catch, take advantage of new opportunities.
- 9: Tools, i.e., forecasting and analysis tools are needed to do this on the needed time and space scales.
- 10: Need to better understand what is happening in 4D on the water and communities at useful time and space scales. This relates to fishing success, lack of it, and socio-economic aspects.
- 11: Need to better understand about episodic events including recruitment, (match-mismatch with right conditions of habitat, food and prey, hypoxia, red tide, Sargassum



# Separation Slide

