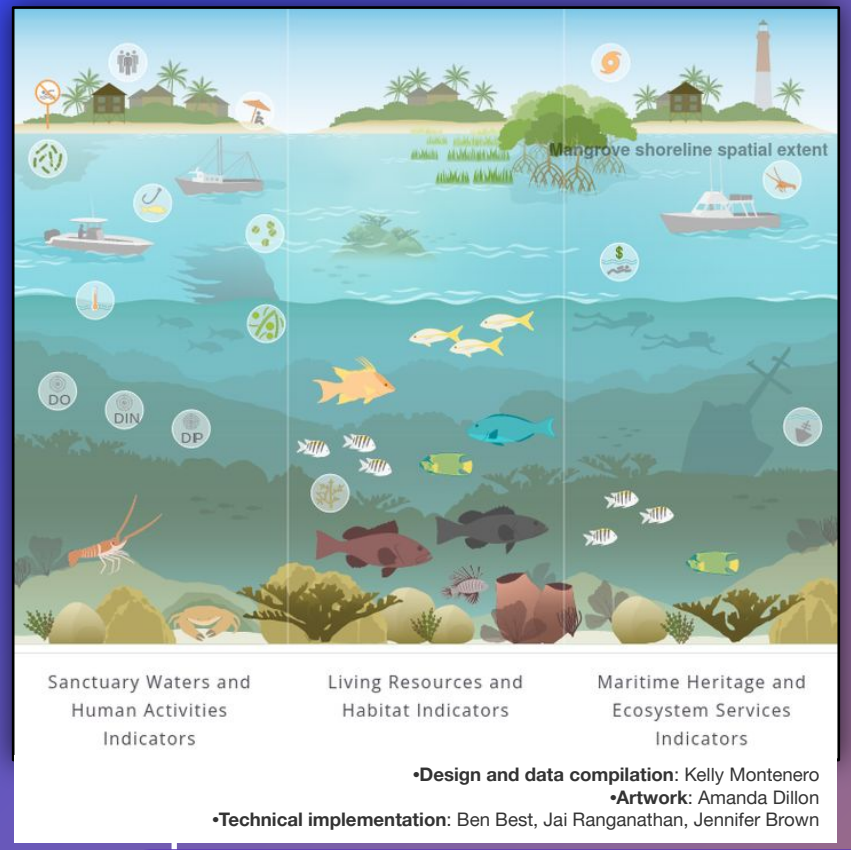
The Southeast US Marine Biodiversity Observation Network (MBON): Toward Operational Marine Life Data for Conservation and Sustainability (An MBON Team Leader Proposal)



MBON
Marine Biodiversity Observation Network

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D. Otis, T. Murray, D. Rueda,
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University of South Florida 1956 · OSU Oregon State University College of Earth, Ocean, and Atmospheric Sciences · SECOORA Southeast Coastal Ocean Observing Regional Association · GCOOS Gulf of Mexico Coastal Ocean Observing System · IOOS Integrated Ocean Observing System · CoastWatch · National Marine Sanctuaries · NOAA · NASA · NOPP National Oceanographic Partnership Program · GEO BON · BOEM · MarineGEO The Tennenbaum Marine Observatories Network · 2021 2030 United Nations Decade of Ocean Science for Sustainable Development · University of Miami · EcoQuants · Marine Life 2030

Goals

- **Stakeholder engagement / understand needs / co-design**
- **Working Groups: methods, data management**
- **Coordinate/Standardize biodiversity obs. (EOV-EBV)**
- **Capacity development**

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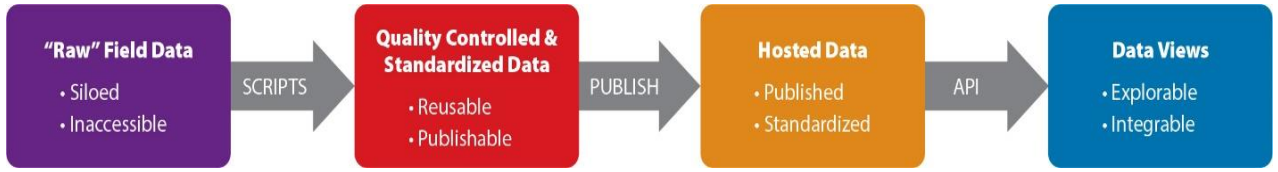
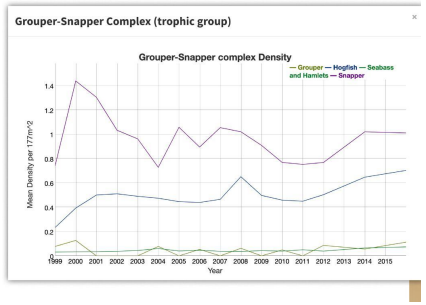
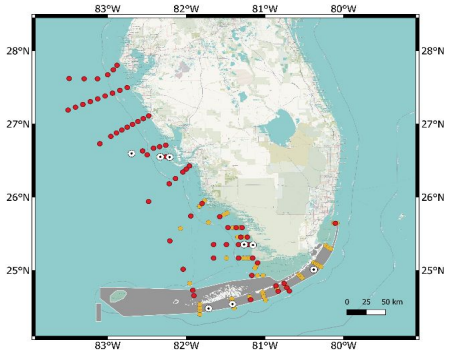
Marine Biodiversity Observation Network





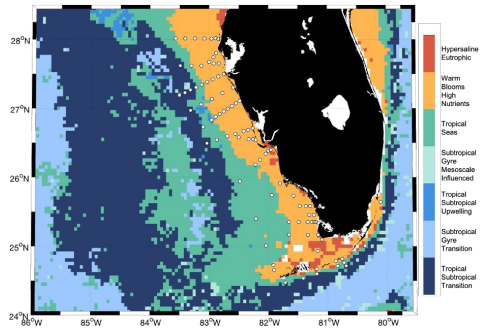
International collaboration: GOOS, OBIS, GEO BON, Ocean Decade

Data Flow

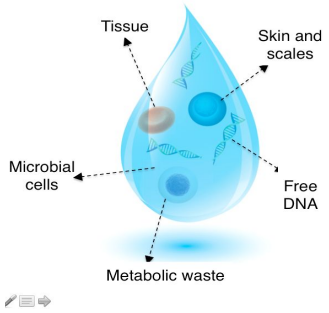


NOAA AOML cruises

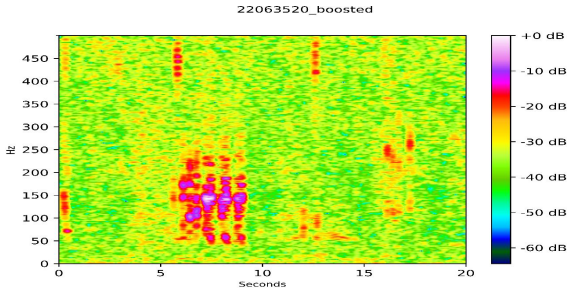
September 2024



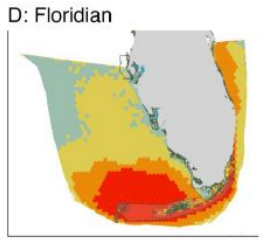
Remote sensing



eDNA and other biogeochemical/optical biodiversity observations



Passive acoustics, animal tracking



Species Distribution Models and Ensembles

Users are involved

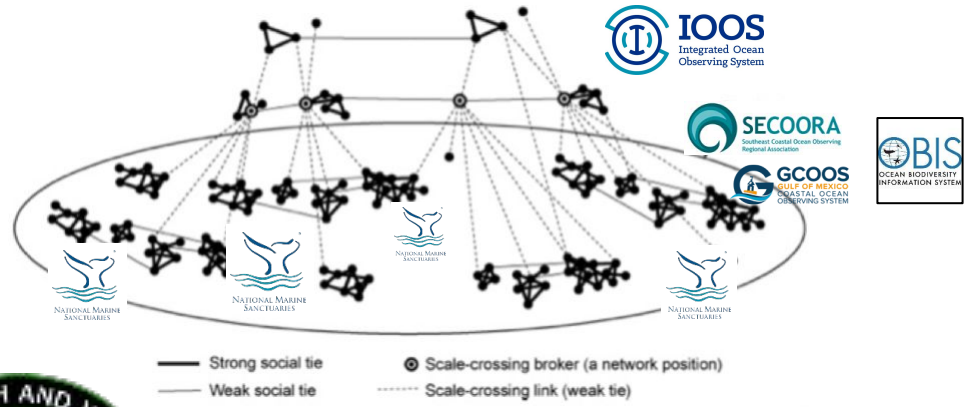
Stakeholder workshops with

NOAA National Marine Sanctuaries

and

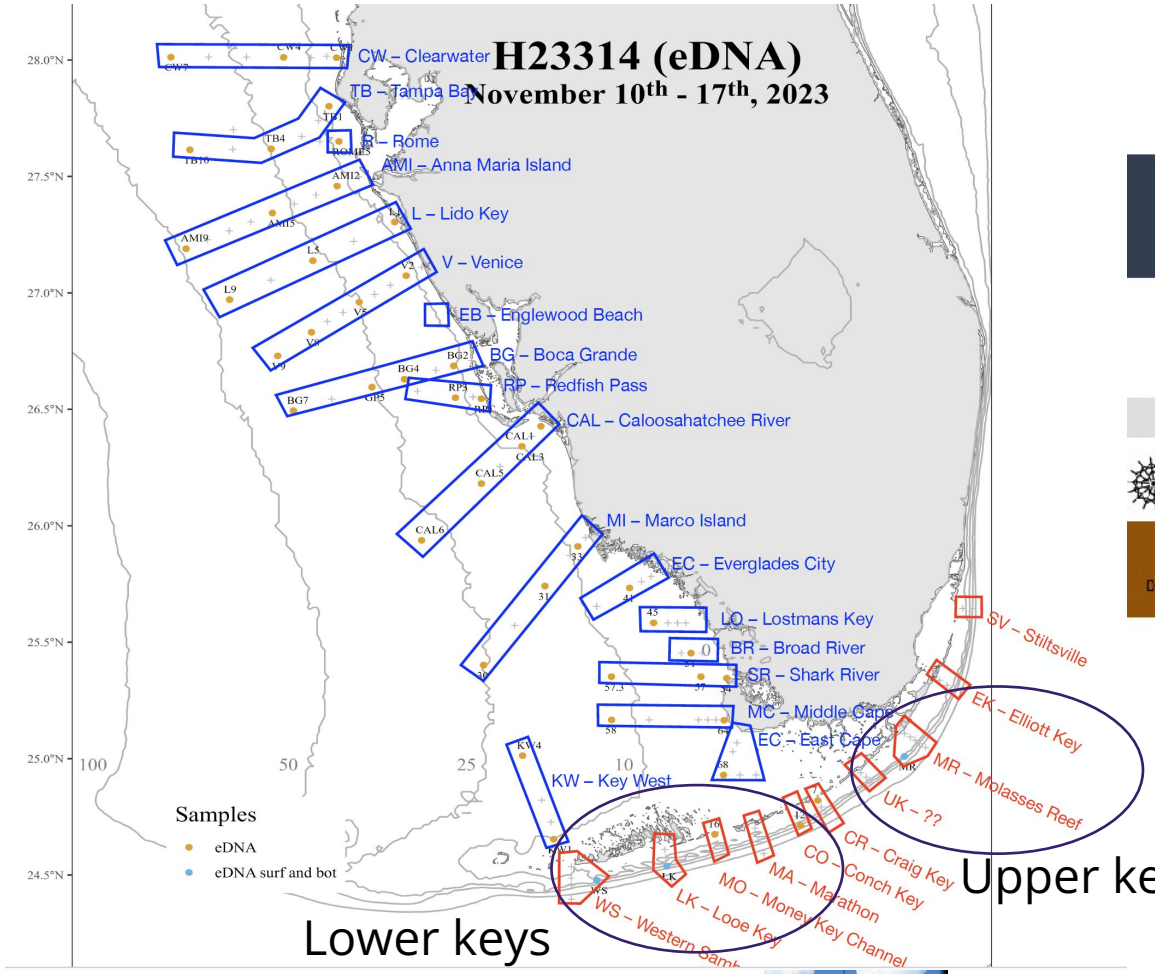
State of Florida Fish and Wildlife Research Institute

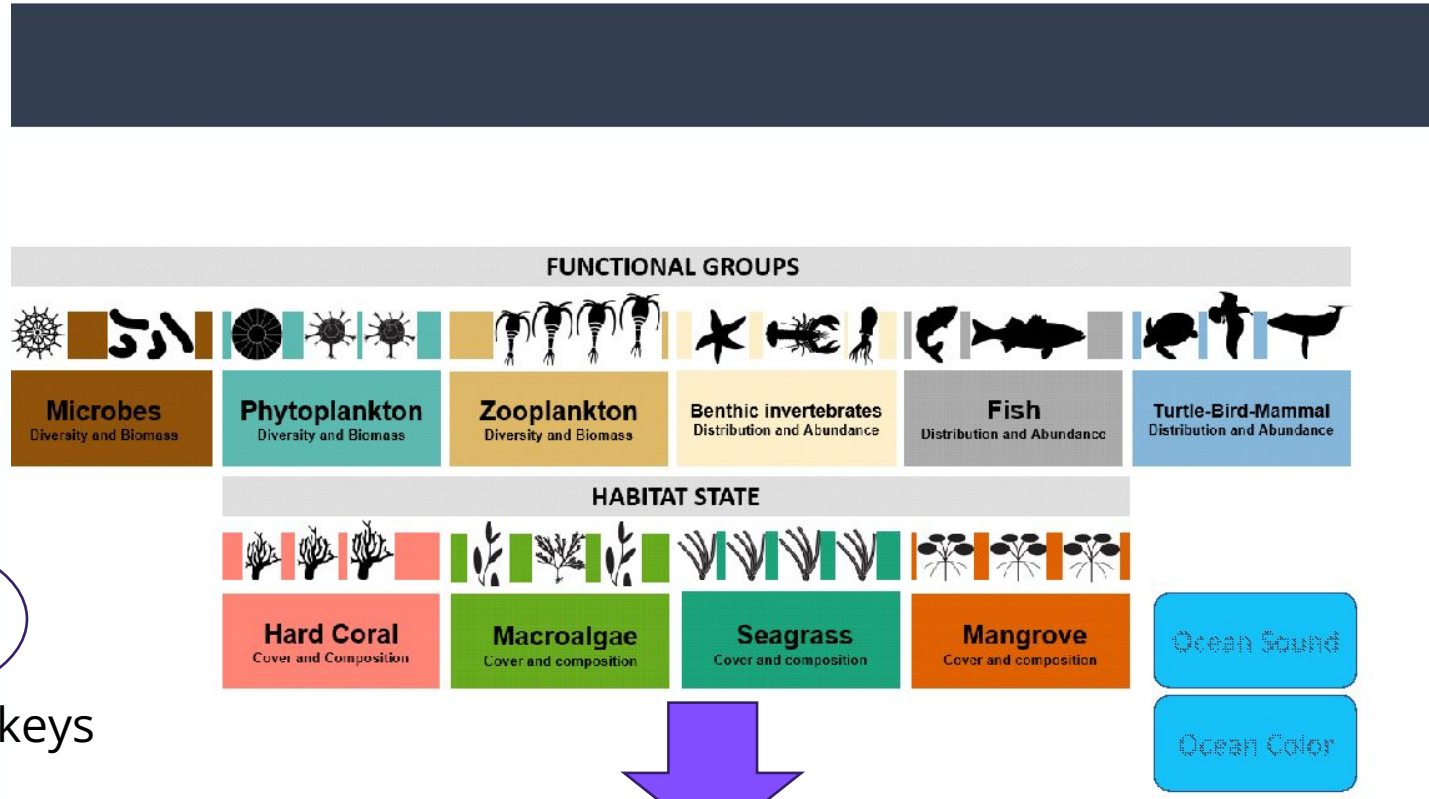
Monitor
Gray's Reef
Florida Keys
Flower Garden Banks



MBON
Marine Biodiversity Observation Network

Field observations: Every two months since 2015





Essential Biodiversity Variables (EBVs)

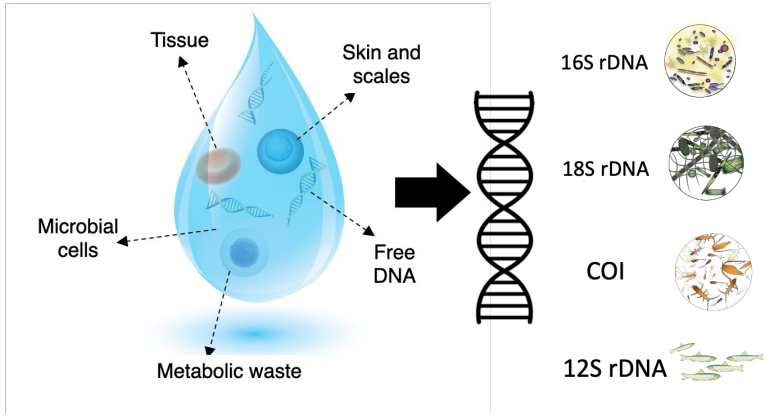
Linking technologies to

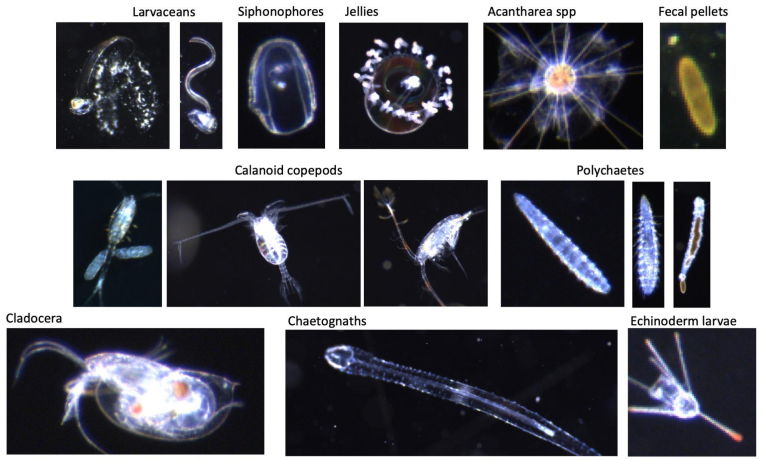
Essential Ocean Variables (EOV) and

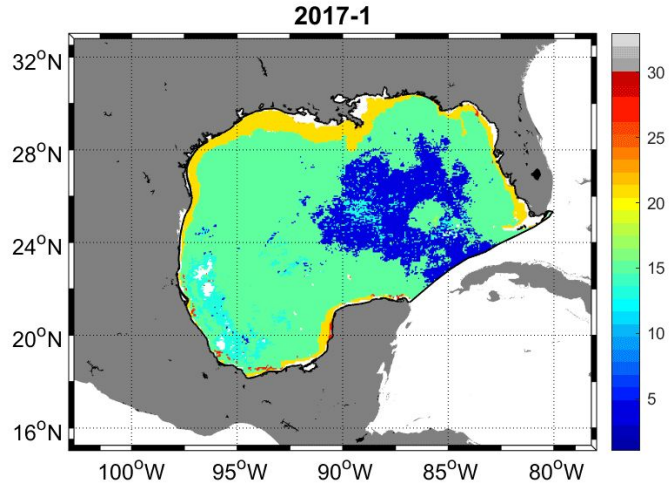
Essential Biodiversity Variables (EBV)

	Functional Groups EOV								Habitat State EOV				Cross-Disciplinary EOV		
	Microbe Biomass and Diversity	Phytoplankton Biomass and Diversity	Zooplankton Biomass and Diversity	Benthic Invertebrate Abundance and Distribution	Fish Abundance and Distribution	Sea turtles Abundance and Distribution	Seabirds Abundance and Distribution	Marine Mammal Abundance and Distribution	Coral Cover and Composition	Seagrass Cover and Composition	Macroalgal Cover and Composition	Mangrove Cover and Composition	Ocean Colour	Ocean Sound	Marine Debris
Optics and Imaging	X	X	X	X	X		X	X	X	X	X	X	X		X
Animal tracking				X	X	X	X	X							
Passive Acoustics			X	X	X			X	X					X	
Active Acoustics			X	X	X				X					X	
Genomics (eDNA)	X	X	X	X	X	X	X	X	X	X	X	X			X
Models, forecasts, scenarios	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Data management and visualization	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Merging eDNA, satellite, plankton imagery, traditional methods (net tows, counts, etc.)



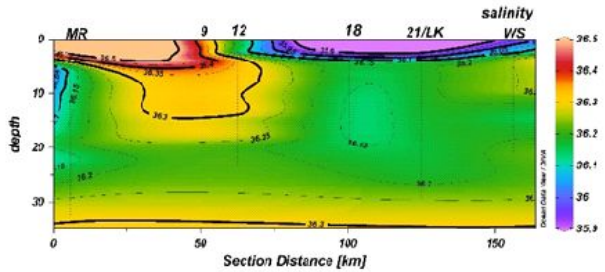


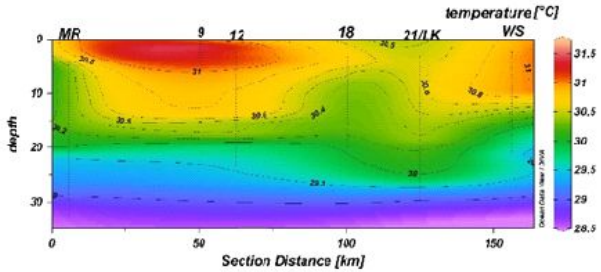


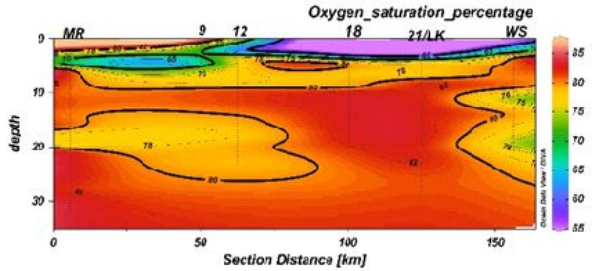
Satellite biogeographic seascapes

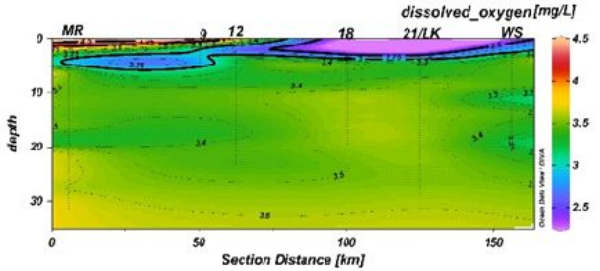
Hydrographic reconstructions : ~Every two months since 2015

Upper Keys Lower Keys

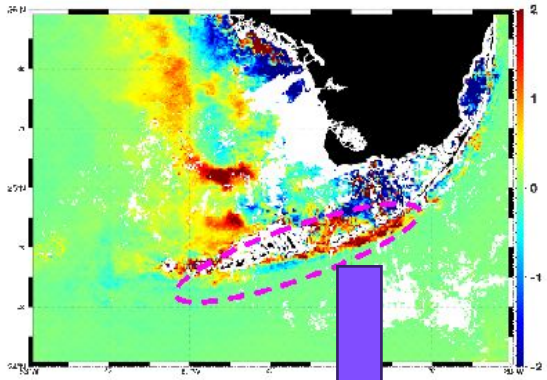


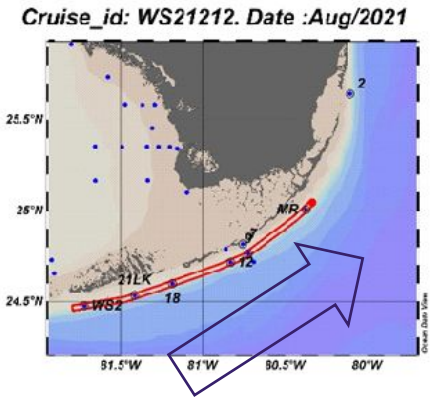




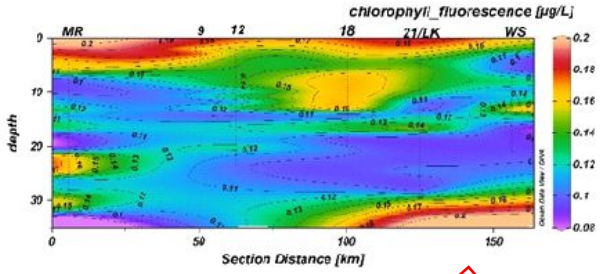


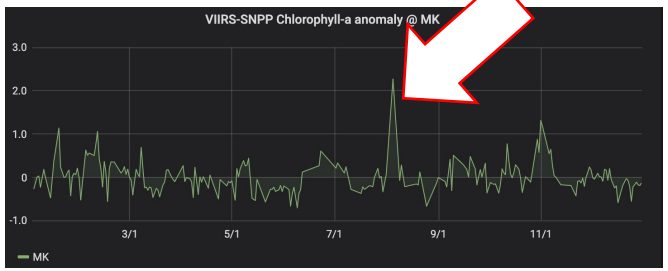
MODIS





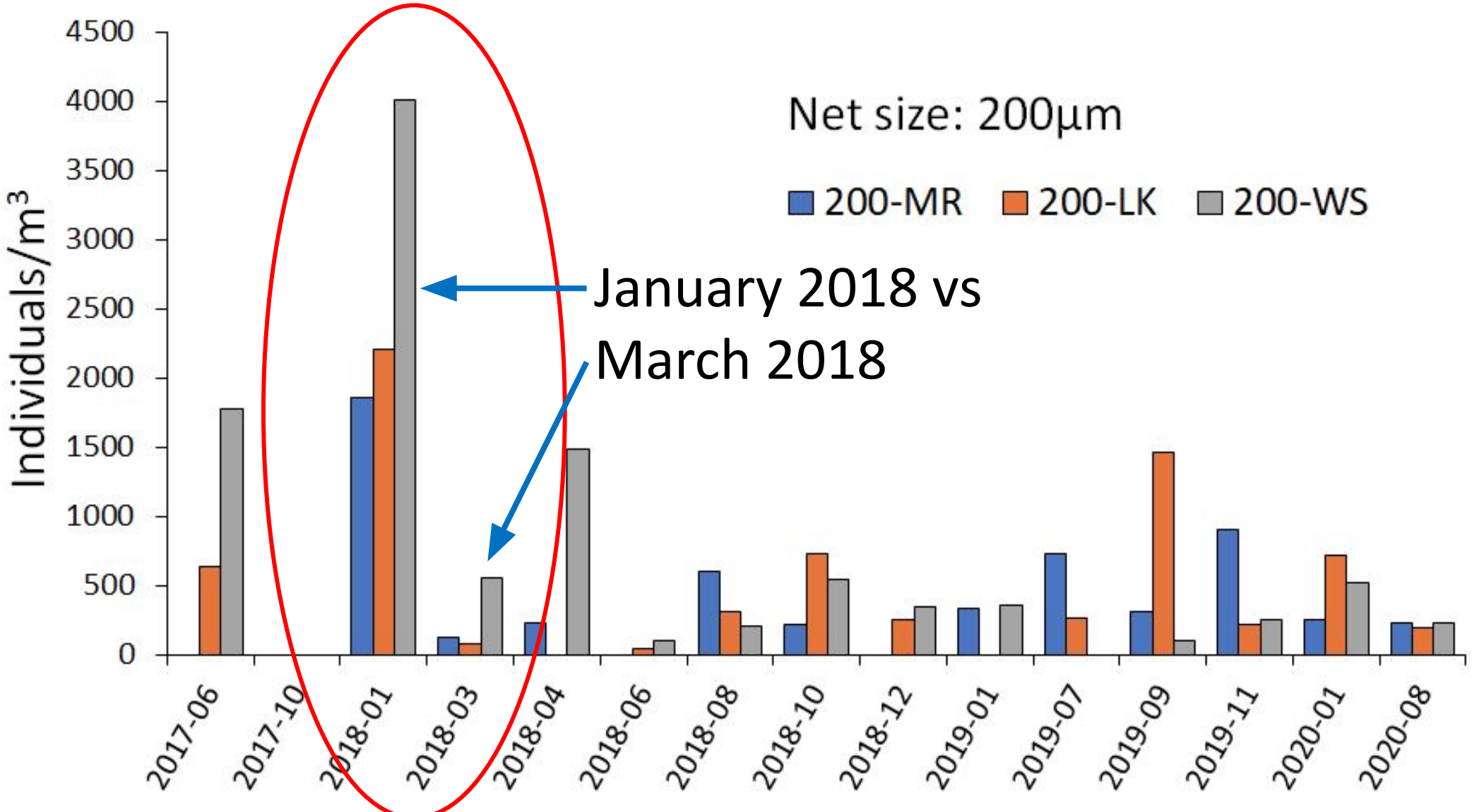
Florida Current



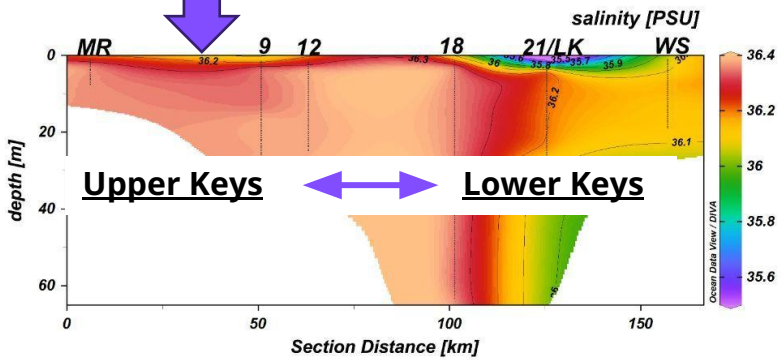


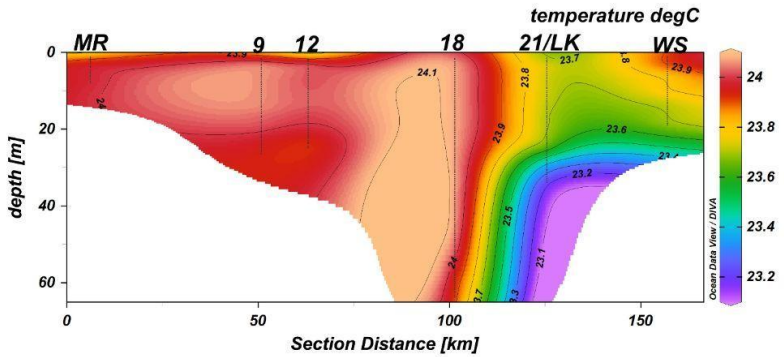
VIIRS Chlorophyll concentration anomaly

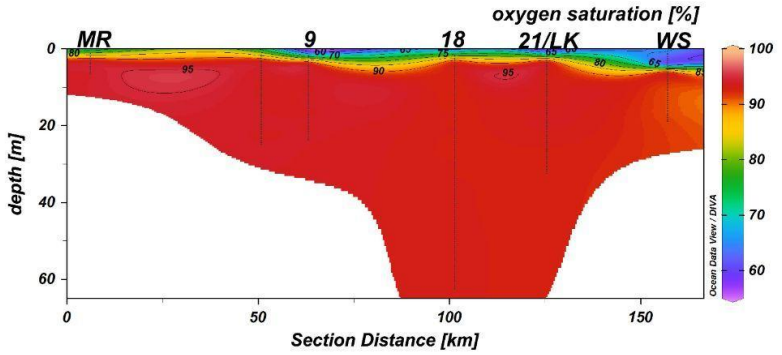
Zooplankton net tows / counts

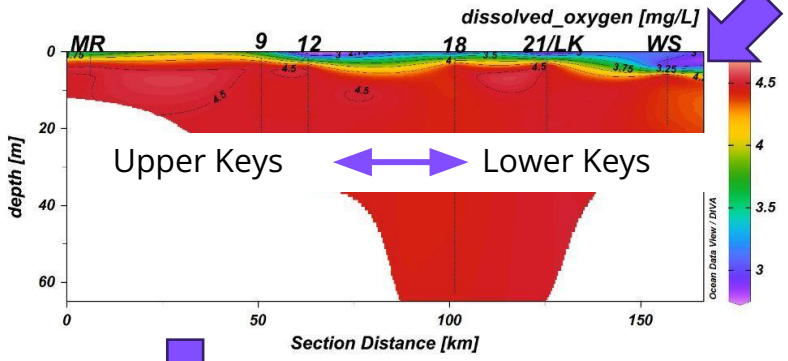


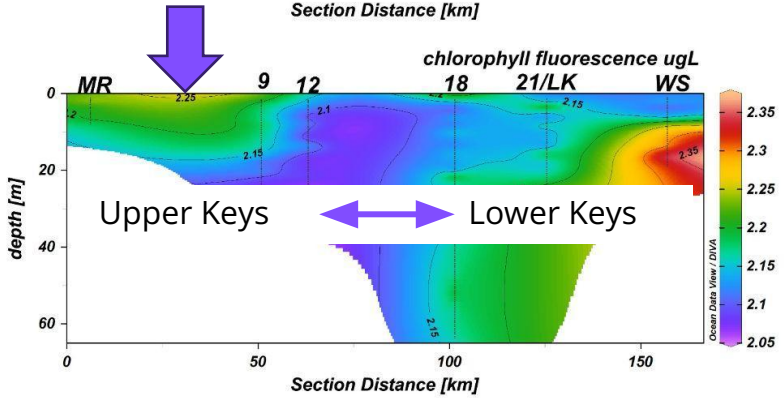
High surface salinity Lower surface salinity

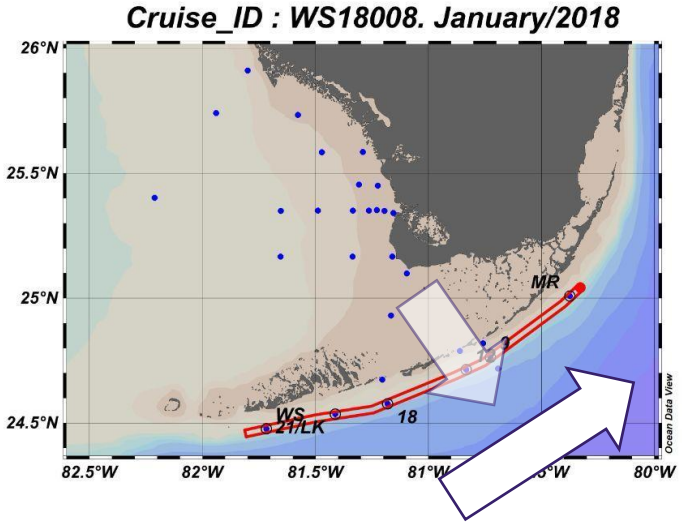












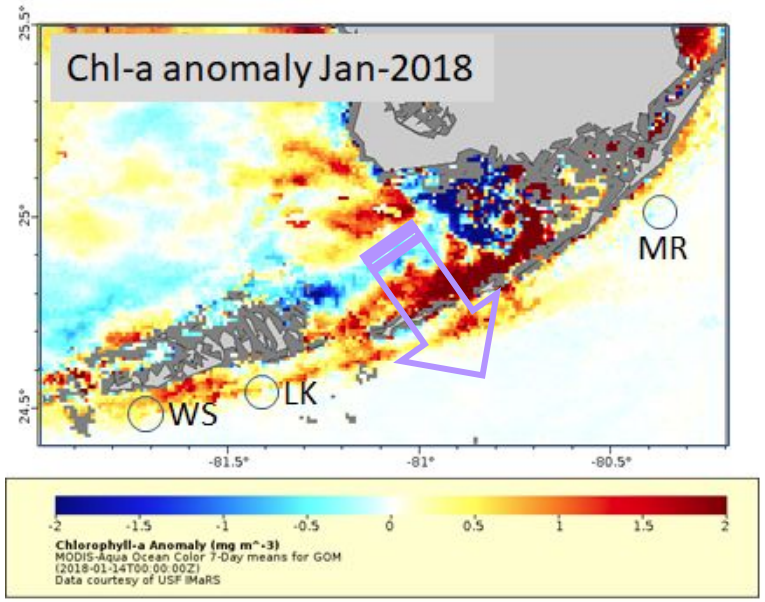
Florida Current

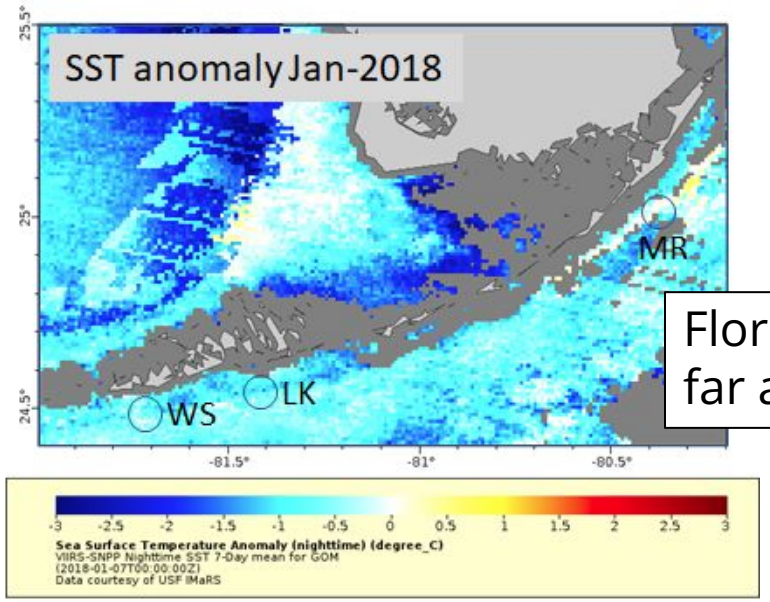
January 2018

Hypothesis:

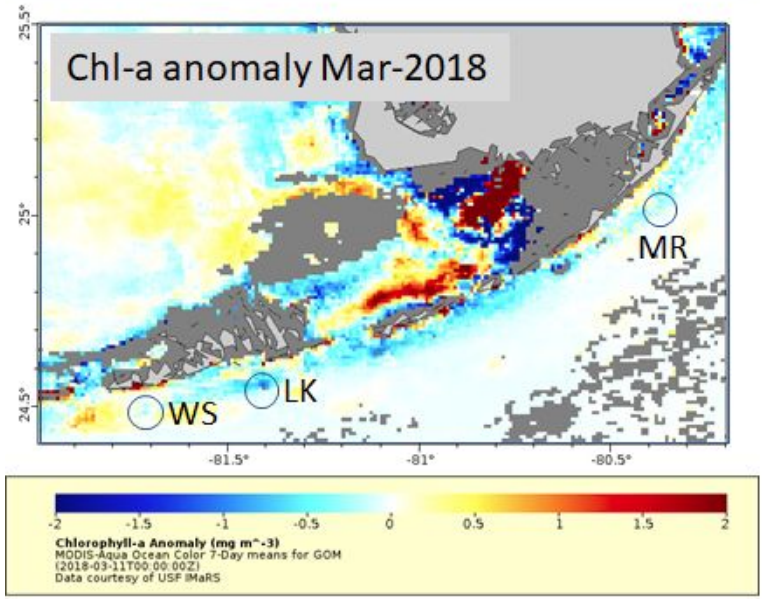
Throughflow and biodiversity in the Florida Keys is modulated by meanders in the Florida Current

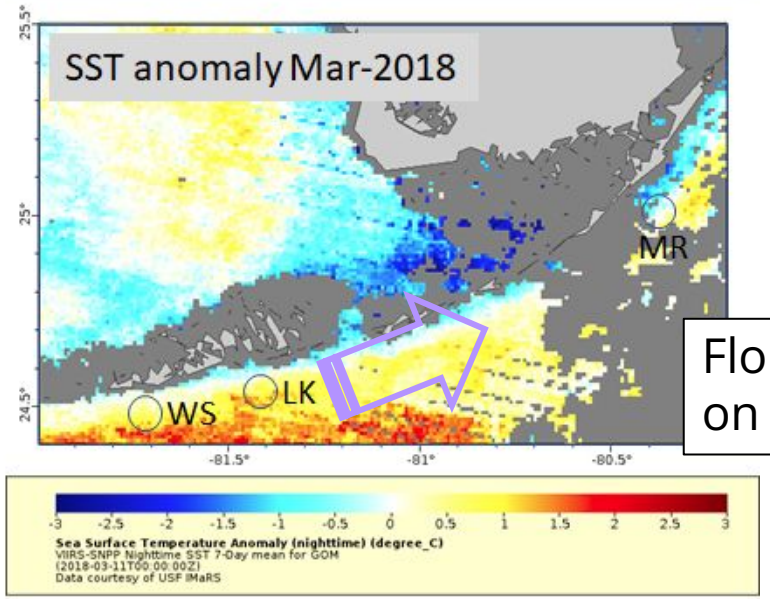
MODIS Chlorophyll concentration anomalies and VIIRS Sea Surface Temperature anomalies





Florida Current is far away



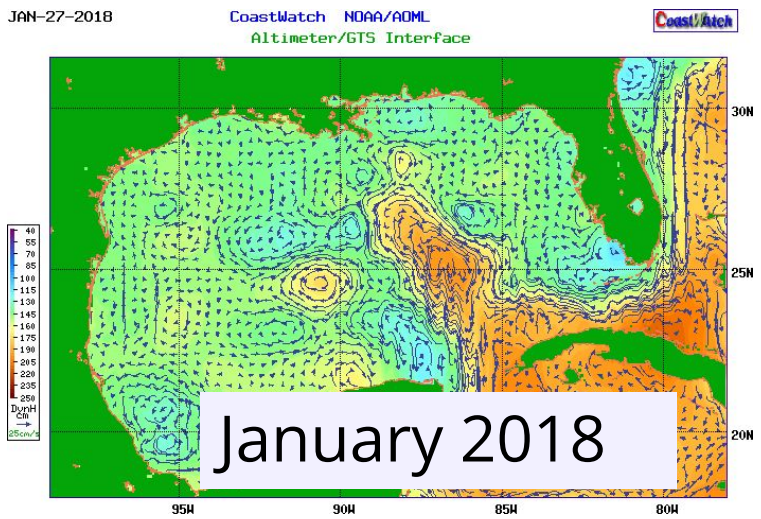


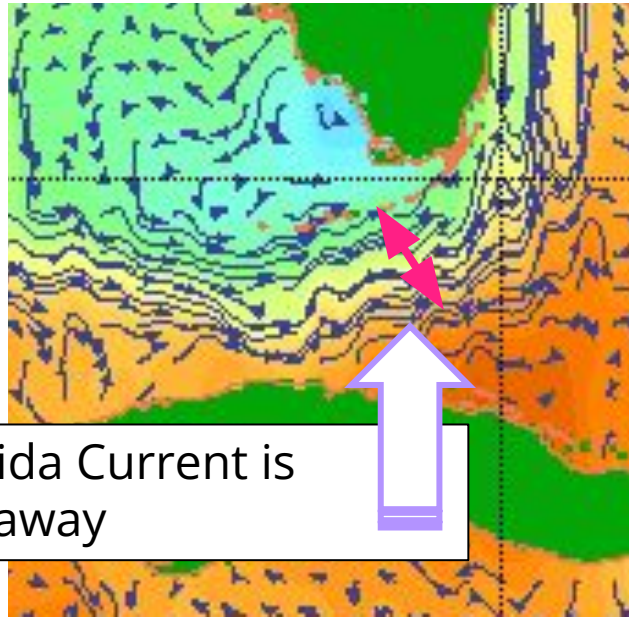
Florida Current is on reef tract

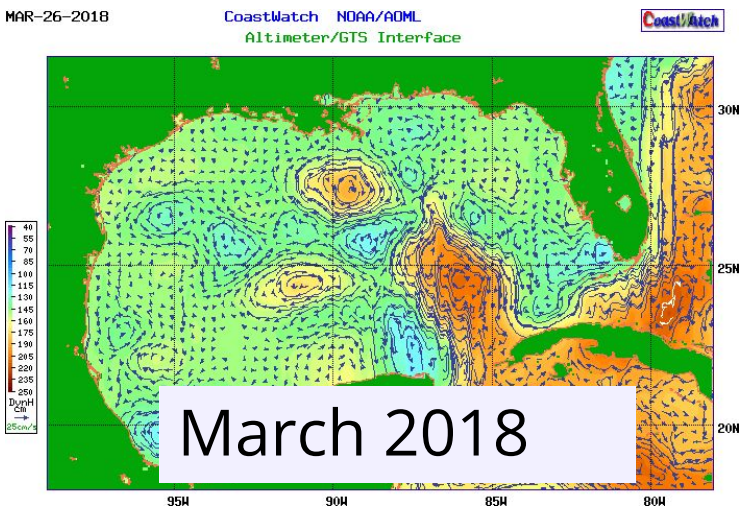
Hypothesis:

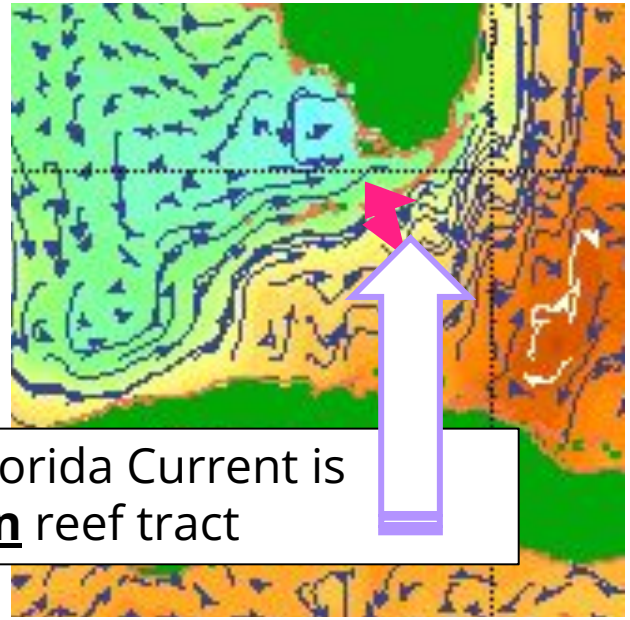
-biodiversity in the Florida Keys is affected by flow through the Florida Keys passages, which is modulated by meanders in the Florida Current

Altimeter Sea Surface Height









Hypothesis:

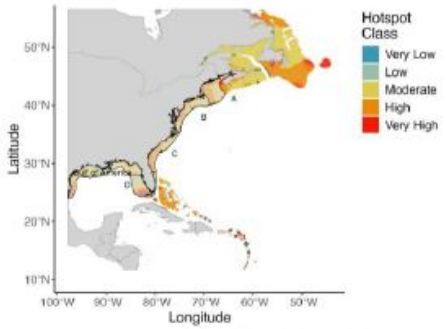
\+

Throughflow and biodiversity in the Florida Keys is modulated by meanders in the Florida Current

BioTrack: shifts in seasonal distribution of fish and overlap with conservation / use areas

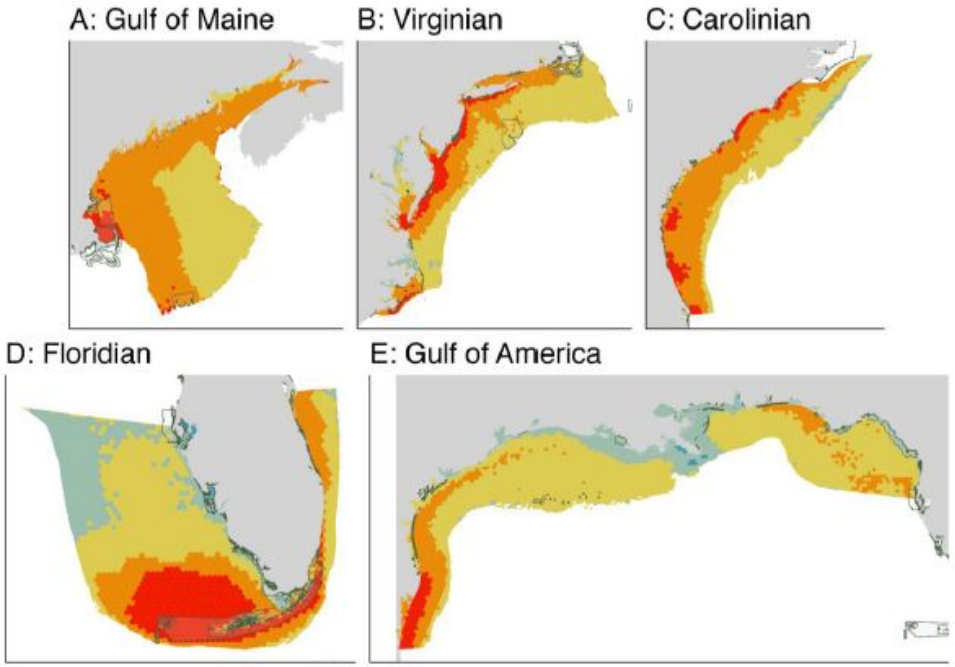
All Species

Summer



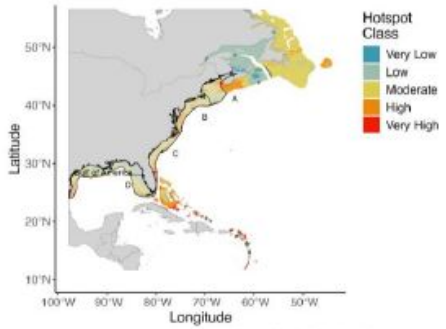
Ecoregion	Within Marine Protected Areas	Outside Marine Protected Areas	Within No Take Areas	Outside No Take Areas
Gulf of Maine	63.6%	36.4%	0.9%	99.1%
Virginian	69.4%	30.6%	0%	100%
Carolinian	42.6%	57.4%	2%	98%
Floridian	49.1%	50.9%	22.8%	77.2%
Gulf of America	1.7%	98.3%	0%	100%

The % of multi-species hotspots within marine protected areas and no take zones per ecoregion of interest



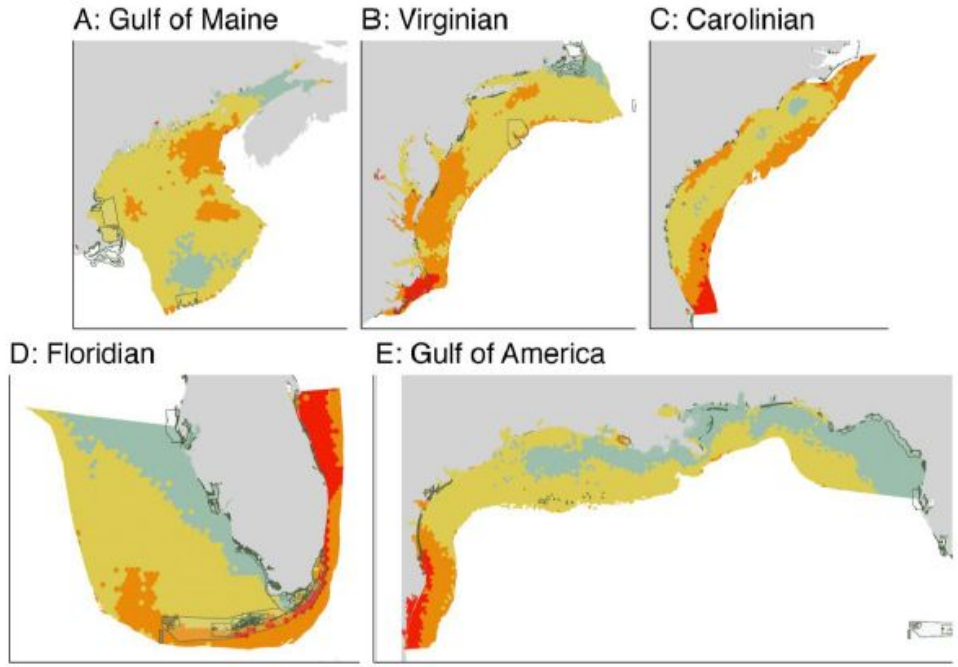
Green Polygons are MPA Boundarie
& Dark Shaded Areas Are No Take Zone

Winter



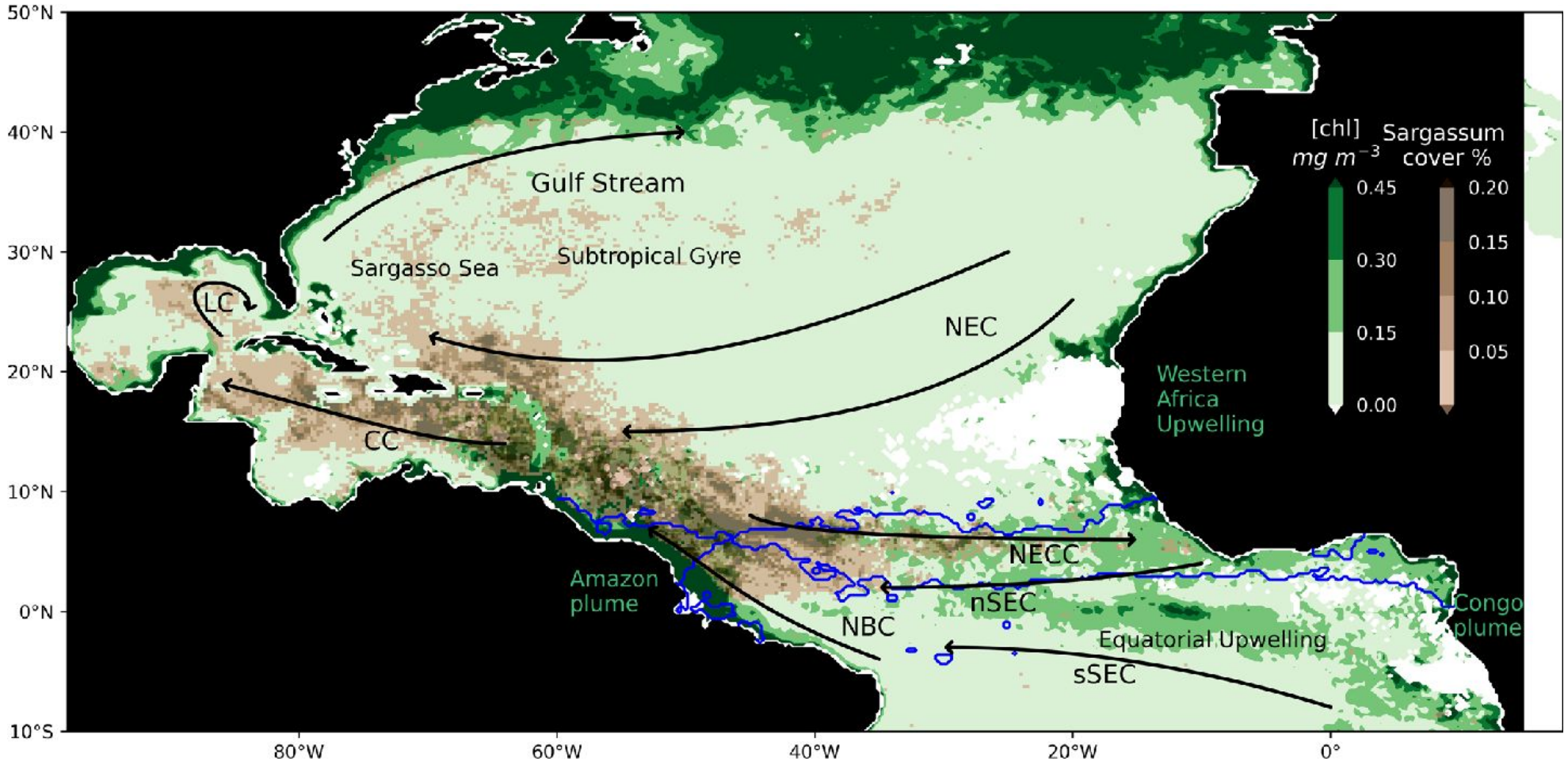
Ecoregion	Within Marine Protected Areas	Outside Marine Protected Areas	Within No Take Areas	Outside No Take Areas
Gulf of Maine	7.7%	92.3%	0%	100%
Virginian	79.3%	20.7%	0%	100%
Carolinian	13.8%	86.2%	0%	100%
Floridian	57.1%	42.9%	13%	87%
Gulf of America	14.9%	85.1%	0%	100%

The % of multi-species hotspots within marine protected areas and no take zones per ecoregion of interest



Green Polygons are MPA Boundaries
& Dark Shaded Areas Are No Take Zones

Sargassum distribution and environmental modeling - primary nutrient source: vertical mixing (NOT Rivers)



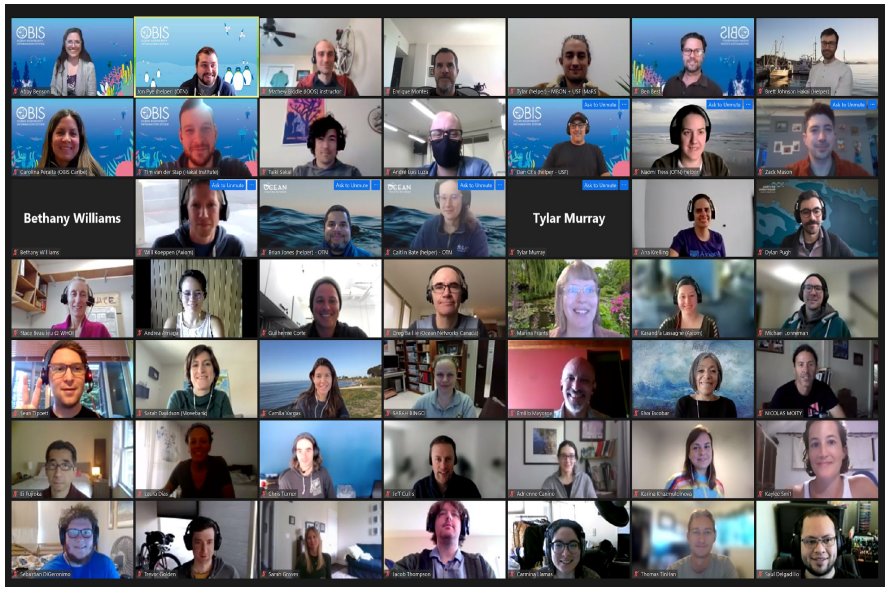
MBON Outreach

- The Journal of Marine Education articles
- National Marine Educators Association Conference (29 June-2 July 2025)
- MBON Communications Workshops

Virtual and in-person Marine BioData Mobilization Workshops

Move scattered, unorganized "raw" data into **OBIS/GBIF**

- Standardizing Marine BioData Working Group (SMBD)
  - https://github.com/ioos/bio_data_guide

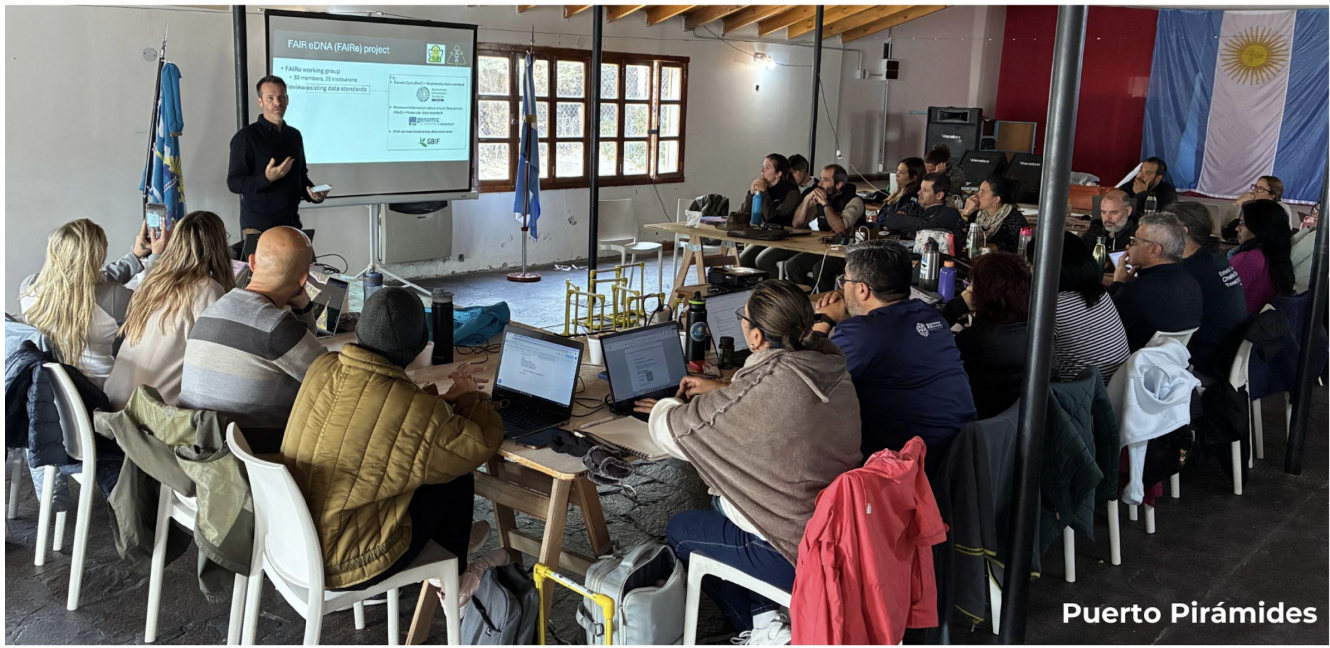


- Benson et al., 2021. https://doi.org/10.5670/oceanog.2021.220
- Biddle et al., 2025. https://doi.org/10.5281/zenodo.15304225

6th MBON Pole to Pole workshop: March 31st – April 4, 2025, Península Valdés (Argentina)

Argentina
Brazil
Chile
Uruguay
Peru
Ecuador
Colombia
Trinidad and Tobago
Puerto Rico
Honduras
United States

Regional Park Managers



Next – Azores in November (West Africa engagement)

MBON
Marine Biodiversity Observation Network

International Engagement

MARCO-BOLO
STRENGTHENING BIODIVERSITY OBSERVATION IN SUPPORT OF DECISION MAKING

LifeWatch ERIC

SCAR
INTERNATIONAL SCIENCE COUNCIL
SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH

BIODIVERSITY.AQ

GEO BON
Group on Earth Observations
Biodiversity Observation Network

GEO GROUP ON EARTH OBSERVATIONS

protectedseas

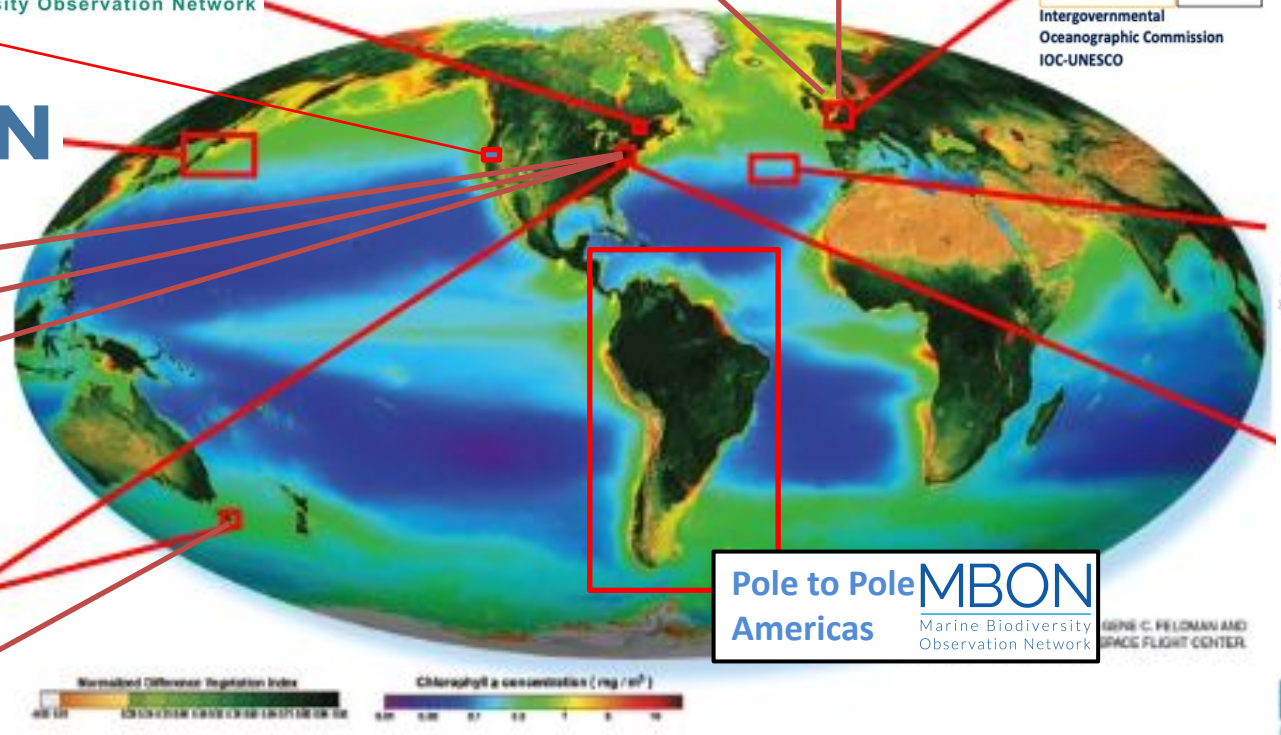
GOOS
Intergovernmental Oceanographic Commission
OBIS
OCEAN BIODIVERSITY INFORMATION SYSTEM
Intergovernmental Oceanographic Commission
IOC-UNESCO

AP MBON

IOOS
Integrated Ocean Observing System

MarineGEO
THE TENNENBAUM MARINE OBSERVATORIES NETWORK

ATN
ANIMAL TELEMETRY NETWORK



Pole to Pole Americas MBON Marine Biodiversity Observation Network

GOOS Bio-Eco
USA / Australia

Amer GEOSS

BLUE PLANET
Oceans and Society

GCRMN
GLOBAL CORAL REEF MONITORING NETWORK

http://marinebon.org

Marine Life 2030

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

AIR CENTRE

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Building global knowledge of marine life for local action

Marine Life 2030

marinelife2030.org

MBON

Marine Biodiversity Observation Network

marinebon.org

Collaboration with other
Ocean Decade Programs:

OBON, SUPREME, OARS, SMARTNET, DOOS, ECOPS, Challenger150, Maritime Acoustic Environment, GOOS Co-Design…

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

The Global Ocean Observing System GOOS

OBIS Ocean Biodiversity Information System

GEO BON

NASA

IOOS Integrated Ocean Observing System

Smithsonian

Black in marine science

Cross-MBON Coordination: Working Groups

- Communications
- Indicators (environmental, biodiversity)
- eDNA
- Animal Tracking
- BioSound (passive acoustics)
- Remote Sensing / Seascapes
- Data Management and Cyberinfrastructure
- International:
  - GEO BON MBON, Marine Life 2030

MBON registration: GEO BON Members (https://members.geobon.org/pages/index)