

# The Oyster : Contributions to Habitat, Biodiversity, & Ecological Resiliency



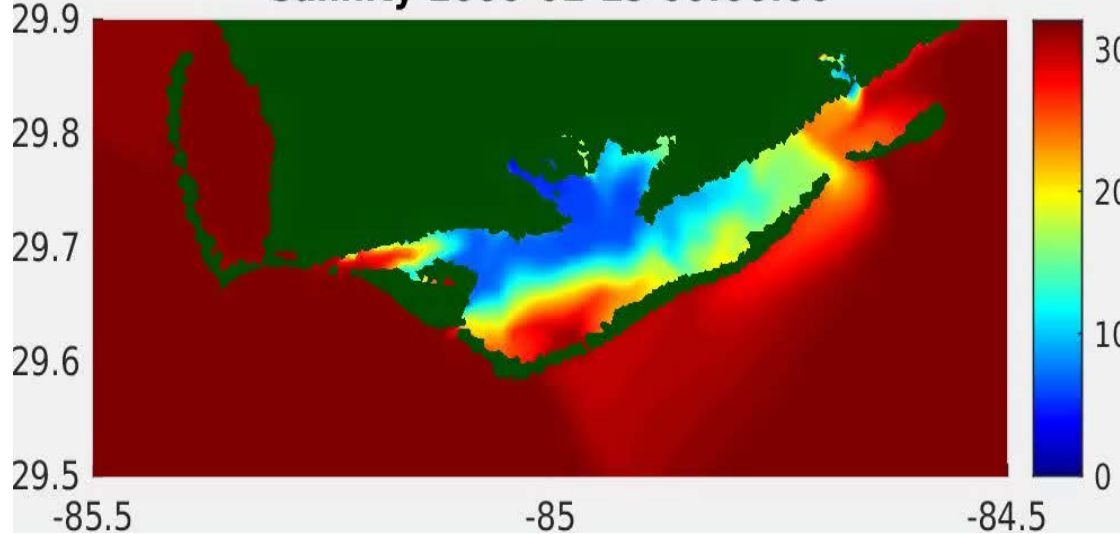
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# Factors Affecting Oyster Distribution & Abundance

Physical = salinity, temperature

Salinity 2000-02-29 00:00:00

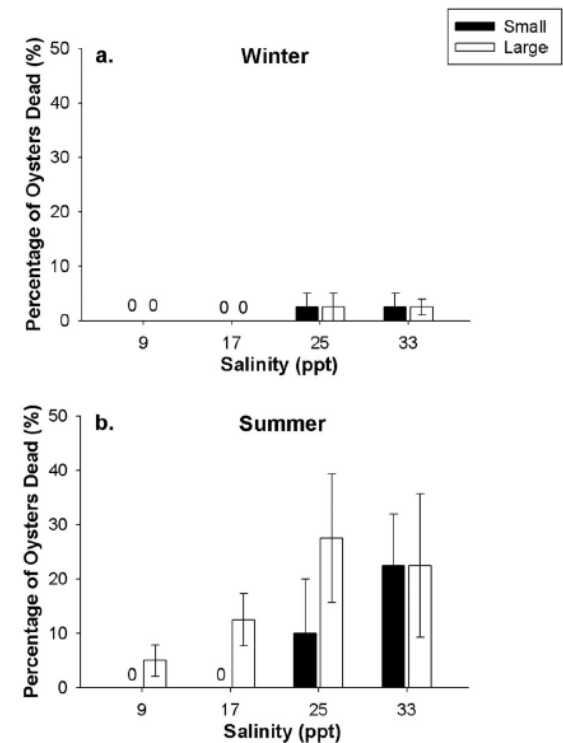


## Salinity & Temperature

- S - dynamic change ~daily basis;  
T - changes seasonally
- Affects community organization  
- high S & T = ↑ predators, disease

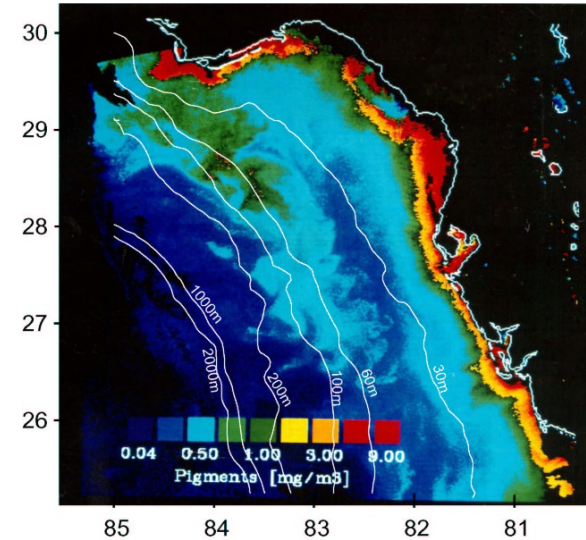
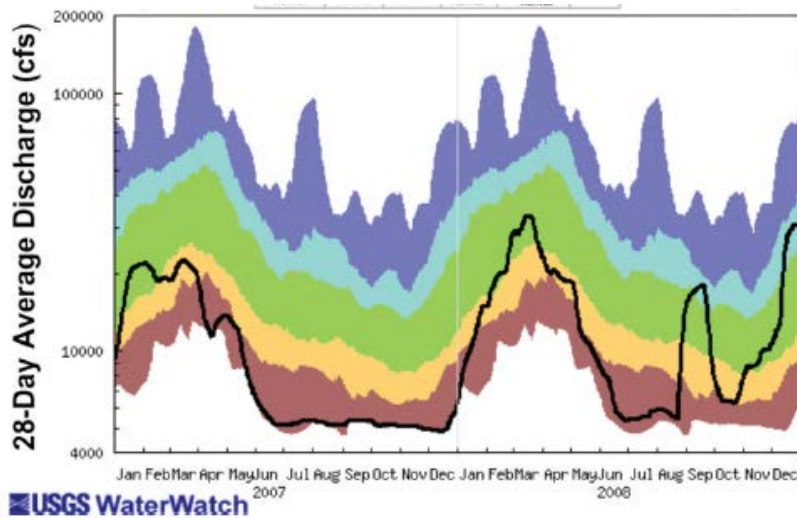
'Oysters suffered significant disease-related mortality under high-salinity, drought conditions, particularly in the summer.' *Dermo Perkinsus marinus*

Petes et al. 2012. Impacts of upstream drought and water withdrawals on the health & survival of downstream estuarine oyster populations. *Ecology & Evolution* 2(7):1712-1724



# Factors Affecting Oyster Distribution & Abundance

Physical = River flow



## Seasonal River Flow

- Major influence on physical & biological relationships
- Delivers low salinity H<sub>2</sub>O, ↑ turbidity, high nutrient & detritus concentrations
- River flow, when high, can extend far offshore influencing shelf-edge productivity



# Factors Affecting Oyster Distribution & Abundance

## Competition for space & food at different life stages



Oysters



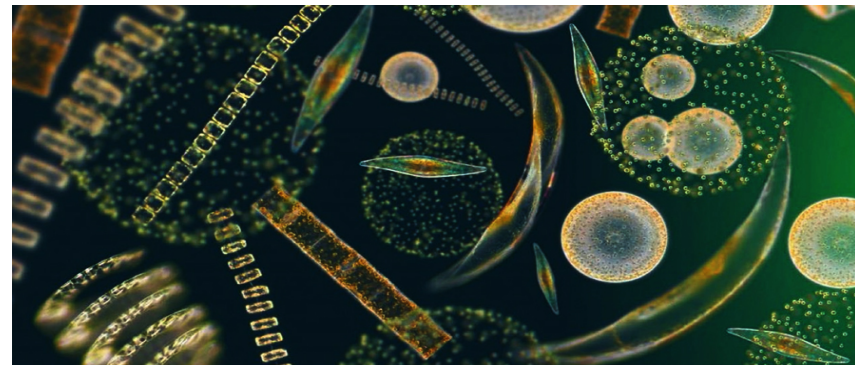
Barnacles



Mussels & Tunicates

- Can be **intraspecific** -oysters competing with oysters- or **interspecific** - other species competing with oysters)
- Can affect settlement patterns, and so alter community structure
- Can reduce oyster density, growth, or physical condition

Oysters eat phytoplankton & other organisms within a small size range, competing with other filter feeders



# Factors Affecting Oyster Distribution & Abundance

## Species interactions – predation & disease



Oystercatcher



Crown Conch - invaders



Oyster drills – economic pests

- Habitat complexity influences ability of predator & prey to locate & capture or avoid each other.
- Oysters can't avoid predators, so they address predation risk with heavy armor
- Marine predator invasions (e.g., crown conch oyster drills) tend to occur during high salinity events when river flow is relatively low.



Bacterial Disease –  
*Vibrio vulnificus*



# What is an Ecosystem Engineer?

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It is a **keystone species** that creates, significantly modifies, or maintains habitats in a way that directly or indirectly changes the availability of resources to other organisms

- by their physical structure



Oyster Reef



Saltmarshes



Seagrass Meadows



Coral-sponge reefs

- by their activities



Beaver building dams



Red grouper excavating sea floor



# Defining Biological Diversity

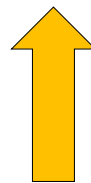
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**Taxonomic Diversity**  
– Who is there?

- shorebirds, fish, crabs, sponges, worms
- juveniles of commercially valuable fish & invertebrates

**Functional Diversity** –  
What is their role?



resilience & ecosystem health  
resistance to change

**Genetic** - How do they  
adapt to change?

Have genetic ability to cope with  
temperature variation & changes in salinity,  
air exposure & heavy metals.



# Enhancing Water Quality

Removing suspended solids from surrounding waters



1 oyster can filter ~50 gal/day



- Promotes recovery of seagrass habitat
- Reduces harmful algae blooms
- Removes excess nutrients



# Providing Natural Coastal Buffers

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Stabilizes sediments, reduces erosion, flooding, storm damage



- Protects mangrove, seagrass, and marsh habitats
- Protects coastal property

Oyster protection used by municipalities & military bases in major armament projects

# Enhancing Economies

Going beyond seafood

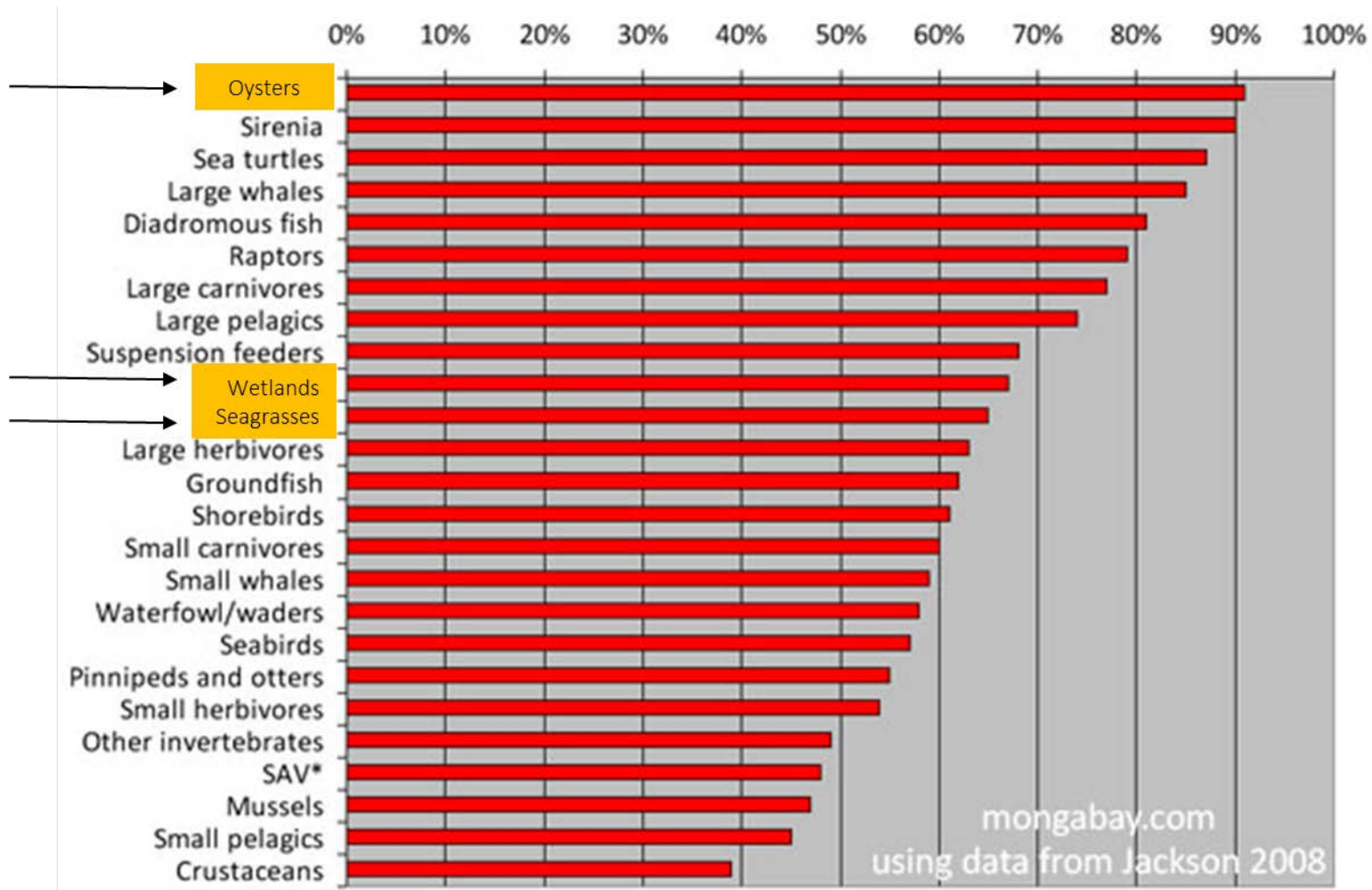


- Increases commercially important fish & invertebrate production
- Increases water quality which increases property values
- Enhances tourism and nature-based recreation industries



# Oyster Reefs Threatened World Wide

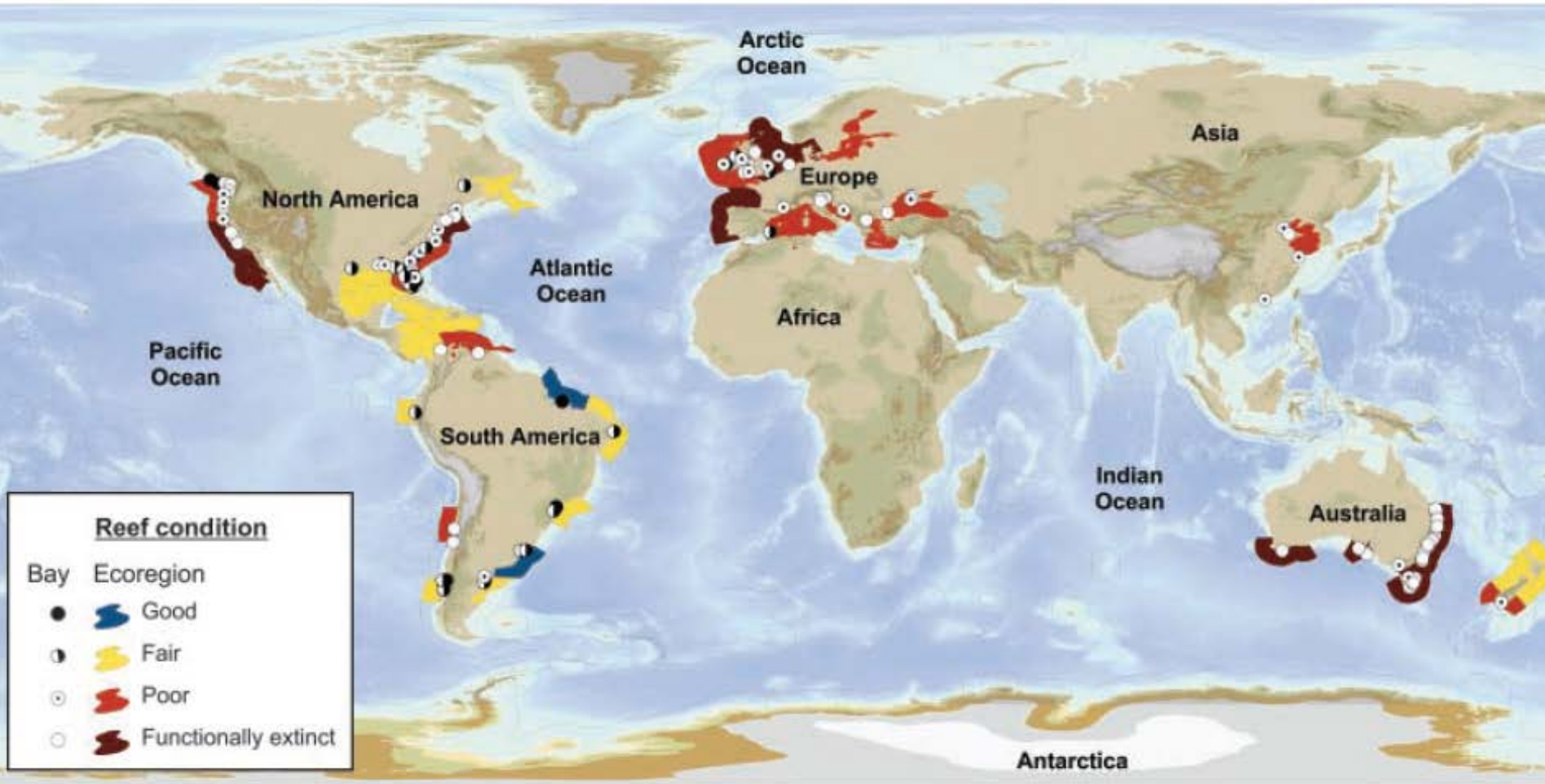
% loss in estuaries & coastal seas compared to pristine state



Data from Jackson (2008). Ecological extinction & evolution in the brave new ocean. PNAS.

# Global Condition of Oyster Reefs – 85% loss

Poor management, poor water quality, coastal development



From Beck et al. 2011 Oyster Reefs at Risk & Recommendations for Conservation, Restoration, & Management. Bioscience 61(2):107-116