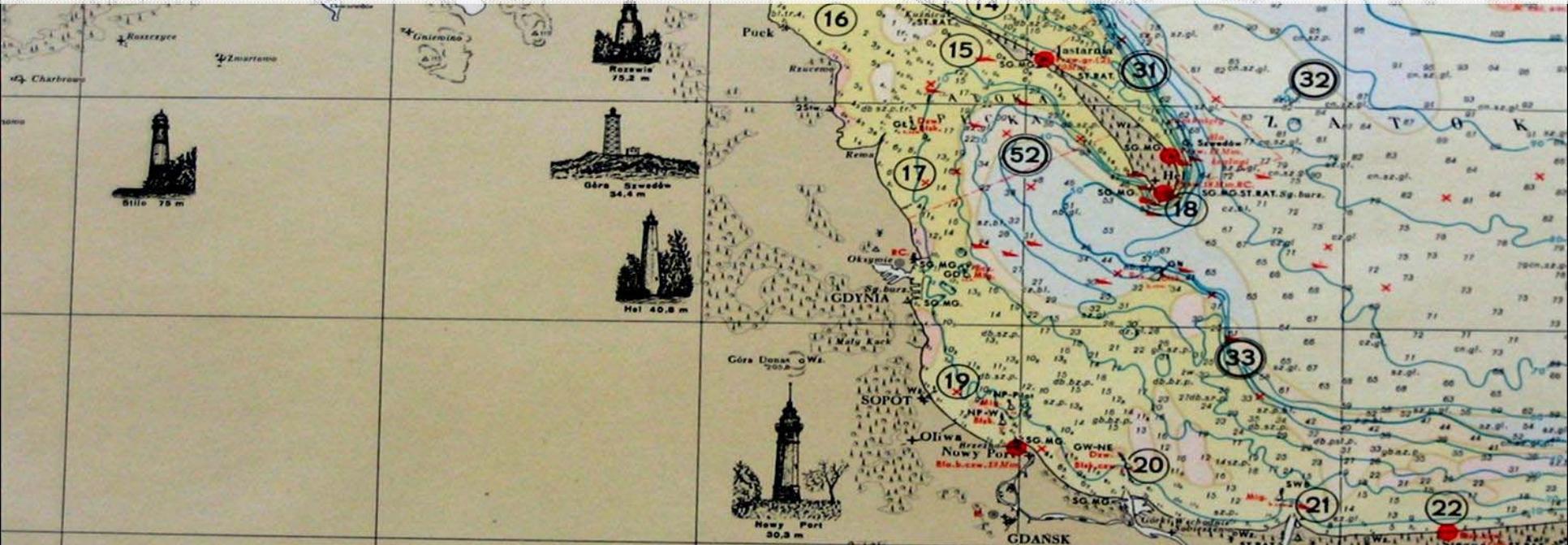


Merging Marine Historical Ecology and Climatology

CLIMAR-III

Third JCOMM Workshop on Advances in Marine Climatology
6-9 May 2008. Gdynia, Poland



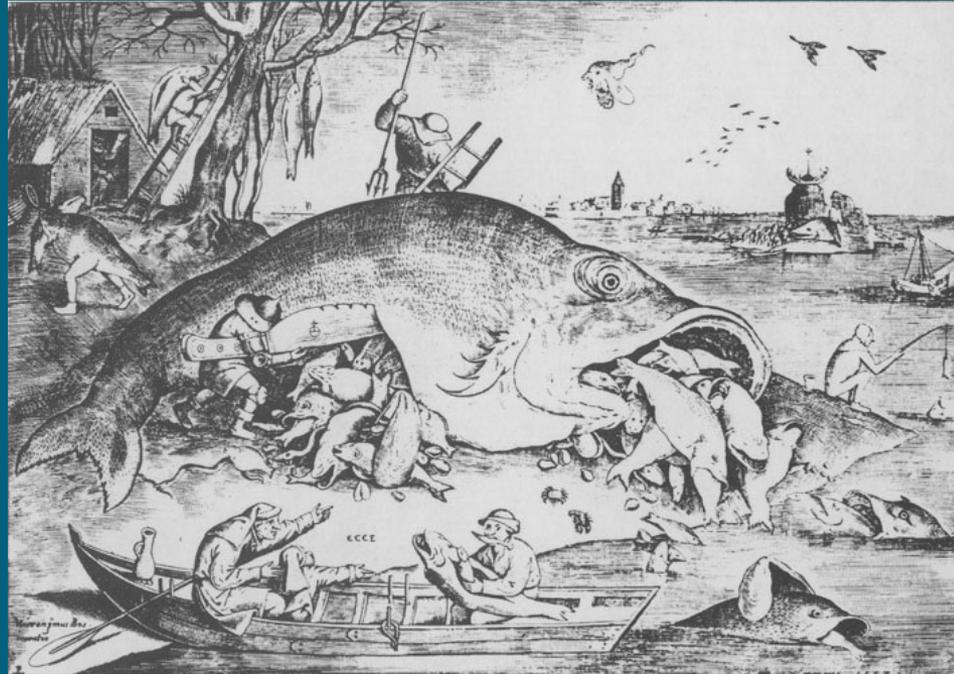
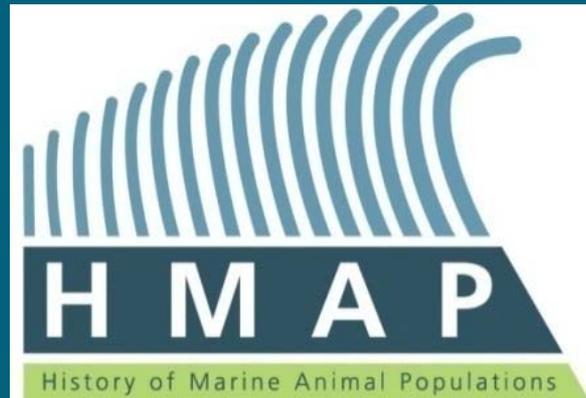
Catherine Marzin
Historical Ecology Program Manager
National Marine Sanctuary Program



Stefan Claesson
Research Scientist
Gulf of Maine Cod Project
Ocean Process Analysis Laboratory

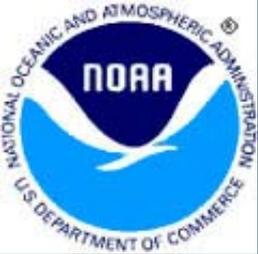


What is Marine Historical Ecology?



Goals:

- Improve understanding of ecosystem dynamics
- Ecological impact of large-scale harvesting
- Role of marine resources in social, cultural and economic development
- Long-term changes in stock abundance, distribution and diversity



Gulf of Maine Cod Project (GMCP)

University of New Hampshire



Fisheries Scientist



Andy Rosenberg

Historian



Jeffrey Bolster

Project Coordinator



Karen Alexander

Archaeologist



Stefan Claesson

Bio-statistics/Modeling



Andrew Cooper

Historian



William Leavenworth

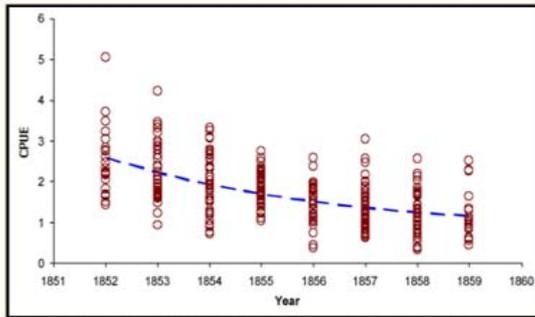
Projects:

- Scotian Shelf Cod Biomass Modeling (HMAP)
- Stellwagen Bank Marine Historical Ecology (NOAA National Marine Sanctuary Program)

Scotian Shelf: Modeling Historic Cod Populations

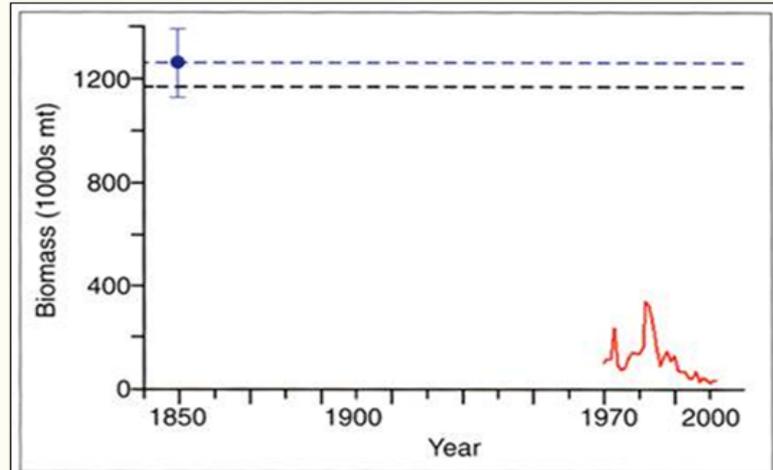


Findings of Rosenberg et al. 2005,
Frontiers in Historical Ecology

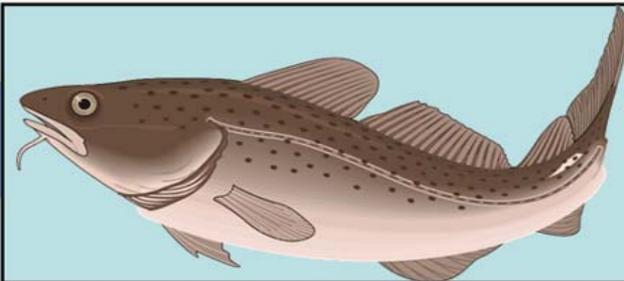


CATCH PER UNIT EFFORT - 1851-1860

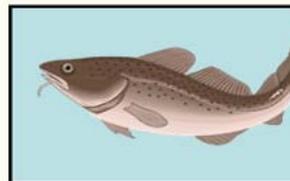
DeLury Graph for the Scotian Shelf cod fishery out of Beverly, Massachusetts, in the 1850s



Biomass estimates for Scotian Shelf Cod: ● this study, with confidence interval (1852); --- estimated carrying capacity of this marine ecosystem from late 20th century data (Myers et al. 2001); — total biomass estimates from 1970 to 2000 for cod, 4X, 4V'sW (Mohr 1998; Canada DFO 2000; Fanning 2003).



Average size cod caught in the 1850s: 20 lbs.



Average size cod caught in the 1990s, 6.5 lbs.

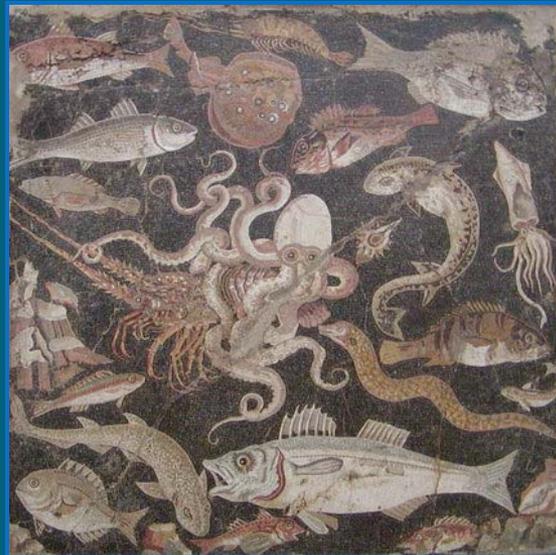
From **1.26** million to **0.050** million in less than 150 years
From **20** Lbs average cod size to **6.5** Lbs

NOAA Sanctuary Program

“maintain and conserve for future generations”

Question: What was condition of marine environment **BEFORE** overfishing, pollution, etc.?

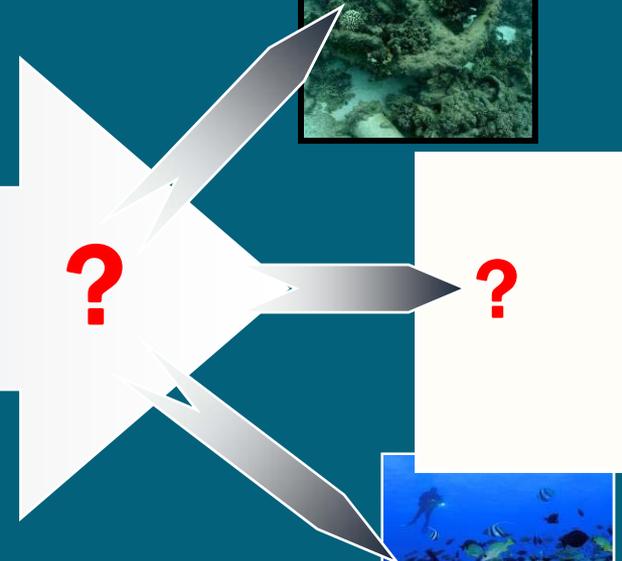
PAST



NOW



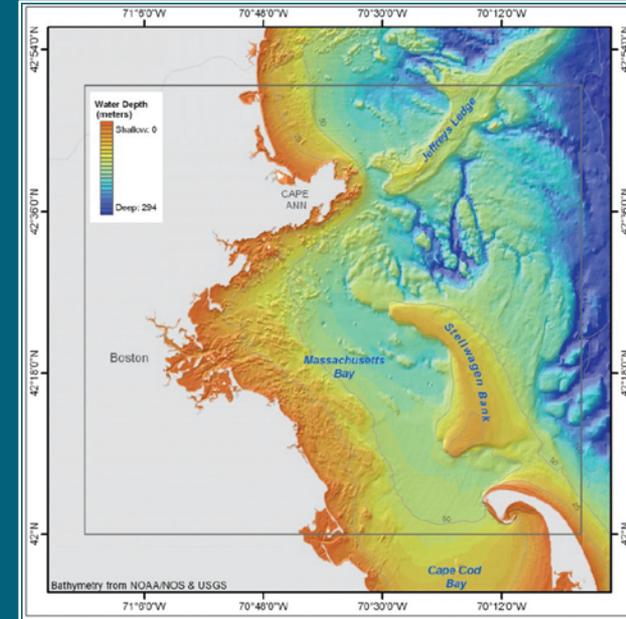
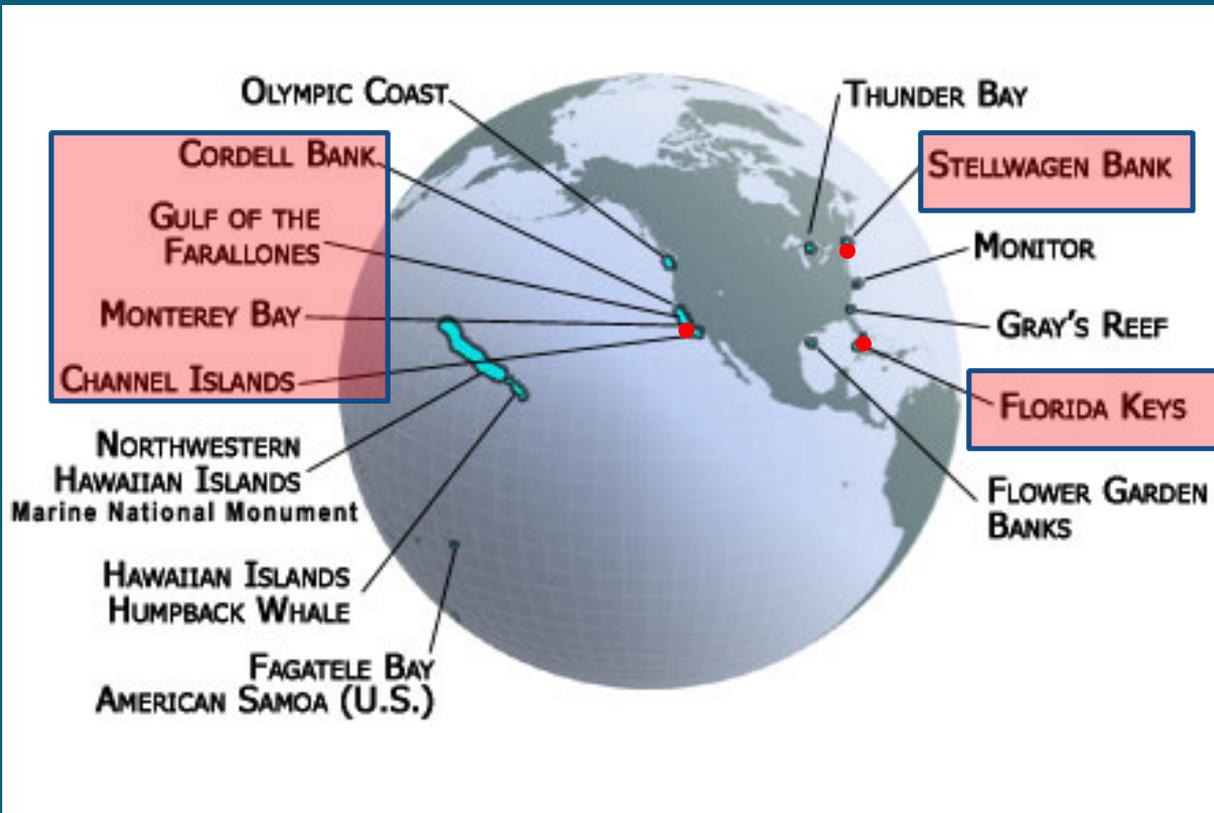
FUTURE



Historical Ecology Activities at NOAA

Research Goals:

1. Estimate historical biomass and biodiversity
2. Understand drivers that explain current state of sanctuary resources
3. Provide baseline information for sanctuary monitoring
4. Increase understanding of human and ecological history to inform decision making and increase public awareness

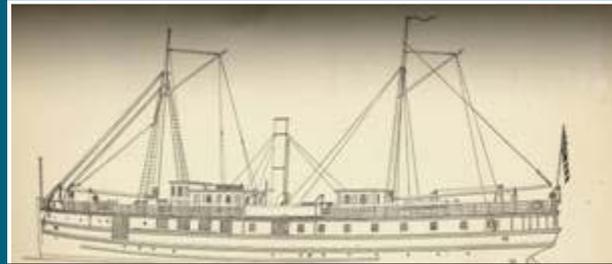




U.S. Fish Commission Historical Records



- Fisheries Catch Statistics
- Oral Histories
- Maps
- Scientific Survey Logbooks



U. S. COMMISSION OF FISH AND FISHERIES.
FISHERY STATISTICS.

STATEMENT of Quantities and Values of various Fishery Products landed at Gloucester and Boston, Mass., by American Fishing Vessels during the month of January, 1924.

SPECIES	QUANTITY		VALUE		PERCENTAGE OF TOTAL
	TONS	BOXES	DOLLARS	CENTS	
WATER BUCKLE	100		100		100
...
TOTAL	10,000	100,000	1,000,000	00	100

EAT FISH

U. S. FOOD ADMINISTRATION
U. S. BUREAU of FISHERIES
U. S. DEPARTMENT of AGRICULTURE
and THE FISH TRADE

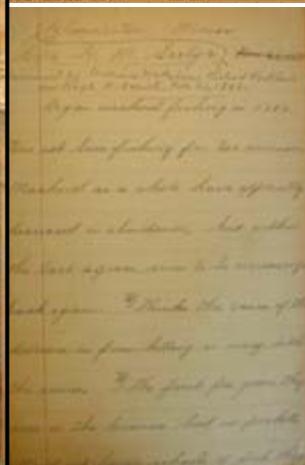
are helping you get

Fine Fish at Low Prices

HARD TAIL
(Mullet or Cynoscion)

THIS fish is half green above and yellow below or silver below. It is healthy, is plentiful wherever the Atlantic touches the land along where the tail. The soft slippery skin is thin and tender, so tenderly delicate as to be almost unrecognizable. It is one of the most important food fishes and is found in immense quantities off Florida, Alabama and Mississippi.

**Save Meat and Money
WIN THE WAR**

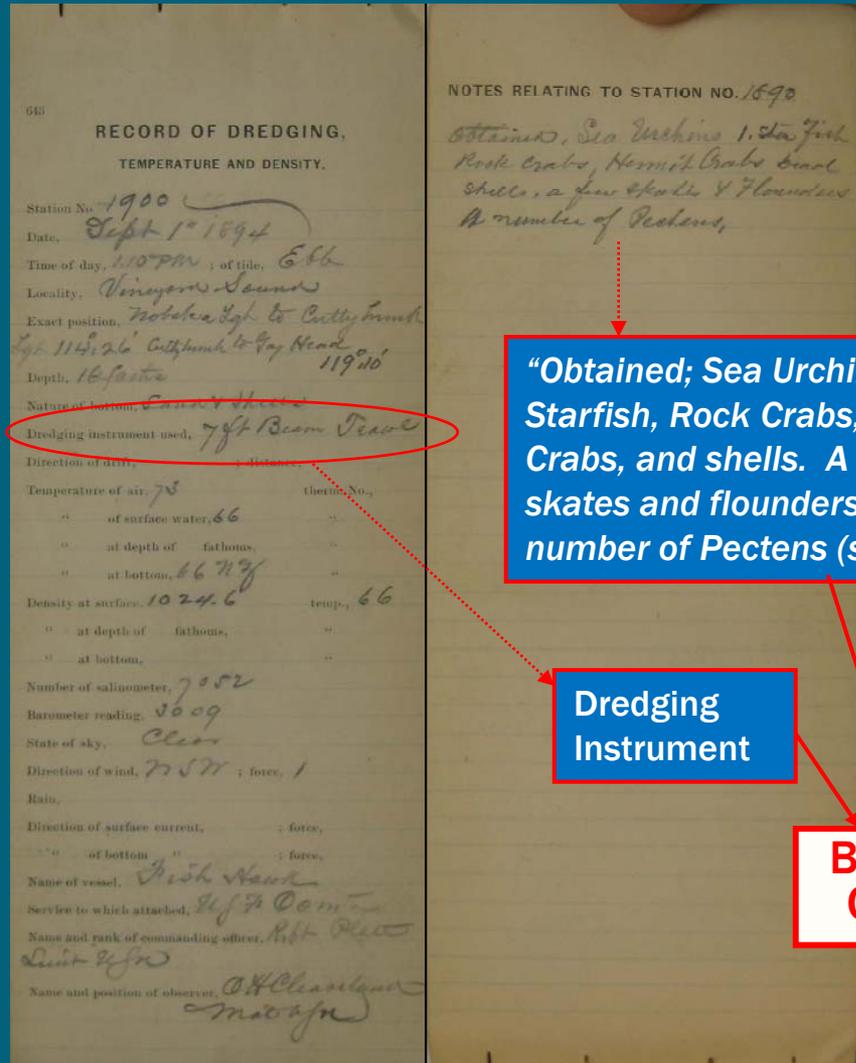


Climate and Biological Data in Survey Logbooks



**Atmospheric,
Geologic and
Oceanographic
Changes?**

- Date
- Position
- Depth
- Nature of Bottom
- Air Temperature
- Sea Surface Temperature
- Bottom Temperature
- Salinity
- Barometer
- Cloud Cover
- Wind

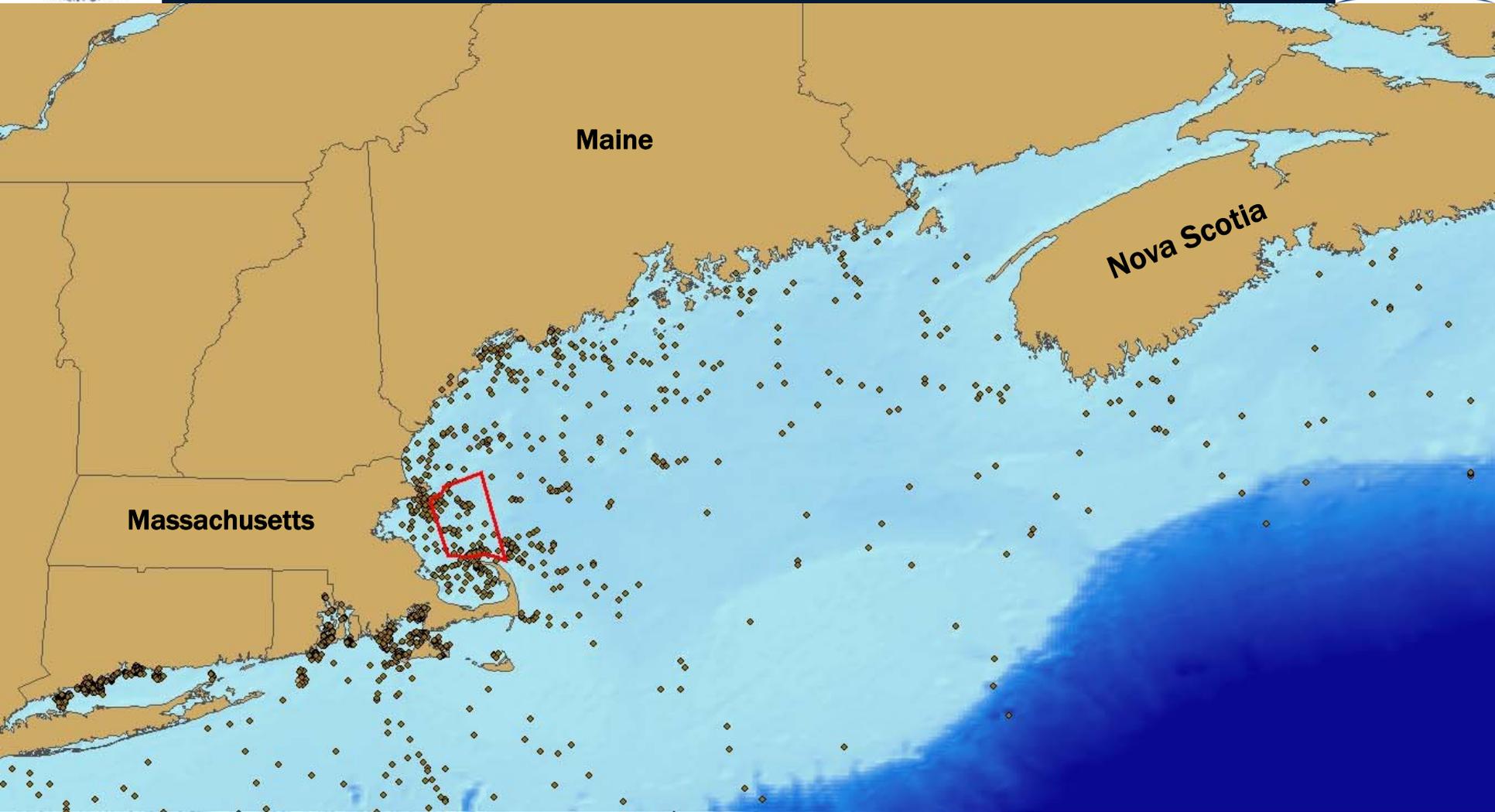


“Obtained; Sea Urchins, 1. Starfish, Rock Crabs, Hermit Crabs, and shells. A few skates and flounders a number of Pectens (scallops)”

Dredging Instrument

Biodiversity Changes?

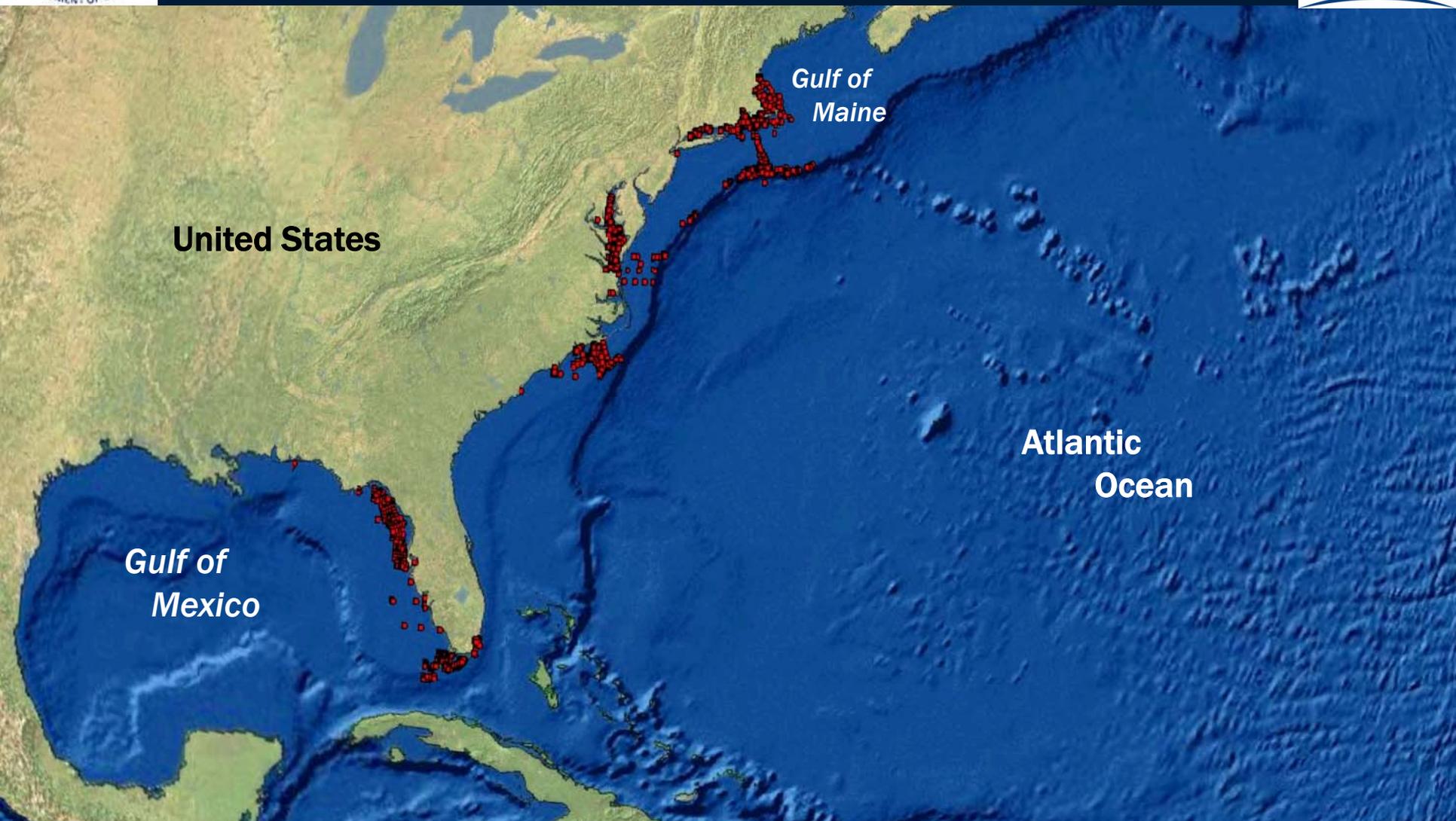
Gulf of Maine



Sea Surface, Bottom, and Water Column Temperatures and Salinity

- ca. 4000 Observations
- 1870s – 1920s

Fishhawk 1880-1925



Ca. 3000 survey stations

Albatross 1883-1921



**First research vessel
commissioned exclusively
for fisheries research by
the United States**

Missions:

Atlantic Shelf from Cape Hatteras to Newfoundland (1883)

Caribbean Sea (1884)

Northeastern Pacific Ocean, Bering Sea, and Alaska (1887)

West coast of Mexico, Central America, and the Galapagos Islands (1891)

San Francisco and Hawaii (1891)

San Diego Bay (1894)

Puget Sound (1896)

South Seas and Japan (1899)

U.S. West Coast, Hawaii, and Mexico (1900)

West coast of South America to Galapagos, Easter, and Gambier Islands (1904)

Japanese seas, Aleutian Islands, Petropaulski, Kamchatka, and the Kuril Islands (1906)

Philippines (1907)

Alaska and West Coast (1911)

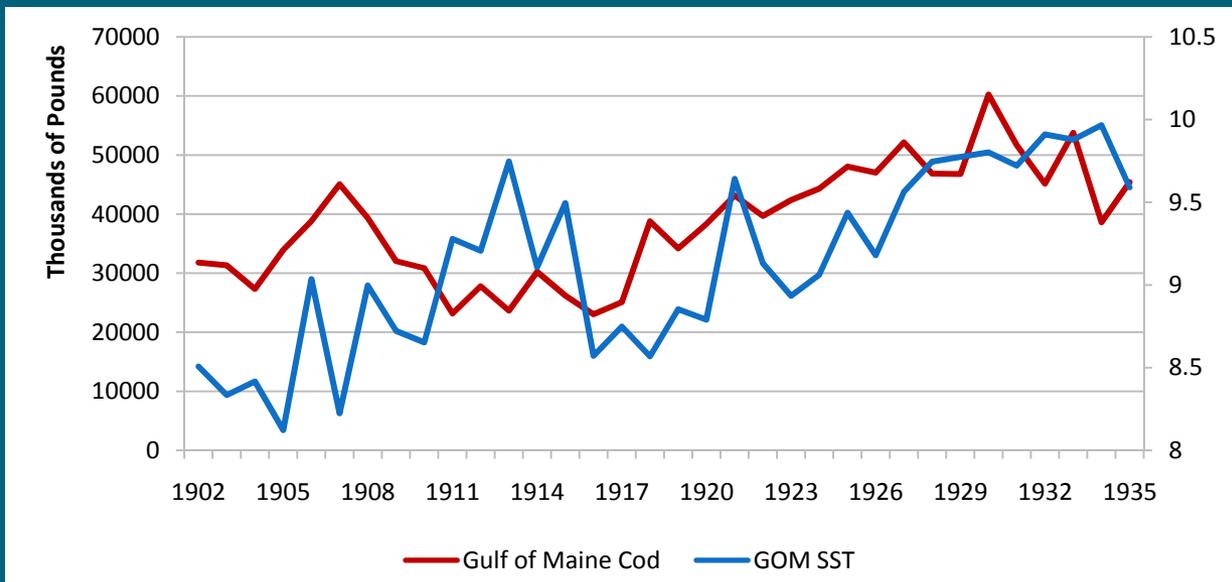
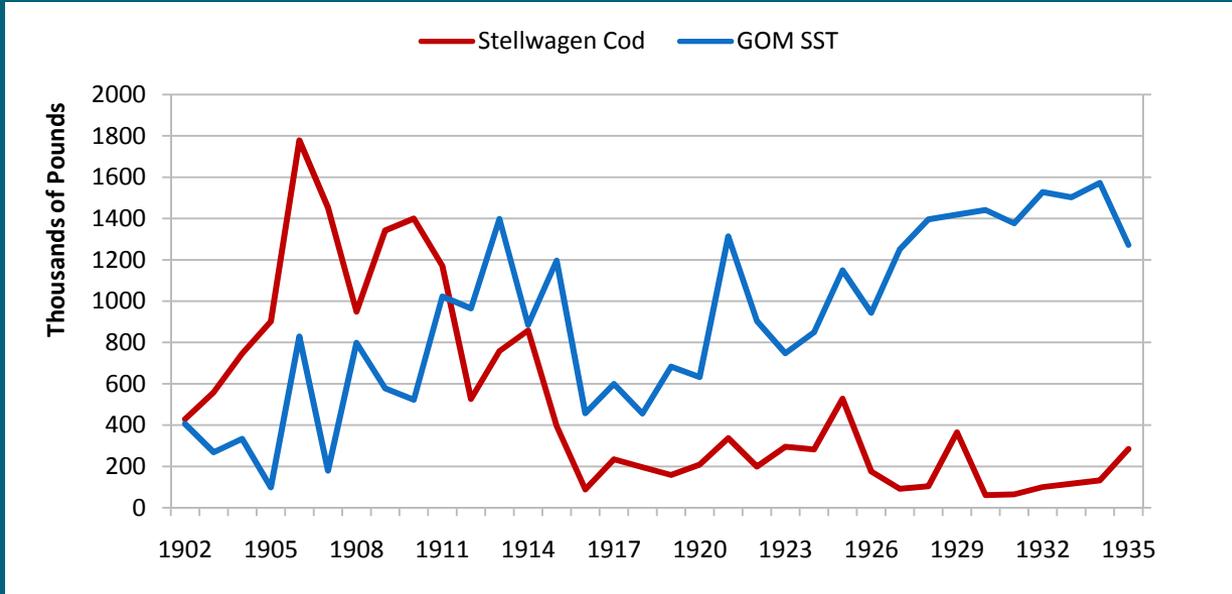
San Francisco Bay (1912)

Cuba and off the South Atlantic coast (1917)

Gulf of Maine (1920)



Coupling Marine Climatology and Biology



Why?



- Documenting history of marine ecosystems to identify:
 - Potential **productivity** of the oceans
 - Ecological **baselines**
 - Long-term ecosystem **changes** and proximate **causes**



**What do we
want the
future to be?**

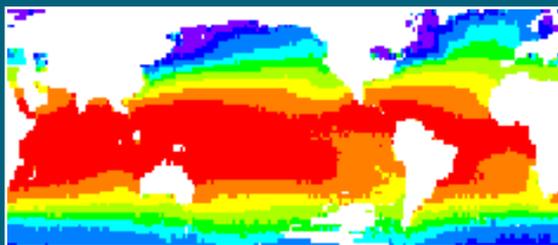
- What should **recovery** of depleted resources look like?
 - Restoration based on historical knowledge

Building Partnerships in Research

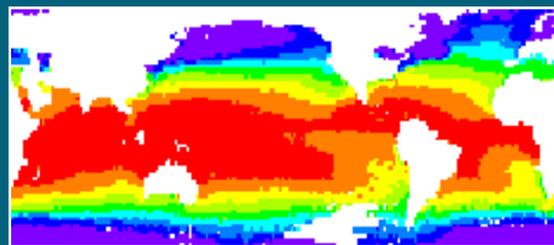


GOAL: Integrate historic climate data with ICOADS and the World Ocean Database.

- **2004:** UNH conduct historical research and identify relevant U.S. Fish Commission records at National Archives
- **2005-2007:** CDMP funds digital imaging and data entry of U.S. Fish Commission records containing time series of Northwest Atlantic fisheries.
- **2008:** CDMP funds digital imaging of U.S. Fish Commission scientific survey vessels logbooks
- **2009:** Propose data entry of atmospheric, physical oceanography, biological, and geological information from logbooks



Air temperature



Sea Surface temperature



Thank you!



- CLIMAR-III
- Polish Hydro-Meteorological Service
- University of Gdańsk, Institute of Oceanography
- NOAA Marine Sanctuary Program
- NOAA Earth System Research Laboratory



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