

Monitoring and Observing Exploited Marine Resources in the Gulf of Maine

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Monitoring Exploited Resources:

Fishery Dependent Data

Commercial fisheries

Recreational fisheries

Observing Marine Resources:

Fishery Independent Data

Research Surveys

Cooperative Research

Fishery Dependent Data

Commercial Fisheries

- Dealers

 - Landings and Economic data

- Fishermen

 - Interviews (1964-1994)

 - Mandatory Reporting (1994-present)

 - Area fished ; Location

 - Species Caught

 - Effort

- Biological Samples

 - Length frequencies

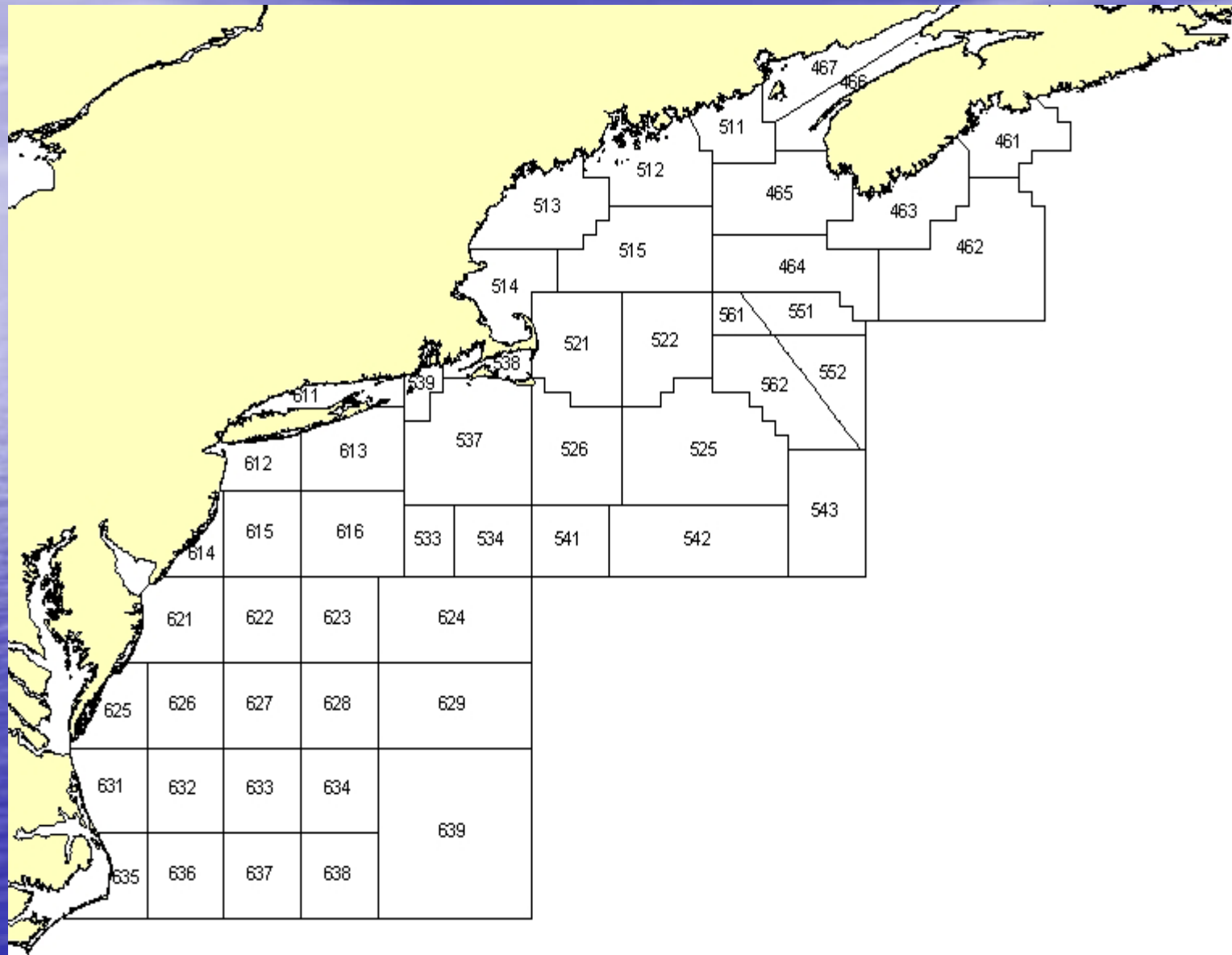
 - Age structures

Recreational Fisheries

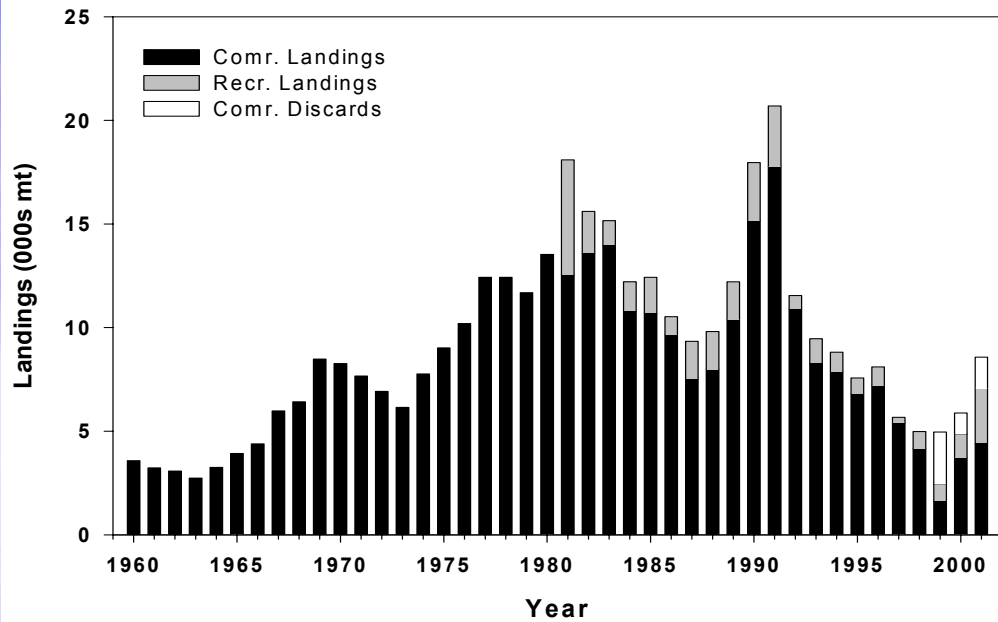
 - Intercept

 - Phone survey

NAFO Statistical Areas
based on historical fishing grounds

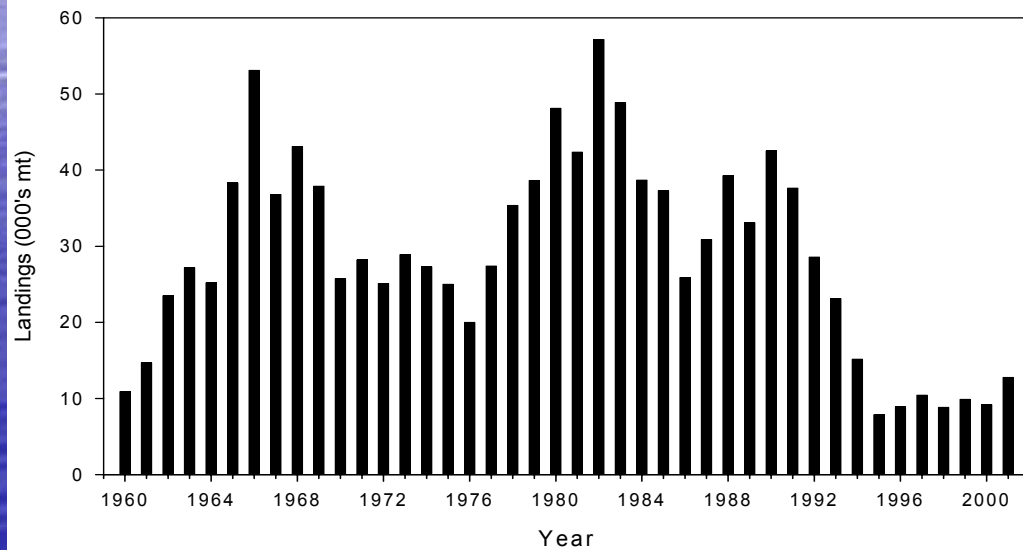


Gulf of Maine Cod

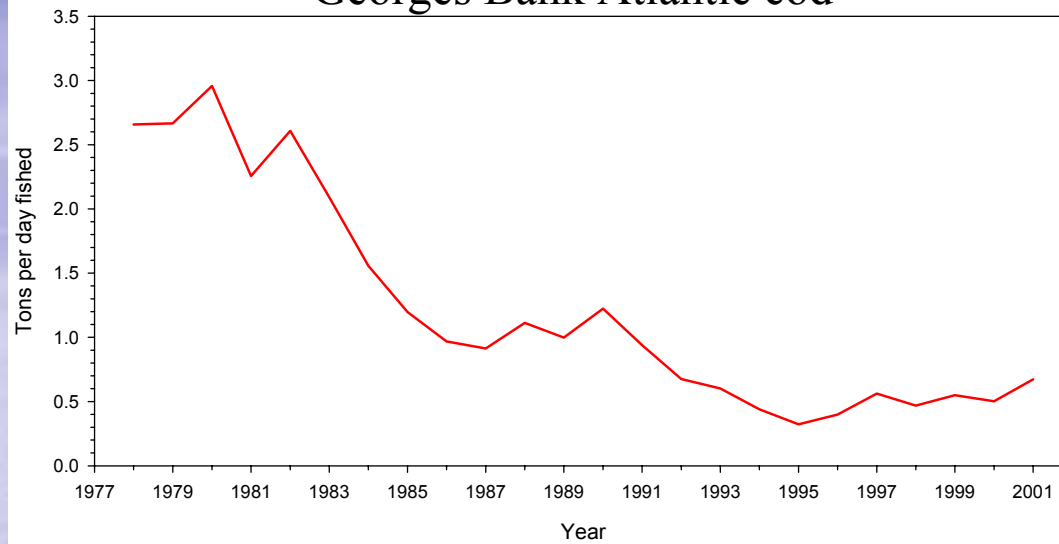


Landings by area ; stock

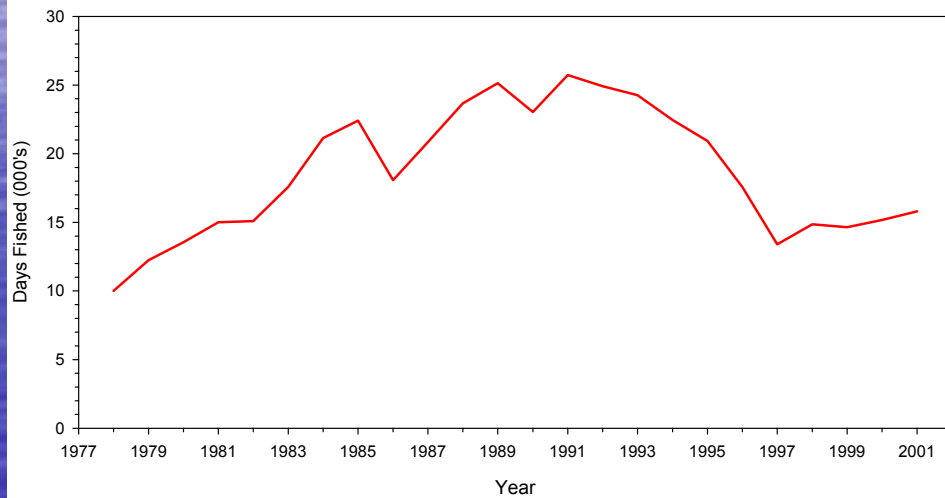
Georges Bank Cod



Georges Bank Atlantic cod



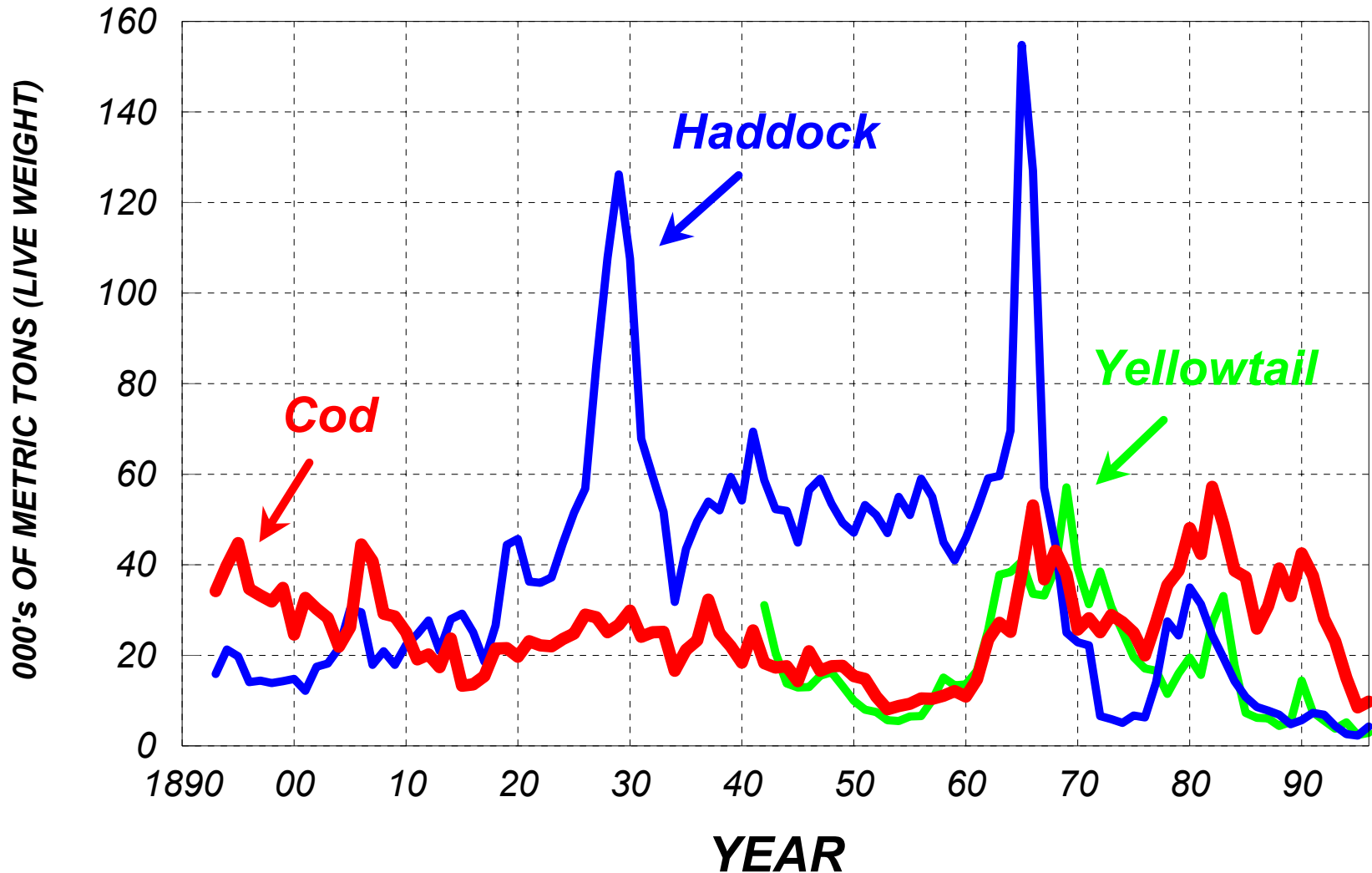
LPUE time series



Effort time series

COD, HADDOCK & YELLOWTAIL

Georges Bank & Southern New England



Fishery Independent Data

NEFSC Research Surveys

Stratified random bottom trawl survey

- Spring (1968- present)
- Autumn (1963- present)
- Winter (1992- present)

Stratified random shellfish survey

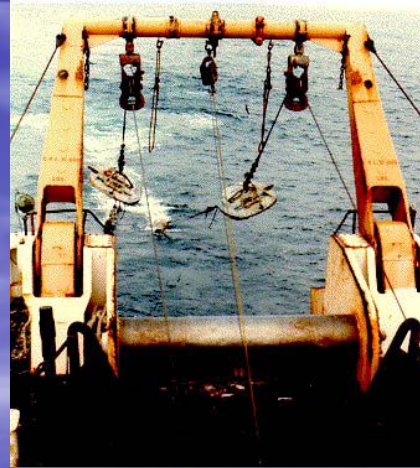
- Scallop (1975-present)
- Clam (1965-present)

Hydroacoustic surveys

Herring and mackerel (1997-present)

Ecosystem Monitoring Surveys (1996-present)

Marine Mammal surveys (1989-present)



Objectives of the bottom trawl survey:

To monitor fluctuations in structure and size of fish populations –
to provide a measure of the effects of fishing that is independent
of commercial fishery statistics

To assess the production potential of Atlantic coastal waters

To determine environmental factors controlling fish distribution
and abundance

To provide basic ecological data on fishes (e.g., growth rates and food)
necessary to understand interrelationships between fish and their
environment

Grosslein 1969

Stratified random surveys

- Stratified by depth and area
- Stations allocated by area
- Station protocol established:
 - duration of tow
 - configuration of gear
 - monitoring of gear
 - qualitative assessment of each station



Albatross IV

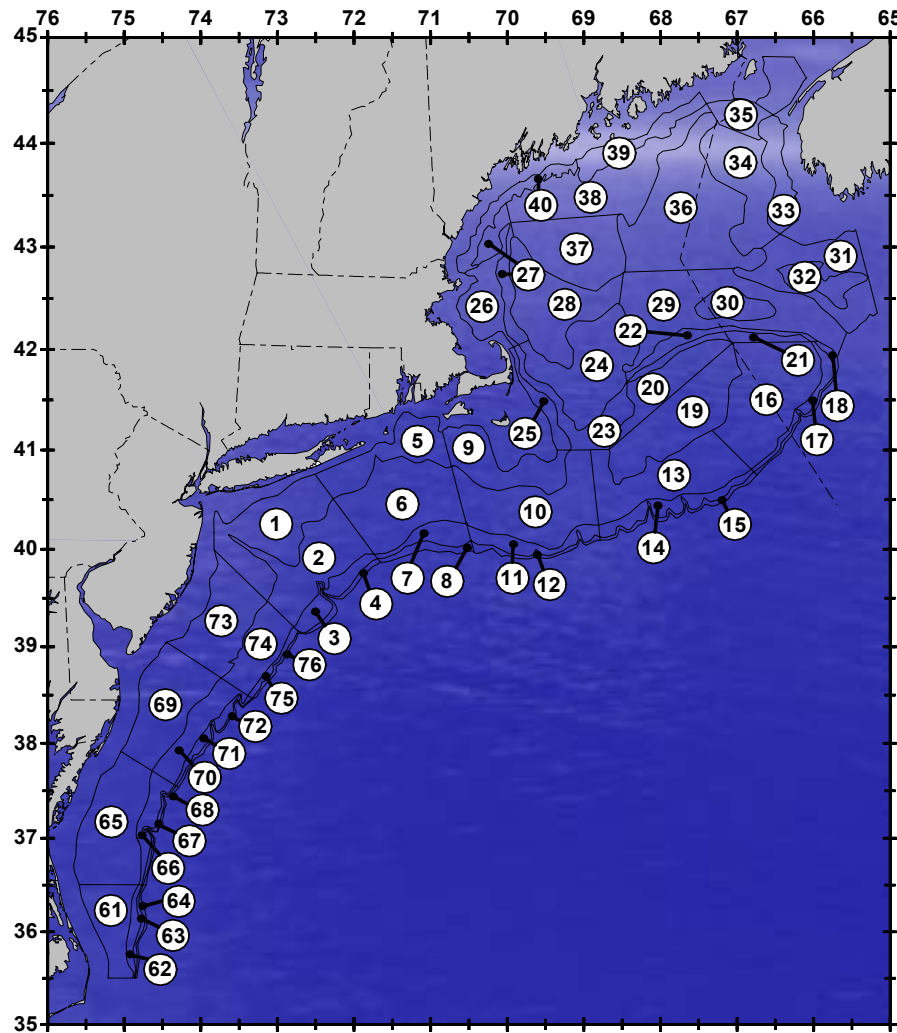


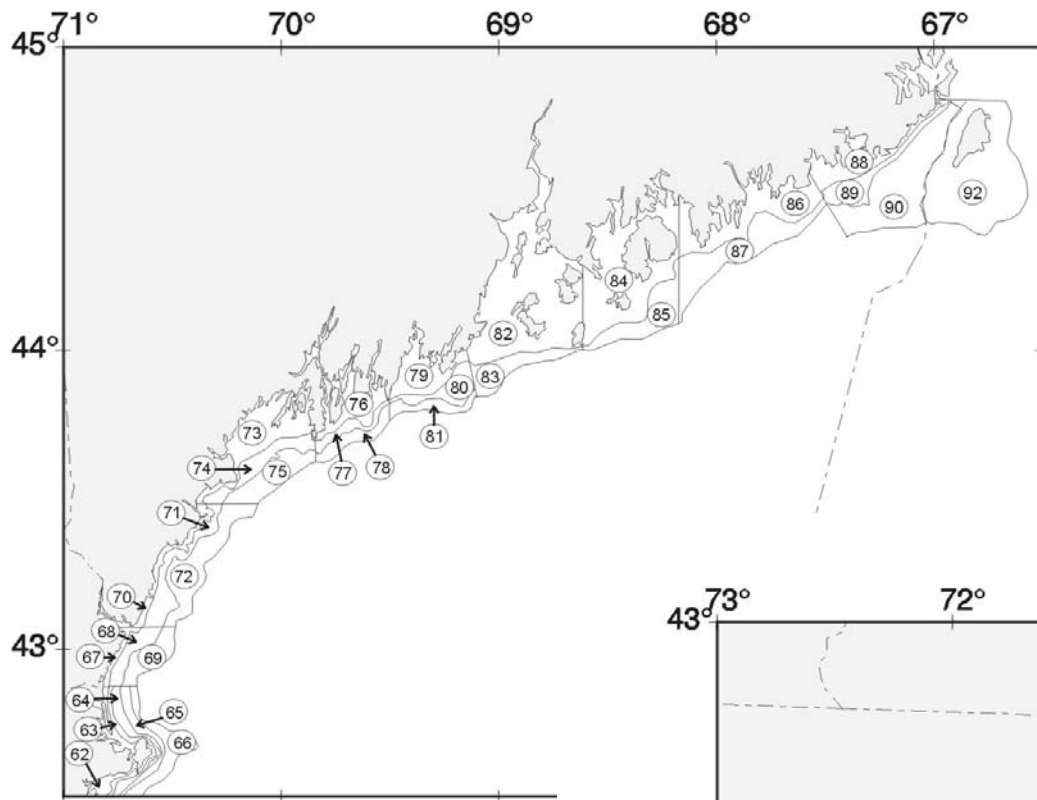
Delaware II



Albatross IV

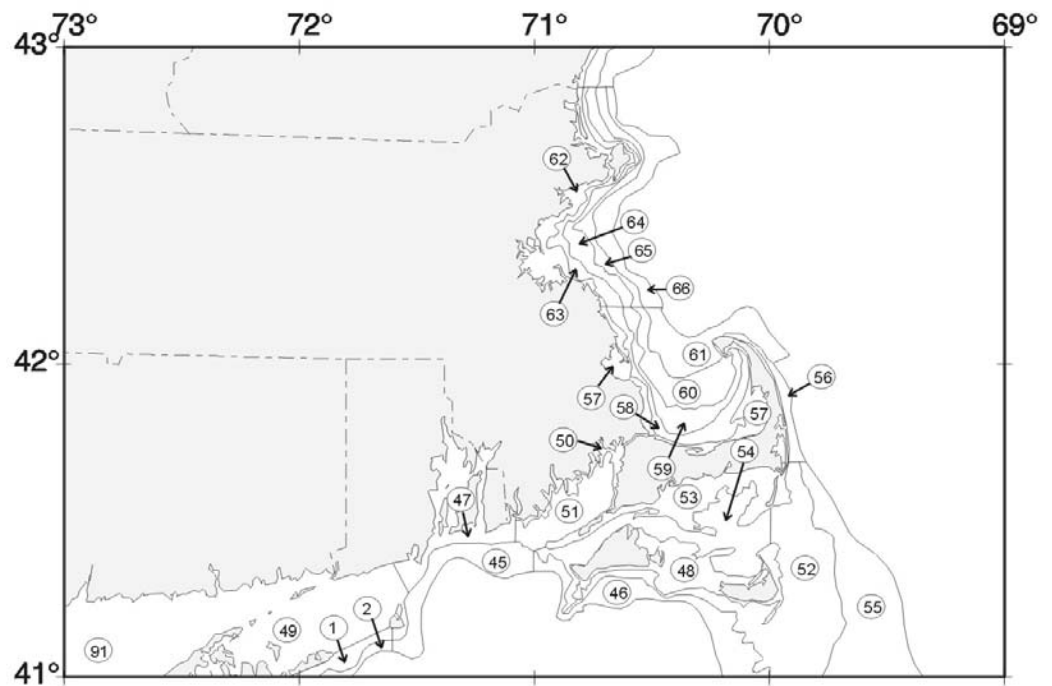
NEFSC offshore bottom trawl survey strata





NEFSC Inshore

Northern extension of
NEFSC inshore bottom trawl
survey strata



NEFSC Inshore Bottom Trawl Survey Strata - Cape Cod & Southern New England Areas

Routine Sampling

Biological Sampling:

- ✓ Weight of catch
- ✓ Length frequency
- ✓ Age structure
- ✓ Food habits
- ✓ Sex and Maturity



Physical sampling: CTD

- ✓ Temperature
- ✓ Salinity
- ✓ Depth



Routine Sampling

Special Sampling (i.e. blood samples, skate maturity, specimens for id)

- ✓ NEFSC
- ✓ Academia
- ✓ Others



Additional Co-operative Surveying:

- ✓ Phytoplankton/Zooplankton
- ✓ CTD
- ✓ Sea bird observers
- ✓ Marine Mammal observer



FSCS (Fisheries Scientific Computer System) –at sea electronic data entry system

Products from research cruises:

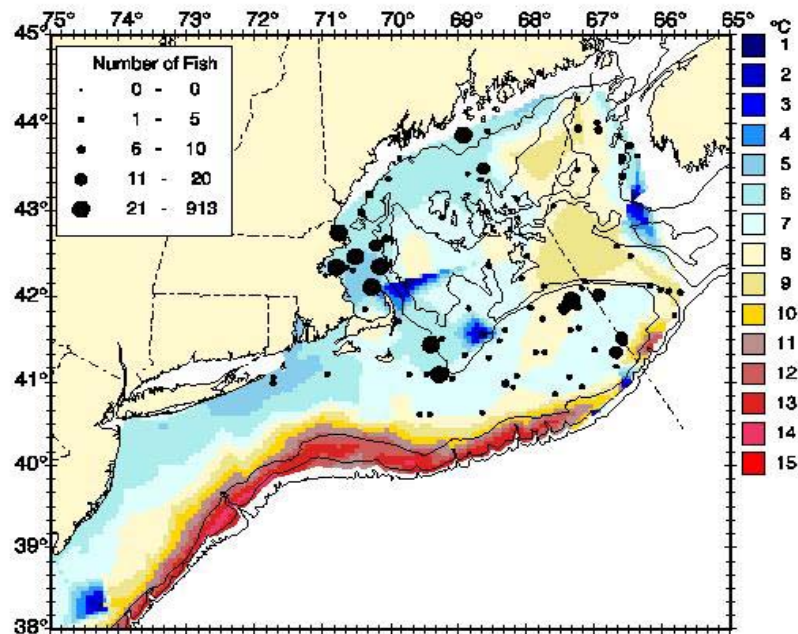
Spatial and Temporal Distributions

Abundance and Biomass Time series

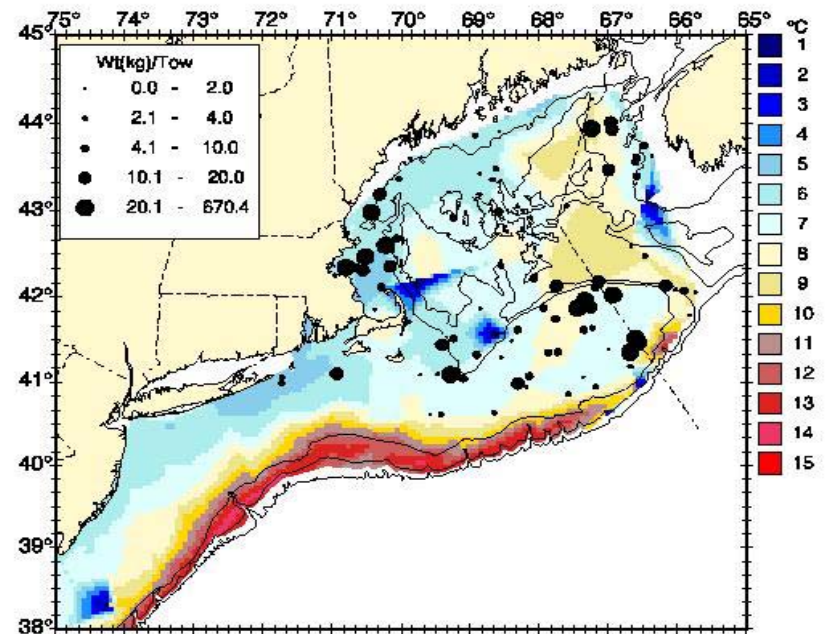
Length and age frequencies

Length weight equations: basic biology and auditing

Temperature series



Distribution of Atlantic cod in the NEFSC Spring Bottom Trawl Survey for 2000 in relation to bottom temperatures.



Distribution of Atlantic cod in the NEFSC Spring Bottom Trawl Survey for 2000 in relation to bottom temperatures.

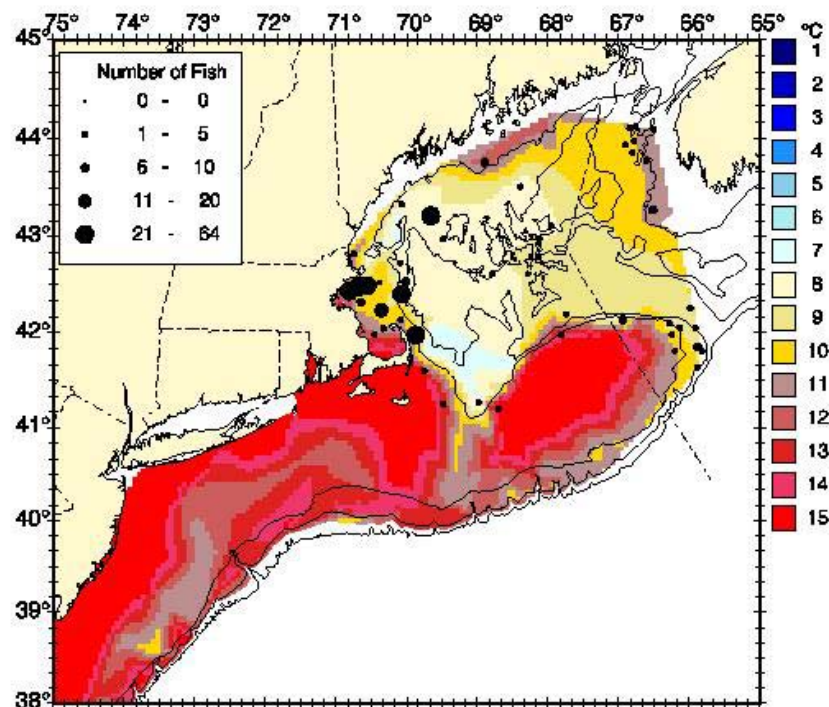


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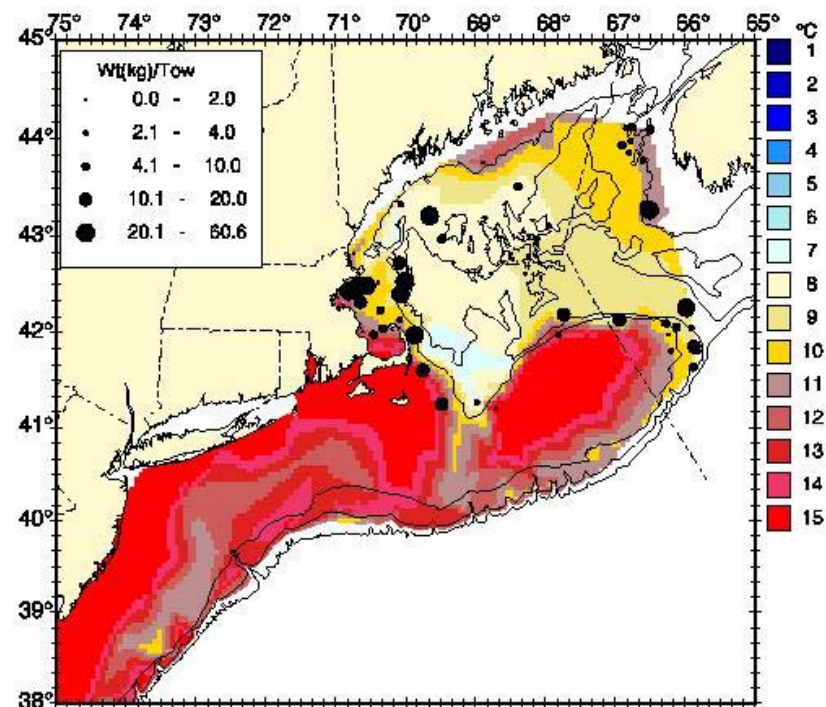


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Distribution of species with temperature overlay



Distribution of Atlantic cod in the NEFSC Autumn Bottom Trawl Survey for 2000 in relation to bottom temperatures.



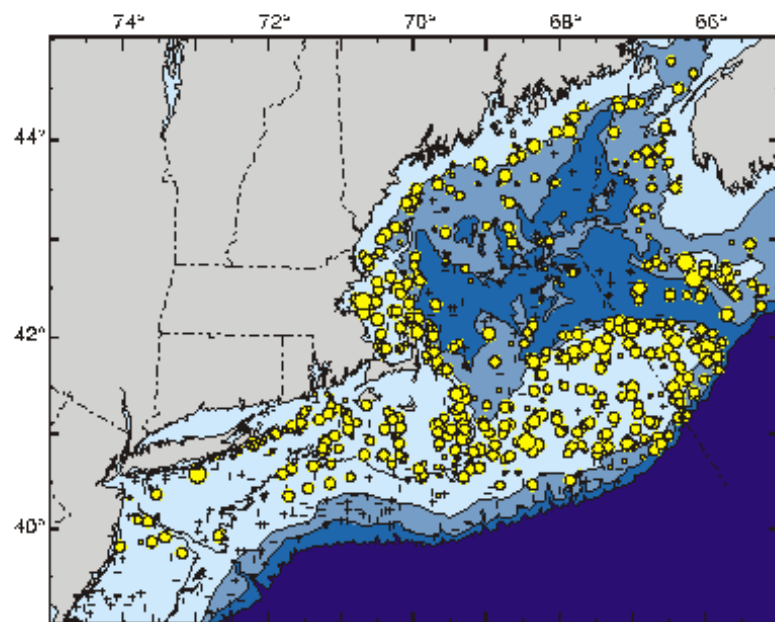
Distribution of Atlantic cod in the NEFSC Autumn Bottom Trawl Survey for 2000 in relation to bottom temperatures.



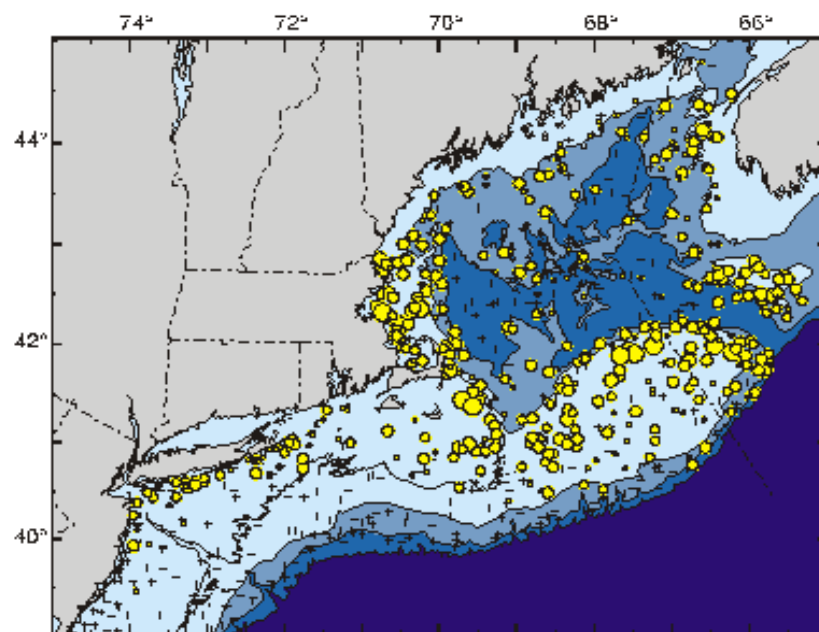
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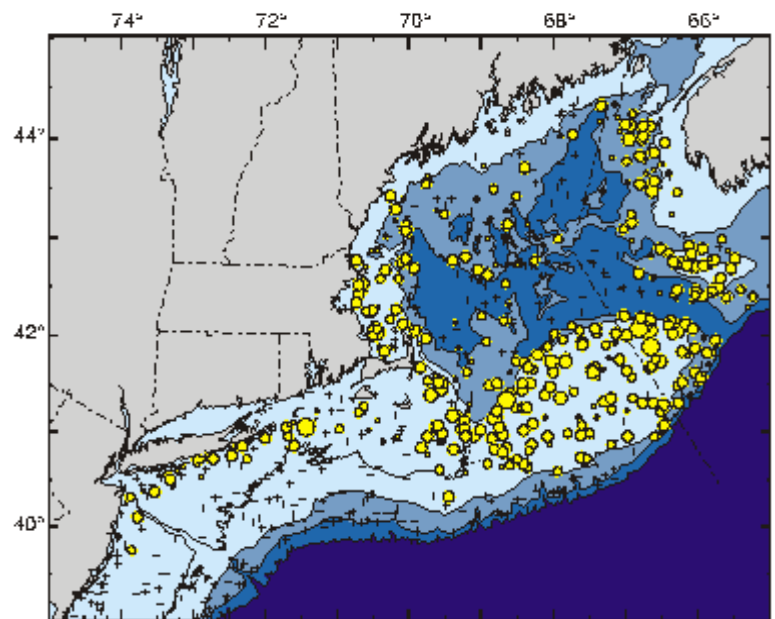


Spring 1979-1981

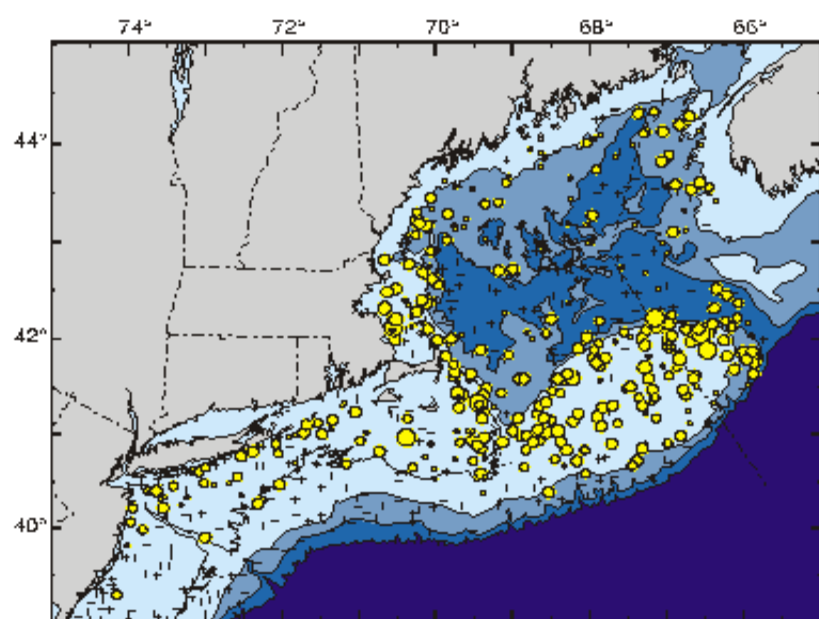


Spring 1982-1984

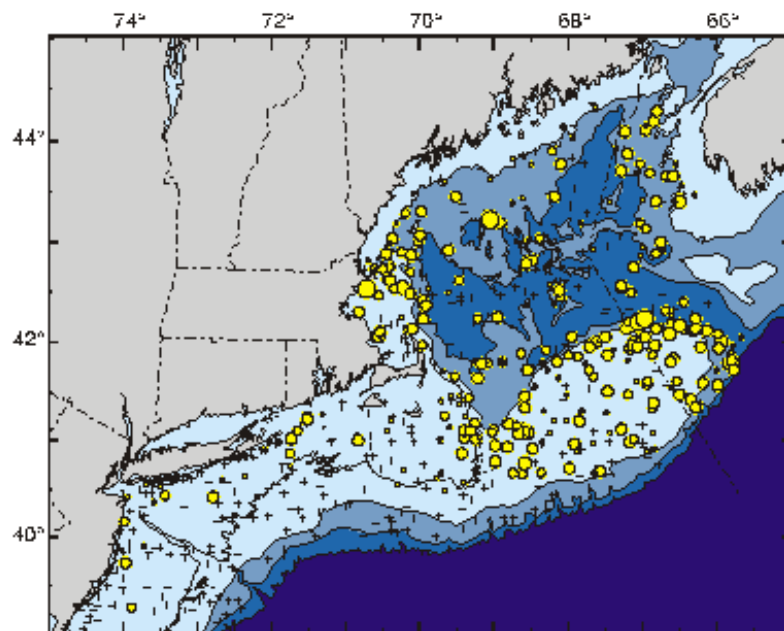
Atlantic cod



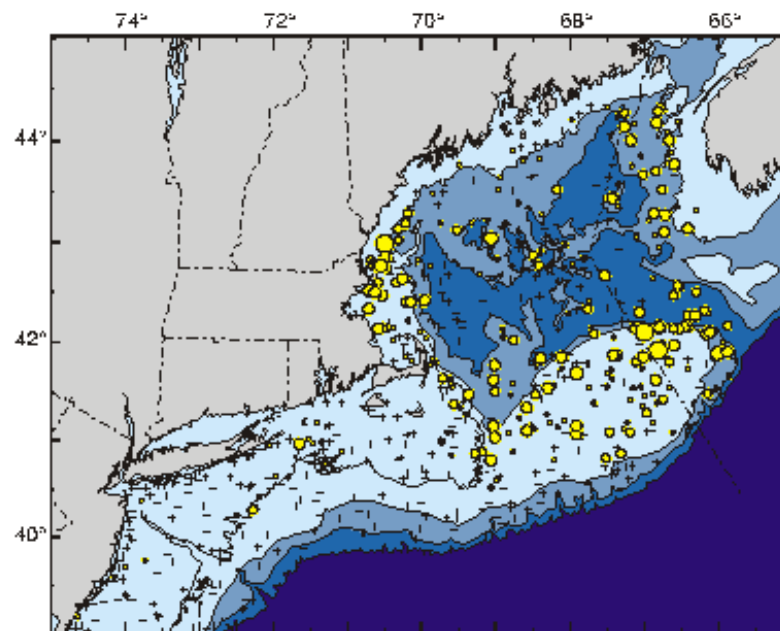
Spring 1985-1987



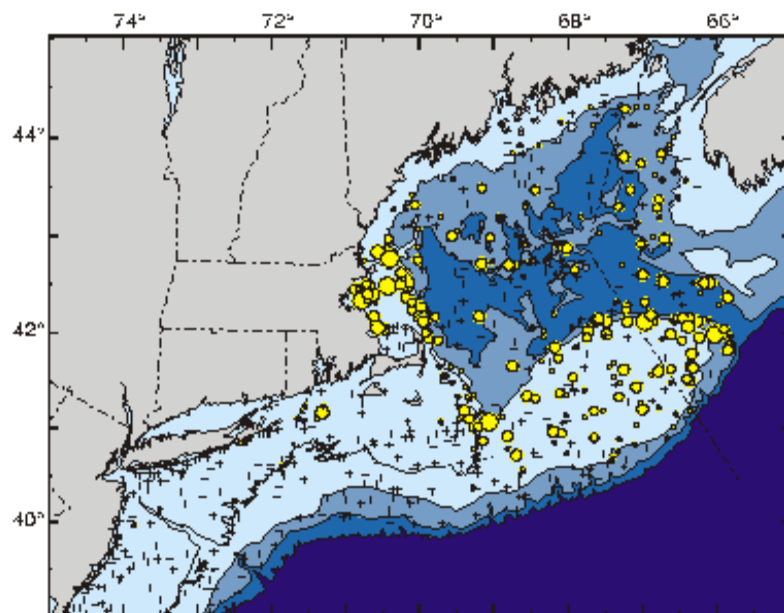
Spring 1988-1990



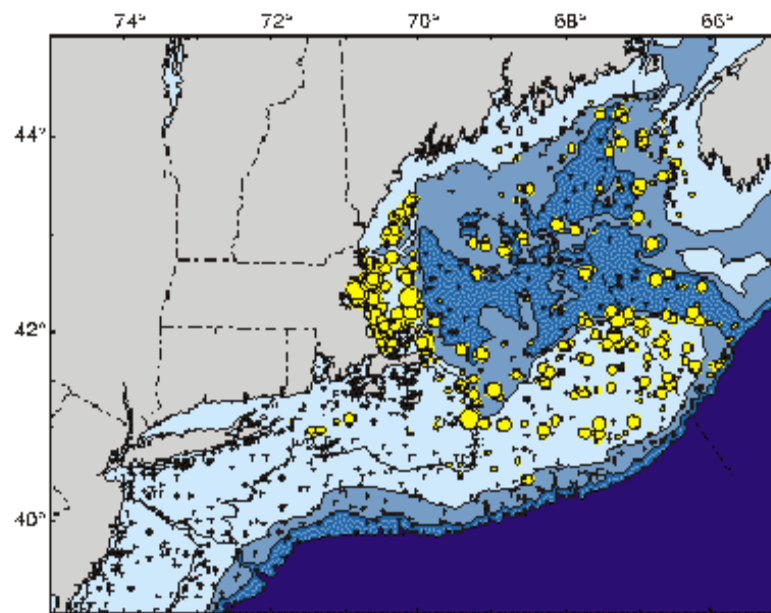
Spring 1991-1993



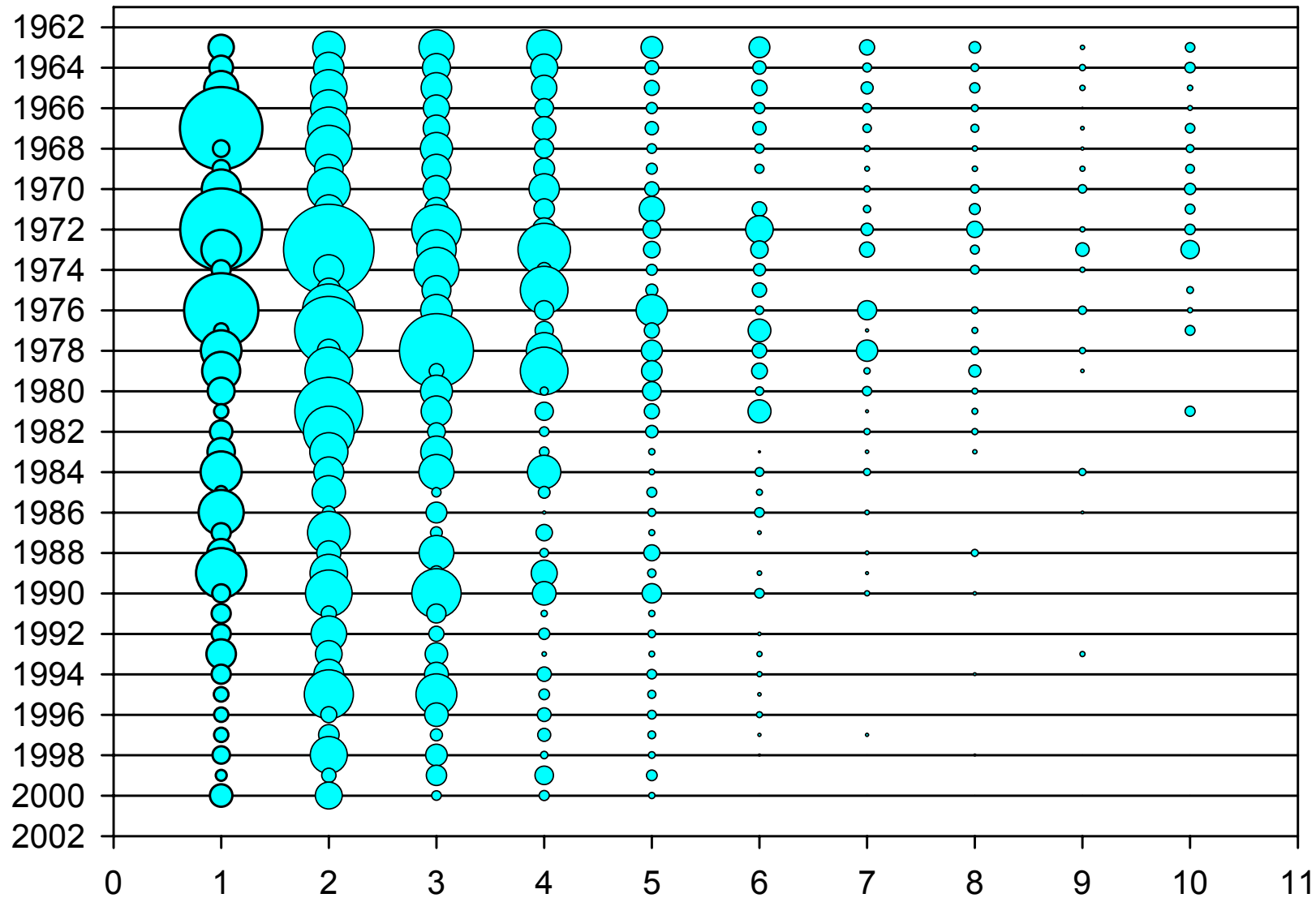
Spring 1994-1996



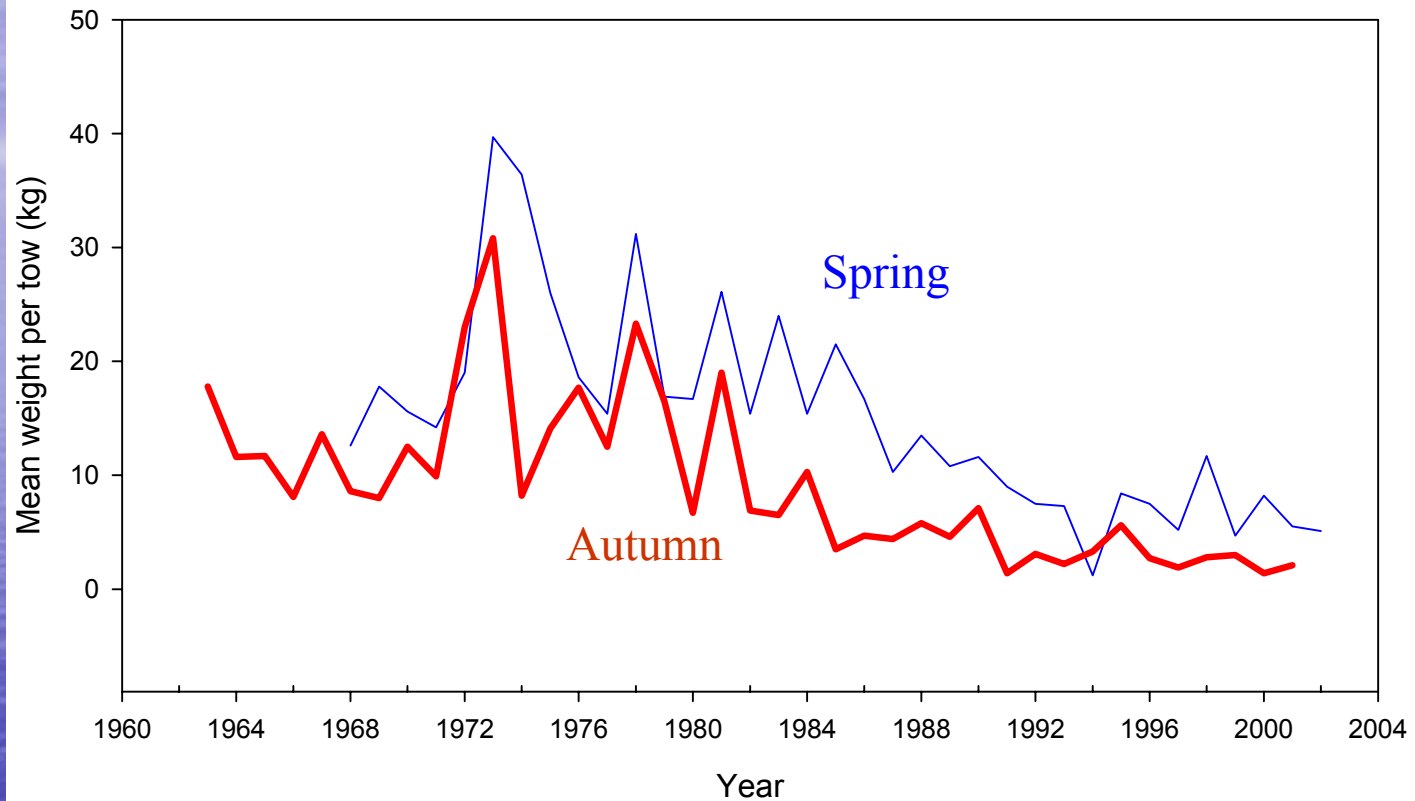
Spring 1997-1999



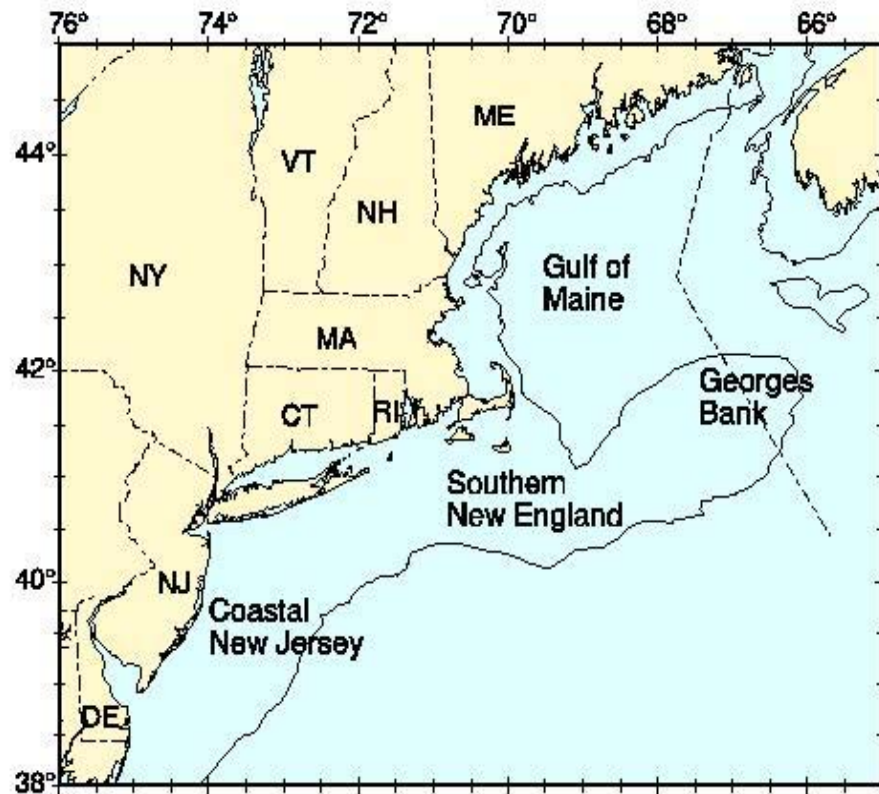
Spring 2000-2002



Stratified mean catch per tow at age – Georges Bank cod



Stratified mean weight per tow (kg) for Georges Bank cod



Data exchange and cooperative assessments with Canada for Transboundary stocks (cod, haddock, yellowtail flounder).

Stock Assessments:

Single species assessments –

Assessment model is data-dependent:

Age /Size structured model : apply landings and survey data at age/size

Production Model : apply landings and survey data, age aggregated

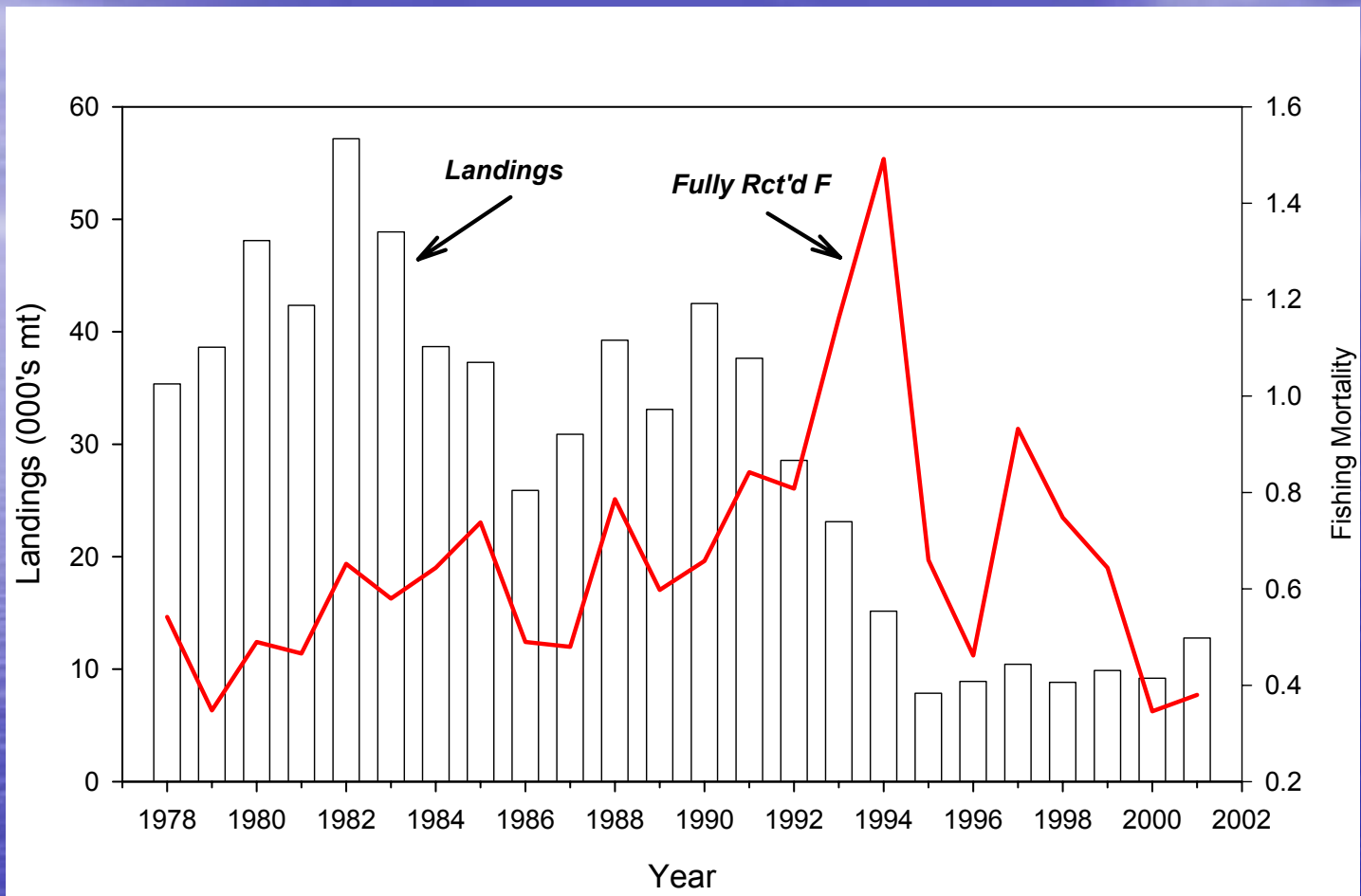
Index: apply only survey or commercial data.

Peer Review

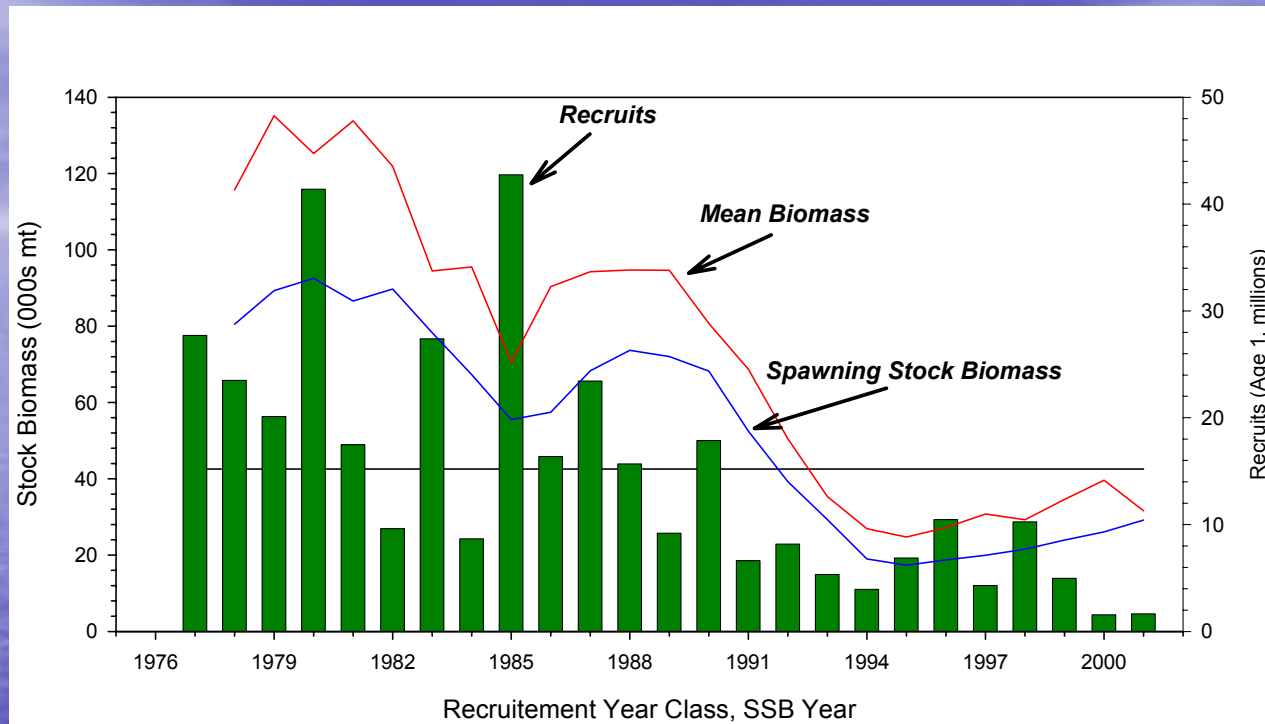
Northeast Regional Stock Assessment Review Committee (SARC)

US/Canada Tranboundary Resources Assessment Committee (TRAC)

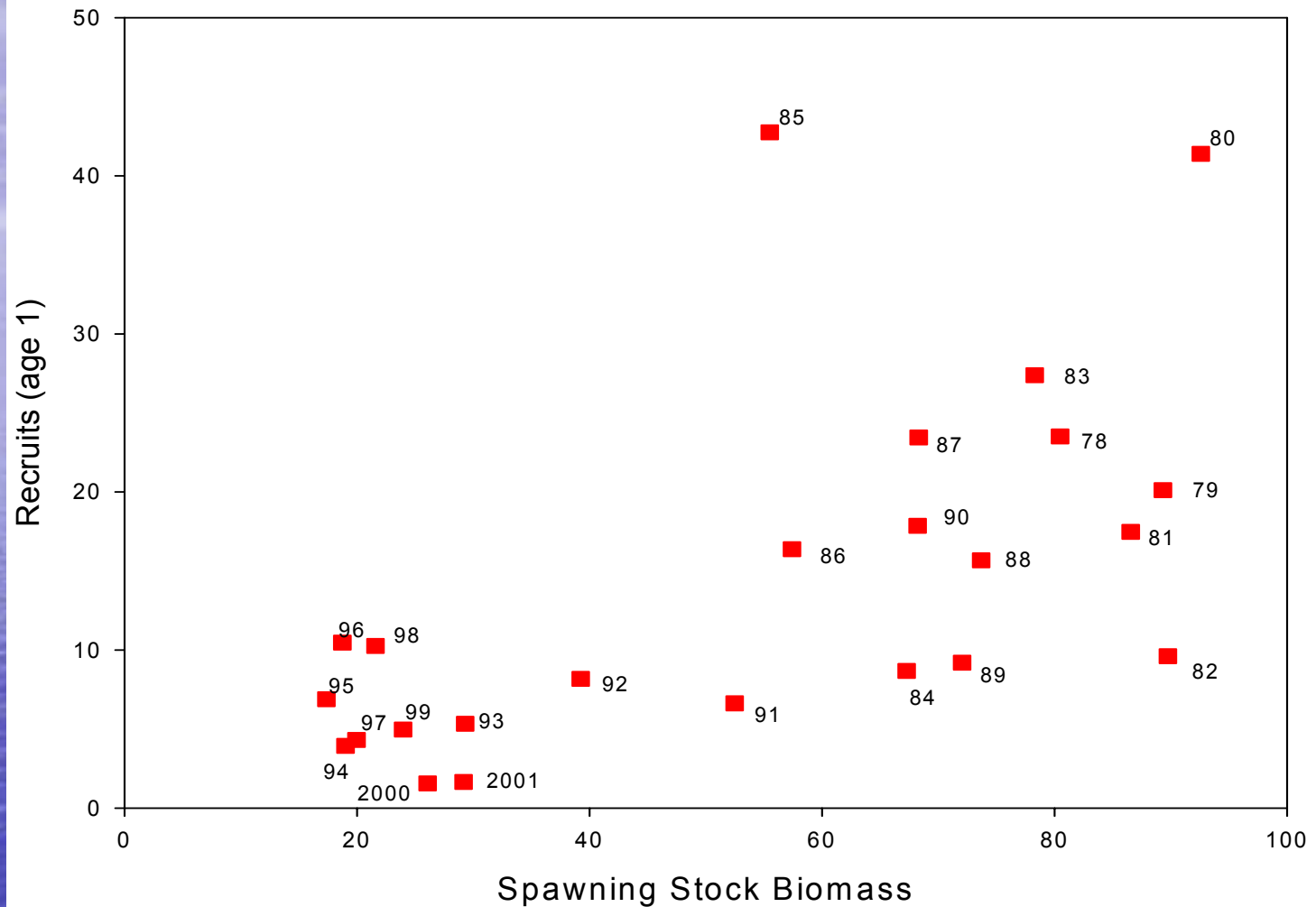
Georges Bank: Cod, Haddock, Yellowtail flounder, Herring



Time series of Fishing mortality estimates from an age structured model



Time series of spawning stock biomass, mean biomass, and recruitment



*Spawning stock biomass and recruitment relationship
relevant to estimation of biological reference points*

Current simultaneous goals for NOAA Fisheries assessments

Assessment levels

- 0 = none
- 1 = index only (commercial or research CPUE)
- 2 = simple life history equilibrium models
- 3 = aggregated production models
- 4 = size/age/stage structured models
- 5 = add ecosystem (multispecies, environment),
spatial & seasonal analyses

TIER 3

Next generation assessments

- ▶ assess all managed species or species groups at a minimum level of 3
 - ▶ assess core species at a Level of 4 or 5
 - ▶ explicitly incorporate ecosystem considerations, environmental effects, oceanography, spatial analyses



TIER 2

Elevate all assessments to new national standards of excellence

- ▶ upgrade to at least Level 3 for core species
- ▶ adequate baseline monitoring for all managed species



TIER 1

Improve assessments using existing data

- ▶ more comprehensive for core species
- ▶ mine existing databases for species of unknown status

Northeast Fisheries Science and Research Center

<http://www.nefsc.noaa.gov/>

Commercial landings:

<http://www.st.nmfs.gov/st1/commercial>

MRFSS : Marine recreational fisheries statistics Survey

<http://www.st.nmfs.gov/st1/recreational>

In the Near Future:

NEFSC & DFO Groundfish Survey Data

[http:// NWAGS](http://NWAGS) : Northwest Atlantic Groundfish Surveys

