An Update on Spiny Dogfish in the Northeast

Spiny Dogfish Forum
Philadelphia, PA
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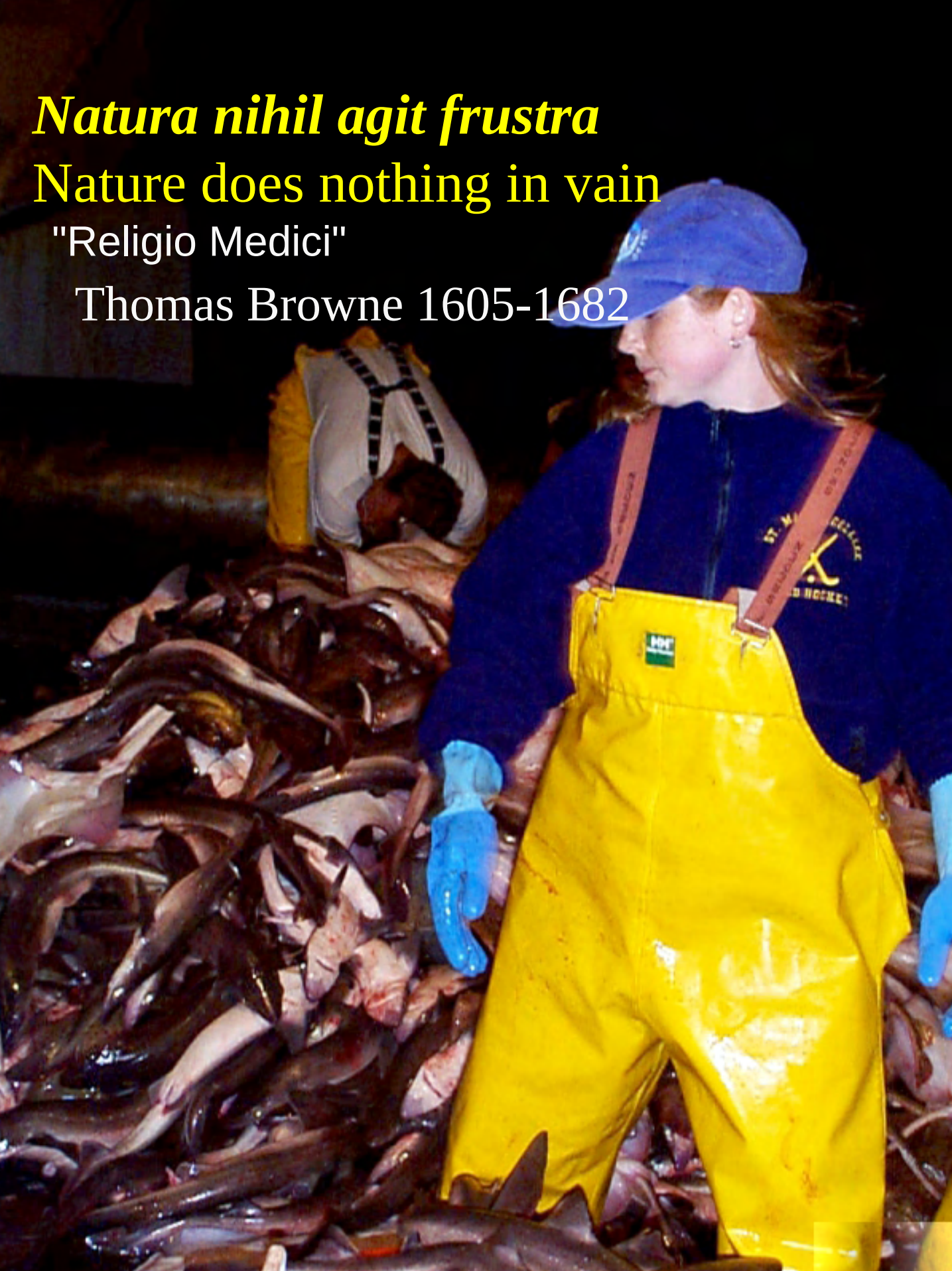
http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0614/

http://www.nefsc.noaa.gov/nefsc/saw/saw43/SARC43summary%20report-July10-%202006-no-OQ.pdf

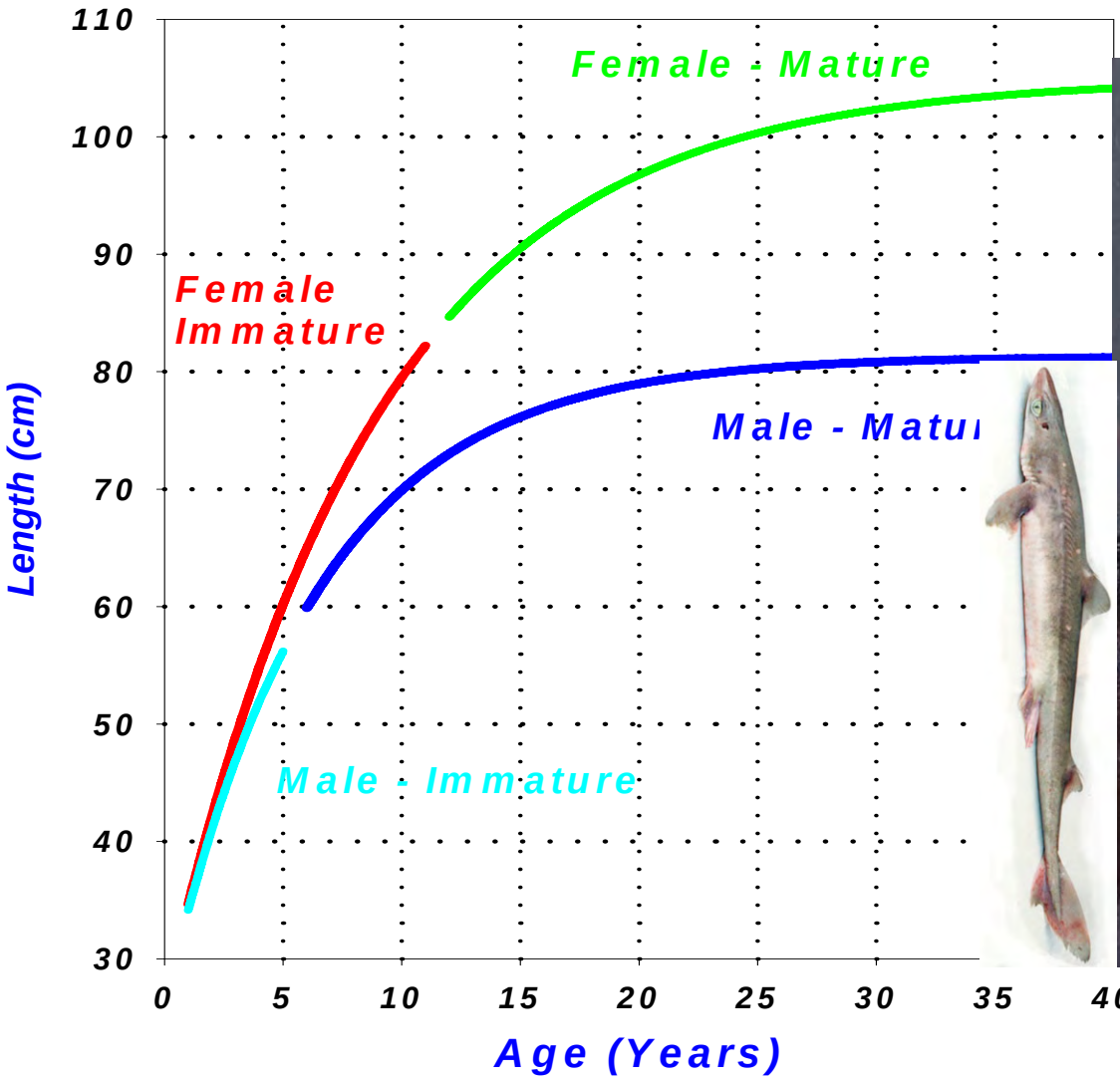

Natura nihil agit frustra
Nature does nothing in vain
"Religio Medici"
Thomas Browne 1605-1682

Overview

- Basic Biology
- Fishery History
- Distribution Patterns
- Effects of Fishery on Population
- Reconsiling Alternative Views —Are fishermen and scientists seeing the same patterns?
- What should a future fishery look like?

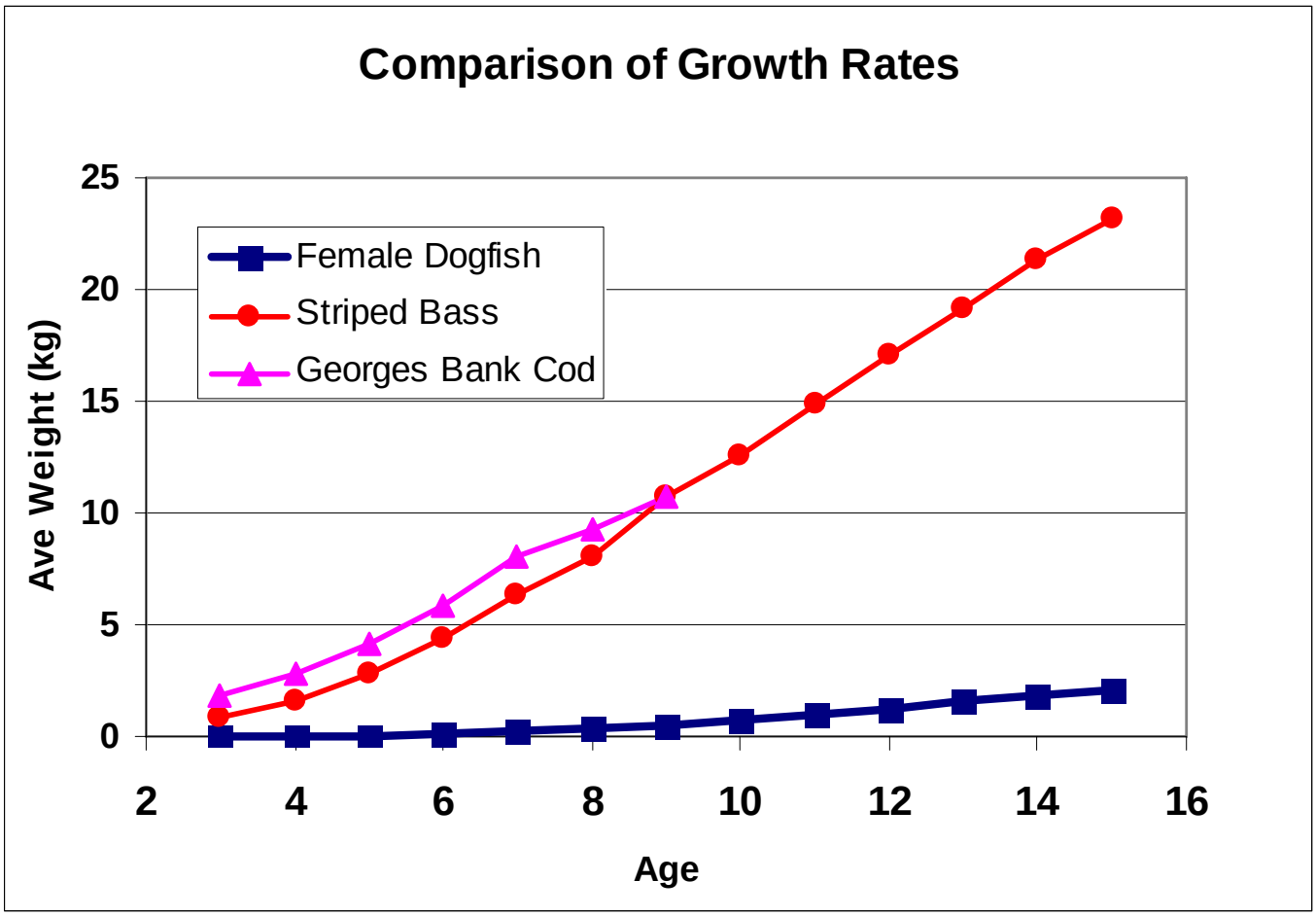
Spiny Dogfish Life History and Distribution

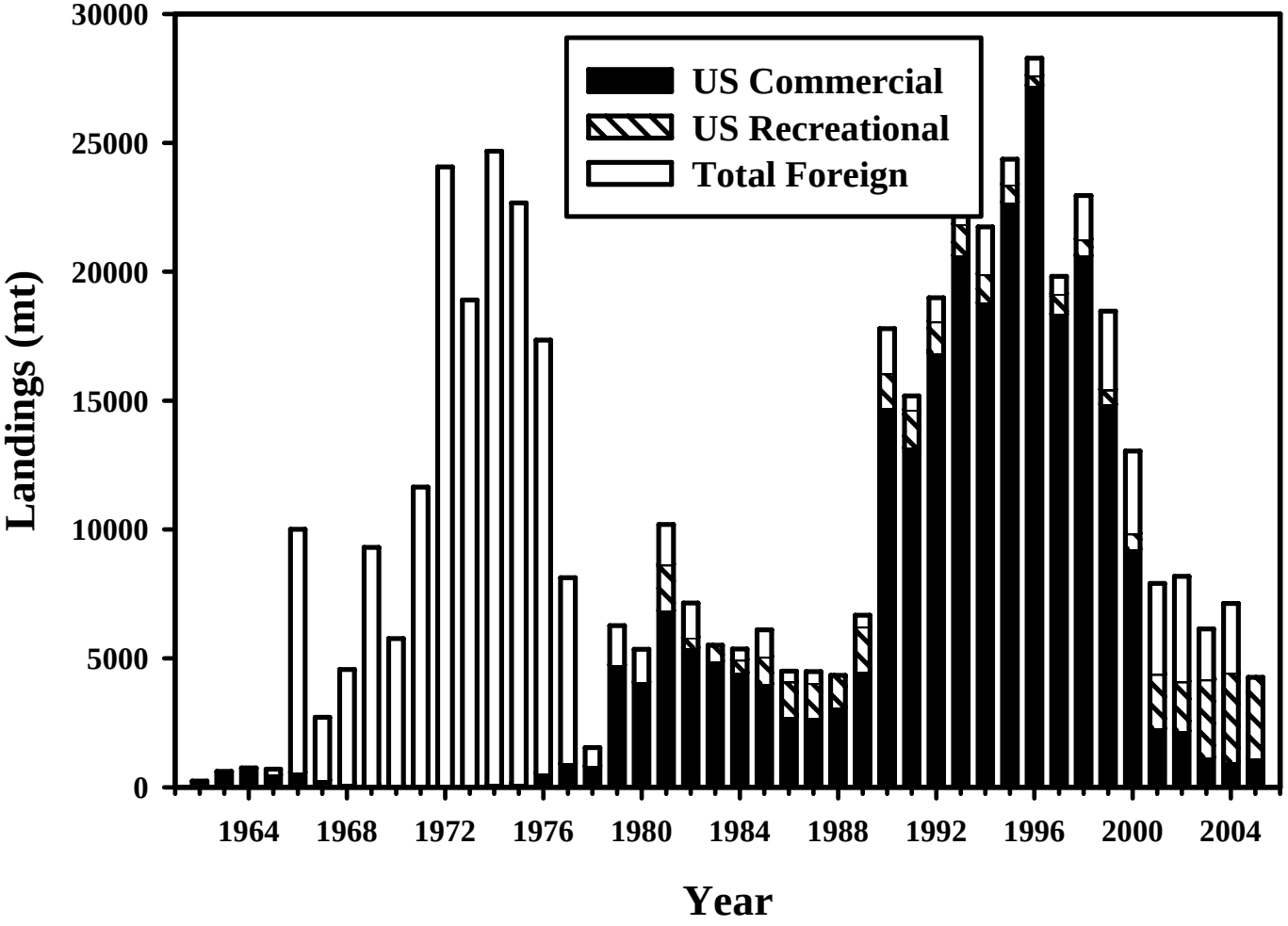
Growth Rates of Spiny Dogfish



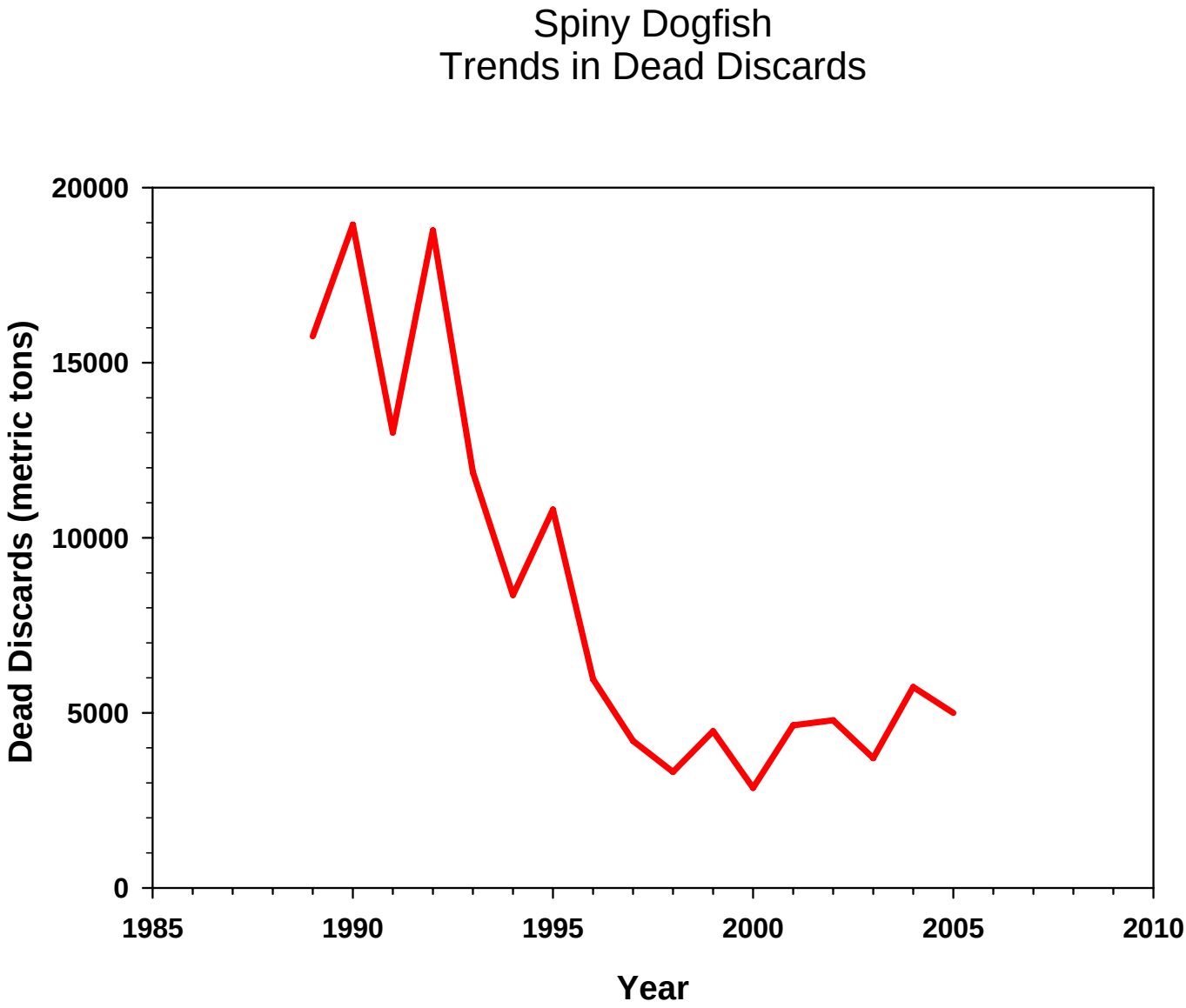
- Long lived … 50 to 100 yrs (Pacific).
- Grow Slowly… Males 80 cm, Females 105 cm
- Mature Late …Male 6-11 yr, Females 12-21 yr
- Long gestation…22 month, longest for any vertebrate
- Large size at birth ~25-30 cm
- Low fecundity…2-10 pups

An appreciation of how slow dogfish grow can be obtained by comparing predicted average weights at age with striped bass and Georges Bank cod.





Commercial landings (metric tons) and total recreational catch, 1962-2005. Landings in 2005 assumed to be 1500 mt for Canada and 330 mt for other foreign fisheries. Commercial landings are taken in NAFO areas 2-6. Canadian estimates of landings for 2005 not included.



Estimated total dead discard estimates for spiny dogfish in Northeast US fisheries, 1989-2005.

Landings and Discards for 2006

- **US Landings 2,363.9 mt**
- **Canadian Landings**
- **2,352 mt**
- **Total Removals= Landings +Discard**

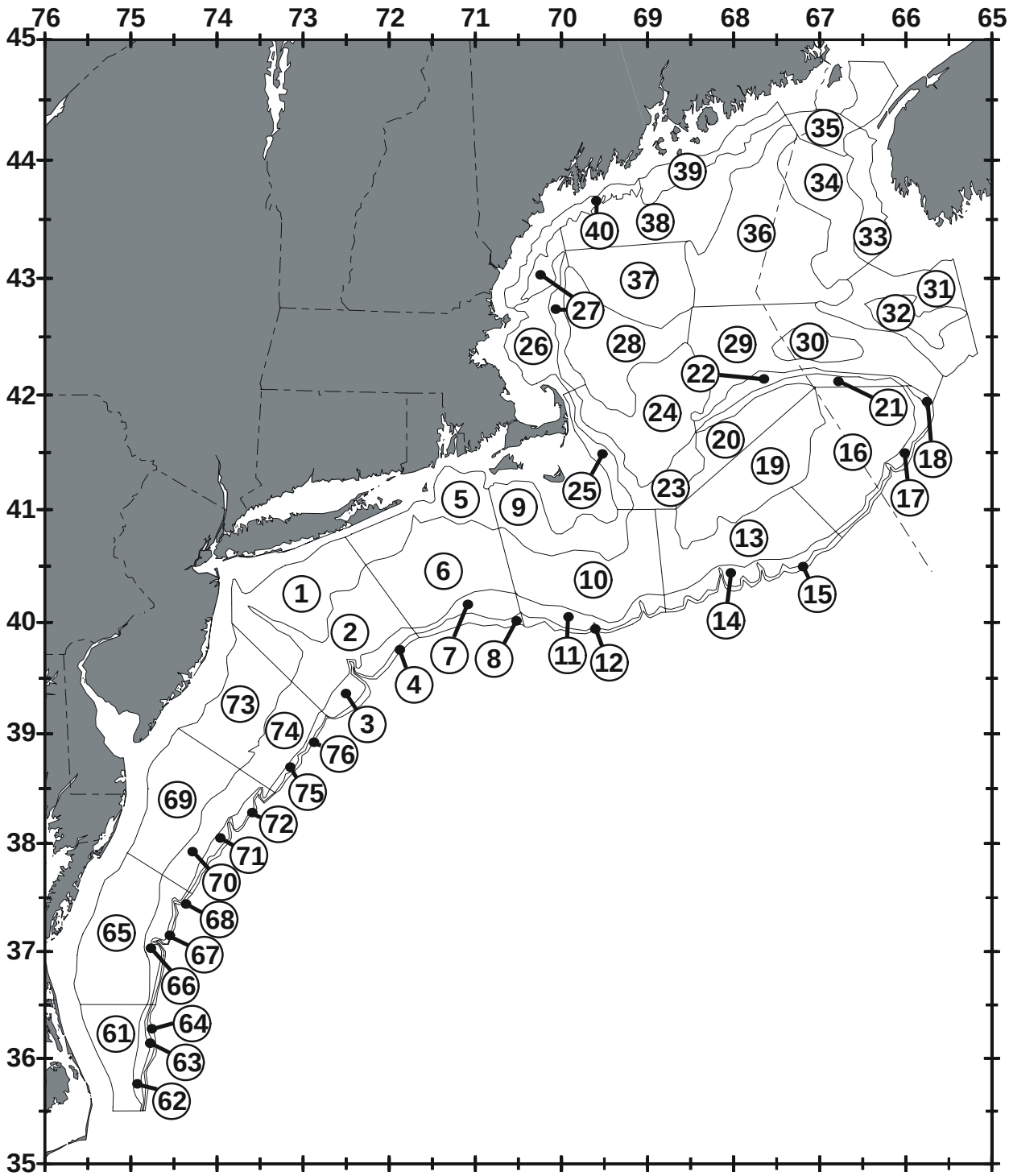
~10,292 mt

Gear (fraction dead)	Discard (mt)	Dead Discards (mt)
Otter Trawl (0.5)	**7495.1**	**3747.5**
Sink gill net (0.30)	**3369.2**	**1010.8**
Midwater trawl (0.5)	**277.2**	**138.6**
Scallop trawl (0.5)	**0.5**	**.25**
Scallop dredge (0.75)	**13.5**	**10.1**
Purse Seine (0.5)	**4.1**	**4.1**
Line Trawl (0.1)	**130.9**	**13.1**
Recreational Landings + 0.2 x Discards	**3262**	**652**
TOTAL(mt)	**14552**	**5576.5**

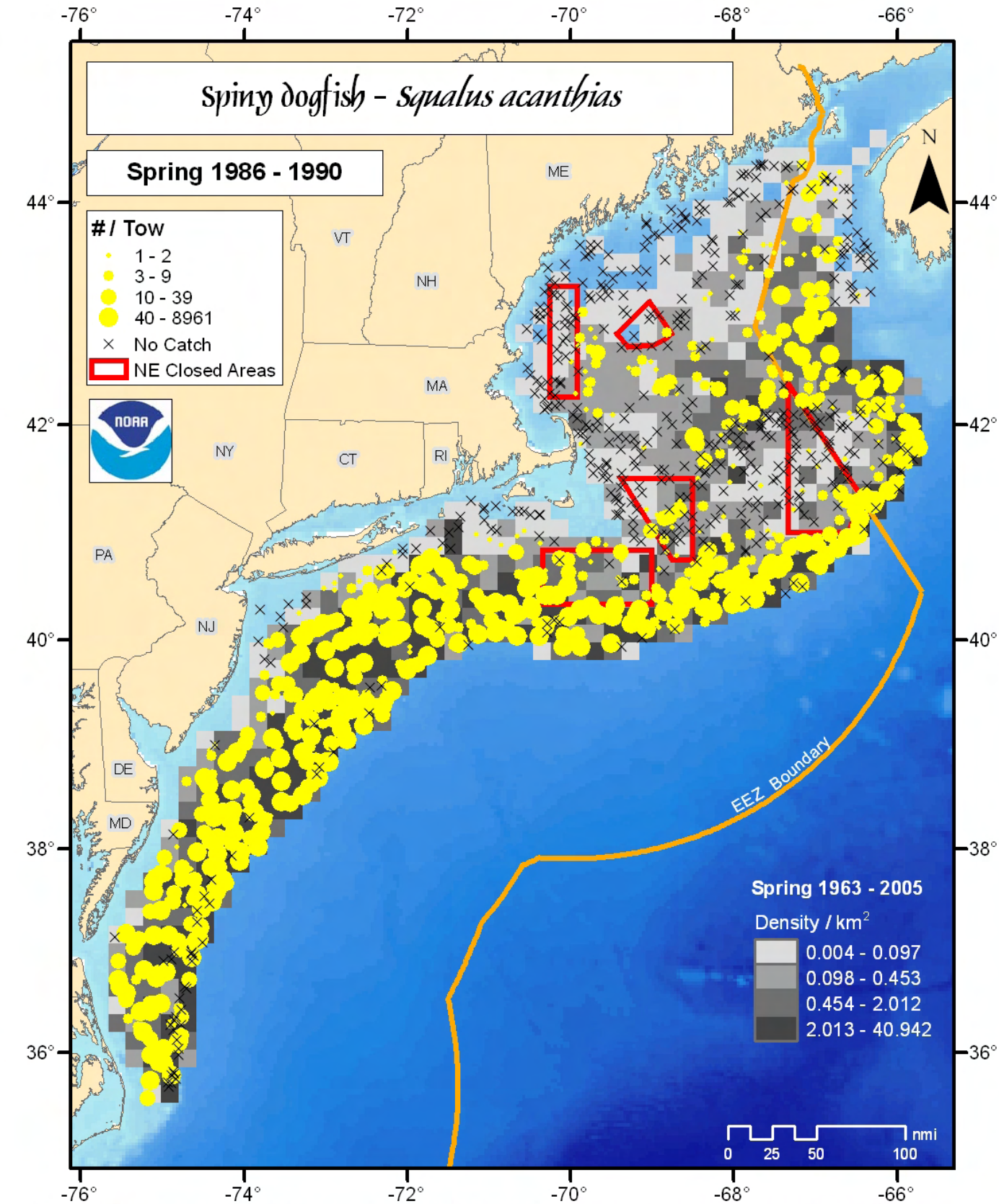
Landings and Discards for 2007

- **US Landings 2007: 3,524 mt**
- **Canadian Landings 2007— ~>2000 mt**
- **TOTAL~ 12,108 mt**

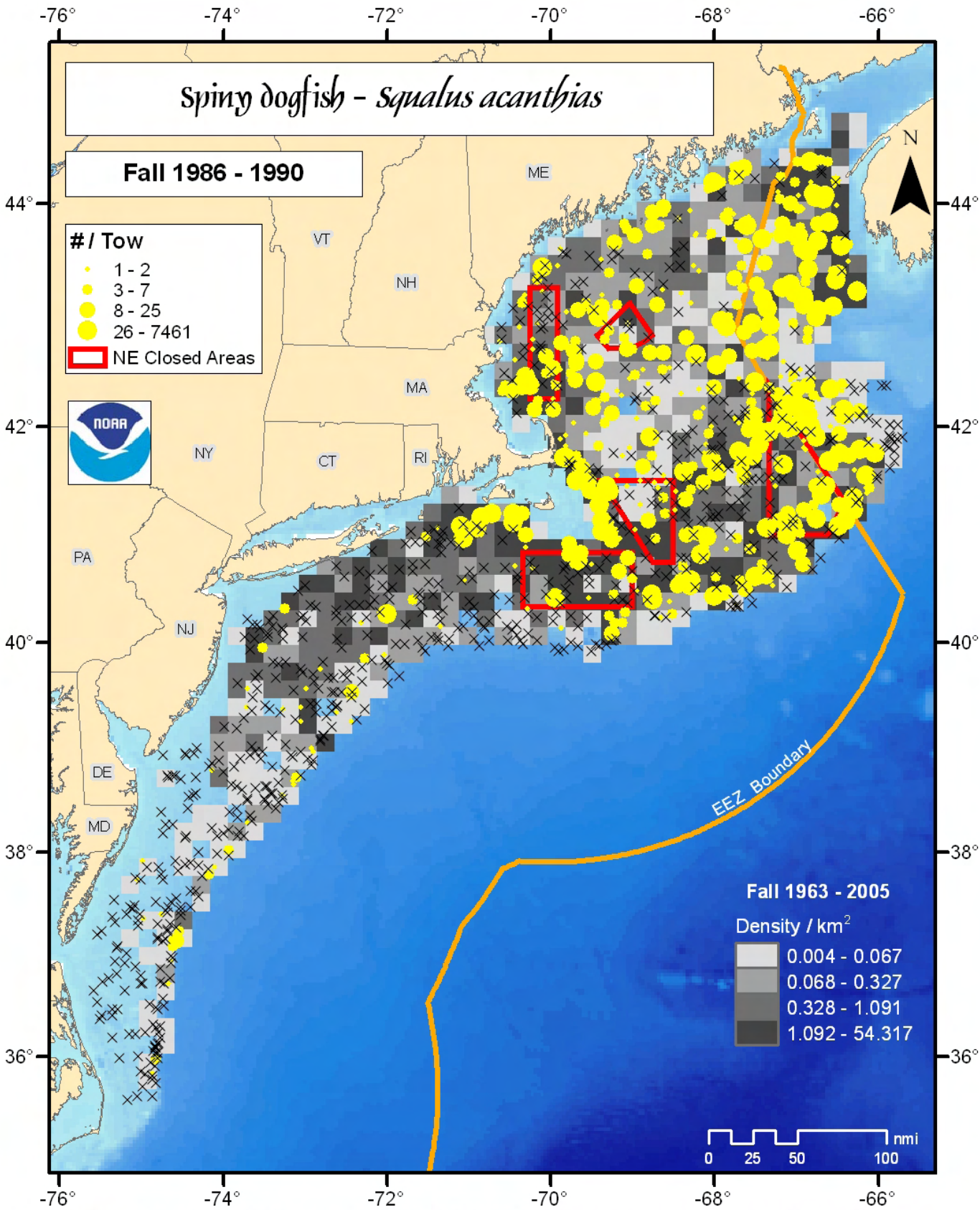
Gear (fraction dead)	Discard (mt)	Dead Discards (mt)
Otter Trawl (0.5)	8,115	4,058
Sink gill net (0.30)	5,133	1,540
Line Trawl (0.1)	883	88
Recrea-tional Landings + 0.2 x Discards	4,341	898
TOTAL (mt)	18,472	6,584



Offshore Sampling strata for NMFS research trawl finfish surveys.



Relative species abundance and distribution from NEFSC bottom trawl survey by time block and relative species density for the full time series.



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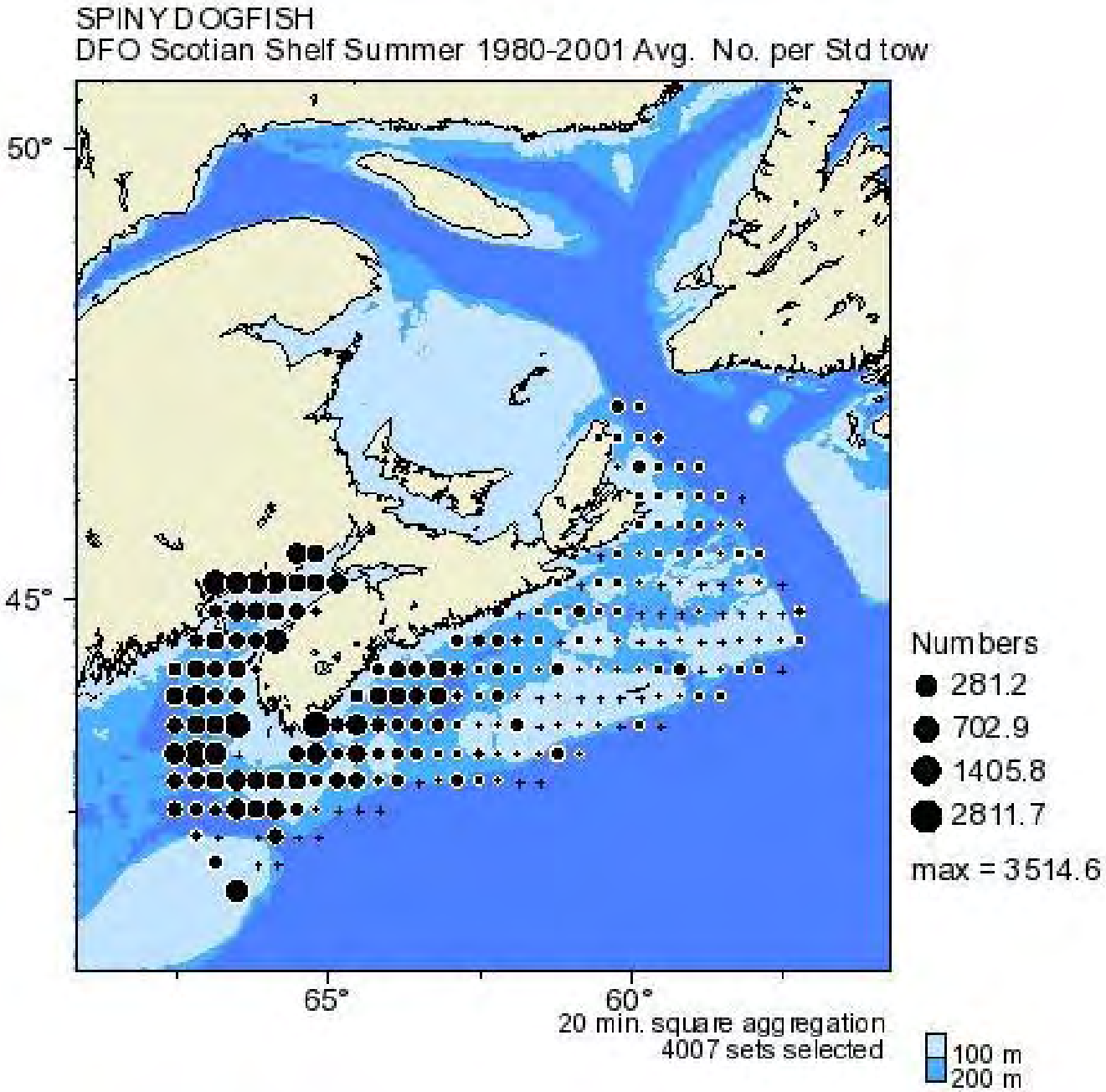
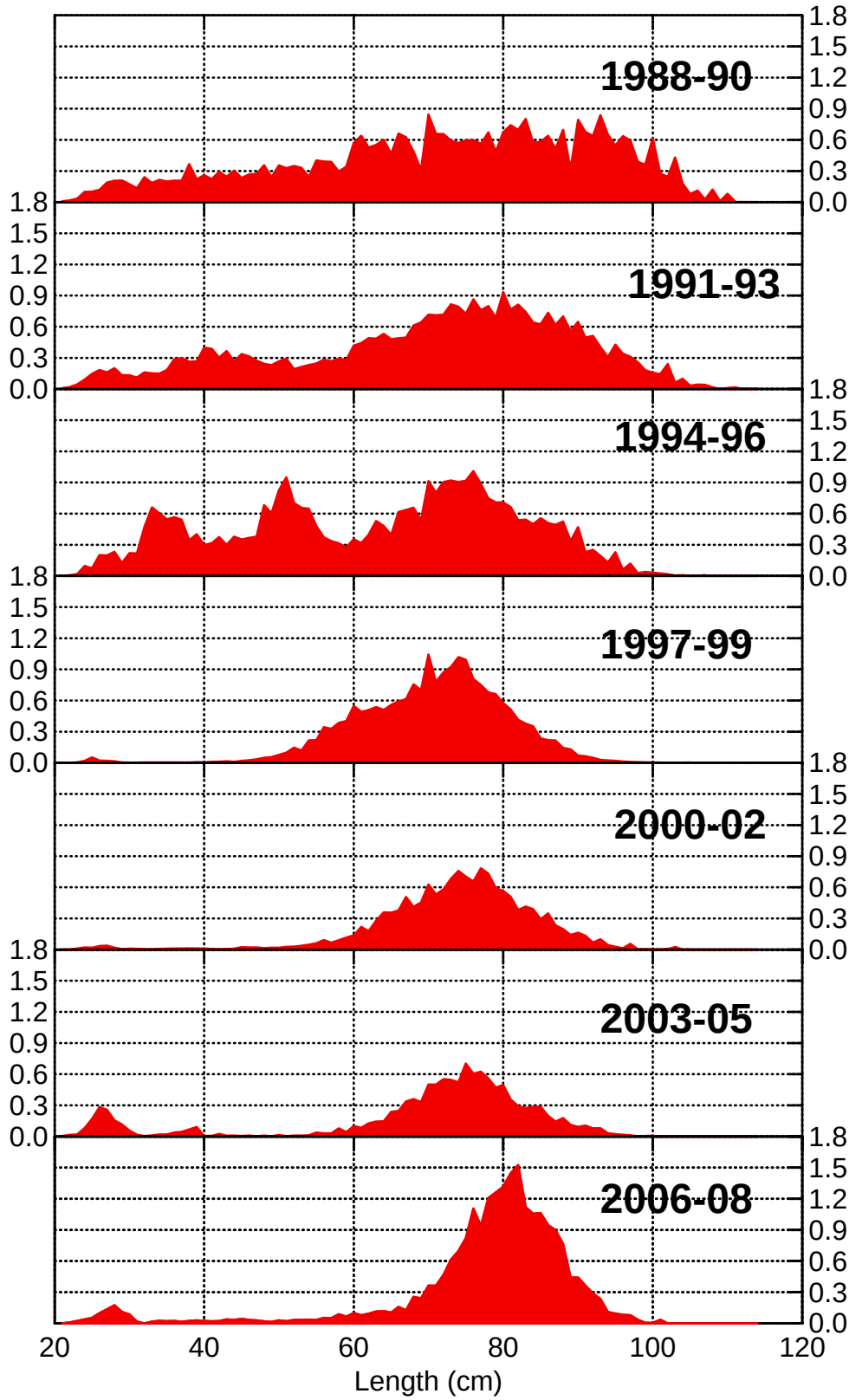
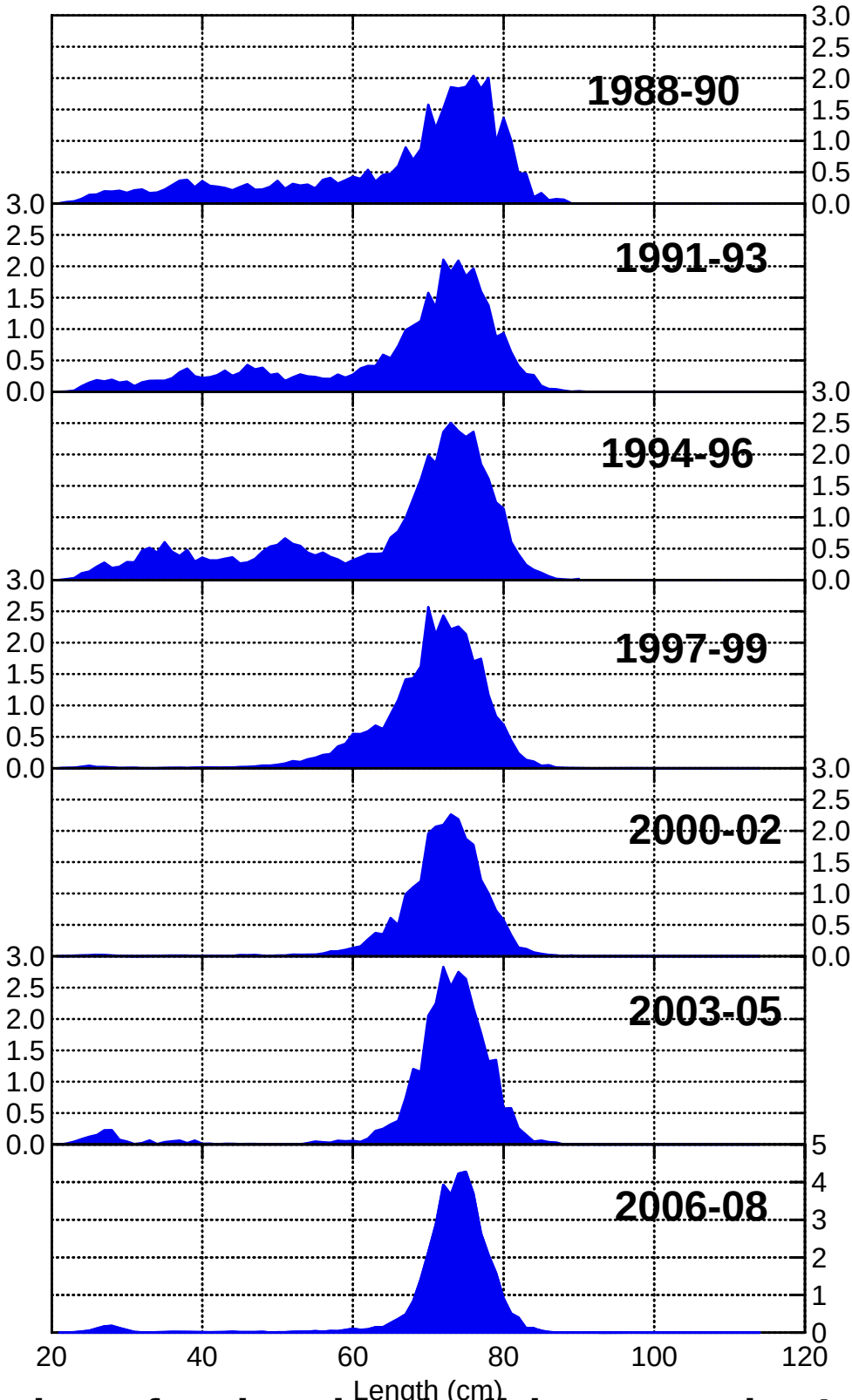


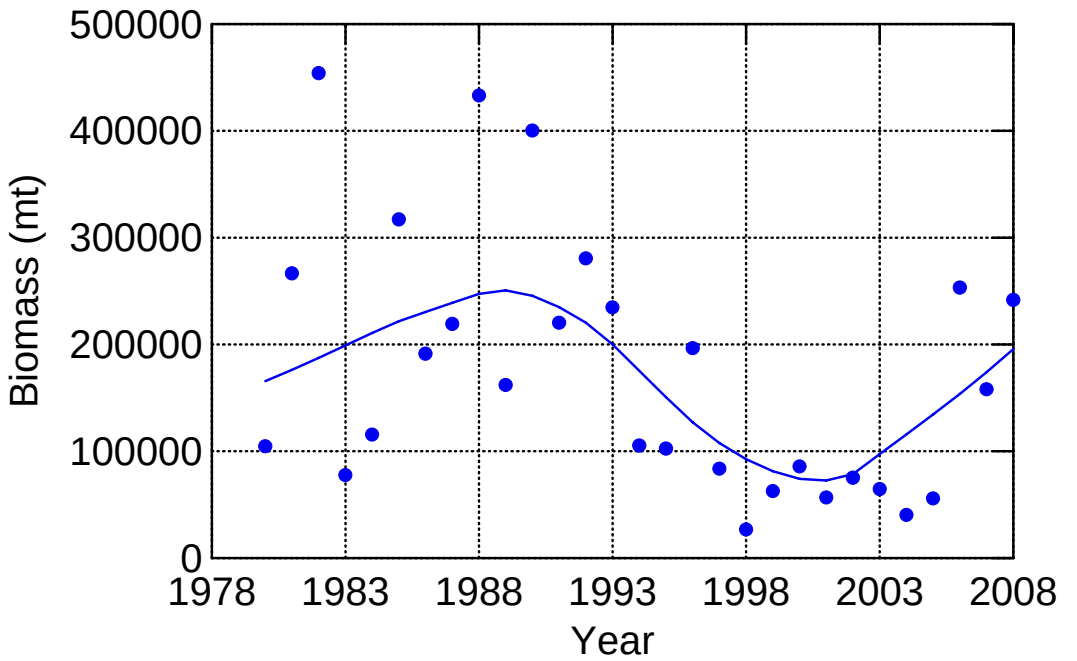
Summary of DFO Canadian R/V trawl survey swept area survey estimates (mt), 1980-2005 for males, females and total. Map data express average densities per standard tow, binned at a 20 minute square aggregation. Survey estimates provide courtesy of Bette Hatt and Stratis Gavaris, DFO.

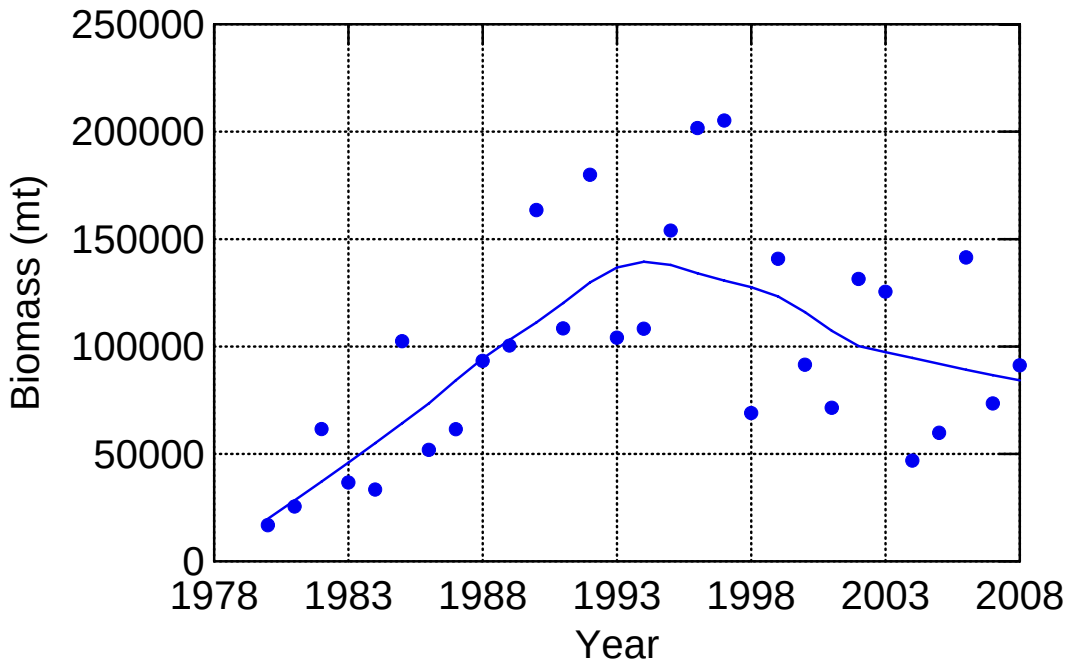


Number of female spiny dogfish per tow by 1 cm length class in NEFSC Spring Bottom Trawl Survey by 3-yr period, 1988-2008.

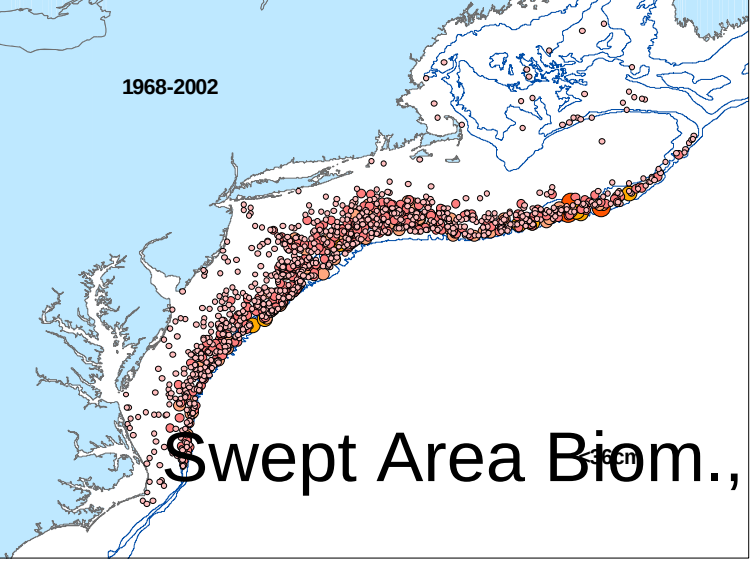


Number of male spiny dogfish per tow by 1 cm length class in NEFSC Spring Bottom Trawl Survey by 3-yr period, 1988-2008. Not the scale change for 2006-08.

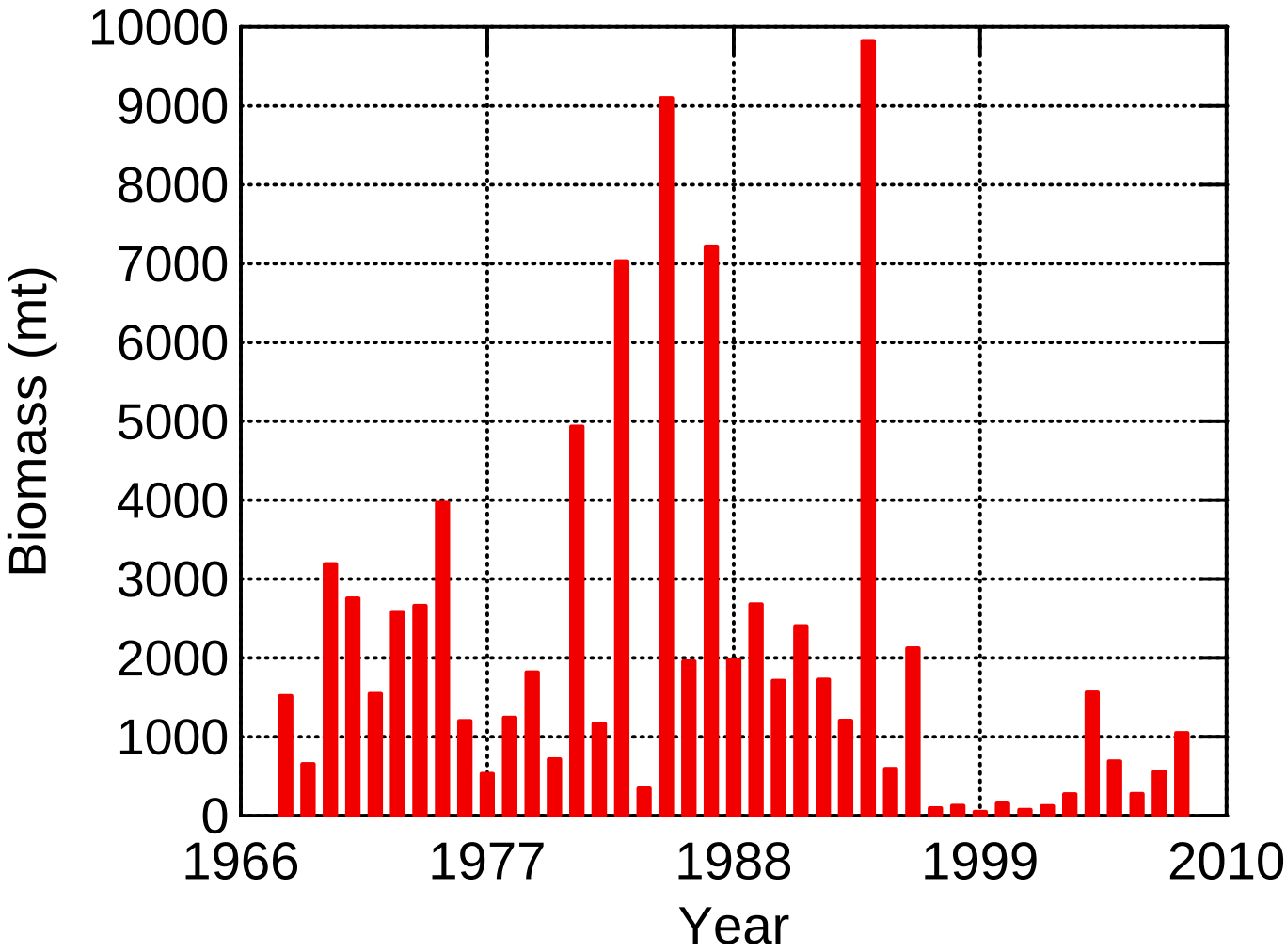




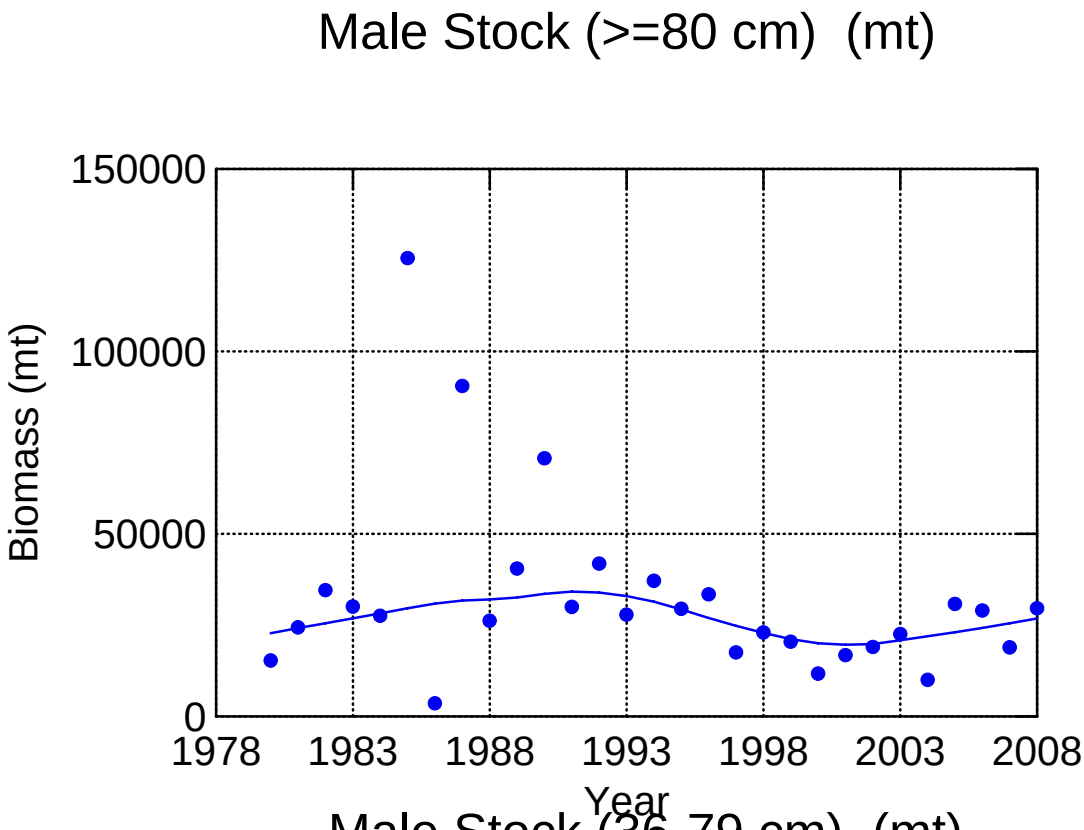
Swept area biomass of female dogfish 80 cm and greater (top) and biomass of female dogfish 36-79 cm (bottom), based on NEFSC Spring Bottom Trawl Survey, 1980-2008.

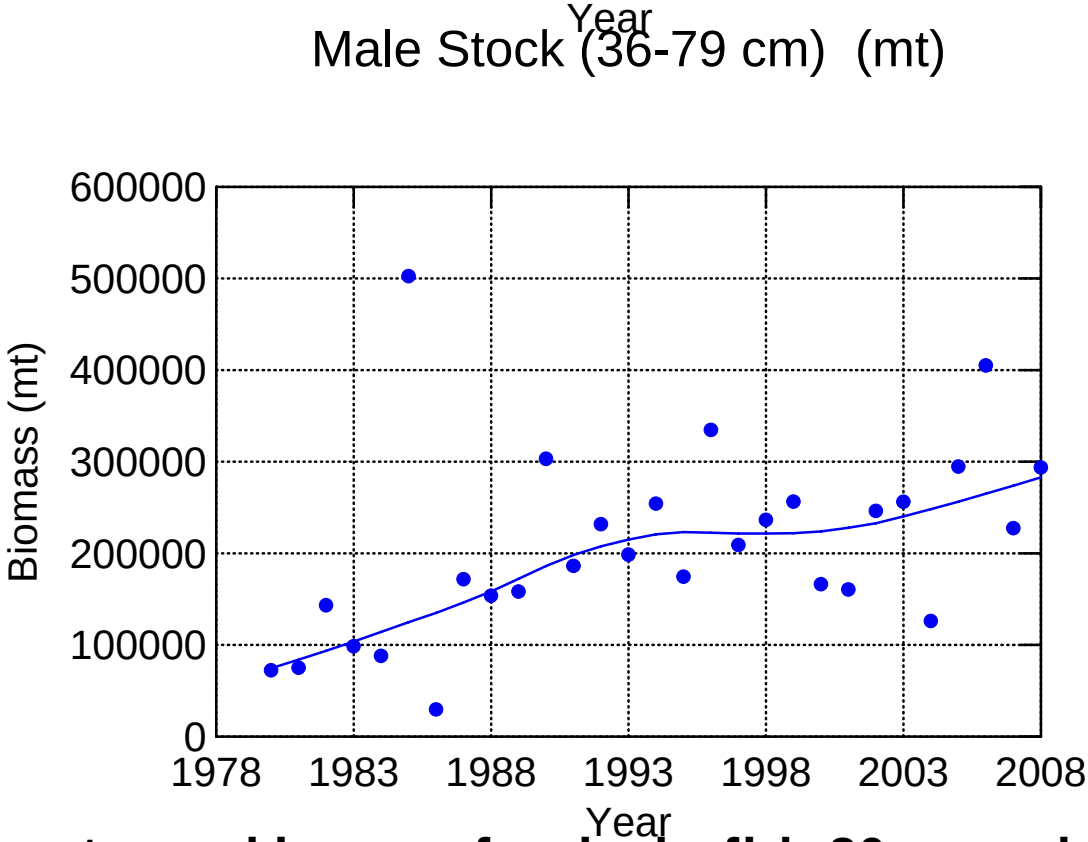


Swept Area Biom., Pups, Nom. Footprint



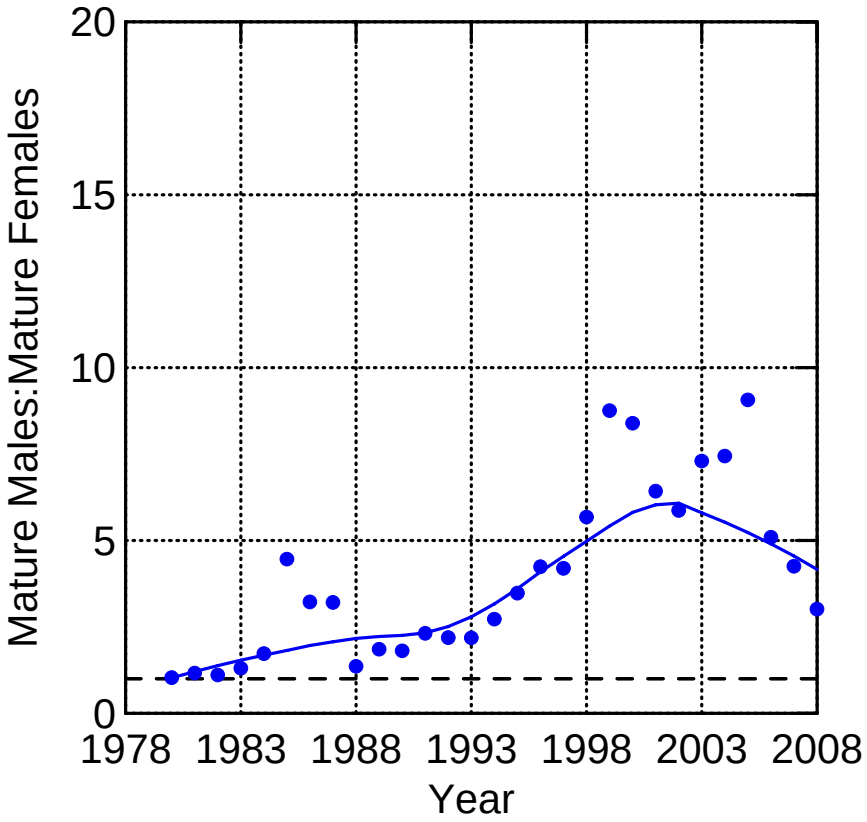
Swept area biomass of spiny dogfish recruits (< 1 yr old and < 36 cm TL), based on NEFSC Spring Bottom Trawl Survey, 1968-2008. both sexes combined.





Swept area biomass of male dogfish 80 cm and greater (top) and biomass of male dogfish 36-79 cm (bottom), based on NEFSC Spring Bottom Trawl Survey, 1980-2008.

Mature Male to Female Ratio (3 yr), Spring Survey, 1980-2008



Ratio of number of mature male (>60 cm) to mature female (>80 cm) spiny dogfish in NEFSC Spring Bottom Trawl Surveys, 1980-2008. Line represents LOWESS smooth with tension =0.5.

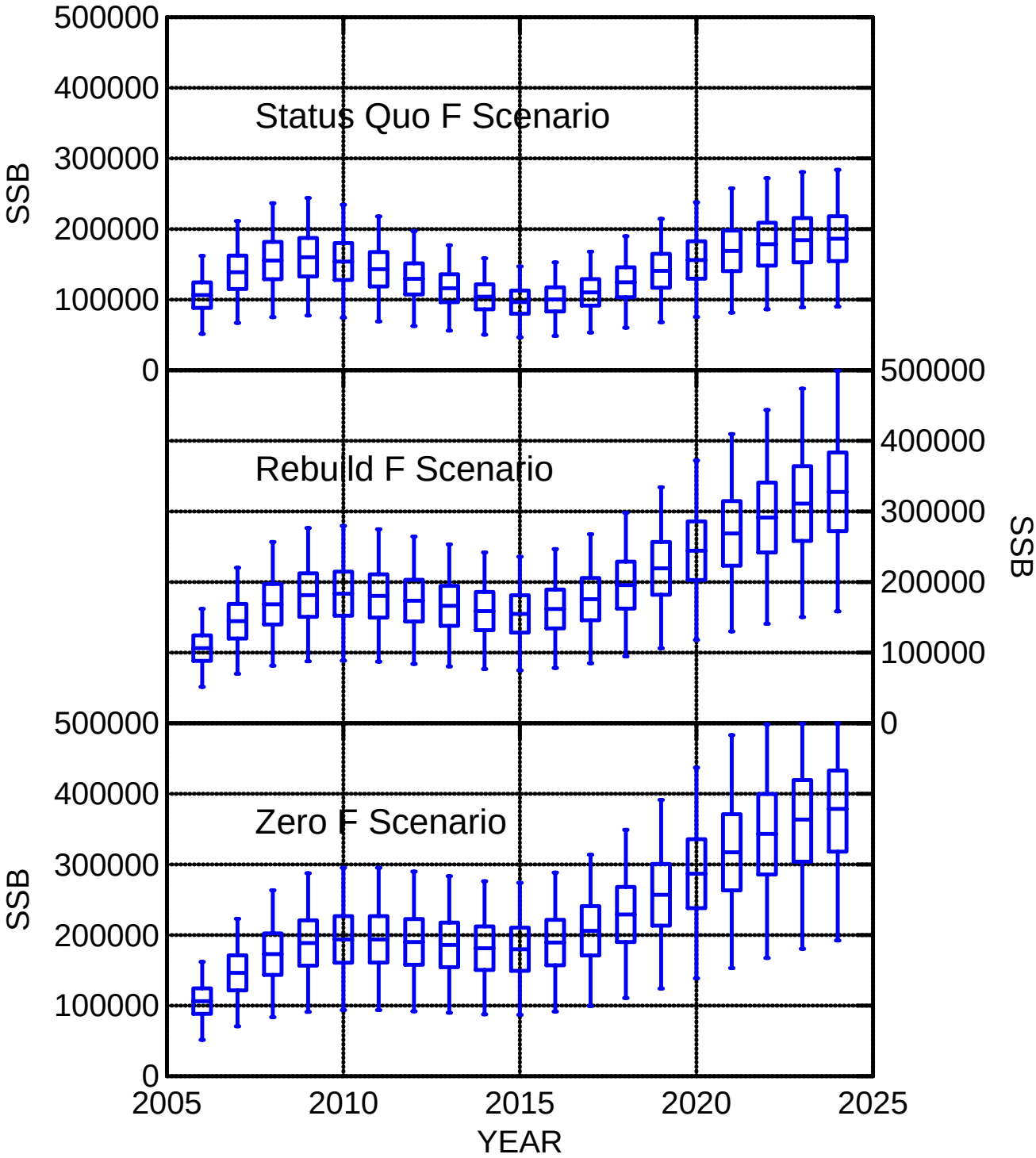
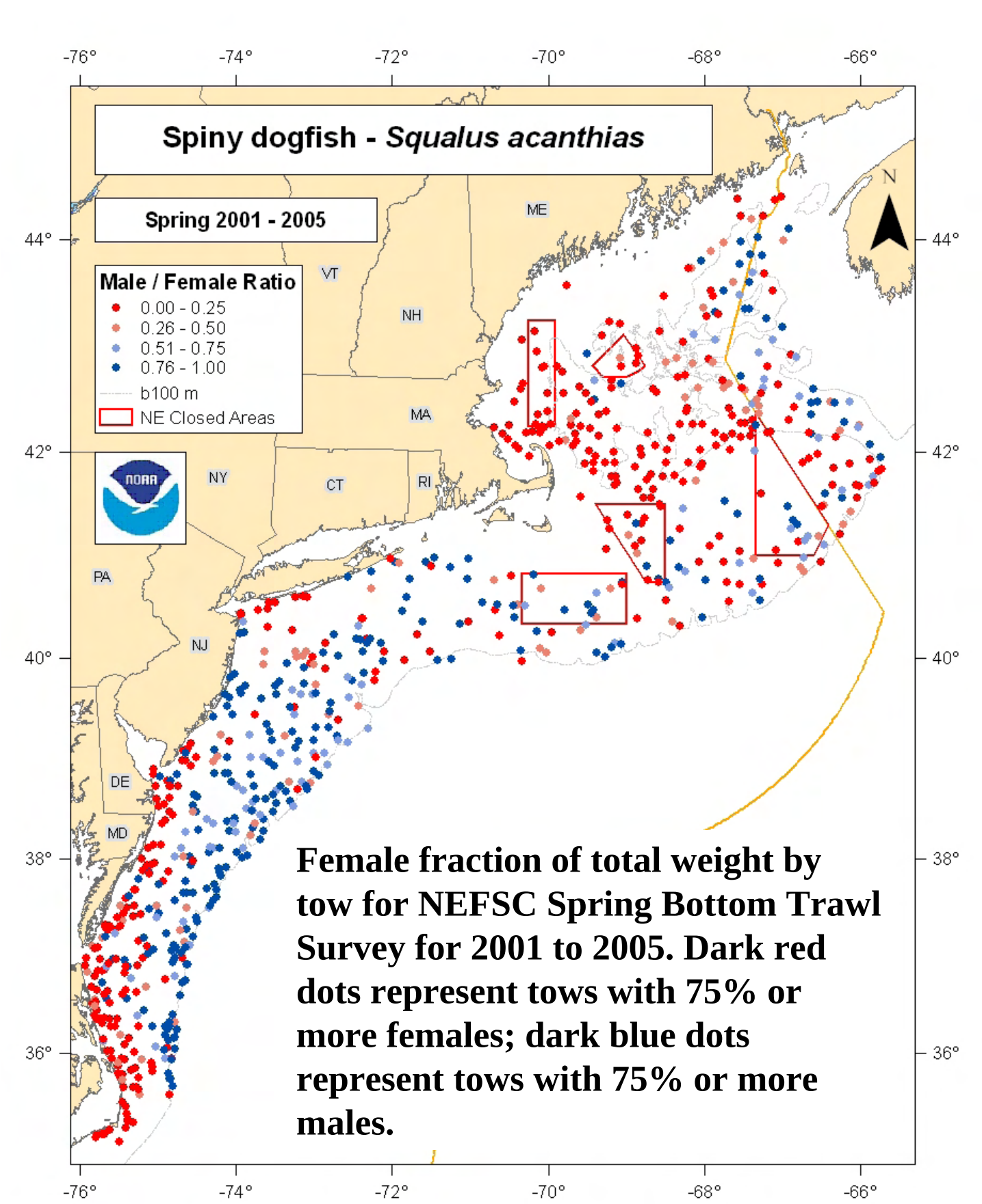
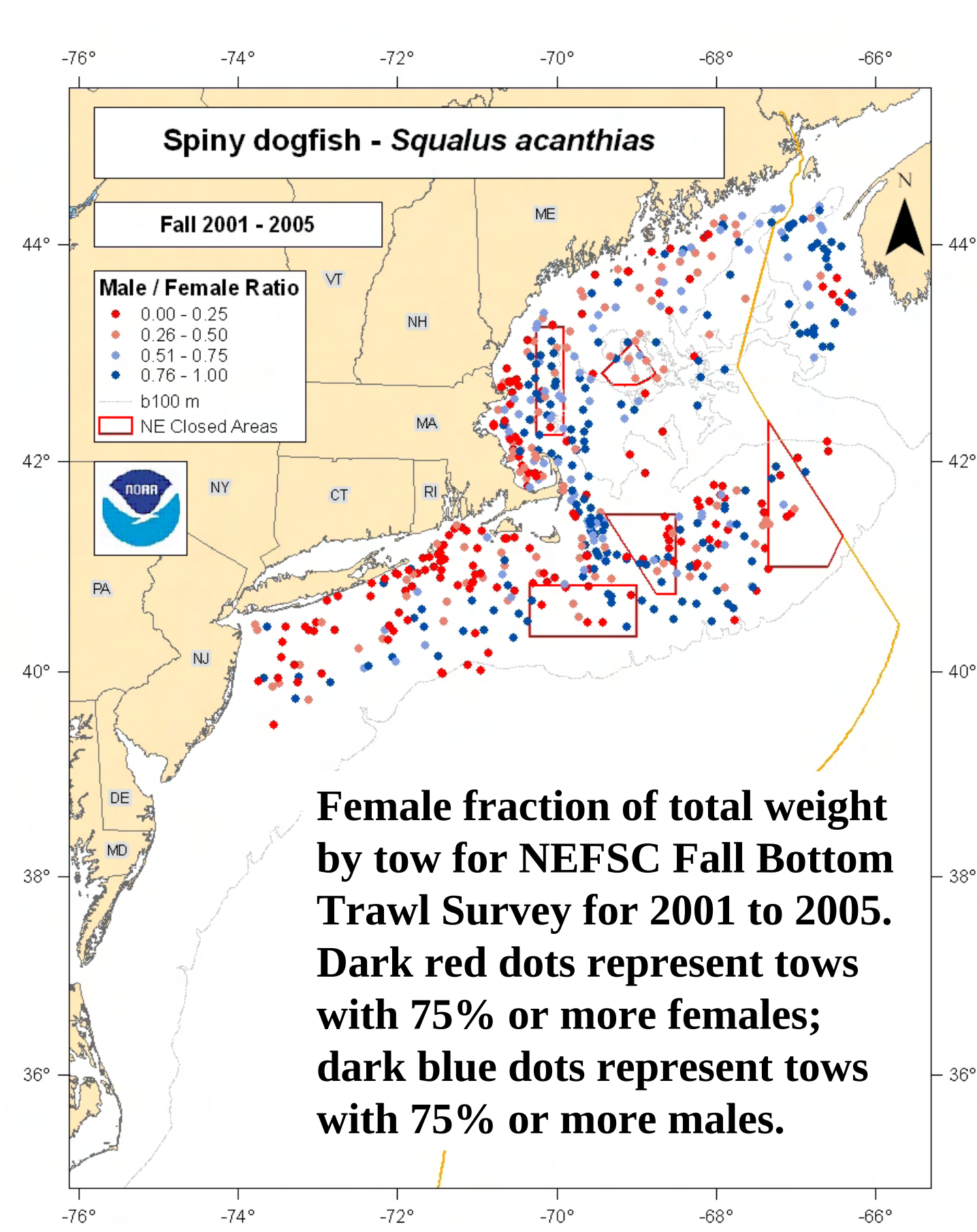


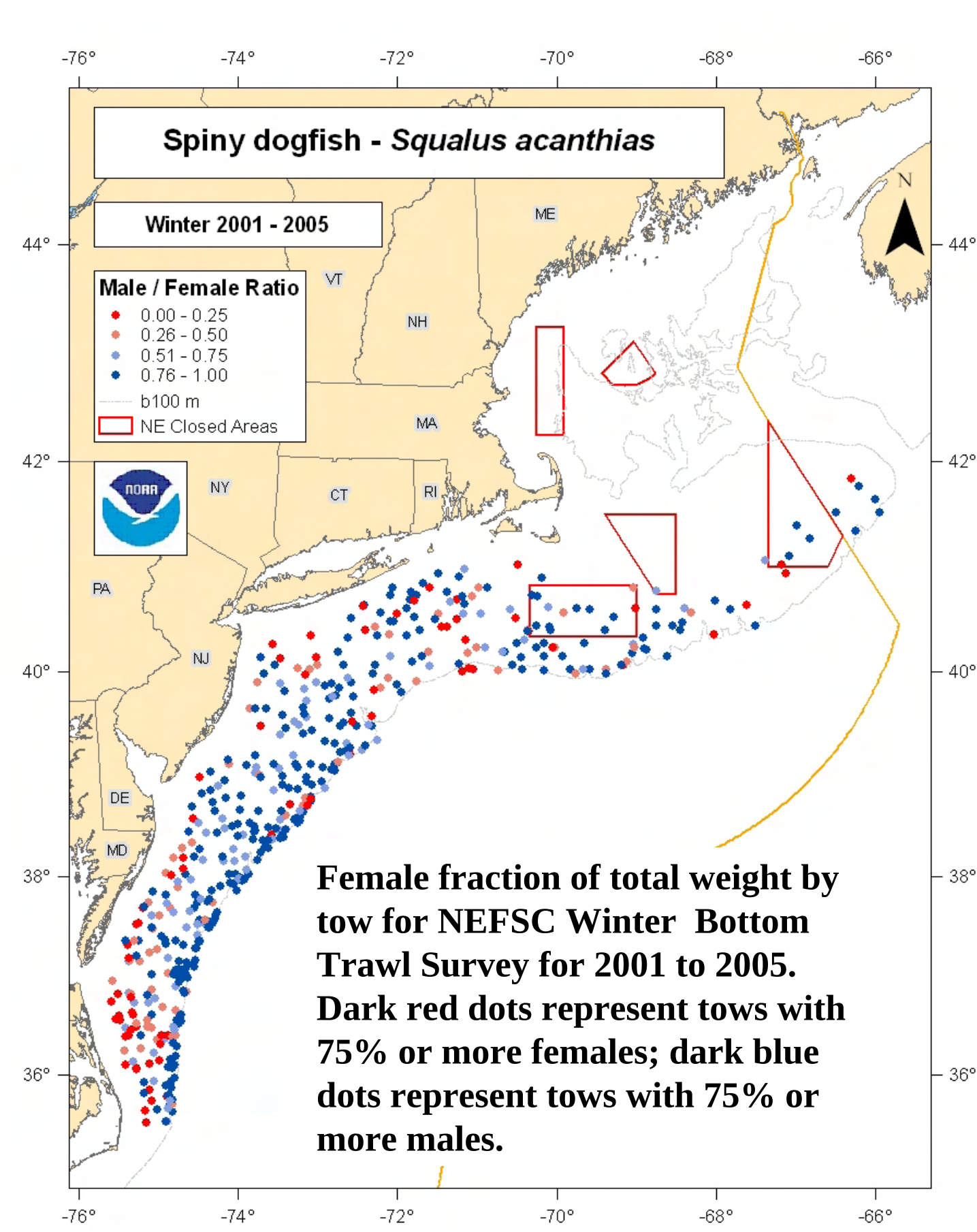
Fig. 5. (Formerly Fig. 11. SARC 43, 2006.) Spiny dogfish spawning stock projections, 2006-2024, for three alternative scenarios: Status quo (full F=0.128), Rebuild F (0.03), and Zero F. Boxes represent interquartile ranges.



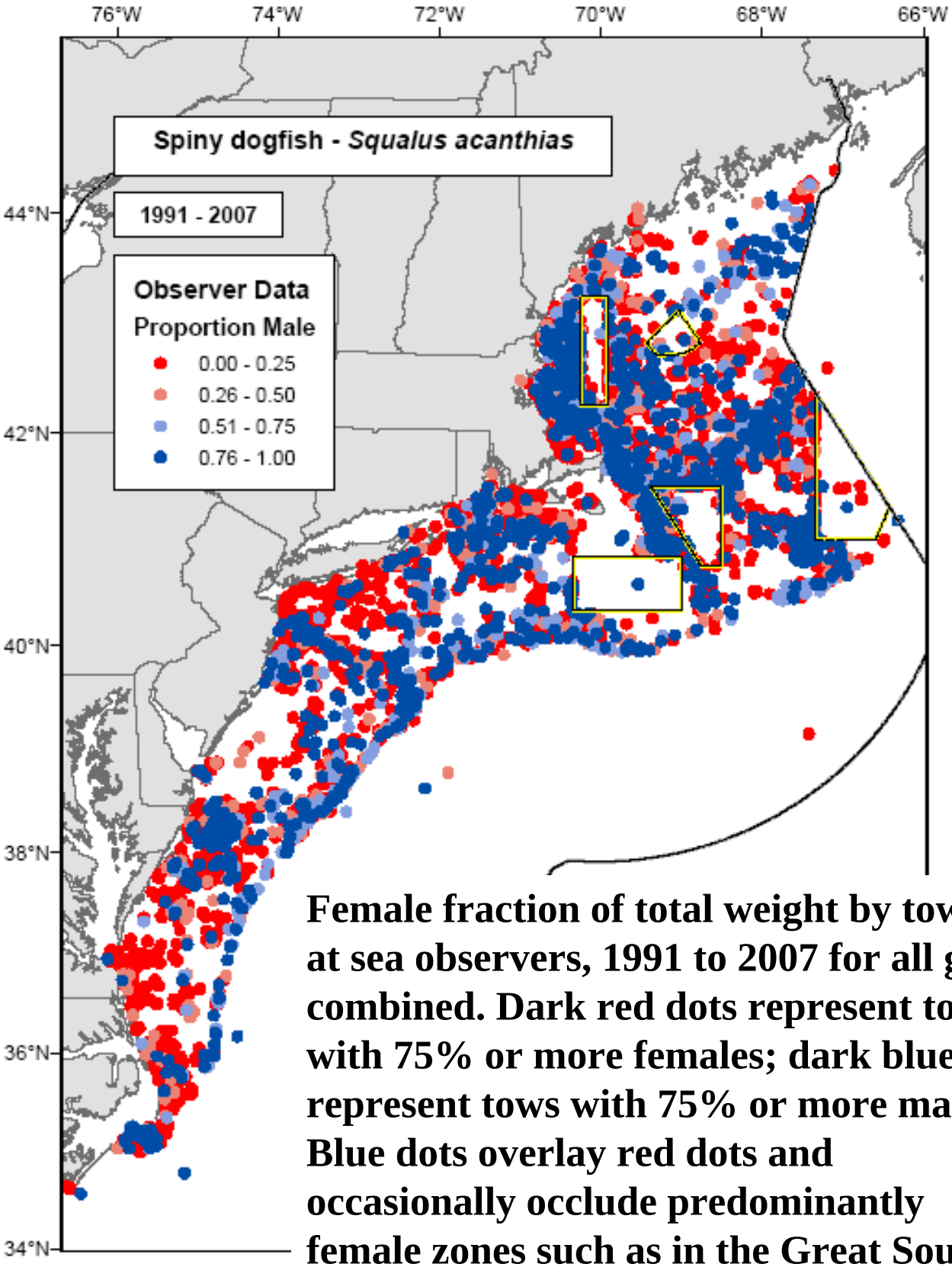
Female fraction of total weight by tow for NEFSC Spring Bottom Trawl Survey for 2001 to 2005. Dark red dots represent tows with 75% or more females; dark blue dots represent tows with 75% or more males.



Female fraction of total weight by tow for NEFSC Fall Bottom Trawl Survey for 2001 to 2005. Dark red dots represent tows with 75% or more females; dark blue dots represent tows with 75% or more males.

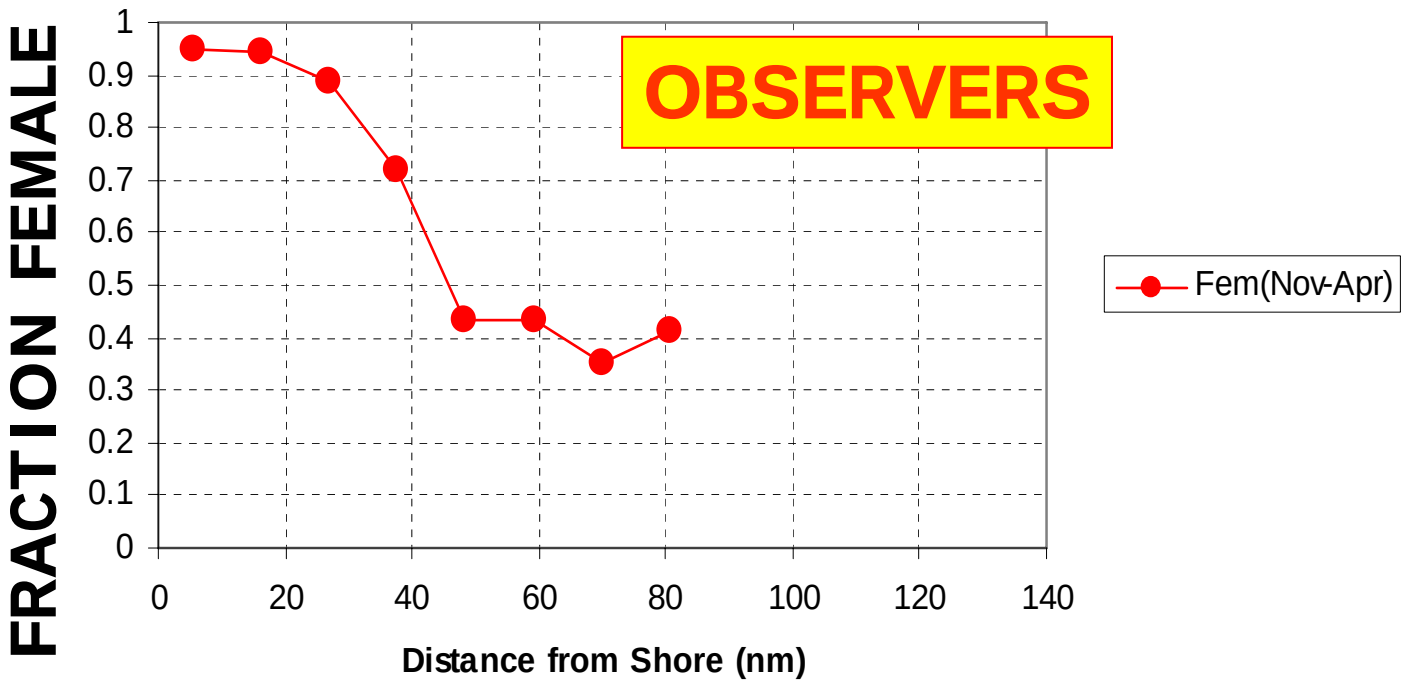


Female fraction of total weight by tow for NEFSC Winter Bottom Trawl Survey for 2001 to 2005. Dark red dots represent tows with 75% or more females; dark blue dots represent tows with 75% or more males.

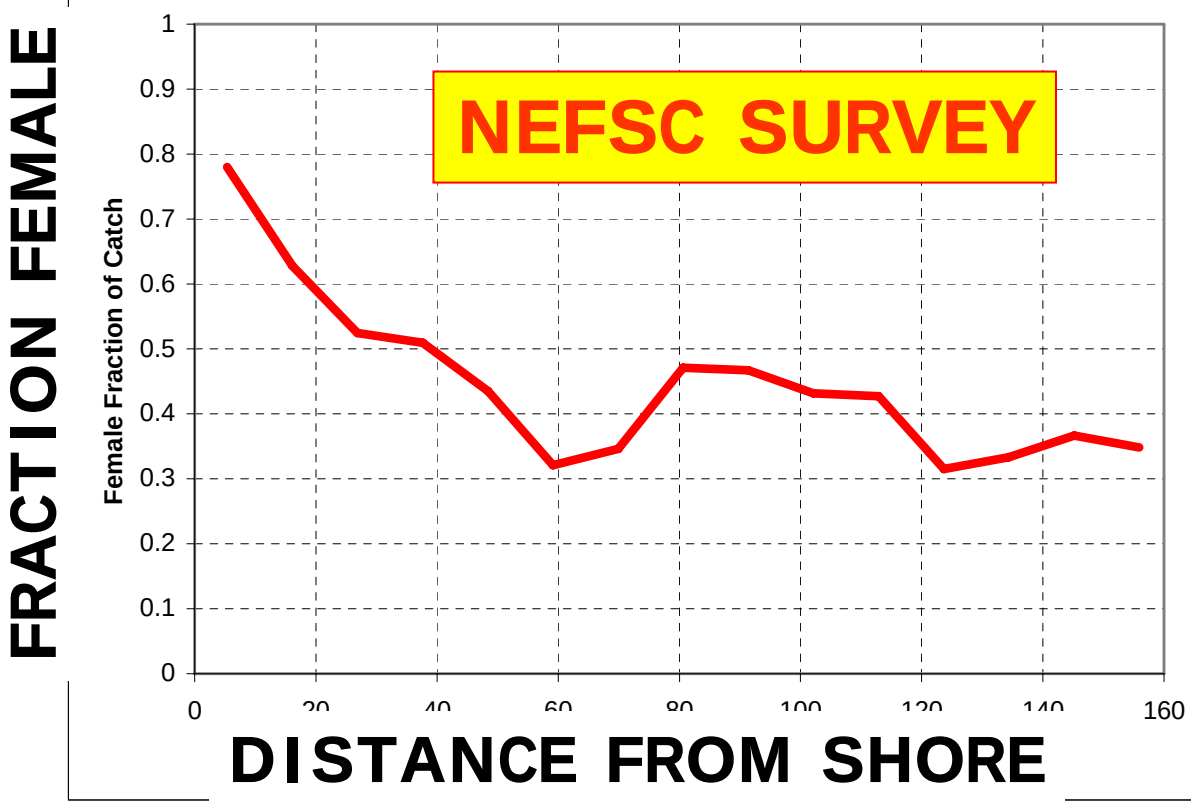


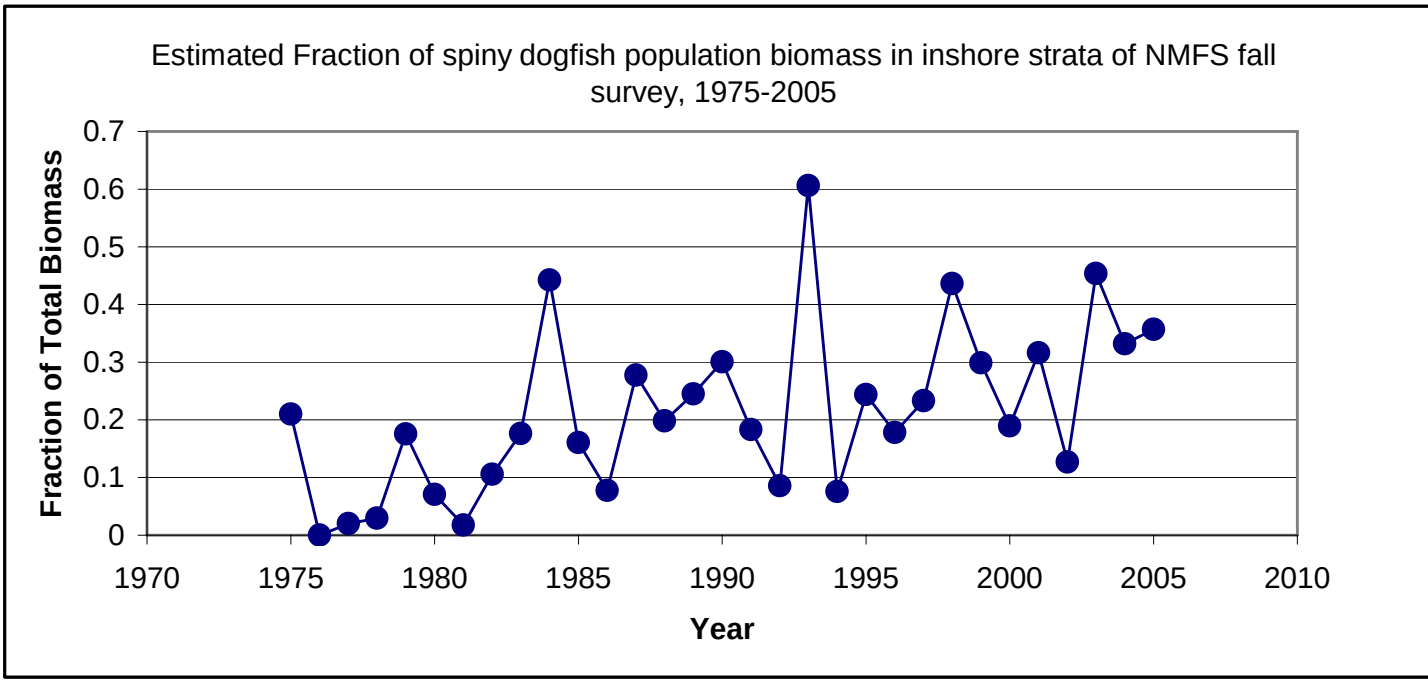
Female fraction of total weight by tow for at sea observers, 1991 to 2007 for all gears combined. Dark red dots represent tows with 75% or more females; dark blue dots represent tows with 75% or more males. Blue dots overlay red dots and occasionally occlude predominantly female zones such as in the Great South Channel, and Cape Cod Bay to New Hampshire.

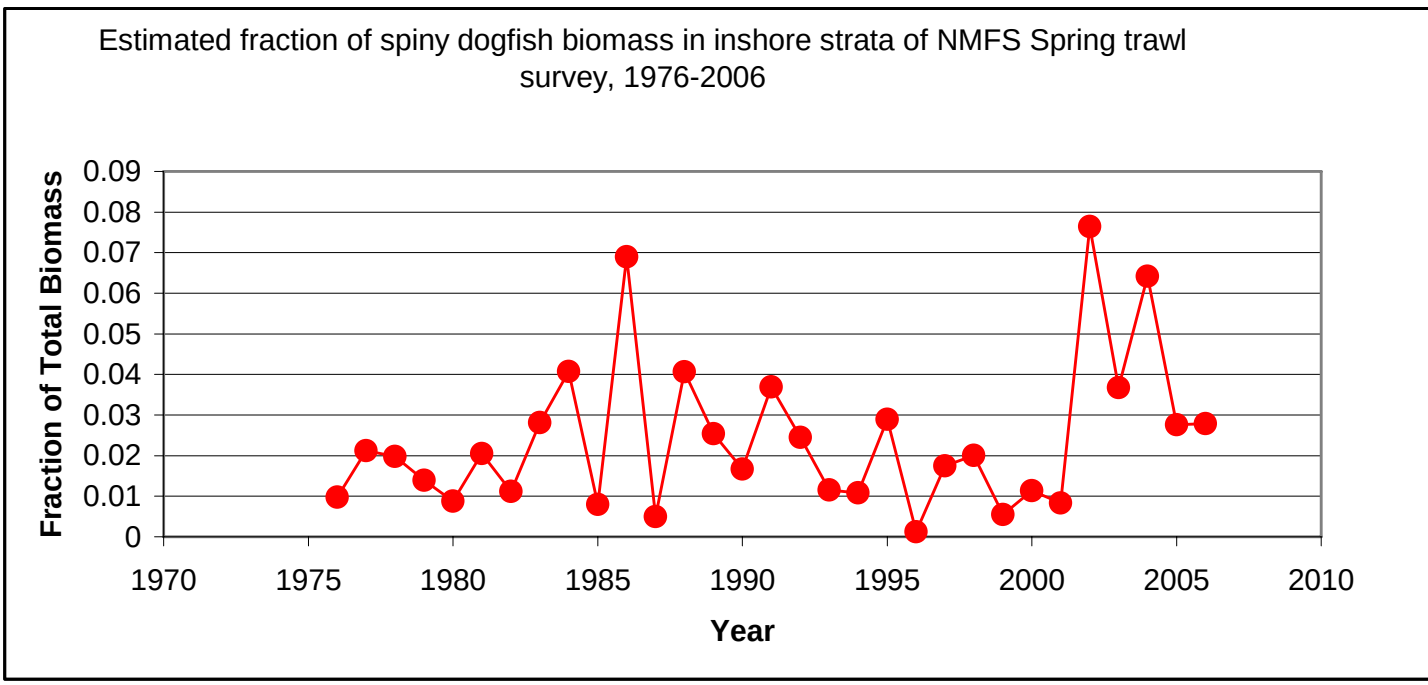
Fraction female in observed tows (1991-2007)
South of 40.5 degrees



D. Spring Survey, South of 40.5 deg







Fraction of total spiny dogfish swept-area estimates of population biomass in inshore strata in NMFS fall (top panel) and spring (bottom) bottom trawl survey.

Future Fishery

- Stock is approaching rebuilt status but the size structure is unbalanced.
- The low recruitment period from late ’90s , early 2000’s will need to be paid back.
- Stock should remain high for 5-8 years then begin to decline
- What is the best way to manage the stock?

Why do we care about a balanced size structure for dogfish?

✓The sustainability of spiny dogfish fisheries is directly linked to the reproduction of adult females.

✓Grow is slow and wide swings in recruitment are improbable.

✓Yields of 10,000 mt per year are possible, but only when total biomass is about 450,000 mt.

✓Of this 450,000 mt, most of the biomass (~200,000 mt) comprises mature females >80 cm

✓Unknown effects on reproductive output

Mostly Male Fishery: Feasibility Issues

- Biological
  - Would reduction of males help or harm population?
  - Would is acceptable increase in mortality on females?
  - Ecosystem Issues?
- Fishery
  - Can the predominately male schools be located consistently?
  - Can discarding and mortality of females be reduced to acceptable levels?
  - Can the male schools be found close to shore?
- Economics
  - Marketability of smaller fish
  - Processing costs: more work per pound processed
  - Costs of capture, esp fuel
- Regulatory
  - Increase in landings
  - Changes in allocations among fisheries
  - Requirements for rebuilding