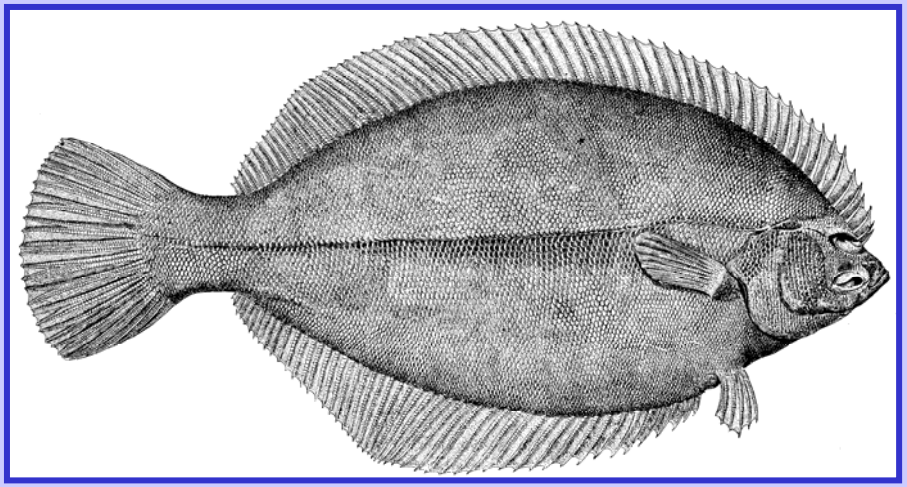
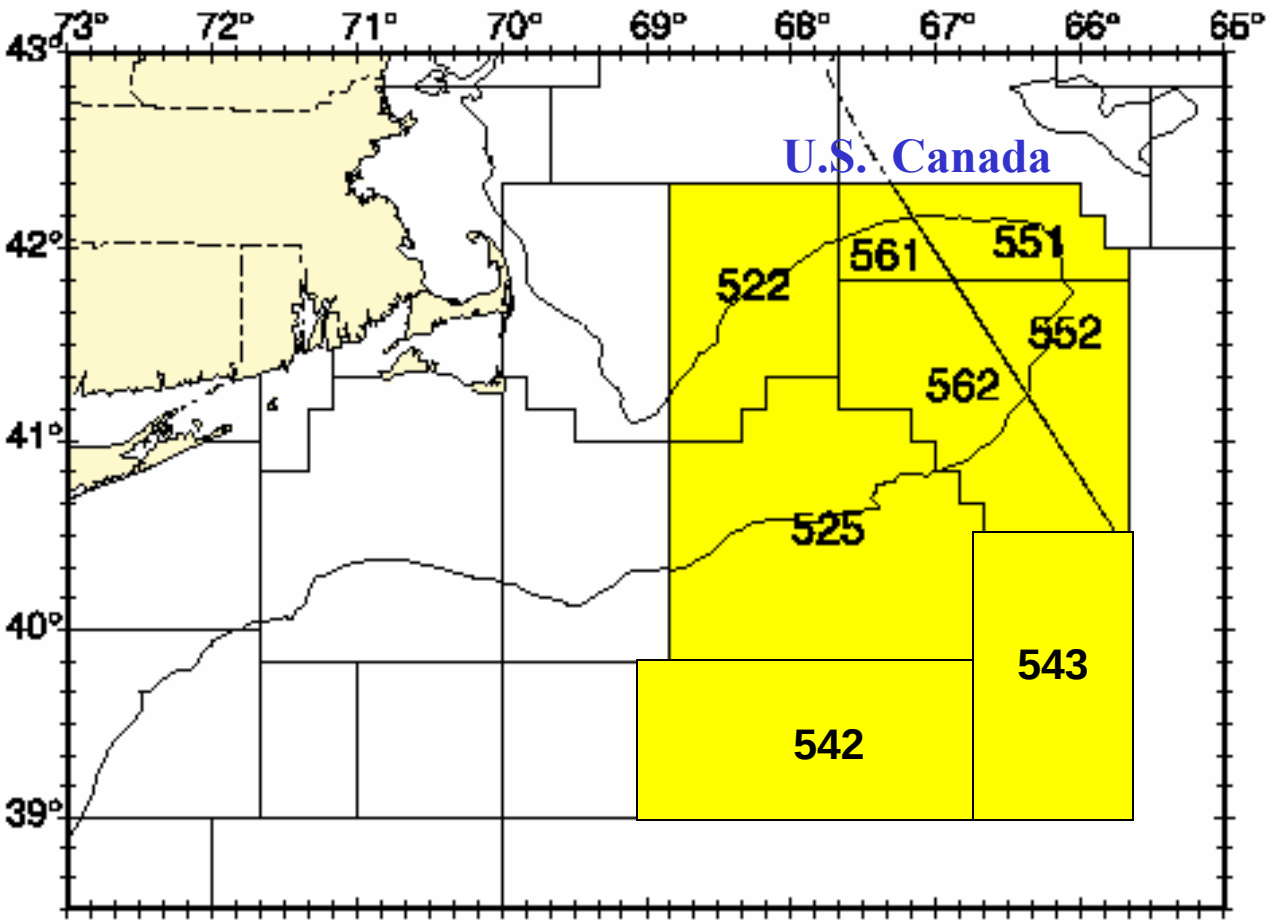
K. Georges Bank Winter Flounder



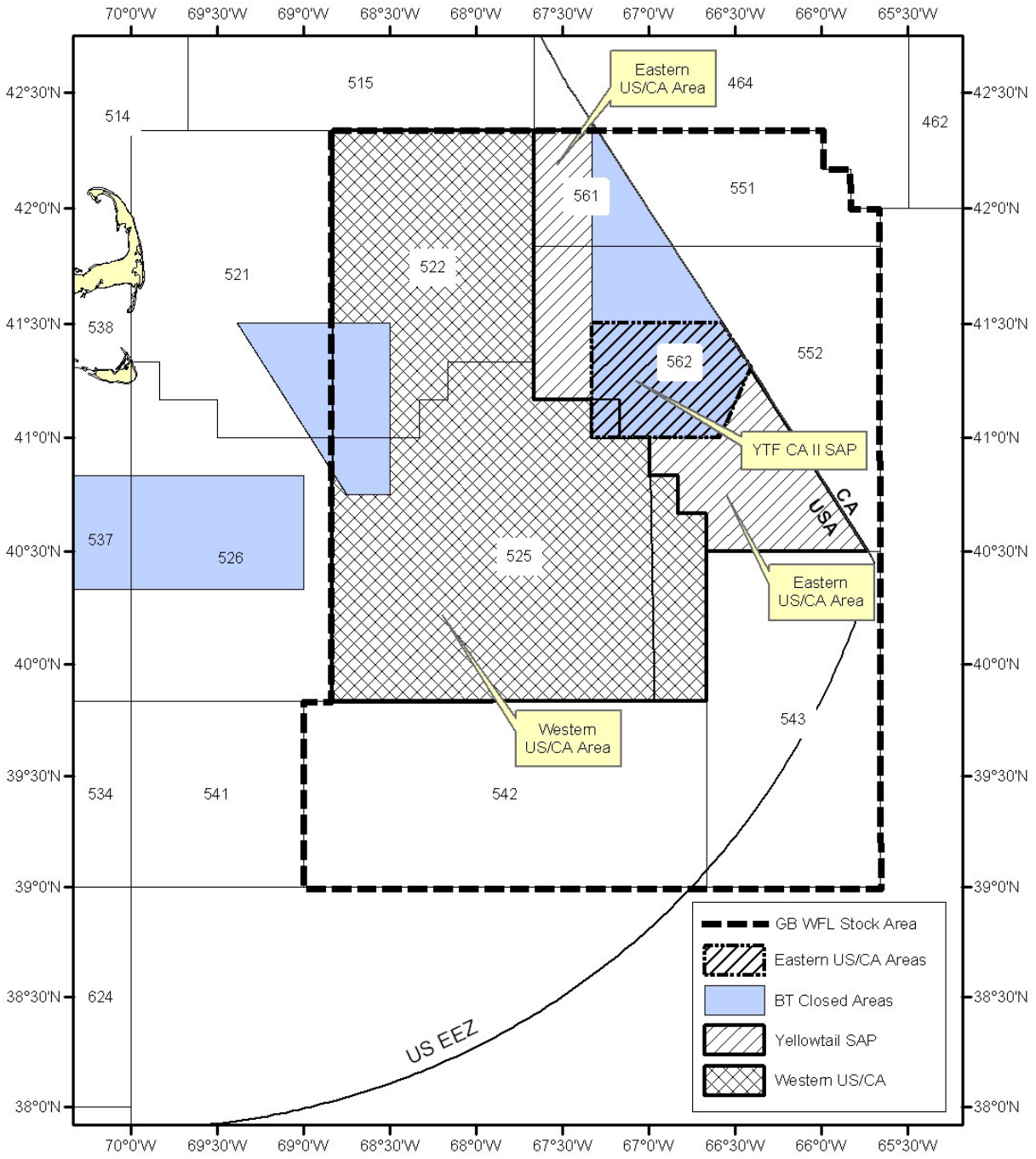
Pseudopleuronectes americanus



GB winter flounder stock area

Affected by a complex set of regulations that include:

- Areas closed to trawls
- Areas open to scallop dredges
- SAPs requiring gear modifications to reduce groundfish bycatch, effort limitations, and trip limits



Data Available for Assessments

Fishery Data

Landings, 1964-2006

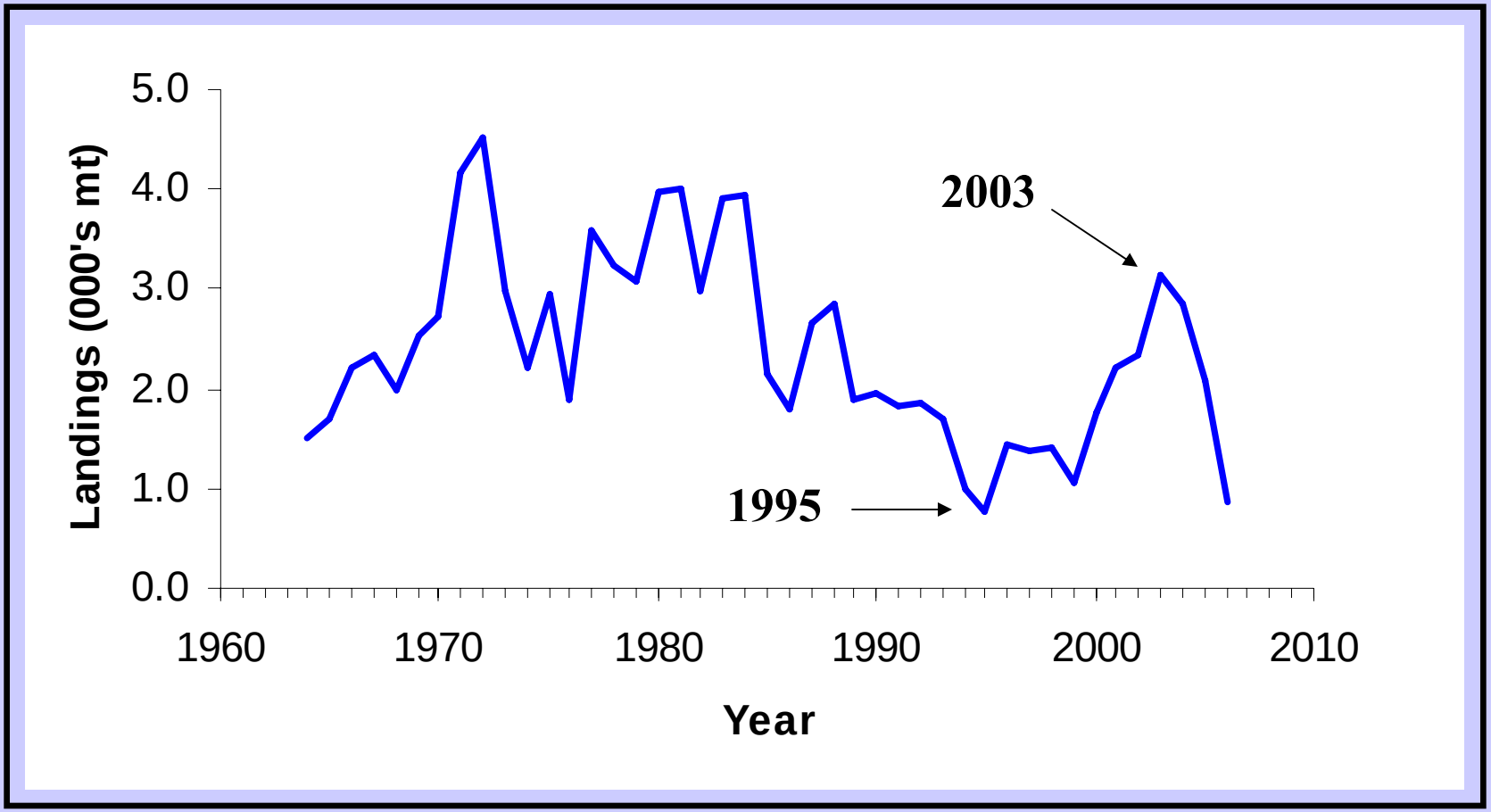
Discards, 1989-2006 (3 fleets by qtr, initial est.)

- OT, lg mesh (≥ 5.5 in.)
- OT, sm mesh groundfish (< 5.5 in.)
- Scallop dredge, limited permit category

LAA, 1982-1988

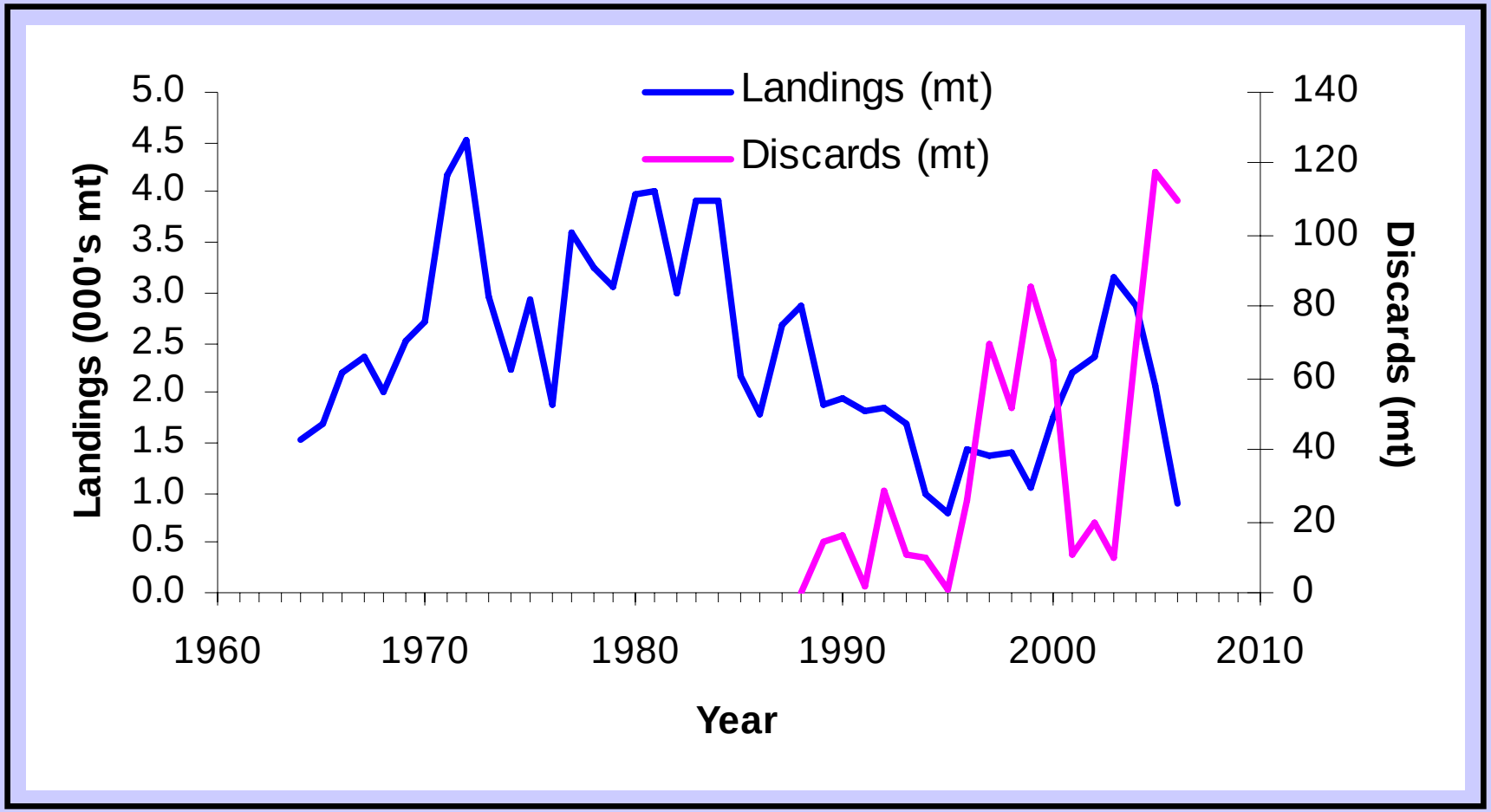
CAA, 1989-2006

Landings, 1964-2006



Mainly lg mesh OT, some scallop dredge

Landings and Discards



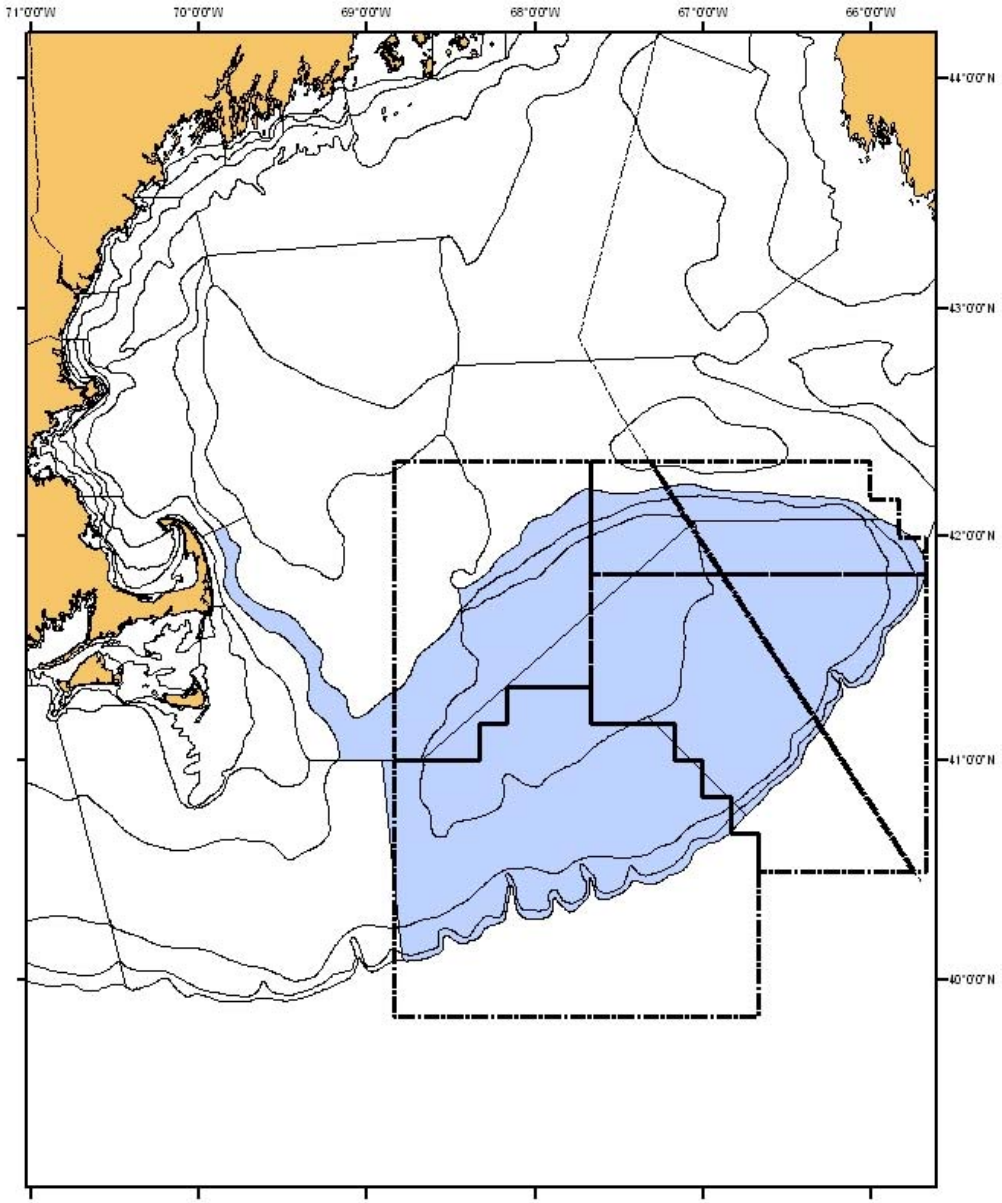
Data Available for Assessments

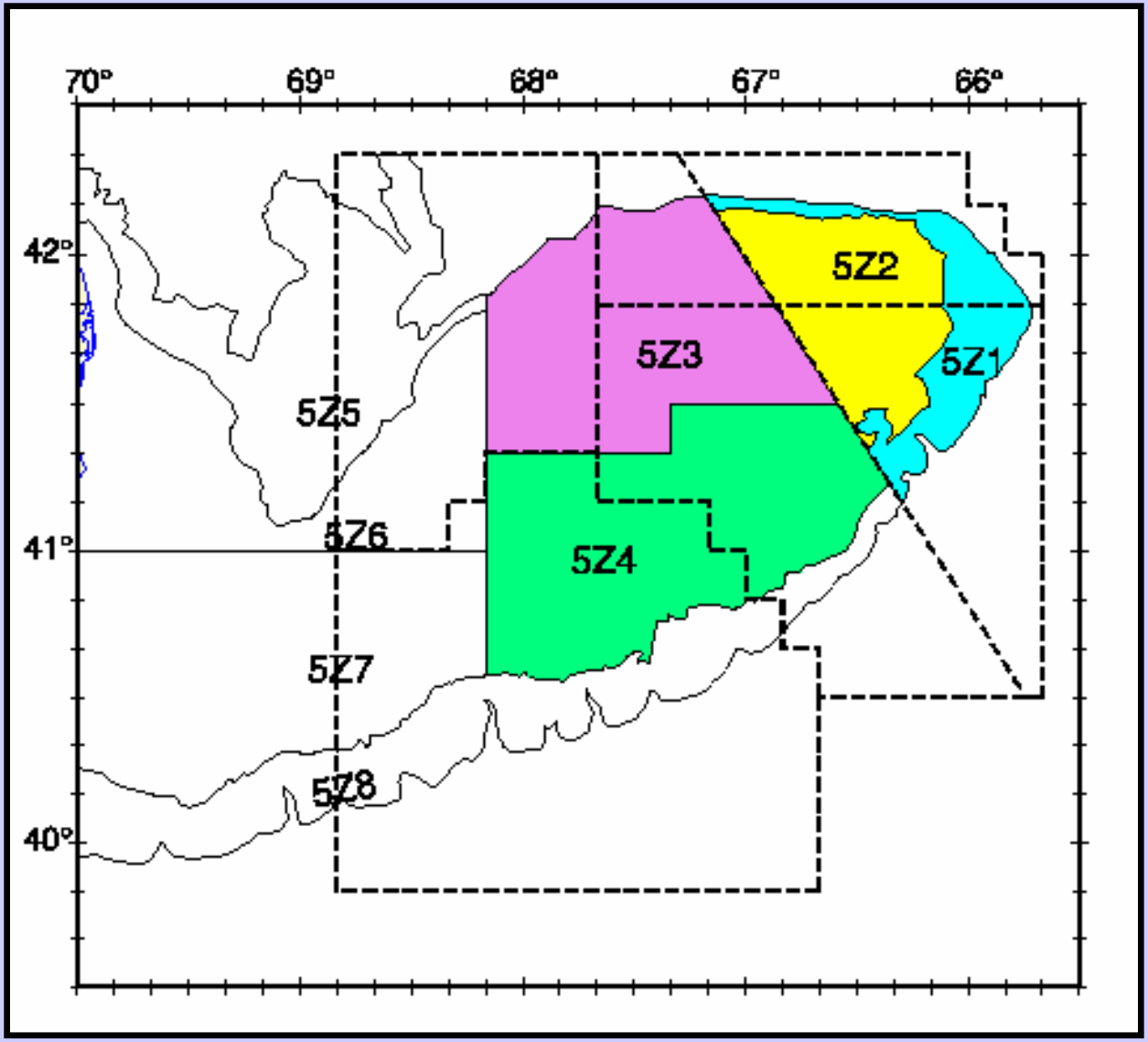
Survey Data

Numbers at age, 1982-2006

- **NEFSC spring**
- **NEFSC fall**
- **CA spring (use NEFSC spring svy age composition)**

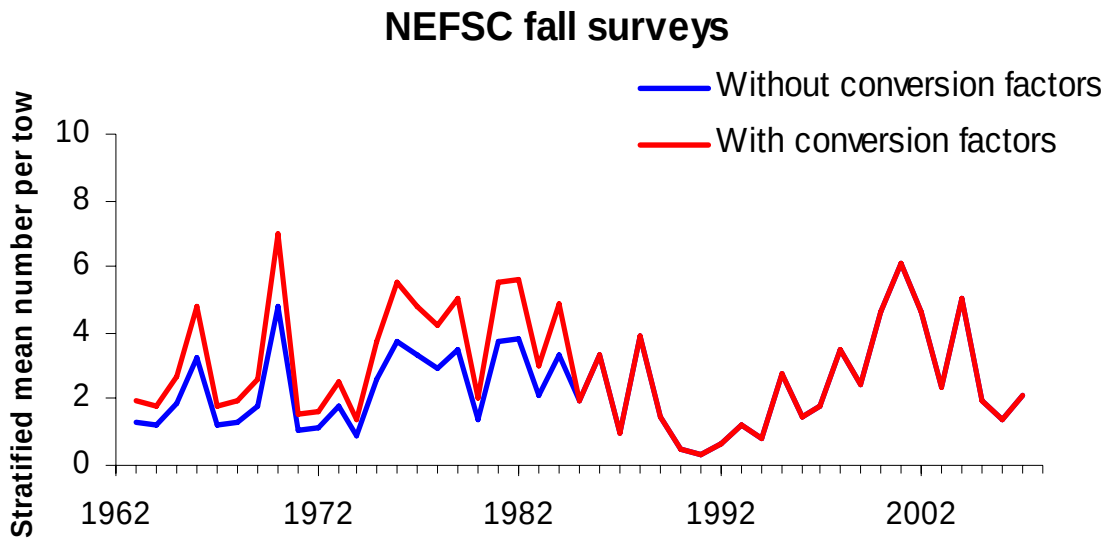
NEFSC survey strata set and stock area

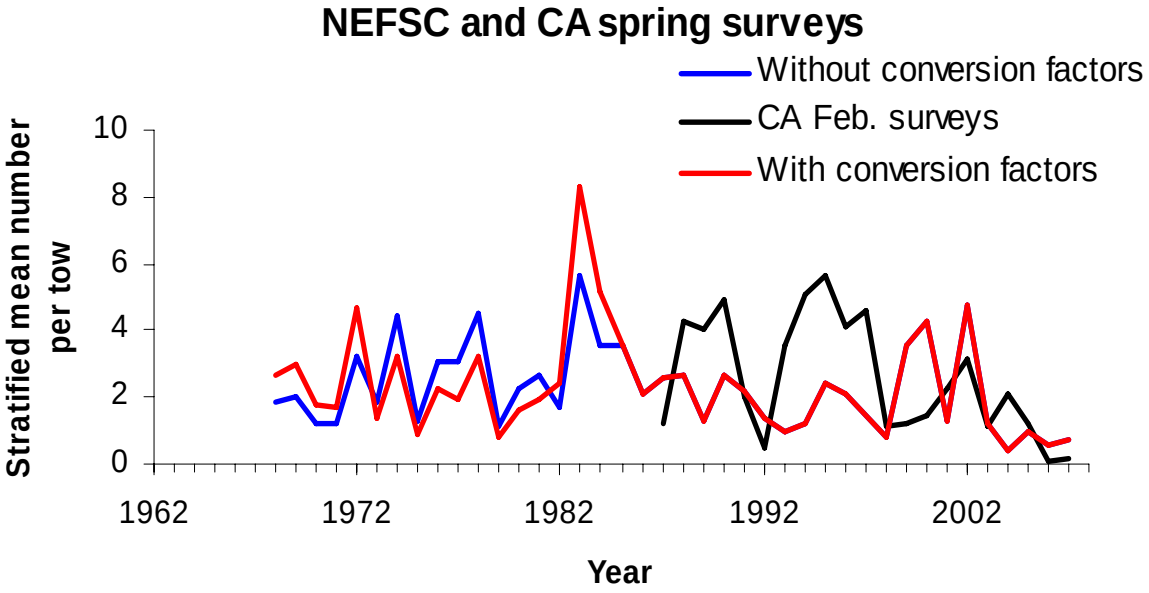




CA research survey strata (5Z1-4) and GB WFL stock area

Relative Abundance Indices





In 2004,
overfishing was occurring
but the stock was not overfished

Current Assessment Model (fallback)

ASPIC (production model)

Weaknesses

- ref. pts. re-estimated with each model run
- no direct linkage of results to ref. pts. (relative ref. pts. must be compared to the more precise estimates of F and B which are relative values, F_t/F_{MSY})
- no incorporation of size and age comp. info.

Strengths

- Longer time series of input data, reasonable model fit with no strong retrospective patterns

Proposed Model

VPA or ASAP, 1982-2007

- Sampling intensity of fishery age and length compositions has improved since 2000 when SARC 34 VPA was conducted

Table K2. Discard Summary
Table K3. Trip Summary

Lg mesh OT Best sampled, 13-303 trips/yr
(< 10 trips during 1997-1999)
Discards 0-47 mt (highest 15-47 mt, 2004-06)
Lowest CVs 0.25-1.69 (67% CVs > 0.50)
Est. landings fair approx. of actual landings

Sm mesh OT Poorly sampled (< 10 trips, 1990-2002)
Discards < 1 mt except 2004-2006 (15 mt)
CVs consistently higher, 0.64 – 0.97
2003-06 largest N trips, est. landings overest. actual landings

Table K2. Discard Summary
Table K3. Trip Summary

Scallop dredge

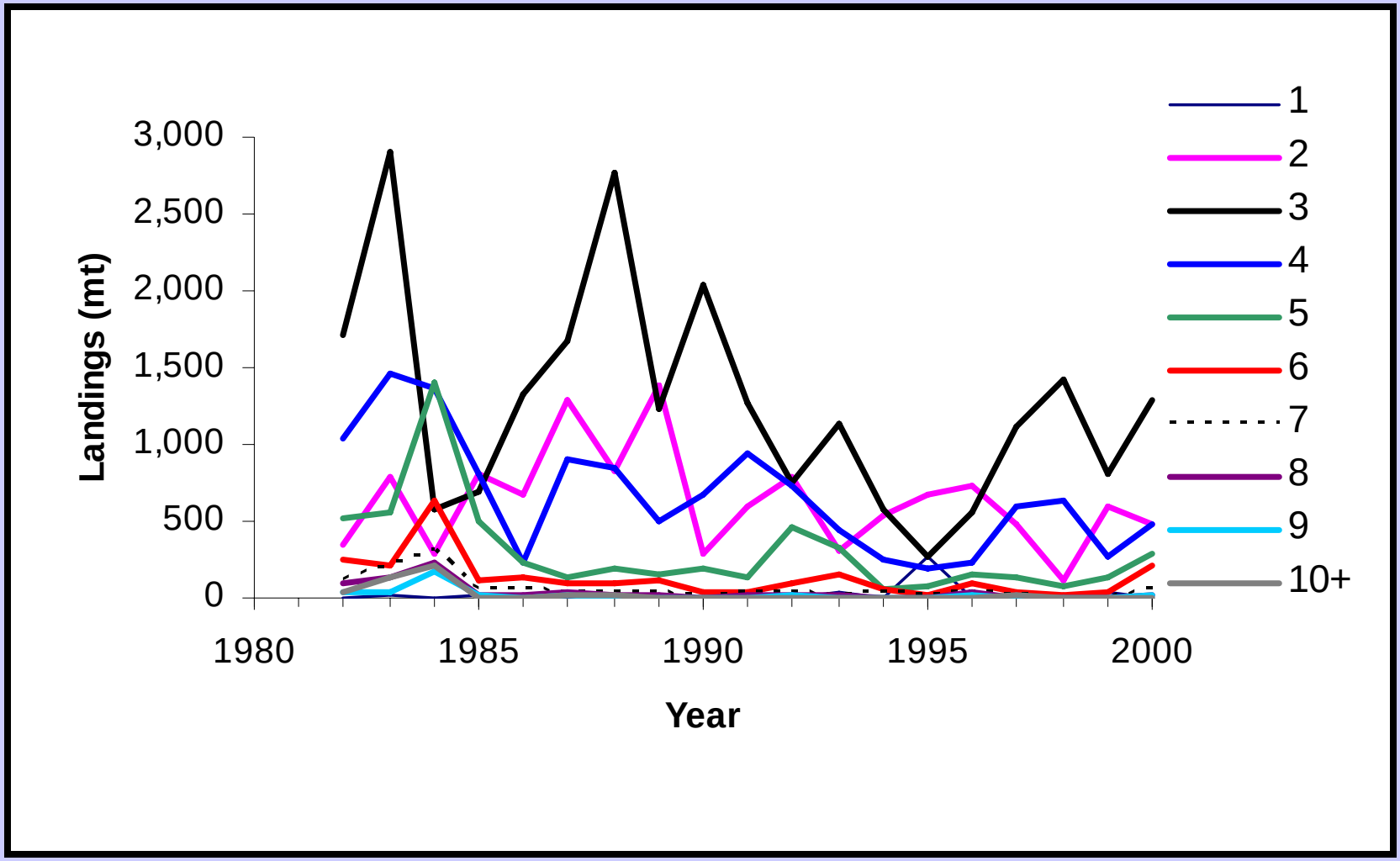
Very poorly sampled (0-8 trips during all but 6 yrs

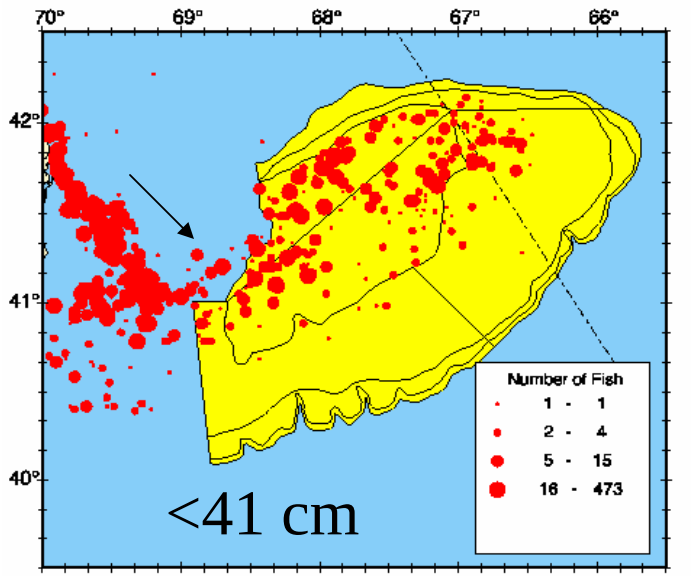
Highest D/K ratios

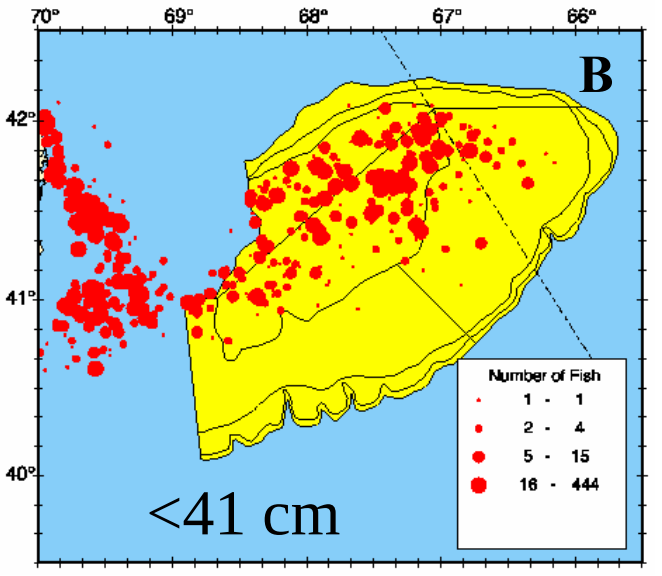
Highly variable discards, 0.03-87 mt (high 1997-2000, 40-70 mt, highest 2005-2006, 69-87 mt)

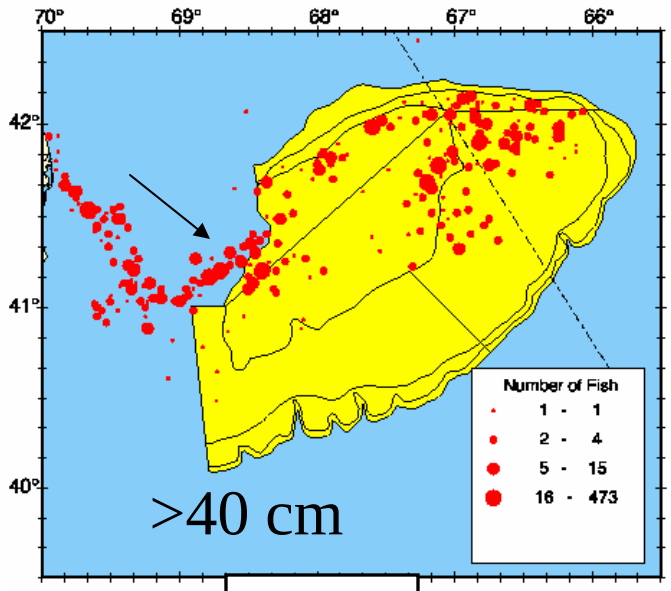
Highly variable CVs 0.14 – 3.06

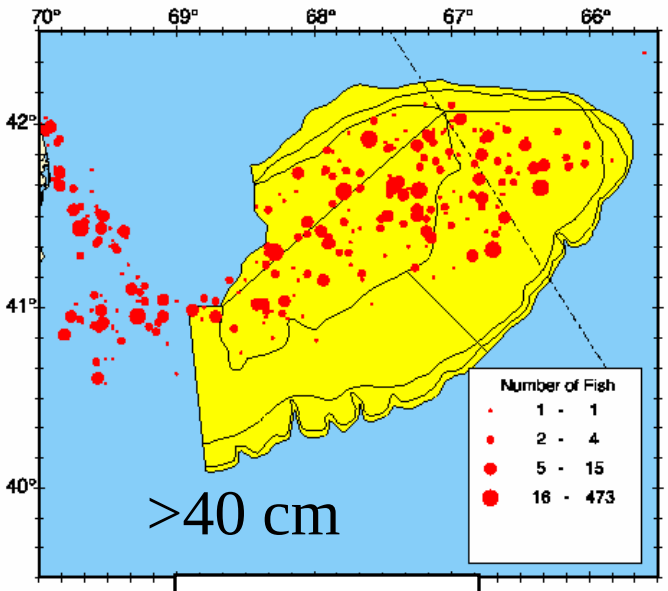
LAA, 1982-2000
(source: SARC34)









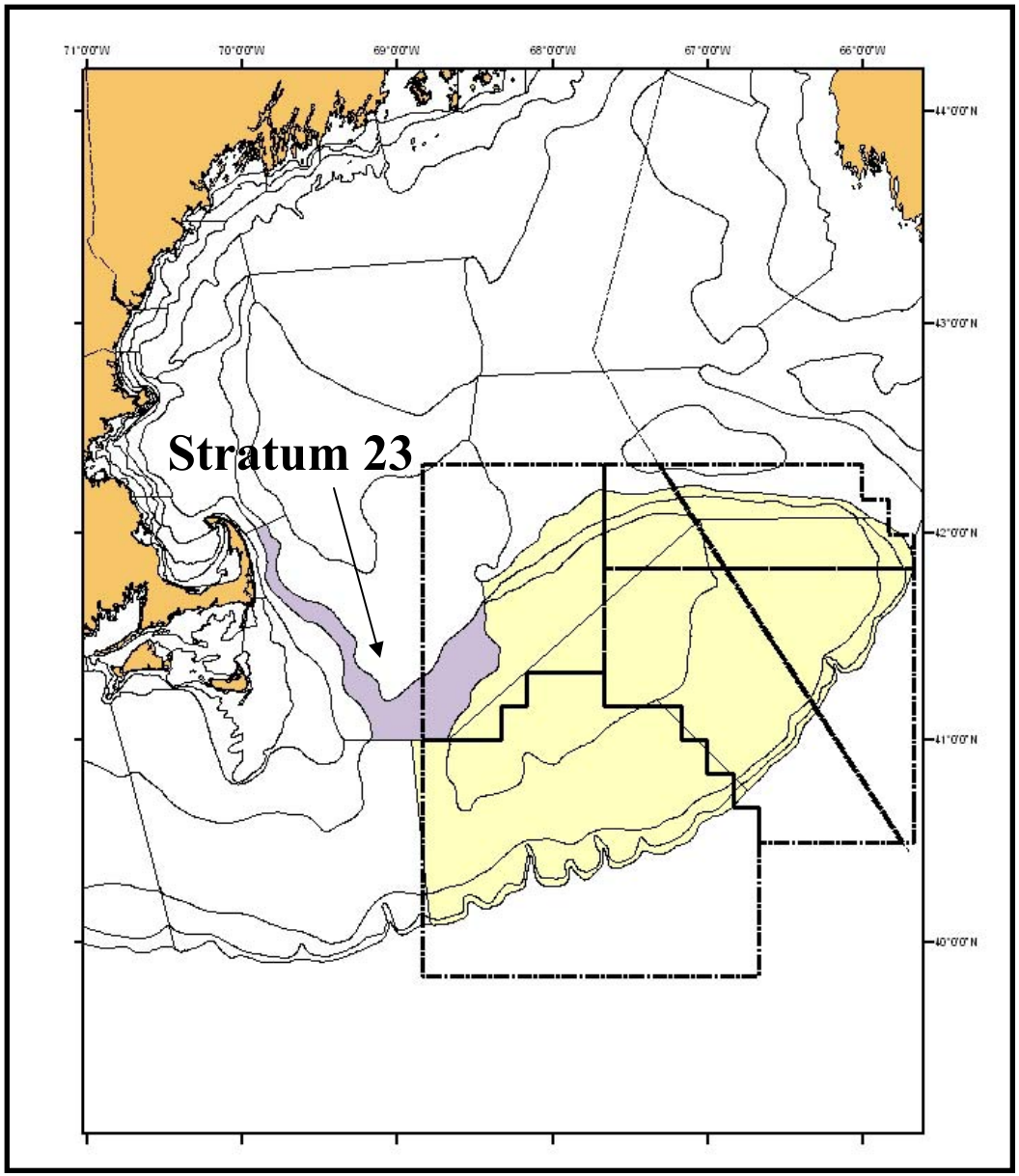


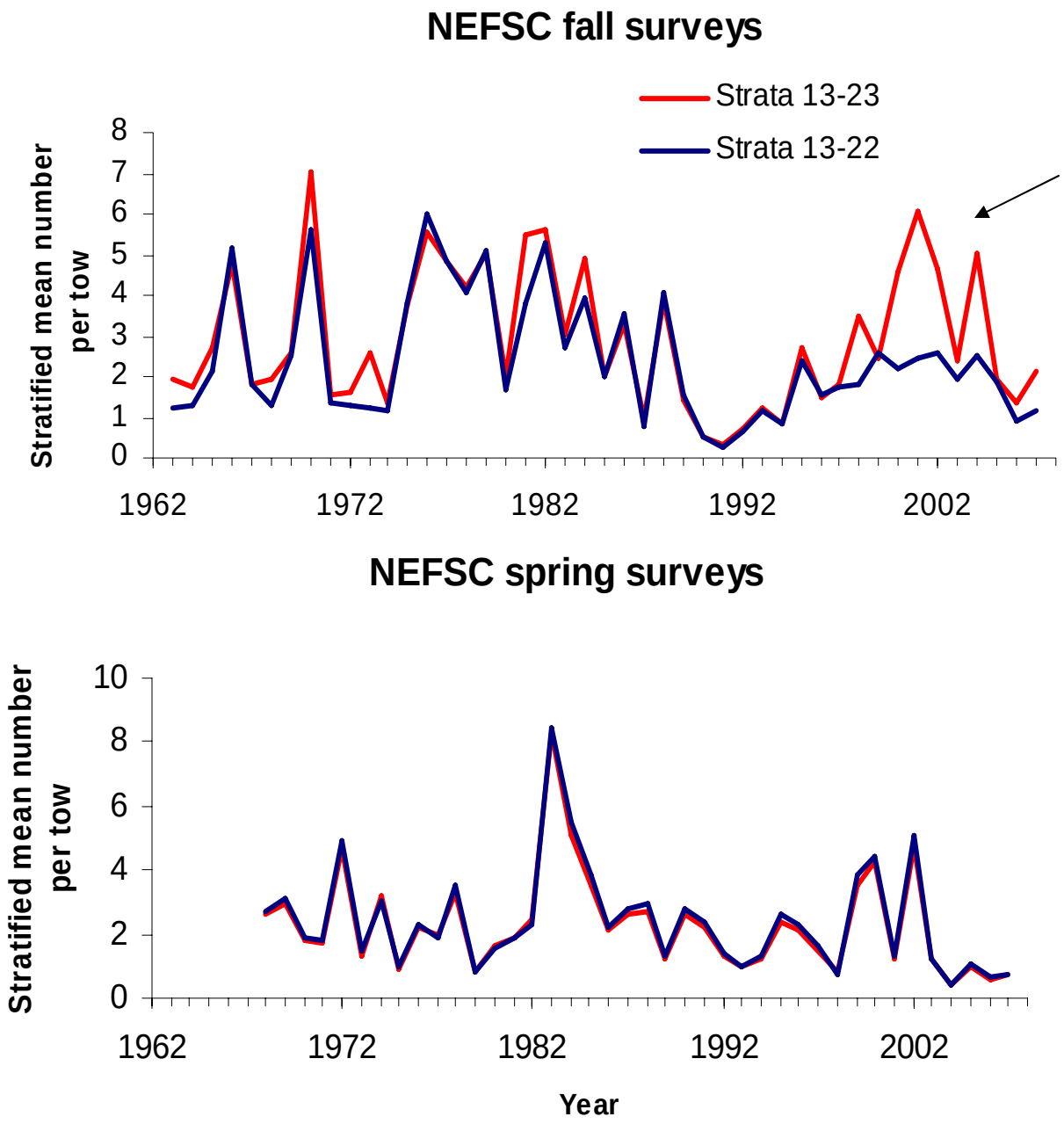
FALL

SPRING

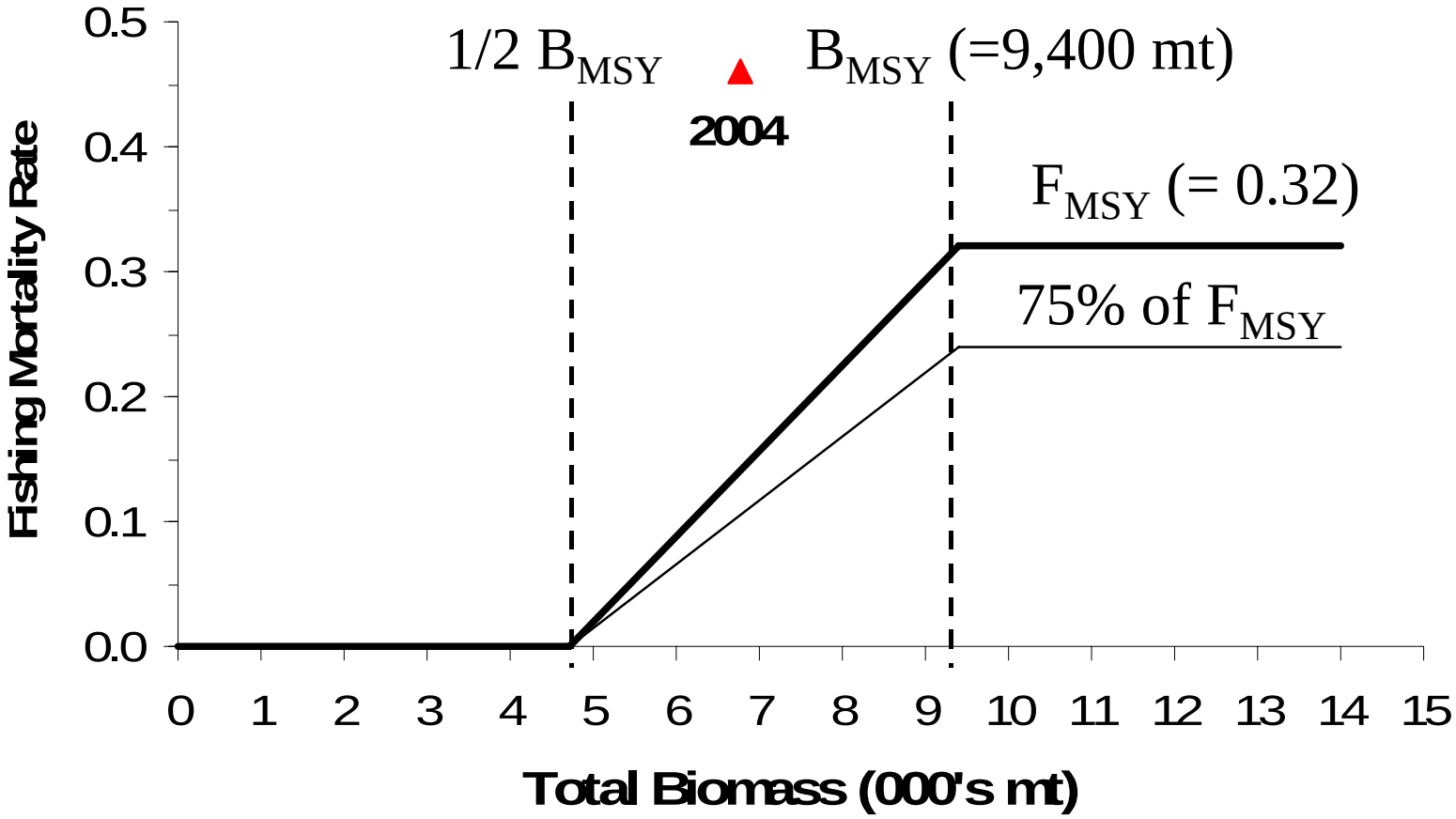
NEFSC surveys 1982-2000

Stratum 23 added to GB WFL strata set (13-22)

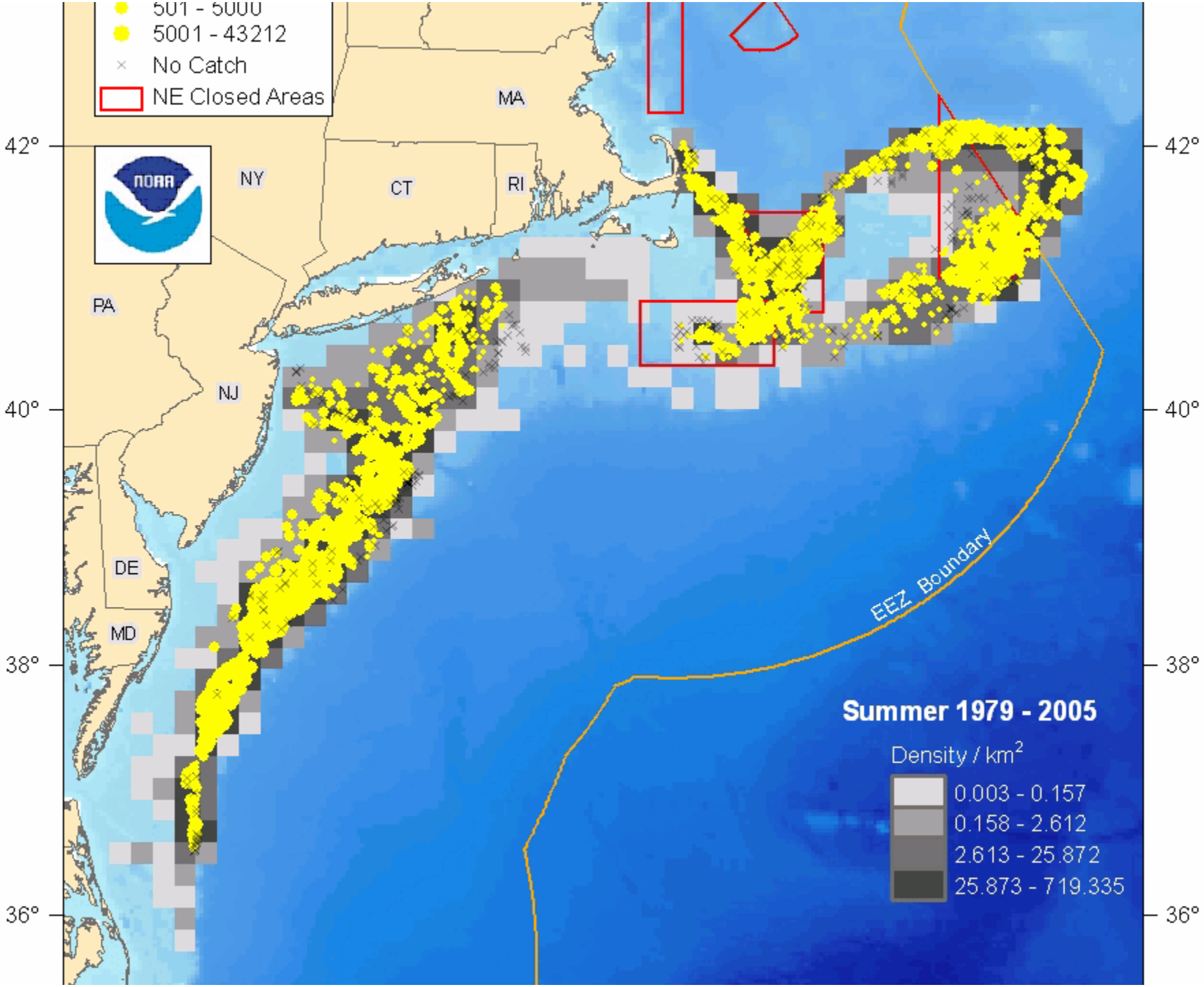


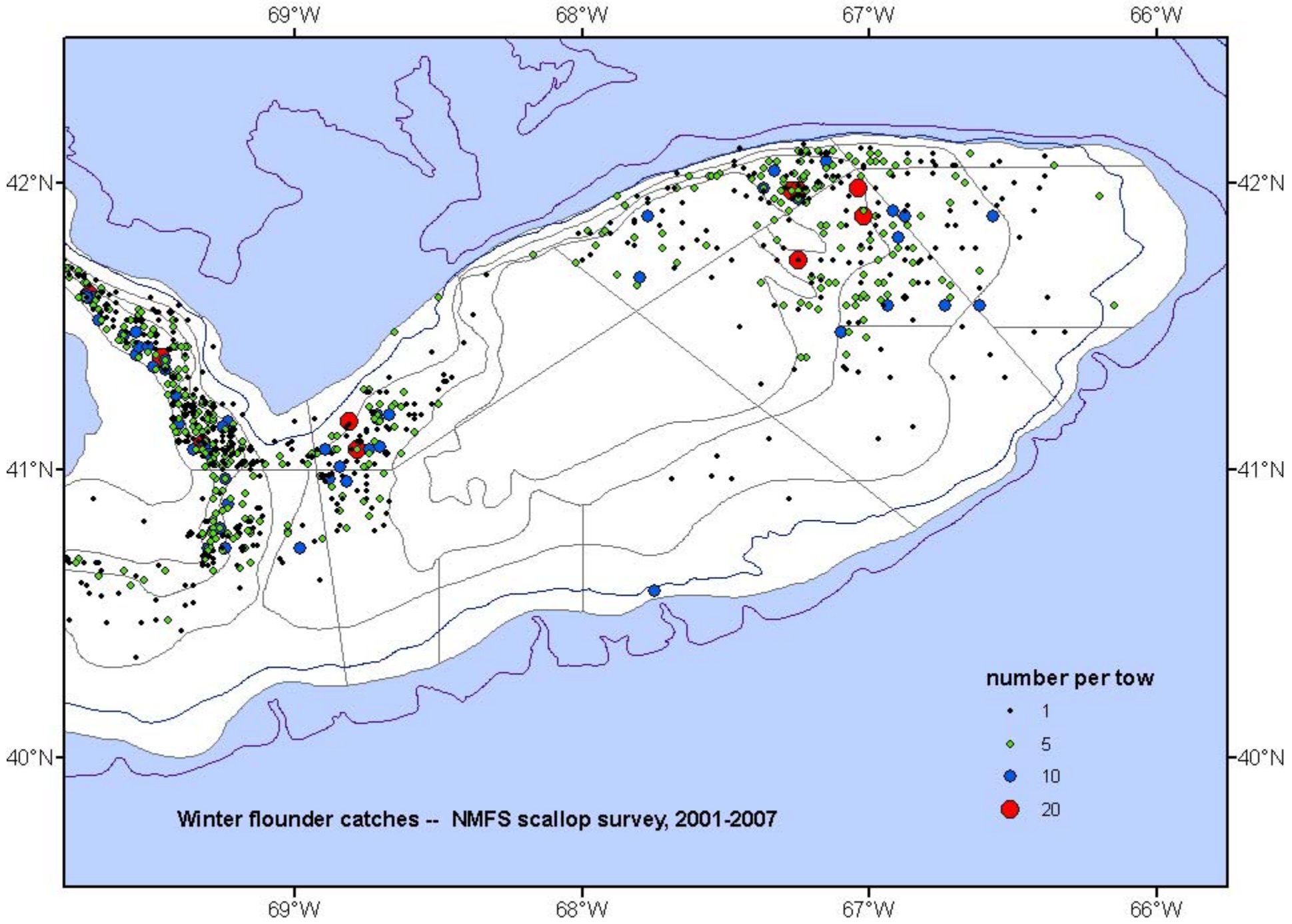

NEFSC fall surveys
Strata 13-23
Strata 13-22
Stratified mean number per tow
0
1
2
3
4
5
6
7
8
1962
1972
1982
1992
2002
NEFSC spring surveys
Stratified mean number per tow
0
2
4
6
8
10
1962
1972
1982
1992
2002
Year

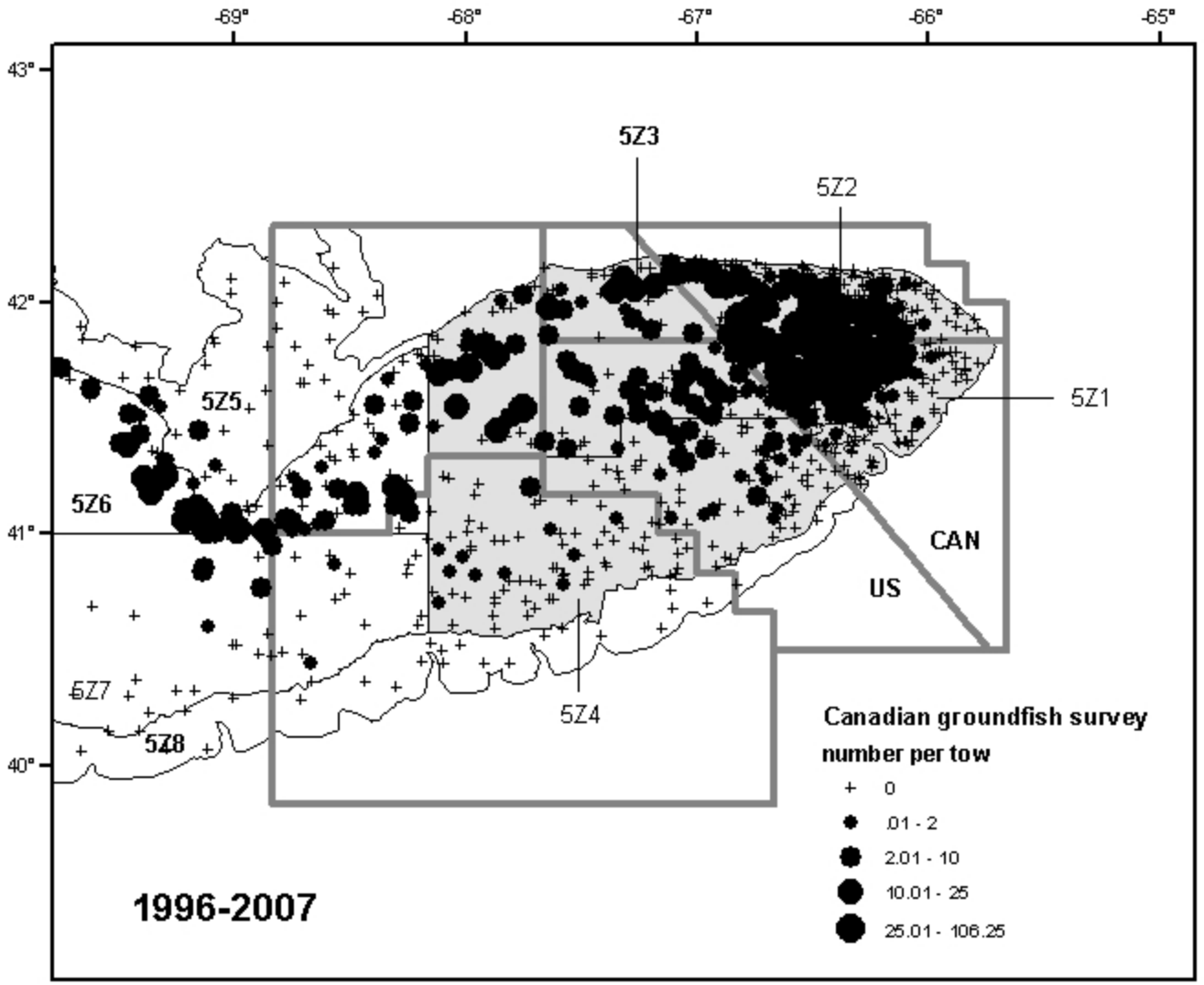
2004 Stock Status



Not overfished but overfishing was occurring in 2004


501 - 5000
5001 - 43212
No Catch
NE Closed Areas
MA
NY
CT
RI
PA
NJ
DE
MD
42°
40°
38°
36°
EEZ Boundary
Summer 1979 - 2005
Density / km²
0.003 - 0.157
0.158 - 2.612
2.613 - 25.872
25.873 - 719.335


69°W
68°W
67°W
66°W
42°N
41°N
40°N
number per tow
1
5
10
20
Winter flounder catches -- NMFS scallop survey, 2001-2007



CA spring survey

ASSESSMENT HISTORY

Last assessed in October at GARM 2002

SAW 34 formulation of ASPIC model incorporating:

1. **Landings (1964-2001)**

   Reliable estimates of annual discards not possible at SARC 34

2. **NEFSC autumn survey (1964-2001)**

3. **NEFSC spring survey (1968-2002), lagged back one yr (end-of-year index)**

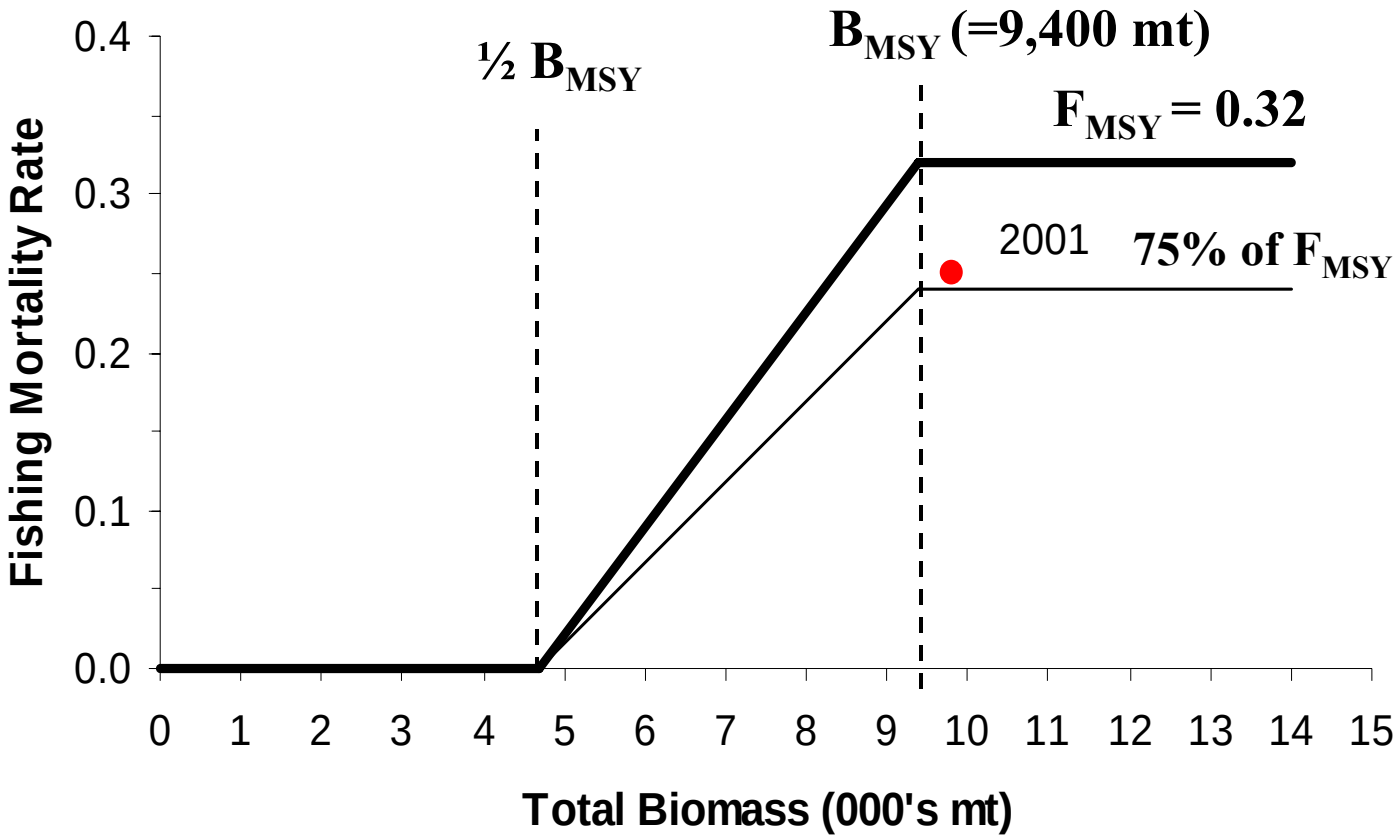
ASSESSMENT HISTORY

ASPIC model results:

1. **Reasonable fit, no strong retrospective patterns in F or total B**
2. **Yield below surplus production since 1994**
3. **Total B increased during 1994-2001 and was slightly above B_{MSY} (=9,400 mt) in 2001**
4. **F was at or below F_{MSY} (=0.32) during 1995-2001**

Control Rule and 2001 Stock Status

(ASPIC-based)



Not overfished and overfishing not occurring

UPDATE of 2002 ASSESSMENT

SAW 34/ 2002 GARM ASPIC model:

- **Landings, 2002-2004**
- **Autumn biomass indices, 2002-2004**
- **Spring biomass indices, 2002-2005**

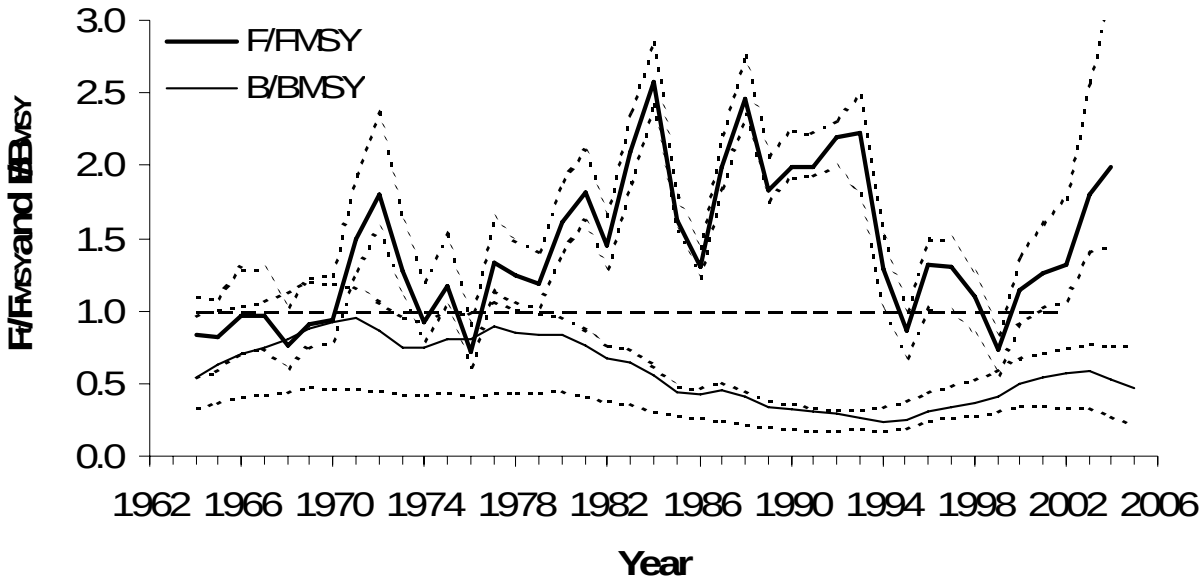
Determine stock status in 2004 using ASPIC-based BRPs

ASPIC Model Results

	U.S. autumn survey, 1964-2001 U.S. spring survey, 1968-2002 Total Landings, 1964-2001 GARM 2002 model, ASPIC v. 3.7.2	U.S. autumn survey, 1964-2001 U.S. spring survey , 1968-2002 Total Landings, 1964-2001 GARM 2002 model, ASPIC v. 5.10	**U.S. autumn survey, 1964-2004 U.S. spring survey, 1968-2005 Total landings, 1968-2004 Assessment update, ASPIC v. 5.10**
Total Objective Function	1.959	1.959	**2.448**
B-ratio coverage	0.92 (ideal = 2)	0.46 (ideal = 1)	**0.36**
B-ratio nearness	1.00 (ideal = 1)	1.00 (ideal = 1)	**0.97**
R^2 in CPUE, q			
U.S. Autumn Survey	0.34, 0.271	0.34, 0.271	**0.29, 0.232**
U.S. Spring Survey	0.23, 0.349	0.23, 0.349	**0.20, 0.274**
r	0.664	NA, based on MSY and K model est., r = 0.667	**NA, based on MSY and K model est., r = 0.463**
K (mt)	NA, based on r and MSY model est., K = 18,241	18,160	**26,860**
F_{msy}	0.33	0.33	**0.23**
B_{msy} (mt)	9,119	9,080	**13,430**
MSY (mt)	3,028	3,027	**3,112**
$B_{2001 \text{ or } 2004}/B_{MSY}$	1.11	1.11	**0.47**
$F_{2001 \text{ or } 2004}/F_{MSY}$	0.76	0.76	**1.99**

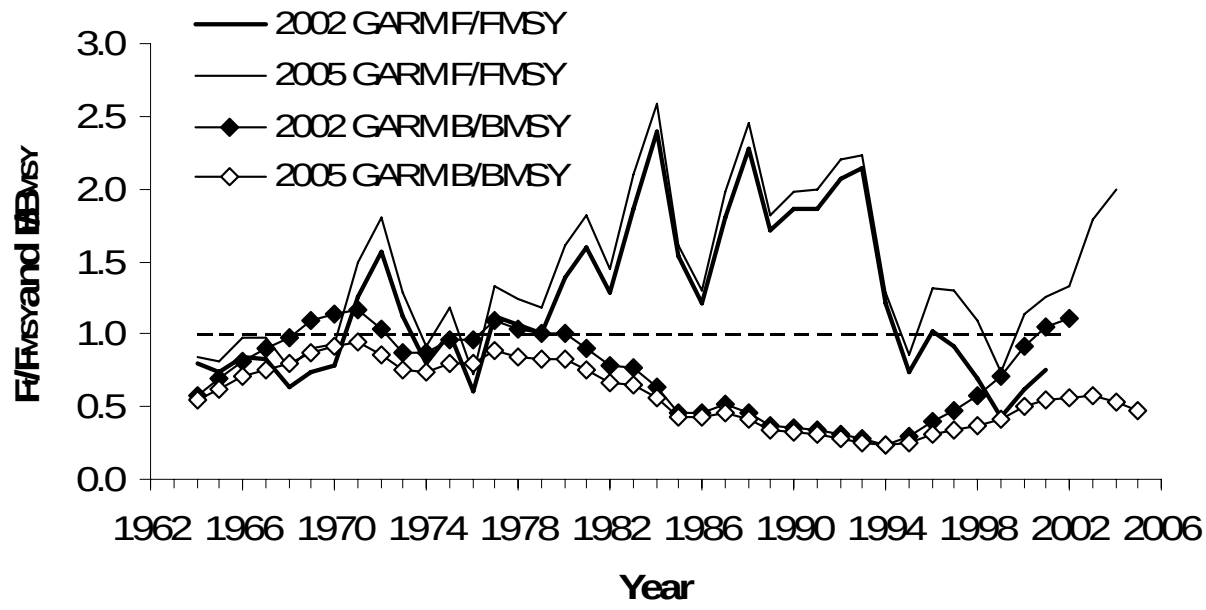
2005 GARM

Rel. B and F, 80% CL

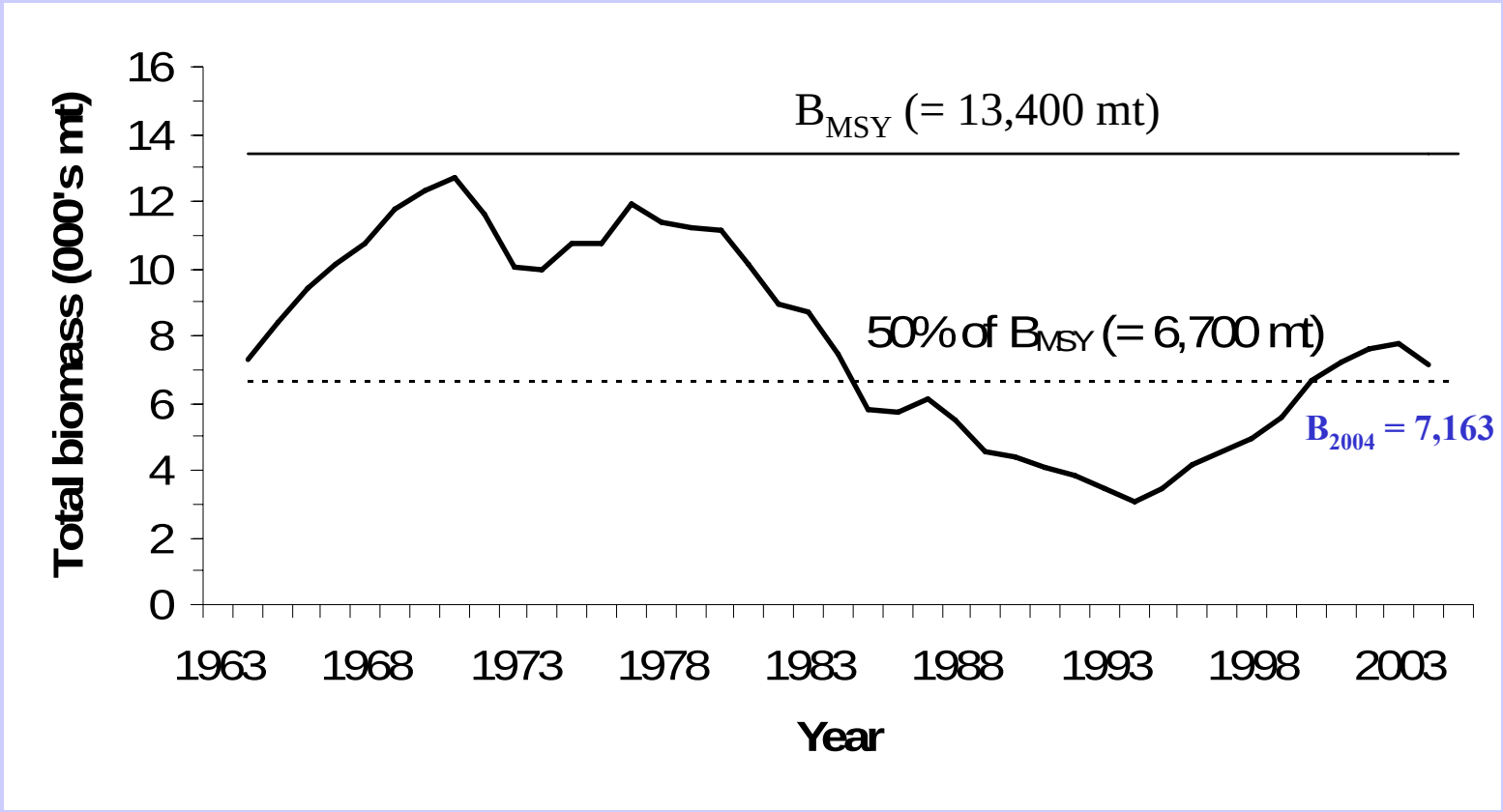


2005 GARM vs. 2002 GARM

Rel. B and F

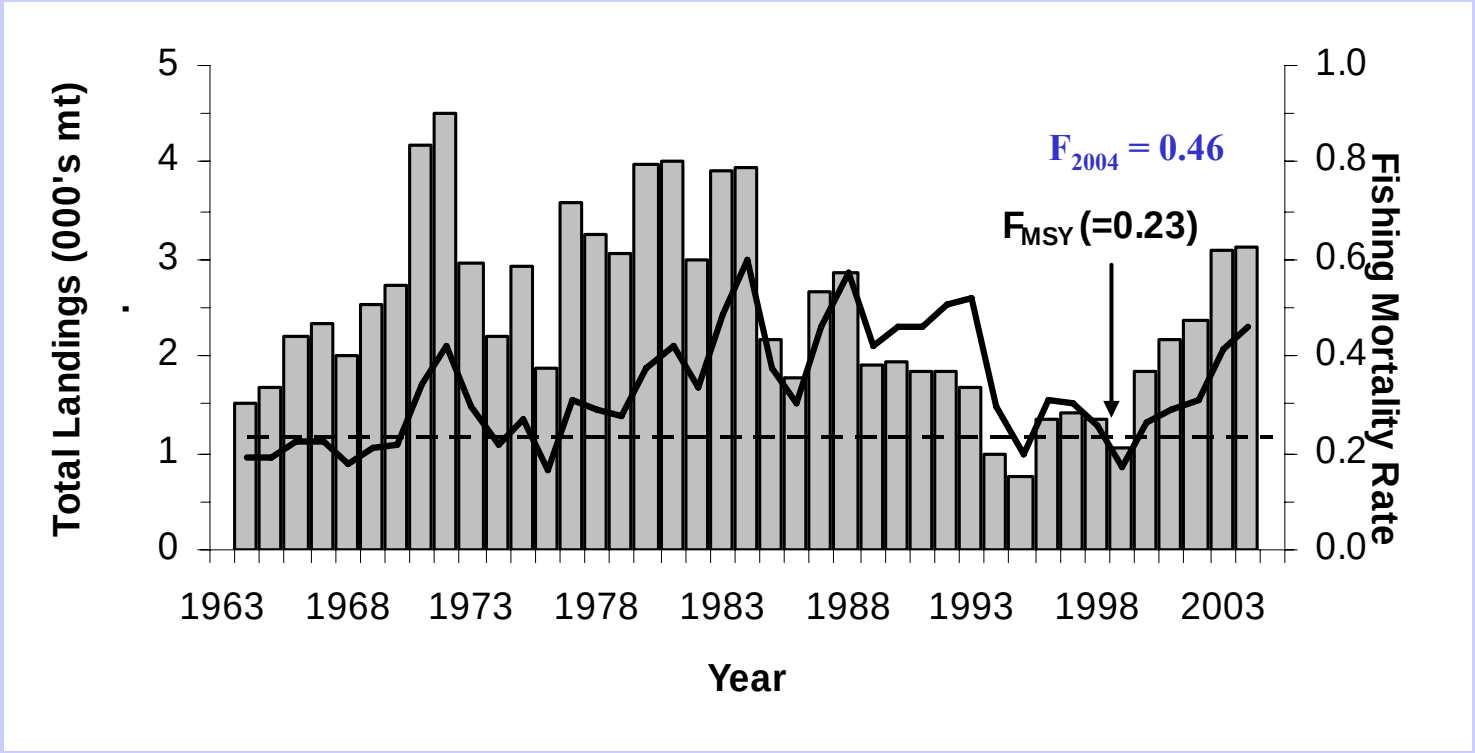


Jan. 1 Total Biomass, 1964-2004



Increased in 1994-2002, above threshold after 2000, but declined in 2003-2004

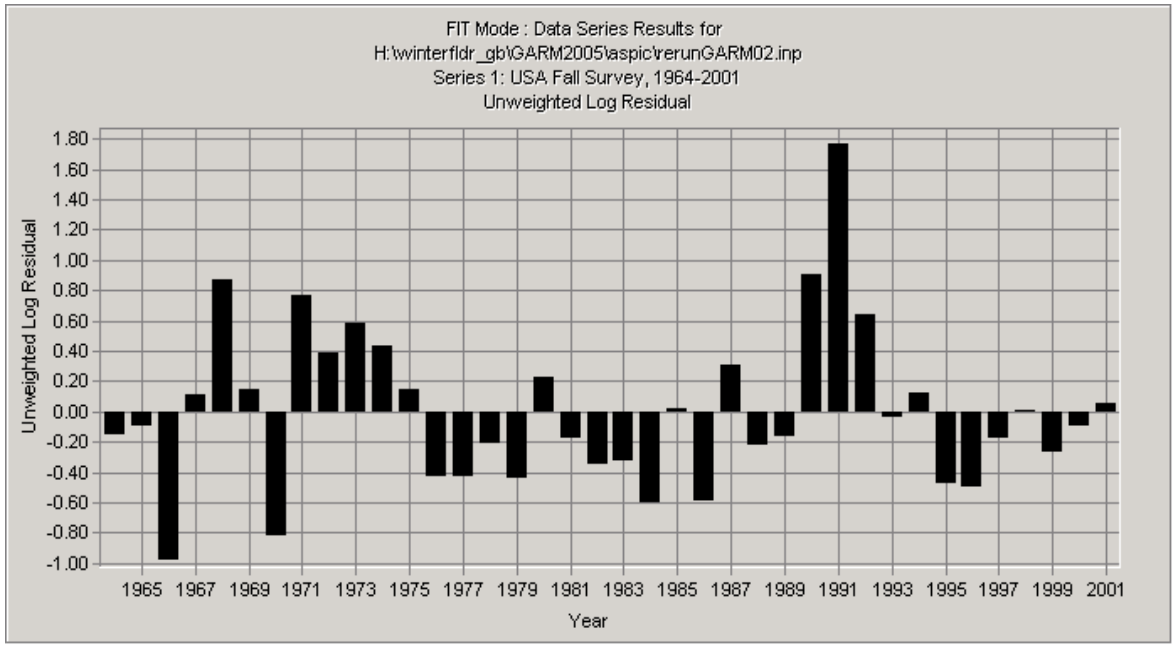
Fishing Mortality Rates, 1964-2004



F increase after 1999 and above F_{MSY} in 2000-2004

Autumn survey biomass

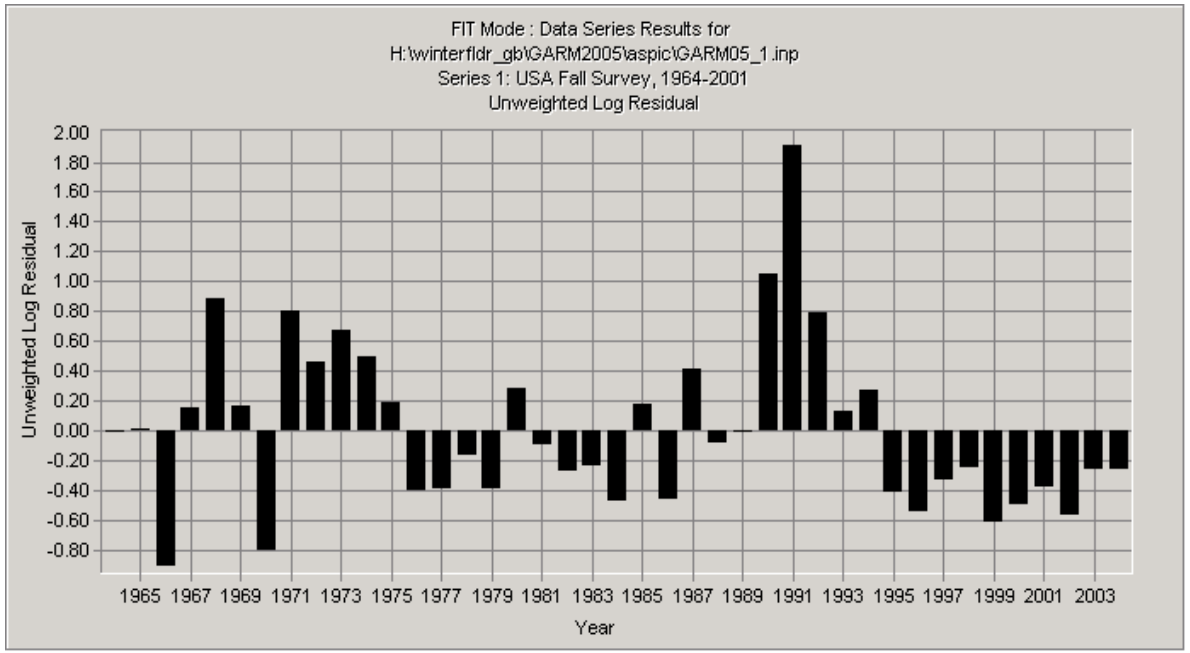
2002 GARM



2005 GARM

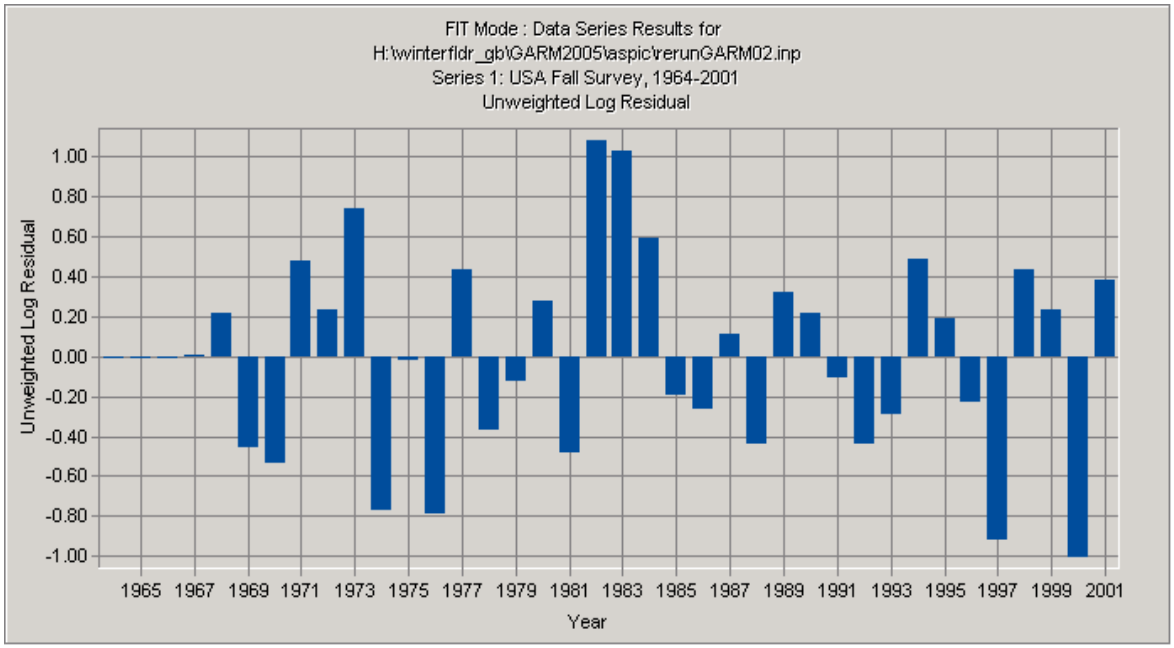
Pos. 90-94

Neg. 95-04

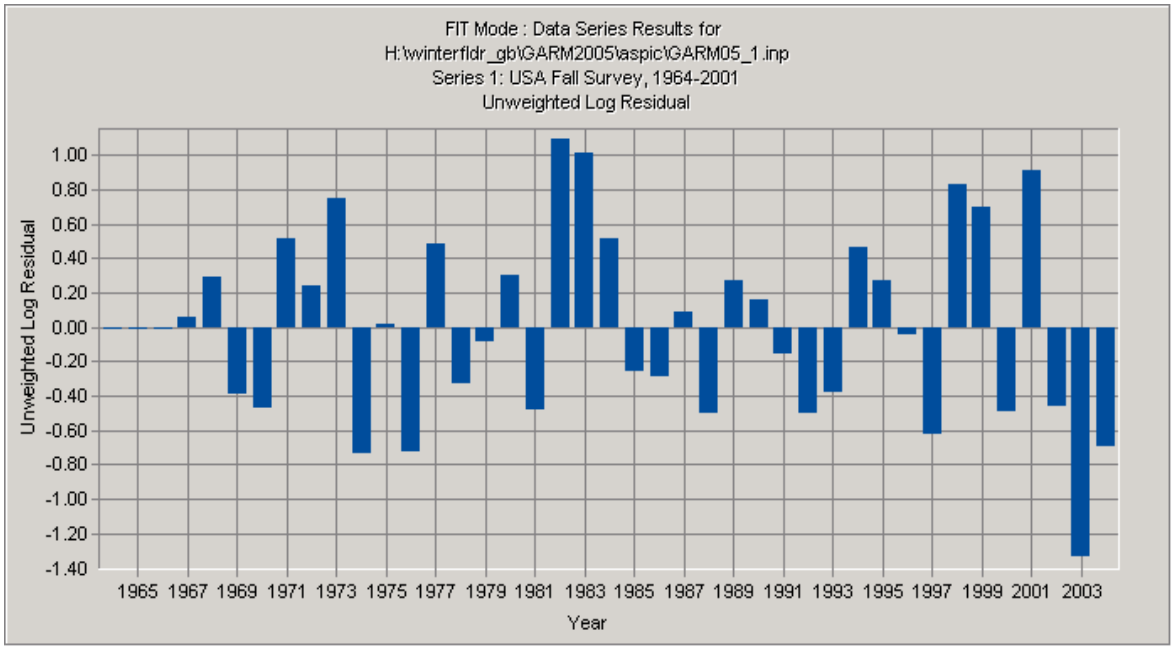


Spring survey biomass

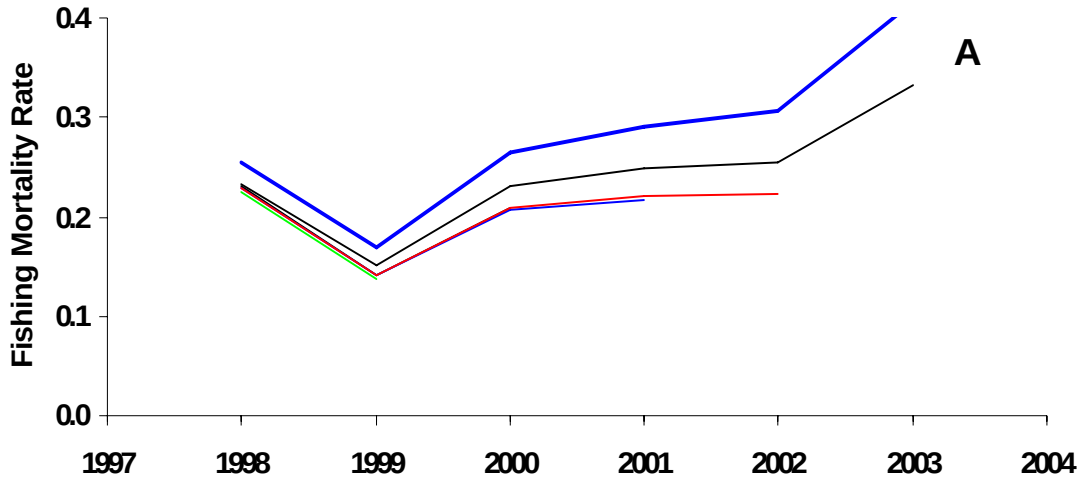
2002 GARM



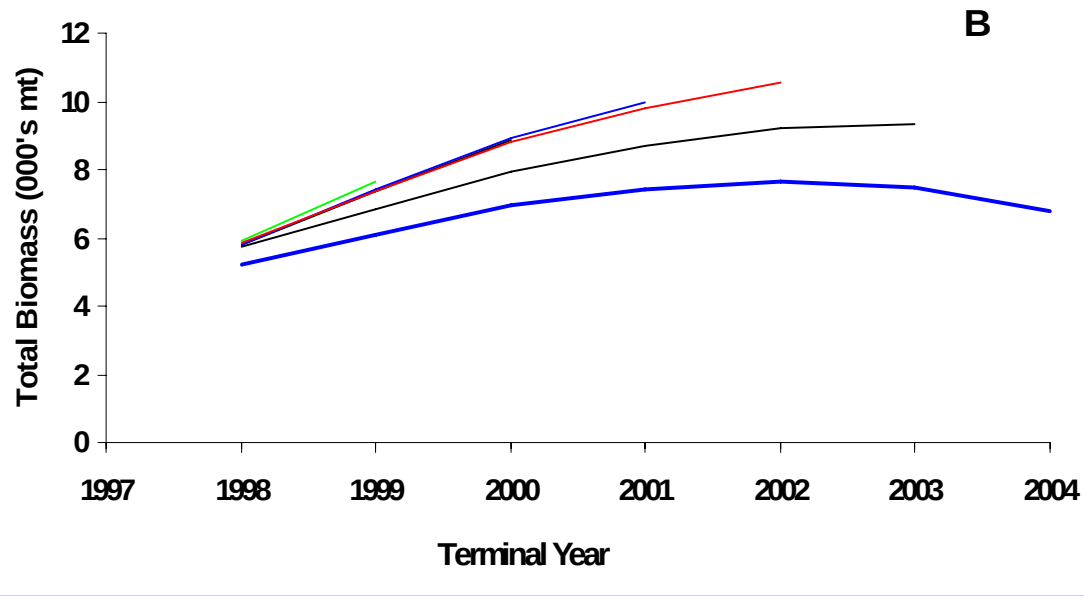
2005 GARM



ASPIC Retrospective Analysis



Underestimation of F

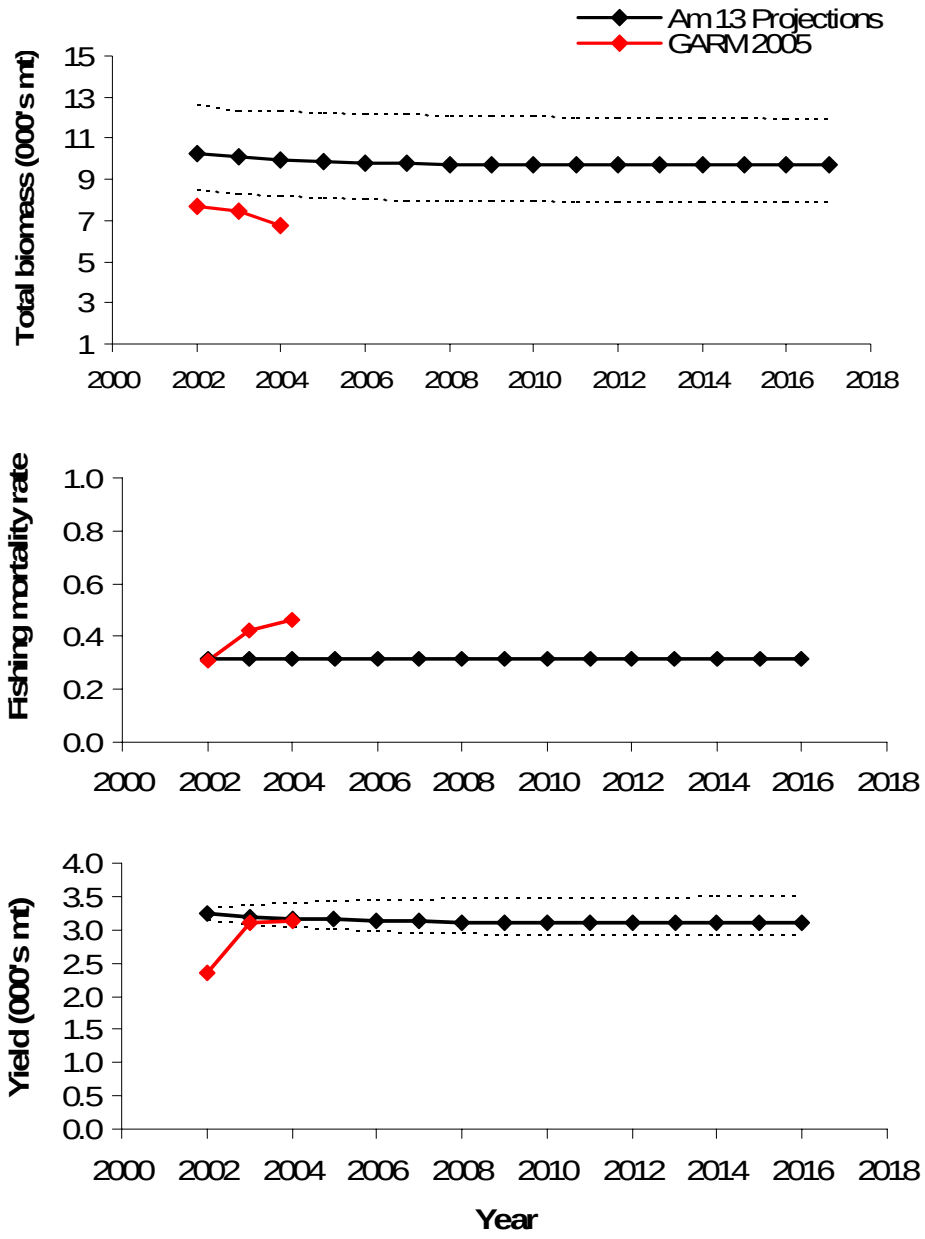


Overestimation of B

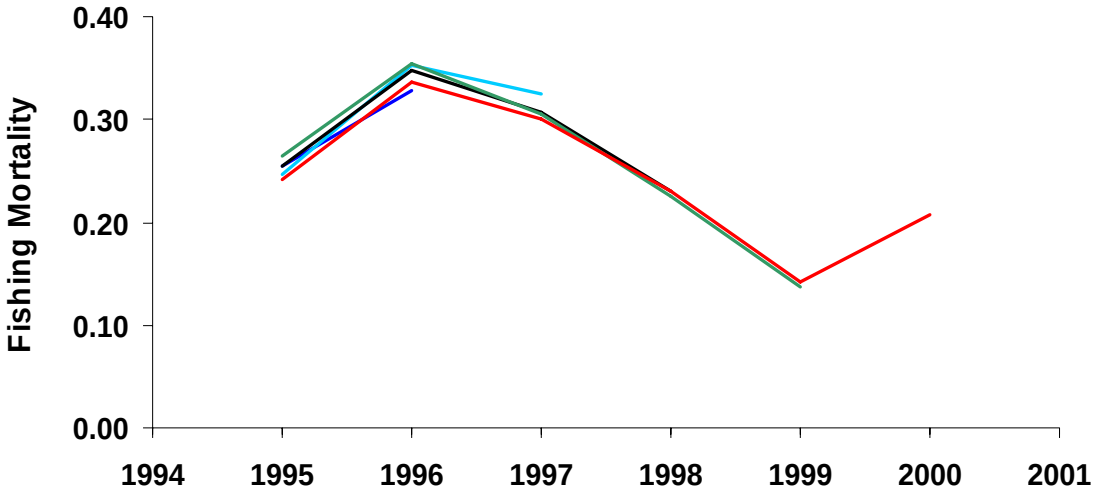
Sources of Uncertainty

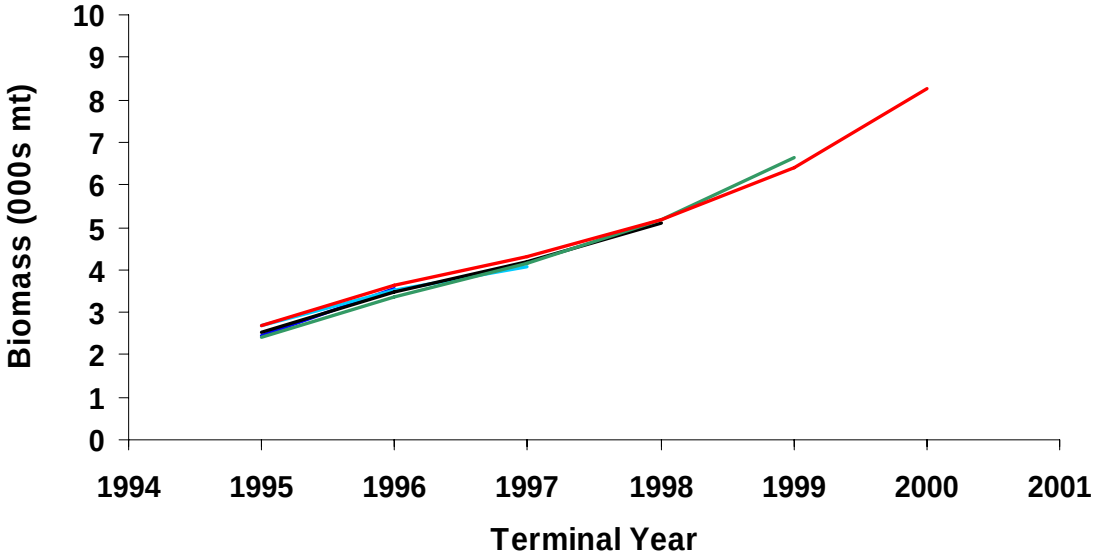
- Underestimation of fishery removals due to due to lack of reliable discard estimates
- Recruitment is implicitly assumed to be a function of total biomass in the ASPIC model
- CA percentage of total landings is small, but may be underestimated (is a bycatch species and some WF may be reported as unclassified fldr)
- USA landings prorated after 1994

Status relative to Am. 13 projections



GARM 2002


Fishing Mortality
0.40
0.30
0.20
0.10
0.00
1994
1995
1996
1997
1998
1999
2000
2001


Biomass (000s mt)
10
9
8
7
6
5
4
3
2
1
0
1994
1995
1996
1997
1998
1999
2000
2001
Terminal Year

DISCARDS

SARC 34 estimates:

deemed unreliable due to insufficient data

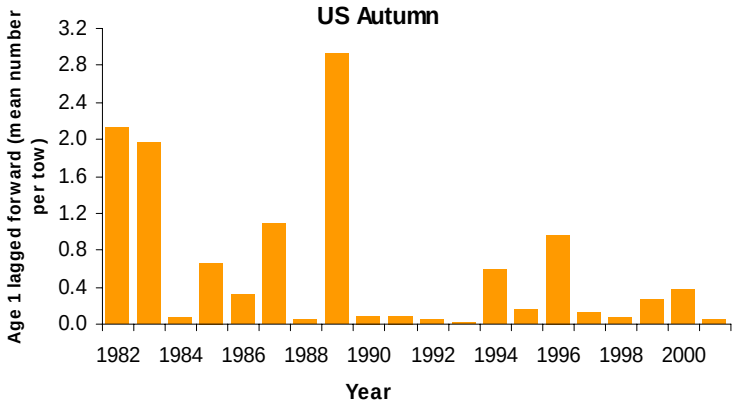
NEFSC Sea Sampling Data

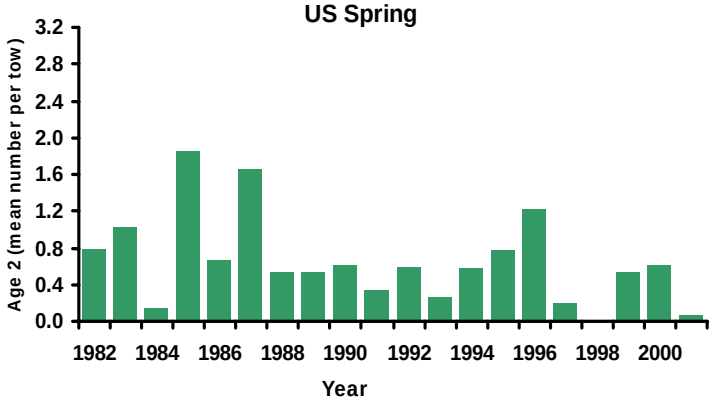
3-17 otter trawl trips/yr, 1989-2000

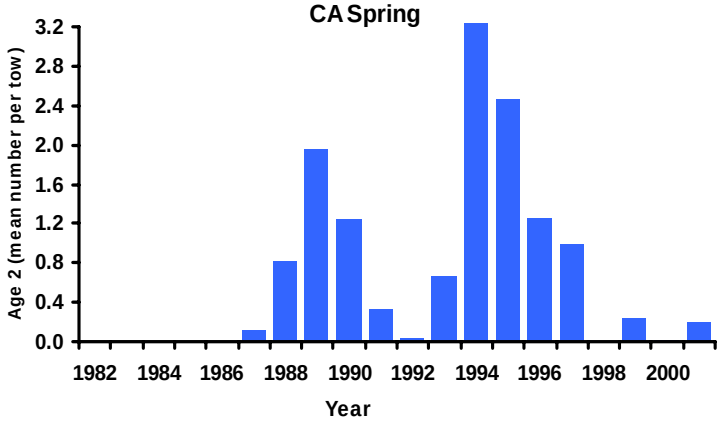
1-9 scallop dredge trips/yr, 1992-2000

Discard L-F samples insufficient to estimate number discarded at length and insufficient age data for sublegal-sized fish

Year Class Trends







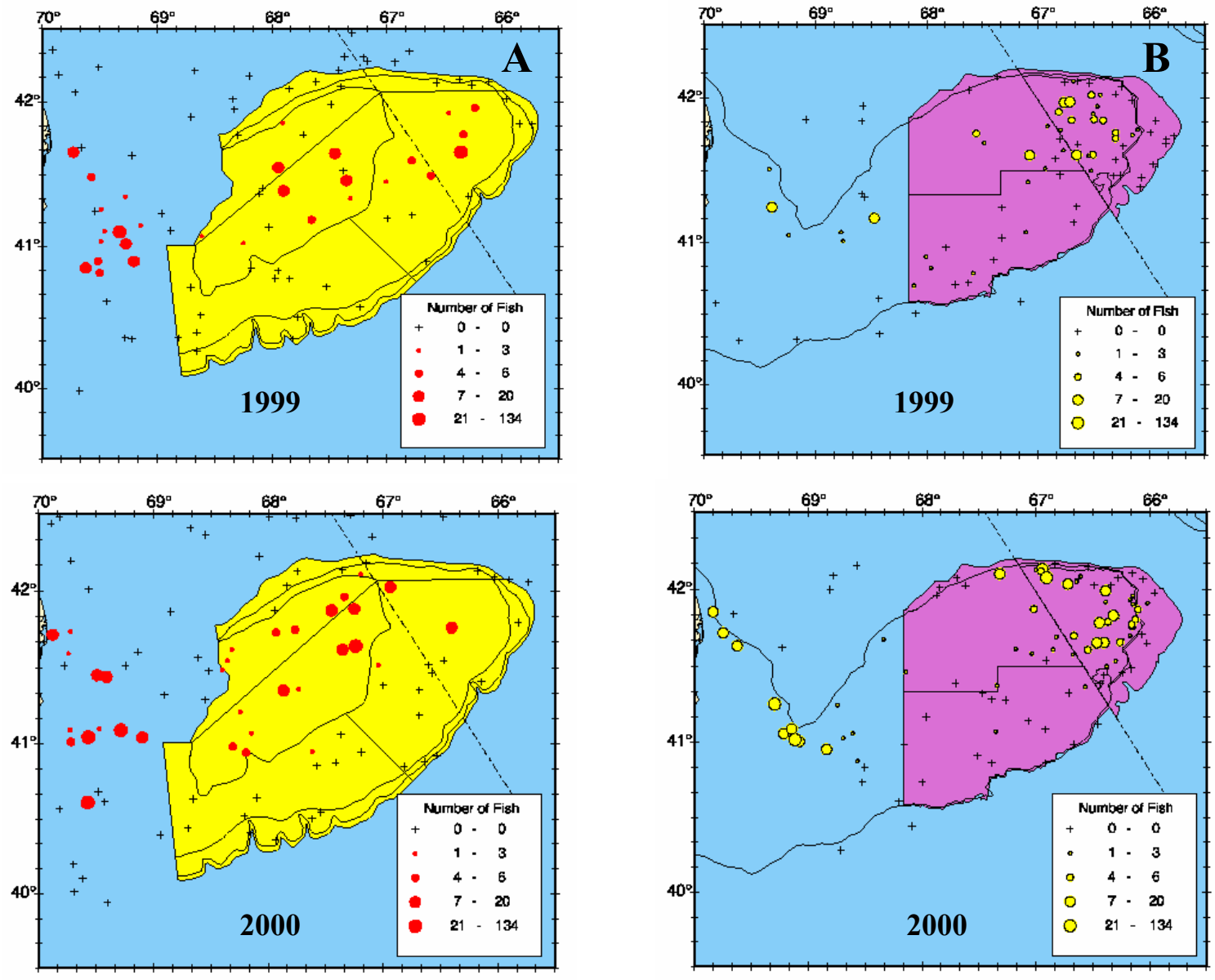


Figure B9. Distribution of Georges Bank winter flounder caught in the (A) NEFSC and (B) Canadian spring bottom trawl surveys during 1999 and 2000.

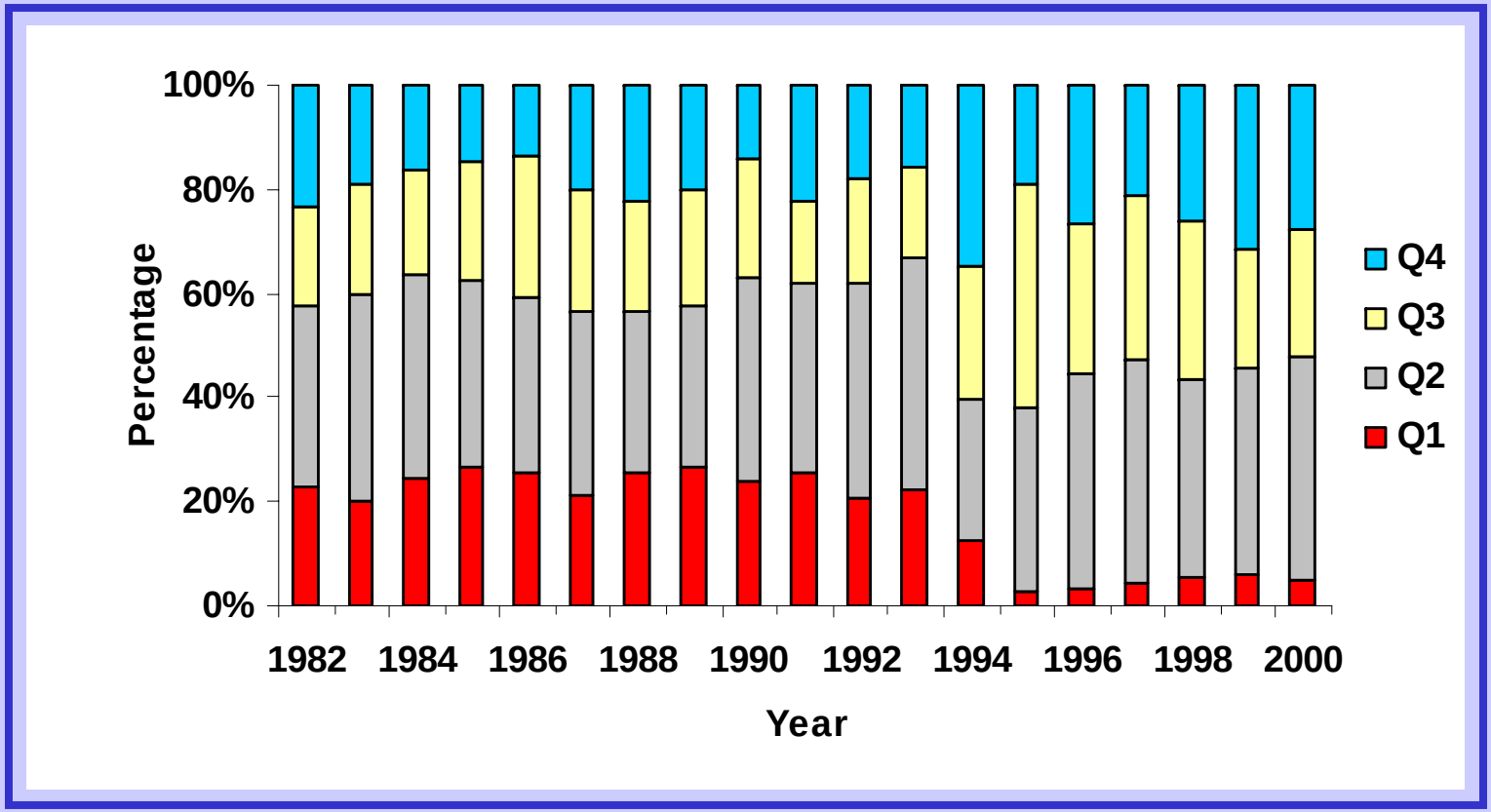
Table I4. Results of sensitivity analysis, of increasing survey biomass indices, from an ASPIC biomass dynamics model for the assessment of Georges Bank winter flounder.

Input Data	U.S. autumn survey, 1964-2001 U.S. spring survey, 1968-2002 Total landings, 1964-2001 (Baseline run)	Baseline run with 10% increase in 2000-2002 survey indices	Baseline run with 25% increase in 2000-2002 survey indices	Baseline run with 100% increase in 2000-2002 survey indices
Total Objective Function	1.959	1.954	1.956	2.055
B coverage	0.923	0.938	0.945	1.130
B nearness	1.000	1.000	1.000	1.000
R^2 in CPUE				
U.S. Autumn Survey	0.34	0.35	0.36	0.41
U.S. Spring Survey	0.23	0.24	0.25	0.29
B1 Ratio	0.57	0.56	0.54	0.47
r	0.66	0.69	0.72	0.86
F_{msy}	0.33	0.35	0.36	0.43
B_{msy}(mt)	9,119	8,742	8,429	7,193
MSY (mt)	3,028	3,036	3,047	3,097
B_{2002}/B_{MSY}	1.10	1.16	1.22	1.38
F_{2001}/F_{MSY}	0.76	0.72	0.68	0.58

Stock Structure

- Tagging studies suggest little mixing between Georges Bank and inshore stocks
- Age and growth studies indicate higher growth rates and earlier maturation than for inshore stocks
- Meristic studies indicate differences in fin ray counts between Georges Bank and inshore stocks

Percent landings by quarter



Temporal distribution of landings

- **Change in the landings pattern since 1994 (Q1 landings declined from 20% to < 5%)**

  Potential causes:

  - **artifact of 1994-2000 proration scheme**

    (no difference in landings allocation when TC inlcuded in proration scheme)

  - **effort reduction due to exhaustion of fishing year days at sea allocations or the potential for loss due to bad weather offshore**

  No definitive explanation for temporal change

Georges Bank Winter Flounder

Demersal flatfish (*Pseudopleuronectes americanus*)

Distribution: NWA from Labrador to Georgia

- **primarily inshore waters and estuaries, but also inhabit shallow offshore banks such as Georges Bank**

Maturity and spawning period

- **Female A_{50} = 1.9 yrs , L_{50} = 24.9 cm**

  (Brown et. al. 2000, O'Brien et. al. 1993)

- **Spawn March-May, peak in April**

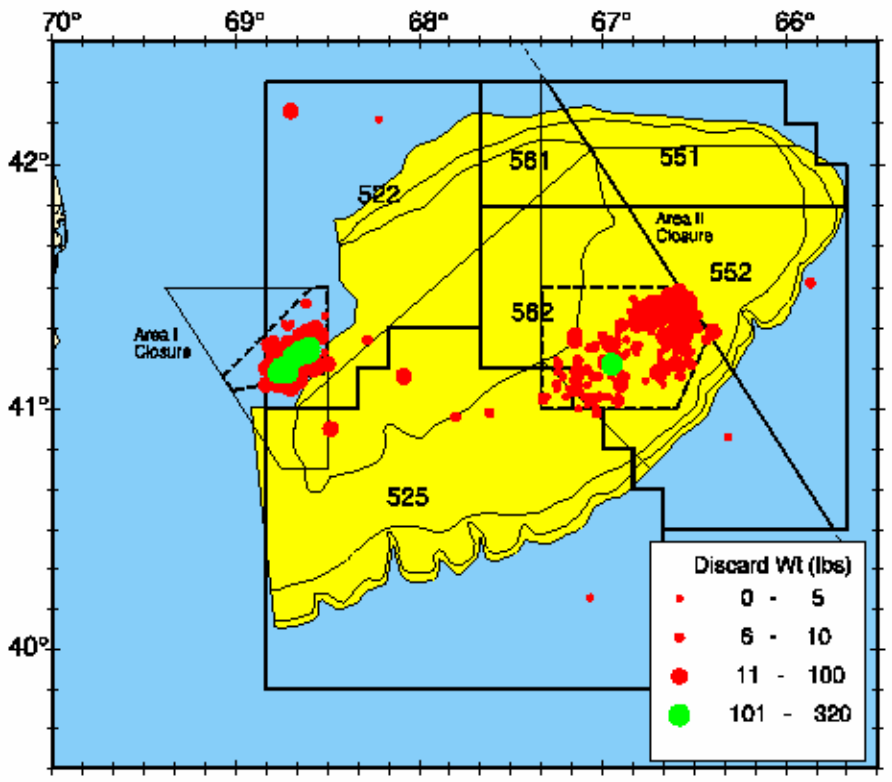
Sources of Uncertainty

2. Uncertainty in CA survey indices

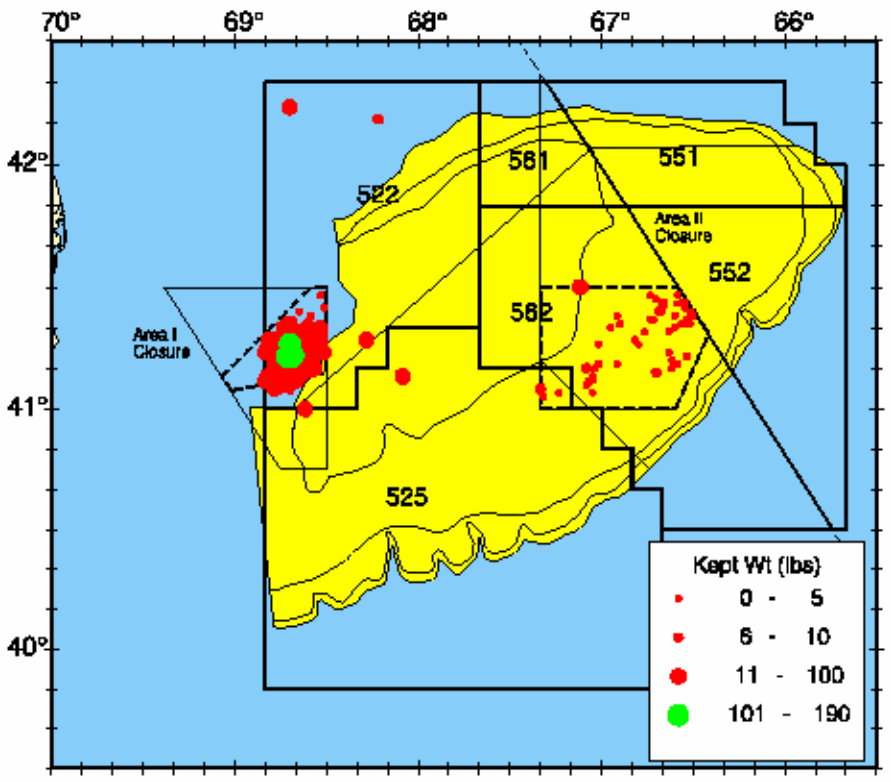
- CA strata 5Z1-4 do not include entire stock area
- Sampling intensity not evenly distributed across the Bank
  - higher in CA waters and CA gear unable to sample some areas
- Different catchabilities, CA survey gear catches larger fish than US gear
- No aging, must use US spring survey age keys supplemented with large fish from sea sampling and/or commercial databases

Catches of GB Winter Flounder in Scallop Dredges

Discard Weight (lbs)



Kept Weight (lbs)

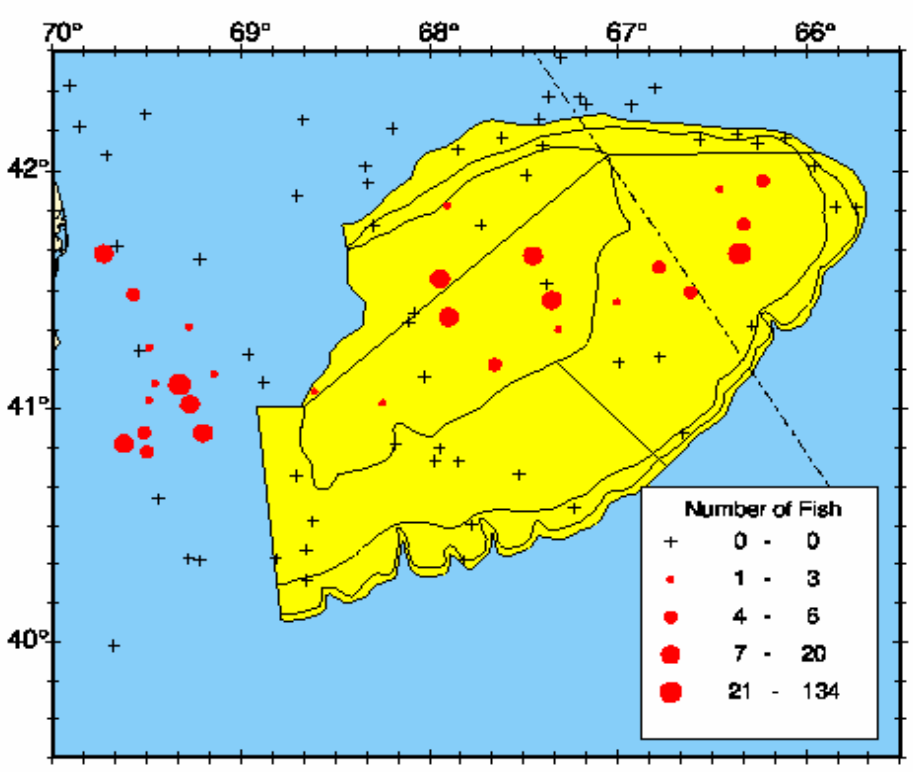


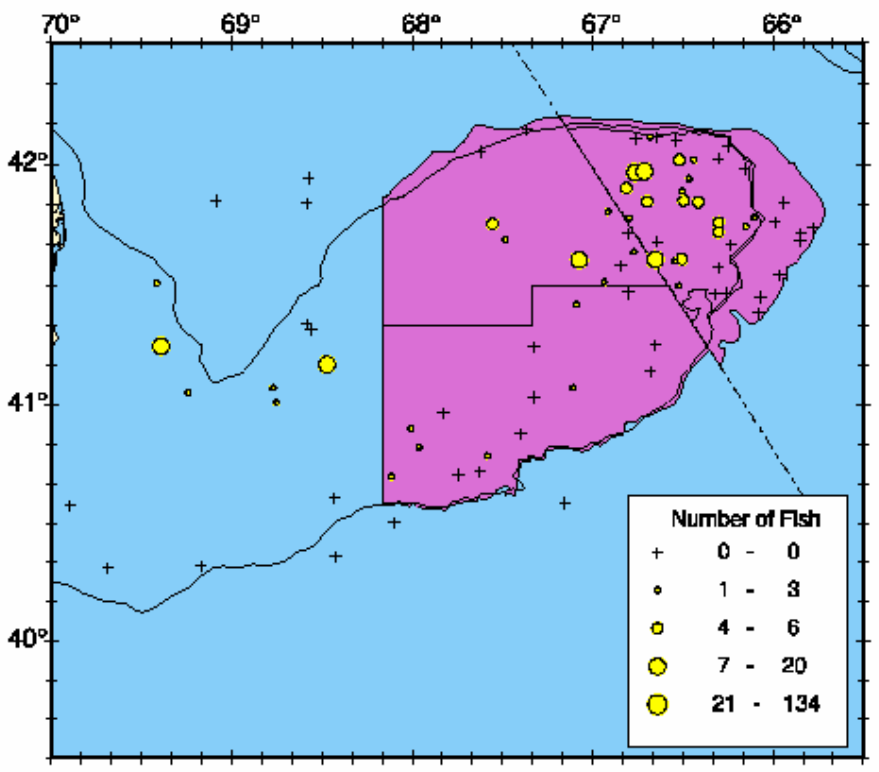
Tows (N=2,111) sampled by NEFSC observers, June-Dec. 2000

Summarized in Table 6

Spring Survey Distribution

1999



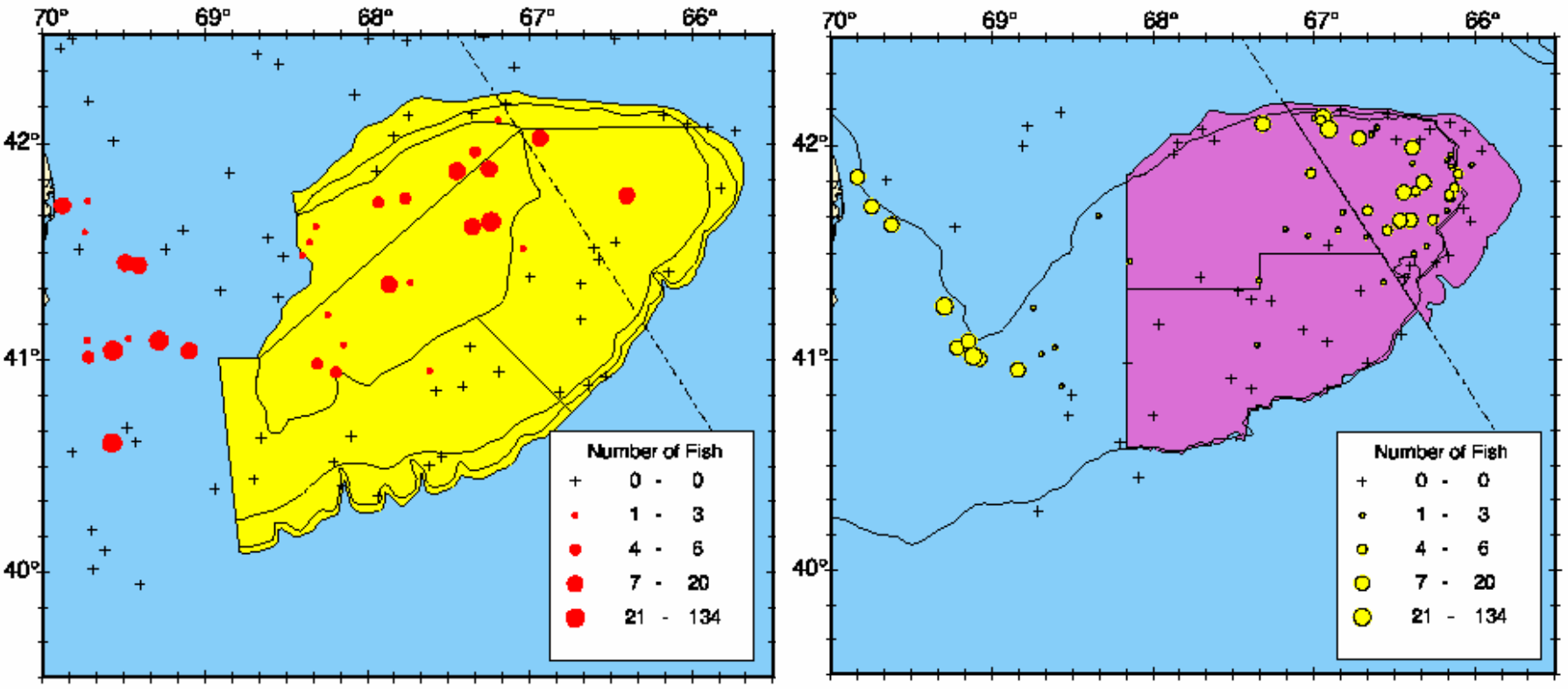


U.S.

Canada

Spring Survey Distribution

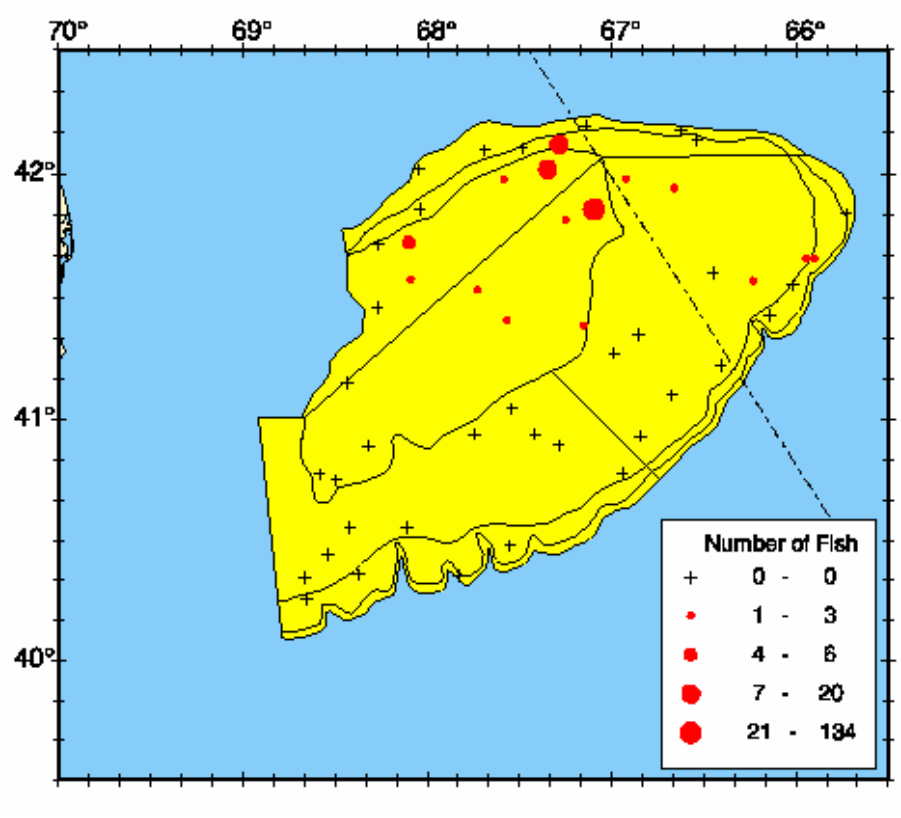
2000

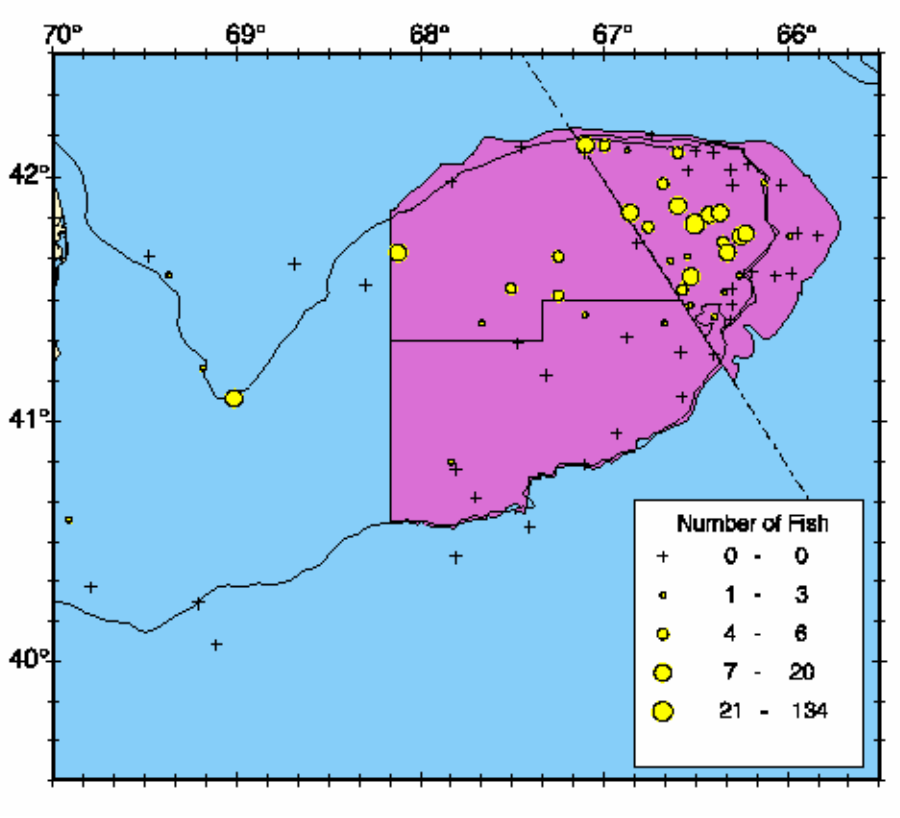


U.S. **Canada**

Spring Survey Distribution

2001





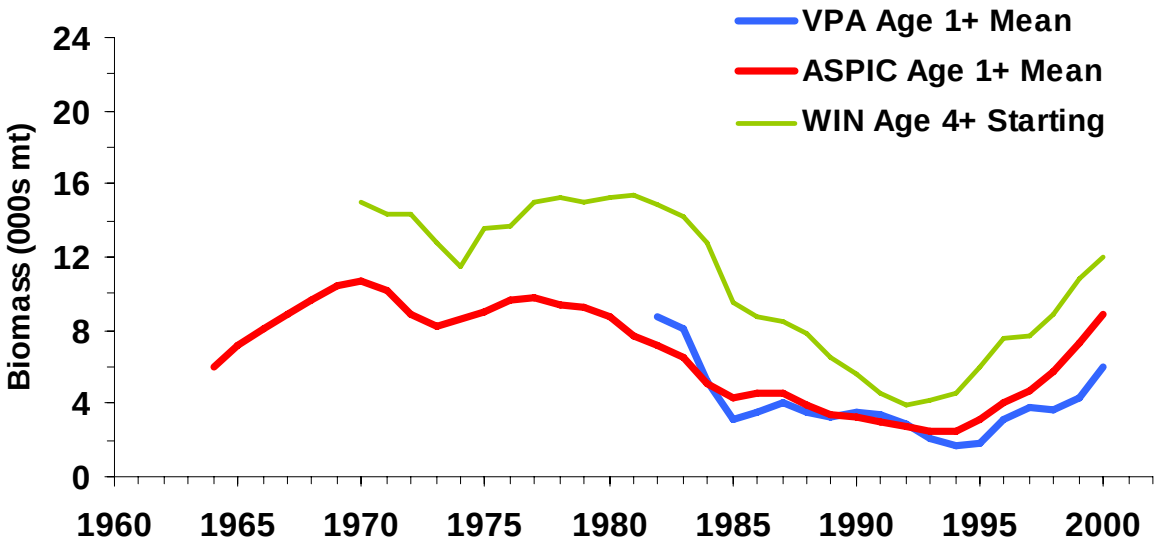
U.S. **Canada**

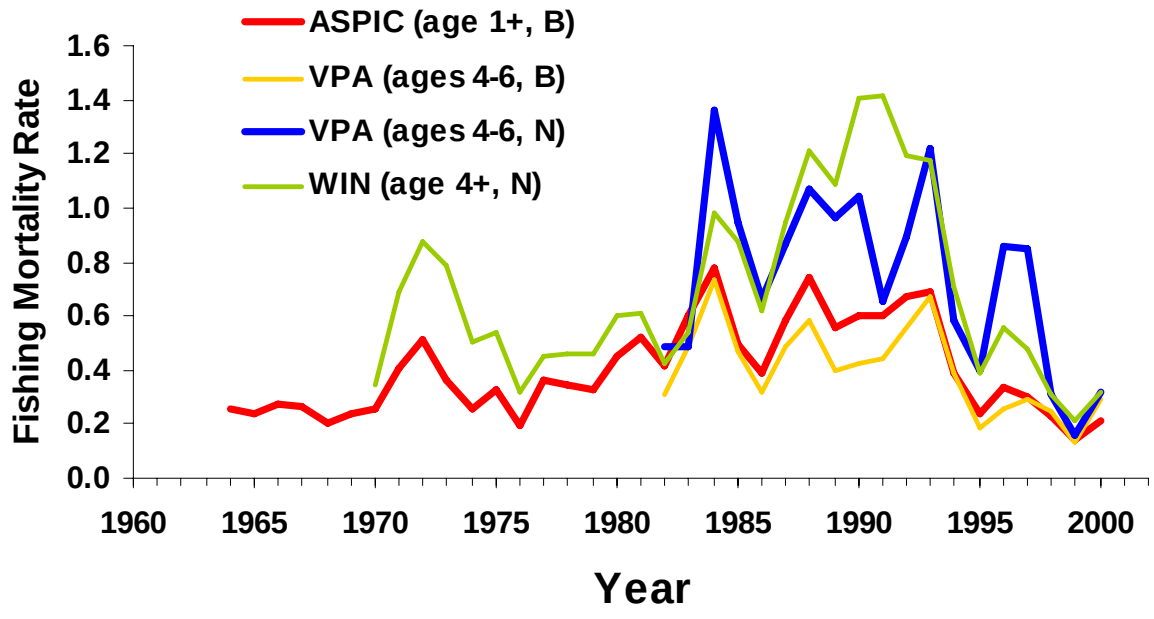
ASPIC Parameter Estimates	
MSY (mt)	3,021
K (mt)	18,750
B_{MSY} (mt)	9,377
F_{MSY}	0.322
r US Autumn survey q US Spring survey q	0.644 0.265 0.338

ASPIC Retrospective Analysis

Terminal Year	1995	1996	1997	1998	1999	2000	2000 Original Run3
Total Objective Function	1.676	1.711	1.804	1.827	1.835	1.942	1.942
B coverage	1.058	1.015	0.883	0.935	0.962	0.917	0.915
B nearness	1.000	1.000	1.000	1.000	1.000	1.000	1.000
R2 in CPUE							
US Autumn	0.340	0.338	0.329	0.336	0.342	0.340	0.340
US Spring	0.203	0.221	0.258	0.241	0.247	0.208	0.209
B1 Ratio	0.590	0.573	0.569	0.565	0.553	0.582	0.581
r	0.847	0.790	0.613	0.684	0.729	0.646	0.644
Fmsy	0.423	0.395	0.307	0.342	0.365	0.323	0.322
Bmsy (mt)	7,206	7,697	9,886	8,870	8,343	9,355	9,377
MSY (mt)	3,050	3,041	3,031	3,032	3,041	3,020	3,021
B1995/BMSY	0.333	0.316	0.272	0.286	0.288	0.289	0.289
F1995/FMSY	0.600	0.646	0.802	0.742	0.726	0.746	0.746

Trends in B and F





Differences in CA (pink) and US spring survey mean numbers/tow at age