O. Ocean Pout *(Zoarces americanus)*

Draft Presentation
For Peer Review Only.
Does not represent
final NOAA Decision/Policy.
5/01/08

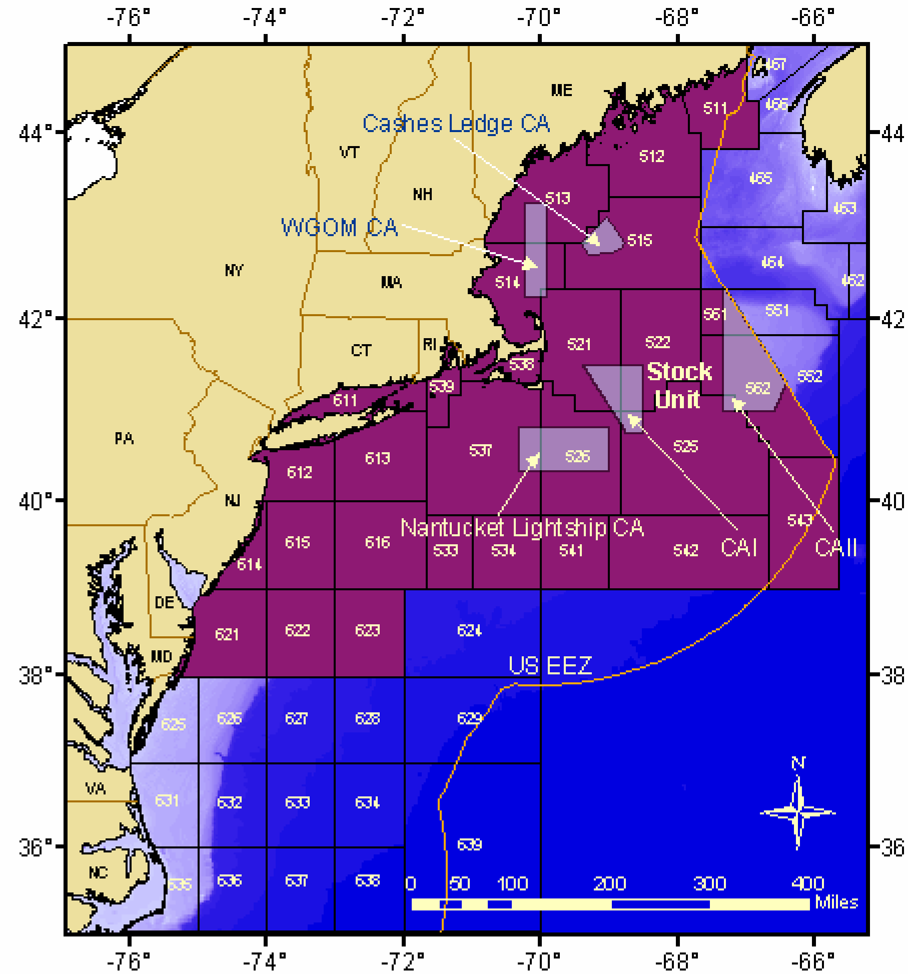


Figure 17.1. Statistical areas used to define the ocean pout stock.

By S. Wigley, L. Col, and C. Legualt

O. Ocean Pout brief overview

Landings - updated through 2006
little to no market for this species

Discards – 1968 to 2006

No recreational catch

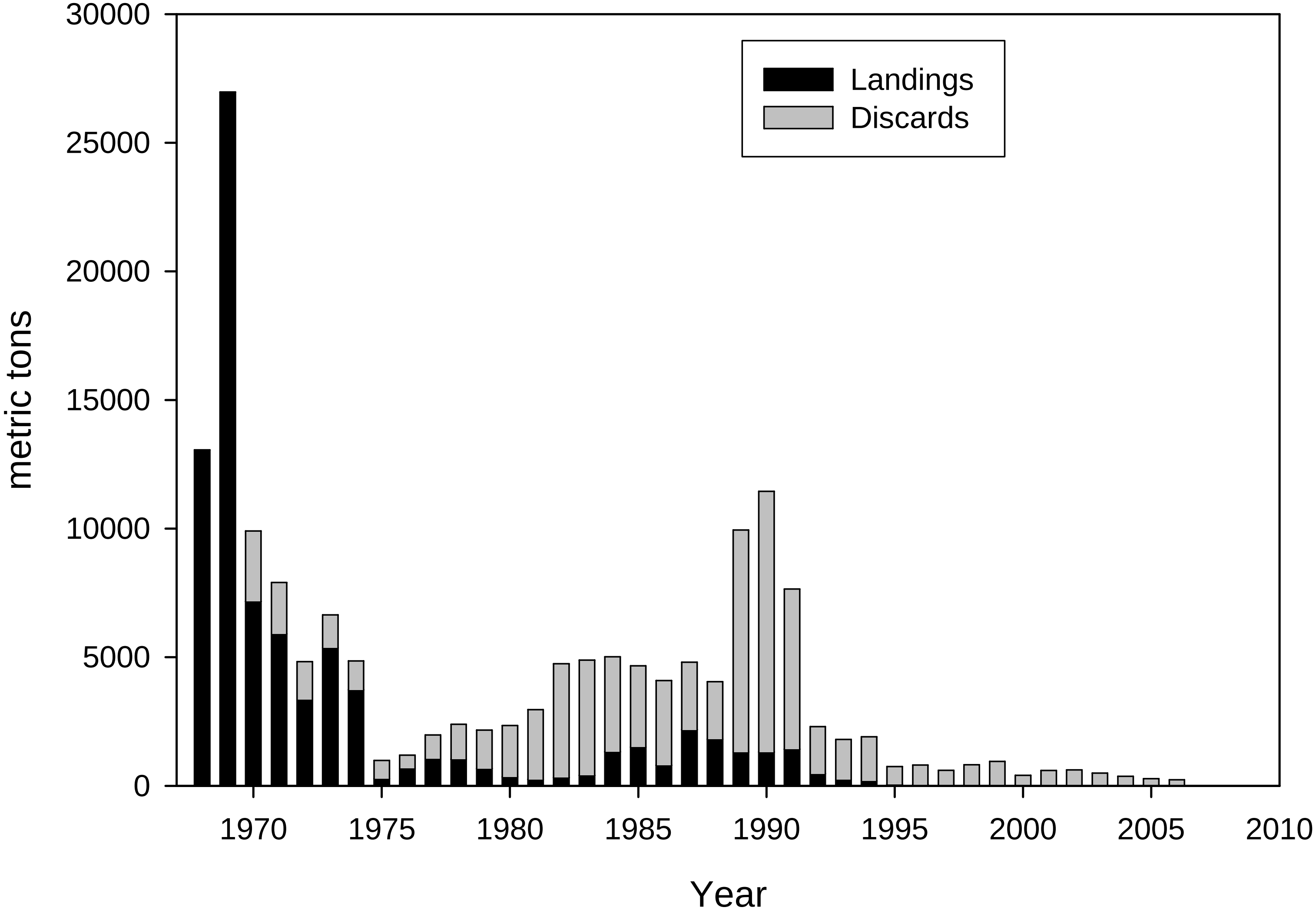
NEFSC survey - updated data through Spring 2007
vessel conversion factors not applicable

Re-evaluating Biological Reference Point (2002)
AIM analysis were not informative to base BRP (using landings)
BRPs were based on proxies developed by the
Overfishing Definition Panel (Applegate et al. 1998)

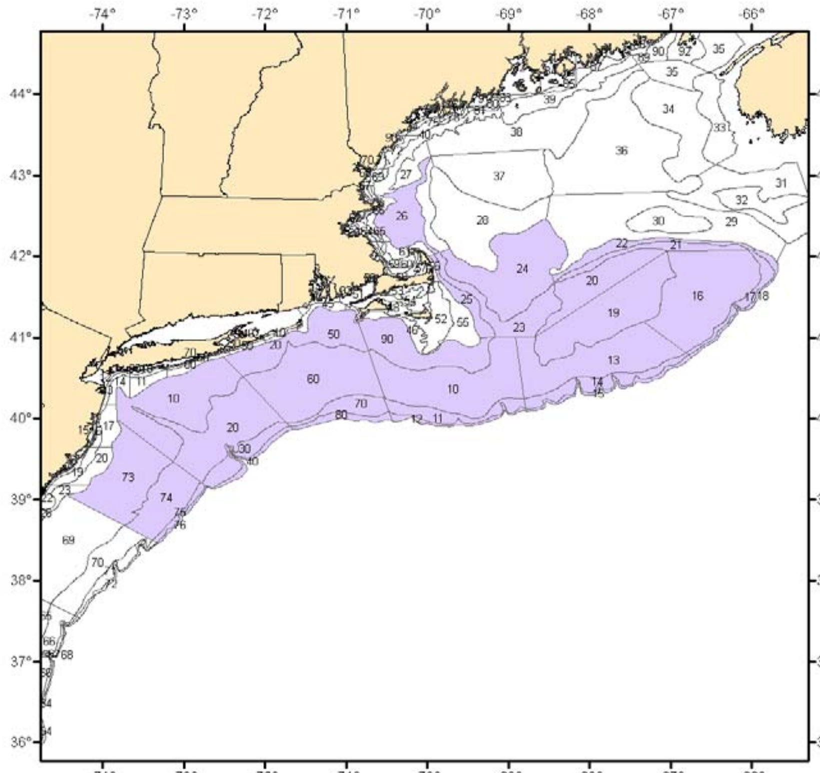
GARM 2008 Data Meeting
Allocated landings had no impact; a unit stock species

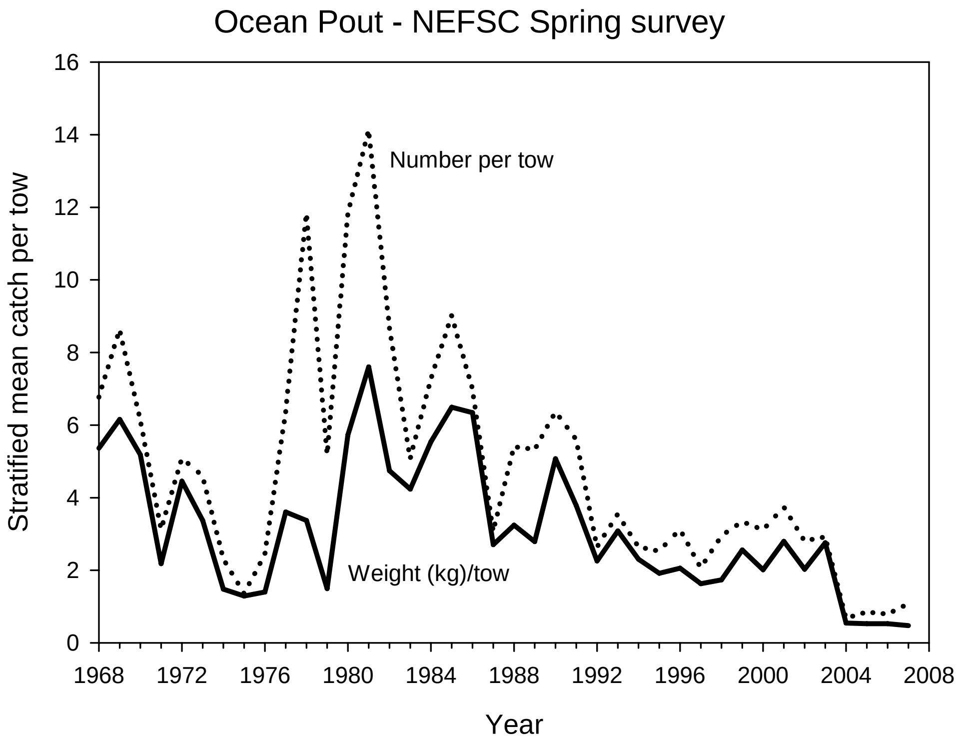
GARM 2008 Assessment Model Meeting
Updated data through 2006; AIM still not informative when <u>catch</u> was used
Panel suggested age-structure biomass dynamic models

O. Ocean Pout: Landings and discards



O. Ocean Pout: NEFSC survey





NEFSC offshore strata 1-26; 73-76

O. Ocean Pout: NEFSC survey

Survey conversion factors
Byrne and Forrester (1991) found significant vessel
    differences for ocean pout

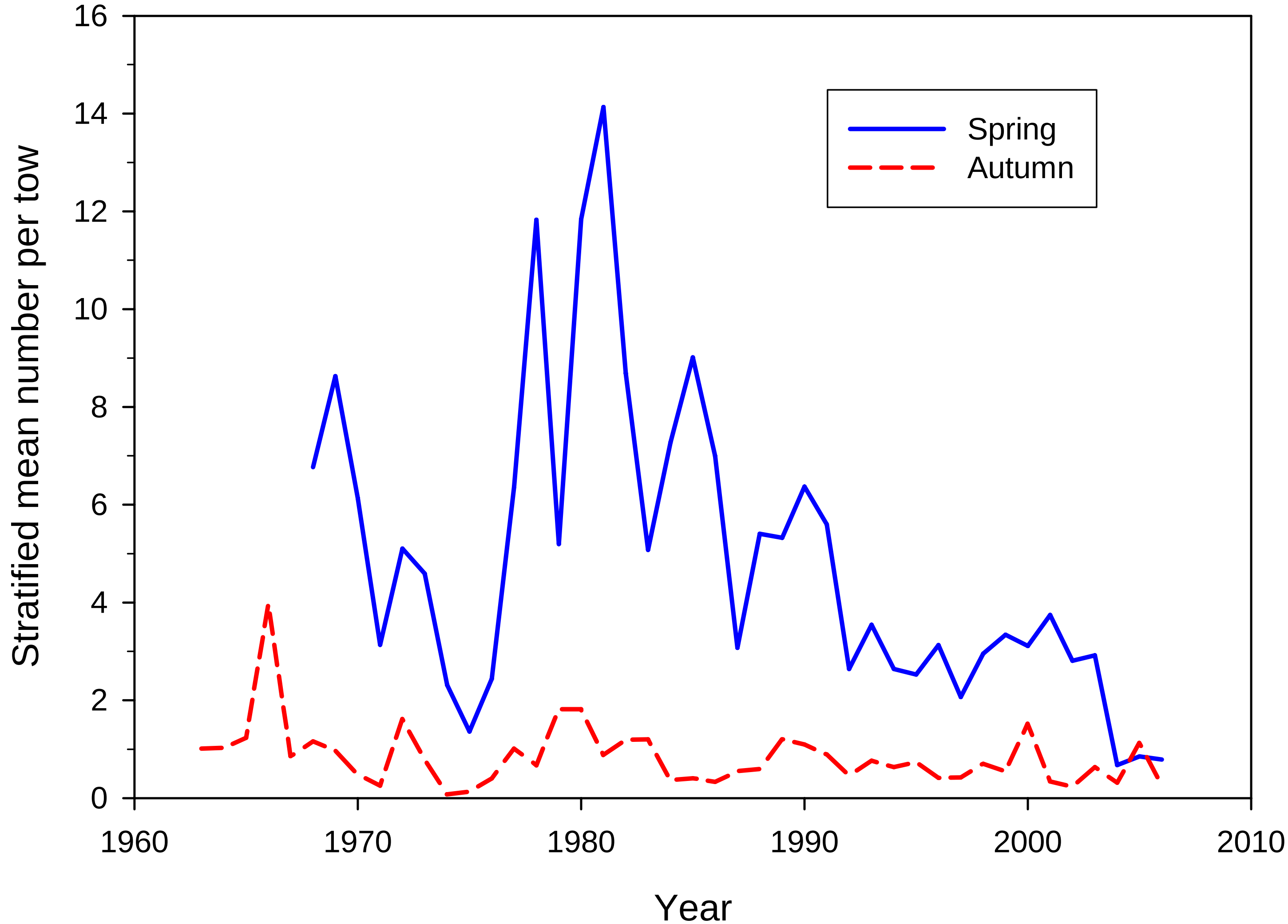
    0.70 for numbers and 0.69 for weight

5 Vessel experiments conducted
- spatially appropriate – mostly in MA-SNE-GB
- temporally not appropriate – 92% of tows in the autumn
- 510 paired tows were conducted
    - 470 paired tows in the autumn (Sept/Oct/Nov)
    - 40 paired tows in the winter (Feb)

    - 57 non-zero paired tows (11% of all tows)

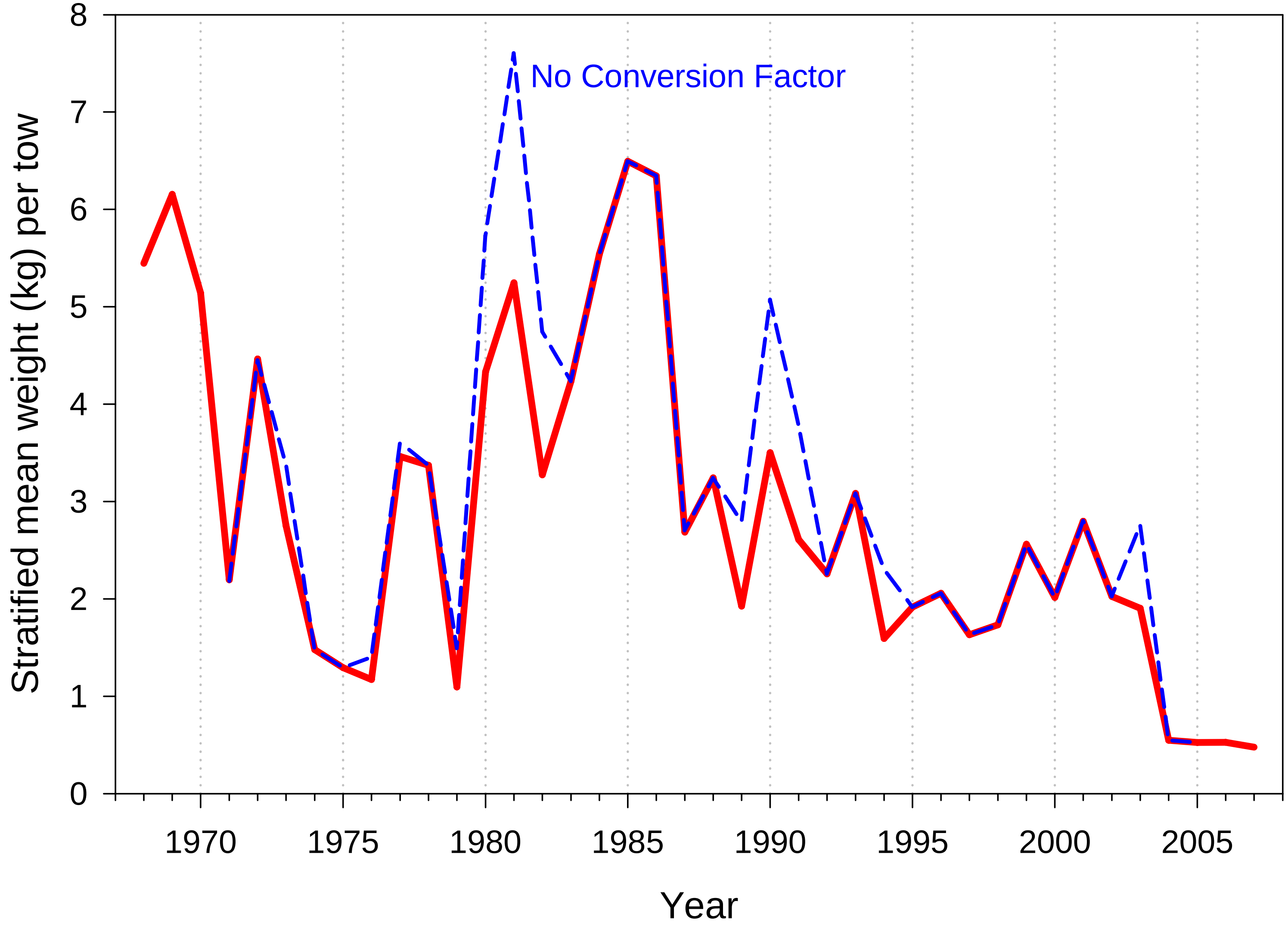
Due to breeding behavior, pout are not available to trawl gear

Ocean Pout NEFSC surveys



Availability of ocean pout is lower in the autumn than in the spring; due to seasonal behavioral differences, it is not appropriate to apply vessel conversion factors derived using autumn data to spring indices.

Ocean pout NEFSC spring index
With and without vessel conversion factors



Analyses without vessel conversion factors are preferred

An Index-based Method (AIM) Analyses

Exploratory analyses were conducted to:

- evaluate the effect of the vessel conversion factor
- sensitivity of the discard estimates
  - landings
  - catch
  - catch using half the discards
  - catch using twice the discards

For all runs: the randomization test was not significant indicating a weak relationship between the replacement ratio and the relative F

Not informative to base recommendations for BRPs

Long-term Observation-error Survey Series (LOSS) Analyses

(Palmer and Legault Working Paper 4.3)

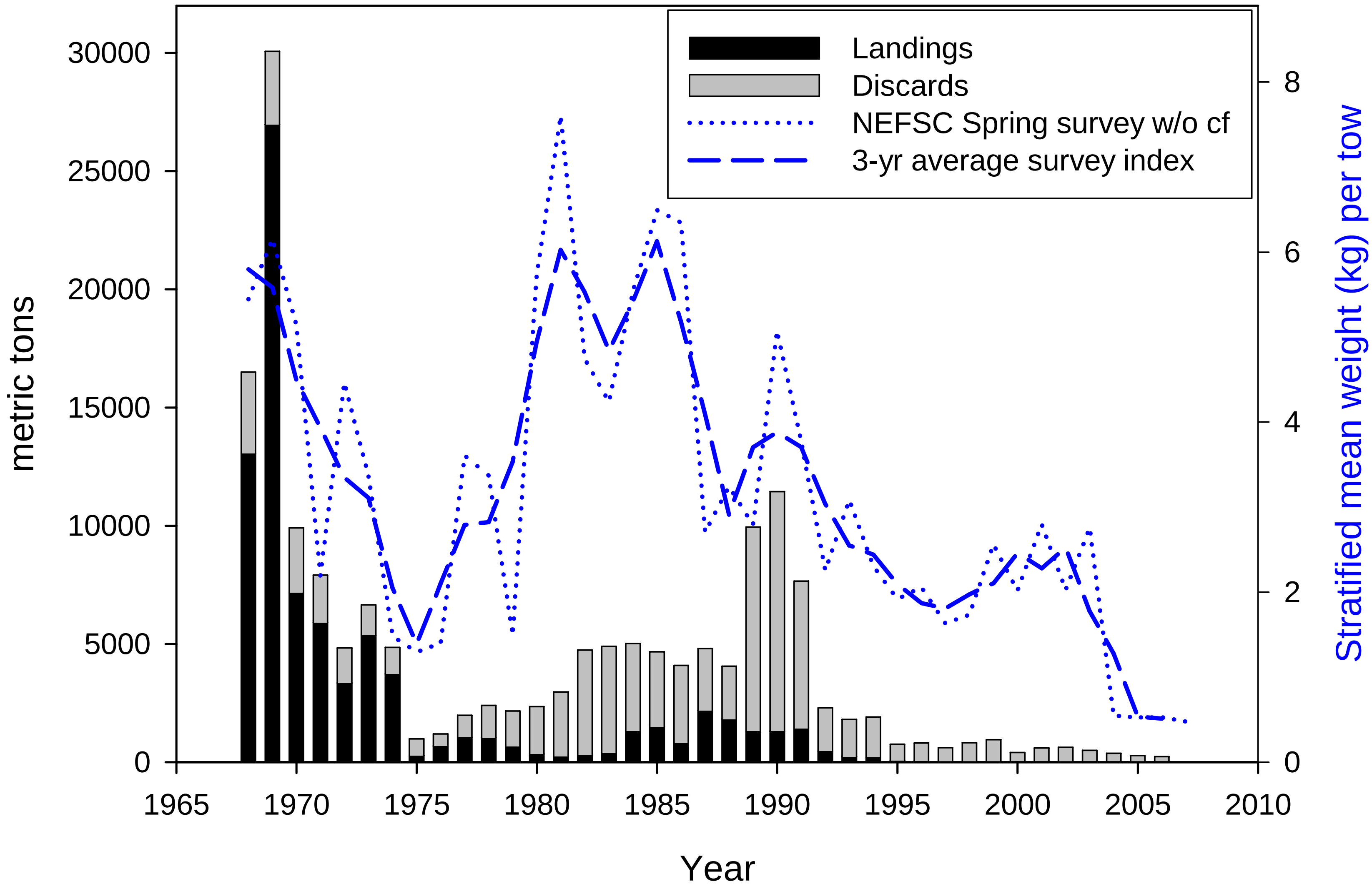
GARM 2008 Model Meeting suggested
exploring age-structured biomass dynamic model

Exploratory runs were conducted over a range of
- stock-recruit steepness (0.25 to 0.95, by 0.1)
- stock depletion (S1/S0) (0.2 to 1.0)
- initial stock size (200,000 and 500,000)

Runs were not significantly different yet
large changes in the reference points and stock status

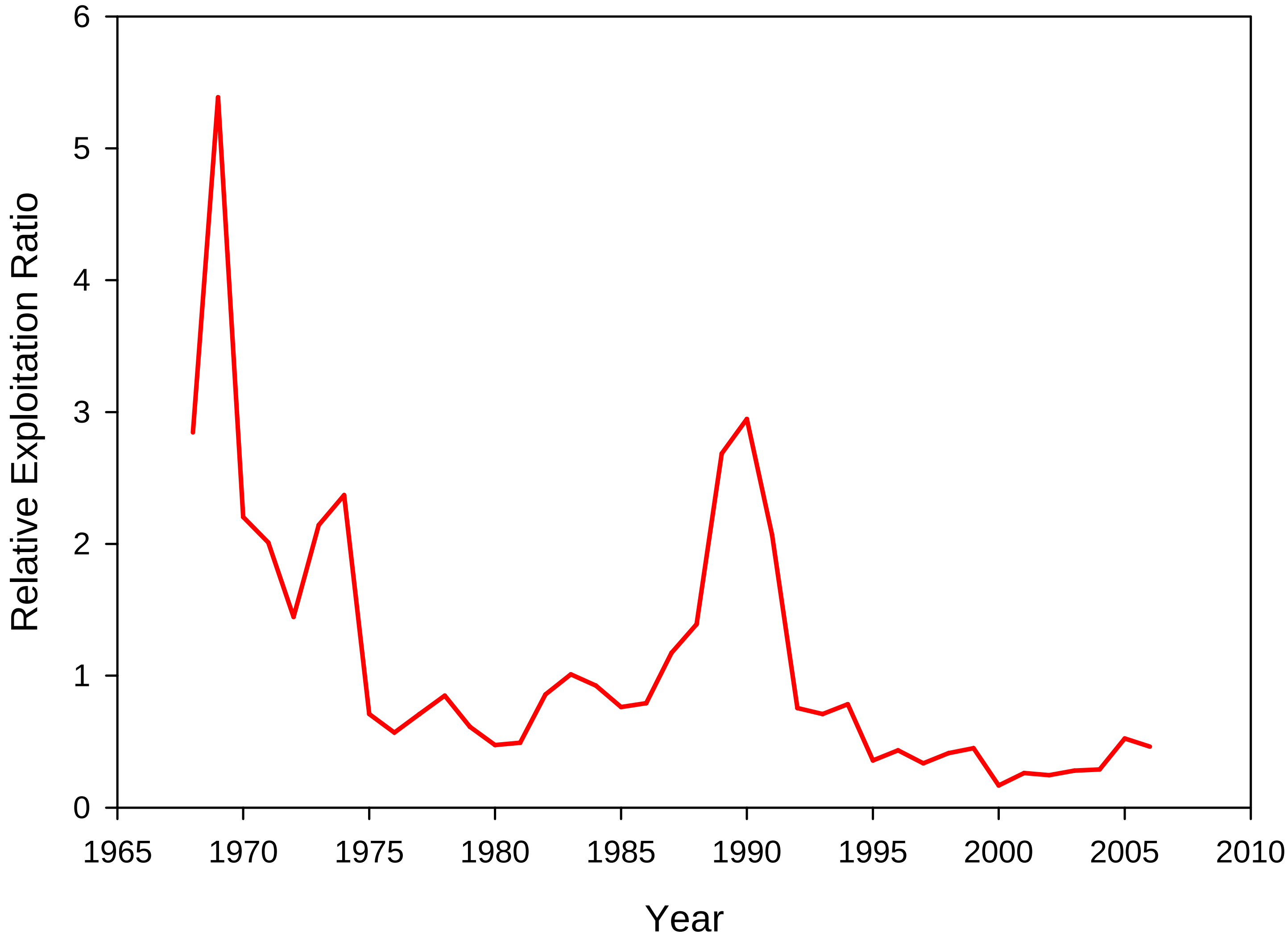
Not informative to base recommendations for BRPs

Ocean Pout



Landings
Discards
NEFSC Spring survey w/o cf
3-yr average survey index
metric tons
30000
25000
20000
15000
10000
5000
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year
8
6
4
2
0
Stratified mean weight (kg) per tow

Ocean Pout: Relative Exploitation Ratio



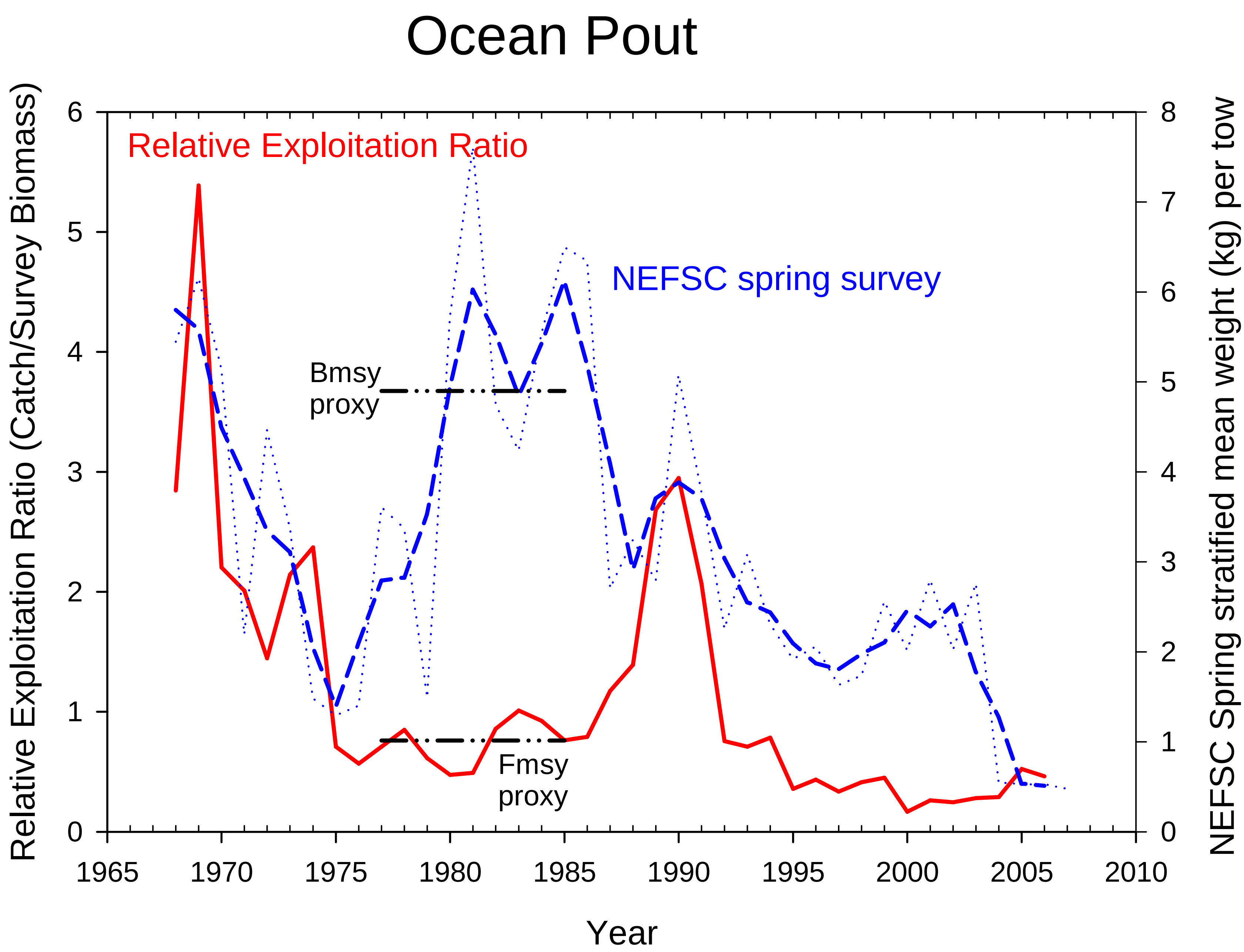
Catch / 3-yr average of NEFSC Spring biomass indices

O. Ocean Pout Biological Reference Points

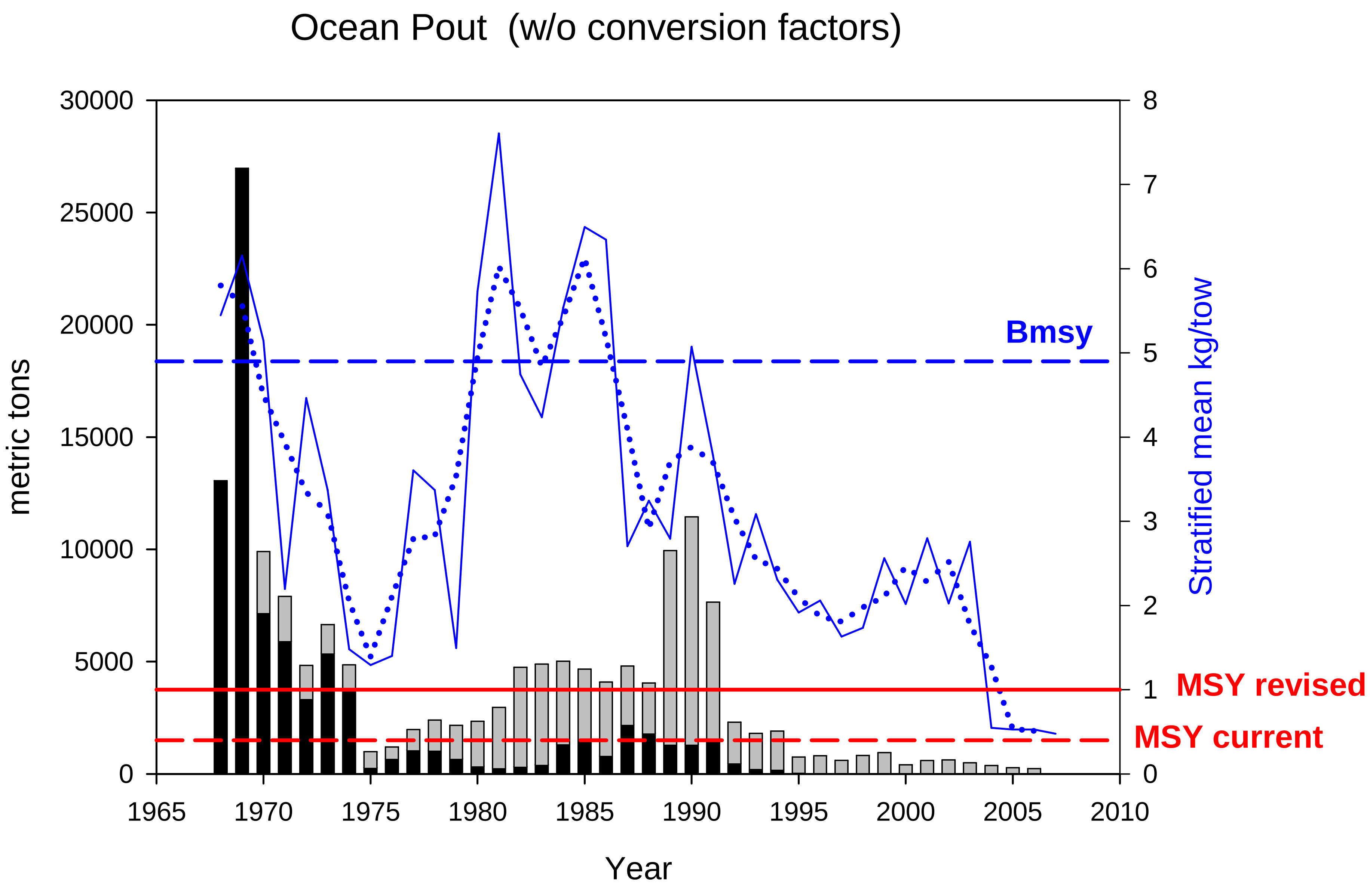
Bmsy proxy = 4.9 kg/tow median survey biomass (1980-1991)
MSY = 1,500 mt
Fmsy proxy = 0.31 (1.5/4.9)

Overfishing Definition Panel (Applegate et al. 1998)
visually inspected landings and survey trends
chose Bmsy and MSY values that appeared to be sustainable

With estimates of discard, the BRPs are updated using:
median survey biomass and
median exploitation ratio
1977-1985 time period used (replacement ratio > 1 and biomass increased)



Ocean Pout
Relative Exploitation Ratio
NEFSC spring survey
Bmsy
proxy
Fmsy
proxy
Relative Exploitation Ratio (Catch/Survey Biomass)
NEFSC Spring stratified mean weight (kg) per tow
Year
0
1
2
3
4
5
6
7
8
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010



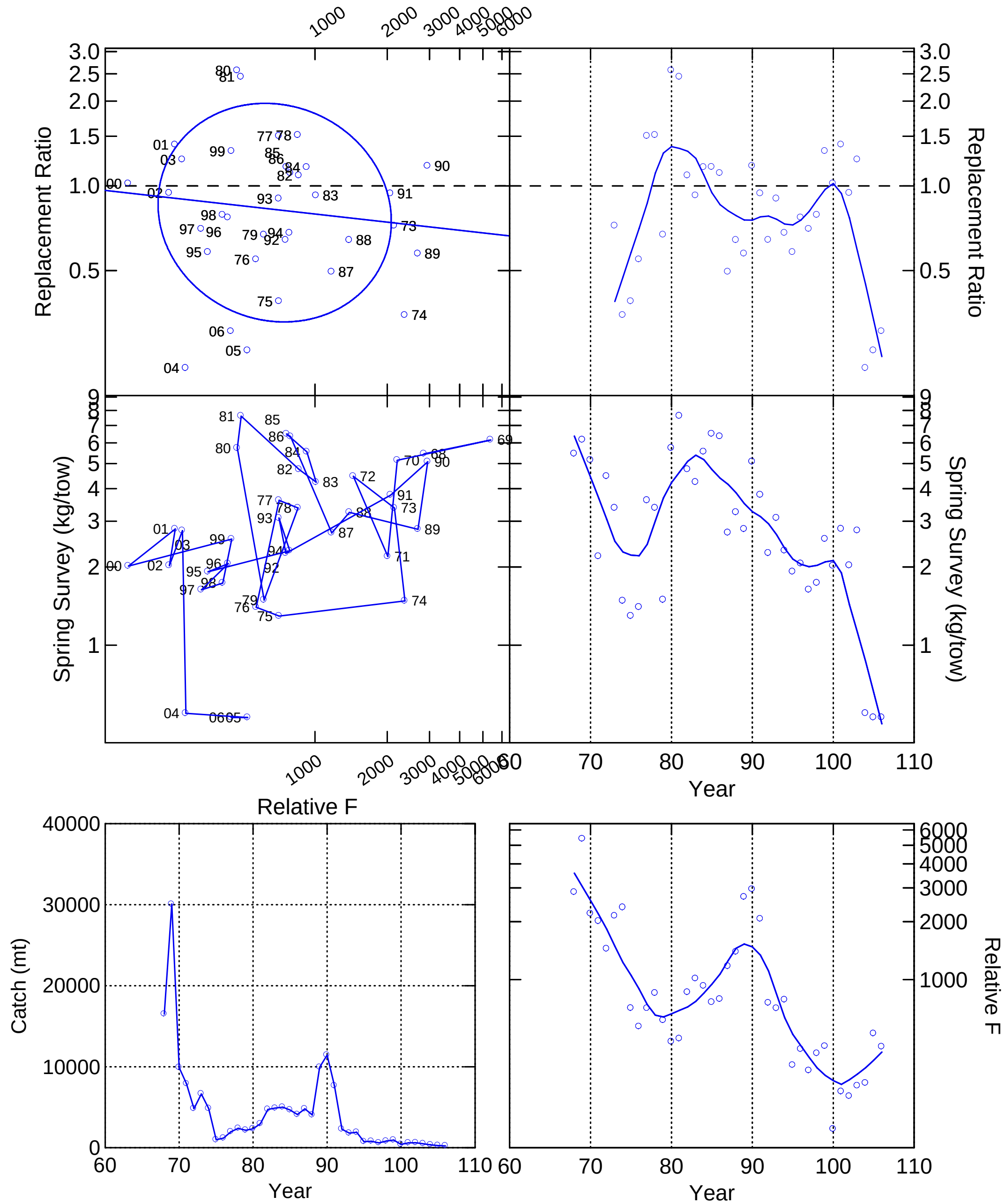
Ocean Pout (w/o conversion factors)
metric tons
30000
25000
20000
15000
10000
5000
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year
Stratified mean kg/tow
8
7
6
5
4
3
2
1
0
Bmsy
MSY revised
MSY current

Ocean Pout: Biological Reference Points

Current

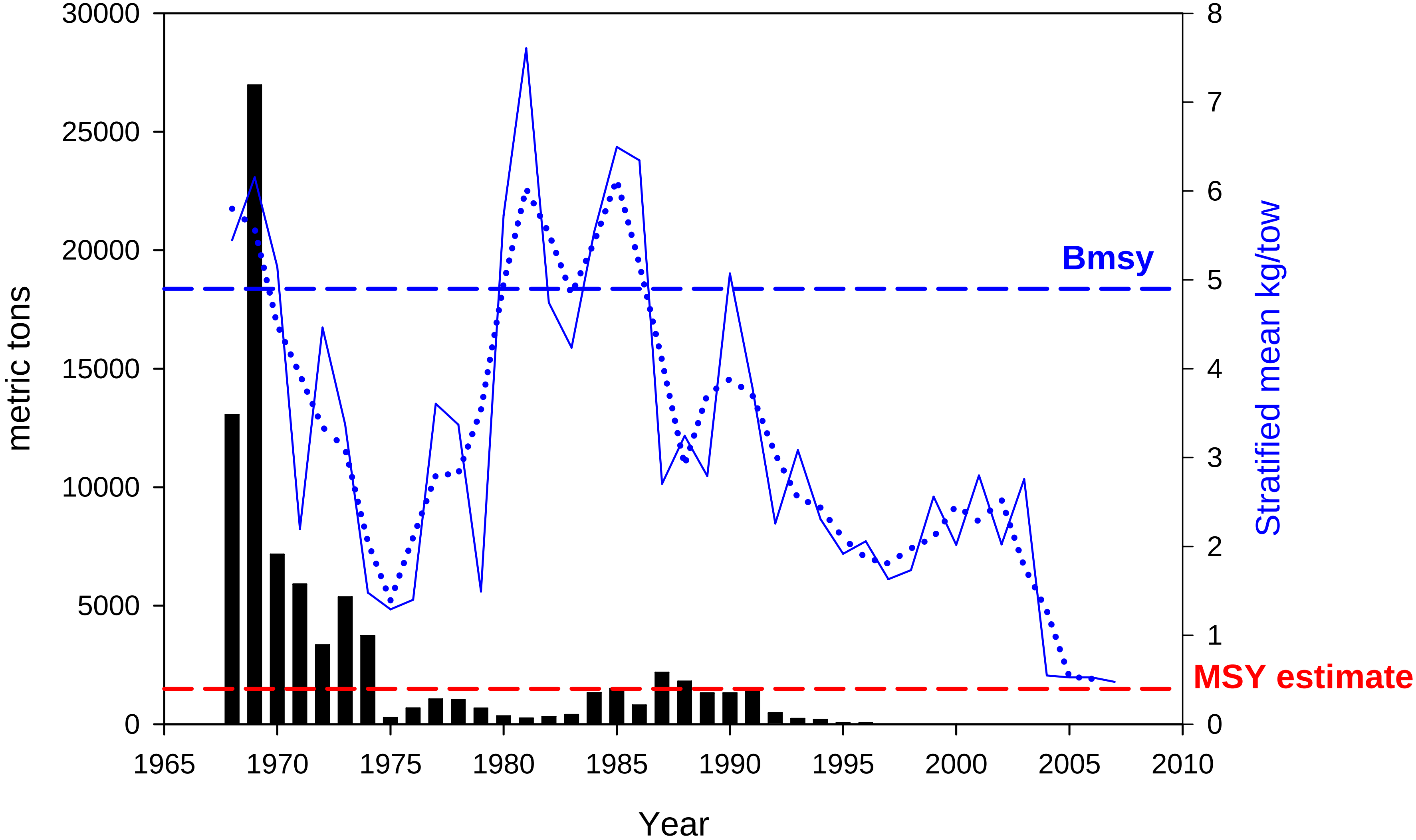
	GARM 2005 using landings	GARM 2008 using catch	GARM 2008 Alternative using catch with ½ discards
without survey vessel conversion factors	Bmsy = 4.9 kg/tow Fmsy = 0.31 MSY = 1,500 mt	**Bmsy = 4.94 kg/tow** **Fmsy = 0.76** **MSY = 3,754 mt**	Bmsy = 4.94 kg/tow Fmsy = 0.50 MSY = 2,470 mt
with survey vessel conversion factors	Bmsy = 3.9 Fmsy = 0.39 MSY = 1,500 mt	Bmsy = 4.25 kg/tow Fmsy = 0.76 MSY = 3,230 mt	Bmsy = 4.25 kg/tow Fmsy = 0.57 MSY = 2,422 mt

Ocean Pout, NEFSC Spring Survey



GARM 2005

Ocean Pout (w/o conversion factors)



Applegate et al. 1998 used landings to select MSY

Bmsy = 4.9; MSY = 1,500 mt; Fmsy = 0.31

3) Hindcast method used for ocean pout

$$\hat{D}_{t,h} = \bar{r}_{c,2004-2006,h} * K_{t,h} * \left(\frac{I_t}{\bar{I}_{2004-2006}} \right)$$

where

$\hat{D}$ is the discarded pounds of ocean pout for fleet h in year t;

$\bar{r}_c$ is the 2004 to 2006 average combined ratio for fleet h in year t;

K is the total kept pounds of all species in fleet h in year t;

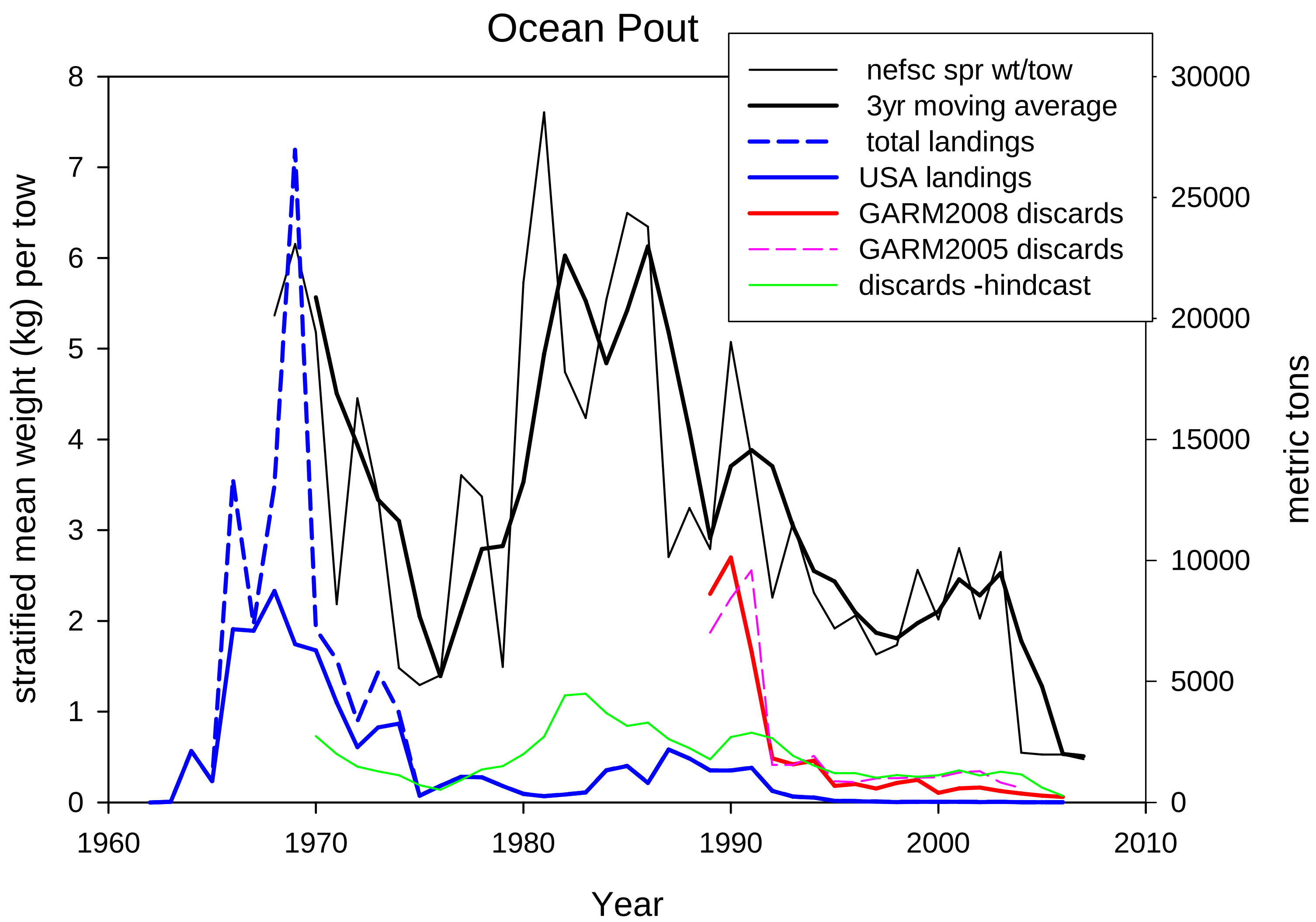
I is the smoothed NEFSC spring survey index in year t;

$\bar{I}$ is the 2004 to 2006 average NEFSC spring survey index.

Observer coverage is highest in 2004-2006

K from USA landings only – assume no discards from foreign fleet

Four fleets: LM otter trawl, SM otter trawl, gillnet, scallop
prior to 1982, no LM otter trawl due to mesh regulations;
hindcast methods used for scallop from 1991 and back.



$$\hat{D}_{t,h} = \bar{r}_{c,2004-2006,h} * K_{t,h} * \left(\frac{I_t}{\bar{I}_{2004-2006}} \right)$$

42 LOSS runs

obj_fun	18.9304	18.9808	19.0364	19.0956	19.1582	19.1166	19.1019	19.103	18.9265	18.9272	18.9279	18.9292	18.9304	18.9316
likely_ind	18.9304	18.9808	19.0364	19.0956	19.1582	19.1166	19.1019	19.103	18.9265	18.9272	18.9279	18.9292	18.9304	18.9316
likely_catchwt	0.00	2.98E-10	0.00	6.45E-10	7.43E-10	2.68E-07	3.07E-07	2.45E-07	1.83E-10	1.72E-10	1.61E-10	1.43E-10	0.00	1.12E-10
Fpen	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rmse	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
sigma	0.566	0.595012	0.629	0.667358	0.710524	0.68153	0.67157	0.672339	0.563567	0.563968	0.564354	0.565088	0.566	0.566417
S1/S0	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	**0.20**	**0.30**	**0.40**	**0.60**	**0.80**	**1.00**
S0	215237	164421	141935	128870	120142	296994	474431	437114	685103	475182	370631	266613	215237	185100
R0	302182	230839	199269	180927	168673	416965	666078	613687	961851	667133	520348	374311	302182	259871
steepness	**0.25**	**0.35**	**0.45**	**0.55**	**0.65**	**0.75**	**0.85**	**0.95**	0.25	0.25	0.25	0.25	0.25	0.25
Fmsy	0.016	0.042	0.066	0.088	0.109	0.131	0.155	0.181	0.016	0.016	0.016	0.016	0.016	0.016
SSBmsy	102380	71907	57774	49144	43060	100107	150123	129231	325877	226026	176295	126817	102380	88045
Fratio	0.33	0.15	0.10	0.07	0.05	0.01	0.00	0.00	0.39	0.38	0.37	0.35	0.33	0.31
SSBratio	0.51	0.60	0.71	0.86	1.05	2.75	3.04	3.25	0.13	0.20	0.26	0.38	0.51	0.62

obj_fun	18.9586	19.041	19.1067	19.1291	3525.1	19.1402	19.1412	3490.36	3.01E+08	1.71E+08	85724800	8413490	18.9586	18.9393
likely_ind	18.9586	19.041	19.1067	19.1291	19.1375	19.1402	19.1412	19.1415	20.2771	20.2588	20.2339	20.0103	18.9586	18.9393
likely_catchwt	7.72E-10	1.05E-10	5.643E-11	4.57E-11	3505.96	3.79E-11	3.56E-11	3471.22	3.01E+08	1.71E+08	85723100	8413470	7.72E-10	8.55E-11
Fpen	0	0	0	0	0	0	0	0	44745.3	22893.7	1595.37	1.3386	0	0
rmse	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
sigma	0.581939	0.631918	0.67486	0.69008	0.695939	0.697847	0.698529	0.698706	2.17506	2.13567	2.08313	1.66583	0.581939	0.570796
S1/S0	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	**0.20**	**0.30**	**0.40**	**0.60**	**0.80**	**1.00**
S0	**200,000**	**200,000**	**200,000**	**200,000**	**200,000**	**200,000**	**200,000**	**200,000**	**200,000**	**200,000**	**200,000**	**200,000**	**200,000**	**200,000**
R0	280790	280790	280790	280790	280790	280790	280790	280790	280790	280790	280790	280790	280790	280790
steepness	**0.25**	**0.35**	**0.45**	**0.55**	**0.65**	**0.75**	**0.85**	**0.95**	0.25	0.25	0.25	0.25	0.25	0.25
Fmsy	0.016	0.042	0.066	0.088	0.109	0.131	0.155	0.181	0.016	0.016	0.016	0.016	0.016	0.016
SSBmsy	95132	87467	81409	76269	71681	67414	63286	59129	95132	95132	95132	95132	95132	95132
Fratio	0.53	0.06	0.03	0.02	0.01	0.01	0.01	0.01	319.93	320.05	320.09	320.53	0.53	0.23
SSBratio	0.34	1.19	1.75	2.11	2.38	2.61	2.83	3.08	0.00	0.00	0.00	0.00	0.34	0.78

obj_fun	19.0478	19.0928	19.1015	19.1029	55473700	19.1016	24470	59.5129	18789000	18.9398	19.0255	19.0556	19.0478	2278070
likely_ind	19.0478	19.0928	19.1015	19.1029	19.0952	19.1016	19.1008	19.1	20.1336	18.9398	19.0255	19.0556	19.0478	19.0346
likely_catchwt	7.87E-12	4.79E-12	4.119E-12	3.8E-12	55473700	3.46E-12	24450.9	40.4129	18789000	1.81E-10	6.44E-11	1.59E-11	7.87E-12	2278050
Fpen	0	0	0	0	0	0	0	0	2.0263	0	0	0	0	0
rmse	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
sigma	0.636255	0.665497	0.67135	0.672252	0.667089	0.67141	0.670826	0.670305	1.88439	0.571097	0.622227	0.641219	0.636255	0.627871
S1/S0	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	**0.20**	**0.30**	**0.40**	**0.60**	**0.80**	**1.00**
S0	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**
R0	701976	701976	701976	701976	701976	701976	701976	701976	701976	701976	701976	701976	701976	701976
steepness	**0.25**	**0.35**	**0.45**	**0.55**	**0.65**	**0.75**	**0.85**	**0.95**	0.25	0.25	0.25	0.25	0.25	0.25
Fmsy	0.016	0.042	0.066	0.088	0.109	0.131	0.155	0.181	0.016	0.016	0.016	0.016	0.016	0.016
SSBmsy	237831	218667	203521	190673	179203	168535	158214	147823	237831	237831	237831	237831	237831	237831
Fratio	0.05	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.27	0.12	0.06	0.05	0.04
SSBratio	1.43	1.95	2.24	2.46	2.63	2.84	3.04	3.27	0.00	0.26	0.61	1.10	1.43	1.68

O. Ocean Pout

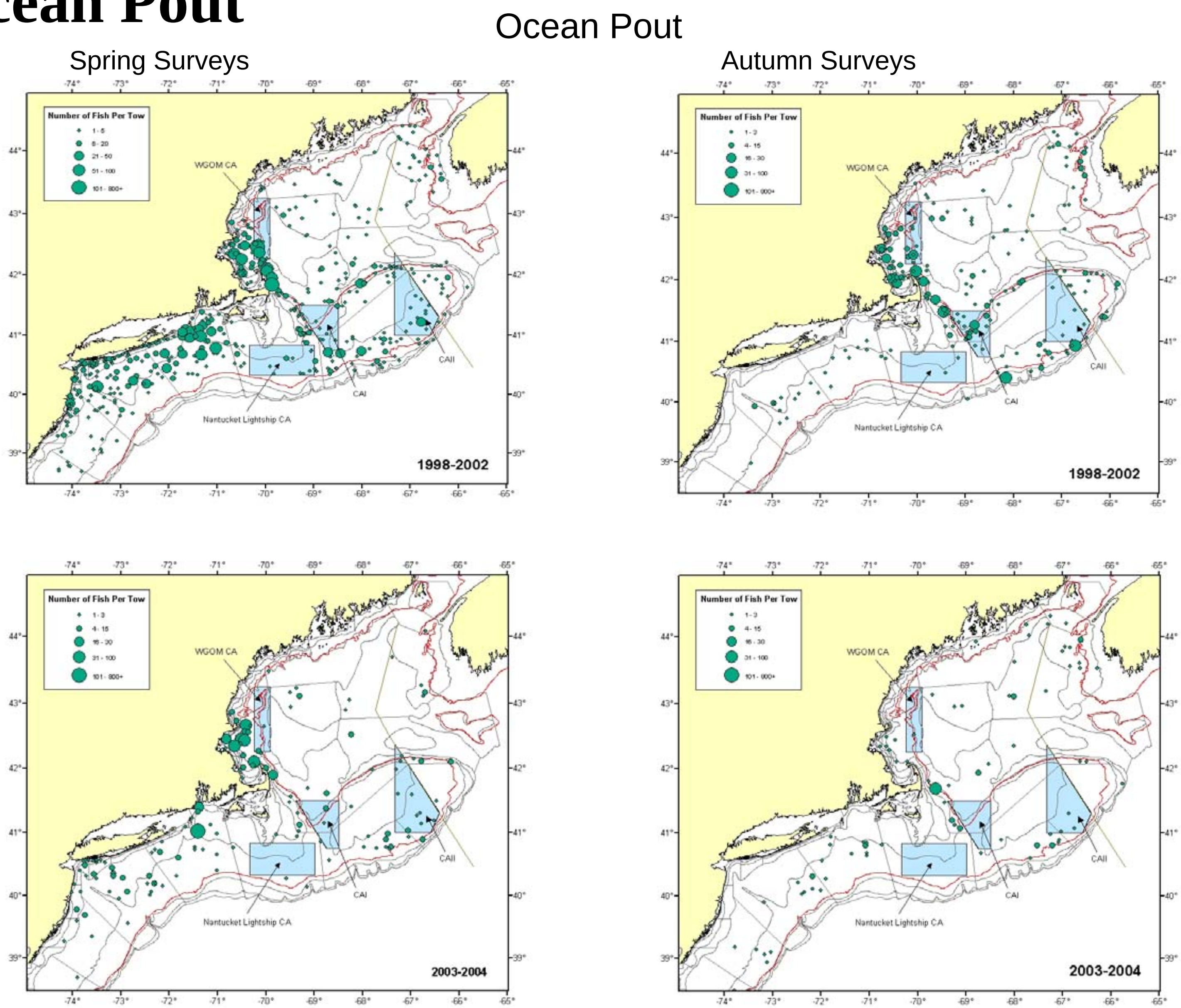
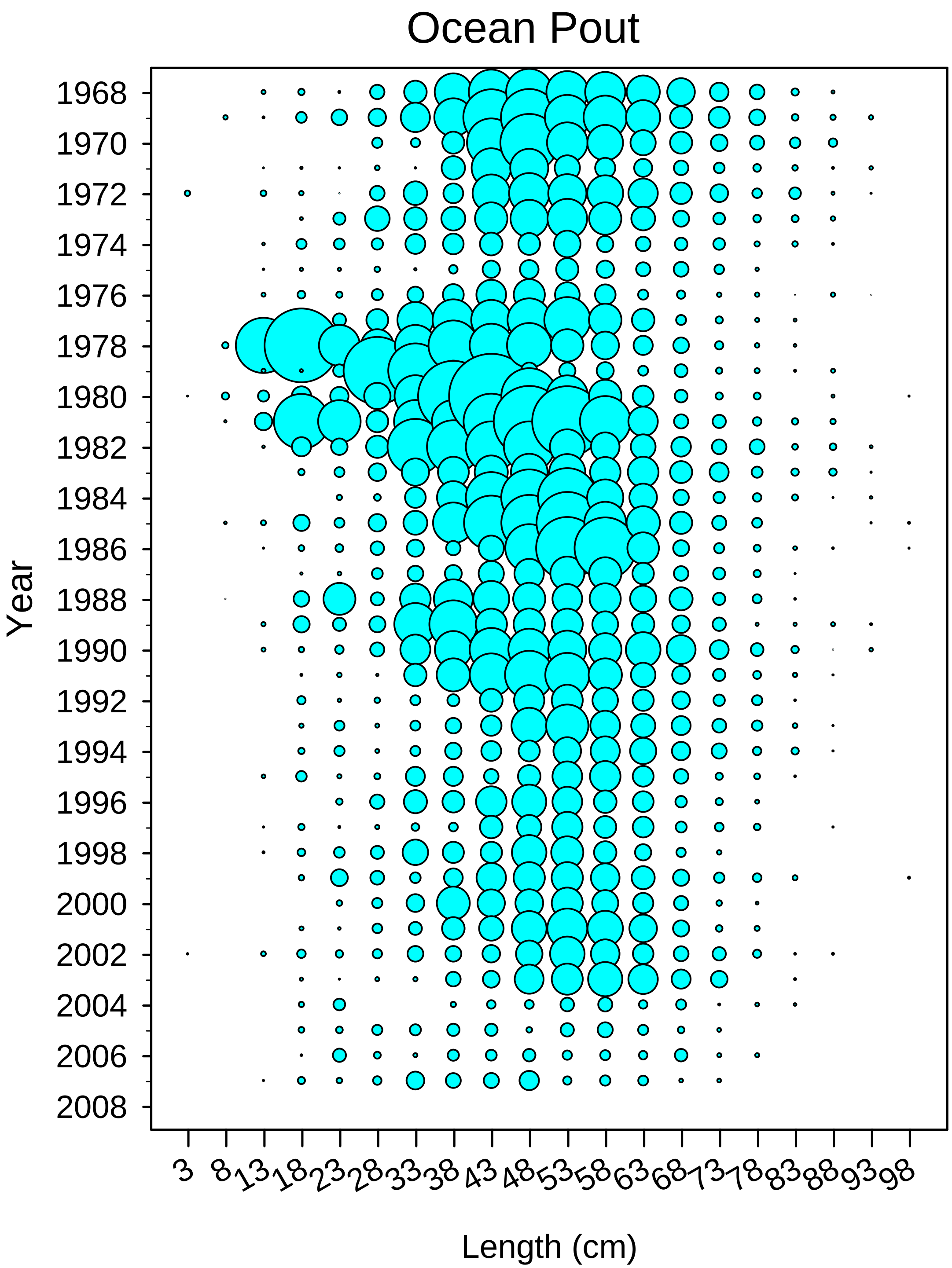
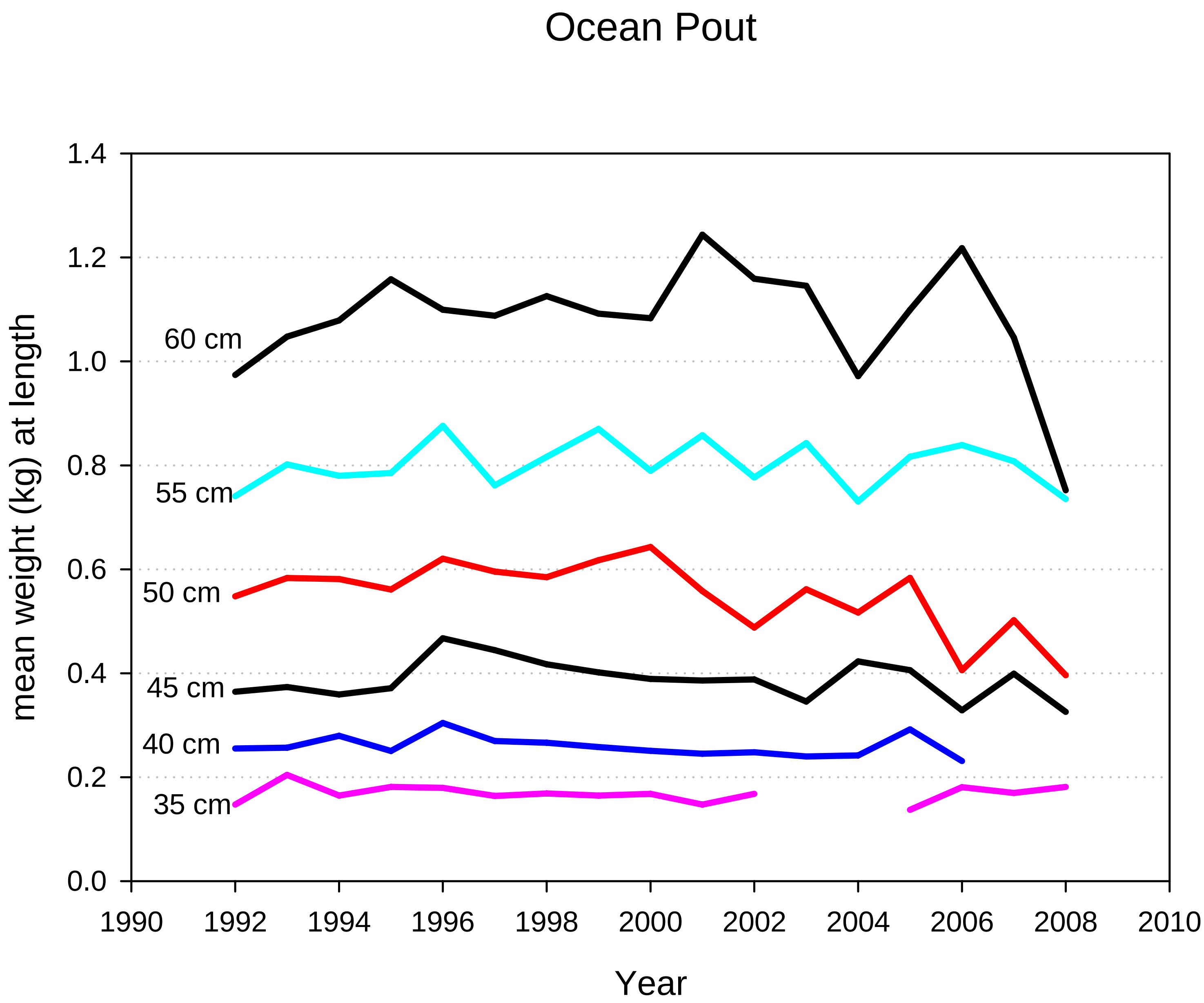
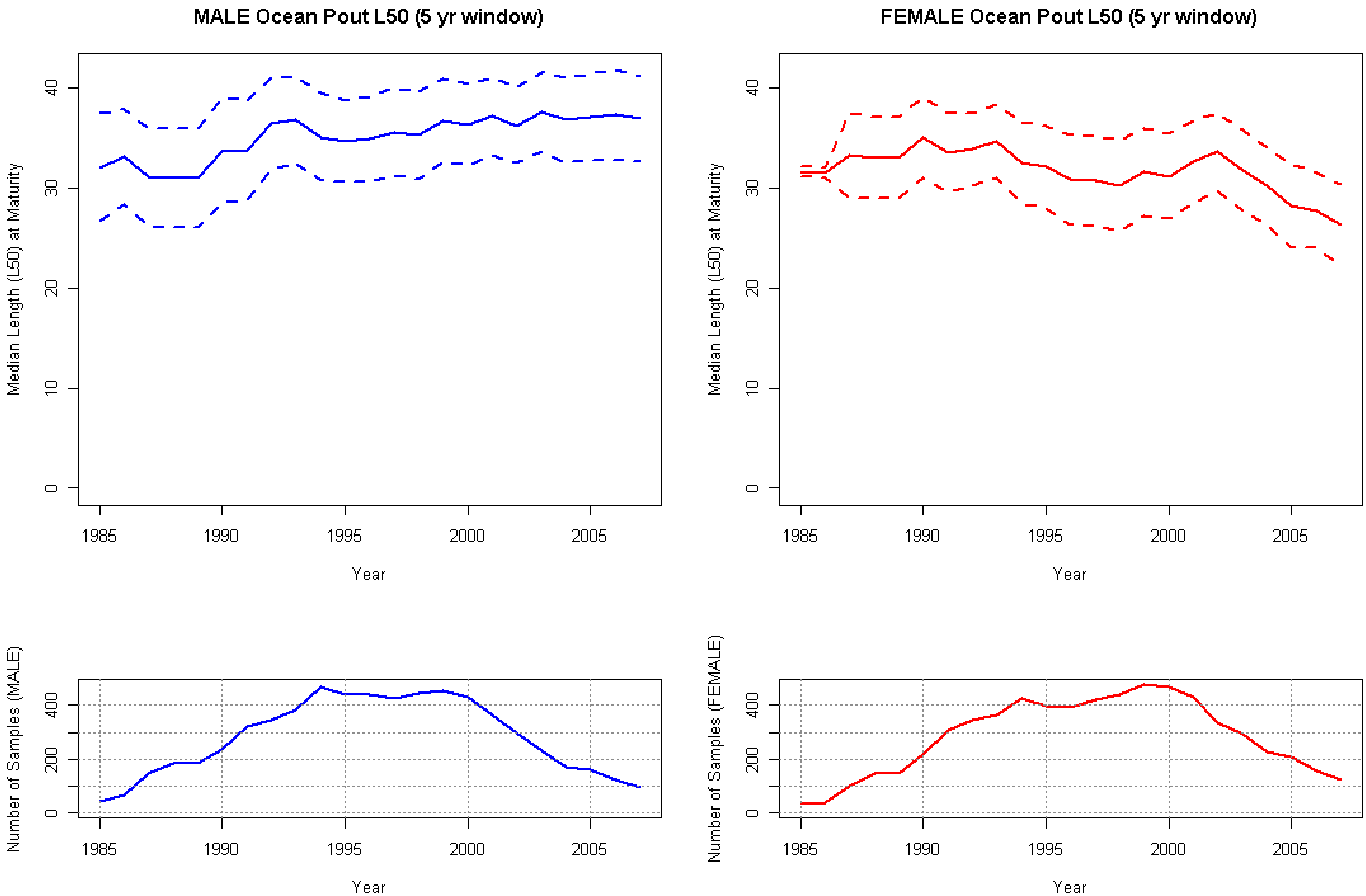


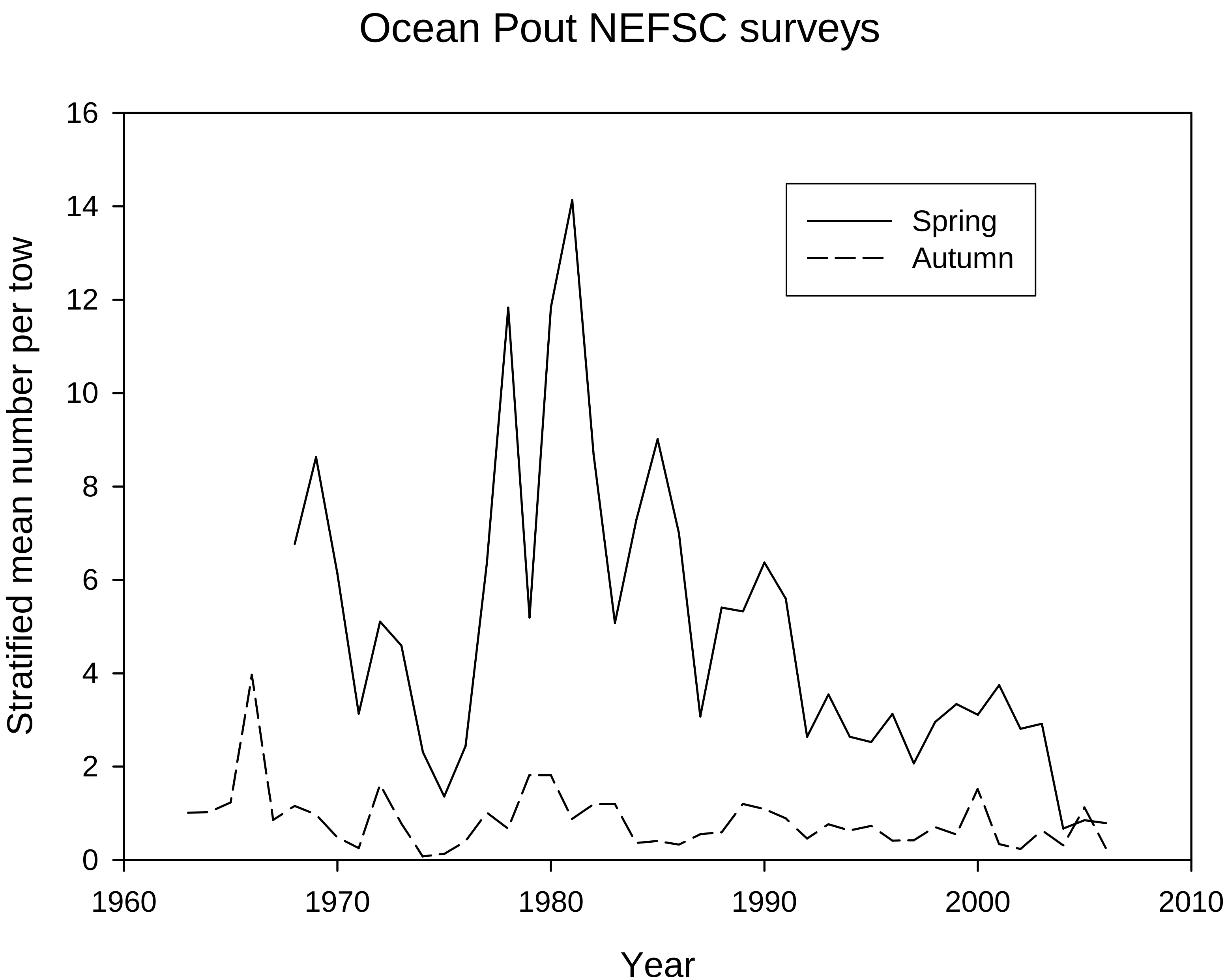
Figure . Distribution of ocean pout in the NEFSC spring and autumn bottom trawl surveys from 1999-2002 and 2003-2004.

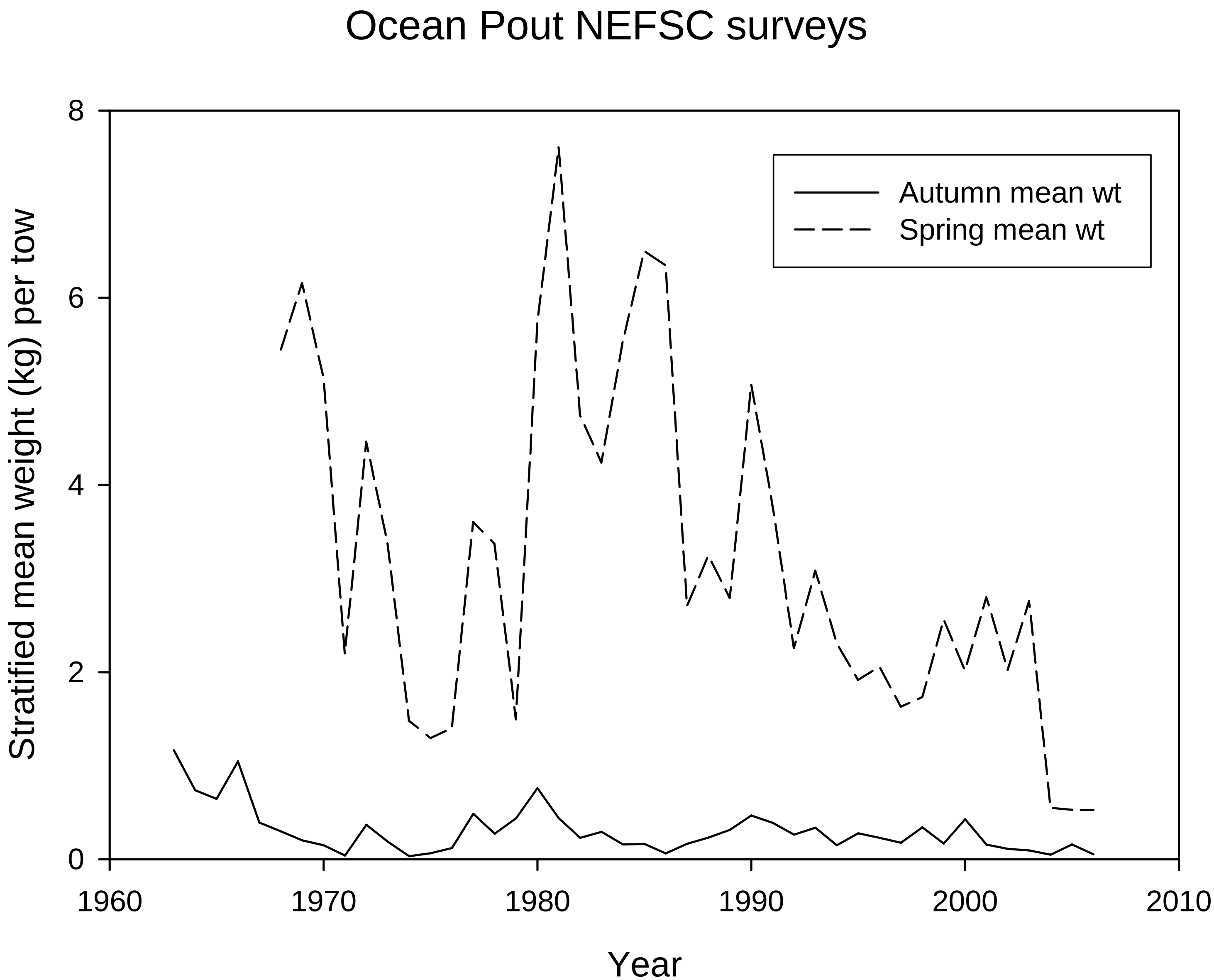

Ocean Pout
Year
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
3
8
13
18
23
28
33
38
43
48
53
58
63
68
73
78
83
88
93
98
Length (cm)



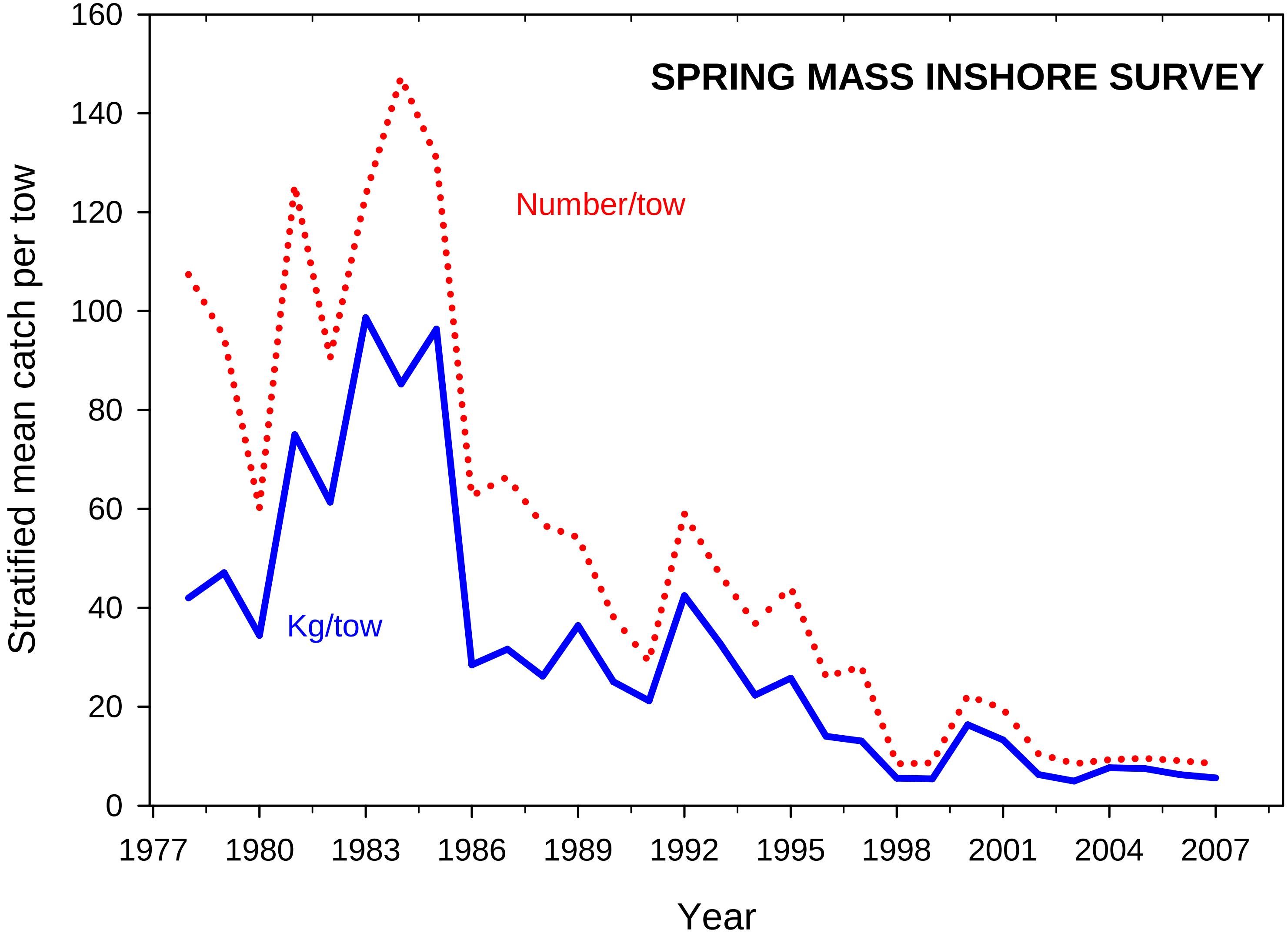
Ocean Pout
mean weight (kg) at length
Year
60 cm
55 cm
50 cm
45 cm
40 cm
35 cm
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010


MALE Ocean Pout L50 (5 yr window)
FEMALE Ocean Pout L50 (5 yr window)
Median Length (L50) at Maturity
Year
Number of Samples (MALE)
Number of Samples (FEMALE)
0
10
20
30
40
200
400
1985
1990
1995
2000
2005

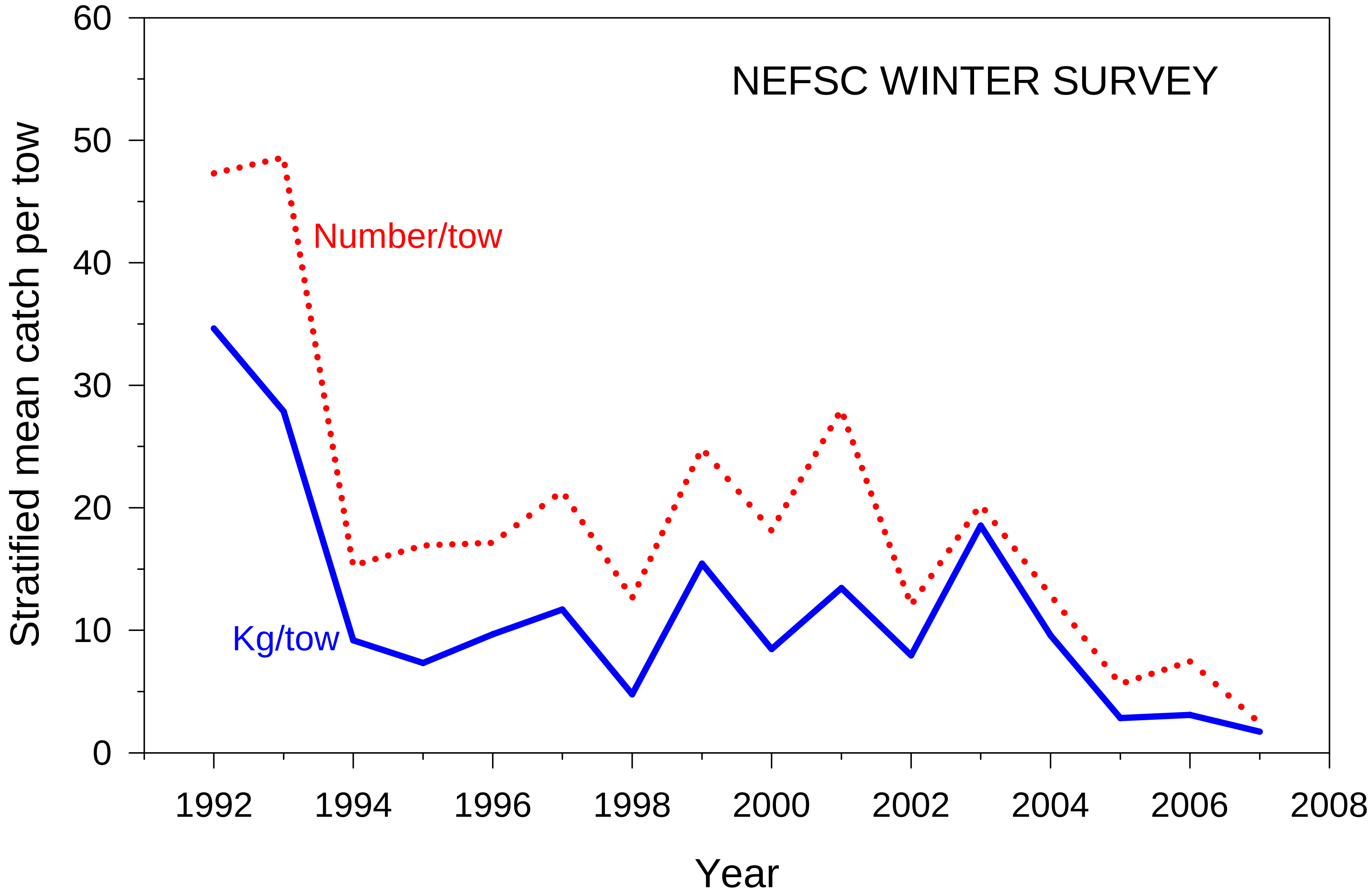

Ocean Pout NEFSC surveys
Spring
Autumn
Stratified mean number per tow
0
2
4
6
8
10
12
14
16
1960
1970
1980
1990
2000
2010
Year



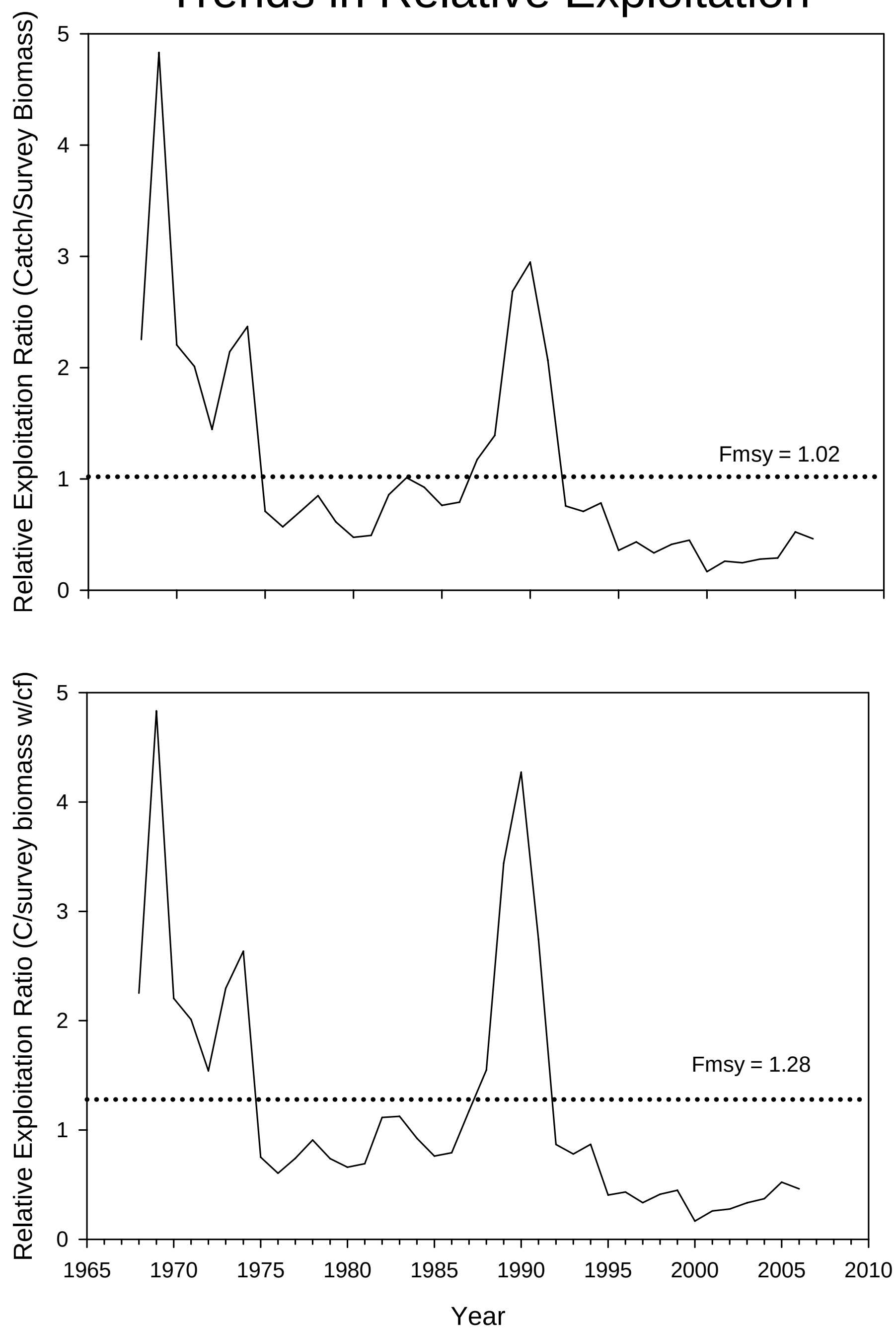
Ocean Pout NEFSC surveys
Stratified mean weight (kg) per tow
Year
Autumn mean wt
Spring mean wt
0
2
4
6
8
1960
1970
1980
1990
2000
2010



SPRING MASS INSHORE SURVEY
Number/tow
Kg/tow
Stratified mean catch per tow
Year
0
20
40
60
80
100
120
140
160
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007

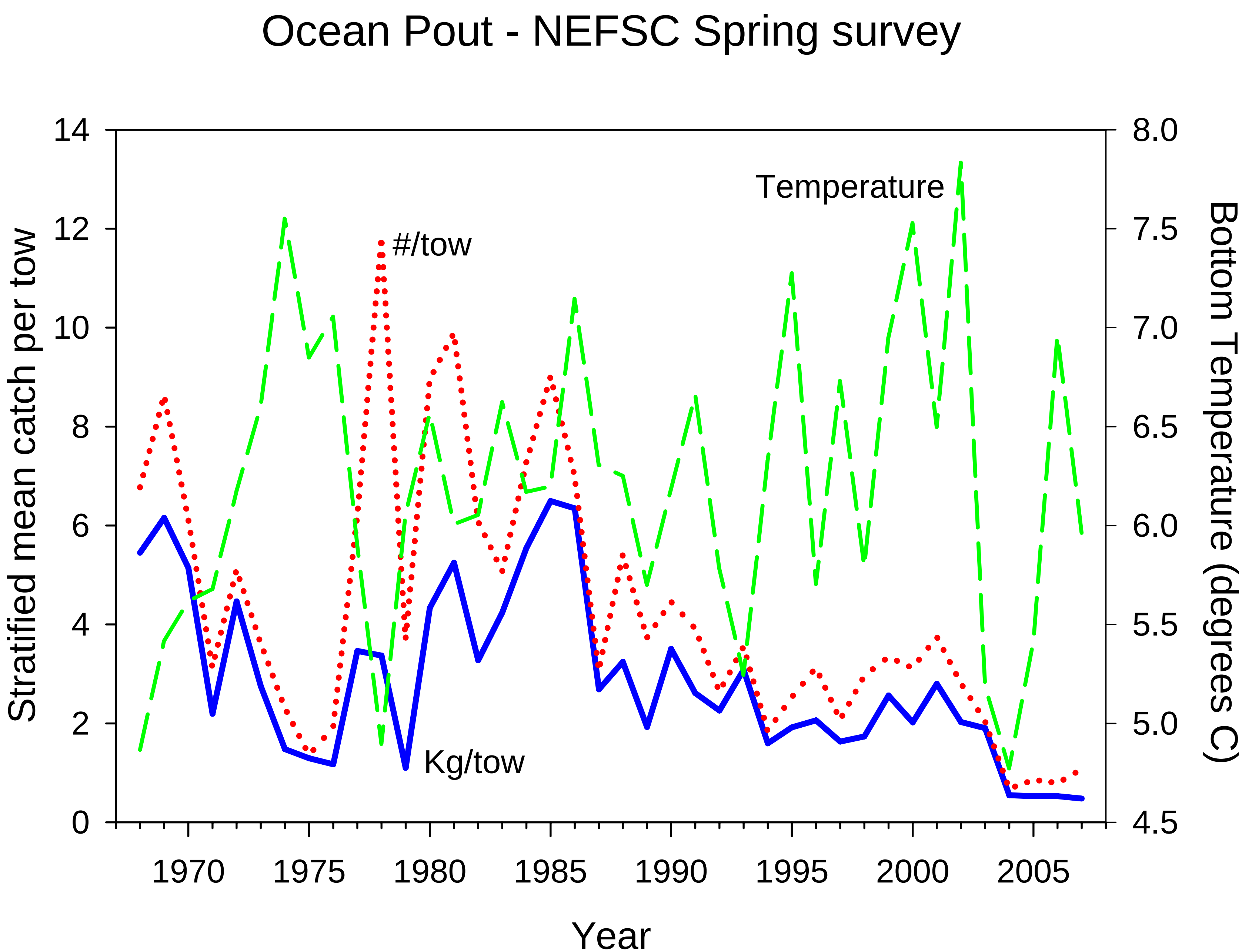

NEFSC WINTER SURVEY
Number/tow
Kg/tow
Stratified mean catch per tow
Year
0
10
20
30
40
50
60
1992
1994
1996
1998
2000
2002
2004
2006
2008

Trends in Relative Exploitation



Without CF

With CF



Ocean Pout - NEFSC Spring survey
Temperature
#/tow
Kg/tow
Stratified mean catch per tow
Bottom Temperature (degrees C)
Year
0
2
4
6
8
10
12
14
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
1970
1975
1980
1985
1990
1995
2000
2005

O. Ocean Pout

Strengths and weaknesses

Long time series of data
Limited biological data are available
GARM 2005 recommended estimating discards prior to 1989

Feasibility of changing assessment models

Changing models will be challenging without additional data
Use total catch (landing + discards) for the exploitation ratio

O. Ocean Pout

History of current approach

An index-based assessment has been conducted for ocean pout since 1990 using NEFSC spring survey (1968+) and landings.

Stock status is evaluated using a 3-yr moving average biomass (NEFSC spring survey kg/tow) and an exploitation ratio (landings / 3-yr average spring survey biomass).

In 2002, an Index Assessment Model (AIM) was explored using the replacement ratio analysis. A weak relationship between replacement ratio and relative F exists, indicating the input data for this species may be imprecise. It was concluded that these analyses were not informative to determine biological reference points.

In 2005 ocean pout was assessed using survey biomass and an exploitation ratio. Discards were estimated for 1989 to 2004.