O. Ocean pout
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Additional details and supporting information can be found in the Appendix of the GARM-III Report (NEFSC 2008).

1.0. Background

Ocean pout, *Zoarces americanus*, are assessed as a unit stock from Cape Cod Bay south to Delaware. An index assessment for this species was last reviewed at the 2005 Groundfish Assessment Review Meeting (Wigley and Col 2005). At that time, the three year average spring biomass index (2002-2004 average = 1.78 kg/tow) was below the biomass threshold (½ B_{MSY} = 2.4 kg/tow) of the B_{MSY} proxy (1980-1991 median = 4.9 kg/tow). The relative exploitation ratio (0.003) indicated that fishing mortality was well below the F threshold (F_{MSY} proxy = 0.31). Ocean pout are included in the New England Fishery Management Council's Multispecies Fishery Management Plan and is one of twelve species listed in the "Large Mesh/Groundfish" group based on fish size and type of gear used to harvest the fish.

2.0. Fishery

From 1964 to 1974, an industrial fishery developed for ocean pout, and nominal catches by the U.S. fleet averaged 4,700 mt (Table O1, Figures O1 and O2). Distant-water fleets began harvesting ocean pout in large quantities in 1966, and total nominal catches peaked at 27,000 mt in 1969. Foreign catches declined substantially afterward, and none have been reported since 1974. United States landings declined to an average of 600 mt annually during 1975 to 1983. Catches increased in 1984 and 1985 to 1,300 mt and 1,500 mt respectively, due to the development of a small directed fishery in Cape Cod Bay supplying the fresh fillet market. Landings have declined more or less continually since 1987. In recent years, landings from the southern New England/Mid-Atlantic area have continued to dominate the catch, reversing landing patterns observed in 1986-1987, when the Cape Cod Bay fishery was dominant. The shift in landings is attributed to the changes in management (gear/mesh) regulations. The majority of landings are taken using otter trawl gear (Table O2). Total landings in 2007 were 4 mt, a record low in the time series (Table O1, Figure O2).

Dock-side sampling of commercial ocean pout landings began in 1984 (Appendix Table O1; NEFSC 2008); landed ocean pout range between 40 and 90 cm, with most fish between 50 and 60 cm. In recent years, dock-side sampling has been sporadic.

Discard Estimation

The primary reason reported in the Northeast Fisheries Observer Program[1] (NEFOP) for ocean pout discards is "no market". Limited NEFOP data are available for gear types other than otter trawl, gillnet and scallop dredge gear. A combined ratio estimator, discard weight of ocean pout to kept weight of all species, was used to estimate ocean pout discards in the otter trawl fishery by large (>=5.5 inch) and small (<5.5 inch) mesh groups, gillnet, and scallop dredge using the NEFOP data from the Cape Cod Bay, Georges Bank and Southern New England and

[1] Northeast Fisheries Observer Program was implemented in 1989.

Mid-Atlantic regions[2]. Total discards were derived by expanding the discard ratios by the kept weight of all species, by gear type and mesh group, using the Dealer weighout data for 1989 – 2007 (Appendix Tables O2 and O3).

Prior to 1989, ocean pout discards were estimated using the survey-scale method (as described in Palmer et al. 2008) utilizing an average combined ratio based on 2004 to 2006 NEFOP data, the NEFSC spring survey weight per tow indices, and the kept weight of all species. Ocean pout discards (mt) were derived for four fleets (large-mesh otter trawl, small-mesh otter trawl, gillnet and scallop dredge) from 1968 – 1988 (Appendix Table O4). Total discards range between 175 mt in 2007 to 9,434 mt in 1990 (Table O3 and Figure O2). The majority of ocean pout discards occur in the large-mesh and small-mesh otter trawl fisheries. Discards from the otter trawl fleets exceed landings in most years (Tables O1 and O3).

3.0 Research Surveys

Commercial landings and the NEFSC spring research vessel survey biomass index followed similar trends during 1968 to 1975 (encompassing peak levels of foreign fishing and the domestic industrial fishery); both declined from very high values in 1968-1969 to lows of 300 mt and 1.3 kg per tow, respectively, in 1975 (Table O4 and Figure O2). Between 1975 and 1985, survey indices increased to record high levels, peaking in 1981 and 1985. Since 1985, survey catch per tow indices have generally declined, and the 2007 index (0.48 kg/tow) is the lowest value in the time series. Both NEFSC winter survey and the Massachusetts Division of Marine Fisheries inshore research vessel surveys confirm the declining trend observed in the NEFSC spring survey (Appendix Tables O5 and O6, Appendix Figures O1 and O2). Decreases in maximum size can be observed in the NEFSC spring survey length frequencies over time (Appendix Figure O3).

Survey conversion factors

There are no significant net or door conversion factors for ocean pout, however, there are significant vessel conversion factors for ocean pout (Byrne and Forrester 1991). Vessel conversion factors for numbers and weight are 0.70 and 0.69 (p-value 0.004), respectively. The vessel conversion factors were based upon 510 paired tows from five experiments conducted in the Mid-Atlantic, Southern New England, Georges Bank, and Gulf of Maine regions during the autumn, with the exception of 40 paired tows that were conducted during February. These experiments are spatially appropriate for this species; however, the temporal aspect is problematic. The availability of ocean pout to the otter trawl gear is very different between spring and autumn due to the life history behavior of ocean pout to nest-guard their egg masses in rocky areas during the autumn. In the autumn, ocean pout are not as available to the otter trawl gear as in the spring (Appendix Figure O4). Given this, the NESFC spring survey is used to monitor trends for this species. Since the majority of paired tows during these experiments took place in the autumn when breeding behavior is occurring and relatively low numbers of ocean pout are caught, it is questionable whether it is appropriate to apply the vessel conversion factors to the NEFSC spring survey. In this assessment, the vessel conversion factors have been applied as an 'alternative' series for comparison purposes only. Trends in survey catch with vessel conversion factors are given in Appendix Table O7 and Appendix Figure O5.

[2] statistical areas (514, 521,522,561,562,525,562,537-539,611-616).

4.0 Assessment

In the previous assessment, the data for ocean pout had insufficient dynamic range over the time series to provide estimates for biological reference points; however, for this assessment, the AIM model was explored using catch through 2006 and a three-year centered average of the NEFSC spring biomass (kg/tow) index through 2007. Exploratory analyses were conducted to evaluate the effect of using survey vessel conversion factors and the sensitivity of the discard estimates. Two series of analyses were conducted, with and without vessel conversion factors. Each series used a range of catch values: landings only, catch (landings and discards), catch derived using half of the discard estimate, and catch derived using twice the discards. Similar to the previous AIM analyses (NEFSC 2002), all AIM runs were non-informative to base recommendation for B_{MSY}, F_{MSY} and MSY (Appendix Table O8). The AIM analysis was updated to include catch through 2007 and the 2008 NEFSC spring biomass index; the lack of a significant relationship between relative F and replacement ratio persisted (Appendix Figure O6).

Exploratory analyses were also conducted using an age-structured biomass dynamic model (LOSS; Palmer and Legault 2008). Analyses were conducted using a range of values for stock-recruit steepness, stock depletion (S1/S0) and initial stock size while holding other input parameters constant. Natural mortality was assumed constant (0.2); mean weights-at-age, maturity-at-age, fishing selectivity and index selectivity were estimated for ocean pout based on information provided within FISHBASE[3]. These results were also non-informative, with little change occurring in the objective function with large changes in reference points and stock status (Appendix Tables O9a and O9b).

Relative Exploitation Rate

Computing survey biomass indices of exploitable biomass for use in calculating exploitation ratio was explored. However, given no minimum fish size, no market demand, no mesh selection parameters, and limited commercial length frequency data, there was insufficient information to apply a selection ogive to the ocean pout survey length frequency data.

Exploitation ratios were derived using catch (landings and discards) divided by the three year average of NEFSC spring survey biomass indices (without vessel conversion factors applied). Exploitation ratios have declined sharply from a peak in 1973 to low levels in the early 1980s then increased slightly in the late-1980s, after which they declined to record low levels (Table O5, Figure O3). The 2007 exploitation index is 0.38. Exploitation ratios derived using the survey biomass indices adjusted by the vessel conversion factor are presented in Appendix Table O10.

5.0 Biological Reference Points

Biological reference point proxies were first established for ocean pout by the Overfishing Definition Panel (Applegate et al. 1998). The Overfishing Definition Panel visually inspected the landings and survey trends and chose values for MSY and B_{MSY} that appeared to be sustainable. The B_{MSY} proxy (4.9 kg/tow) was based on the 1980-1991 median NEFSC spring survey biomass index. The MSY=1,500 mt was chosen because stock biomass appears to decline when landings exceeded this level (Applegate et al. 1998). MSY was based on landings, not catch. F_{MSY} proxy (0.31) was derived from MSY and B_{MSY} proxy.

[3] http://www.fishbase.org/search.php

With discards estimated in this assessment, biological reference point proxies were updated using catch. The median NEFSC 3yr average spring biomass index (4.94 kg/tow) and the median exploitation ratio (0.76) during 1977-1985 are used as B_{MSY} and F_{MSY} proxies, respectively. The 1977-1985 time period corresponds to the time when the replacement ratio was above 1 and biomass increased (Appendix Figure O6). Based on these proxies, MSY is estimated to be 3,754 mt (4.94 * 0.76 * 1000). Given below are biological reference point proxies used in GARM 2005 and re-estimated proxies for GARM 2008 that were accepted by the GARM Biological Reference Point Meeting Panel.

GARM 2005 using landings	GARM 2008 using catch
B_{MSY} = 4.9 kg/tow F_{MSY} = 0.31 MSY = 1,500 mt	B_{MSY} = 4.94 kg/tow F_{MSY} = 0.76 MSY = 3,754 mt

Trends in average survey biomass indices and relative exploitation rates are given in Figure O4. Since the mid-1990s, the 3yr average survey biomass index has been at or below the ½ B_{MSY} proxy and the relative exploitation rate has been below the F_{MSY} proxy (Table O5 and Figure O4).

The NEFSC spring survey biomass indices have been expanded to total population biomass using the survey strata area and the swept-area of the survey net. In recent years, estimates of total population biomass are below the estimate of MSY (Figure O5)

6.0 Projections

No projections have been conducted for ocean pout.

7.0 Stock Status Summary

The base analysis presented above was accepted as the final analysis. The three year average of NEFSC spring survey indices and the exploitation ratio (2007 catch / average of 2006, 2007, 2008 spring survey biomass indices) are used as proxies for biomass and fishing mortality, respectively. In 2007, the three year average survey index (0.48 kg/tow) was 10% of the B_{MSY} proxy (1977-1985 median = 4.94 kg/tow; Figure O6). The relative exploitation ratio (0.38) indicates that fishing mortality was 50% of the F threshold (F_{MSY} proxy = 0.76; Figure O6). In 2007, ocean pout was overfished, but overfishing was not occurring.

This index assessment reveals that catch, survey indices and exploitation ratios remain at, or near, record low levels and the annual estimates of discards exceeds the landings. Although exploitation has been low, stock size has not increased suggesting that this stock may be in a depensatory state. Discards are estimated to be an important component of catch and may be sufficiently high to hinder recovery of the stock.

For ocean pout, the replacement ratio and relative F analyses, as well as age-structured

biomass dynamics model analyses, were not informative upon which to base B_{MSY}, F_{MSY}, and MSY. Thus, biological reference points for ocean pout remain based upon research vessel survey biomass trends and the exploitation history based on total catch.

Changes from Last Assessment

Discards have been estimated for 1968 onward for four fleets (large-mesh otter trawl, small-mesh otter trawl, gillnet and scallop dredge). Biological references points have been updated using total catch.

Sources of Uncertainty

- Due to the lack of commercial length samples (13 samples since 1997), the size composition of the commercial landings could not be characterized.
- Biological reference points are based on catch; the estimated discards used in catch are based on a mix of direct and indirect methods. The catch used to determine MSY is based on indirect methods.

8.0 Panel Discussion/Comment

Conclusions

The Panel noted the unsuccessful application of the Relative Trends Model (AIM) to this stock. The Panel accepted the analysis notwithstanding the following concerns. The relationship between the Replacement Ratio and the Relative Exploitation Rate, that was significant at the time of GARM II is now weak. This is largely attributed to the four most recent, and low, Relative Exploitation Ratio estimates, which are among the lowest in the time series. However, the trend in the survey abundance index (used for the Replacement Ratio) continues downward. Thus, the GARM II AIM analysis was not updated and status is based upon interpretation of trends in the NMFS spring survey time series in relation to fishery catches. In relation to the latter, it is important to note that the BRPs have been adjusted to include discards and not just landings.

As was noted at the GARM III 'models' review; it is possible that the stock's dynamics have been so severely impacted by historical overfishing, that it may not be possible to determine the link between exploitation rate and productivity. The lack of response of the resource to a reduction in exploitation suggests that ocean pout may be in a depensatory state where the stock unlikely to rebuild to BRPs even in the absence of removals. Limiting catch may not result in a positive stock response.

Research Recommendations

The Panel noted that the spatial contraction of the stock may be leading to local depletion. It encouraged the examination of the stock's distribution in association with changes in abundance to provide more insight on the resource's status and dynamics at low population sizes.

9.0 Acknowledgements

We would like to recognize and thank all those who diligently collected data from the commercial fisheries (port and at-sea) and the research vessel surveys. We thank Jessica Blaylock for her assistance. We thank all the members of the Groundfish Assessment Review Meeting for their review and helpful comments.

10.0 References

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Table O1. Commercial landings and discards (mt, live) of ocean pout from the Gulf of Maine to the Mid-Atlantic region (NAFO Subareas 5 and 6), 1962-2007.

	USA Landings			Other	Total		Total
Year	5	6	Total	Landings	Landings	Discards	Catch
1962	0	0	0	0	0		0
1963	20	0	20	0	20		20
1964	2123	0	2123	0	2123		2123
1965	877	0	877	0	877		877
1966	7149	0	7149	6231	13380		13380
1967	7090	0	7090	271	7361		7361
1968	8373	364	8737	4324	13061	3476.9	16538
1969	5571	966	6537	20435	26972	3129.5	30101
1970	5851	426	6277	895	7172	2765.8	9938
1971	2678	1448	4126	1784	5910	2021.5	7932
1972	1927	358	2285	1066	3351	1498.2	4849
1973	2810	285	3095	2275	5370	1294.2	6664
1974	2790	459	3249	483	3732	1133.9	4866
1975	209	65	274	3	277	716.6	994
1976	341	337	678	0	678	522.2	1200
1977	809	250	1059	0	1059	928.1	1987
1978	715	320	1035	0	1035	1377.6	2413
1979	658	14	672	0	672	1509.3	2181
1980	339	11	350	0	350	2015.9	2366
1981	234	17	251	0	251	2743.2	2994
1982	317	4	321	0	321	4439.5	4761
1983	408	0	408	0	408	4488.7	4897
1984	1324	0	1324	0	1324	3692.2	5016
1985	1450	54	1504	0	1504	3161.0	4665
1986	801	1	802	0	802	3296.4	4098
1987	2111	74	2185	0	2185	2623.6	4809
1988	1765	46	1811	0	1811	2243.6	4055
1989	1308	6	1314	0	1314	7414.9	8729
1990	1299	13	1312	0	1312	9434.0	10746
1991	1361	63	1424	0	1424	4925.6	6350
1992	406	68	474	0	474	1520.0	1994
1993	217	15	232	0	232	1345.9	1578
1994	137	59	196	0	196	1280.9	1477
1995	51	14	65	0	65	573.5	639
1996	34.7	16.3	51.0	0	51	628.6	680
1997	7.6	25.4	33.0	0	33	521.5	555
1998	8.6	8.4	17.0	0	17	672.9	690
1999	8.9	9.1	18.0	0	18	786.1	804
2000	8.4	10.6	19.0	0	19	347.8	367
2001	8.4	9.2	17.6	0	18	531.6	549
2002	3.5	8.6	12.1	0	12	575.7	588
2003	18.1	7.4	25.6	0	26	426.8	452
2004	3.0	2.4	5.4	0	5	290.7	296
2005	0.6	3.0	3.6	0	4	200.8	205
2006	0.2	4.9	5.1	0	5	182.5	188
2007	1.4	2.1	3.5	0	4	175.0	178

Table O2. Percentage of annual commercial landings of ocean pout by gear type, 1964 -2007.

YEAR	Longline & Handline	Otter Trawl	Fish Pot	Lobster Pot	Unknown	Other	Total
1964		100.0					100.0
1965		100.0					100.0
1966		100.0					100.0
1967		100.0					100.0
1968		100.0					100.0
1969		100.0					100.0
1970		100.0					100.0
1972		100.0					100.0
1973		100.0					100.0
1975	4.0	96.0					100.0
1976	0.1	99.9					100.0
1977	0.0	100.0					100.0
1978		100.0				0.0	100.0
1979		99.9				0.1	100.0
1980		100.0					100.0
1981		100.0					100.0
1982		100.0				0.0	100.0
1983		100.0					100.0
1984		100.0					100.0
1985		100.0					100.0
1986		100.0					100.0
1987	0.6	99.2				0.2	100.0
1988	0.2	99.6	0.0			0.2	100.0
1989	0.2	99.5	0.0	0.1		0.2	100.0
1990	0.3	99.5	0.0	0.0		0.1	100.0
1991	1.2	97.5	1.2	0.0		0.1	100.0
1992	6.6	90.1	2.5	0.0		0.7	100.0
1993	5.3	91.3	2.2	0.3		1.0	100.0
1994	4.7	91.2	3.2	0.2	0.0	0.6	100.0
1995	9.7	77.9	3.5	1.0	6.5	1.4	100.0
1996	5.4	89.3	2.4	1.6	0.0	1.3	100.0
1997	3.8	85.7	1.6	6.1	0.0	2.7	100.0
1998	9.0	77.9	4.9	3.9	0.3	4.0	100.0
1999	12.7	74.4	7.3	2.7		2.9	100.0
2000	11.7	65.2	4.7	9.1		9.3	100.0
2001	15.5	71.5	5.9	5.0	2.1	0.1	100.0
2002	1.1	73.8	12.6	5.7	6.4	0.5	100.0
2003	4.9	80.3	6.9	0.9	0.1	6.8	100.0
2004	18.2	62.4	5.0	10.8	3.0	0.6	100.0
2005	31.8	32.8	9.2	25.8	0.4	.	100.0
2006	25.6	35.5	21.4	4.9	11.2	1.3	100.0
2007	12.9	44.4	15.2	16.3	5.0	6.2	100.0

Table O3. Ocean pout discards (mt) and coefficient of variation from the large-mesh (>= 5.5 inches) otter trawl, small-mesh (<5.5 inches) otter trawl, gillnet, and scallop dredge fleets, 1968 – 2007. A combined ratio estimator of ocean pout discard to kept of all species based on NEFOP data is used to estimate discards from 1989 to 2007. The survey scale method is used to estimate discards prior to 1989.

	Large-mesh Otter Trawl		Small-mesh Otter Trawl		Gillnet		Scallop Dredge		Total	
YEAR	mt	CV	mt	CV	mt	CV	mt	CV	mt	CV
1968			3470.4		1.0		5.5		3476.9	
1969			3125.1		0.9		3.5		3129.5	
1970			2761.6		0.9		3.2		2765.8	
1971			2018.4		0.6		2.5		2021.5	
1972			1495.9		0.8		1.4		1498.2	
1973			1292.2		0.6		1.4		1294.2	
1974			1131.6		0.7		1.6		1133.9	
1975			714.8		0.3		1.5		716.6	
1976			520.0		0.2		2.0		522.2	
1977			922.9		0.4		4.7		928.1	
1978			1369.5		1.3		6.9		1377.6	
1979			1499.2		1.9		8.1		1509.3	
1980			2002.6		5.1		8.3		2015.9	
1981			2724.3		5.5		13.5		2743.2	
1982	2110.5		2308.1		6.3		14.6		4439.5	
1983	3308.0		1161.2		6.0		13.4		4488.7	
1984	2988.9		687.0		7.0		9.3		3692.2	
1985	2506.7		636.8		7.4		10.1		3161.0	
1986	2420.9		851.0		10.4		14.1		3296.4	
1987	2002.6		597.1		7.5		16.5		2623.6	
1988	1681.5		541.4		6.7		14.0		2243.6	
1989	4912.2	0.33	2488.3	0.50	0.1	1.50	14.3		7414.9	0.28
1990	8887.3	0.30	525.4	0.42	1.8	1.26	19.5		9434.0	0.29
1991	3189.1	0.41	1713.2	0.37	3.5	0.58	19.7		4925.6	0.30
1992	1147.6	0.36	192.3	0.42	3.1	0.27	177.1	0.57	1520.0	0.29
1993	941.5	0.28	146.6	0.62	3.9	0.39	254.0	0.34	1345.9	0.21
1994	445.0	0.40	784.8	4.51	4.9	0.85	46.1	0.52	1280.9	2.77
1995	417.9	0.34	146.2	0.48	0.8	0.65	8.6	0.45	573.5	0.28
1996	448.7	0.39	137.6	1.21	1.1	0.84	41.2	0.72	628.6	0.39
1997	456.3	0.53	29.3	0.49	3.2	0.59	32.6	0.29	521.5	0.46
1998	595.7	0.63	30.2	0.57	0.3	0.80	46.7	0.75	672.9	0.56
1999	701.5	0.30	45.6	0.69	4.4	0.57	34.6	0.68	786.1	0.27
2000	310.3	0.64	19.5	0.51	8.4	0.75	9.6	0.27	347.8	0.57
2001	490.0	0.36	30.4	0.43	1.3	0.56	9.8	0.41	531.6	0.34
2002	539.4	0.33	28.0	0.34	3.4	0.54	5.0	0.56	575.7	0.31
2003	379.7	0.17	34.6	0.40	3.1	0.34	9.3	0.28	426.8	0.15
2004	248.1	0.12	38.8	0.29	2.7	0.34	1.2	0.54	290.7	0.11
2005	140.5	0.09	56.2	0.21	1.0	0.62	3.1	0.20	200.8	0.09
2006	113.3	0.12	65.0	0.54	0.5	0.77	3.8	0.21	182.5	0.21
2007	143.4	0.11	26.3	0.44	0.8	0.78	4.3	0.28	175.0	0.11

Table O4. Stratified mean catch per tow in weight and numbers, individual average fish weight, mean length and swept-area population biomass of ocean pout in **NEFSC spring surveys without conversion factors applied**, in the Gulf of Maine-Mid-Atlantic region (strata 1-26, 73-76), 1968-2007; 2008 preliminary

without vessel conversion factors

Year	Mean weight per tow (kg)	Mean number per tow	Individual average weight (kg)	Mean length (cm)	Swept-area population biomass (mt)
1968	5.446	6.768	0.805	51.1	17,065
1969	6.154	8.629	0.713	49.3	19,282
1970	5.143	6.133	0.839	51.9	16,115
1971	2.195	3.135	0.700	50.2	6,879
1972	4.463	5.104	0.874	51.6	13,986
1973	3.373	4.591	0.735	48.8	10,569
1974	1.479	2.310	0.640	47.0	4,636
1975	1.293	1.358	0.952	53.4	4,052
1976	1.400	2.440	0.574	46.5	4,387
1977	3.605	6.366	0.566	44.8	11,274
1978	3.371	11.831	0.285	31.6	10,562
1979	1.493	5.197	0.287	34.7	4,678
1980	5.729	11.837	0.484	42.6	17,952
1981	7.605	14.131	0.538	42.7	23,829
1982	4.743	8.690	0.546	44.0	14,863
1983	4.236	5.076	0.835	50.5	13,274
1984	5.540	7.275	0.762	50.0	17,359
1985	6.494	9.011	0.721	48.7	20,348
1986	6.345	6.995	0.907	53.0	19,880
1987	2.705	3.076	0.879	51.7	8,475
1988	3.244	5.405	0.600	45.0	10,165
1989	2.792	5.323	0.525	44.0	8,748
1990	5.074	6.369	0.797	50.3	15,898
1991	3.783	5.596	0.676	49.7	11,853
1992	2.257	2.639	0.855	52.9	7,071
1993	3.084	3.546	0.870	53.4	9,663
1994	2.309	2.640	0.875	54.3	7,234
1995	1.916	2.525	0.759	50.5	6,004
1996	2.058	3.127	0.658	47.6	6,450
1997	1.632	2.069	0.789	52.4	5,113
1998	1.733	2.957	0.586	46.1	5,430
1999	2.561	3.340	0.767	50.2	8,025
2000	2.016	3.113	0.648	48.2	6,317
2001	2.798	3.748	0.746	51.6	8,767
2002	2.025	2.809	0.721	51.3	6,345
2003	2.758	2.919	0.945	55.4	8,643
2004	0.546	0.673	0.812	50.8	1,712
2005	0.526	0.854	0.616	45.9	1,648
2006	0.526	0.789	0.667	47.4	1,649
2007	0.477	1.076	0.443	42.9	1,493
2008	*0.424*	*0.839*	*0.505*	*43.9*	1,327
mean 1968-2007	3.173				9,942
median 1968-2007	2.775				8,696

Table O5. NEFSC spring survey index(kg/tow), total catch (‘000 mt), 3 year moving average of spring survey biomass index, relative exploitation rate (catch/ 3 yr average of spring survey biomass index) for ocean pout, 1968 – 2007. Without vessel conversion factors applied.

Year	NEFSC Spring Index kg/tow	Total Catch ('000, mt)	3 year moving average (kg/tow)	Exploitation ratio (catch/ 3yr avg index)
1968	5.446	16.5379	5.800	2.851
1969	6.154	30.1015	5.581	5.394
1970	5.143	9.9378	4.497	2.210
1971	2.195	7.9315	3.934	2.016
1972	4.463	4.8492	3.344	1.450
1973	3.373	6.6642	3.105	2.146
1974	1.479	4.8659	2.048	2.375
1975	1.293	0.9936	1.391	0.714
1976	1.400	1.2002	2.099	0.572
1977	3.605	1.9871	2.792	0.712
1978	3.371	2.4126	2.823	0.855
1979	1.493	2.1813	3.531	0.618
1980	5.729	2.3659	4.942	0.479
1981	7.605	2.9942	6.026	0.497
1982	4.743	4.7605	5.528	0.861
1983	4.236	4.8967	4.840	1.012
1984	5.540	5.0162	5.423	0.925
1985	6.494	4.6650	6.126	0.761
1986	6.345	4.0984	5.181	0.791
1987	2.705	4.8086	4.098	1.173
1988	3.244	4.0546	2.914	1.392
1989	2.792	8.7289	3.703	2.357
1990	5.074	10.7460	3.883	2.768
1991	3.783	6.3496	3.704	1.714
1992	2.257	1.9940	3.041	0.656
1993	3.084	1.5779	2.550	0.619
1994	2.309	1.4769	2.436	0.606
1995	1.916	0.6385	2.094	0.305
1996	2.058	0.6796	1.869	0.364
1997	1.632	0.5545	1.808	0.307
1998	1.733	0.6899	1.975	0.349
1999	2.561	0.8041	2.103	0.382
2000	2.016	0.3668	2.458	0.149
2001	2.798	0.5492	2.280	0.241
2002	2.025	0.5879	2.527	0.233
2003	2.758	0.4524	1.777	0.255
2004	0.546	0.2960	1.277	0.232
2005	0.526	0.2048	0.533	0.384
2006	0.526	0.1875	0.510	0.368
2007	0.477	0.1785	0.475	0.375
2008	0.424			
mean 1968-2007	3.17		3.18	1.06
median 1968-2007	2.78		2.87	0.68
1980-91 median			4.89	0.97
1977-85 median			4.94	0.76

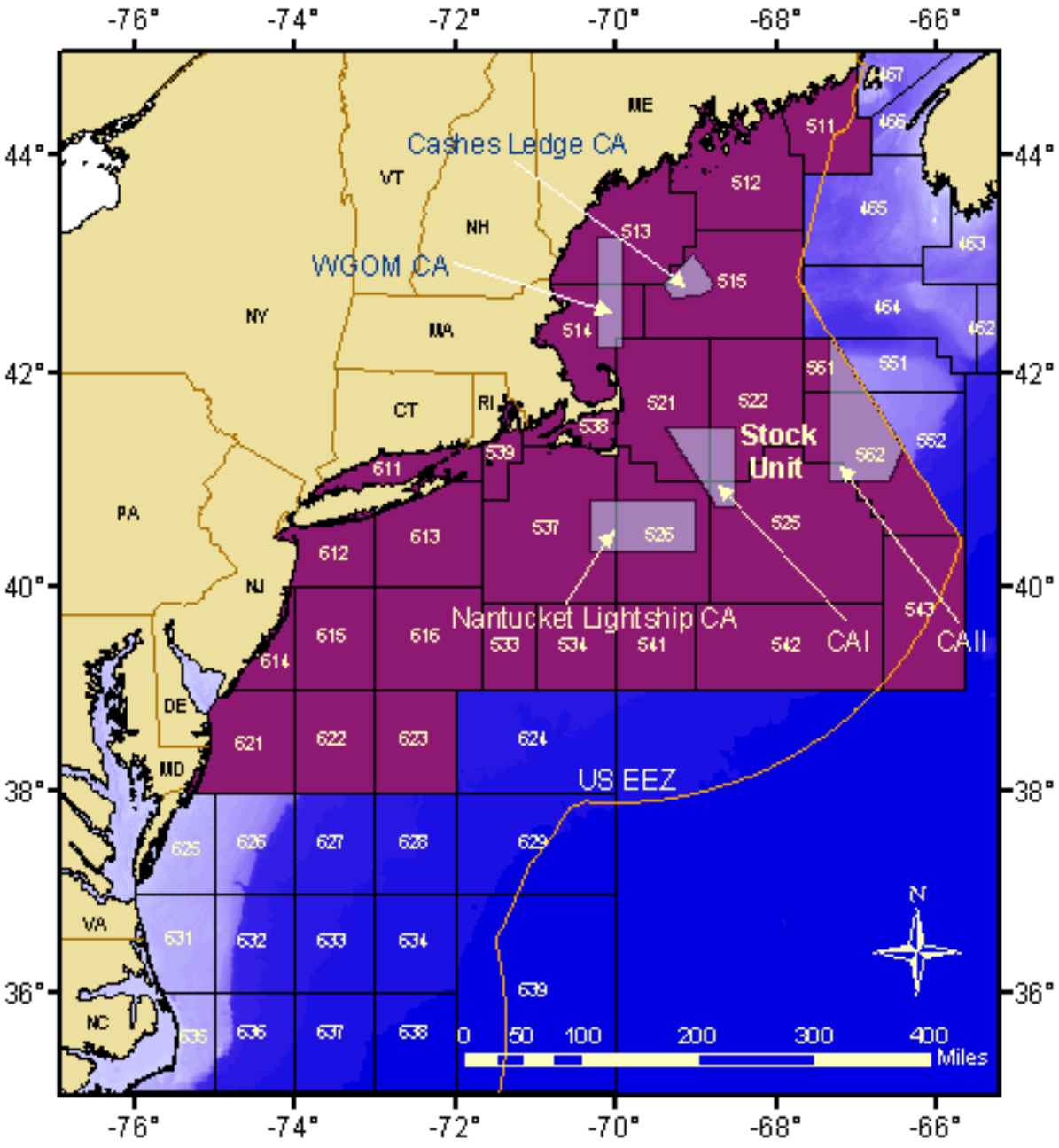

Figure O1. Statistical areas used to define the ocean pout stock.

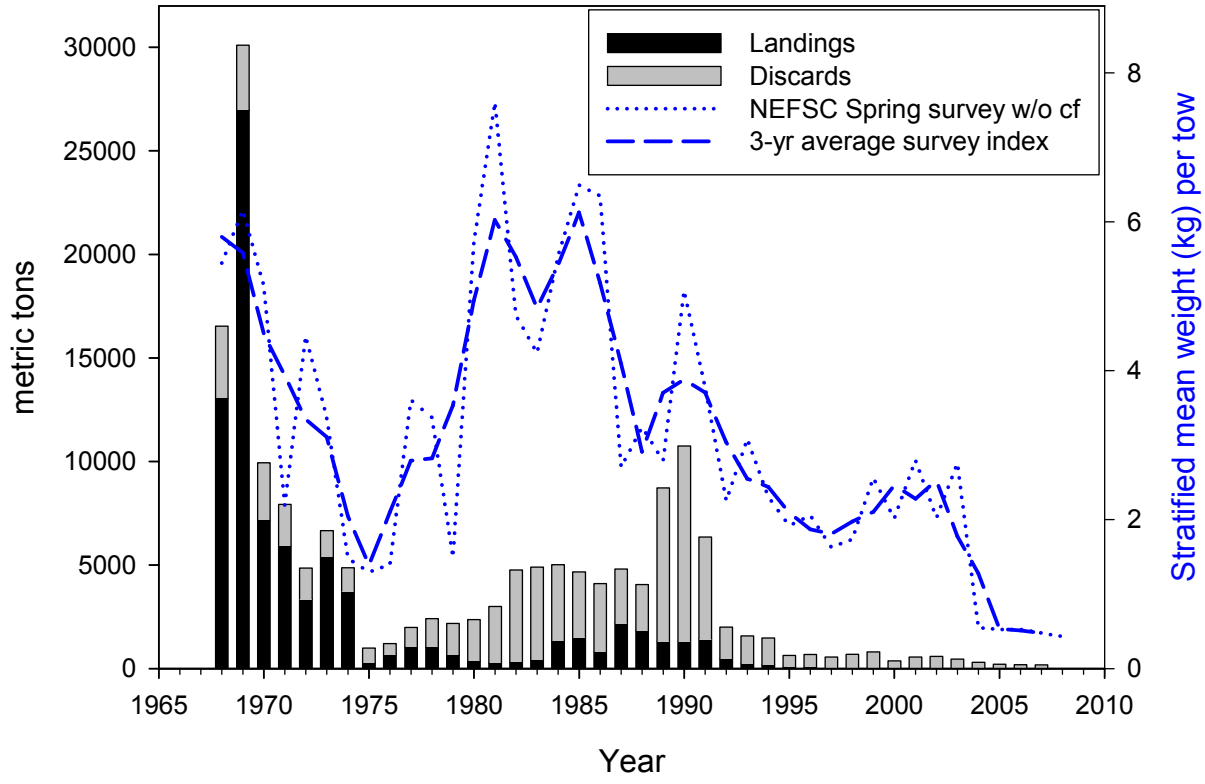

Figure O2. Trends in landings (mt), discards (mt) and NEFSC spring survey biomass (kg/tow) for ocean pout, 1968 – 2007.

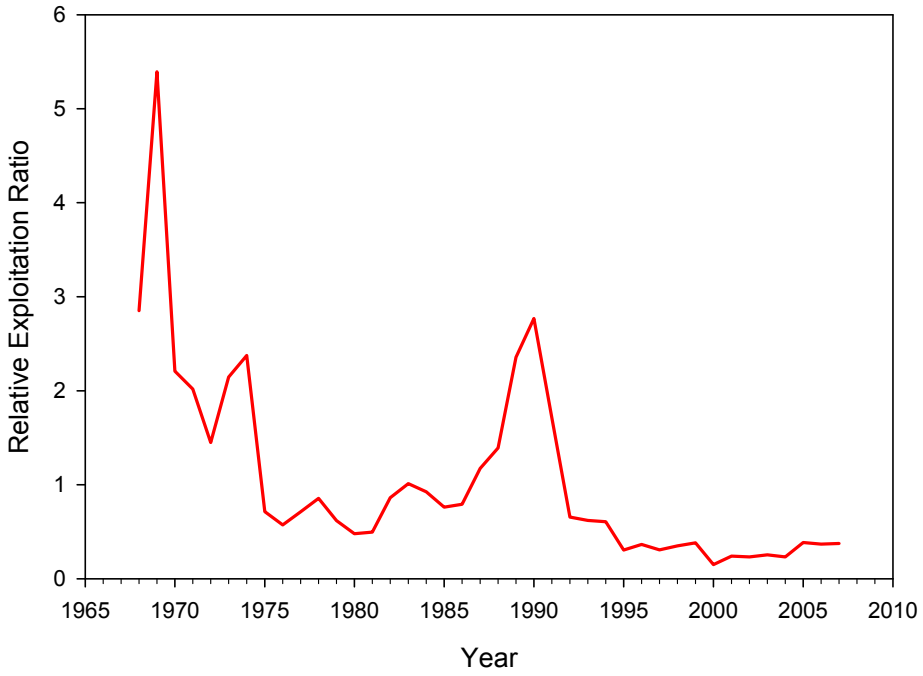

Figure O3. Trends in relative exploitation ratio (catch / 3-yr average of spring biomass index) for ocean pout, 1968 – 2007.

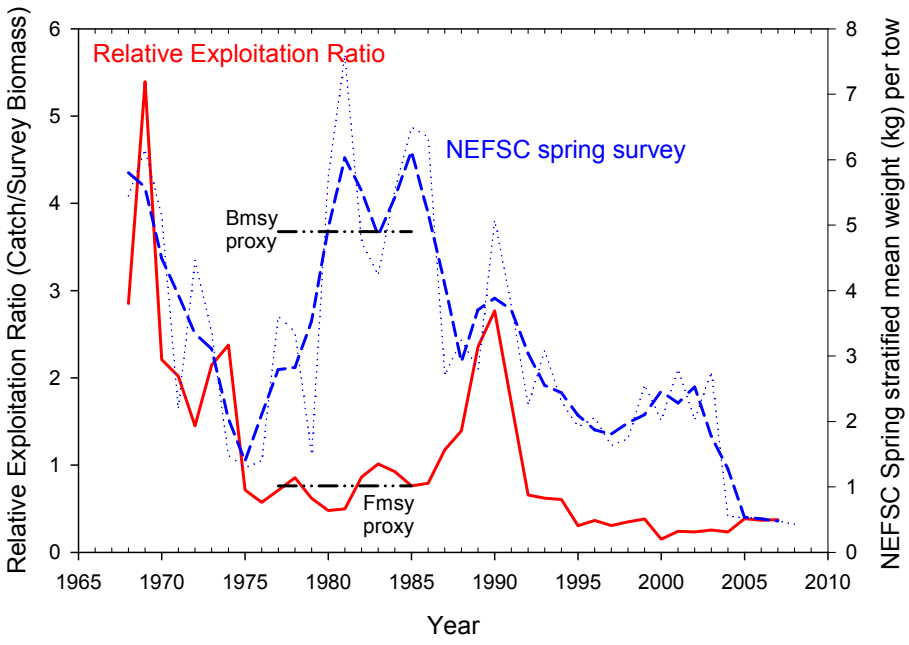

Figure O4. Trends in relative exploitation rate (catch / 3-yr average of spring biomass index) and NEFSC spring survey weight (kg) per tow for ocean pout, 1968 – 2007, with updated biological references point proxies based on total catch.

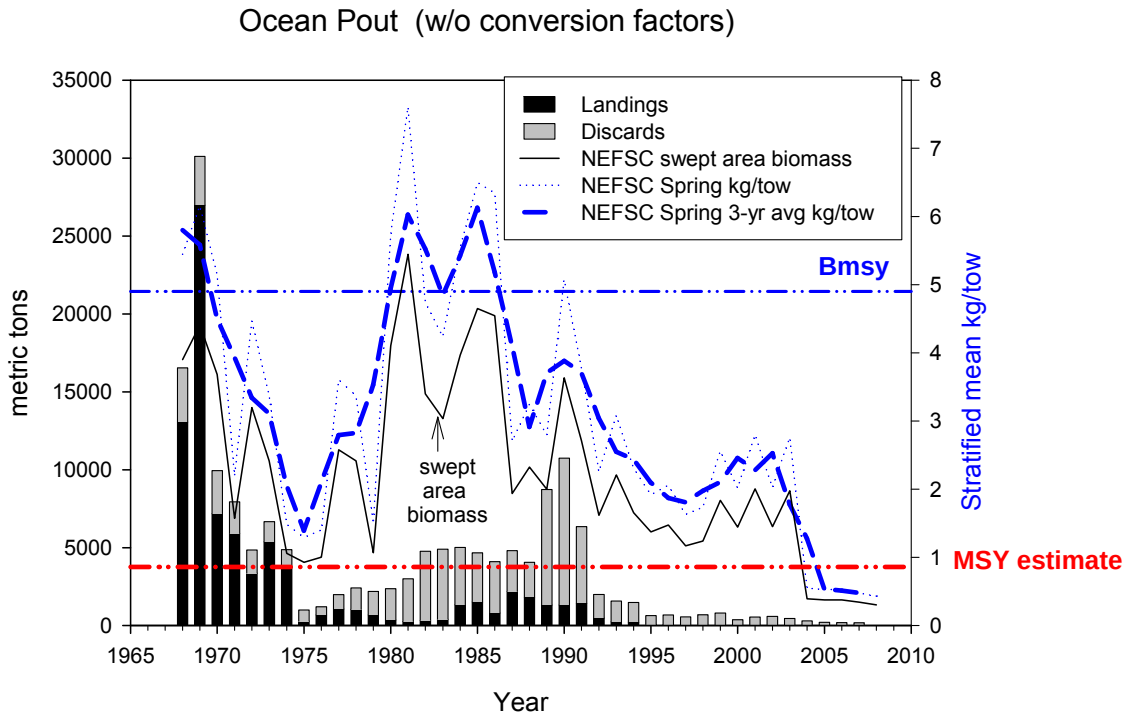

Figure O5. Trends in landings (mt), discards (mt), NEFSC spring survey biomass (kg/tow) and total population biomass (mt) for ocean pout, 1968 – 2007, with updated biological reference points based on total catch.

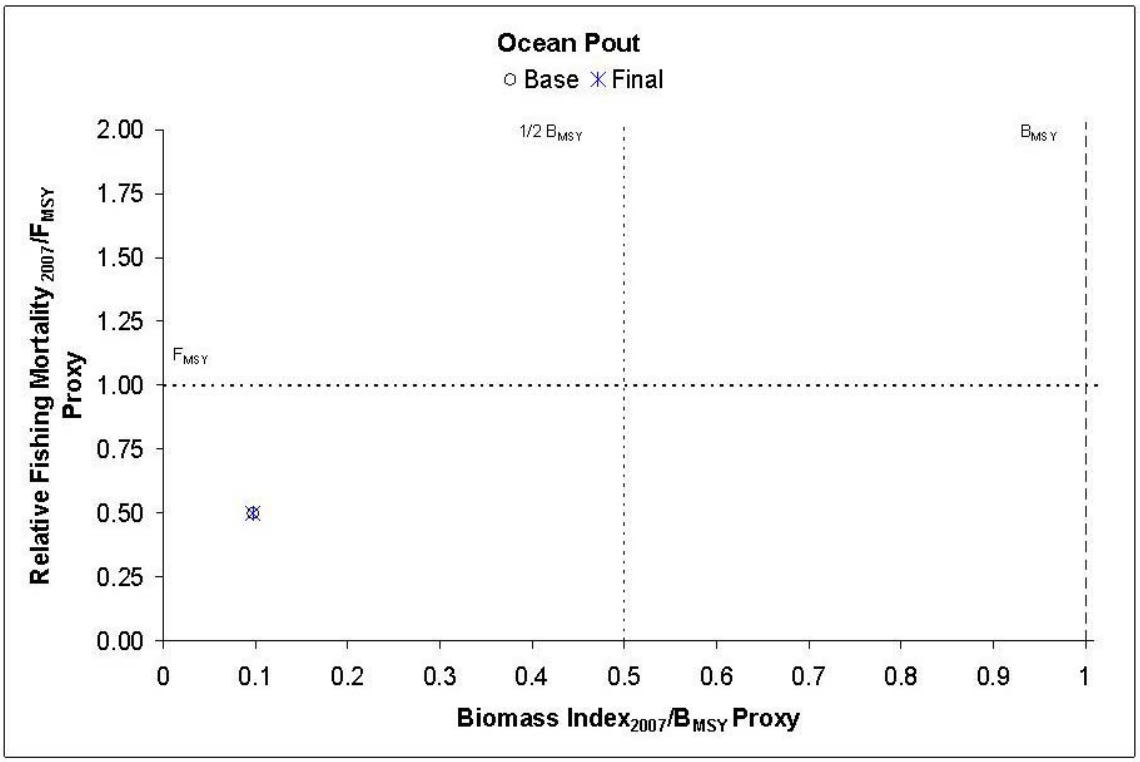

Figure O6. Ocean pout survey biomass index and relative fishing mortality in 2007, with respect to biological reference point proxies. The base analysis was accepted as the final analysis to determine ocean pout stock status in 2007.