



UNITED STATES DEPARTMENT OF COMMERCE
 National Oceanic and Atmospheric Administration
 NATIONAL MARINE FISHERIES SERVICE
 Northeast Fisheries Science Center
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MEMORANDUM FOR: Patricia A. Kurkul
 Regional Administrator

FROM: Nancy B. Thompson, Ph.D. *N. Thompson*
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SUBJECT: Update of Skate Stock Status Based on NEFSC Bottom Trawl Survey
 Data through Autumn 2010

The purpose of this memo is to update the status of seven species of skates based on NEFSC bottom trawl survey data through autumn 2010. The previous update was done April 13, 2009 based on NEFSC bottom trawl survey data through autumn 2008.

The 2009 report stated that two skate species were overfished (smooth, thorny) and overfishing was not occurring in any of the seven skate species.

Based on new survey data collected through 2010, one skate species remains overfished (thorny) and overfishing was not occurring in any of the seven skate species.

For smooth skate, which is no longer overfished, the 3-year average (2008-2010) survey catch per tow (0.16 kg/tow) was slightly greater than the $B_{\text{threshold}}$ (0.145 kg/tow). For thorny skate, the 3-year average (2008-2010) survey catch per tow (0.248 kg/tow) was less than the $B_{\text{threshold}}$ (2.06 kg/tow).

With exception of smooth skate, none of the other skates has had a change in stock status from that described in the 2009 memo. A few other results are noteworthy. Survey indices of winter and little skate have increased since 2006. Three-year average rosette skate indices had been above the B_{target} , but the latest index is between B_{target} and $B_{\text{threshold}}$.

Details about the survey indices, vessel calibration coefficients, and Biological Reference Points for each skate species are provided on the following pages.

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There are seven species of skates occurring along the North Atlantic coast of the United States: winter skate (*Leucoraja ocellata*), little skate (*L. erinacea*), barndoor skate (*Dipturus laevis*), thorny skate (*Amblyraja radiata*), smooth skate (*Malacoraja senta*), clearnose skate (*Raja eglanteria*), and rosette skate (*L. garmani*). Skates are currently managed under the New England Fishery Management Council's Skate Fishery Management Plan implemented in 2003. This plan includes mandatory reporting by species, possession prohibitions on barndoor, thorny, and smooth skates, trip limits for winter skate, and ACLs for the wing and bait fisheries.

Indices of relative abundance (stratified mean weight per tow) have been developed from NEFSC bottom trawl surveys for the seven species in the skate complex and these form the basis for most of the conclusions about the status of the complex. All statistically significant NEFSC gear, door, and vessel conversion factors were applied to little, winter, and smooth skate indices when applicable. All values for survey catch per tow in Table 1 and Figure 1 are expressed in "Albatross" units. The strata sets used for each species are given in Table 1.

Since spring 2009, the NEFSC bottom trawl survey has been conducted with the FSV *Henry B. Bigelow*. The *Bigelow* uses a new trawl design that is much more efficient in capturing many species, and especially skates. Prior to implementation of this new vessel and net we conducted experiments to calibrate the net with respect to the capture efficiency of the R/V *Albatross IV*, the previous survey vessel. The results of these calibration experiments were peer-reviewed in August 2009 and results those experiments are summarized in Miller et al. (2010). In order to properly interpret the trends since spring 2009 it is necessary to apply calibration coefficients to the *Bigelow* estimate to convert them to equivalent the *Albatross* units. This conversion is necessary in order to distinguish changes in abundance from changes in capture efficiency.

The calibration coefficients below represent changes in overall catch rates expressed in terms of average weight per tow. For example, a hypothetical calibration coefficient of 3.0 would signify that on average the *Bigelow* survey tow captures 3 times as much weight of skates an *Albatross* tow. For some species the capture efficiency differences between survey vessels vary with fish length. The identification of such differences and their importance for stock assessments is an area of ongoing research. For skate species there is some evidence that length-specific differences occur, with higher calibration coefficients for smaller skates. We are presently investigating the importance of these differences for the determination of stock status under the current fishery management plan.

Calibration coefficients for seven skate species captured during NEFSC bottom trawl surveys:

Species	Calibration Coefficient (Std Err)	Comment
Little <i>Leucoraja erinacea</i>	2.785519 (0.32)	Spring Survey
Winter <i>Leucoraja ocellata</i>	2.174334 (0.31)	Fall Survey
Barndoor <i>Dipturus laevis</i>	3.661128 (0.51)	Fall Survey
Thorny <i>Amblyraja radiata</i>	3.626359 (0.58)	Fall Survey
Smooth <i>Malacoraja senta</i>	4.449518 (0.67)	Fall Survey
Clearnose <i>Raja eglanteria</i>	6.189401 (0.81)	Fall Survey
Rosette <i>Leucoraja garmani</i>	8.813973 (0.98)	Based on the calibration coefficient for little skate in the fall survey comparisons

Biomass reference points are based entirely on NEFSC survey data since reliable landings and discard information are not available by species. For all species but barndoor, the Bmsy proxy is defined as the 75th percentile of the appropriate survey biomass index time series for that species (Table 1). For barndoor skate, the Bmsy proxy is the average of 1963-1966 autumn survey biomass indices since the survey did not catch barndoor for a protracted period.

The fishing mortality reference points are based on changes in survey biomass indices. If the three-year moving average of the survey biomass index for a skate species declines by more than the average CV of the survey time series, then fishing mortality is assumed to be greater than Fmsy and overfishing is occurring for that skate species. The average CVs of the indices are given by species in Table 1.

For winter skate, the 2008-2010 NEFSC autumn average biomass index of 9.64 kg/tow is above both the biomass threshold reference point (2.80 kg/tow) and the Bmsy proxy (5.60 kg/tow), and thus the species is not overfished and is above Bmsy. The 2008-2010 average index is above the 2007-2009 index by 18%, therefore overfishing is not occurring.

For little skate, the 2008-2010 NEFSC spring average biomass index of 8.15 kg/tow is above the both the biomass threshold reference point (3.51 kg/tow) and the Bmsy proxy (7.03 kg/tow), and thus the species is not overfished and is above Bmsy. The 2008-2010 average index is above the 2007-2009 index by 33%, therefore overfishing is not occurring.

For barndoor skate, the 2008-2010 NEFSC autumn average survey biomass index of 1.11 kg/tow is above the biomass threshold reference point (0.81 kg/tow), and thus the species is not overfished, but is not yet rebuilt to Bmsy. The 2008-2010 average index is above the 2007-2009 index by 10%, therefore overfishing is not occurring.

For thorny skate, the 2008-2010 NEFSC autumn average biomass index of 0.26 kg/tow is well below the biomass threshold reference point (2.06 kg/tow), indicating that the species is in an overfished condition. The 2008-2010 index is lower than the 2007-2009 index by 4.4%, but overfishing is not occurring as this decline is not more than 20%.

For smooth skate, the 2008-2010 NEFSC autumn average biomass index of 0.16 kg/tow is above the biomass threshold reference point (0.145 kg/tow) and thus the species is not overfished but is not yet rebuilt to Bmsy. The 2008-2010 index is above the 2007-2009 index by 22%, therefore overfishing is not occurring.

For clearnose skate, the 2008-2010 NEFSC autumn average biomass index of 1.10 kg/tow is above both the biomass threshold reference point (0.39 kg/tow) and the Bmsy proxy (0.77 kg/tow), and hence the species is not overfished. The 2008-2010 index is below the 2007-2009 index by 5.1%, but overfishing is not occurring as this decline is not more than 30%.

For rosette skate, the 2008-2010 NEFSC autumn average biomass index of 0.040 kg/tow is above both the biomass threshold reference point (0.024 kg/tow), and thus the species is not overfished. The 2008-2010 index is lower than the 2007-2009 index by 26%, but overfishing is not occurring as this decline is not below 60%.

Reference

Miller TJ, Das C, Politis PJ, Miller AS, Lucey SM, Legault CM, Brown RW, Rago PJ. 2010. Estimation of Albatross IV to Henry B. Bigelow calibration factors. Northeast Fish Sci Cent Ref Doc. 10-05; 233 p.

	BARNDOR	CLEARNOSE	LITTLE	ROSETTE	SMOOTH	THORNY	WINTER
Survey (kg/tow) Time series basis Strata Set	Autumn 1963-1966 Offshore 1-30, 33-40	Autumn 1975-2007 Offshore 61-76, Inshore 15-44	Spring 1982-2008 Offshore 1-30, 33-40, 61-76, Inshore 1-66	Autumn 1967-2007 Offshore 61-76	Autumn 1963-2007 Offshore 1-30, 33-40	Autumn 1963-2007 Offshore 1-30, 33-40	Autumn 1967-2007 Offshore 1-30, 33-40, 61-76
1999	0.30	1.05	9.96	0.07	0.07	0.48	5.09
2000	0.29	1.03	8.80	0.03	0.15	0.83	4.38
2001	0.54	1.61	6.84	0.12	0.29	0.33	3.89
2002	0.78	0.89	6.44	0.05	0.11	0.44	5.60
2003	0.55	0.66	6.49	0.03	0.19	0.74	3.39
2004	1.30	0.71	7.22	0.05	0.21	0.71	4.03
2005	1.04	0.52	3.24	0.07	0.13	0.22	2.82
2006	1.17	0.53	3.32	0.06	0.21	0.73	2.48
2007	0.80	0.85	4.46	0.07	0.09	0.32	3.71
2008	1.09	1.73	7.34	0.03	0.10	0.21	9.50
2009	1.13	0.89	6.55	0.06	0.21	0.25	11.33
2010	1.10	0.68	10.58	0.03	0.18	0.28	8.09
2003-2005 3-year average	0.96	0.63	5.65	0.049	0.18	0.56	3.34
2004-2006 3-year average	1.17	0.59	4.59	0.057	0.19	0.55	3.04
2005-2007 3-year average	1.00	0.64	3.67	0.064	0.14	0.42	2.93
2006-2008 3-year average	1.02	1.04	5.04	0.052	0.13	0.42	5.23
2007-2009 3-year average	1.01	1.16	6.12	0.054	0.13	0.260	8.18
2008-2010 3-year average	1.11	1.10	8.15	0.040	0.16	0.248	9.64
Percent change 2008-2010 compared to 2007-2009	+10.1	-5.1	+33.3	-25.9	+22.2	-4.4	+17.9
Percent change for overfishing status determination in FMP	-30	-30	-20	-60	-30	-20	-20
Biomass Target	1.82	0.77	7.03	0.048	0.29	4.12	5.60
Biomass Threshold	0.81	0.38	3.51	0.024	0.14	2.06	2.80
CURRENT STATUS	Not Overfished Overfishing is Not Occurring	Not Overfished Overfishing is Not Occurring	Not Overfished Overfishing is Not Occurring	Not Overfished Overfishing is Not Occurring	Not Overfished Overfishing is Not Occurring	Overfished Overfishing is Not Occurring	Not Overfished Overfishing is Not Occurring

Table 1.

Skate Complex Biomass Indices

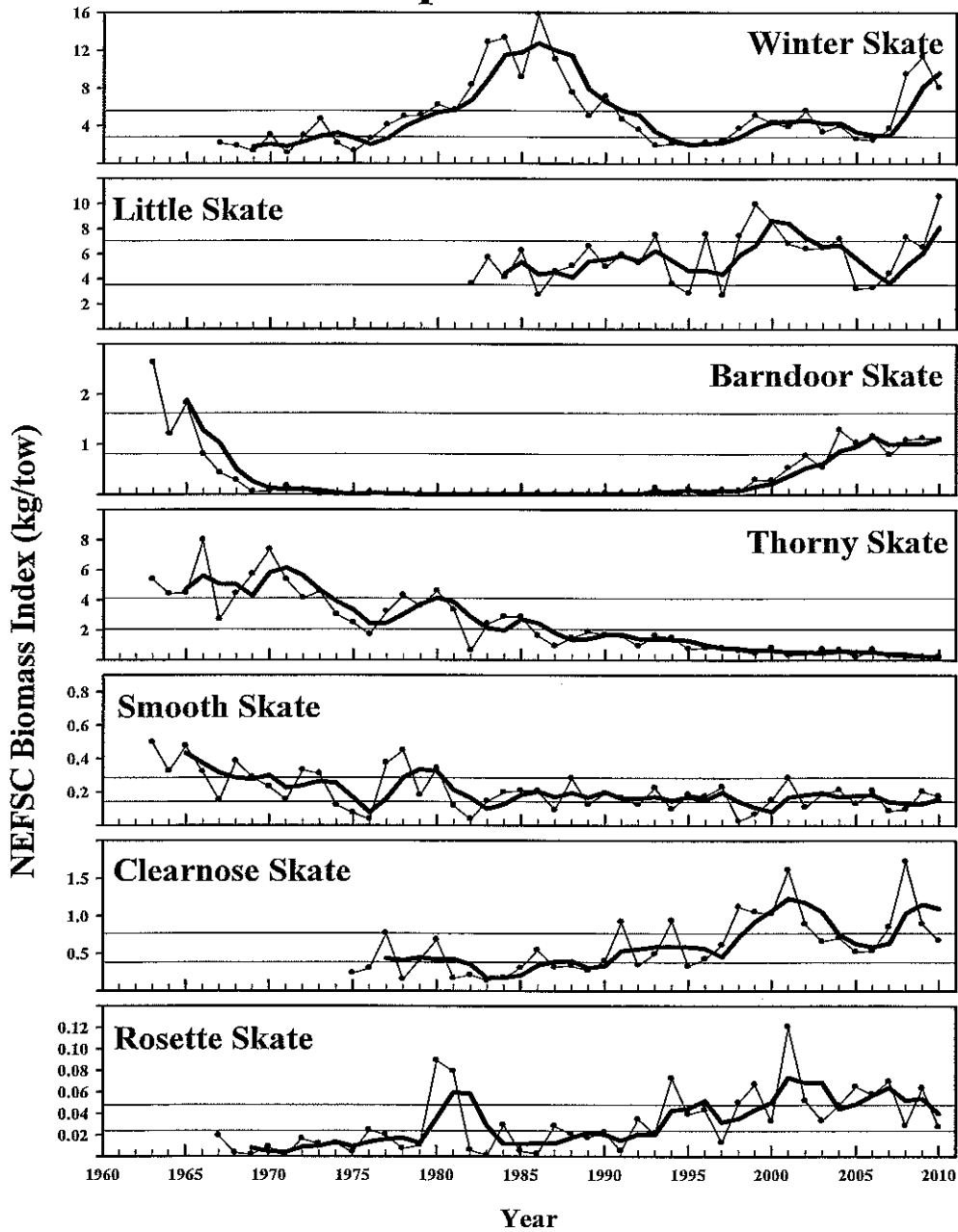


Figure 1. NEFSC survey biomass indices (kg/tow). Thin lines with symbols are annual indices, thick lines are 3-year moving averages, and the thin horizontal lines are the biomass thresholds (red) and targets (blue) developed through 2007/2008.