New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
John Pappalardo, *Chairman* | Paul J. Howard, *Executive Director*

MEMORANDUM

DATE: **March 8, 2010**

TO: Scientific and Statistical Committee

FROM: Skate PDT

SUBJECT: **Review of fall 2008 survey indices and effect on skate catch limits**

After closely examining and analyzing the 2008 survey data, particularly for the winter skate abundance and biomass index, the Skate PDT finds no scientific justification for excluding the fall 2008 index from the Skate ABC calculation. Unlike the 2008 survey data, the 2009 spring and fall surveys were conducted with the RV Bigelow using different trawl gear. Peer-reviewed calibrations are not yet available for examination of survey data beyond fall 2008.

The fall 2008 skate indices do not appear to be anomalous, despite the increase in the winter skate biomass index from 2.48 kg/tow in 2006 and 3.71 kg/tow in 2007 to 9.50 kg/tow in 2008 (the 5th highest in the 42 year time series), an increase that might occur due to a significant change in catchability, a large recruitment event, or a transient immigration of adult skates. There were also biomass increases for clearnose and little skates in 2008. Other surveys which are not used in the formal status determination and not used in the formal ABC calculation appear to corroborate the increase in the fall survey winter skate biomass index (Figure 1).

The PDT examined the following characteristics to make this determination about the validity of the 2008 survey data:

1. The survey indices are calculated by a standard program, SURVAN. This software has been well reviewed and is used to calculate survey indices for a very wide range of stocks in the NE Region.

2. The geographical distribution of survey tows with winter skates (Figure 2 and Figure 3) do not appear to be appreciably different than previous years.

3. The mean catch per tow by stratum appear to be relatively consistent with one another (Figure 4), i.e. there is not just one large stratum with an extraordinary tow that is generating the higher winter skate biomass index in 2008.

4. The variability of winter skate biomass in survey tows over all strata does not appear to have increased (Figure 5).

5. The size frequency of winter skates in the 2008 fall survey data appear to be mostly consistent with the 2007 data (Figure 6) when growth (Frisk and Miller 2006) and natural mortality (M=0.2) are taken into account, however there is a higher catch of 75-90 cm skates in 2008 than was predicted from 2007 length frequency data.

Although the winter skate biomass increased by a large amount, this increase is not unprecedented, occurring in 1982-1985. Frisk et al. (2008) concluded that the increase in winter skate biomass in the early 1980s was partially attributable to an influx of large winter skates from the Scotian Shelf, but based on US survey data these skates appeared to persist in US waters for several years. There appears to be some indication that the winter skates observed in the 2008 survey were larger than those predicted to grow from the 2007 survey distribution, hinting that a similar immigration of adult winter skates may have once again occurred.

The method for calculating the ABC was approved by the SSC in February 2009. The ABC is calculated as the sum of the product of the median catch/biomass ratio and the most recent three year average survey biomass. Including the fall 2008 survey, skate biomass indices in the three-year average calculations (and dropping the 2005 fall biomass) would increase the ABC from 30,643 mt to 41,080 mt (+34%), due primarily to the large increase in observed winter skate biomass.

Table 1. Amendment 3 catch limits (current) for the 2010 and 2011 fishing years, compared to potential adjustment using the fall 2008 survey data.

	Current	Updated
ABC/ACL	30,643	41,080
ACT	22,982	30,810
TAL	9,427	12,638
Skate Wing TAL	6,269	8,404
Skate Bait TAL	3,158	4,234

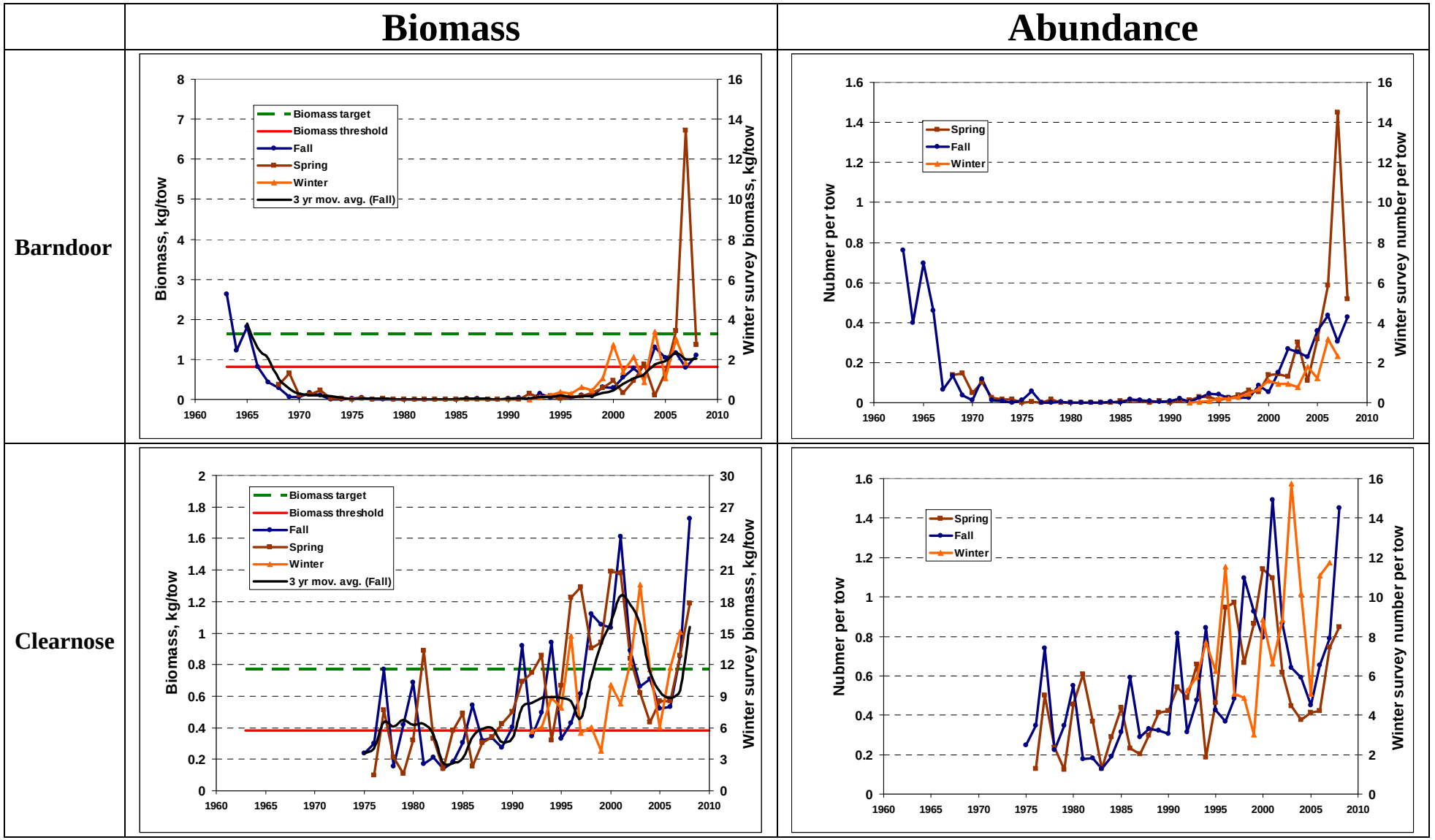
Updating the ABC, a revised TAL would likewise increase from 9,427 mt to 12,638 mt (+34%), which might allow the Council to increase the skate possession limits. If discard estimates are updated, however an increase in skate discards might be expected due to the higher biomass of little and winter skate. This in turn may affect the TAL, decreasing if the discard rate increases and vice versa.

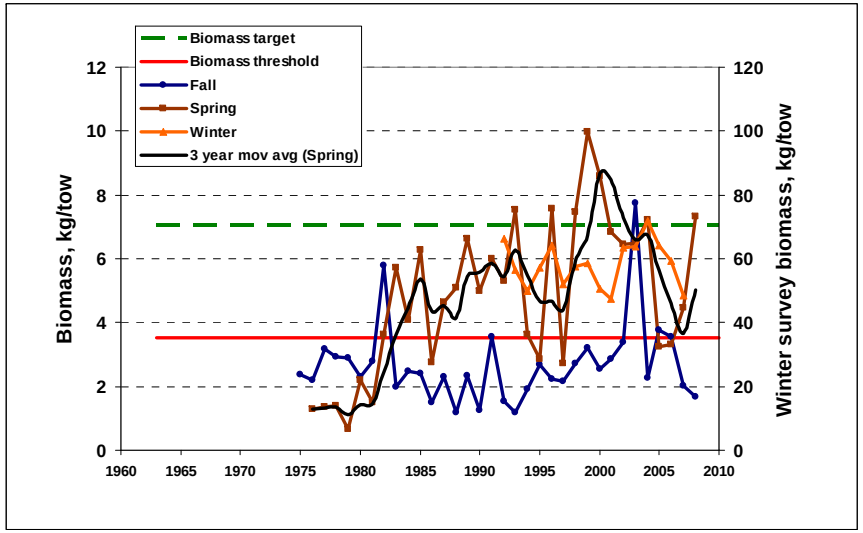
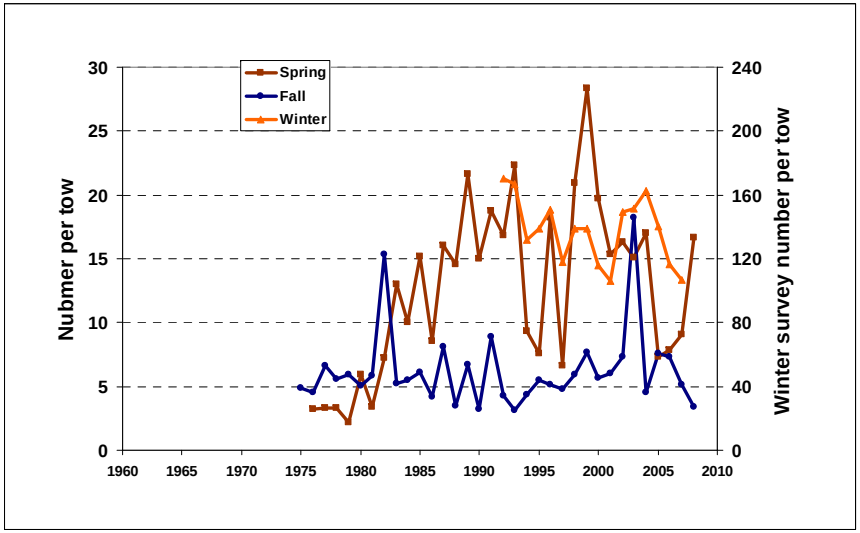
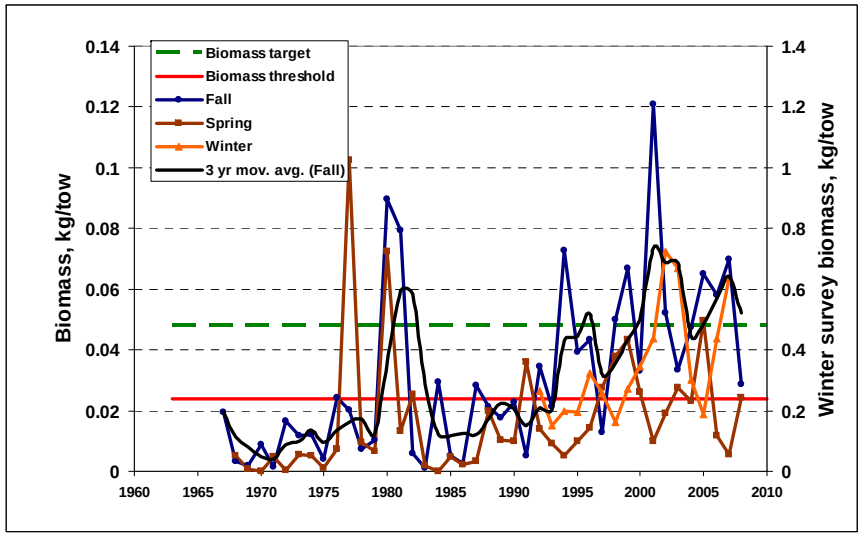
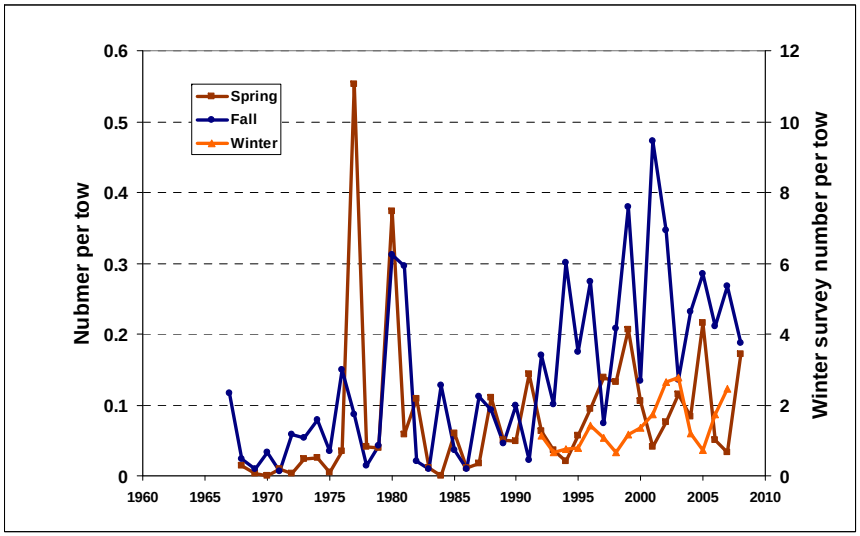
Further analysis would also be required to determine the degree to which skate wing possession limits (which were estimated to achieve a TAL of 11,544 mt) could be increased. The PDT notes however that such an increase in the ABC and possession limits would be less conservative for overfished smooth and thorny skates, which arise as bycatch on skate and other trips. The

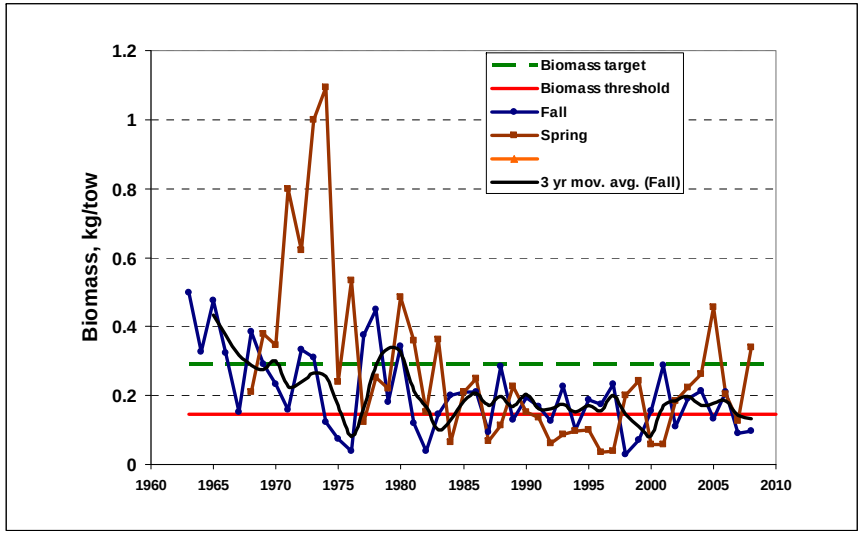
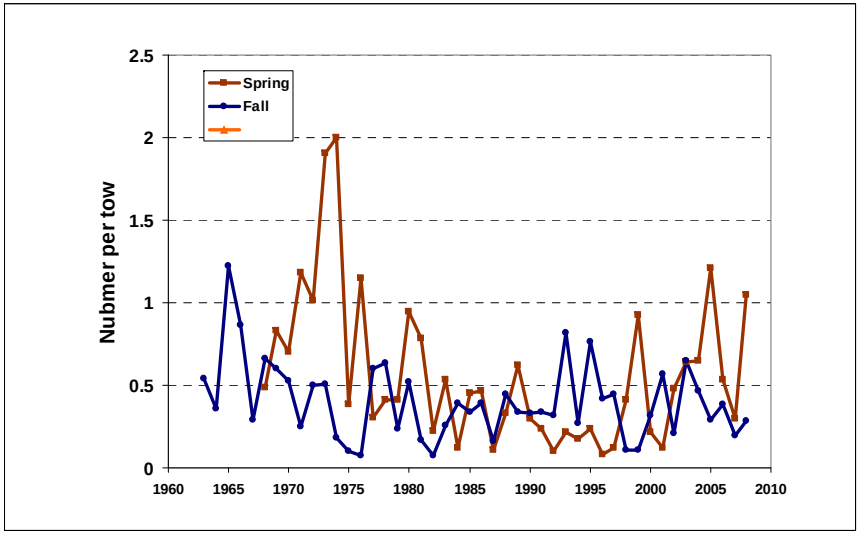
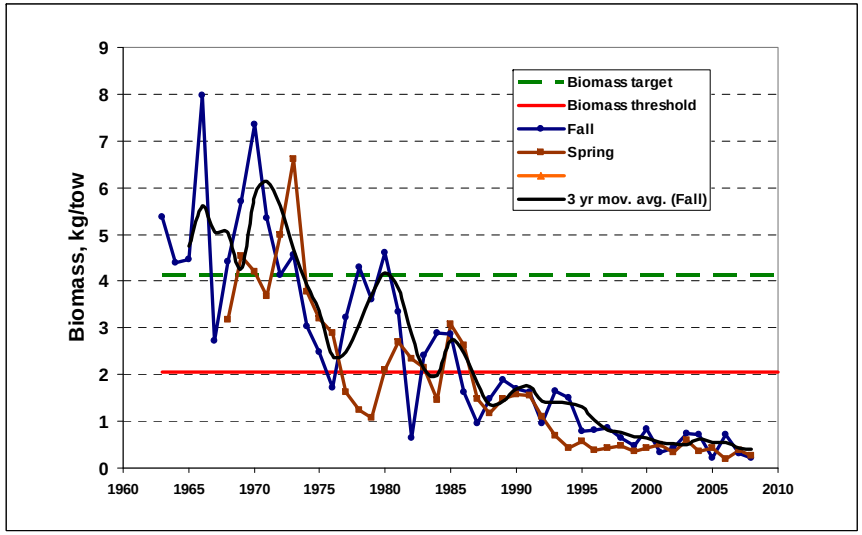
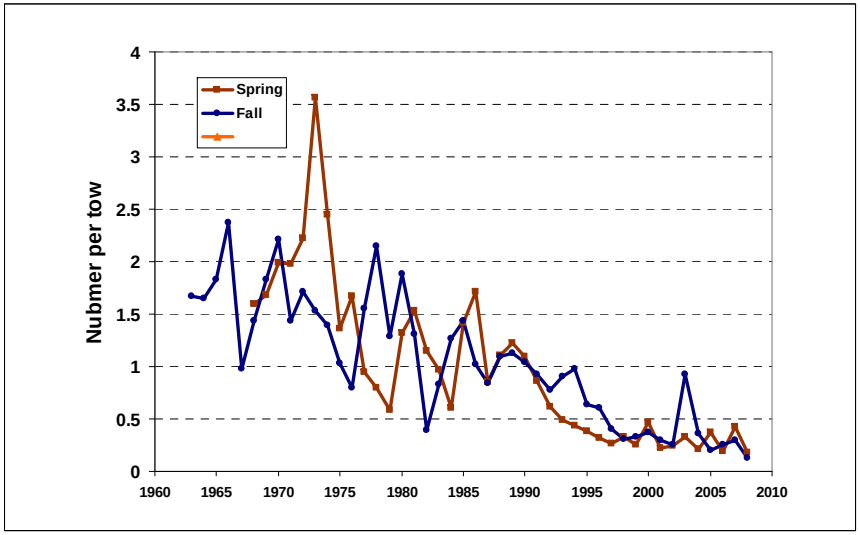
PDT also notes that frequent updates to an index based ABC using a three year moving average is likely to have some natural instability (Figure 7). Updating the index means that not only one year of new data is added, but also one year is dropped from the calculation.

Updated survey values beginning with spring 2009 will depend on calibration of the RV Bigelow data. Calibration analyses have been completed for little and winter skates, but more analysis is required and calibration may be problematic for other skates due to low sample size in the paired tow experiments.

Figure 1. Updated survey trends in skate biomass and abundance through 2008.



Little		
Rosette		

Smooth		
Thorny		

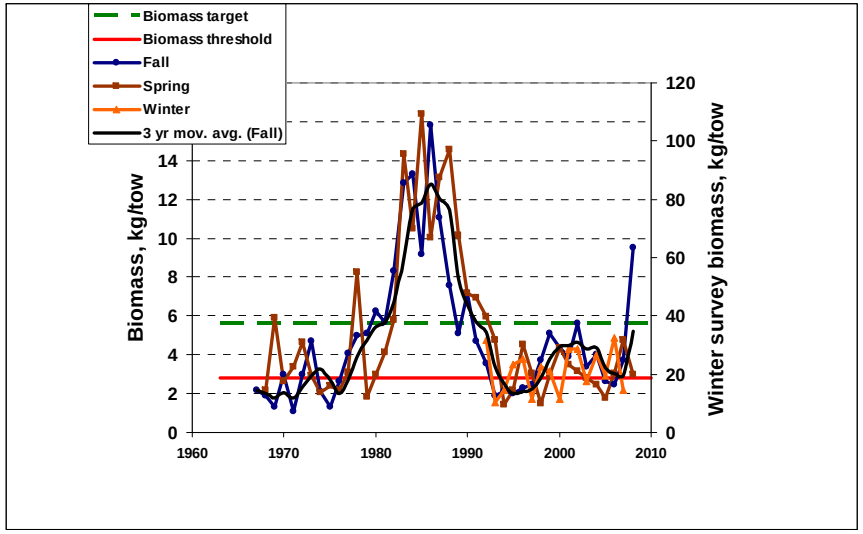
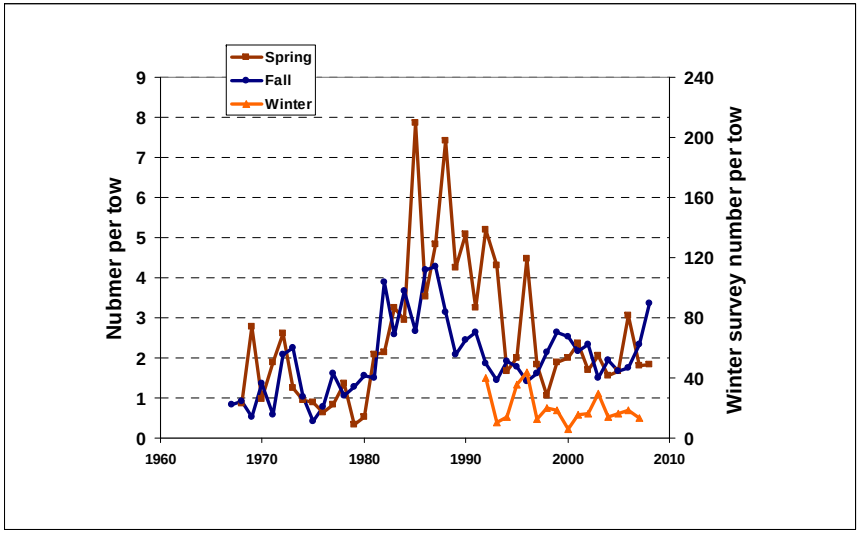
Winter	 Biomass target Biomass threshold Fall Spring Winter 3 yr mov. avg. (Fall) Biomass, kg/tow Winter survey biomass, kg/tow 0 2 4 6 8 10 12 14 0 20 40 60 80 100 120 1960 1970 1980 1990 2000 2010	 Spring Fall Winter Nubmer per tow Winter survey number per tow 0 1 2 3 4 5 6 7 8 9 0 40 80 120 160 200 240 1960 1970 1980 1990 2000 2010

Table 2. Survey biomass trends and skate status determinations as of 2008.

	BARNDOOR	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**
1997	0.11	0.61	2.71	0.01	0.23	0.85	2.46
1998	0.09	1.12	7.47	0.05	0.03	0.65	3.75
1999	0.30	1.05	9.98	0.07	0.07	0.48	5.09
2000	0.29	1.03	8.60	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	2.62
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
2000-2002 3-year average	0.38	1.23	8.47	0.07	0.17	0.55	4.45
2001-2003 3-year average	0.62	1.05	6.59	0.07	0.20	0.50	4.29
2002-2004 3-year average	0.88	0.75	6.72	0.04	0.17	0.63	4.34
2003-2005 3-year average	0.96	0.63	5.65	0.05	0.18	0.56	3.34
2004-2006 3-year average	1.17	0.59	4.59	0.06	0.19	0.55	3.04
2005-2007 3-year average	1.00	0.64	3.67	0.06	0.14	0.42	2.93
2006-2008 3-year average	1.02	1.04	5.04	0.05	0.13	0.42	5.23
Percent change 2001-2003 compared to 2000-2002	65	-14	-22	-9	16	-8	-4
Percent change 2002-2004 compared to 2001-2003	41	-29	2	-34	-14	25	1
Percent change 2003-2005 compared to 2002-2004	9	-16	-16	11	6	-11	-23
Percent change 2004-2006 compared to 2003-2005	22	-6	-19	16	6	-2	-9
Percent change 2005-2007 compared to 2004-2006	-15	8	-20	12	-26	-24	-4
Percent change 2006-2008 compared to 2005-2007	2	63	37	-19	-7	0	78
Percent change for overfishing status determination in FMP	-30	-30	-20	-60	-30	-20	-20
Biomass Target	1.62	0.77	7.03	0.048	0.29	4.12	5.6
Biomass Threshold	0.81	0.385	3.515	0.024	0.145	2.06	2.8
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	Overfished Overfishing is Not Occurring	Overfished Overfishing is Not Occurring	Not Overfished Overfishing is Not Occurring

Figure 2. Distribution of winter skate weight per tow in 2006-2008, RV Albatross and MADMF fall surveys.

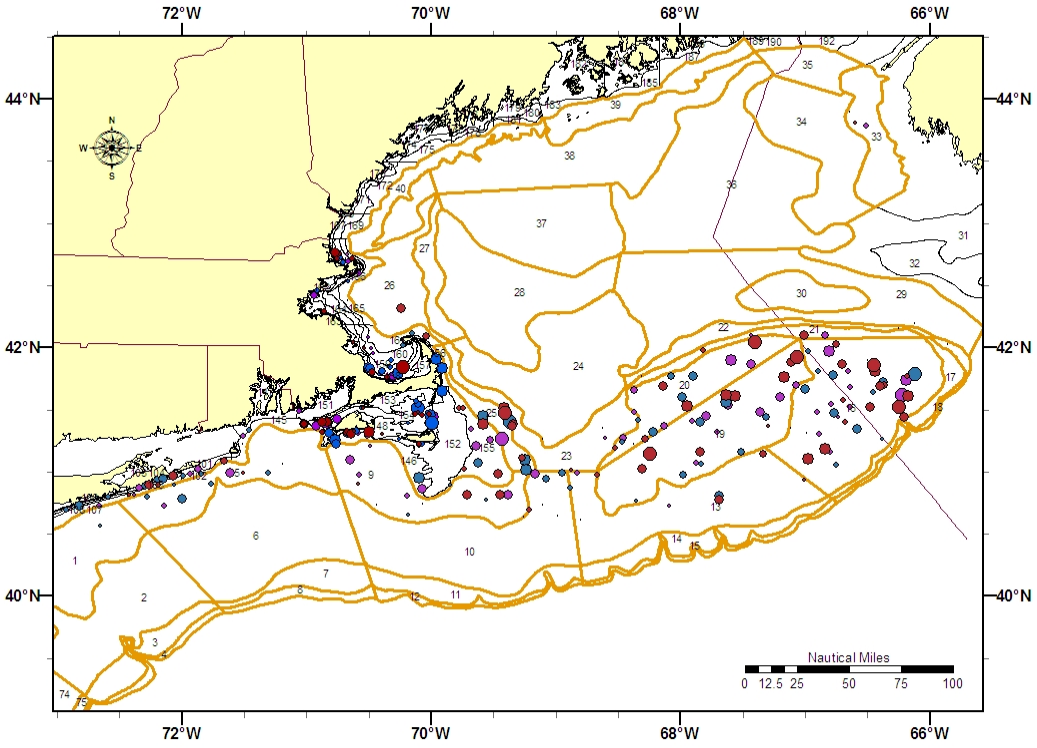


Figure 3. Trend in winter skate biomass (stratified mean kg/tow) for different sets of fall survey strata.

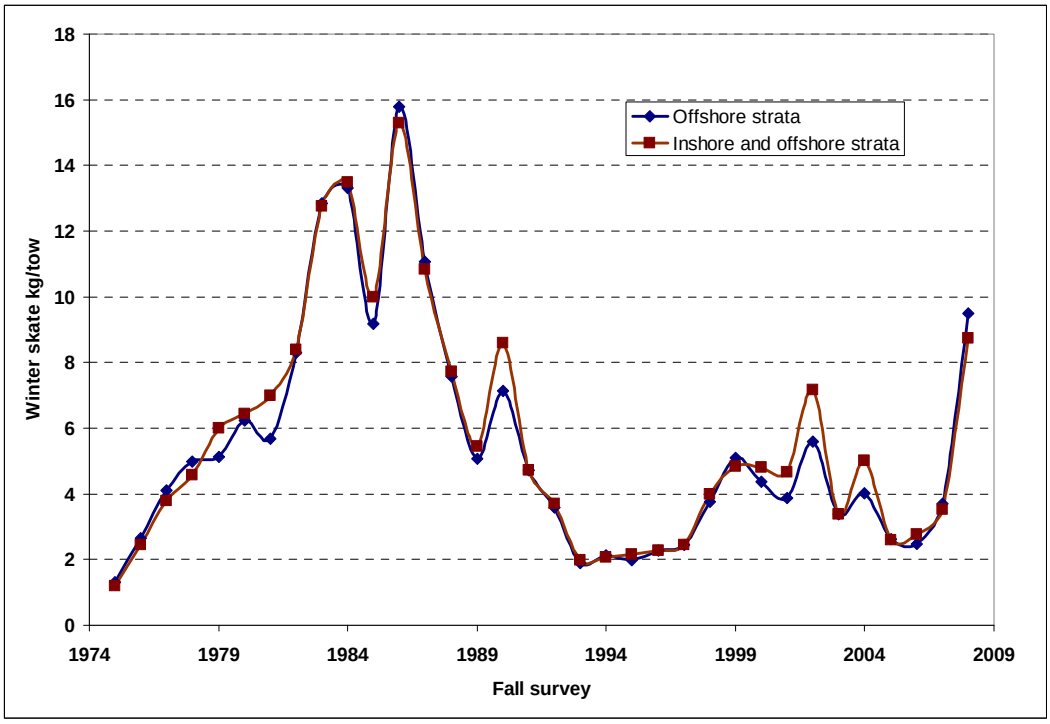


Figure 4. Mean and variance of fall survey tow winter skate biomass for strata with the 10 highest means, 2006-2008.

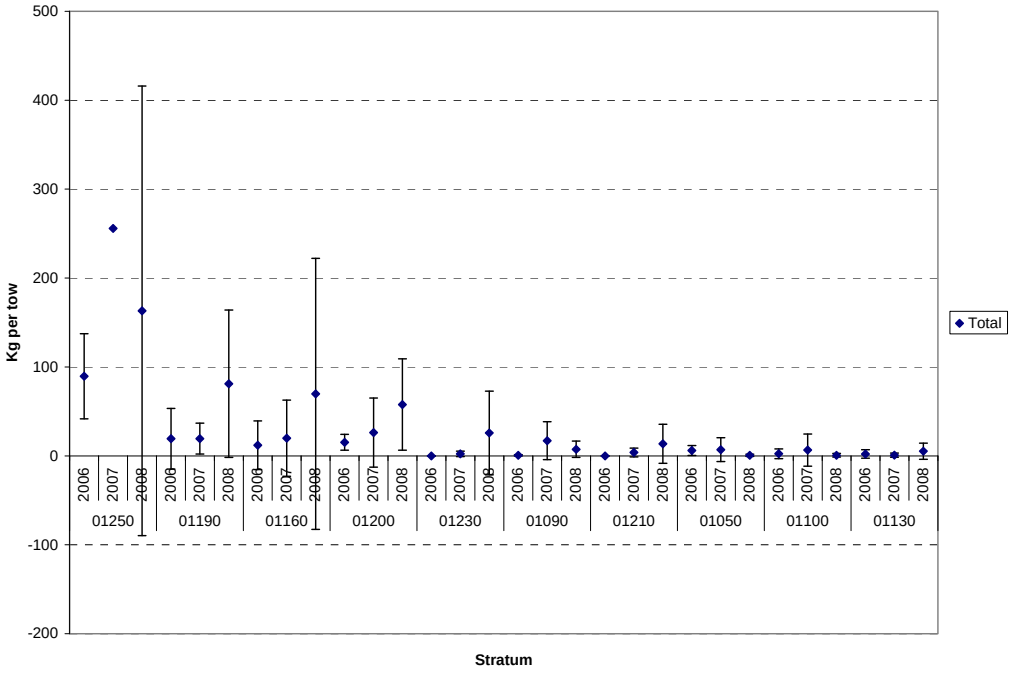


Figure 5. Frequency distribution of winter skate weight per tow, 2006-2008.

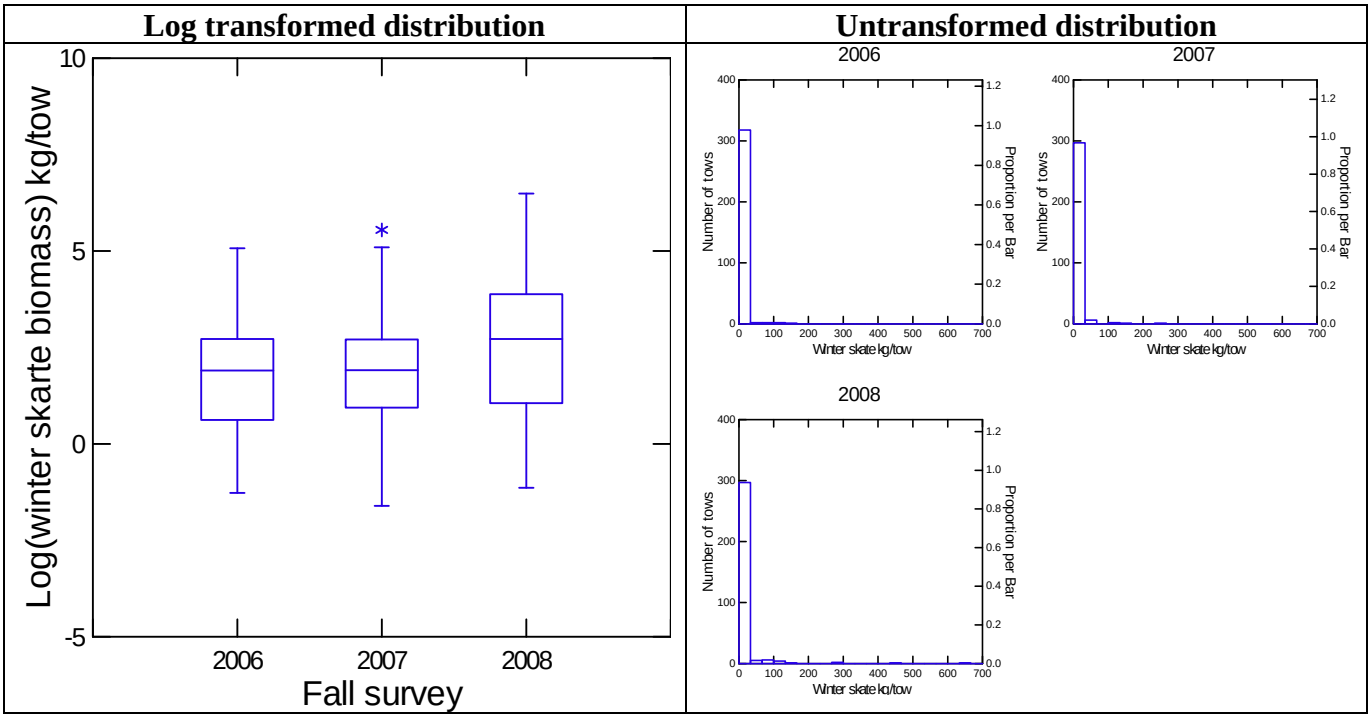


Figure 6. Observed winter skate length frequencies in winter skate status determination strata, compared to projected length frequencies from previous year.

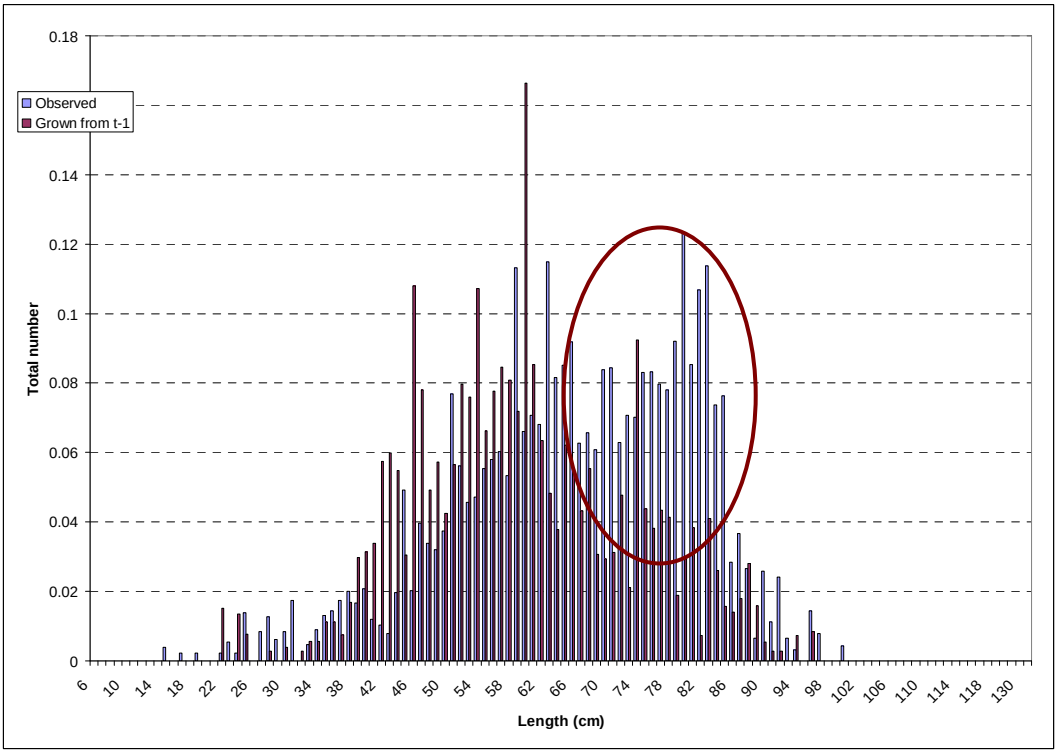


Figure 7. Total skate landings and catch compared to ABC reference points derived from three year moving average for biomass during 1985-2007.

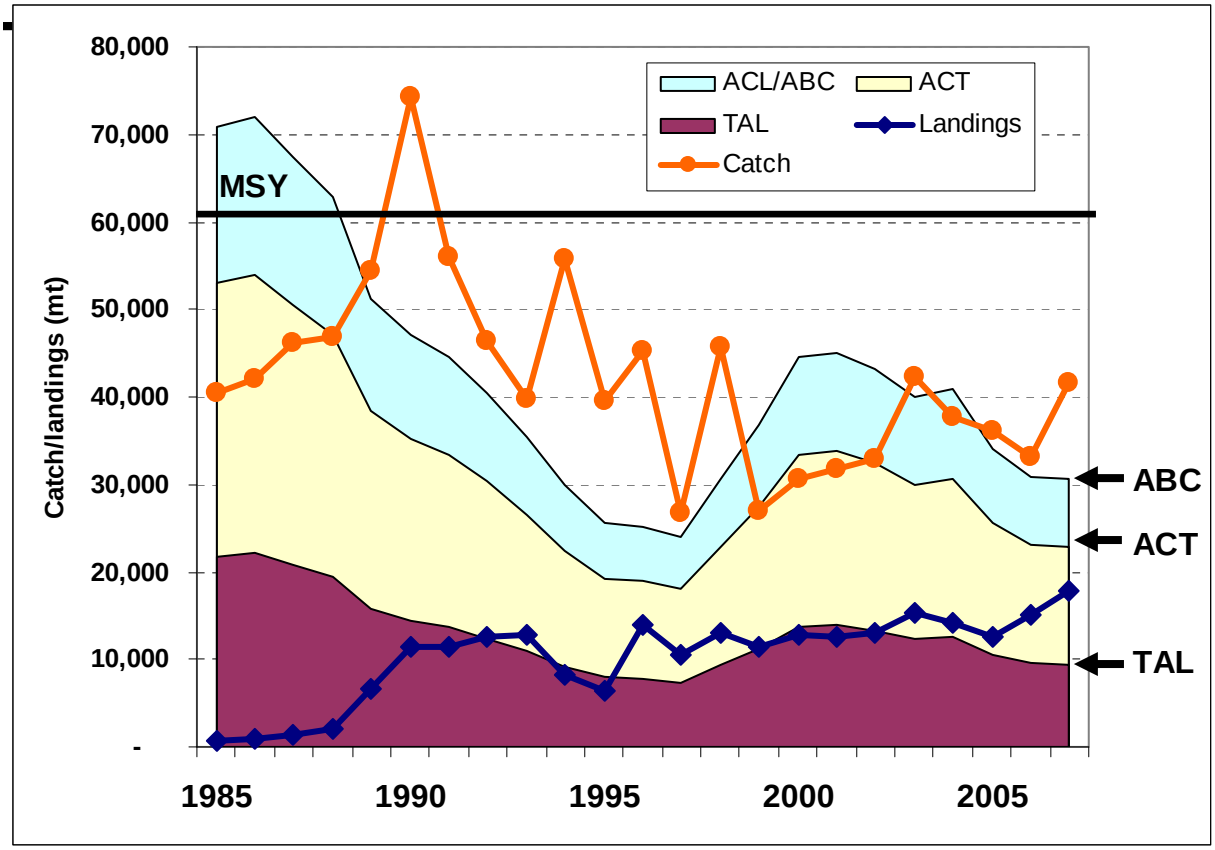


Table 3. Skate landings and ex-vessel revenue by landed product type, 1998-2009, as of March 4, 2010.

	CATEGORY Data					
	Whole		Wings		Total Landings, mt, live weight.	Total Revenue, thousand $.
YEAR	Landings, mt, live weight.	Revenue, thousand $.	Landings, mt, live weight.	Revenue, thousand $.		
1998	4,206	606	8,196	3,136	12,402	3,742
1999	3,731	538	6,411	2,382	10,142	2,920
2000	3,603	588	8,404	2,970	12,007	3,558
2001	3,240	557	8,324	2,432	11,564	2,989
2002	3,157	606	8,122	2,570	11,279	3,176
2003	3,168	546	10,352	3,276	13,521	3,822
2004	2,479	470	11,952	4,337	14,431	4,807
2005	2,548	549	9,930	4,206	12,478	4,755
2006	3,595	811	11,538	5,884	15,133	6,695
2007	3,618	822	13,991	7,530	17,609	8,352
2008	5,570	1,391	13,040	5,834	18,610	7,225
2009	5,059	1,068	12,706	5,560	17,765	6,628

Literature cited

Frisk, Michael G. and Thomas J. Miller. 2006. Age, growth, and latitudinal patterns of two Rajidae species in the northwestern Atlantic: little skate (Leucoraja erinacea) and winter skate (Leucoraja ocellata).

M. G. Frisk, T. J. Miller, S. J. D. Martell, K. Sosebee 2008. New Hypothesis Helps Explain Elasmobranch "Outburst" On Georges Bank in the 1980s. Ecological Applications. 18(1): 234-245.