18. Assessment of the skate stock complex in the Bering Sea and Aleutian Islands

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Executive Summary

The Bering Sea and Aleutian Islands (BSAI) skate complex is managed in aggregate, with a single set of harvest specifications applied to the entire complex. However to generate the harvest recommendations the stock is divided into two units. Harvest recommendations for Alaska skate (*Bathyraja parmifera*), the most abundant skate species in the BSAI, are made using the results of an age structured model and Tier 3. The remaining species ("other skates") are managed under Tier 5 due to a lack of data. The Tier 3 and Tier 5 recommendations are combined to generate recommendations for the complex as a whole.

New information regarding "other skates " is derived mainly from the eastern Bering Sea (EBS) slope and Aleutian Islands trawl surveys. Because these are biennial surveys, full assessments for the BSAI skate complex is only conducted in years when those surveys occur. In "off" years, an executive summary is prepared that incorporates updated catch information, results from the EBS shelf survey (conducted annually), and updated harvest recommendations from a new run of the Alaska skate projection model.

Summary of Changes in Assessment Inputs

1) Biomass estimates are included from the 2013 EBS shelf bottom trawl survey.
2) Catch data are updated through September 18, 2013.
3) For Alaska skates, a run of the Alaska projection model was performed using updated catch data.

Summary of results

1) Biomass estimates from the EBS shelf survey increased slightly from 2012 for Alaska skate and the "other skates" group (Tables 1 &2; Figure 1). Although the estimates have fluctuated on an annual basis, they have maintained a level of approximately 400,000 t since 1990. The CVs for the skate complex as a whole are generally low.
2) The 2013 catch as of September 18 decreased relative to 2012, but is similar to recent years (Tables 3-5). Patterns of skate catch in 2013 were consistent with other years, i.e. most incidental catches of skates occur in the Pacific cod, yellowfin sole, and pollock fisheries.
3) Data from 2011-2013 indicate that 24-29% of incidentally-caught skates are retained (Table 6).
4) Harvest recommendations for Alaska skate are reduced relative to the 2012 specifications.

Alaska skate harvest recommendations				
	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity	2013	2014	**2014**	2015
M (natural mortality rate)	0.13	0.13	**0.13**	0.13
Tier	3a	3a	**3a**	3a
Projected total (age 0+) biomass (t)	650,483	630,086	**603,520**	579,785
Female spawning biomass (t)				
Projected	194,072	189,811	**185,076**	178,762
$B_{100\%}$	266,810	266,810	**266,810**	266,810
$B_{40\%}$	106,724	106,724	**106,724**	106,724
$B_{35\%}$	93,384	93,384	**93,384**	93,384
F_{OFL}	0.113	0.113	**0.113**	0.113
$maxF_{ABC}$	0.098	0.098	**0.098**	0.098
F_{ABC}	0.098	0.098	**0.098**	0.098
OFL (t)	36,315	34,596	**32,381**	30,278
Maximum ABC (t)	31,720	30,218	**28,282**	26,444
ABC (t)	31,720	30,218	**28,282**	26,444
	As determined *last* year for:		As determined *this* year for:	
Status	2011	2012	2012	2013
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

other skate harvest recommendations				
	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity	2013	2014	**2014**	2015
M (natural mortality rate)	0.1	0.1	**0.1**	0.1
Tier	5	5	**5**	5
Biomass (t)	94,684	94,684	**94,684**	94,684
F_{OFL}	0.1	0.1	**0.1**	0.1
$maxF_{ABC}$	0.075	0.075	**0.075**	0.075
F_{ABC}	0.075	0.075	**0.075**	0.075
OFL (t)	9,468	9,468	**9,468**	9,468
Maximum ABC (t)	7,101	7,101	**7,101**	7,101
ABC (t)	7,101	7,101	**7,101**	7,101
	As determined *last* year for:		As determined *this* year for:	
Status	2011	2012	2012	2013
Overfishing	No	n/a	No	n/a

aggregate harvest recommendations for the BSAI skate complex				
	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity	2013	2014	**2014**	2015
OFL (t)	45,800	44,100	**41,849**	39,746
ABC (t)	38,800	37,300	**35,383**	33,545

Tables

Table 1. Total skate biomass (t) with coefficient of variation (CV) from bottom trawl surveys of the Eastern Bering Sea (EBS) shelf, EBS slope, and Aleutian Islands (AI), 1975 - 2013.

year	EBS shelf		EBS slope		AI	
	biomass	CV	biomass	CV	biomass	CV
1975	24,349	0.19				
1976						
1977						
1978						
1979	58,147	0.14	3,056	0.26		
1980					4,257	0.25
1981			2,743	0.12		
1982	175,647	0.09	2,723	0.10		
1983					9,750	0.12
1984	198,888	0.08				
1985	172,251	0.13	3,329	0.10		
1986	267,329	0.14			15,515	0.19
1987	356,519	0.09				
1988	369,098	0.12	3,271	0.21		
1989	414,311	0.08				
1990	482,885	0.11				
1991	453,382	0.08	4,031	0.25	15,013	0.17
1992	399,369	0.09				
1993	389,129	0.07				
1994	404,732	0.08			25,051	0.10
1995	361,448	0.08				
1996	422,097	0.06				
1997	418,707	0.06			29,021	0.14
1998	369,383	0.05				
1999	354,387	0.17				
2000	336,720	0.06			29,129	0.09
2001	431,944	0.06				
2002	382,652	0.06	69,275	0.50	34,471	0.11
2003	404,761	0.05				
2004	439,464	0.05	33,156	0.08	53,242	0.16
2005	508,570	0.05				
2006	456,252	0.05			53,922	0.12
2007	496,108	0.07				
2008	380,915	0.05	37,548	0.08		
2009	370,395	0.06				
2010	385,088	0.06	35,177	0.12	51,988	0.11
2011	428,111	0.05				
2012	386,545	0.06	60,730	0.10	35,454	0.12
2013	413,776	0.06				

Table 2. Survey biomass estimates (t) and coefficient of variation (CV) for Alaska skate, other skates, and total skates by area and year, 1980-2013.

		Alaska skate		other skates		all skates	
		biomass	CV	biomass	CV	biomass	CV
EBS slope	2002	35,932	0.95	33,344	0.14	69,275	0.50
	2004	4,248	0.33	28,909	0.08	33,156	0.08
	2008	4,516	0.32	33,033	0.08	37,548	0.08
	2010	1,296	0.32	33,882	0.12	35,177	0.12
	2012	19,829	0.27	40,901	0.08	60,730	0.10
AI	1980	643	0.80	3,615	0.25	4,257	0.25
	1983	322	0.25	9,428	0.13	9,750	0.12
	1986	259	0.53	15,257	0.19	15,515	0.19
	1991	1,624	0.50	13,388	0.18	15,013	0.17
	1994	7,133	0.20	17,917	0.11	25,051	0.10
	1997	7,862	0.17	21,159	0.18	29,021	0.14
	2000	9,578	0.15	19,551	0.12	29,129	0.09
	2002	10,739	0.20	23,732	0.13	34,471	0.11
	2004	12,923	0.22	40,319	0.21	53,242	0.16
	2006	13,279	0.19	40,643	0.14	53,922	0.12
	2010	3,681	0.20	48,307	0.12	51,988	0.11
	2012	1,503	0.31	33,951	0.12	35,454	0.12
EBS shelf	1982	761	0.36	174,887	0.09	175,647	0.09
	1983						
	1984	93,624	0.10	105,264	0.12	198,888	0.08
	1985	66,786	0.30	105,465	0.09	172,251	0.13
	1986	61,764	0.28	205,565	0.16	267,329	0.14
	1987	127,686	0.12	228,833	0.12	356,519	0.09
	1988	107,323	0.21	261,775	0.14	369,098	0.12
	1989	767	1.00	413,544	0.08	414,311	0.08
	1990			482,885	0.11	482,885	0.11
	1991			453,382	0.08	453,382	0.08
	1992	18,597	0.22	380,773	0.09	399,369	0.09
	1993			389,129	0.07	389,129	0.07
	1994			404,732	0.08	404,732	0.08
	1995			361,448	0.08	361,448	0.08
	1996	352,354	0.06	69,743	0.16	422,097	0.06
	1997	333,988	0.07	84,719	0.18	418,707	0.06
	1998	357,143	0.05	12,239	0.16	369,383	0.05
	1999	323,240	0.17	31,147	0.93	354,387	0.17
	2000	311,977	0.06	24,743	0.27	336,720	0.06
	2001	414,539	0.06	17,405	0.37	431,944	0.06
	2002	364,004	0.07	18,647	0.26	382,652	0.06
	2003	372,379	0.05	32,381	0.24	404,761	0.05
	2004	424,808	0.05	14,656	0.16	439,464	0.05
	2005	487,742	0.05	20,828	0.54	508,570	0.05
	2006	437,737	0.05	18,515	0.22	456,252	0.05
	2007	478,872	0.07	17,236	0.27	496,108	0.07
	2008	361,298	0.06	19,617	0.24	380,915	0.05
	2009	350,233	0.06	20,162	0.23	370,395	0.06
	2010	366,186	0.06	18,902	0.21	385,088	0.06
	2011	410,340	0.05	17,771	0.25	428,111	0.05
	2012	369,881	0.06	16,664	0.25	386,545	0.06
	2013	386,816	0.06	26,961	0.41	413,776	0.06

Table 3. Estimated catch (t) of all skate species combined by target fishery, 2003-2013. Source: AKRO CAS. 2013 data incomplete; retrieved September 18, 2013. YFS = yellowfin sole, FHS = flathead sole, ATF = arrowtooth flounder.

target fishery	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	***2013****
Pacific cod	14,950	18,336	19,450	15,111	13,458	14,311	12,698	11,444	16,704	18,487	*15,341*
YFS	1,513	596	942	1,133	1,405	1,301	1,799	1,906	2,123	2,218	*1,854*
pollock	471	841	732	1,310	1,287	2,758	3,856	1,887	2,348	2,018	*1,730*
rock sole	530	509	423	931	1,001	559	947	1,211	711	653	*521*
Atka	91	143	140	141	153	179	185	246	269	510	*304*
FHS	627	1,184	844	851	769	664	362	301	112	75	*200*
rockfish	73	23	30	37	72	63	96	53	104	97	*196*
IFQ halibut	265	282	130	82	18	1,364	25	38	10	37	*187*
ATF	103	64	127	281	81	297	192	179	122	207	*181*
sablefish	57	13	26	123	61	40	100	76	106	45	*97*
Kamchatka	0	0	0	0	0	0	0	0	93	101	*49*
AK plaice	0	0	0	1	0	1	1	5	36	8	*42*
Gr. turbot	221	136	168	121	174	69	209	357	370	359	*29*
other flat	26	78	43	7	64	2	14	2	3	3	*0*
BSAI total	**19,156**	**22,300**	**23,084**	**20,250**	**18,615**	**21,672**	**20,595**	**17,713**	**23,128**	**24,819**	***20,732***

*2013 data incomplete; retrieved September 18, 2013.

Table 4. Estimated catch (t) of all skate species combined by reporting area, 2003-2013. Source: AKRO CAS. 2013 data are incomplete; retrieved September 18, 2013.

	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	***2013****
508	0	0	0	0	0	0	0	0	6	0	*0*
509	1,968	2,160	3,267	3,537	3,577	4,039	5,009	2,791	6,091	6,149	*6,538*
512	25	205	15	0	0	29	16	13	7	161	*2*
513	2,757	2,821	4,010	2,667	2,360	2,050	2,502	1,861	3,083	1,812	*2,009*
514	279	67	196	221	445	84	134	78	150	1,585	*116*
516	132	408	239	253	398	490	576	664	243	779	*597*
517	2,863	2,946	3,669	2,399	2,139	2,470	3,200	2,831	2,616	3,288	*3,213*
518	25	6	16	11	5	480	56	41	18	19	*25*
519	184	139	104	69	109	189	55	80	104	122	*30*
521	8,946	10,313	8,478	8,353	7,105	7,757	6,182	6,618	8,678	8,021	*6,283*
523	306	325	243	283	334	242	264	396	267	1,074	*836*
524	1,016	2,025	2,151	1,492	1,137	2,426	1,396	1,003	1,147	728	*138*
530	0	0	0	0	0	0	1	0	0	0	*0*
EBS total	**18,501**	**21,415**	**22,388**	**19,284**	**17,608**	**20,254**	**19,389**	**16,375**	**22,410**	**23,739**	***19,788***
541	302	466	487	563	337	496	452	465	488	775	*517*
542	234	278	126	336	394	576	335	446	201	271	*343*
543	118	141	83	67	276	345	419	427	30	35	*85*
AI total	**655**	**885**	**696**	**966**	**1,007**	**1,417**	**1,206**	**1,338**	**718**	**1,080**	***945***
BSAI total	**19,156**	**22,300**	**23,084**	**20,250**	**18,615**	**21,672**	**20,595**	**17,713**	**23,128**	**24,819**	***20,732***

*2013 data incomplete; retrieved September 18, 2013.

Table 5. Estimated Alaska skate catch (t) by gear type based on observed catch data and survey species composition. 2013 catch is as reported through September 18, 2013.

year	EBS shelf longline	EBS shelf trawl	EBS slope longline	EBS slope trawl	AI longline	AI trawl	BSAI longline	BSAI trawl
1992	12,204	2,690	23	8	169	94	12,396	2,792
1993	8,797	1,939	16	6	122	68	8,935	2,013
1994	10,234	2,256	19	7	142	79	10,394	2,341
1995	10,715	2,362	20	7	148	83	10,883	2,451
1996	9,097	2,005	17	6	126	70	9,240	2,081
1997	12,885	2,840	24	8	150	84	13,059	2,932
1998	13,876	3,059	26	9	198	110	14,100	3,178
1999	10,129	2,233	19	7	141	78	10,288	2,318
2000	13,020	2,870	24	9	317	177	13,362	3,055
2001	13,778	3,037	26	9	440	245	14,244	3,291
2002	15,702	3,461	119	42	122	68	15,943	3,571
2003	13,944	3,271	30	7	115	64	14,088	3,342
2004	16,104	3,777	26	22	155	86	16,285	3,886
2005	17,498	3,333	40	4	122	68	17,660	3,405
2006	14,710	3,243	27	10	169	94	14,907	3,346
2007	13,432	2,961	25	9	177	98	13,634	3,068
2008	15,449	3,405	29	10	249	139	15,726	3,554
2009	14,796	3,262	28	10	211	118	15,035	3,389
2010	12,493	2,754	23	8	235	131	12,750	2,892
2011	17,096	3,768	32	11	126	70	17,253	3,850
2012	18,109	3,992	34	12	189	105	18,333	4,109
2013	*15,095*	*3,327*	*28*	*10*	*166*	*92*	*15,289*	*3,430*

Table 6. Retention rates of skates in federal groundfish fisheries in the BSAI, 2011-2013. Data source: AKRO CAS. The 2013 data are incomplete; retrieved October 28, 2013.

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year	percent retained
2011	24%
2012	29%
*2013**	*29%*

*2013 are incomplete; retrieved October 28, 2013.

Figures

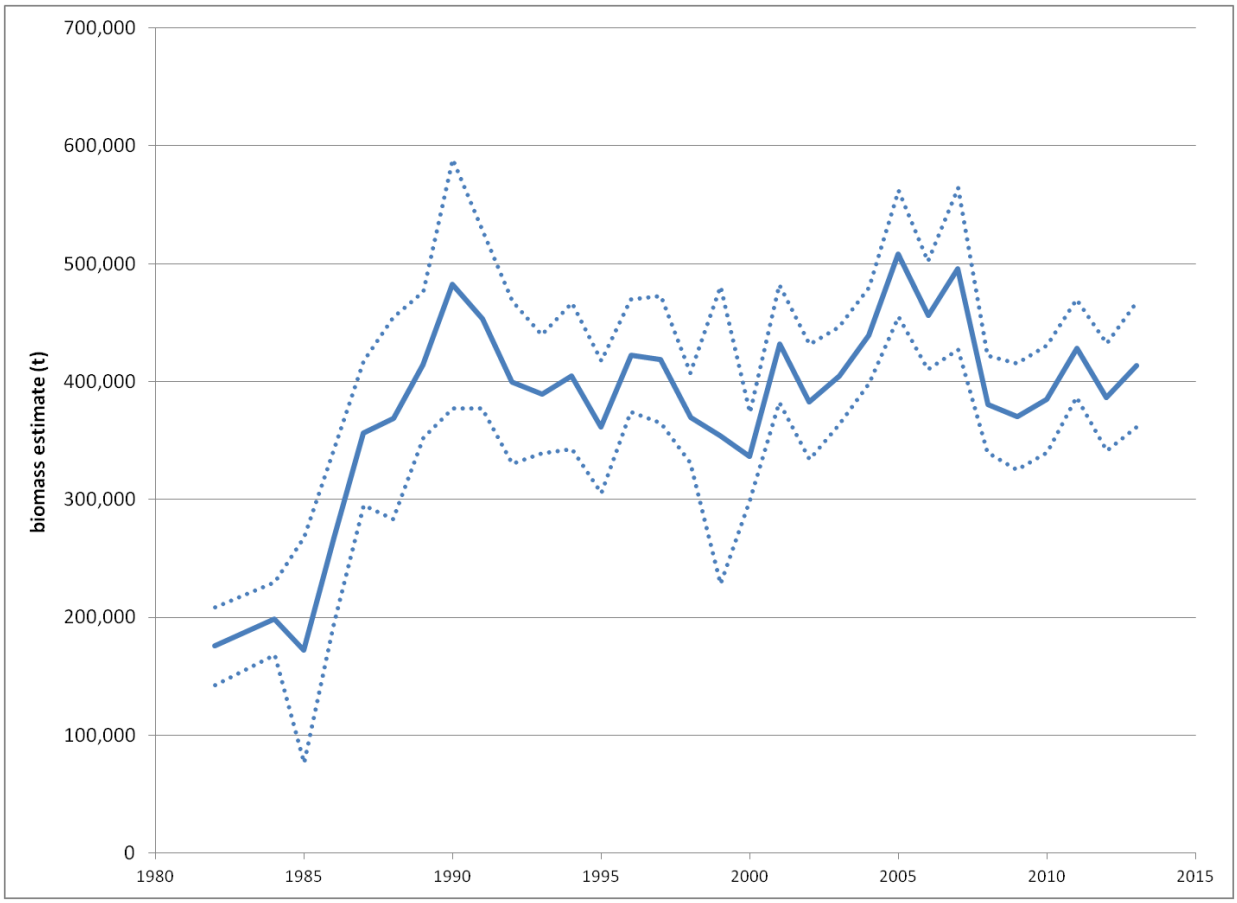

Figure 1. Survey biomass estimates (t) for all skates in the BSAI skate complex, 1982-2013. Dashed lines indicate 95% confidence interval.