18. Assessment of the skate stock complex in the Gulf of Alaska

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Executive Summary

The Gulf of Alaska (GOA) skate complex is managed as three units. Big skates (*Raja binoculata*) and longnose skates (*Raja rhina*) each have separate harvest specifications, with acceptable biological catches (ABCs) specified for each GOA regulatory area (western, central, and eastern). A single gulfwide overfishing level (OFL) is specified for each stock. All remaining skate species are managed as an "Other Skates" group with gulfwide harvest specifications. All GOA skates are managed under Tier 5, where OFL and ABC are based on survey biomass estimates and natural mortality rate.

Gulf of Alaska skates are normally on a biennial stock assessment schedule, with full assessments due in odd years. In 2013 however, the shutdown of the federal government limited the amount of time to prepare assessments and the author was requested to do only an executive summary similar to an "off-year" assessment. The full assessment from 2011 is available on the web (Ormseth 2011, http://www.afsc.noaa.gov/REFM/docs/2011/GOAskate.pdf).

Summary of Changes in Assessment Inputs

1) This report contains 2013 survey biomass data and catch data updated through September 18, 2013.
2) An updated 3-year average survey biomass estimate is used for harvest recommendations that includes the 2009, 2011, and 2013 surveys.

Summary of Results

1) The 2013 survey biomass estimates for longnose skate and "other skates" increased substantially relative to the 2011 estimate, with CVs similar to earlier years (Table 1, Figure 1). The estimate for longnose skates is the highest in the 1984-2013 time series.

2) The 2013 survey biomass estimate for big skate was down considerably from 2013 (Tables 1 & 2, Figure 1). There are several notable features of the big skate survey data: (a) an anomalous single large tow of big skates in the EGOA during the 2011 survey inflated the 2011 estimates as well as the CV, and no such event occurred in 2013. As a result, the EGOA estimate for 2013 is more similar to years prior to 2011, (b) the 2013 estimate for the WGOA was the highest since 1999, (c) the biomass estimate for the CGOA, where the majority of big skate biomass is typically observed, decreased by almost half, and (d) the 2013 CV was lower than in 2011 but was elevated relative to years prior to 2011.

3) Estimates of incidental catches (including statistical areas 649 and 659) increased substantially for longnose skates and "other skates" in 2013, mainly in the IFQ halibut target fishery (Tables 3-5). For longnose skates most of the increased catch occurred in the EGOA, and the catch

exceeded the ABC for that area (Table 3). For "other skates" the increased catches occurred in the CGOA and EGOA. It is likely that this increased level of catch is due to the increased catch reporting from the IFQ halibut fishery as a result of the fishery observer redeployment.

4) Catch of big skates in the CGOA exceeded the ABC for that area, as it has every year since 2010 (Table 3).

5) Retention of skates during 2013 decreased relative to 2012, contrary to the recent trend of increasing skate retention (Table 6). This may be due to the increase in data collection in the IFQ halibut fishery, where skates are generally not retained.

Following are the harvest recommendation summary tables for the GOA skate complex. W, C, and E indicate the western, central, and eastern GOA regulatory areas, respectively. Big and longnose skates have area-specific ABCs and gulfwide OFLs; other skates have a gulfwide ABC and OFL.

big skate (*Raja binoculata*)					
		As estimated or *specified last* year for		As estimated or *recommended this* year for:	
Quantity		*2013*	*2014*	**2014**	2015
M (natural mortality)		*0.1*	*0.1*	**0.1**	0.1
Specified/recommended Tier		*5*	*5*	**5**	5
Biomass (t; 3-survey average)	W	*6,258*	*6,258*	**7,857**	7,857
	C	*23,900*	*23,900*	**20,421**	20,421
	E	*20,071*	*20,071*	**21,877**	21,877
	GOA-wide	*50,229*	*50,229*	**50,155**	50,155
F_{OFL} (F=M)		*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)	GOA-wide	*5,023*	*5,023*	**5,016**	5,016
ABC (t; equal to maximum ABC)	W	*469*	*469*	**589**	**589**
	C	*1,793*	*1,793*	**1,532**	**1,532**
	E	*1,505*	*1,505*	**1,641**	**1,641**
	GOA-wide	*3,767*	*3,767*	**3,762**	3,762
		As determined *last* year for:		As determined *this* year for:	
Status		2011	2012	**2012**	2013
Overfishing?		*no*	*na*	**no**	na
(for Tier 5 stocks, data are not available to determine whether the stock is in an overfished condition)					

longnose skate (*Raja rhina*)					
		As estimated or *specified last* year for		As estimated or *recommended this* year for:	
Quantity		*2013*	*2014*	**2014**	2015
M (natural mortality)		*0.1*	*0.1*	**0.1**	0.1
Specified/recommended Tier		*5*	*5*	**5**	5
Biomass (t; 3-survey average)	W	*928*	*928*	**1,427**	1,427
	C	*25,059*	*25,059*	**25,806**	25,806
	E	*9,008*	*9,008*	**11,116**	11,116
	GOA-wide	*34,995*	*34,995*	**38,349**	38,349
F_{OFL} (F=M)		*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)	GOA-wide	*3,500*	*3,500*	**3,835**	3,835
ABC (t; equal to maximum ABC)	W	*70*	*70*	**107**	107
	C	*1,879*	*1,879*	**1,935**	1,935
	E	*676*	*676*	**834**	834
	GOA-wide	*2,625*	*2,625*	**2,876**	2,876
		As determined *last* year for:		As determined *this* year for:	
Status		2011	2012	**2012**	2013
Overfishing?		*no*	*n/a*	**no**	n/a
(for Tier 5 stocks, data are not available to determine whether the stock is in an overfished condition)					

other skates (*Bathyraja* sp.)					
		As estimated or *specified last* year for		As estimated or *recommended this* year for:	
Quantity		*2013*	*2014*	**2014**	2015
M (natural mortality)		*0.1*	*0.1*	**0.1**	0.1
Specified/recommended Tier		*5*	*5*	**5**	5
Biomass (t)	GOA-wide	*27,061*	*27,061*	**26,518**	26,518
F_{OFL} (F=M)		*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)	GOA-wide	*2,706*	*2,706*	**2,652**	2,652
ABC (t; equal to maximum ABC)	GOA-wide	*2,030*	*2,030*	**1,989**	1,989
		As determined *last* year for:		As determined *this* year for:	
Status		2011	2012	**2012**	2013
Overfishing?		*no*	*na*	**no**	na
(for Tier 5 stocks, data are not available to determine whether the stock is in an overfished condition)					

Tables

Table 1. Biomass estimates (t) of skate species from GOA bottom trawl surveys, 1984-2013, and the 3-survey average biomass used for making harvest recommendations. The 3 years used to create the average are marked in bold. CV = coefficient of variation. The EGOA was not surveyed in 2001 and estimates from that year are not comparable to other years.

year	big skate		longnose skate		other skates		total skate
	biomass (t)	CV	biomass (t)	CV	biomass (t)	CV	biomass (t)
1984	27,540	0.22	9,002	0.38	4,647	0.16	41,189
1987	28,093	0.16	6,631	0.36	3,339	0.21	38,063
1990	22,316	0.25	11,995	0.22	13,936	0.25	48,248
1993	39,708	0.18	17,803	0.12	6,191	0.14	63,702
1996	43,064	0.18	26,226	0.14	11,912	0.17	81,201
1999	54,650	0.15	39,333	0.14	18,946	0.11	112,929
2001	39,082	0.19	23,275	0.16	12,857	0.16	75,214
2003	55,397	0.16	39,603	0.09	21,775	0.11	116,775
2005	39,320	0.16	41,449	0.08	30,063	0.11	110,832
2007	38,458	0.19	34,421	0.11	32,334	0.11	105,212
2009	**44,349**	**0.16**	**36,652**	**0.09**	**27,461**	**0.12**	108,463
2011	**67,883**	**0.37**	**33,911**	**0.11**	**21,389**	**0.10**	123,183
2013	**38,234**	**0.26**	**44,484**	**0.11**	**30,705**	**0.11**	113,423
3-survey ave.	**50,155**		**38,349**		**27,061**		

Table 2. Survey biomass estimates (t) for big skates by regulatory area, 1984-2013. CV = coefficient of variation.

	big skate					
	WGOA		**CGOA**		**EGOA**	
	biomass	CV	biomass	CV	biomass	CV
1984	3,339	0.22	17,635	0.23	6,566	0.60
1987	4,313	0.16	20,855	0.19	2,925	0.47
1990	1,745	0.25	9,071	0.35	11,501	0.39
1993	2,287	0.18	21,586	0.19	15,836	0.37
1996	13,130	0.18	26,544	0.19	3,391	0.30
1999	11,038	0.15	34,007	0.20	9,606	0.34
2001	8,425	0.19	30,658	0.22	n/a	-
2003	9,602	0.16	33,814	0.22	11,981	0.38
2005	9,792	0.16	25,544	0.21	3,984	0.36
2007	5,872	0.19	23,249	0.26	9,337	0.33
2009	6,652	0.16	26,691	0.22	11,007	0.32
2011	6,251	0.37	21,761	0.17	39,870	0.61
2013	10,669	0.26	12,810	0.21	14,755	0.56

Table 3. Time series of ABC, OFL and catch (t) for skates, beginning in 2004 when skates were first managed separately from the Other Species complex. ABC and catch are divided by GOA regulatory area (**W**estern, **C**entral, **E**astern). **Eastern GOA catches include statistical areas 649 and 659.** Outlined cells with bold text indicate years/areas where the catch exceeded the ABC.

	ABC			**OFL**	**estimated skate catch**			**management method**
	W	**C**	**E**		**W**	**C**	**E**	
2004		4,435		10,859		1,569		big/longnose CGOA
		3,709				1,451		o.skates GW, big/longnose W/E
2005	727	2,463	809	5,332	26	811	67	big (ABC by area)
	66	1,972	780	3,757	37	993	173	longnose (ABC by area)
		1,327		1,769		719		other skates gulfwide
2006	695	2,250	599	4,726	72	1,268	359	big (ABC by area)
	65	1,969	861	3,860	57	679	240	longnose (ABC by area)
		1,617		2,156		1,402		other skates gulfwide
2007	695	2,250	599	4,726	69	1,517	9	big (ABC by area)
	65	1,969	861	3,860	76	966	335	longnose (ABC by area)
		1,617		2,156		1,241		other skates gulfwide
2008	632	2,065	633	4,439	132	1,241	48	big (ABC by area)
	78	2,041	768	3,849	34	965	115	longnose (ABC by area)
		2,104		2,806		1,403		other skates gulfwide
2009	632	2,065	633	4,439	73	1,827	128	big (ABC by area)
	78	2,041	768	3,849	77	1,037	277	longnose (ABC by area)
		2,104		2,806		1,341		other skates gulfwide
2010	598	2,049	681	4,438	146	**2,220**	172	big (ABC by area)
	81	2,009	762	3,803	104	843	181	longnose (ABC by area)
		2,093		2,791		1,488		other skates gulfwide
2011	598	2,049	681	4,438	94	**2,075**	126	big (ABC by area)
	81	2,009	762	3,803	62	863	106	longnose (ABC by area)
		2,093		2,791		1,211		other skates gulfwide
2012	469	1,793	1,505	5,023	66	**1,894**	59	big (ABC by area)
	70	1,879	676	3,500	38	771	104	longnose (ABC by area)
		2,030		2,706		1,228		other skates gulfwide
2013*	469	1,793	1,505	5,023	*83*	***1,853***	*167*	big (ABC by area)
	70	1,879	676	3,500	*43*	*995*	***724***	longnose (ABC by area)
		2,030		2,706		*1,572*		other skates gulfwide

* 2013 catch data are incomplete; retrieved September 18, 2013.

Sources: Harvest specifications from AKRO catch statistics website. Estimated skate catch 2003-2013 from AKRO Catch Accounting System (CAS).

Table 4. Catches (t) of big, longnose, and other skates by regulatory area, 2003-2013. Data are from the Alaska Regional Office Catch Accounting System. **Eastern GOA catches include statistical areas 649 and 659.** The 2013 data are incomplete; retrieved September 18, 2013.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	*2013**
					WGOA						
big	0	63	26	72	69	132	73	146	94	66	*83*
longnose	1	28	37	57	76	34	77	104	62	38	*43*
other	571	358	163	354	479	253	335	412	285	254	*201*
W total	**572**	**449**	**226**	**483**	**623**	**419**	**485**	**663**	**442**	**358**	***327***
					CGOA						
big	0	1,125	811	1,268	1,517	1,241	1,827	2,220	2,075	1,894	*1,853*
longnose	40	444	993	679	966	965	1,037	843	863	771	*995*
other	3,802	794	506	988	672	1,059	881	984	858	867	*1,131*
C total	**3,843**	**2,362**	**2,310**	**2,935**	**3,155**	**3,264**	**3,746**	**4,048**	**3,797**	**3,532**	***3,978***
					EGOA						
big	0	16	67	359	9	48	128	172	126	59	*167*
longnose	11	67	173	240	335	115	277	181	106	104	*724*
other	154	125	50	61	90	91	125	92	68	108	*241*
E total	**165**	**208**	**290**	**660**	**434**	**254**	**530**	**445**	**300**	**271**	***1,131***

* 2013 catch data are incomplete; retrieved September 18, 2013.

Table 5. Catches (t) of skates in the GOA by target fishery, 2003-2013. Data in Tables 5a-c are from the Alaska Regional Office Catch Accounting System. The 2013 data are incomplete; retrieved September 18, 2013. ATF = arrowtooth flounder, FHS = flathead sole. Fisheries are arranged separately in each table according to the 2013 estimated catch, in descending order.

Table 5a. Big skate catches, GOA, 2003-2013. No data are available for big skates in 2003.

big skate											
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	***2013****
ATF		140	225	163	299	219	433	478	812	677	*918*
Pacific cod		331	222	417	537	586	550	940	919	755	*548*
IFQ halibut		24	37	577	11	36	90	43	132	38	*298*
rex sole		31	49	99	74	70	264	172	106	140	*145*
pollock		1	2	23	38	22	34	47	93	48	*127*
shallow flat		237	251	350	608	413	535	707	190	288	*44*
FHS		38	21	30	23	66	53	112	31	57	*15*
sablefish		6	24	9	6	3	5	11	3	3	*5*
rockfish		16	19	4	0	4	4	14	8	13	*2*
other		376	56	27	0	2	60	14	1	0	*1*
deep flat		4	0	0	0	0	0	1	1	0	*0*
GOA total		**1,204**	**904**	**1,699**	**1,595**	**1,421**	**2,028**	**2,539**	**2,295**	**2,020**	***2,103***

* 2013 catch data are incomplete; retrieved September 18, 2013.

Table 5b. Longnose skate catches (t)**,** GOA**,** 2003-2013.

longnose skate											
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	***2013****
IFQ halibut	1	35	106	197	394	109	379	115	171	88	*904*
Pacific cod	10	83	139	165	306	361	325	425	346	329	*347*
ATF	14	63	373	135	165	212	152	166	238	181	*212*
sablefish	16	121	113	306	264	123	79	98	77	111	*152*
rex sole	0	13	19	29	24	36	82	52	44	45	*54*
shallow flat	3	26	278	97	168	227	239	173	78	65	*45*
pollock	0	0	5	13	27	24	35	10	35	9	*22*
rockfish	1	32	20	21	17	12	17	12	25	23	*18*
FHS	9	7	11	11	13	11	24	30	17	60	*8*
other	0	155	137	2	0	0	61	47	0	0	*1*
deep flat	0	3	1	0	0	0	0	1	0	0	*0*
GOA total	**53**	**539**	**1,202**	**976**	**1,377**	**1,114**	**1,392**	**1,129**	**1,032**	**912**	***1,762***

* 2013 catch data are incomplete; retrieved September 18, 2013.

Table 5c. Other skates catches (t), GOA, 2003-2013.

	other skates										
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	***2013****
Pacific cod	806	490	175	981	529	958	689	1,059	666	768	*683*
IFQ halibut	191	73	47	78	108	58	253	46	122	51	*607*
sablefish	153	113	129	128	260	134	82	121	116	141	*168*
rex sole	346	46	36	56	103	22	60	41	21	19	*33*
shallow flat	559	65	36	27	70	107	98	36	12	33	*22*
pollock	11	2	1	5	9	6	3	7	2	6	*21*
rockfish	105	19	59	49	20	10	14	28	14	20	*18*
ATF	195	173	194	64	122	88	99	133	243	174	*12*
FHS	191	44	38	12	20	5	13	19	13	17	*8*
other	1,971	251	2	3	0	16	30	0	0	0	*0*
Atka mackerel	0	0	0	0	0	0	0	0	2	0	*0*
deep flat	0	1	0	0	0	0	0	0	0	0	*0*
GOA total	**4,527**	**1,277**	**719**	**1,402**	**1,241**	**1,403**	**1,341**	**1,488**	**1,211**	**1,228**	***1,572***

* 2013 catch data are incomplete; retrieved September 18, 2013.

Table 6. Retention rates of skates in GOA fisheries, 2007-2013. Data are from tables published by the Alaska Regional Office. The 2013 data are incomplete; retrieved October 28, 2013.

	other skates	**big skate**	**longnose skate**
2007	27%	46%	28%
2008	17%	70%	64%
2009	18%	76%	51%
2010	15%	72%	64%
2011	19%	81%	65%
2012	13%	93%	74%
*2013**	*1%*	*72%*	*37%*

* 2013 catch data are incomplete; retrieved October 28, 2013.

Figures

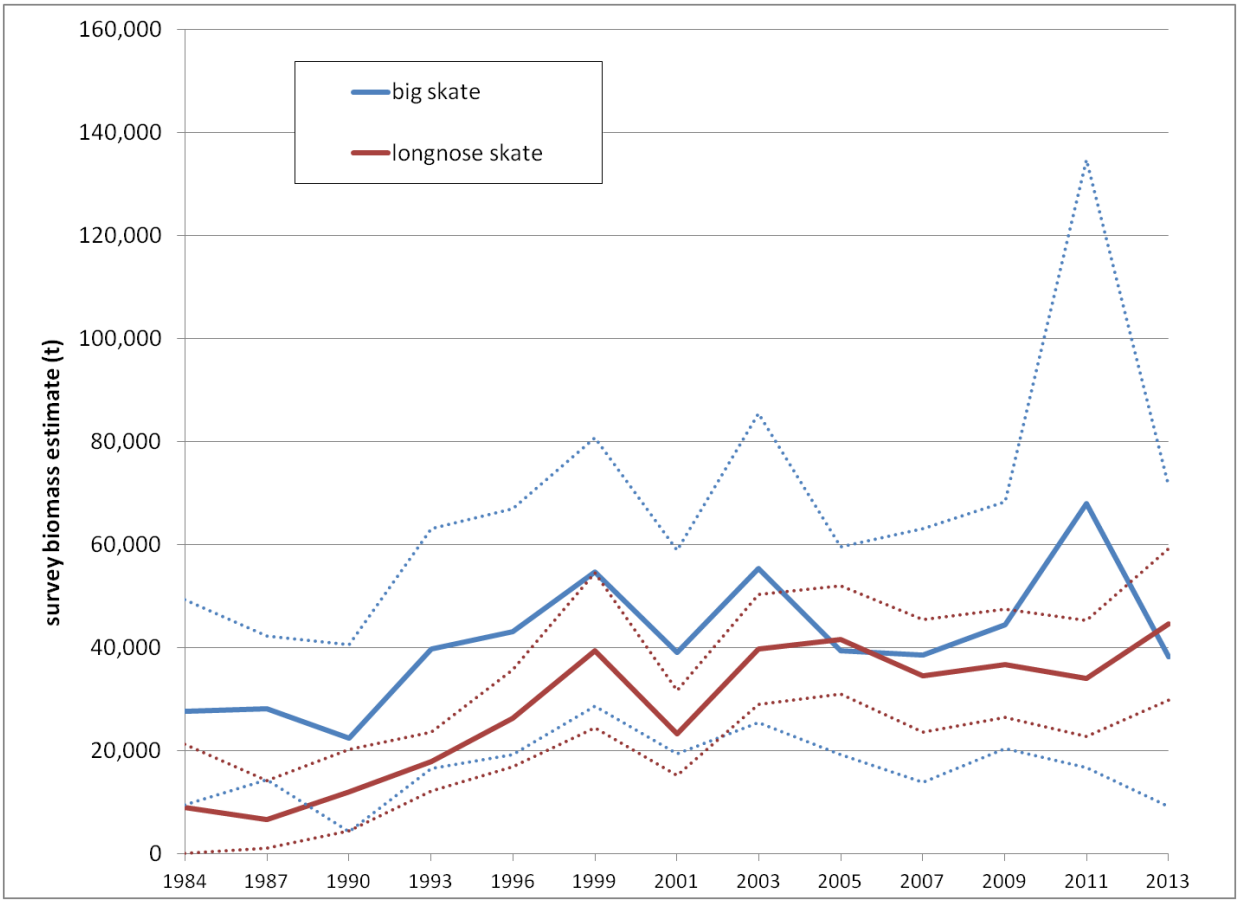

Figure 1. Survey biomass estimates (t) for big and longnose skates, 1984-2013. Dotted lines (with corresponding colors) indicate 95% confidence intervals. Data are from the AFSC bottom trawl surveys.

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