North Pacific Fishery Management Council

Groundfish Species Profiles

2015

Biology • Management • Catch History • Economics • Assessment• Fishery

Since 1976, the North Pacific Fishery Management Council has provided responsible stewardship of the groundfish resources under its jurisdiction, resulting in sustainable and profitable fisheries off Alaska. The foundation for this success is the scientifically based annual catch limits that are established for each target groundfish stock, species, or species complex. The NMFS Alaska Fisheries Science Center provides the necessary scientific information, ranging from basic research data on life history parameters to fishery independent surveys and rigorous stock assessments. These stock assessments are peer reviewed by the BSAI and GOA Groundfish Plan Teams and the Scientific and Statistical Committee. Using this information, the Council establishes total allowable catch levels that do not exceed biologically sustainable catch limits set by the scientists. All catch accrues towards the total allowable catch levels, and catches are closely monitored by the NMFS Alaska Regional Office during the season based on data from mandatory electronic reporting by vessels and processing plants, and a comprehensive observer program.

This publication was developed to provide the public with readily available and accessible information about the federally managed groundfish fisheries. For more information on the Council's management program, I invite you to visit the website at www.npfmc.org.

Dave Witherell

Deputy Director, NPFMC

This 2015 update was prepared by David Witherell and Jim Armstrong based on the annual Stock Assessment and Fishery Evaluation (SAFE) reports, which are assembled by the groundfish plan teams and include contributions from numerous assessment authors (see list of contributors at the end of the document). Front cover image courtesy of Julianne Curry, United Fishermen of Alaska, and back cover image courtesy of SeaAlliance and Alaska Groundfish Databank. Special thanks to those who provided editorial revisions and suggestions to improve the report: Sandra Lowe, Jim Ianelli, Grant Thompson, Steve Barbeaux, Jon Heifetz, Dana Hanselman, Chris Lunsford, Carey McGilliard, Olav Ormseth, Phil Rigby, Ingrid Spies, Paul Spencer, Cindy Tribuzio, Tom Wilderbuer, Elizabeth Conners, Martin Dorn, Teresa D'mar, Jack Turnock, and Diana Stram, as well as Mike Sigler who prepared many of the BSAI figures.

Species Profiles

Bering Sea/Aleutian Islands

Pollock 1
Pacific Cod 3
Sablefish 5
Yellowfin Sole 7
Arrowtooth Flounder 9
Kamchatka Flounder 10
Rock Sole 11
Greenland Turbot 13
Alaska Plaice 14
Flathead Sole and Bering Flounder 15
Other Flatfish 16
Pacific Ocean Perch 17
Northern Rockfish 19
Blackspotted and Rougheye Rockfish 20
Shortraker Rockfish 21
Other Rockfish 22
Atka Mackerel 23
Squid 24
Sculpins 25
Skates 26
Sharks 27
Octopus 28

Diana Evans, NPFMC

Megan Peterson, UAF

Gulf of Alaska

Pollock 29
Pacific Cod 31
Sablefish 33
Shallow Water Flatfish 35
Deepwater Flatfish 37
Rex Sole 38
Arrowtoooth Flounder 39
Flathead Sole 40
Pacific Ocean Perch 41
Northern Rockfish 43
Shortraker Rockfish 44
Other Slope Rockfish 45
Dusky Rockfish 46
Rougheye and Blackspotted Rockfish 47
Demersal Shelf Rockfish 48
Thornyhead Rockfish 49
Atka Mackerel 50
Longnose Skate, Big Skate, and Other Skates 51
Sharks 53
Squid 55
Octopus 56
Sculpins 57

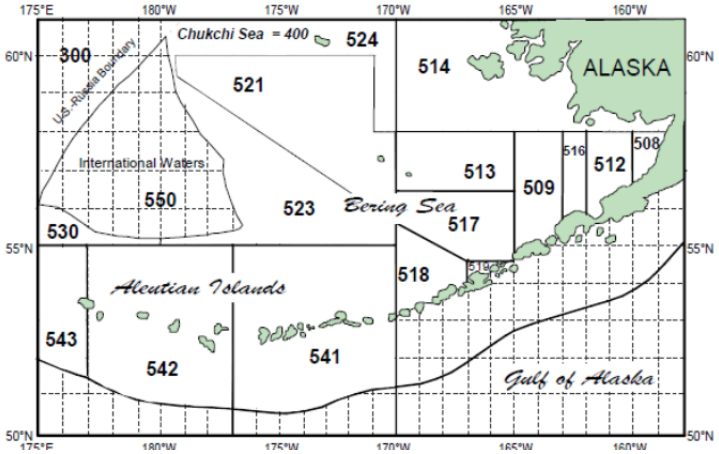
Julianne Curry, PVOA

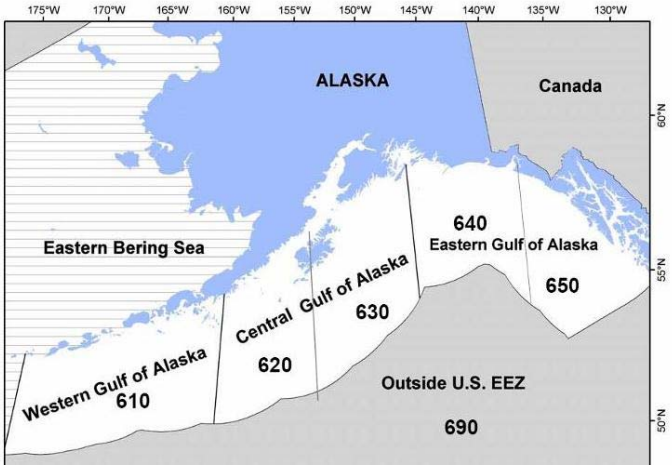
AFSC, NOAA Fisheries

Common Acronyms

ABC	Acceptable Biological Catch
ACL	Annual Catch Limit
AFA	American Fisheries Act
AI	Aleutian Islands
AP	Advisory Panel
ADF&G	Alaska Department of Fish and Game
AFSC	Alaska Fisheries Science Center
BSAI	Bering Sea and Aleutian Islands
CDQ	Community Development Quota
CP	Catcher Processor
CV	Catcher Vessel
EBS	Eastern Bering Sea
ESA	Endangered Species Act
F/V	Fishing Vessel
FMP	Fishery Management Plan
GOA	Gulf of Alaska
IFQ	Individual Fishing Quotas
LLP	License Limitation Program
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	Minimum Stock Size Threshold
MSY	Maximum Sustainable Yield
mt	Metric Ton
NMFS	National Marine Fisheries Service
NPFMC	North Pacific Fishery Management Council
OFL	Overfishing Level
POP	Pacific ocean perch
PSC	Prohibited species catch
QS	Quota Share
SAFE	Stock Assessment and Fishery Evaluation
SSC	Scientific and Statistical Committee
TAC	Total allowable catch

Regulatory Areas

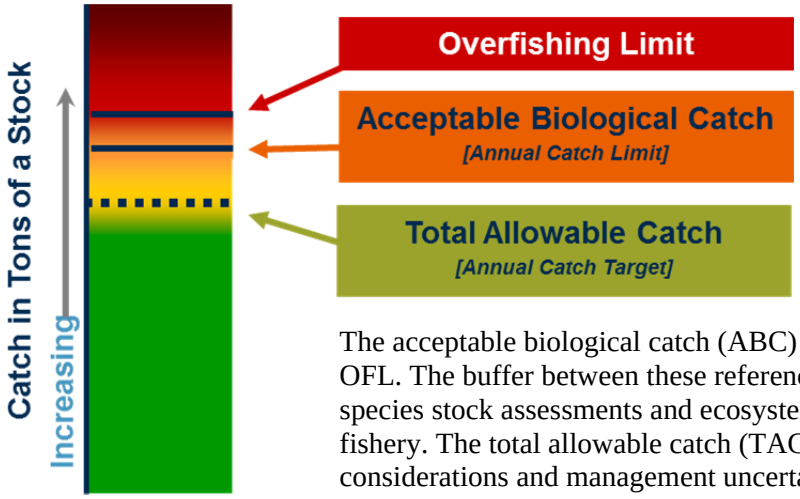




Steve Barbeaux, AFSC

Forward

Strict annual catch limits for every target fishery have proven an effective management tool for achieving sustainable fisheries. In the North Pacific, a rigorous process in place for over 35 years ensures that annual quotas are set at conservative, sustainable levels for each of our managed groundfish stocks. Below is a brief summary of the process for setting annual catch limits for Gulf of Alaska groundfish (comprised of 141 species) Bering Sea and Aleutian Islands groundfish (comprised of 148 species).



Three reference points are used for management of groundfish fisheries in the North Pacific. The overfishing level (OFL) is the catch limit which should never be exceeded. It is based on the fishing mortality rate associated with producing the maximum sustainable yield on a continuing basis. The acceptable biological catch (ABC) is the annual catch limit, and is set lower than the OFL. The buffer between these reference points allows for scientific uncertainty in single species stock assessments and ecosystem considerations, and operational management of the fishery. The total allowable catch (TAC) is the target catch level that incorporates economic considerations and management uncertainty. The fishery management plans prescribe that TAC may equal but never exceed ABC, such that **TAC≤ABC<OFL**. The sum of TACs for all groundfish stocks must also remain within the optimum yield range defined in the FMP. In the BSAI, the upper limit is 2 million mt, which can be constraining. TAC may be set lower than ABC for a variety of reasons, such as to remain under the 2 million mt optimum yield limit; to increase a rebuilding rate or address other conservation issues; to limit incidental bycatch; or to account for state water removals. Fisheries are managed in-season to achieve the TACs without exceeding the ABC or OFL. All catch taken in directed fisheries or caught incidentally in other fisheries, whether retained or discarded, accrues towards the TAC.

Catch Limit Control Rules for North Pacific Groundfish.

Tier 1: Reliable point estimates of B and B_{MSY} and pdf of F_{MSY} .
- 1a) Stock status: $B/B_{MSY} > 1$
  $F_{OFL} = mA$, the arithmetic mean of the pdf
  $F_{ABC} \leq mH$, the harmonic mean of the pdf
- 1b) Stock status: $\alpha < B/B_{MSY} \leq 1$
  $F_{OFL} = mA \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
  $F_{ABC} \leq mH \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
- 1c) Stock status: $B/B_{MSY} \leq \alpha$
  $F_{OFL} = 0$; $F_{ABC} = 0$

Tier 2: Reliable point estimates of B, B_{MSY} , F_{MSY} , $F_{35\%}$, and $F_{40\%}$.
- 2a) Stock status: $B/B_{MSY} > 1$
  $F_{OFL} = F_{MSY}$
  $F_{ABC} \leq F_{MSY} \times (F_{40\%}/F_{35\%})$
- 2b) Stock status: $\alpha < B/B_{MSY} \leq 1$
  $F_{OFL} = F_{MSY} \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
  $F_{ABC} \leq F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
- 2c) Stock status: $B/B_{MSY} \leq \alpha$
  $F_{OFL} = 0$; $F_{ABC} = 0$

Tier 3: Reliable point estimates of B, $B_{40\%}$, $F_{35\%}$, and $F_{40\%}$.
- 3a) Stock status: $B/B_{40\%} > 1$
  $F_{OFL} = F_{35\%}$; $F_{ABC} \leq F_{40\%}$
- 3b) Stock status: $\alpha < B/B_{40\%} \leq 1$
  $F_{OFL} = F_{35\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$
  $F_{ABC} \leq F_{40\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$
- 3c) Stock status: $B/B_{40\%} \leq \alpha$
  $F_{OFL} = 0$; $F_{ABC} = 0$

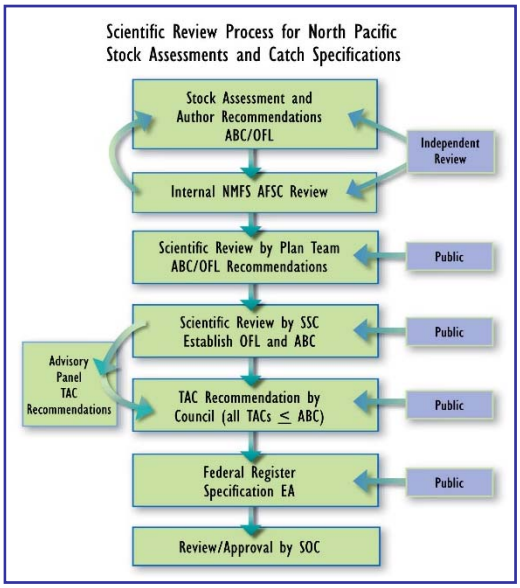
Tier 4: Reliable point estimates of B, $F_{35\%}$, and $F_{40\%}$.
  $F_{OFL} = F_{35\%}$; $F_{ABC} \leq F_{40\%}$

Tier 5: Reliable point estimates of B and natural mortality rate M.
  $F_{OFL} = M$; $F_{ABC} \leq 0.75 \times M$

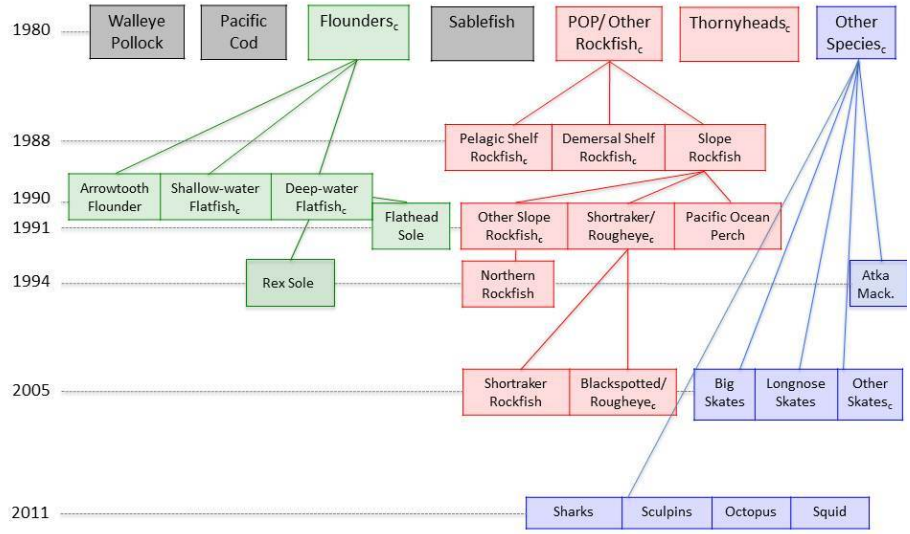
Tier 6: Reliable catch history from 1978 through 1995.
  OFL = the average catch, unless an alternative value is established by the SSC.
  $ABC \leq 0.75 \times$ OFL

The catch limits are specified annually through an established public process. The annual process of determining OFL and ABC specifications begins with the assignment of each stock to one of six "tiers" based on the availability of information about that stock. Stocks in Tier 1 have the most information, and those in Tier 6, the least. Application of a control rule for each tier prescribes the resulting OFL and maximum ABC for each stock. For many groundfish stocks F_{ABC} is set at $F_{40\%}$. $F_{40\%}$ is the fishing mortality rate at which the spawning biomass per recruit is reduced to 40% of its value in the equivalent unfished stock. The control rules for Tiers 1-3 also provide for better chances of rebuilding, because if a stock falls below target biomass level, rates for computing ABC and OFL are reduced.

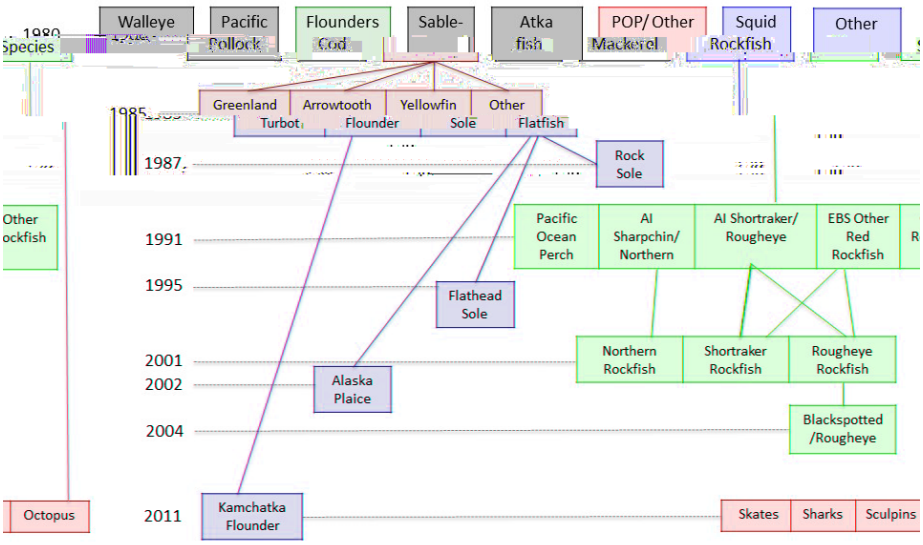
Scientists prepare an assessment of the status of each stock (or stock complex), and include alternate model simulations and tier assignments to arrive at recommendations for OFLs and ABCs. The Groundfish Plan Teams review the assessments and compile them into Stock Assessment and Fishery Evaluation (SAFE) reports, develop their own OFL and ABC recommendations (which may differ from the stock assessment author), and present this information to the Council and its Scientific and Statistical Committee (SSC) and Advisory Panel (AP). The SSC is responsible for setting the Council's OFLs and ABCs, using the SAFE reports and Plan Team recommendations. The SSC retains the flexibility to adjust ABC values downward from the control rule, based on factors such as multispecies interactions, ecosystem considerations, and additional scientific uncertainty. The Council then sets the TAC levels at or below the ABC levels, incorporating recommendations from the Advisory Panel and stakeholders. The public has an opportunity to provide input at each step in the process.



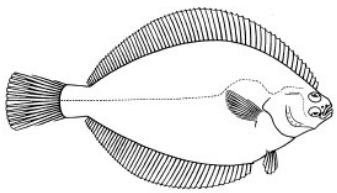
Gulf of Alaska Species Complex History



Bering Sea Aleutian Islands Species Complex History



Groundfish stock groupings for establishing catch limits have evolved over time as new scientific information has become available and new markets have developed for certain species. The original fishery management plans set catch limits for the few major target species (e.g., Pollock, Cod, Sablefish), with the remaining species managed in a few complex groups (e.g., flounders, rockfish, other species). Over time, with new information and new fisheries developing, species were separated out from the complexes and assigned their own catch limits. Currently, there are nearly 50 separate single species groundfish stocks or species complexes that are assigned annual catch limits. For many of these stocks, catch limits are further subdivided into each regulatory area as a precautionary measure to prevent disproportionate exploitation rates in small areas, in case the stock consists of multiple populations.



Catch Specifications

At each December meeting, the Council specifies catch limits for a two year period, which when implemented (in early March) supersede the limits that were set the prior year to start the fishery (which opens January 1). For example, the adjacent specification tables adopted by the Council in December 2014 will be implemented for 2015 and 2016 fisheries, effectively replacing the catch limits that were previously recommended. The 2-year cycle allows for the use of the most recent biological information in the stock assessment while eliminating any potential delay or gap in setting the second year's limits.

Bering Sea & Aleutian Islands

Catch Specifications for 2015-2016 BSAI Groundfish

Species	Area	2015 OFL	2015 ABC	2015 TAC	2016 OFL	2016 ABC	2016 TAC
Pollock	EBS	3,330,000	1,637,000	1,310,000	3,490,000	1,554,000	1,310,000
	AI	36,005	29,659	19,000	38,699	31,900	19,000
	Bogoslof	21,200	15,900	100	21,200	15,900	100
Pacific cod	BS	346,000	255,000	240,000	389,000	255,000	240,000
	AI	23,400	17,600	9,422	23,400	17,600	9,422
Sablefish	BS	1,575	1,333	1,333	1,431	1,211	1,211
	AI	2,128	1,802	1,802	1,934	1,637	1,637
Yellowfin sole	BSAI	266,400	248,800	149,000	262,900	245,500	149,000
Greenland turbot	BSAI	3,903	3,172	2,648	6,453	5,248	2,648
	BS	n/a	2,448	2,448	n/a	4,050	2,448
	AI	n/a	724	200	n/a	1,198	200
Arrowtooth flounder	BSAI	93,856	80,547	22,000	91,663	78,661	22,000
Kamchatka flounder	BSAI	10,500	9,000	6,500	11,000	9,500	6,500
Northern rock sole	BSAI	187,600	181,700	69,250	170,100	164,800	69,250
Flathead sole	BSAI	79,419	66,130	24,250	76,504	63,711	24,250
Alaska plaice	BSAI	54,000	44,900	18,500	51,600	42,900	18,500
Other flatfish	BSAI	17,700	13,250	3,620	17,700	13,250	3,620
Pacific Ocean perch	BSAI	42,558	34,988	32,021	40,809	33,550	31,991
	BS	n/a	8,771	8,021	n/a	8,411	8,021
	EAI	n/a	8,312	8,000	n/a	7,970	7,970
	CAI	n/a	7,723	7,000	n/a	7,406	7,000
	WAI	n/a	10,182	9,000	n/a	9,763	9,000
Northern rockfish	BSAI	15,337	12,488	3,250	15,100	12,295	3,250
Blackspotted/Rougheye rockfish	BSAI	560	453	349	688	555	349
	EBS/EAI	n/a	149	149	n/a	178	149
	CAI/WAI	n/a	304	200	n/a	377	200
Shortraker rockfish	BSAI	690	518	250	690	518	250
Other rockfish	BSAI	1,667	1,250	880	1,667	1,250	880
	BS	n/a	695	325	n/a	695	325
	AI	n/a	555	555	n/a	555	555
Atka mackerel	BSAI	125,297	106,000	54,500	115,908	98,137	54,817
	EAI/BS	n/a	38,492	27,000	n/a	35,637	27,317
	CAI	n/a	33,108	17,000	n/a	30,652	17,000
	WAI	n/a	34,400	10,500	n/a	31,848	10,500
Skates	BSAI	49,575	41,658	25,700	47,035	39,468	25,700
Sculpins	BSAI	52,365	39,725	4,700	52,365	39,725	4,700
Sharks	BSAI	1,363	1,022	125	1,363	1,022	125
Squids	BSAI	2,624	1,970	400	2,624	1,970	400
Octopuses	BSAI	3,452	2,589	400	3,452	2,589	400

Gulf of Alaska

Catch Specifications for 2015-2016 GOA Groundfish

Species	Area	2015 OFL	2015 ABC	2015 TAC	2016 OFL	2016 ABC	2016 TAC
Pollock	W (61)	n/a	31,634	31,634	n/a	41,472	41,472
	C (62)	n/a	97,579	97,579	n/a	127,936	127,936
	C (63)	n/a	52,594	52,594	n/a	68,958	68,958
	WYAK	n/a	4,719	4,719	n/a	6,187	6,187
	Subtotal	256,545	191,309	186,526	321,067	250,824	244,553
	EYAK/SEO	16,833	12,625	12,625	16,833	12,625	12,625
	Total	273,378	203,934	199,151	337,900	263,449	257,178
Pacific Cod	W	n/a	38,702	27,091	n/a	38,702	27,091
	C	n/a	61,320	45,990	n/a	61,320	45,990
	E	n/a	2,828	2,121	n/a	2,828	2,121
	Total	140,300	102,850	75,202	133,100	102,850	75,202
Sablefish	W	n/a	1,474	1,474	n/a	1,338	1,338
	C	n/a	4,658	4,658	n/a	4,232	4,232
	WYAK	n/a	1,708	1,708	n/a	1,552	1,552
	SEO	n/a	2,682	2,682	n/a	2,436	2,436
	Total	12,425	10,522	10,522	11,293	9,558	9,558
Shallow-Water Flatfish	W	n/a	22,074	13,250	n/a	19,577	13,250
	C	n/a	19,297	19,297	n/a	17,114	17,114
	WYAK	n/a	2,209	2,209	n/a	1,959	1,959
	EYAK/SEO	n/a	625	625	n/a	554	554
	Total	54,207	44,205	35,381	48,407	39,204	32,877
Deep-Water Flatfish	W	n/a	301	301	n/a	299	299
	C	n/a	3,689	3,689	n/a	3,645	3,645
	WYAK	n/a	5,474	5,474	n/a	5,409	5,409
	EYAK/SEO	n/a	3,870	3,870	n/a	3,824	3,824
	Total	15,993	13,334	13,334	15,803	13,177	13,177
Rex Sole	W	n/a	1,258	1,258	n/a	1,234	1,234
	C	n/a	5,816	5,816	n/a	5,707	5,707
	WYAK	n/a	772	772	n/a	758	758
	EYAK/SEO	n/a	1,304	1,304	n/a	1,280	1,280
	Total	11,957	9,150	9,150	11,733	8,979	8,979
Arrowtooth Flounder	W	n/a	30,752	14,500	n/a	29,545	14,500
	C	n/a	114,170	75,000	n/a	109,692	75,000
	WYAK	n/a	36,771	6,900	n/a	35,328	6,900
	EYAK/SEO	n/a	11,228	6,900	n/a	10,787	6,900
	Total	226,390	192,921	103,300	217,522	185,352	103,300
Flathead Sole	W	n/a	12,767	8,650	n/a	12,776	8,650
	C	n/a	24,876	15,400	n/a	24,893	15,400
	WYAK	n/a	3,535	3,535	n/a	3,538	3,538
	EYAK/SEO	n/a	171	171	n/a	171	171
	Total	50,792	41,349	27,756	50,818	41,378	27,759

Species	Area	2015 OFL	2015 ABC	2015 TAC	2016 OFL	2016 ABC	2016 TAC
Pacific Ocean Perch	W		2,302	2,302		2,358	2,358
	C		15,873	15,873		16,184	16,184
	WYAK		2,014	2,014		2,055	2,055
	W/C/WYAK	23,406	20,189	20,189	23,876	20,597	20,597
	SEO	954	823	823	973	839	839
	E(subtotal)		2,837	2,837		2,894	2,894
	Total	24,360	21,012	21,012	24,849	21,436	21,436
Northern Rockfish	W	n/a	1,226	1,226	n/a	1,158	1,158
	C	n/a	3,772	3,772	n/a	3,563	3,563
	E	n/a	-		n/a	-	
	Total	5,961	4,998	4,998	5,631	4,721	4,721
Shortraker Rockfish	W	n/a	92	92	n/a	92	92
	C	n/a	397	397	n/a	397	397
	E	n/a	834	834	n/a	834	834
	Total	1,764	1,323	1,323	1,764	1,323	1,323
Dusky Rockfish	W	n/a	296	296	n/a	273	273
	C	n/a	3,336	3,336	n/a	3,077	3,077
	WYAK	n/a	1,288	1,288	n/a	1,187	1,187
	EYAK/SEO	n/a	189	189	n/a	174	174
	Total	6,246	5,109	5,109	5,759	4,711	4,711
Rougheye and Blackspotted Rockfish	W	n/a	115	115	n/a	117	117
	C	n/a	632	632	n/a	643	643
	E	n/a	375	375	n/a	382	382
	Total	1,345	1,122	1,122	1,370	1,142	1,142
Demersal shelf rockfish	Total	361	225	225	361	225	225
Thornyhead Rockfish	W	n/a	235	235	n/a	235	235
	C	n/a	875	875	n/a	875	875
	E	n/a	731	731	n/a	731	731
	Total	2,454	1,841	1,841	2,454	1,841	1,841
Other Rockfish (Other slope)	WGOA & CGOA	n/a	1,031	1,031	n/a	1,031	1,031
	WYAK	n/a	580	580	n/a	580	580
	EYAK/SEO	n/a	2,469	200	n/a	2,469	200
	Total	5,347	4,080	1,811	5,347	4,080	1,811
Atka mackerel	Total	6,200	4,700	2,000	6,200	4,700	2,000
Big Skate	W	n/a	731	731	n/a	731	731
	C	n/a	1,257	1,257	n/a	1,257	1,257
	E	n/a	1,267	1,267	n/a	1,267	1,267
	Total	4,340	3,255	3,255	4,340	3,255	3,255
Longnose Skate	W	n/a	152	152	n/a	152	152
	C	n/a	2,090	2,090	n/a	2,090	2,090
	E	n/a	976	976	n/a	976	976
	Total	4,291	3,218	3,218	4,291	3,218	3,218
Other Skates	Total	2,980	2,235	2,235	2,980	2,235	2,235
Sculpins	GOA-wide	7,448	5,569	5,569	7,448	5,569	5,569
Sharks	GOA-wide	7,986	5,989	5,989	7,986	5,989	5,989
Squids	GOA-wide	1,530	1,148	1,148	1,530	1,148	1,148
Octopuses	GOA-wide	2,009	1,507	1,507	2,009	1,507	1,507
Total		870,064	685,597	536,158	910,895	731,049	590,161

Megan Peterson, UAF

Walleye Pollock

Diana Stram, NPFMC

Biology: Walleye Pollock *Gadus chalcogrammus* is the most abundant fish species in the Bering Sea. In the Eastern Bering Sea (EBS), pollock are found throughout the water column and adults are concentrated along the outer continental shelf. Seasonal migrations occur from overwintering areas along the outer shelf to shallower waters to spawn. Pollock feed on copepods, euphausiids (krill) and fish (primarily juvenile pollock) and are prey for other fish, marine mammals and seabirds.

Pollock is a relatively fast growing and short lived species. They begin to recruit to the fishery at age 3 and longevity extends to 12 years or more. Annual natural mortality is estimated at 25% (M=0.30). Most fish reach maturity between ages 3 and 5. Females produce 60,000 to 400,000 pelagic eggs. Peak spawning occurs in the in the southeastern BS and eastern AI along the outer continental shelf in late February. Smaller spawning aggregations also occur in the northern Bering Sea in mid-late April.

Fishery Management: The U.S. manages pollock as 3 separate stocks; the Eastern Bering Sea stock (Unimak Pass to the U.S.-Russia Convention line), the Aleutian Islands stock (the Aleutian Islands shelf region from 170°W to the U.S.-Russia Convention line), and the Central Bering Sea - Bogoslof Island stock.

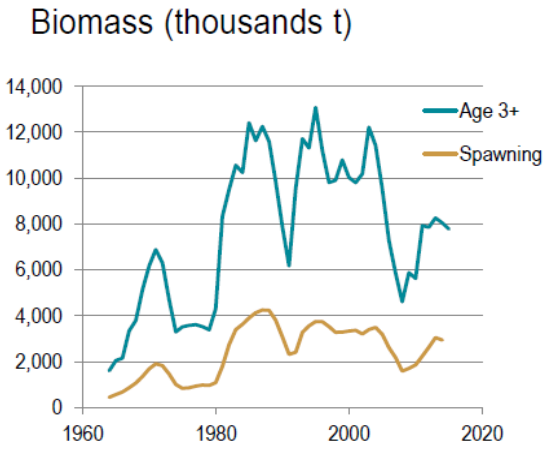
The American Fisheries Act (1998) established eligibility to participate in the BSAI pollock fishery and settled the contentious inshore/offshore allocation issue by establishing permanent allocations of pollock quota among sectors. CDQ groups are allocated 10% of EBS pollock TAC. The remaining TAC is divided up as follows; catcher vessels delivering inshore (50%), catcher processors offshore (40%) and catcher vessels delivering to motherships (10%). The 2004 Appropriations Act established that the non-CDQ pollock fishery in the AI is fully allocated to the Aleut Corporation, for the purpose of economic development in Adak, with a percentage allocated to vessels 60 feet or less in length overall.

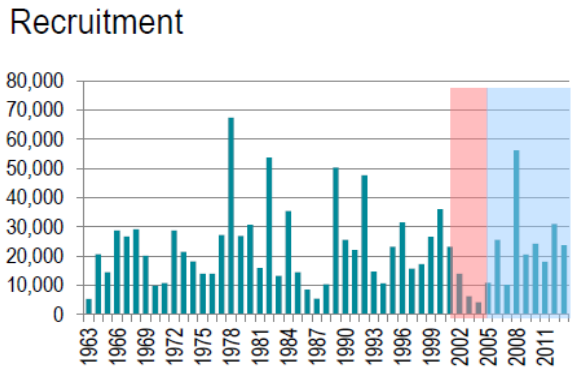
The EBS pollock fishery has been redistributed spatially and seasonally to reduce the potential competition for prey with the endangered western stock of Steller sea lions, with fishery exclusion zones around sea lion rookeries. TACs have also been divided into

Stock assessment:

J. Ianelli, T. Honkalehto, S. Barbeaux, and S. Kotwicki. 2014. Assessment of Walleye Pollock in the Eastern Bering Sea.

www.afsc.noaa.gov/refm/stocks/assessments.htm





separate seasons since 2000; the "A-season" (Jan-Apr) and the "B-season" (Jun-Oct).

Catch History: Fisheries for Bering Sea pollock developed in 1964, and catches increased rapidly in the early 1970s and peaked in 1972 at 1.9 million mt. Early 1980s joint ventures were phased out by the domestic fleet by 1991. The international zone or "Donut Hole" also supported significant harvests of pollock through 1987, followed by a sharp decline and a fishing moratorium for the international zone beginning in 1993.

Stock Assessment: The EBS pollock assessment is based on a statistical age-structured model that incorporates fishery data and fishery independent data from annual bottom trawl surveys and biennial acoustic trawl surveys. Catch specifications for EBS pollock are established under Tier 1a of the ABC/OFL control rule. B_{msy} is equal to 1,948,000 mt. EBS catch specifications for 2015 are as follows; OFL=3,330,000, mt, ABC=1,637,000 mt, TAC=1,310,000 mt. The AI pollock ABC =29,659 mt and the Bogoslof ABC = 15,900 mt.

Biomass of EBS pollock declined steadily from 2004-2009 due to poor recruitment from the 2000-2005 year classes. The biomass is now increasing with recruitment of above average 2008 and 2010 year-classes.

Total catches, pre-season catch specifications, and exploitable biomass of age 3+ Walleye Pollock in the EBS 1980-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
1980	958,280	1,000,000	1,300,000	-	-
1981	973,502	1,000,000	1,300,000	-	-
1982	955,964	1,000,000	1,300,000	-	-
1983	981,450	1,000,000	1,300,000	-	-
1984	1,092,055	1,200,000	1,300,000	-	-
1985	1,139,676	1,200,000	1,300,000	-	-
1986	1,141,993	1,200,000	1,300,000	-	-
1987	859,416	1,200,000	1,300,000	-	-
1988	1,228,721	1,300,000	1,500,000	-	6,500,000
1989	1,229,600	1,340,000	1,340,000	-	5,300,000
1990	1,455,193	1,280,000	1,450,000	-	5,843,800
1991	1,195,646	1,300,000	1,676,000	-	6,667,146
1992	1,390,331	1,300,000	1,490,000	1,770,000	6,190,000
1993	1,326,601	1,300,000	1,340,000	1,340,000	5,900,000
1994	1,329,350	1,330,000	1,330,000	1,590,000	8,020,000
1995	1,264,245	1,250,000	1,250,000	1,500,000	8,080,000
1996	1,192,778	1,190,000	1,190,000	1,460,000	7,360,000
1997	1,124,430	1,130,000	1,130,000	1,980,000	6,120,000
1998	1,101,165	1,110,000	1,110,000	2,060,000	5,820,000
1999	989,816	992,000	992,000	1,720,000	7,040,000
2000	1,132,707	1,139,000	1,139,000	1,680,000	7,700,000
2001	1,387,194	1,400,000	1,842,000	3,536,000	10,060,000
2002	1,480,195	1,485,000	2,110,000	3,530,000	9,800,000
2003	1,490,899	1,491,760	2,330,000	3,530,000	11,100,000
2004	1,480,543	1,492,000	2,560,000	2,740,000	11,000,000
2005	1,483,286	1,478,500	1,960,000	2,100,000	8,410,000
2006	1,486,435	1,485,000	1,930,000	2,090,000	8,050,000
2007	1,354,097	1,394,000	1,394,000	1,640,000	6,360,000
2008	990,566	1,000,000	1,000,000	1,440,000	4,357,000
2009	810,784	815,000	815,000	977,000	6,240,000
2010	810,215	813,000	813,000	918,000	4,620,000
2011	1,199,069	1,252,000	1,267,000	2,447,000	9,620,000
2012	1,205,197	1,200,000	1,220,000	2,474,000	8,340,000
2013	1,270,745	1,247,000	1,375,000	2,550,000	8,140,000
2014	1,298,593	1,267,000	1,369,000	2,795,000	8,045,000
2015	-	1,310,000	1,637,000	3,330,000	9,203,000

[1]Catch data current through November 2014.
[2]TAC, ABC and OFL data from Federal Register Harvest Specifications.
[3]Biomass from annual SAFE report projections issued the previous year.

Fishery: The BSAI pollock fishery is prosecuted by relatively large vessels using pelagic trawls. A total of 77 catcher vessels delivering shoreside, 14 catcher vessels delivering to motherships, and 16 catcher processors participated in the 2014 fishery. The A-season fishery is focused in the southeast portion of the EBS and targets pre-spawning pollock. Roe, fillets and surimi are the main product forms of the A-season fishery, and approximately 40% of the TAC is caught during the A-season. The B-season fishery takes the remaining 60% of the quota and is distributed over the outer shelf edge of the Bering Sea extending to the Russian border.

Economics: Pollock fishery products include whole fish, head and gut, roe, deep-skin fillets, other fillets, surimi, minced fish, and fish meal. In 2013, production was 546,410 mt for all pollock products in Alaska, with a gross value of $1.33 billion. Surimi products comprised approximately 28% of the gross value of pollock products, roe comprised around 9%, and fillets about 42% of the gross value.

Ecosystem Components: Pollock are an important prey for fish, seabirds, and marine mammals (including Steller sea lions) in the BSAI.

Diana Evans, NPFMC

Pacific Cod

Biology: Pacific Cod *Gadus macrophalus* is a demersal species found in the EBS, the AI, and GOA south to California. Pacific Cod are distributed over the continental shelf at depths from shoreline to 500 m. Mature fish tend to concentrate on the outer continental shelf and prefer muddy or sandy soft sediment substrate. Juvenile Pacific cod feed primarily on small invertebrates and euphausiids, whereas adults feed on fish such as juvenile pollock, and invertebrates such as polychaetes, amphipods and crangonid shrimp. Predators of Pacific Cod include adult Pacific Cod, Pacific Halibut, salmon shark and Steller sea lions.

Pacific Cod are a relatively fast growing and short lived fish. Longevity can extend to 19 years. The size at 50% maturity is 58 cm (about 5 years). Females are highly fecund and can produce more than 1 million eggs. Adults form spawning aggregations from January to May in the BS. Natural mortality is estimated at M=0.34. Pacific Cod begin to recruit to the fisheries at age 3 and are 50% recruited by ages 4-5.

Catch History: Pacific Cod were taken by Japanese longline and trawl fisheries beginning in the early 1960s. Vessels from the USSR entered the fishery in 1971. Japanese and Russian fisheries harvested around 50,000 mt annually in the 1970s. Joint ventures became more prevalent in the early 1980s until they were entirely phased out by the domestic fleet a few years later. Catches have remained fairly stable since 1991, averaging just over 200,000 mt annually.

Jackie Patt, UAF

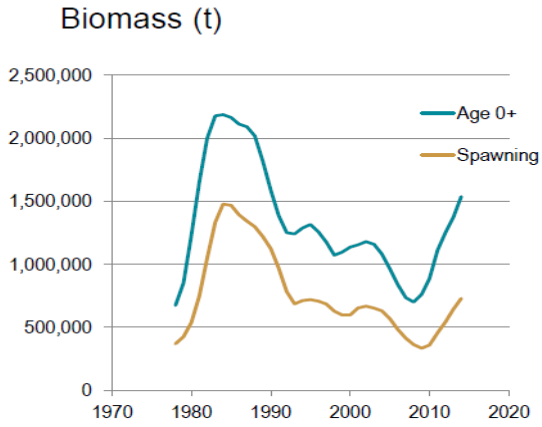
Stock assessment:

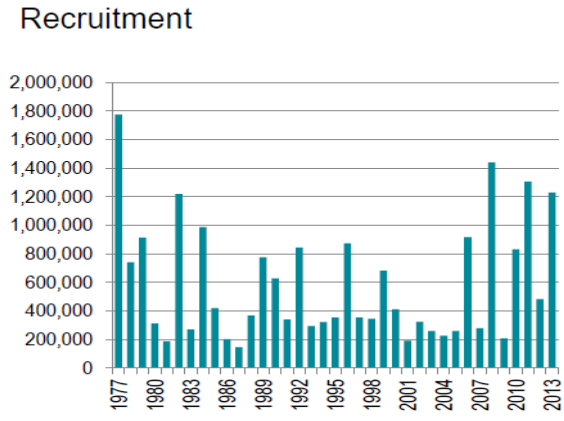
G. Thompson, 2014. Assessment of the Pacific Cod Stock in the Eastern Bering Sea.

www.afsc.noaa.gov/refm/stocks/assessments.htm

Fishery Management: Like most other groundfish, 10.7% of the TAC is allocated to CDQ fisheries. Since 2007 with implementation of Amendment 85, the remaining TAC is allocated among sectors as follows: 1.4% to jig gear; 2% to hook and line/pot catcher vessels < 60', 0.2% to hook and line/pot catcher vessels ≥ 60' LOA; 48.7% to hook and line catcher processors; 8.4% to pot catcher vessels > 60'; 1.5% to pot catcher processors; 2.3% to AFA trawl catcher processors; 13.4% to non-AFA trawl catcher processors; and 22.1% to trawl catcher vessels.

EBS Pacific cod





Stock Assessment: In the EBS, the Pacific Cod assessment is based on a Stock Synthesis model that uses both length-structured and age-structured data. This model incorporates fishery data and fishery-independent data from the NMFS EBS trawl surveys. Pacific Cod fall under Tier 3a of the ABC/OFL control rules. The 2015 Bering Sea Pacific Cod biomass is estimated at 1,680,000 mt. Catch specifications for Bering Sea cod in 2015 are as follows: OFL=346,000 mt (F_{OFL}=0.35), ABC=255,000 mt, TAC=240,000 mt. Catch specifications for Aleutian Islands stock of Pacific Cod in 2015 are: OFL=23,400 mt, ABC=17,600 mt, TAC=9,422 mt.

Estimated biomass of Pacific Cod has fluctuated over the last 40 years. The stock increased rapidly and peaked in the mid-1980s, then declined through 2008. Biomass has been increasing due to relatively good year classes produced in 2006, 2008, and 2011.

Total catches, pre-season catch specifications, and biomass of Pacific Cod in the BSAI, 1980-2013, and BS 2014 to present.

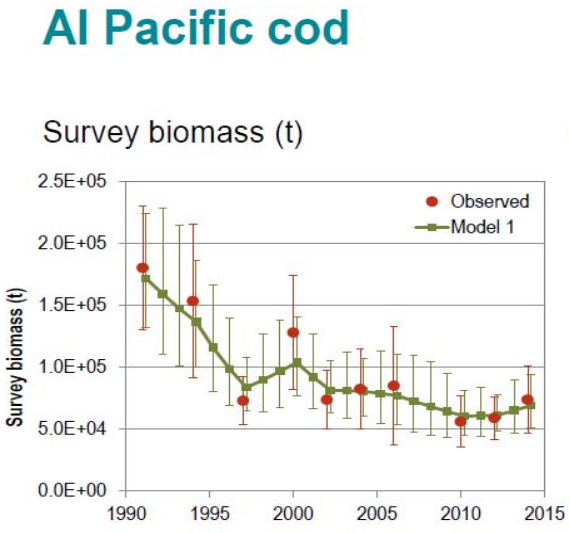
Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
1980	51,649	70,700	148,000	-	-
1981	63,941	78,700	160,000	-	-
1982	69,501	78,700	168,000	-	-
1983	103,231	120,000	298,200	-	-
1984	133,084	210,000	291,300	-	-
1985	150,384	220,000	347,400	-	-
1986	142,511	229,000	249,300	-	-
1987	163,110	280,000	400,000	-	-
1988	208,236	200,000	385,300	-	1,481,000
1989	182,865	230,681	370,600	-	1,190,000
1990	179,608	227,000	417,000	-	1,389,500
1991	172,158	229,000	229,000	-	1,030,000
1992	206,129	182,000	182,000	188,000	910,000
1993	167,390	164,500	164,500	192,000	655,000
1994	196,572	191,000	191,000	228,000	925,000
1995	245,030	250,000	328,000	390,000	1,620,000
1996	240,590	270,000	305,000	420,000	1,640,000
1997	234,641	270,000	306,000	418,000	1,590,000
1998	195,645	210,000	210,000	336,000	1,340,000
1999	162,361	177,000	177,000	264,000	1,210,000
2000	191,056	193,000	193,000	240,000	1,300,000
2001	176,659	188,000	188,000	248,000	1,320,000
2002	197,353	200,000	223,000	294,000	1,540,000
2003	211,059	207,500	223,000	324,000	1,680,000
2004	212,161	215,500	223,000	350,000	1,660,000
2005	205,635	206,000	206,000	265,000	1,290,000
2006	193,017	194,000	194,000	230,000	922,000
2007	174,486	170,720	176,000	207,000	960,000
2008	171,277	170,720	176,000	207,000	1,080,000
2009	175,756	176,540	182,000	212,000	1,260,000
2010	171,875	168,780	174,000	205,000	1,140,000
2011	220,109	227,950	235,000	272,000	1,560,000
2012	250,899	275,000	314,000	369,000	1,690,000
2013	250,274	260,000	307,000	359,000	1,510,000
2014	200,729	250,274	260,000	307,000	1,629,000
2015	-	240,000	255,000	346,000	1,680,000

[1]Catch data current through November 2014. BS and AI specifications set separately beginning in 2014; all numbers combined in this table.
[2]TAC, ABC and OFL data from annual SAFE report.
[3]Biomass from annual SAFE report projections issued the previous year.

Fishery: Pacific Cod are taken with trawl, longline, pot and jig gear. In 2013, a total of 47 vessels using longline gear (18 catcher vessels, 29 catcher processors), 59 pot gear vessels (56 catcher vessels, 3 catcher processors), and 72 vessels using trawl gear (54 catcher vessels, 18 catcher processors) caught Pacific Cod in the BSAI.

Economics: In 2013, ex-vessel value of Pacific Cod catch in the BSAI was $130 million, and production for all Pacific Cod products in Alaska was 145,490 mt, worth $390 million. Primary products included whole fish, headed and gutted fish, and fillets. Exvessel price averaged $0.24/lb for trawl gear and $0.25/lb for fixed gear.

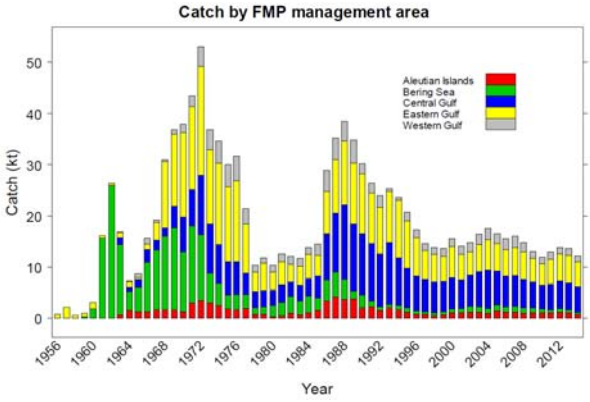
Ecosystem Components: Pacific Cod are an important prey item for SSLs, especially in winter months.



Sablefish

AFSC, NOAA Fisheries

Biology: Sablefish *Anoplopoma fimbria* distribution extends from the northern Mexico through the Gulf of Alaska, along the Aleutian Islands and into the Bering Sea. Adult Sablefish are generally found at depths greater than 200 m along the continental slope, shelf gullies and deep fjords. Juveniles (less than 40 cm) spend the first 2-3 years farther inshore along the continental shelf and begin to move out to the continental slope around age 4-5. Young-of-the-year feed primarily on euphausiids and copepods while adults are more opportunistic feeders, relying more heavily on fish such as pollock, Pacific Herring and Pacific Cod. Squid and jellyfish are important invertebrates in the adult Sablefish diet. Coho and Chinook salmon are the main predators of young-of-the-year.



Sablefish are relatively long lived. They begin to recruit to the fishery at age 4 or 5 and longevity often reaches 40 years (the oldest recorded Sablefish in Alaska was 94 years old). Female Sablefish size at 50% maturity is approximately 65 cm (age 6). Females are slightly larger than males, and fish in the BSAI generally tend to be smaller than in the GOA. Natural mortality is estimated at M=0.10. Off Alaska, Sablefish spawn near the edges of the continental slope at depths greater than 500 m between January and March.

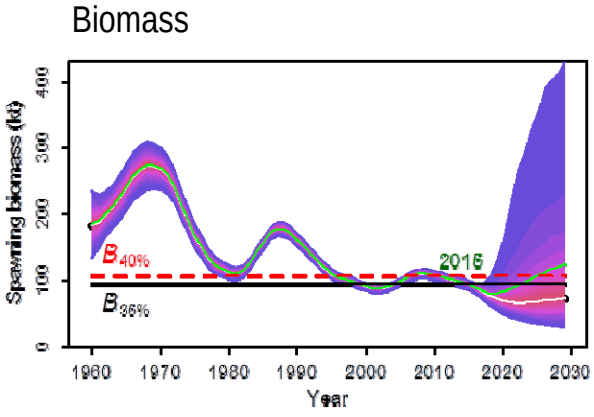
Stock assessment:

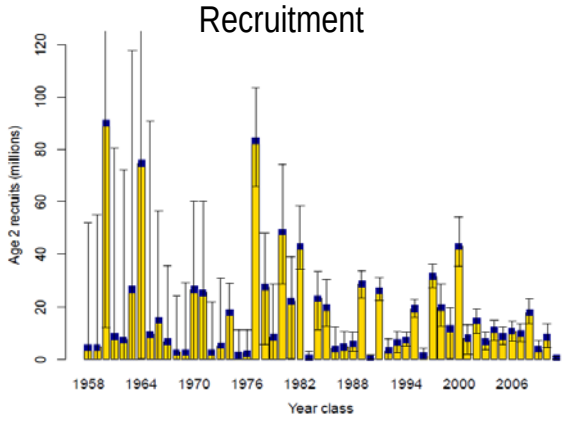
D. Hanselman, C. Lunsford, and C. Rodgveller. 2014. Assessment of the Sablefish stock in Alaska.

www.afsc.noaa.gov/refm/stocks/assessments.htm

Catch History: U.S. fishermen have harvested Sablefish since the end of the 19th century as a byproduct of halibut fisheries. Harvests were relatively small, averaging 1,666 mt from 1930-1957. Japanese longlining began in the EBS around 1958 and expanded into the AI and GOA through the 1970s. Japanese fleet catches increased throughout the 1960s, and catch peaked 36,776 mt in 1972. High fishing pressure in the early 1970s may have resulted in a population decline of Sablefish in the mid-1970s. By 1988, U.S. fishermen took the majority of the Sablefish harvested in the GOA and BSAI. The fishery was a derby-style fishery in the late 1980s and early 1990s until Individual Fishing Quotas were implemented for the hook and line fishery in 1995.

Fishery Management: BSAI and GOA Sablefish are managed as one population in federal waters due to their highly migratory behavior during certain life history stages.





In 1990, Amendment 13 to the BSAI FMP similarly allocated Sablefish quota by gear type; 50% to fixed gear and 50% to trawl gear in the BS; 75% to fixed gear and 25% to trawl gear in the AI. Amendment 20 to the GOA FMP and 15 to BSAI FMP established IFQ management for the Sablefish fishery and allocated 20% of the fixed gear quota to a CDQ reserve for the BSAI, effective 1990.

Stock Assessment: The Sablefish assessment is based on a statistical sex-specific age-structured model. This model incorporates fishery data and fishery independent data from domestic and Japan-U.S. cooperative longline surveys and the NMFS GOA trawl survey. Sablefish fall under Tier 3b of the ABC/OFL control rules. Specifications are apportioned among management areas based on a 5-year exponential weighting of the survey and fishery abundance indices. Catch specifications for 2015 Bering Sea Sablefish are as follows; OFL=1,575 mt, ABC=1,333 mt, TAC=1,333 mt. For the Aleutian Islands, OFL=2,128 mt, ABC=1,802 mt, TAC=1,802 mt.

Total catches, pre-season catch specifications, and exploitable biomass of Sablefish age 4+ in the BS and AI, 1980-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
1980	2,480	5,000	-	-	148,000
1981	3,137	5,000	-	-	159,000
1982	4,139	5,000	-	-	163,000
1983	3,368	5,000	-	-	173,000
1984	3,328	5,340	6,185	-	205,000
1985	3,796	4,500	6,080	-	213,000
1986	6,546	6,450	7,200	-	212,000
1987	8,012	7,700	7,700	-	187,000
1988	6,608	8,400	9,200	-	141,000
1989	4,500	5,270	6,200	-	137,000
1990	4,445	7,200	7,200	-	118,000
1991	3,199	6,300	6,300	-	80,000
1992	2,104	4,400	4,400	5,870	60,000
1993	2,747	4,100	4,100	4,500	50,000
1994	2,470	3,340	3,340	4,160	52,000
1995	2,048	3,800	3,800	4,900	58,000
1996	1,349	2,300	2,500	3,300	52,000
1997	1,326	2,300	2,675	5,610	48,000
1998	1,181	2,680	2,680	4,390	51,000
1999	1,211	3,200	3,200	4,980	61,000
2000	1,790	3,900	3,900	4,840	63,000
2001	1,937	4,060	4,060	4,980	70,000
2002	2,261	4,480	4,480	6,750	85,000
2003	2,048	6,000	6,000	8,880	86,000
2004	1,993	6,000	6,450	8,640	86,000
2005	2,539	5,060	5,060	6,120	87,000
2006	2,166	5,820	6,160	7,420	85,000
2007	2,322	5,790	5,790	9,840	85,000
2008	2,018	5,300	5,300	6,270	86,000
2009	1,939	4,920	4,920	5,810	84,000
2010	1,849	4,860	4,860	5,760	81,000
2011	1,729	4,750	4,750	5,610	59,000
2012	1,948	4,280	4,280	5,070	45,000
2013	1,696	3,720	3,720	4,400	62,000
2014	1,085	3,150	3,150	3,725	73,000
2015	-	3,135	3,135	3,703	58,000

[1]Catch data current through November 2014.
[2]TAC, ABC and OFL from annual Federal Register.
[3]Biomass from annual SAFE report projections.

Biomass of Sablefish has fluctuated over time. There were two high points in biomass in the early 1970s and mid-1980s and two decreases in the late 1970s and the mid-1990s. Relative abundance is near an all-time but may increase with recruitment of an average 2008 year class.

Fishery: Sablefish are taken with trawl, longline and pot gear. Most Sablefish are taken with longline gear in the Aleutian Islands and pot gear in the Bering Sea. The Sablefish season is open 7 months beginning in April, concurrent with the halibut fishing season. Primary species taken incidentally in the Sablefish fishery include Shortaker, Rougheye and Thornyhead Rockfish.

Sperm whale and killer whale depredation occurs when whales remove Sablefish from longline gear, damage the fish and/or fishing gear. Killer whale depredation predominates in the BSAI and sperm whale depredation is more common the GOA. Depredation can lead to significant economic losses in the form of reduced catch, extended travel distances, and damaged gear. Depredation may also reduce the accuracy of Sablefish stock assessment models. Additionally, depredating whales may be at greater risk of mortality or injury through vessel strikes or entanglement in gear.

Economics: In 2013, the ex-vessel value of Sablefish catch from the BSAI was $9.7 million. Exvessel prices for BSAI Sablefish in 2013 averaged $2.84/lb for fish caught on longline gear and $1.17/lb for fish taken with trawl gear. For both gear types, the primary product is frozen, head and gutted fish.

Diana Evans, NPFMC

Yellowfin Sole

Biology: Yellowfin Sole *Limanda aspera* are distributed from the Sea of Japan to British Columbia, with the highest abundance in the Bering Sea. Yellowfin Sole are the target of the largest flatfish fishery in the U.S. and are one of the most abundant flatfish species in the EBS. Adult Yellowfin Sole occupy the benthos and have separate winter spawning and summertime feeding grounds on the EBS shelf. Adults over-winter near the shelf margins and then migrate to inner shelf areas in April/May each year for spawning and feeding. Yellowfin Sole predate on bivalves, polychaetes, amphipods, mollusks and fish. They are prey for Pacific Cod, Pacific Halibut and skates.

Yellowfin Sole are relatively slow-growing and long-lived. They begin to recruit to the fishery at age 6, are fully selected by age 13 and longevity extends to 30+ years. Females reach 50% maturity at 30 cm (10.5 years old) and are highly fecund, producing 1.3-3.3 million eggs depending on size. Annual natural mortality of adults is estimated at 0.12. Spawning occurs in June/July in shallow waters from Bristol Bay to Nunivak Island.

Diana Evans, NPFMC

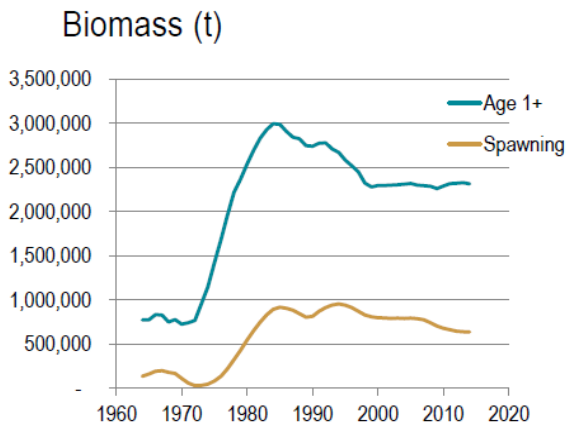
Fishery Management:
BSAI Flatfish are regulated under the BSAI groundfish FMP through permits, limited entry, catch quotas (TACs), seasons, in-season adjustments, gear restrictions, closed waters, bycatch limits and rates (for halibut and crab), allocations, regulatory areas, record keeping, reporting requirements and observer monitoring.

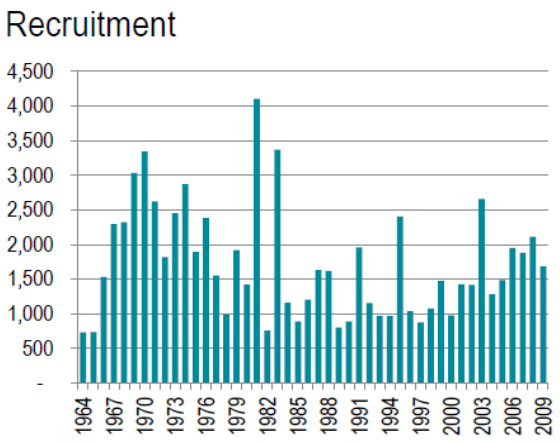
Stock assessment:

T. Wilderbuer, D. Nichol, and J. Ianelli. 2014. Assessment of Yellowfish Sole in the Bering Sea and Aleutian Islands.

www.afsc.noaa.gov/refm/stocks/assessments.htm

In 1985, the Flounder (Flatfish) category was broken into four management groups (Greenland Turbot, Arrowtooth Flounder, Yellowfin Sole, Other Flatfish) due to significant differences in stock robustness and product values. Northern Rock Sole was separated from the Other Flatfish complex in 1995, and Alaska Plaice was separated in 2002.





In 2008, BSAI FMP Amendment 80 established catch shares for the bottom trawl catcher-processor fleet. Flatfish resources were allocated among BSAI trawl harvesters according to their historic harvest patterns, monitoring requirements were increased, and fishermen were given the ability to form cooperatives. Up to 93% of the Yellowfin Sole TAC is allocated to the Amendment 80 fleet, depending on the TAC. Like other groundfish stocks except pollock, 10.7% of TAC is first allocated to CDQ groups.

Catch History: Yellowfin Sole have been harvested annually since the inception of the BS bottom trawl fishery in 1954. Overharvesting by foreign vessels occurred from 1959-1962, and catches averaged 404,000 mt annually during that period. Catches declined during the late 1960s and early 1970s as a result of reduced abundance. Domestic and joint venture fisheries for Yellowfin Sole emerged in the 1980s, and only domestic harvesting has occurred since 1990, and catches have increased in more recent years.

Total catches, pre-season catch specifications, and exploitable biomass of Yellowfin Sole in the BSAI, 1980-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
1980	87,391	117,000	169,000	-	-
1981	97,301	117,000	214,500	-	-
1982	95,712	117,000	214,500	-	-
1983	108,385	117,000	214,500	-	-
1984	159,526	230,000	310,000	-	-
1985	227,107	226,900	310,000	-	-
1986	208,597	209,500	230,000	-	-
1987	181,429	187,000	187,000	-	-
1988	223,156	254,000	254,000	-	1,408,000
1989	153,165	182,675	241,000	-	1,530,000
1990	80,584	207,650	278,900	-	1,640,000
1991	96,135	135,000	250,600	-	1,790,000
1992	146,946	235,000	372,000	452,000	2,660,000
1993	105,809	220,000	238,000	275,000	2,500,000
1994	144,544	150,325	230,000	269,000	1,925,000
1995	124,752	190,000	277,000	319,000	2,770,000
1996	130,163	200,000	278,000	342,000	2,850,000
1997	166,915	230,000	233,000	339,000	2,530,000
1998	101,315	220,000	220,000	314,000	3,010,000
1999	67,320	207,980	212,000	308,000	3,180,000
2000	84,070	123,262	191,000	222,600	2,820,000
2001	63,578	113,000	176,000	209,000	2,380,000
2002	74,985	86,000	115,000	136,000	1,597,000
2003	81,050	83,750	114,000	136,000	1,550,000
2004	75,510	86,075	114,000	135,000	1,560,000
2005	94,384	90,686	124,000	148,000	1,560,000
2006	99,138	95,701	121,000	144,000	1,680,000
2007	121,029	136,000	225,000	240,000	2,000,000
2008	148,894	225,000	248,000	265,000	2,200,000
2009	107,528	210,000	210,000	224,000	1,870,000
2010	118,624	219,000	219,000	234,000	1,960,000
2011	151,164	196,000	239,000	262,000	1,958,600
2012	147,183	202,000	203,000	222,000	1,950,000
2013	164,944	198,000	206,000	220,000	1,960,000
2014	145,900	184,000	239,800	259,700	2,113,000
2015	-	149,000	248,800	266,400	2,127,800

[1]Catch data current through November 2014.
[2]1988-2010 TAC, ABC and OFL data from annual Federal Register Harvest Specs. Pre-1988 TAC and ABC data from annual SAFE reports.
[3]Biomass from annual SAFE report projections.

Stock Assessment: The Yellowfin Sole assessment is a separable catch-age, sex-specific analysis. This model incorporates fishery data and fishery independent data from annual trawl surveys. Yellowfin Sole fall under Tier 1a of the ABC/OFL control rules. The 2015 projected age 6+ biomass is 2,127,800 mt. Catch specifications for 2015 are as follows; OFL=266,400 mt, ABC= 248,800 mt, TAC= 149,000 mt.

Yellowfin Sole biomass peaked in the early-1990s. The population has been in a slow decline as the strongest year classes have passed through the fishery, however, the population remains at fairly high/stable levels.

Fishery: Yellowfin Sole are primarily caught with trawl gear. Seven catcher vessel and 27 catcher processors participated in 2013 BSAI Yellowfin Sole fishery. Fishing effort is focused on the mid and inner BS shelf during ice-free conditions. A small area in Bristol Bay is open to bottom trawling from April 1 – June 15 to allow the fishery to target this species when they are aggregated and can be taken with low incidental catches of other species. Yellowfin Sole are usually headed and gutted or frozen whole for further processing. In 2013, the retention rate of Yellowfin Sole caught by the Amendment 80 sector was 97 percent.

Economics: In 2013, production was 169,150 mt for all flatfish products for a total gross value of $234 million. Ex-vessel value of all flatfish caught in the BSAI in 2013 was $96 million.

Arrowtooth Flounder

Arrowtooth Flounder
AFSC, NOAA Fisheries

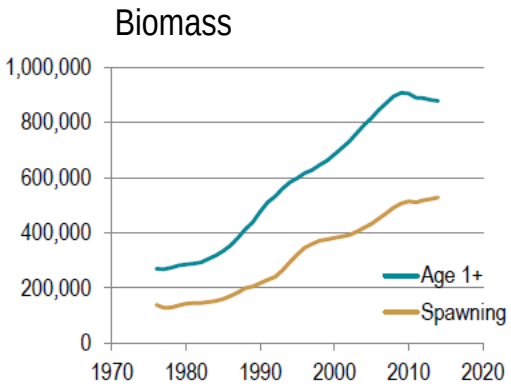
Biology: Arrowtooth Flounder *Atheresthes stomias* are distributed from the Kamchatka Peninsula to the BSAI south to central California. Adults migrate seasonally from shelf margins in the winter to the outer shelf in April/May with the onset of warmer waters temperatures. In the BSAI, Arrowtooth Flounder prey on juvenile pollock (47%), adult pollock (19%) and euphausiids (9%).

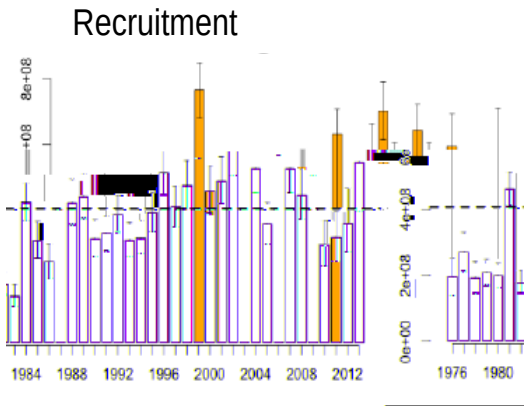
Arrowtooth Flounder length at 50% maturity is 28 cm for males (4 years) and 37 cm for females (5 years). Natural mortality is estimated at M=0.2 for females and M=0.35 for males. Adult males range in size from 30-50 cm, and females range in size from 30-70 cm. The spawning period for Arrowtooth Flounder is protracted and variable, ranging from September through March.

Stock assessment:

I. Spies, T. Wilderbuer, D. Nichol, and K. Aydin. 2014. Assessment of the Arrowtooth Flounder stock in the Bering Sea and Aleutian Islands.

www.afsc.noaa.gov/refm/stocks/assessments.htm





Catch History: USSR and Japan targeted Greenland Turbot and Arrowtooth Flounder during the 1960s. Catches peaked from 1974-1976 at 19,000-25,000 mt. Arrowtooth Flounder and Greenland Turbot were managed as a complex until 1985 due to their similar life history characteristics and distribution. Catches decreased following implementation of the Magnuson-Stevens Act in 1977.

Total catches, pre-season catch specifications, and exploitable biomass of Arrowtooth Flounder in the BSAI, 2000-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
2000	13,228	131,000	131,000	160,000	785,000
2001	14,056	22,011	117,000	141,500	701,000
2002	11,853	16,000	113,000	137,000	671,000
2003	14,580	12,000	112,000	139,000	597,000
2004	18,139	12,000	115,000	142,000	696,000
2005	14,237	12,000	108,000	132,000	684,000
2006	13,361	13,000	136,000	160,000	964,000
2007	11,917	20,000	158,000	193,000	1,280,000
2008	21,884	75,000	244,000	297,000	1,780,000
2009	28,914	75,000	156,000	190,000	1,140,000
2010	38,881	75,000	156,000	191,000	1,120,000
2011	20,195	25,900	153,000	186,000	1,124,200
2012	22,379	25,000	150,000	181,000	1,130,000
2013	20,501	25,000	152,000	186,000	1,130,000
2014	18,119	25,000	106,599	125,642	1,023,440
2015	-	22,000	80,547	93,856	908,379

[1]Catch data current through November 2014.
[2]TAC, ABC and OFL data from Harvest Specifications. Kamchatka Flounder separated out in 2011; data not included thereafter.
[3]Biomass from annual SAFE report projections.

Stock Assessment: Arrowtooth Flounder and Kamchatka Flounder were assessed and managed together as a complex through 2010, when Kamchatka Flounder were split out as a separate target fishery. The assessment model is a length-based approach using survey and fishery lengths to estimate population numbers at age. Arrowtooth Flounder fall under Tier 3a of the ABC/OFL control rules.

Fishery: Arrowtooth Flounder has developed into a target fishery and retention rates have increased in response to developing markets and implementation of the Amendment 80 catch share cooperatives in 2008. From 2005-2007, at least 50% of Arrowtooth Flounder caught was discarded. In 2013, the retention rate of Arrowtooth Flounder caught by trawl gear was 85%.

Kamchatka Flounder

Biology: Kamchatka Flounder *Atheresthes evermanni* are distributed from northern Japan to the Aleutian Islands and along the eastern Bering Sea slope. This species generally occurs in waters deeper than 200m, and the larger fish (> 50 cm) are most common at depths of 500m to 800 m.

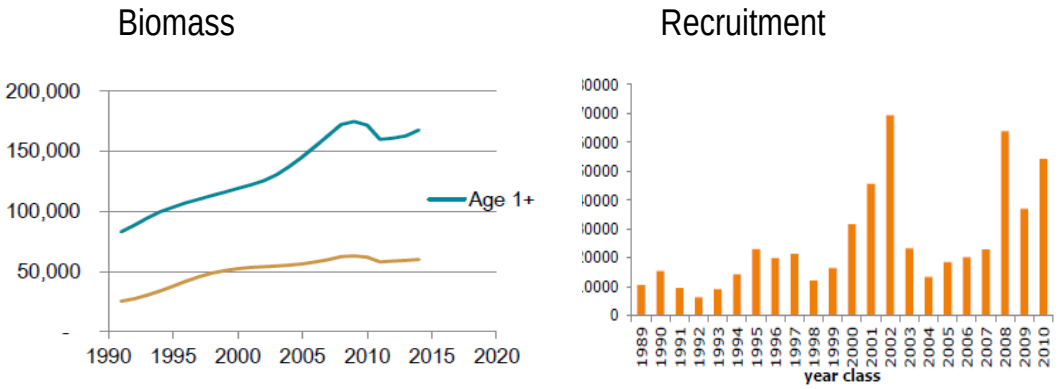
Kamchatka Flounder recruitment to the fishery begins at about 30 cm, and are fully recruited at about 45 cm. The age at 50% maturity is 10 years for females. Natural mortality is estimated at M=0.11. Kamchatka Flounder live to a maximum age of 35 years, and can grow to a maximum size of about 90 cm.

Catch History: From 1986 until 2011, Kamchatka Flounder and Arrowtooth Flounder were managed together under the Arrowtooth Flounder complex. However, a directed fishery for Kamchatka Flounder began to emerge, and catches were increasing. Because the ABC was based on the large amount of Arrowtooth Flounder relative to Kamchatka Flounder (complex is about 93% Arrowtooth Flounder) the possibility arose of an overharvest of Kamchatka Flounder. So beginning in 2011, separate catch specifications were established.

Stock assessment:

T. Wilderbuer, J. Ianelli, D. Nichol, and R. Lauth. 2014. Assessment of Kamchatka Flounder in the Bering Sea and Aleutian Islands.

www.afsc.noaa.gov/refm/stocks/assessments.htm



Stock Assessment: The Kamchatka Flounder assessment uses a sex-specific length and age based approach. Kamchatka Flounder fall under Tier 3a of the ABC/OFL control rules. The 2015 projected biomass is 174,500 mt. Catch specifications for 2015 are as follows: OFL=10,500 mt, ABC= 9,000 mt, TAC= 6,500 mt.

Total catches, pre-season catch specifications, and exploitable biomass of Kamchatka Flounder in the BSAI, 2011-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
2011	9,935	17,700	17,700	23,600	129,000
2012	9,514	17,700	18,600	24,800	125,000
2013	7,772	10,000	12,200	16,000	125,000
2014	6,395	7,100	7,100	8,270	136,600
2015	-	6,500	9,000	10,500	174,500

[1]Catch data current through November 2014.
[2]TAC, ABC and OFL data from Harvest Specifications.
[3]Biomass from annual SAFE report projections.

Fishery: The Kamchatka Flounder fishery developed in response to developing markets and implementation of the Amendment 80 catch share cooperatives. Retention rate of Kamchatka Flounder caught by trawl gear was 92% in 2013.

Ecosystem Components: Kamchatka Flounder prey on pollock, shrimp, and euphausiids.

Diana Evans, NPFMC

Rock Sole

Biology: Two species of rock sole, Northern Rock Sole *Lepidopsetta polyxstra* and Southern Rock Sole *L. bilineatus*, occur in the North Pacific Ocean and are managed together as one complex in the BSAI, but separately in the GOA. Northern Rock Sole are the most commonly found species of rock sole in the BSAI. Adults are bottom dwellers and occupy separate winter and summer feeding ground along the continental shelf. As early juveniles, rock sole consume plankton and zooplankton, switching to bivalves, polychaetes, amphipods, mullosks and crustaceans as they age and become late juveniles and adults. Small rock sole are prey for Pacific Cod, Walleye Pollock, Yellowfin Sole, skates and Pacific Halibut.

Recruitment to the fishery begins at age 4 and they are fully selected by age 11. Estimated length at 50% maturity is 31 cm (9 years). Natural mortality is estimated at M=0.15. Rock sole spawn from December to March in two separate concentrations in the BS along the continental shelf/slope break.

Catch History: Rock sole were harvested by Japanese and Soviet vessels beginning in 1963. Catches averaged 7,000 mt annually from 1963-1969 and increased during the early 1970s. Peak catch occurred in 1972 (61,000 mt). Catches declined until joint venture operations began in 1980. Catches again increased during the 1980s and peaked in 1988 (86,000 mt). The fishery was fully domesticated by 1990, and catches have remained fairly stable since 1990 (average 46,000 mt annually).

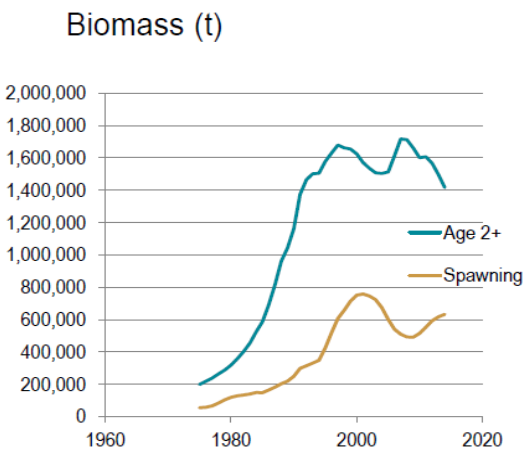
Stock assessment:

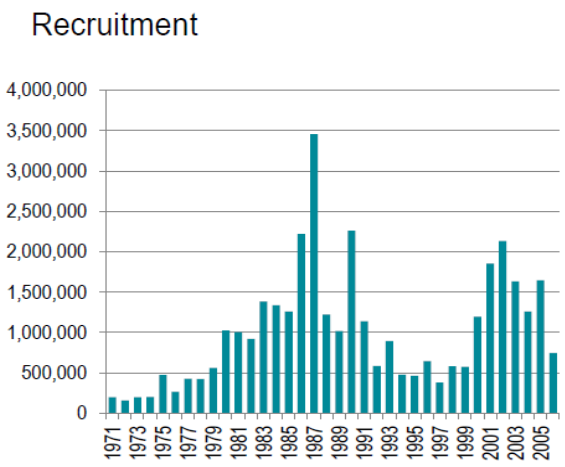
T. Wilderbuer and D. Nichol. 2014. Assessment of Northern Rock Sole in the Bering Sea and Aleutian Islands.

www.afsc.noaa.gov/refm/stocks/assessments.htm

Fishery Management: Rock sole is regulated under the BSAI groundfish FMP through permits, limited entry, catch quotas (TACs), seasons, in-season adjustments, gear restrictions, closed waters, bycatch limits and rates, allocations, regulatory areas, record keeping, reporting requirements and observer monitoring. In 2008, BSAI FMP Amendment 80 modified rock sole fishery management, such that 100% of the directed fishery rock sole TAC is allocated among non-AFA trawl catcher processors according to their historic harvest patterns, groundfish retention standards were extended to catcher/processor fleet and fishermen were given the ability to form cooperatives. Like other groundfish, 10.7% of rock sole TAC is allocated to CDQ groups.

Stock Assessment: The rock sole assessment uses a separable catch-age analysis that estimates abundance, mortality and recruitment. This model incorporates fishery data and





fishery independent data from EBS and AI trawl surveys. Rock sole fall under Tier 1a of the ABC/OFL control rules. The 2015 projected age 6+ biomass is 1,233,400 mt and B_{msy}=260,000.

Strong recruitment and low fishing effort enabled rock sole biomass to increase significantly from 1985-1995. Estimated biomass peaked in the late 1990s and then declined by about 20% through 2005. The decline during the early 2000s was attributed to below average recruitment to the adult population during the 1990s. Estimated biomass began increasing again in 2005 as a result of a series of above average year-classes.

Fishery: Rock sole are caught by trawl catcher-processors targeting roe-bearing females. The primary product for the rock sole fishery is the high value roe. The fishery occurs from January-March and is focused in outer Bristol Bay and north of Unimak Island. A total of 7 catcher vessels and 27 catcher processors participated in the 2013 flatfish fisheries in the BSAI. From 1987-2000, over 50% of rock sole catch was discarded. Retention rate for rock sole by trawl gear increased to 87% by 2009, and to 95% in 2013.

Ecosystem Components: Northern Rock Sole recruitment has been linked to decadal scale climate variability, especially ocean forcing by onshelf/offshelf winds in the BS. After spawning in March, Northern Rock Sole larvae are subject to advection from wind, current and tidal forcing during the spring. Using an ocean surface current model, Northern Rock Sole larvae advection towards favorable nursery areas and resultant above-average recruitment occurred during years with onshelf (easterly) winds during the 1980s and again in 2001-2003. Conversely, periods of off-shelf (westerly) winds during the 1990s corresponded with average or poor recruitment.

Total catches, pre-season catch specifications, and exploitable biomass of Rock Sole* in the BSAI, 1989-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
1989	68,912	90,762	171,000	-	1,277,900
1990	35,253	60,000	216,300	-	1,193,900
1991	46,681	90,000	246,500	-	1,363,700
1992	51,956	40,000	260,800	260,800	1,481,000
1993	64,260	75,000	185,000	270,000	1,550,000
1994	60,584	75,000	313,000	363,000	1,790,000
1995	55,028	60,000	347,000	388,000	2,330,000
1996	47,146	70,000	361,000	420,000	2,360,000
1997	67,520	97,185	296,000	427,000	2,390,000
1998	33,667	100,000	312,000	449,000	2,360,000
1999	40,511	120,000	309,000	444,000	2,320,000
2000	49,666	137,760	230,000	273,000	2,070,000
2001	29,475	75,000	228,000	271,000	1,940,000
2002	41,865	54,000	225,000	268,000	1,850,000
2003	37,339	44,000	110,000	132,000	877,000
2004	48,680	41,000	139,000	166,000	1,160,000
2005	37,361	41,500	132,000	157,000	1,380,000
2006	36,411	41,500	126,000	150,000	1,490,000
2007	36,768	55,000	198,000	200,000	1,670,000
2008	51,275	75,000	301,000	304,000	1,880,000
2009	48,649	90,000	296,000	301,000	1,630,000
2010	53,221	90,000	240,000	243,000	1,770,000
2011	60,401	85,000	224,000	248,000	1,868,400
2012	76,099	87,000	208,000	231,000	1,860,000
2013	59,773	92,380	214,000	241,000	1,470,000
2014	52,250	85,000	203,800	228,700	1,393,200
2015	-	69,250	181,700	187,600	1,233,400

*Rock Sole included in Other Flatfish category before 1989.
[1]Catch data current through November 2014.
[2]1989-2010 TAC, ABC and OFL data from annual Federal Register Harvest Specifications.
[3]Biomass from annual SAFE report projections.

Diana Evans, NPFMC

NOAA Fisheries

Greenland Turbot

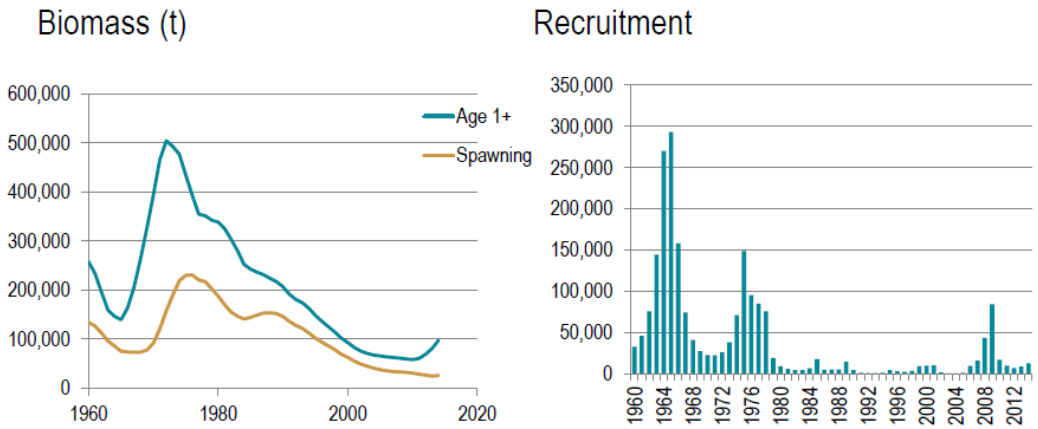
Biology: Greenland Turbot *Reinhardtius hippoglossoides* has a circumpolar distribution, occurring in both the North Pacific and North Atlantic Oceans. Juveniles inhabit shallow continental shelf waters (<200 m) for the first 3-4 years and move out to the deeper waters of the continental slope (200-1,000 m). Greenland Turbot predate on euphausiids, polychaetes and small fish (e.g. pollock) as they mature. In the North Pacific, juveniles are prey for Pacific Cod and Pacific Halibut.

Greenland Turbot size at 50% maturity is around 60 cm (age 5-10). Greenland Turbot begin to recruit to longline fisheries at about 60 cm and are fully recruited at 90 cm. Natural mortality is estimated at M=0.112. Peak spawning period is from November – February in the EBS. Female fecundity is fairly low; females less than 83 cm release 25,000-150,000 eggs.

Stock assessment:

S. Barbeaux, J. Ianelli,, D. Nichol, and T. Hoff. 2014. Assessment of Greenland Turbot in the Eastern Bering Sea and Aleutian Islands Area.

www.afsc.noaa.gov/refm/stocks/assessments



Catch History: Catches averaged 30,000 mt annually during that during the 1960s when the USSR and Japan first targeted the Greenland Turbot fishery. Catches peaked in the mid-1970s, and declined after 1986 due to poor recruitment.

Total catches, pre-season catch specifications, and exploitable biomass of Greenland Turbot in the BS and AI, 2000-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
2000	6,974	9,300	9,300	42,000	233,000
2001	5,312	8,400	8,400	31,000	210,000
2002	3,635	8,000	8,100	36,500	208,000
2003	3,530	4,000	5,800	17,800	112,000
2004	2,239	3,500	4,740	19,300	132,000
2005	2,579	3,500	3,930	19,200	98,300
2006	1,977	2,740	2,740	14,200	74,200
2007	2,003	2,440	2,440	15,600	119,000
2008	2,923	2,540	2,540	15,600	104,000
2009	4,511	7,380	7,380	14,800	105,000
2010	4,138	6,120	6,120	7,460	61,100
2011	3,646	5,050	6,140	7,220	73,981
2012	4,720	8,660	9,660	11,700	76,900
2013	1,745	2,060	2,060	2,540	81,000
2014	1,646	2.124	2,124	2,647	84,546
2015	-	2,648	3,172	3,903	122,298

[1]Catch data current through November 2014.
[2]TAC, ABC and OFL from Federal Register Harvest Specifications.
[3]Biomass from annual SAFE report projections.

Stock Assessment: The Greenland Turbot assessment is based on a stock synthesis model that incorporates fishery data and fishery independent data from EBS slope and shelf bottom-trawl surveys and the NMFS longline survey. Greenland Turbot fall under Tier 3b of the ABC/OFL control rules. Catch limits are further apportioned into BS and AI components. Biomass had declined since the early 1970s, but strong year classes produced in 2007-2009 are contributing to a steep increase in abundance.

Fishery: The Greenland Turbot fishery is prosecuted by both trawls and longline gear. Predominantly a longline fishery from 1993-2007, the trawl fishery began harvesting a larger share of the TAC beginning in 2008. Fishing effort is concentrated on the continental slope throughout the EBS and on both sides of the AI.

Current Issues: Killer whale depredation is problematic for Greenland Turbot longline fisheries in the EBS.

Alaska Plaice

Diana Evans, NPFMC

Biology: Alaska Plaice *Pleuronectes quadrituberculatus* distribution extends through the Sea of Japan, Chukchi Sea, BSAI and GOA. Alaska Plaice are generally found along the EBS continental shelf, with relatively few found in the AI region. Summer distribution of adults is generally confined to depths less than 110 m, with larger fish in deeper waters and smaller juveniles in shallower coastal waters. Alaska Plaice predate on polychaetes and amphipods and are prey for Pacific Cod, Pacific Halibut and Yellowfin Sole.

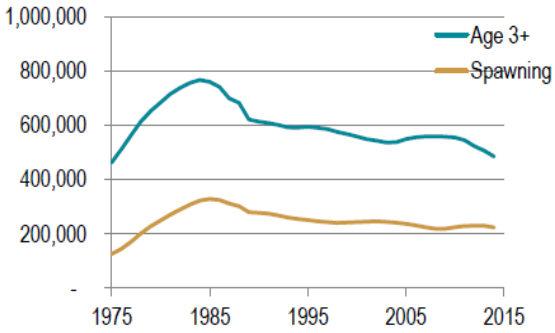
Alaska Plaice recruit to trawl fisheries at age 4, are full recruited by age 13. Females mature between ages 7 and 12. Natural mortality is estimated at M=0.13. Spawning usually occurs in March and April on hard sandy substrate in the EBS.

Stock assessment:

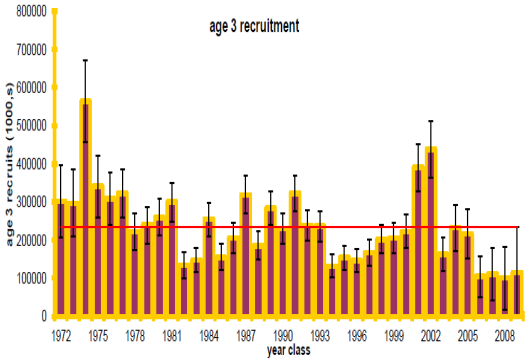
T. Wilderbuer, D. Nichol, and P. Spencer. 2014. Assessment of Alaska Plaice in the Bering Sea and Aleutian Islands.

www.afsc.noaa.gov/refm/stocks/assessments.htm

Biomass



Recruitment



Catch History: Alaska Plaice were harvested by Japanese and Soviet vessels beginning in 1963. Catches increased from 1,000 mt in 1971 to a peak of 62,000 mt to in 1988. Joint ventures began in 1988, and the fishery was fully harvested by domestic vessels in 1991. Alaska Plaice are taken in a directed target fishery as well as a secondary catch in the Yellowfin Sole fishery.

Total catches, pre-season catch specifications, and exploitable biomass of Alaska Plaice* in the BSAI, 2002-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
2002	-	-	-	-	1,100,000
2003	10,118	10,000	137,000	165,000	1,080,000
2004	7,888	8,000	203,000	258,000	1,050,000
2005	11,194	8,000	189,000	237,000	913,000
2006	17,318	8,000	188,000	237,000	1,008,000
2007	19,522	25,000	190,000	241,000	1,340,000
2008	17,376	50,000	194,000	248,000	1,850,000
2009	13,944	50,000	232,000	298,000	1,500,000
2010	16,165	50,000	224,000	278,000	2,260,000
2011	23,656	16,000	65,100	79,100	780,300
2012	16,612	24,000	53,400	64,600	606,000
2013	23,523	20,000	55,200	67,000	589,000
2014	19,000	24,500	55,100	66,800	576,300
2015	-	18,500	44,900	54,000	471,500

*Alaska Plaice removed from Other flatfish complex 2002.
[1]Catch data current through November 2014.
[2]TAC, ABC and OFL data from Federal Register.
[3]Biomass from annual SAFE report projections.

Stock Assessment: The assessment uses a sex-specific, age-structured model. This model incorporates fishery data and fishery independent data from trawl surveys. Alaska Plaice fall under Tier 3a of the ABC/OFL control rules. The 2015 projected biomass is 471,500 mt. Catch specifications for 2015 are as follows; OFL= 54,000 mt, ABC= 44,900 mt, TAC= 18,500 mt.

Fishery: Alaska Plaice are caught primarily by trawl catcher processors targeting higher-value flatfish species such as Yellowfin Sole. With the implementation of Amendment 80 in 2008, retention rates of Alaska Plaice increased from about 5% (2003-2005 average) to an average of 70% in the last few years.

AFSC, NOAA Fisheries

Flathead Sole and Bering Flounder

Stock assessment:

C. McGillard, D. Nichol, W. Palsson, and W. Stockhausen. 2014. Assessment of the Flathead Sole-Bering Flounder stock in the Bering Sea and Aleutian Islands.

www.afsc.noaa.gov/refm/stocks/assessments.htm

Biology: Flathead Sole is managed as a two-species complex including Flathead Sole *Hippoglossoides elassodon* and Bering Flounder *Hipogloissoides robustus.* Individuals of both species are morphologically similar; Flathead Sole are faster growing and achieve larger size. Flathead Sole are distributed in the Kuril Islands, BS, GOA and down to northern California. In the northern part of the Bering Sea, Flathead Sole distribution overlaps with Bering Flounder. Bering Flounder distribution extends from the Chukchi Sea into the northern BS. Bering Flounder generally represents less than 3% of the estimated survey biomass of the two species. Adult Flathead Sole overwinter near the shelf margins before migrating to the mid and outer continental shelf in April or May each year for feeding. Flathead Sole predate on pollock, polychaetes, brittle stars and crustaceans. They are prey for adult pollock and Pacific Cod.

Flathead Sole recruitment to the fishery begins at age 4, and longevity extends to 32 years. Estimated length at 50% maturity is 32 cm. Natural mortality is estimated at M=0.20. Flathead Sole spawn in March and April, primarily in deeper waters near the margins of the continental shelf. Females release from 70,000-600,000 eggs depending on size.

Catch History: Flathead Sole were harvested by Japanese and Soviet vessels beginning in 1963. Flathead Sole catches peaked in 1971 (51,000 mt). Catches declined to 15,000 mt in 1975 and remained under 10,000 mt until 1990. Catch levels have increased since the 1980s due to higher incidental catch rates and emerging markets for Flathead Sole, averaging 18,377 mt from 1995-2009.

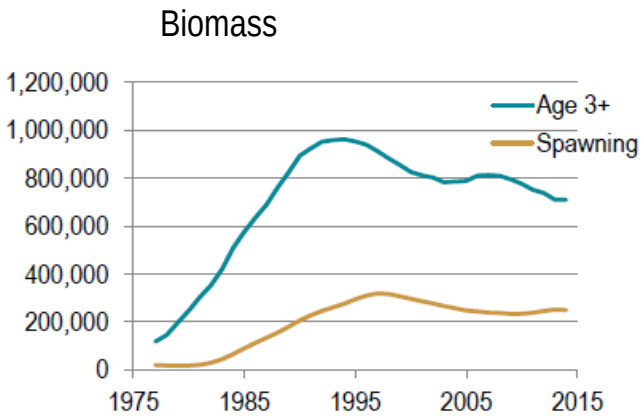
Total catches, pre-season catch specifications, and exploitable biomass of Flathead Sole* in the BSAI, 1995-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
1995	14,713	30,000	138,000	167,000	677,000
1996	17,344	30,000	116,000	140,000	593,000
1997	20,681	43,500	101,000	145,000	632,000
1998	24,597	100,000	132,000	190,000	824,000
1999	18,555	77,300	77,300	118,000	710,000
2000	20,439	52,652	73,500	90,000	660,000
2001	17,809	40,000	84,000	102,000	618,000
2002	15,547	25,000	82,600	101,000	695,000
2003	13,792	20,000	66,000	81,000	550,000
2004	16,850	19,000	61,900	75,200	505,000
2005	16,151	19,500	58,500	70,200	560,000
2006	17,947	19,500	59,800	71,800	636,000
2007	18,744	30,000	79,200	95,300	875,000
2008	24,539	50,000	71,700	86,000	820,000
2009	19,549	60,000	71,400	83,500	834,000
2010	20,125	60,000	69,200	83,100	785,000
2011	13,556	41,548	69,300	83,300	791,000
2012	11,366	34,134	70,400	84,500	811,000
2013	17,358	22,699	67,900	81,500	748,000
2014	15,906	24,500	66,293	79,633	745,237
2015	-	24,250	66,130	79,419	736,947

*Flathead Sole removed from Other Flatfish category 1995. Flathead Sole category includes Bering Flounder and Flathead Sole.
[1]Catch data from BSAI SAFE, through November 2014.
[2]TAC, ABC and OFL from annual Specifications.
[3]Biomass corresponds to the annual SAFE report projections.

Stock Assessment: The assessment uses a split-sex, age-based model with length-based formulations for fishery and survey selectivities. This model incorporates fishery data and fishery independent data from trawl surveys. Flathead Sole fall under Tier 3a of the ABC/OFL control rules.

Fishery: 100% of the directed fishery Flathead Sole TAC is allocated among non-AFA trawl catcher processors according to their historic harvest patterns. The fishery mainly occurs from January-June. Primary products are H&G with roe-in and kirimi.



Dover Sole
AFSC, NOAA Fisheries

Other Flatfish

Biology: The Other Flatfish complex consists of 15 species. Starry Flounder, Rex Sole, Longhead Dab, Dover Sole, and Butter Sole comprise the majority of harvested "Other Flatfish."

Data are limited for many of the species in this complex. Rex Sole and Dover Sole are distributed from Baja California, through the BSAI and widely throughout the GOA. Adult Rex Sole and Dover Sole are bottom dwellers and are generally found in water deeper than 300 m. Available natural mortalities are as follows; Rex Sole M=0.17, Dover Sole M=0.085, remaining Other Flatfish M=0.15.

Common Name	Scientific Name
Arctic Flounder	*Liopsetta glacialis*
Butter Sole	*Isopsetta isolepis*
Curlfin Sole	*Pleuronectes decurrens*
Deepsea Sole	*Embassichths bathybius*
Dover Sole	*Microstomus pacificus*
English Sole	*Parophrys vetulus*
Longhead Dab	*Limanda proboscidea*
Pacific Sanddab	*Citharichthys sordidus*
Petrale Sole	*Eopsetta jordani*
Rex Sole	*Glyptocephalus zachirus*
Roughscale Sole	*Clidodoerma asperrimum*
Sand Sole	*Psettichthys melanostictus*
Slender Sole	*Lyopsetta exilis*
Starry Flounder	*Platichthys stellatus*
Sakhalin Sole	*Limanda sakhalinensis*

Stock assessment:

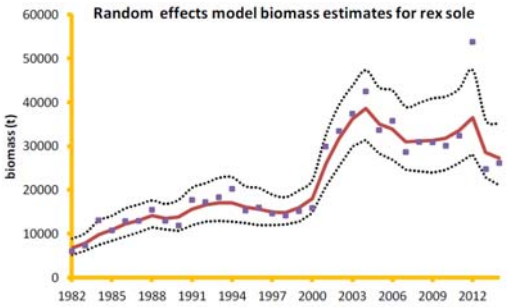
T. Wilderbuer, and D. Nichol. 2014. Assessment of Other Flatfish in the Bering Sea and Aleutian Islands.

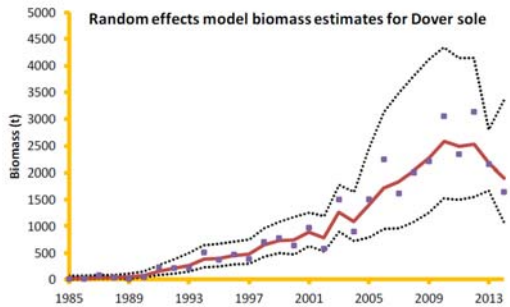
www.afsc.noaa.gov/refm/stocks/assessments.htm

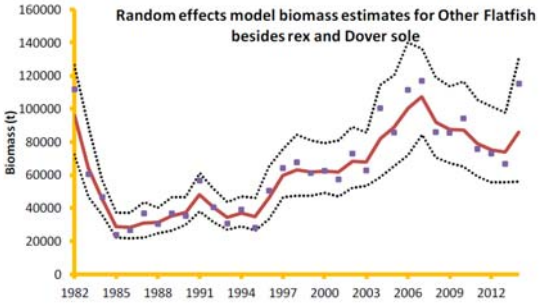
Catch History: Other Flatfish have been incidentally captured in target flatfish fisheries since Japanese and Soviet fleets began fishing in the Bering Sea in 1963. Prior to its removal from the "Other Flatfish" complex in 2002, Alaska Plaice comprised the majority of harvested "Other Flatfish." Catch of Alaska Plaice and "Other Flatfish" peaked in 1988 at 137,418 mt. Since the removal of Alaska Plaice from the complex, annual catches have averaged about 3,500 mt from 2003-2010.

Stock Assessment: The Other Flatfish assessment is based on survey biomass estimates. Other Flatfish are managed under Tier 5 of the ABC/OFL control rules.

Fishery: Other Flatfish are caught primarily by trawl catcher processors targeting higher value flatfish species. Nevertheless, 47% of the other flatfish caught by trawl gear were retained in 2013.







Total catches, pre-season catch specifications, and exploitable of Other Flatfish* in the BSAI, 2002-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
2002	2,631	3,000	18,100	21,800	78,300
2003	2,749	3,000	16,000	21,400	107,000
2004	4,669	3,000	13,500	18,100	90,300
2005	4,599	3,500	21,400	28,500	143,000
2006	3,233	3,500	18,100	24,200	121,000
2007	5,840	10,000	21,400	28,500	149,000
2008	3,623	21,600	21,600	28,800	150,000
2009	2,163	17,400	17,440	23,100	121,000
2010	2,194	17,300	17,300	23,000	121,000
2011	3,176	3,000	14,500	19,500	127,329
2012	3,292	3,200	12,700	17,100	111,000
2013	1,536	3,500	13,300	17,800	114,000
2014	4,385	3,500	12,400	16,700	107,500
2015	-	3,620	13,250	17,700	143,000

*Alaska Plaice removed from Other flatfish complex 2002. Flathead Sole removed from Other Flatfish complex 1995.
[1]Catch data current through November 2014.
[2]1988-2010 TAC, ABC and OFL data from FR Specifications.
[3]Biomass from annual SAFE report projections.

AFSC, NOAA Fisheries

Pacific Ocean Perch

Biology: Pacific Ocean Perch (POP) *Sebastes alutus* distribution extends from Japan around the Pacific Rim south to California. POP are most abundant in AI, GOA and British Columbia and are found primarily offshore along the continental slope in depths from 180-420 m. POP are a demersal species found over cobble substrate. Seasonal changes in depth distribution occur, and adults migrate farther offshore to deeper waters during winter. During late spring and summer, POP migrate to shallower waters inshore for summer feeding. Populations often occur in patchy aggregations. Juveniles feed on calanoid copepods, whereas adults prey on euphausiids, shrimp and squids. POP are prey for Pacific Halibut, Sablefish, Pacific Cod and Arrowtooth Flounder.

AFSC, NOAA Fisheries

POP is a slow-growing, long lived species. Recruitment to trawl fisheries begins at age 5, and they are fully recruited to the fishery around age 20 in recent years. Females reach 50% maturity at 9.1 years and longevity extends to 90 years (oldest recorded 98 years). Natural mortality is estimated to be M=0.062. Females are viviparous, retaining their fertilized eggs within the ovary until larval extrusion. Mating takes place in late fall, and larval extrusion occurs in early spring. Females release from 10,000-300,000 eggs each year, depending on size.

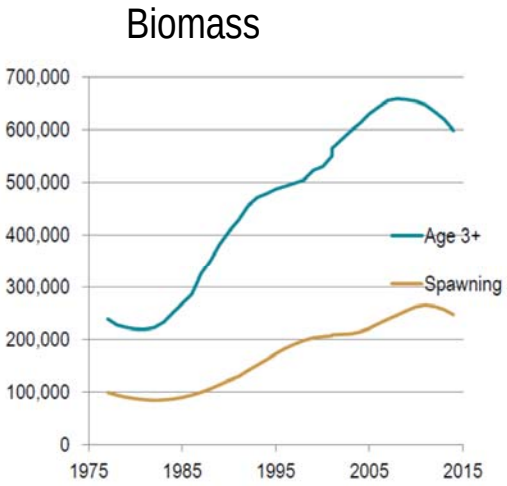
Stock assessment:

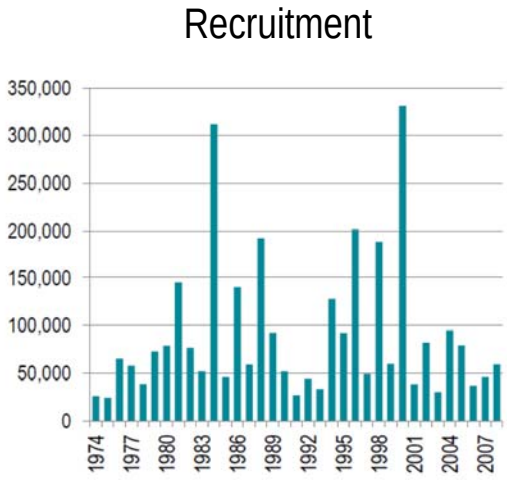
P. Spencer and J. Ianelli. 2014. Assessment of the Pacific ocean perch stock in the Bering Sea and Aleutian Island.

www.afsc.noaa.gov/refm/stocks/assessments.htm

Stock Assessment: The assessment uses an age-structured population dynamics model that incorporates fishery data and fishery independent data from biennial trawl surveys. POP are managed under Tier 3a of the ABC/OFL control rules. The 2015 projected biomass (age 3+) is 577,967 mt. Catch specifications for 2015 are as follows; OFL=42,558 mt, ABC= 34,988 mt, TAC= 32,021 mt. Catch limits (ABC and TAC) are further apportioned by AI subarea.

Estimated biomass declined significantly from 1,131,000 mt in 1960 to 218,000 mt in 1981. Biomass recovered during the late 1980s due to above-average year classes in the AI and





reduced exploitation rates. Estimated biomass averaged 637,000 mt annually from 2004-2014.

Catch History: Soviet and Japanese trawl fisheries targeted POP throughout the 1960s. Catches in the EBS peaked at 47,000 mt in 1961 and in the AI in 1965 at 109,100 mt. Intense harvesting pressure reduced the stock biomass during that time, and catches declined through the mid-1980s. Foreign fisheries were replaced by joint ventures in the late1980s, and the fishery was fully domesticated by 1990, with catches reaching 18,324 mt. Catches averaged 14,4041 mt annually from 2004-2009.

Mark Fina, NPFMC

Fishery: POP are caught primarily in bottom trawl fisheries. Since 1996, the majority of the catch (by weight) occurred in the western Aleutians. In 2014, the discard rate for AI POP was <1%.

Fishery Management: In 1991, the POP and Other Red Rockfish complexes were separated from the POP/Other Rockfish complex. In 2001, the POP complex was separated into three management units; POP, Shortraker/Rougheye, and Sharpchin/Northern Rockfish. In 2002, Sharpchin Rockfish were dropped from the complex due to sparse catches, leaving Northern Rockfish as a single species management unit. In 2004, Shortraker and Rougheye Rockfish were split into single species management units. In 2008, the Rougheye Rockfish category was reclassified as a two species complex, Blackspotted and Rougheye Rockfish.

In 2008, BSAI FMP Amendment 80 allocated 90-98% (depending on sub-area) of the AI Pacific ocean perch TAC, along with flatfish and Atka Mackerel as catch shares among non-AFA trawl catcher processors according to their historic harvest patterns. Like other groundfish, 10.7% of rockfish is first allocated to CDQ groups.

Total catches, pre-season catch specifications, and exploitable biomass of Pacific Ocean Perch in the BSAI, 2004-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
2004	11,896	12,580	13,300	15,800	375,000
2005	10,426	12,600	14,600	17,300	382,000
2006	12,859	12,600	14,800	17,600	385,000
2007	18,468	19,900	21,900	26,100	457,000
2008	17,436	21,700	21,700	25,700	453,000
2009	15,347	18,800	18,880	22,300	402,000
2010	17,852	18,860	18,860	22,400	403,000
2011	24,004	24,700	24,700	36,300	600,600
2012	24,143	24,700	24,700	35,000	594,000
2013	31,393	35,100	35,100	41,900	663,000
2014	25,889	33,122	33,122	39,585	639,505
2015	-	32,021	34,988	42,558	577,967

*POP removed from POP Complex 2004.
[1]Catch data current through November 2014.
[2]TAC, ABC and OFL data from annual Federal Register Harvest Specifications.
[3]Biomass from annual SAFE report projections.

Economics: In 2013, ex-vessel value of catch was $15.9 million for all BSAI Rockfish. Production was 29,170 mt for all rockfish products in Alaska, with a gross value $67.8 million. One catcher vessels and 16 catcher processor vessels participated in rockfish fisheries in the BSAI in 2013. Primary products are H&G and whole fish. Rockfish product price averaged $1.03/lb for at-sea processors and $1.16/lb for shoreside processors.

Ecosytem Components: POP habitat use shifts with ontogeny. Juveniles are thought to remain in more rugged, rocky benthic environments, whereas adults move into deeper, less rough habitats. POP were also found to be associated with epibenthic sea pens and sea whips along the BS slope.

AFSC, NOAA Fisheries

Northern Rockfish

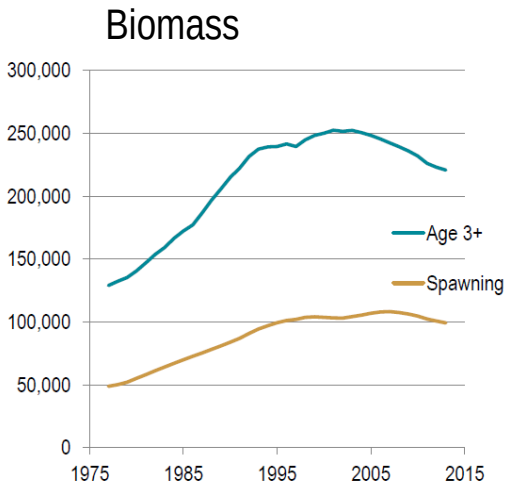
Biology: Northern Rockfish *Sebastes polyspinus* distribution extends from the Kamchatka Peninsula, through the BSAI, GOA and British Columbia. This species is most abundant in the central GOA to the western end of the AI. Northern Rockfish are demersal and are generally found in discrete aggregations with patchy distributions along the outer continental shelf from 75-150 m. Northern Rockfish prey on calanoid copepods, euphausiids and chaetognaths. Based on stomach content data for POP, Pacific Halibut and Sablefish likely prey on Northern Rockfish.

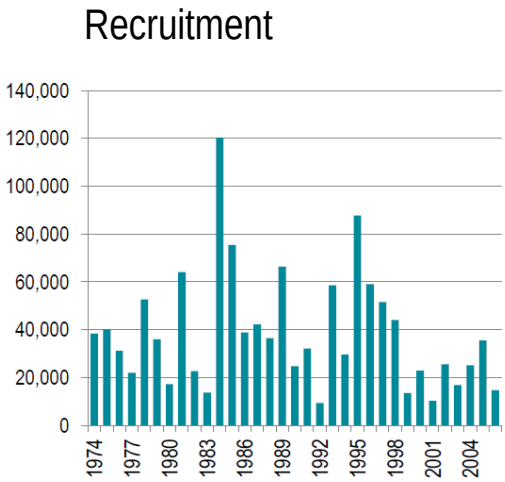
Northern Rockfish is a relatively slow-growing, long lived species. Age at 50% maturity is 8.2 years, and longevity extends to 70 years (the oldest recorded Northern Rockfish was 72 years old). Natural mortality is estimated to be M=0.049. Females are viviparous, retaining their fertilized eggs within the ovary until larval extrusion.

Stock assessment:

P. Spencer and J. Ianelli. 2014. Assessment of Northern Rockfish in the Bering Sea / Aleutian Islands.

www.afsc.noaa.gov/refm/stocks/assessments.htm





Total catches, pre-season catch specifications, and exploitable biomass of Northern Rockfish in the BSAI, 2001-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
2001	-	-	-	-	150,000
2002	-	6,760	6,760	9,020	150,000
2003	-	6,000	7,101	9,468	156,000
2004	4,684	5,000	6,880	8,140	142,000
2005	3,964	5,000	8,260	9,810	200,000
2006	3,824	4,500	8,530	10,100	204,000
2007	4,021	8,190	8,190	9,750	212,000
2008	3,287	8,180	8,180	9,740	212,000
2009	3,111	7,160	7,160	8,540	200,000
2010	4,332	7,240	7,240	8,640	203,000
2011	2,764	4,000	8,670	10,600	201,000
2012	2,479	4,700	8,610	10,500	202,000
2013	2,038	3,000	9,850	12,200	195,000
2014	2,282	2,594	9,761	12,077	196,519
2015	-	3,250	12,488	15,337	218,901

*Northern Rockfish removed from Other Rockfish catetory 2001.
[1]Catch data current through November 2014.
[2]TAC, ABC and OFL from annual Federal Register.
[3]Biomass data corresponds to the annual SAFE report projections.

Catch History: Foreign trawl fisheries were replaced by joint ventures in the 1980s, and the fishery was fully domesticated by 1990. Catches of Northern Rockfish peaked in 1995 at 6,724 mt and ranged from 859-6,724 mt from 1990-2009. Catches from 2004-2009 averaged 3,800 mt annually.

Stock Assessment: The Northern Rockfish assessment uses an age-structured population dynamics model that incorporates fishery data and fishery independent data from biennial trawl surveys. Northern Rockfish are managed under Tier 3a of the ABC/OFL control rules.

Fishery: Northern Rockfish are generally caught in bottom trawl fisheries targeting other species. Catches in the BSAI primarily occur within the Atka Mackerel fishery, and historically, most (>80%) were discarded. Discard rates of Northern Rockfish have been decreasing over time, with an overall 2014 discard rate of 4% in the AI.

Blackspotted Rockfish
AFSC, NOAA Fisheries

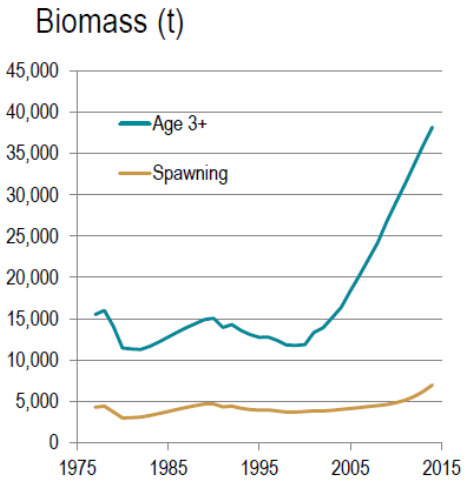
Blackspotted and Rougheye Rockfish

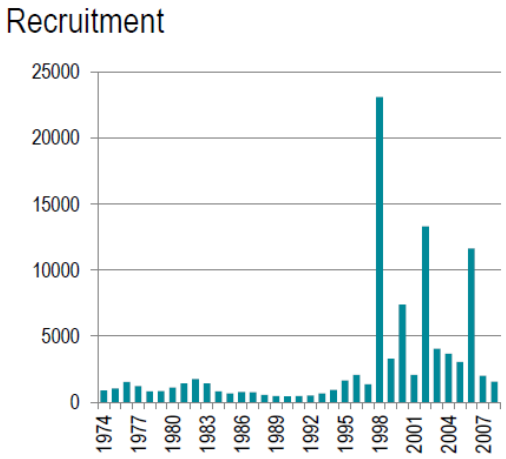
Biology: The Blackspotted and Rougheye Rockfish complex consists of 2 species: Blackspotted Rockfish *S. melanostictus* and Rougheye Rockfish *Sebastes aleutianus*. Blackspotted and Rougheye Rockfish are distributed from Japan, through the BSAI and GOA to southern California. Adults inhabit a narrow band along the upper continental slope at depths from 300-500 m. Data from recent bottom trawl surveys suggests that although the two species distributions overlap, Blackspotted Rockfish are predominant in the AI, while Rougheye Rockfish are more common in the GOA and southeastern BS. Blackspotted and Rougheye Rockfish length at 50% maturity is 44 cm. and longevity may extend to 200 years. Natural mortality is estimated at M=0.033. Blackspotted and Rougheye Rockfish prey primarily on shrimps, squids and myctophids.

Stock assessment:

P. Spencer and C. Rooper. 2014. Assessment of Blackspotted and Rougheye Rockfish Stock Complex in the Bering Sea and Aleutian Islands.

www.afsc.noaa.gov/refm/stocks/assessments.htm





Catch History: Rougheye Rockfish catches were relatively high during the late 1970s and peaked in 1979 at 3,553 mt. Catches then declined in the 1980s as the foreign fishery was reduced. Catches increased again during the 1990s with the domestication of the fishery, averaging 800 mt from 1990-1999. Catches have decreased since 2001, averaging 182 mt from 2004-2009.

Exploitable biomass (mt), pre-season catch specifications (mt), and total catches (mt, including discards) of Blackspotted and Rougheye Rockfish in the BSAI, 2004-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
2004	208	195	195	259	10,400
2005	90	223	223	298	11,900
2006	203	224	224	299	11,900
2007	167	202	202	269	10,800
2008	214	202	202	269	10,800
2009	209	539	539	660	19,000
2010	256	547	547	669	21,200
2011	170	454	454	549	19,319
2012	201	475	475	576	23,400
2013	324	378	378	462	29,800
2014	194	416	416	505	30,447
2015	-	453	453	560	41,666

*Rougheye Rockfish removed from Other Rockfish catetory 2003.
[1]Catch data current through November 2014.
[2]TAC, ABC and OFL from annual Federal Register.
[3]Biomass data corresponds to the annual SAFE report projections issued the preceding year.

Stock Assessment: The Rougheye Rockfish assessment uses an age-structured population dynamics model that incorporates fishery data and fishery independent data from biennial trawl surveys. Rougheye Rockfish are assessed under Tier 3, and Blackspotted Rockfish are assessed under Tier 5 of the ABC/OFL control rules. The catch limits are split into two units: AI (2015 OFL = 516 mt, ABC = 420 mt) and EBS (2015 OFL= 44 mt, ABC = 33 mt).

Fishery: There is no directed fishery for these rockfish species in the BSAI. In the AI, they are primarily taken as incidental catch in the POP trawl fishery, and to a lesser extent the Atka Mackerel trawl fishery and the Pacific Cod longline fishery.

AFSC, NOAA Fisheries

Shortraker Rockfish

Biology: Shortraker Rockfish *Sebastes borealis* are distributed from southeastern Kamchatka, north through the BSAI, the GOA and south to California. Adults are concentrated along the 300-500 m depth interval along the continental slope. Shortraker Rockfish predate on shrimps, squids and myctophids. Shortraker Rockfish is one of the most long-lived species in the northeast Pacific. Age at 50% maturity is 45 cm, and longevity can exceed 140 years. Natural mortality is estimated to be M=0.03. Information on early life history stages of Shortraker Rockfish is limited.

AFSC, NOAA Fisheries

Catch History: Shortraker Rockfish were included in the BS "Other Rockfish" category and AI Shortraker/Rougheye category prior to 2004. Catches of Shortraker Rockfish averaged 300 mt annually from 2009-2014.

Stock Assessment: The Shortraker Rockfish assessment uses a random effects model incorporates fishery data and fishery independent data from biennial trawl surveys. Shortraker Rockfish are managed under Tier 5 of the ABC/OFL control rules.

Stock assessment:

I. Spies, P. Spencer, J. Ianelli, and C. Rooper. 2014. Assessment of the Shortraker Rockfish stock in the Bering Sea and Aleutian Islands.

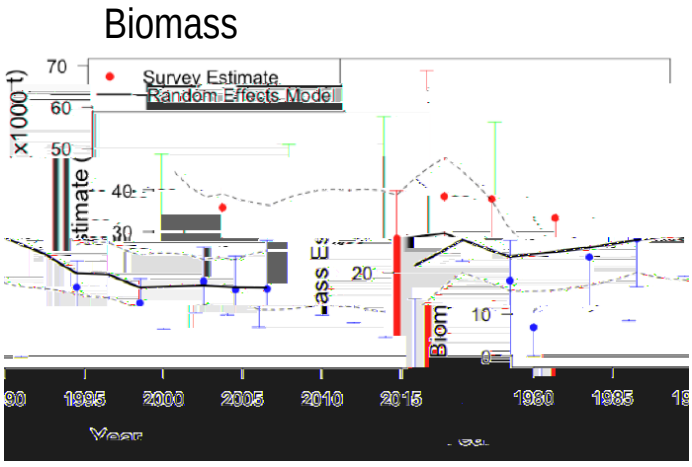
www.afsc.noaa.gov/refm/stocks/assessments.htm

Fishery: Shortraker Rockfish in the Aleutian Islands are primarily taken in rockfish trawl fisheries and longline fisheries targeting Greenland Turbot, Sablefish, and Pacific Cod. The central Aleutians comprised 24% of the 2004-2014 AI Shortraker catch, followed by the western Aleutians (23%) eastern Aleutians (13%), and EBS (35%). In the Eastern Bering Sea, catches of Shortraker Rockfish largely occur in midwater pollock trawl fisheries and longline fisheries for Pacific Cod, Greenland Turbot, and halibut. In 2014, 45% of the Shortraker Rockfish were discarded.

Total catches, pre-season catch specifications, and exploitable biomass of Shortraker Rockfish* in the BSAI, 2004-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
2004	240	526	526	701	23,400
2005	169	596	596	794	26,500
2006	210	580	580	774	25,800
2007	323	424	424	564	18,900
2008	133	424	424	564	18,900
2009	184	387	387	516	17,200
2010	300	387	387	516	17,200
2011	333	393	393	524	17,452
2012	344	393	393	524	17,500
2013	372	370	370	493	16,400
2014	187	370	370	493	16,447
2015	-	518	518	690	23,009

*Shortraker Rockfish removed from SR/RE category 2003.
[1]Catch data current through November 2014.
[2]TAC, ABC and OFL data from annual Federal Register.
[3]Biomass from annual SAFE report projections.



Shortspine Thornyhead Rockfish
AFSC, NOAA Fisheries

Other Rockfish

Biology: The Other Rockfish complex consists of 24 species. The 7 most commonly caught species are listed in the adjacent text box. Shortspine Thornyhead and Dusky Rockfish are the two most abundant species for this complex, accounting for about 80% of the survey biomass and fishery catch. Data are limited for many of the "Other Rockfish" complex species.

Common name	Scientific name
Redbanded Rockfish	*Sebastes babcocki*
Dusky Rockfish	*Sebastes variabilis*
Redstriped Rockfish	*Sebastes proriger*
Yelloweye Rockfish	*Sebastes ruberrimus*
Harlequin Rockfish	*Sebastes variegatus*
Sharpchin Rockfish	*Sebastes zacentrus*
Shortspine Thornyhead	*Sebastolobus alascanus*

Dusky Rockfish distribution extends from Japan into the BSAI and down to central Oregon. Dusky Rockfish are found along the outer continental shelf in patchy distributions. Natural morality is estimated at M=0.09. Dusky Rockfish are viviparous. Dusky Rockfish longevity is approximately 60 years. Shortspine Thornyhead is distributed from Japan to the BSAI down to central California. Shortspine Thornyheads are commonly found at depths from 150-450 m. Natural morality is estimated at M=0.03, and Shortspine Thornyhead longevity extends to 100 years or more. In contrast to many other *Sebastes spp.*, the Shortspine Thornyhead is oviparous.

Stock assessment:

I. Spies and P. Spencer. 2014. Assessment of Other Rockfish stock complex in the Bering Sea / Aleutian Islands.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Catch History: Other Rockfish have been caught in trawl fisheries since Japanese and Soviet fleets began fishing in the BS in the 1960s. Catches of "Other Rockfish" have been tracked since 1977. Catches were relatively high in the BSAI from 1977-1983, ranging annually from 700-2,300 mt. Catches have remained relatively stable from 1993-2009, averaging 677 mt annually.

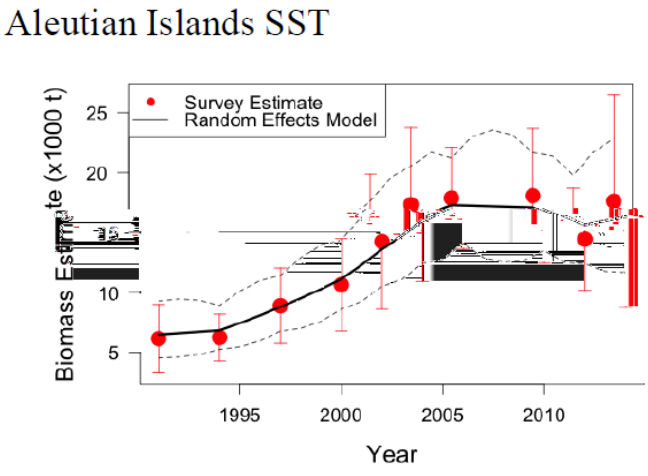
Stock Assessment: Other Rockfish are managed under Tier 5 of the ABC/OFL control rules. Catch specifications for 2015 include further subdivision of ABC limits by area such that BS ABC= 695 mt, and AI ABC=555 mt.

Total catches, pre-season catch specifications and exploitable biomass of Other Rockfish in the BSAI, 1995-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
1995	849	1,022	1,135	1,135	22,800
1996	642	1,304	1,449	1,449	20,700
1997	468	1,087	1,087	1,449	20,700
1998	588	1,054	1,054	1,492	20,300
1999	765	1,054	1,054	1,405	20,030
2000	840	1,054	1,054	1,405	20,030
2001	906	1,037	1,037	1,383	19,780
2002	952	1,037	1,037	1,383	19,780
2003	737	1,594	1,594	2,126	19,780
2004	655	1,594	1,594	2,126	20,400
2005	464	1,050	1,400	1,870	20,400
2006	579	1,050	1,400	1,870	26,600
2007	602	999	999	1,330	26,700
2008	524	999	999	1,330	36,700
2009	487	1,040	1,040	1,380	39,700
2010	657	1,040	1,040	1,380	39,200
2011	892	1,000	1,280	1,700	44,939
2012	816	1,070	1,280	1,700	48,900
2013	758	873	1,160	1,540	47,700
2014	794	773	1,163	1,550	47,700
2015	-	880	1,250	1,667	49,630

[1]Catch data current through November 2014.
[2]TAC, ABC and OFL from annual Federal Register.
[3]Biomass from annual SAFE report projections. Biomass includes Sharpchin Rockfish prior to 2003.

Fishery: There is no directed fishery for Other Rockfish in the BSAI. Dusky Rockfish are primarily taken in the Atka Mackerel fishery in the AI and the EBS Pacific Cod fishery. Shortspine Thornyhead are primarily taken in the AI Sablefish and Greenland Turbot longline fisheries and EBS pollock trawl fishery.



Atka Mackerel

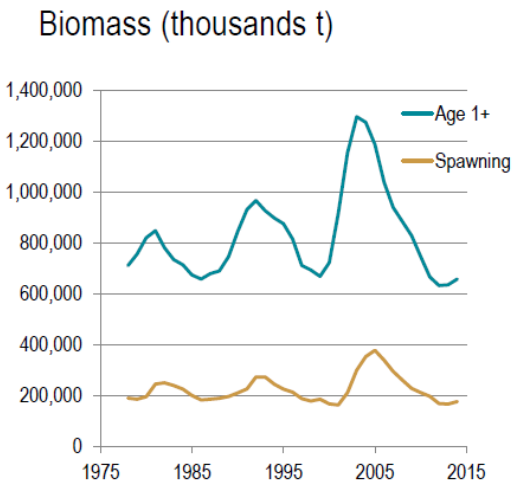
AFSC, NOAA Fisheries

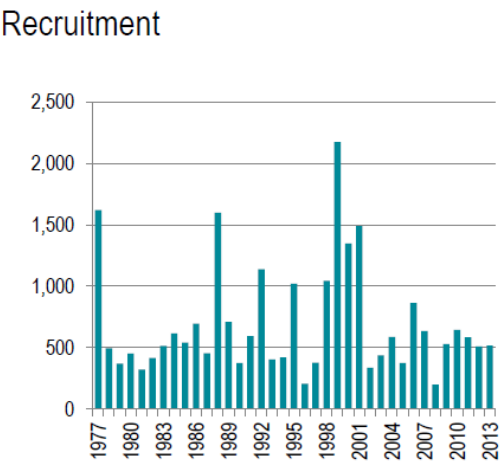
Biology: Atka Mackerel *Pleurogrammus monopterygius* is a schooling, semi-demersal species most commonly found in the AI. Adults occur in large localized aggregations at depths less than 200 m over rough, uneven bottom areas with high tidal currents. Atka Mackerel move off the bottom during daylight hours presumably to feed on their main prey items, euphausiids and copepods. Predators of Atka mackerel include Pacific Cod, Arrowtooth Flounder, Steller sea lions and seabirds. They begin to recruit to the fishery at age 3 and longevity can extend to 15 years. Females reach 50% maturity at 34 cm (3.6 years). Natural mortality is estimated at M=0.30. Atka Mackerel are a substrate spawning fish with male parental care. . During spawning, territorial males become bright yellow. Spawning occurs from July to October, peaking in early September. Eggs are adhesive and deposited in rock crevices in nests guarded by males until hatching, which occurs about 40-45 days later.

Stock assessment:

S. Lowe, J. Ianelli, and W. Palsson. 2014. Assessment of the Atka Mackerel stock in the Bering Sea/Aleutian Islands.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm





Total catches, pre-season catch specifications, and exploitable biomass of Atka Mackerel in the BSAI, 1998-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
1998	57,096	64,300	64,300	134,000	693,144
1999	53,644	66,400	73,300	148,000	668,375
2000	47,229	70,800	70,800	119,000	721,713
2001	61,560	69,300	69,300	138,000	915,282
2002	45,294	49,000	49,000	82,300	1,152,710
2003	59,350	60,000	63,000	99,700	1,295,170
2004	60,564	63,000	66,700	99,700	1,273,540
2005	62,014	63,000	124,000	178,500	1,185,810
2006	61,883	63,000	110,200	147,000	1,037,600
2007	58,831	63,000	74,000	86,900	939,110
2008	58,088	60,700	60,700	71,400	883,655
2009	72,806	76,400	83,800	99,400	828,308
2010	68,619	74,000	74,000	88,200	746,898
2011	51,818	53,080	85,300	101,000	665,884
2012	47,826	50,763	81,400	96,500	631,844
2013	23,181	25,920	50,000	57,700	634,682
2014	31,690	32,322	64,131	74,492	657,228
2015	-	54,500	106,000	125,297	694,421

[1]Catch data current through November 2014.
[2]1988-2010 TAC, ABC and OFL from Federal Register
[3]Biomass data from SAFE report projections.

Catch History: Beginning in 1970, USSR, Russia and Korea harvested Atka Mackerel; foreign catches peaked in 1978 at 24,000 mt. U.S. joint venture fisheries began in 1980 and dominated landings of Atka mackerel from 1982-1988. The last joint venture allocation of Atka mackerel off Alaska was in 1989. Peak domestic catch occurred in 1996 (104,000 mt).

Fishery Management: The Atka Mackerel fishery is heavily regulated to minimize the potential for prey competition with Steller sea lions, including seasonal allowances of TAC and spatial distribution of the fishery away from critical habitat. Since 2008, the fishery has operated as a catch share fishery, with participants operating as cooperatives.

Stock Assessment: The Atka Mackerel assessment model incorporates fishery data and fishery independent data from trawl surveys. Atka Mackerel fall under Tier 3a of the ABC/OFL control rules.

Fishery: Atka Mackerel are targeted by trawl catcher processors. Products include whole fish and H&G.

AFSC, NOAA Fisheries

Biology: There are 14 species in the "Squid" complex in the BSAI. The most commonly caught species in the BS is the Magistrate Armhook Squid *Berryteuthis magister.* Squid in the BSAI are generally pelagic, however, the North Pacific bobtail squid, and magistrate armhook squid are often found in close proximity to the bottom. Most species are associated with the slope and basin, with the highest species diversity along the slope region of BS between 200–1500 m.

Chiroteuthid sp.	*Chiroteuthis calyx*
Glass squid sp.	*Belonella borealis*
Glass squid sp.	*Galiteuthis phyllura*
Minimal Armhook Squid	*Berryteuthis anonychus*
Magistrate Armhook Squid	*Berryteuthis magister*
Armhook squid	*Eogonatus tinro*
Boreopacific Armhook Squid	*Gonatopsis borealis*
Berry Armhook Squid	*Gonatus berryi*
Armhook squid sp.	*Gonatus madokai*
Armhook squid sp.	*Gonatus middendorffi*
Clawed Armhook Squid	*Gonatus onyx*
Robust Clubhook Squid	*Moroteuthis robusta*
Boreal Clubhook Squid	*Onychoteuthis borealijaponicus*
North Pacific Bobtail squid	*Rossia pacifica*

Squids are productive, short-lived animals. Squid display rapid growth, patchy distribution and variable recruitment patterns. Populations of the Magistrate Armhook Squid are complex and are made up of multiple cohorts spawned throughout the year. Magistrate squid are dispersed throughout the summer months in the western BS but form large, dense schools over the continental slope between September and October. Three seasonal cohorts are identified in the region; summer-hatched, fall-hatched and winter-hatched. Growth, maturation and mortality rates vary between cohorts. Juvenile and adult magistrate squid also appear to be separated vertically in the water column. Most squid are generally thought to live less than 2-3 years.

Stock assessment:

O. Ormseth. 2014. Assessment of the squid stock complex in the Bering Sea and Aleutian Islands.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Catch history: Japanese and Korean trawl fisheries targeted squid during the 1960s and 1970s; catches peaked in 1978 at 9,000 mt. Catches have remained below 2,000 mt since 1984.

Stock Assessment: Squid fall under Tier 6 of the OFL/ABC control rules, and catch specifications are therefore based on the average catch of squid between1978-1995. Squid estimated biomass is unknown due to a lack of reliable survey data. Catch specifications for squid in 2015 are as follows: OFL= 2,620 mt, ABC= 1,970 mt, TAC= 400 mt.

Total catches and pre-season catch specifications of Squid in the BSAI, 2007-2015.

Year	Catch	TAC	ABC	OFL
2007	1,188	1,970	1,970	2,620
2008	1,542	1,970	1,970	2,620
2009	360	1,970	1,970	2,620
2010	410	1,970	1,970	2,620
2011	336	425	1,970	2,620
2012	688	425	1,970	2,620
2013	300	700	1,970	2,620
2014	1,668	310	1,970	2,620
2015	-	400	1,970	2,620

*Squid biomass data unavailable.

Fishery: Squid are not a target fishery, and are primarily taken as incidental catch in the pelagic trawl pollock fishery. Discard rates have ranged from about 40 to 70 % in recent years.

Ecosystem Components: Squid important components in the diets of many seabirds, fish and marine mammals. Overall fishing removals of squid are very low (especially relative to natural predation).

Bigmouth Sculpin
AFSC, NOAA Fisheries

Sculpins

Biology: There are a total of 48 species of sculpins in the BSAI, with 41 species identified in the Eastern Bering Sea and 22 species in the Aleutian Islands region. Sculpins occupy all benthic habitats and depths. The six species with the highest biomasses include Great Sculpin (*Myoxocephalus polyacanthocephalus*), Threaded Sculpin (*Gymnocanthus pistillger*) Plain Sculpin (*M. jaok*), Warty Sculpin (*M. verrucosus)*, Bigmouth Sculpin (*Hemitripterus bolini)*, and Yellow Irish Lord (*H. jordani*).

There is limited BSAI-specific data on age and growth, maturity, or reproductive biology for sculpins identified in this management region. Most if not all sculpins lay adhesive eggs in nests, and many exhibit parental care for eggs.

Stock assessment:

I. Spies, D. Nichol, O. Ormseth and T. TenBrink. 2014. Assessment of the sculpin stock comples in the Bering Sea and Aleutian Islands.

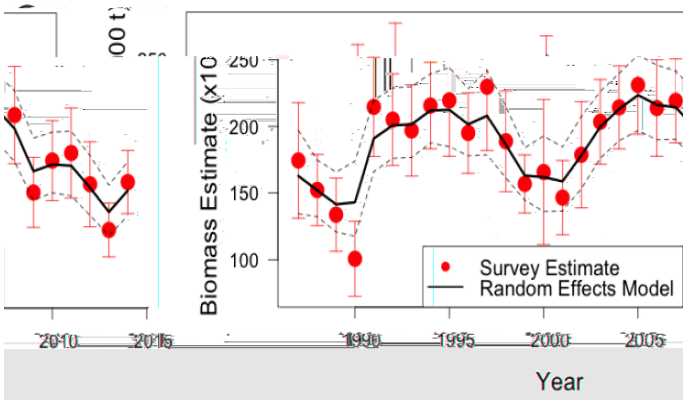
http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Catch history: Based on total catch estimates from 1998-2008, sculpins comprised 19-28% of the total Other Species catch during this time period. Catches from 2000-2008 ranged from 5,735 mt to 7,670 mt per year.

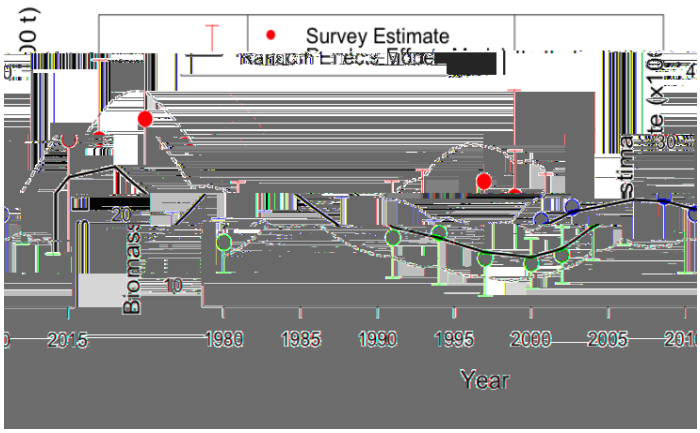
Stock Assessment: Prior to 2011, sculpins were managed as part of the BSAI Other Species complex that included sculpins, skates, sharks, and octopuses. Sculpins fall under Tier 5 of the OFL/ABC control rules. A complex wide natural mortality rate of M=0.29 is applied.

Fishery: There is currently no target fishery for sculpins in the BSAI, and virtually all are discarded or made into meal. Incidental catches of sculpins are taken in the Pacific Cod and Atka Mackerel fisheries in the AI, and in the Pacific Cod rock sole, and Yellowfin Sole fisheries in the BS.

EBS shelf sculpins



Aleutian Islands sculpins



Total catches, pre-season catch specifications, and exploitable biomass of Sculpins in the BSAI, 2008-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
2008	6,682	-	-	-	-
2009	5,915	-	-	-	-
2010	4,227	-	-	-	-
2011	5,146	5,200	43,700	58,300	208,000
2012	5,420	5,200	43,700	58,300	208,000
2013	5,194	5,600	42,300	56,400	216,000
2014	4,204	5,750	42,318	56,424	215,713
2015	-	4,700	42,852	56,487	194,783

[1]Catch data current through November 2014.
[2]TAC, ABC and OFL from SAFE
[3]Biomass data from SAFE report projections.

Alaska Skate
Beth Matta
AFSC, NOAA Fisheries

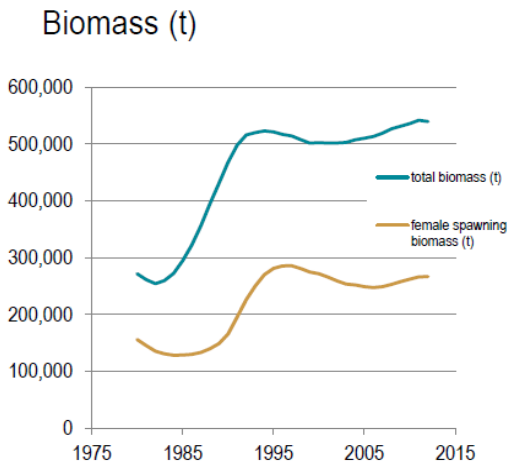
Skates

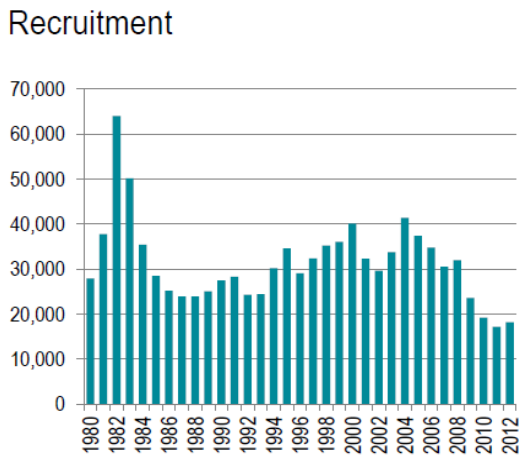
Biology: Skates are cartilaginous fishes with large pectoral "wings" attached to the sides of the head. There are 15 species of skates in the BSAI in four genera, *Raja*, *Bathyraja*, *Beringraja*, and *Amblyraja*. The EBS shelf skate complex is dominated by a single species, the Alaska Skate (*Bathyraja parmifera*), occurring at depths of 50 to 200 m. The Bering or sandpaper Skate (*B. interrupta*) is the next most common species on the EBS shelf, and is distributed on the outer continental shelf. The dominant species on the EBS slope is the Aleutian Skate (*B. aleutica*). A number of other species are found on the EBS slope in significant numbers, including the Alaska Skate, Commander Skate (*B. lindbergi*), Whiteblotched Skate (*B. maculata*), Whitebrow Skate (*B. minispinosa*), roughtail Skate (*B. trachura*), and mud Skate (*B. taranetzi*). Two rare species, the Deepsea Skate (*B. abyssicola*) and Roughshoulder Skate (*Amblyraja badia*), have only recently been reported from EBS slope bottom trawl surveys. The skate complex in the AI is quite distinct from the EBS shelf and slope complexes, with different species dominating the biomass, as well as at least one endemic species, the recently described Butterfly Skate, *Bathyraja mariposa*, as well as the newly identified Leopard Skate. In the AI, the most abundant species is the Whiteblotched Skate, *B. maculate.*

Stock assessment:

O. Ormseth. 2014. Assessment of the skate stock complex in the Bering Sea and Aleutian Islands.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm





Skate life cycles are similar to sharks, with relatively low fecundity, slow growth to large body sizes, and dependence of population stability on high survival rates of a few well developed offspring. Alaska Skates reach 50% maturity at ages 9-10 years, and have life spans of up to 17 years, based on observations to date.

Total catches, pre-season catch specifications, and exploitable biomass of Skates in the BSAI, 2008-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
2008	20,469	-	-	-	-
2009	19,442	-	-	-	634,000
2010	16,515	-	-	-	608,000
2011	23,005	16,500	31,500	37,800	612,000
2012	23,873	24,700	32,600	39,100	645,000
2013	26,165	24,000	38,800	45,800	745,000
2014	21,319	26,000	35,383	41,849	698,204
2015	-	25,700	41,849	49,575	628,314

[1]Catch data current through November 2014.
[2]TAC, ABC and OFL from SAFE
[3]Biomass from SAFE report projections.

Stock Assessment: Until 2011, skate species were managed as part of the "Other species" management category within the BSAI FMP. Catch specifications for the Alaska Skate is based on Tier 3a, and for other skates Tier 5 of the ABC/OFL control rules. Total skate biomass is projected at 628,314 mt in 2015.

Fishery: There is currently no target fishery for skates in the BSAI. Most of the skate is caught incidentally in the hook and line fishery for Pacific Cod, and trawl fisheries for pollock and flatfish. About 35% of the skate catch is retained.

Salmon Shark
AFSC, NOAA Fisheries

Sharks

Biology: The shark complex consists of 8 species. The species most likely to be encountered in BSAI fisheries and surveys are the Pacific Sleeper Shark (*Somniosus pacificus*), the Spiny Dogfish (*Squalus acanthias*), and the Salmon Shark (*Lamna ditropis*). Sharks are long-lived species with slow growth to maturity, a large maximum size, and low fecundity. Spiny Dogfish tend to segregate by sex and by size. Age-at-50%-maturity for Spiny Dogfish is estimated to be 35 years for females, and 19 years for males. Spiny Dogfish may live up to 100 years, and exhibit very slow growth rates. Spiny dogfish are aplacental viviparous, and embryos are nourished solely by their yolk sac, with a gestation period of 18-24 months. Pacific Sleeper Sharks can attain large size, with maximum lengths of 440 cm for females and 400 cm for males, although there are reports of individuals of 700 cm in length. Like Spiny Dogfish, Pacific Sleeper Sharks are aplacental viviparous. Salmon Sarks also grow relatively large, attaining a maximum length of 215 cm precaudal length for females and about 190 cm for males. Maximum ages for Salmon Sharks are 17 years for males and 30 years for females. They are thought to live up to 30 years.

Stock assessment:

C. Tribuzio, K. Echave, C. Rodgveller, and P-J. Hulson. 2014. Assessment of the shark complex in the Bering Sea and Aleutian Islands.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Catch history: Incidental catches of shark species in the BSAI fisheries have been very small compared to catches of target species. Sharks have only been reported to species in the catch since 1997. Pacific Sleeper Shark make up about 60% of the total shark catch in the BSAI, followed by unidentified sharks at 20%, Salmon Shark at 9% and Spiny Dogfish at 2%.

Fishery Management: Shark species were managed as part of the "Other species" management category until 2011, when sharks became a separate management complex with shark specific OLF, ABC, and TAC.

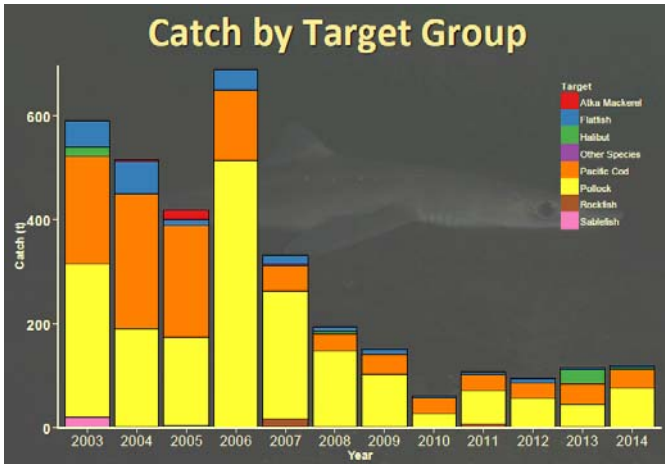
Stock Assessment: Sharks fall under Tier 6 of the OFL/ABC control rules, and catch specifications are based on the maximum catch from 1997-2007 (1,362 mt in 2002). Sharks estimated biomass is undefined due to a lack of reliable survey data. Directed fishing for this species has not been authorized.

Fishery: There is currently no target fishery for sharks in federally or state managed waters of the BSAI, and most incidentally captured sharks are not retained. Spiny Dogfish are at the northern edge of their range in the BSAI but a few are taken in Pacific Cod longline fishery. About majority of the salmon sharks are taken in the Pollock fishery. Sleeper Sharks are taken mainly in the Pacific Cod and Pollock fisheries.

Total catches, pre-season catch specifications, and exploitable biomass of Sharks in the BSAI, 2008-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
2008	194	-	-	-	-
2009	151	-	-	-	-
2010	60	-	-	-	-
2011	107	50	1,020	1,360	Unknown
2012	96	200	1,020	1,360	Unknown
2013	116	100	1,020	1,360	Unknown
2014	184	125	1,022	1,363	Unknown
2015	-	125	454	605	Unknown

[1]Catch data current through November 2014.
[2]TAC, ABC and OFL from SAFE
[3]Biomass from SAFE report projections.



Giant Pacific Octopus
Rex Murphy

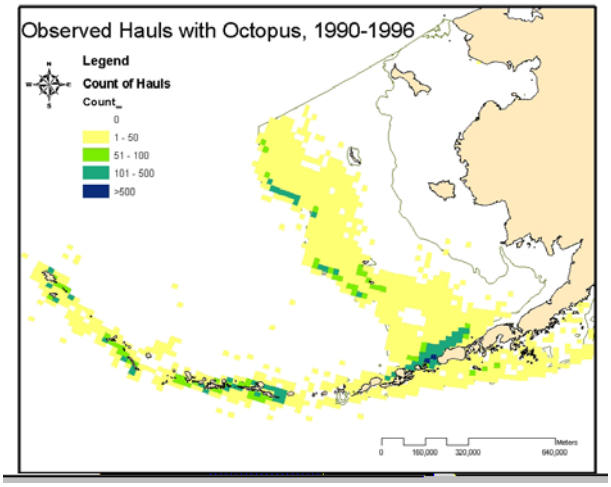
Octopus

Biology: There are at least 7 species of octopus present in the BSAI, and the species composition both of natural communities and commercial harvest is unknown. Some species, particularly *G. boreapacifica*, are primarily distributed at greater depths than are commonly fished. At depths less than 200 meters *E. dofleini* appears to be the most abundant species.

Giant Pacific Octopus	*Enteroctopus dofleini*
Smoothskin Octopus	*Benthoctopus leioderma*
Flapjack Devilfish	*Opisthoteuthis californiana*
Small Pelagic Octopus	*Japatella diaphana*
Stubby Octopus	*Sasakiopus salebrosus*
A deepwater octopus	*Graneledone boreopacifica*
A deepwater octopus	*Benthoctopus oregonesis*

Octopus life spans are either 1-2 years or 3-5 years depending on the species. *E. dofleini* are estimated to mature at 1.5 – 3 years. *E. dofleini* is a terminal spawner, females die after the eggs hatch while males die shortly after mating. The fecundity of this species in Japanese waters has been estimated at 30,000 to 100,000 eggs per female. Based on larval data, *E. dofleini* is the only octopus in the Bering Sea with a planktonic larval stage.

Fishery Management: Until 2011, octopus were managed as part of the "Other species" management category within the BSAI FMP. Octopuses have been managed as a single complex with specific OFL, ABC, and TAC since 2011.



Stock Assessment: Octopus fall under Tier 6 of the OFL/ABC control rules. Catch specifications are based on a natural mortality approach using the geometric mean of annual consumption of octopus by its main predator, Pacific Cod. There are no historical catch records for octopus, and their biomass has not been estimated. Catch specifications for octopus in 2015 are as follows; OFL=3,452 mt, ABC=2,589 mt, TAC=400 mt. Directed fishing for this species is normally prohibited each year.

Stock assessment:

M.E. Conners, C. Conrath, and K. Aydin. 2014. Assessment of the Octopus Stock Complex in the Bering Sea and Aleutian Islands.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Total catches, pre-season catch specifications, and exploitable biomass of Octopus in the BSAI, 2008-2015.

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
2008	212	-	-	-	-
2009	72	-	-	-	-
2010	177	-	-	-	-
2011	587	150	396	528	Unknown
2012	86	900	2,590	3,450	Unknown
2013	223	500	2,590	3,450	Unknown
2014	233	225	2,590	3,450	Unknown
2015	-	400	2,589	3,452	Unknown

[1]Catch data current through November 2014.
[2]TAC, ABC and OFL from SAFE
[3]Biomass from SAFE report projections.

Fishery: There is currently no target fishery for octopus in the BSAI. Octopus are taken as incidental catch in trawl, longline, and pot fisheries throughout the BSAI; the highest catch rates are from Pacific Cod pot fisheries in the three statistical areas around Unimak Pass. The species composition of the octopus community is not well documented, but recent research indicates that the giant Pacific Octopus *Enteroctopus dolfleini* is most abundant in shelf waters and predominates in commercial catch.

Walleye Pollock
AFSC, NOAA Fisheries

Walleye Pollock

Biology: Walleye Pollock *Gadus chalcogrammus* is an abundant fish species in the GOA, found throughout the shelf regions at depths less than 300 m. Seasonal migrations occur from overwintering areas along the outer shelf to shallower waters (30-140 m) to spawn. Pollock feed on copepods, euphausiids and fish and are prey for other fish, marine mammals and seabirds. Pollock begin to recruit to the fishery at age 3 and live to 12 years or more (the oldest Pollock recorded in the GOA is 22 years). Females reach 50% maturity at approximately 43 cm (ages 4-6), and adults produce 60,000 to 400,000 pelagic eggs. Annual natural mortality is estimated to be M=0.30. Peak spawning in the GOA occurs from February to March in the Shumagin Islands and late March in the Shelikof Strait.

Catch History: Foreign fisheries for pollock developed in the GOA in the early 1970s and peak foreign catches occurred in 1981 at 130,324 mt. A late spawning aggregation was discovered in Shelikof Strait in 1981, and a valuable pollock roe fishery was established in the region. U.S. vessels entered the pollock fishery in 1977 and by 1988, the fishery was fully harvested by the domestic fleet.

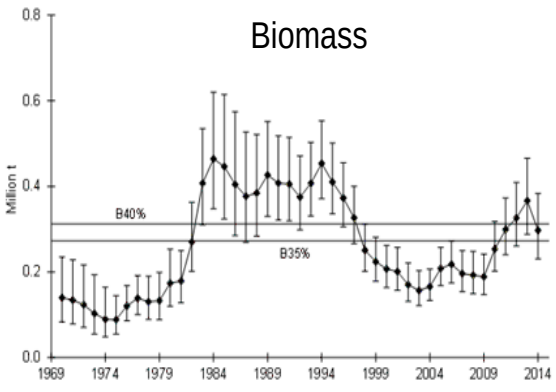
AFSC, NOAA Fisheries

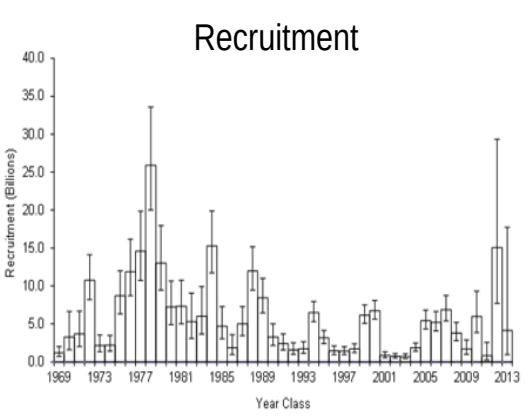
Fishery Management: The GOA pollock fishery is regulated under the GOA groundfish FMP through permits and limited entry, catch quotas (TACs), seasons, in-season adjustments, gear restrictions, closed waters, bycatch limits and rates, allocations, regulatory areas, record keeping, reporting requirements and observer monitoring. In 1993, 100% of GOA pollock was apportioned to the inshore sector (vessels that catch fish to deliver to shore based processing plants). In 1998, trawl gear was prohibited east of 140°W, and 100% retention was required for pollock.

Stock assessment:

M. Dorn, K. Aydin, D. Jones, W. Palsson, K. Spalinger. 2014. Assessment of the Walleye Pollock stock in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm





Since 1992, GOA pollock catch has been apportioned spatially and temporally to reduce fishery impacts on Steller sea lions (SSLs). Additional SSL protection measures implemented in 2001 established 4 seasons in the Central and Western GOA beginning in January, March, August and October (25% TAC to each season). Additionally, a harvest control rule was implemented that requires suspension of directed pollock fishing if spawning biomass declines below 20% of unfished spawning biomass.

Stock Assessment: The GOA pollock assessment is based on an age-structured model. This model incorporates fishery data and fishery independent data from annual bottom trawl surveys and acoustic trawl surveys. GOA pollock fall under Tier 3b of the ABC/OFL control rules. The 2015 age 3+ biomass is estimated at 1,940,031 mt. Gulf wide catch specifications for 2015 are as follows; OFL=273,378 mt, ABC=203,934 mt, TAC=199,151 mt. The catch limits are further spatially apportioned into Western, Central area 62, Central area 63, West Yakutat, and Eastern GOA.

Total catches, pre-season catch specifications, and exploitable biomass of age 3+ Walleye Pollock in the GOA, 1980-2015 (in mt).

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
1980	115,158	-	-	-	1,743,000
1981	147,818	-	-	-	2,694,000
1982	169,045	-	-	-	2,935,000
1983	215,625	-	-	-	2,771,000
1984	307,541	-	-	-	2,425,000
1985	286,900	293,250	-	-	1,983,000
1986	86,910	116,600	116,600	-	1,624,000
1987	68,070	108,000	112,000	-	1,996,000
1988	63,391	93,000	93,000	-	1,910,000
1989	75,585	60,200	63,400	-	1,731,000
1990	88,269	93,000	93,000	-	1,575,000
1991	100,488	133,400	133,400	-	1,757,000
1992	90,858	87,400	99,400	227,900	2,118,000
1993	108,909	114,400	160,400	295,020	1,845,000
1994	107,335	109,300	109,300	246,600	1,539,000
1995	72,618	65,360	65,360	280,400	1,286,000
1996	51,263	54,810	54,810	86,400	1,077,000
1997	90,130	79,980	79,980	112,270	1,108,000
1998	125,460	124,730	130,000	186,100	982,000
1999	95,638	100,920	100,920	146,000	782,000
2000	73,080	100,000	100,000	139,370	689,000
2001	72,077	95,875	105,810	126,360	655,000
2002	51,934	58,250	58,250	84,0 90	821,000
2003	50,684	54,350	54,350	78,020	1,025,000
2004	63,844	71,260	71,260	99,750	835,000
2005	80,978	91,710	91,710	153,030	687,000
2006	71,976	86,807	86,807	118,309	588,000
2007	52,714	68,307	68,307	95,429	561,000
2008	52,584	51,940	51,940	83,150	856,000
2009	44,247	49,900	49,900	69,630	1,292,000
2010	76,745	84,745	84,745	115,536	1,468,000
2011	81,357	86,970	86,970	118,030	1,367,000
2012	103,982	116,444	116,444	158,082	1,263,000
2013	96,363	121,046	121,046	165,183	1,321,000
2014	139,753	174,976	174,976	228,831	1,201,000
2015	-	199,151	203,934	273,378	1,940,031

[1]Catch data through November 8, 2014.
[2]1988-2014 TAC, ABC and OFL data from annual Federal Register Harvest Specifications. Does not include EYAK and SEO.
[3]Biomass from annual SAFE report projections.

Age 3+ GOA pollock model-estimated biomass was high during the early 1980s. Biomass declined through the late 1980s and dropped below target as a result of below average recruitment. More recently, the stock size has shown a strong upward trend, and is now close to target.

Fishery: The directed fishery is prosecuted by vessels using trawl gear, primarily with pelagic trawls. Small amounts of pollock are also taken as bycatch in other fisheries. A total of 91 catcher vessels participated in the 2013 GOA directed pollock trawl fishery.

Economics: In 2013, ex-vessel value of the catch was $36.4 million for GOA pollock. Average ex-vessel price paid for GOA pollock in 2013 was $0.18/lb. round weight. Primary products were surimi, roe, fillets, H&G, and other products.

Ecosystem Components: In the GOA, the main predators of pollock are Arrowtooth Flounder, Pacific Halibut, Pacific Cod, and Steller sea lions. For pollock less than 20 cm, Arrowtooth Flounder represents close to 50% of total mortality, and the abundance of Arrowtooth Flounder has increased dramatically in the GOA since the 1980s.

Pacific Cod
Diana Evans, NPFMC

Pacific Cod

Biology: Pacific Cod *Gadus macrocephalus* is a demersal species found in the eastern BS, the AI, and GOA down to central California. Juveniles are typically distributed over the inner continental shelf at depths from 60-150 m. Adults are found at depths from shoreline to 500 m. Mature fish tend to concentrate on the outer continental shelf and prefer muddy or sandy sediment. Juveniles feed primarily on small invertebrates and euphausiids. Adult Pacific Cod feed on fish such as juvenile pollock, and invertebrates such as polychaetes, amphipods and crangonid shrimp. Predators of Pacific Cod include adult Pacific Cod, Pacific Halibut, Salmon Shark and Steller Sea Lion.

Pacific Cod are a relatively fast growing and short-lived fish. Longevity can extend to 19 years. Pacific Cod begin to recruit to the fishery around age 3 and are 50% recruited by age 7. Natural mortality is estimated at M=0.38. Females reach 50% maturity at 50 cm (4-5 years) and larger fish can produce more than 1 million eggs. Adults form spawning aggregations from January to May in the GOA.

Catch History: Pacific Cod were harvested by foreign fleets targeting higher-value species during the 1970s. By 1976, catches increased to 6,800 mt, and the foreign fishery peaked in 1981 at 35,000 mt. A small joint venture fishery existed through 1988, averaging about 1,400 mt annually. The domestic fishery increased through 1986 and tripled its catch in 1987 to a catch of nearly 31,000 mt. The GOA Pacific Cod fishery was fully harvested by domestic vessels in 1987.

SeaAlliance/AGDB

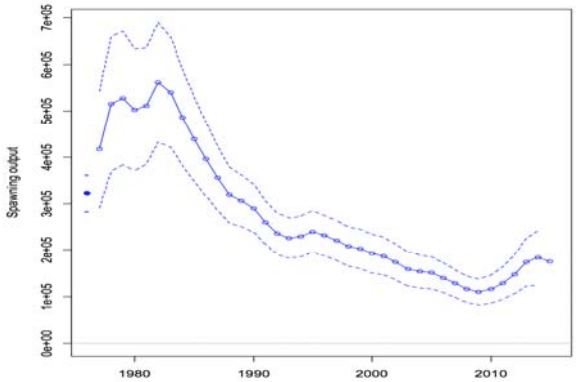
Stock assessment:

T. A'mar and W. Palsson 2014. Assessment of the Pacific Cod stock in the Gulf of Alaska.

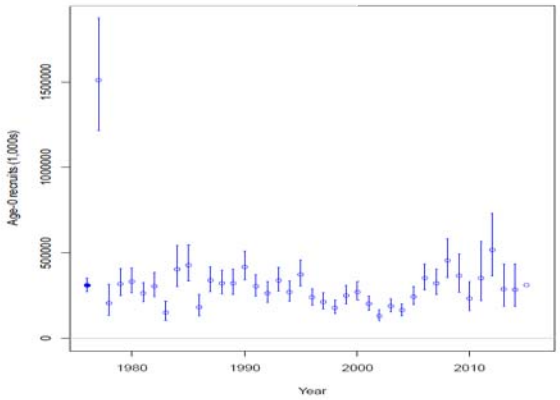
http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Fishery Management: The Pacific Cod fishery is regulated under the GOA groundfish FMP through permits, limited entry, catch quotas (TACs), seasons, in-season adjustments, gear restrictions, closed waters, bycatch limits and rates, allocations, regulatory areas, record keeping, reporting requirements and observer monitoring. In 1992, Amendment 23 allocated 90% of GOA Pacific Cod to the inshore sector and 10% to the offshore sector. In 1998, 100% retention of Pacific Cod was required.

Biomass



Recruitment



Separate TACs are currently identified for Pacific Cod in the Western, Central and Eastern GOA regulatory areas. Within the Central and Western Regulatory Areas, 60% of each component's portion of the TAC is allocated to the A season (January 1 through June 10) and the remainder is allocated to the B season (June 11 through December 31). Longline and trawl fisheries are also associated with a Pacific Halibut mortality limit, which can constrain the magnitude and timing of harvests taken by these two gear types.

Stock Assessment: The Pacific Cod assessment is based on a Stock Synthesis model that uses both length-structured and age-structured data. This model incorporates fishery data and fishery independent data from the NMFS trawl surveys. Pacific Cod catch limits are set by a Tier 3a ABC/OFL control rule. The 2014 age 3+ biomass is estimated at 422,000 mt for GOA Pacific Cod. Since 1997, the Council has reduced the TAC in each area by up to 25% to account for removals in the State waters Pacific Cod fishery.

Total catches, pre-season catch specifications, and exploitable biomass of age 3+ Pacific Cod in the GOA, 1980-2015 (in mt).

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
1980	35,345	60,000	-	-	-
1981	36,131	70,000	-	-	-
1982	29,465	60,000	-	-	-
1983	36,540	60,000	-	-	-
1984	23,896	60,000	-	-	-
1985	14,428	60,000	136,000	-	-
1986	25,012	75,000	125,000	-	-
1987	32,939	50,000	125,000	-	-
1988	33,802	80,000	99,000	-	481,700
1989	43,293	71,200	71,200	-	558,700
1990	72,517	90,000	90,000	-	498,044
1991	76,328	77,900	77,900	-	424,100
1992	80,747	63,500	63,500	87,600	363,000
1993	56,488	56,700	56,700	78,100	324,000
1994	47,485	50,400	50,400	71,100	296,000
1995	68,985	69,200	69,200	126,000	573,000
1996	68,280	65,000	65,000	88,000	557,000
1997	77,018	69,115	81,500	180,000	650,000
1998	72,525	66,060	77,900	141,000	785,000
1999	81,785	67,835	84,400	134,000	648,000
2000	66,560	59,800	76,400	102,000	567,000
2001	51,542	52,110	67,800	91,200	526,000
2002	54,483	44,230	57,600	77,100	428,000
2003	52,579	40,540	52,800	70,100	428,000
2004	56,625	48,033	62,810	102,000	484,000
2005	47,585	44,433	58,100	86,200	472,000
2006	47,854	52,264	68,859	95,500	453,000
2007	51,428	52,264	68,859	97,600	375,000
2008	58,949	50,269	64,493	88,660	233,310
2009	52,931	41,807	55,300	66,000	520,000
2010	78,027	59,563	79,100	94,100	701,200
2011	84,841	65,100	86,800	102,600	428,000
2012	78,022	65,700	87,600	104,000	521,000
2013	51,792	60,600	80,800	97,200	449,300
2014	59,633	64,738	88,500	107,300	422,000
2015	-	75,202	102,850	140,300	583,800

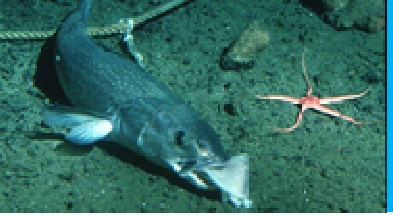
[1] Catch data f through November 2014, includes state waters fishery catch.
[2]TAC, ABC and OFL data from Federal Register.
[3]Biomass from annual SAFE report projections issued the preceding year.

Estimated biomass of Pacific Cod peaked in the early 1980s, and then slowly declined as the exceptional 1977 year class gradually exited the population. Estimated biomass appears to be increasing in the short term due to above average recruitment in recent years.

Fishery: The Pacific Cod fishery is the second major species (after pollock) targeted in the commercial groundfish catch in the GOA. Pacific Cod are taken with trawl, longline, pot and jig gear. Participants in the 2009 GOA directed fishery included 240 vessels using longlines or jig gear, 125 vessels using pot gear, and 64 vessels using trawl gear.

Economics: In 2013, ex-vessel value of Pacific Cod catch in the GOA was $37.2 million, and ex-vessel fixed-gear price averaged $0.27/lb round weight. Primary products include whole fish, H&G and fillets.

Ecosystem components: Pacific Cod are a prey item for Steller Sea Lions in the GOA and BSAI.



Sablefish
AFSC, NOAA Fisheries

Sablefish

Biology: Sablefish *Anoplopoma fimbria* distribution extends from the northern Mexico through the Gulf of Alaska, the AI and into the BS. Adult Sablefish are generally found at depths greater than 200 m along the continental slope, shelf gullies and deep fjords. Juvenile Sablefish (less than 40 cm) spend the first 2-3 years farther inshore along the continental shelf and begin to move out to the continental slope around age 4. Young-of-the-year Sablefish feed primarily on euphausiids and copepods while adults are more opportunistic feeders, relying more heavily on pollock, Pacific Herring, Pacific Cod, squid and jellyfish. Coho and Chinook Salmon are the main predators of young-of-the-year Sablefish.

Sablefish are relatively long lived. They begin to recruit to the fishery at age 4 or 5 and longevity often reaches 40 years (the oldest recorded Sablefish in Alaska was 94 years old). Female size at 50% maturity is around 65 cm (approximately age 6.5). Females are slightly larger than males, and natural mortality is estimated at M=0.10. Off Alaska, Sablefish spawn at depths near the edges of the continental slope (500 m) between January and April.

Stock assessment:

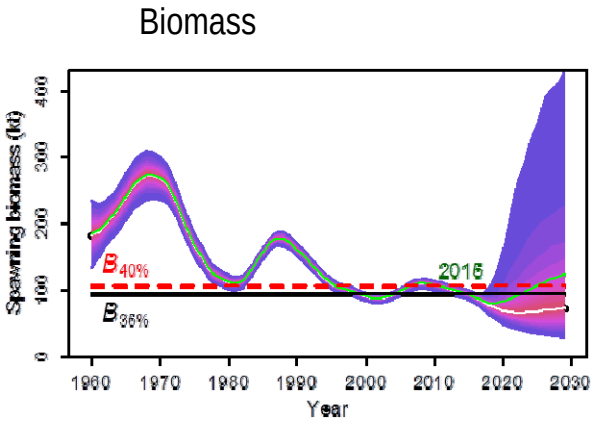
D. Hanselman, C. Lunsford, and C. Rodgveller. 2014. Assessment of the Sablefish stock in Alaska.

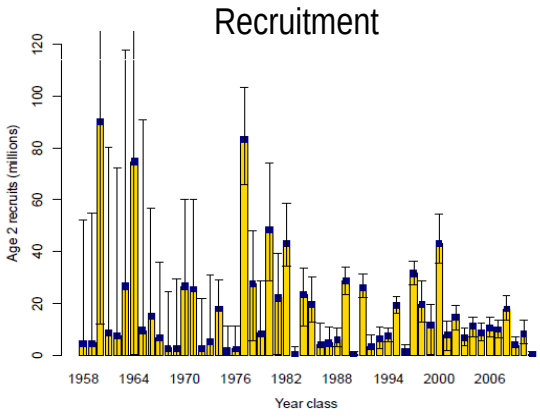
www.afsc.noaa.gov/refm/stocks/assessments.htm

Catch History: U.S. fishermen have harvested Sablefish (also called black cod) since the end of the 19th century as a byproduct of halibut fisheries. Harvests were relatively small, averaging 1,666 mt from 1930-1957. Japanese longlining began in the EBS around 1958 and expanded into the AI and GOA through the 1970s. Japanese fleet catches increased throughout the 1960s, and peak Sablefish catch reached 36,776 mt in 1972. High fishing pressure in the early 1970s by Japanese and USSR vessels may have resulted in a population decline of Sablefish in the mid-1970s. By 1988, U.S. fishermen took the majority of the Sablefish harvested in the GOA and BSAI. Sablefish was increasingly harvested as a derby-style fishery in the late 1980s and early 1990s until Individual Fishing Quotas were implemented for the hook and line fishery in 1995.

Fishery Management: BSAI and GOA Sablefish are managed as one population in federal waters due to their highly migratory behavior during certain life history stages. There are four management areas in the GOA; Western, Central West Yakutat and East Yakutat/Southeast Outside.

In 1985, Amendment 14 to the GOA FMP allocated Sablefish TAC by gear type; 80% to fixed gear (including pots) and 20% to trawl in the Western and Central GOA, 95% to fixed gear and 5% to trawl gear in the Eastern GOA. Amendment 20 to the GOA FMP established IFQ management for the GOA Sablefish fishery, which began in 1995.





Stock Assessment: The Sablefish assessment is based on a statistical sex-specific age-structured model. This model incorporates fishery data and fishery independent data from domestic and Japan-U.S. cooperative longline surveys and the NMFS GOA trawl survey. Sablefish fall under Tier 3b of the ABC/OFL control rule. Separate ABCs and TACs are established for each GOA subregion: Western, Central, West Yakutat, and Southeast Outside.

Fishery: The Sablefish IFQ fishery season opening date is concurrent with the halibut fishery for the purposes of reducing bycatch and regulatory discards between the two fisheries. In the GOA, the directed fishery for Sablefish is prosecuted with longline gear (pot gear is prohibited for directed Sablefish fishing in the GOA). Sablefish are also taken by trawl gear in directed fisheries for rockfish and deepwater flatfish. Primary incidental catch species in the directed Sablefish fishery include Shortraker, Rougheye and Thornyhead Rockfishes.

Total catches, pre-season catch specifications and exploitable biomass of Sablefish in the GOA, 1980-2015 (in mt).

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass[3]
1980	8,543	13,000	13,000	-	-
1981	9,917	14,350	14,350	-	-
1982	8,556	12,300	12,300	-	-
1983	9,002	9,480	9,480	-	-
1984	10,230	8,980	8,980	-	-
1985	12,479	8,980	8,980	-	-
1986	21,614	15,000	18,800	-	-
1987	26,325	20,000	25,000	-	383,000
1988	29,903	28,000	35,000	-	520,000
1989	29,842	26,000	30,900	-	426,000
1990	25,701	26,000	26,200	-	312,000
1991	19,580	22,500	22,500	-	194,000
1992	20,451	20,800	20,800	28,200	179,000
1993	22,671	20,900	20,900	27,750	190,400
1994	21,338	25,500	25,500	31,700	218,000
1995	18,631	21,500	21,500	25,730	194,900
1996	15,826	17,080	17,080	22,800	169,500
1997	14,129	14,520	14,520	39,950	199,920
1998	12,758	14,120	14,120	23,450	166,000
1999	13,918	12,700	12,700	19,720	150,000
2000	13,779	13,330	13,330	16,660	169,000
2001	12,127	12,840	12,840	15,720	188,000
2002	12,246	12,820	12,820	19,350	188,000
2003	14,345	14,890	14,890	20,020	182,000
2004	15,630	16,550	16,550	22,160	179,000
2005	13,997	15,940	15,940	19,280	185,000
2006	13,367	14,840	14,840	17,880	152,000
2007	12,265	14,310	14,310	16,906	158,000
2008	12,326	12,730	12,730	15,040	167,000
2009	10,910	11,160	11,160	13,190	149,000
2010	9,998	10,370	10,370	12,270	140,000
2011	11,148	11,290	11,290	13,340	149,000
2012	11,914	12,960	12,960	15,330	180,000
2013	11,945	12,510	12,510	14,780	167,000
2014	10,375	10,572	10,572	12,500	149,000
2015	-	10,522	10,522	12,425	130,000

[1]Catch data through November 2014.
[2]TAC, ABC and OFL from annual Federal Register.
3Biomass from SAFE report projections for following year.

Economics: In 2013, the ex-vessel value of Sablefish catch from the GOA was $83.6 million. Ex-vessel prices for GOA Sablefish in 2013 averaged $3.22/lb for fish caught on longline gear and $2.43/lb for fish taken with trawl gear. For both gear types, the primary product is frozen, head and gutted fish.

Current Issues: Sperm whale and killer whale depredation is problematic for Sablefish fisheries in the GOA and BSAI. Depredation occurs when whales remove Sablefish from longline gear, damage the fish and/or fishing gear. Killer whale depredation predominates in the BSAI and sperm whale depredation is more common the GOA. Depredation can lead to economic losses in the form of reduced catch, extended travel distances, extended wait times and damaged gear. Depredation may also reduce the accuracy of Sablefish stock assessment models. Additionally, depredating whales may be at greater risk of mortality or injury through vessel strikes or risk of entanglement in gear.


PVOA

Northern Rock Sole
Washington DFW

Shallow-water Flatfish

Biology: The shallow-water flatfish complex is comprised of 8 flatfish species. Northern Rock Sole, Southern Rock Sole, Butter Sole and Yellowfin Sole account for the majority of the current biomass of shallow-water flatfish. All flatfish are demersal but have varying depth ranges. Shallow-water flatfish feed on euphausiids, bivalves, polychaetes, amphipods, mollusks and fish. They are prey for Pacific Cod, Pacific Halibut and skates.

Northern Rock Sole	*Lepidopsetta polyxystra*
Southern Rock Sole	*Lepidopsetta bilineata*
Butter Sole	*Pleuronectes isolepis*
Yellowfin Sole	*Pleuronectes asper*
Starry Flounder	*Platichthys stellatus*
English Sole	*Pleuronectes vetulus*
Alaska Plaice	*Pleuronectes quadrituberculatus*
Sand Sole	*Psettichthys melanostictus*

Yellowfin Sole distribution extends from the Sea of Japan, through the Chukchi Sea and south to British Columbia. Yellowfin Sole are the second most abundant finfish species (after pollock) in Cook Inlet and are also found in Prince William Sound. Yellowfin Sole spawning period is protracted and likely extends from May to August, occurring primarily in shallow water. Females are relatively fecund, ranging from 1.3-3.3 million eggs depending on size. Yellowfin Sole begin to recruit to the fishery at age 6 and are fully selected by age 13. The estimated age of 50% maturity is 10.5 years for females. Natural mortality is estimated at M=0.12-0.16, and longevity extends to 31 years.

Stock assessment:

B. Turnock W. and T. A'mar. 2014. Assessment of Shallow Water Flatfish in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

The rock sole stock in the GOA consists of both Northern and Southern Rock Sole. The two species are similar in appearance but have different life history characteristics. Northern Rock Sole stock spawns beginning in midwinter and peaking during the spring, and the Southern Rock Sole stock spawns during the summer. The estimated age of 50% maturity is 9 years for Southern Rock Sole and 7 years for Northern Rock Sole. For both species, natural mortality is estimated to be M=0.18-0.20 for females, and M=0.25-0.26 for males, and longevity can extend to 30 years. Rock sole are most abundant in the Kodiak and Shumagin areas. Adults occupy separate winter spawning and summertime feeding distributions on the continental shelf margins.

Starry Flounder
AFSC, NOAA Fisheries

Catch History: The flatfish fishery was predominantly a foreign fishery targeting non-flatfish species until 1981. With the cessation of foreign fishing in 1986, joint venture fishing began to account for the majority of flatfish catch, and the fishery was fully domestic by 1988. Shallow-water flatfish catch was 5,455 mt in 1978. Catch declined to a low of 957 mt in 1986 then increased to 9,715 mt in 1993. Shallow-water flatfish catch is often constrained by Pacific Halibut bycatch limits.

Fishery Management: The Council divided the "Flatfish" complex into 3 categories (Deep-water flatfish, Shallow-water flatfish, and Arrowtooth Flounder) in 1990 due to significant differences in halibut bycatch rates, biomass and commercial value in directed fisheries for shallow and Deep-water flatfish. Flathead Sole was separated out from the Deep-water

flatfish complex in 1991 due to its distributional overlap between both shallow and deep-water groups.

All flatfish species under the GOA groundfish FMP are regulated through permits, limited entry, catch quotas (TACs), seasons, in-season adjustments, gear restrictions, closed waters, bycatch limits and rates, allocations, regulatory areas, record keeping, reporting requirements and observer monitoring. GOA flatfish species or complexes are managed with area-specific ABC and TAC apportionments to avoid the potential for localized depletions.

Stock Assessment: The Northern and Southern Rock Sole stock assessments are based on Stock Synthesis models that use both length-structured and age-structured data. These models incorporate fishery data and fishery independent data from the NMFS trawl surveys. The Northern and Southern Rock Sole catch limits are set by a Tier 3a ABC/OFL control rule. The 2015 projected biomass is 287,534 mt. Catch specifications for 2015 are as follows; OFL=54,207 mt, ABC= 44,205 mt, TAC= 35,381 mt.

Survey biomass for all species in the shallow-water complex has declined from 2009 to 2013, except English Sole and Alaska Plaice, which have shown no trend. Northern Rock Sole survey biomass declined about 22% from 2009 to 2013, while Southern Rock Sole and Yellowfin Sole survey biomass declined about 31%.

Total catches, pre-season catch specifications and exploitable biomass of Shallow Water Flatfish* in the GOA, 1991-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL	Biomass
1991	5,298	12,000	74,000	-	333,900
1992	8,783	11,740	50,480	70,900	257,338
1993	9,715	16,240	50,480	70,860	261,724
1994	9,343	18,630	34,420	44,670	261,720
1995	5,430	18,630	52,270	60,262	355,590
1996	9,350	18,630	52,270	60,262	355,590
1997	7,775	18,630	43,150	59,540	314,960
1998	3,565	18,630	43,150	59,540	315,590
1999	2,577	18,770	43,150	59,540	314,960
2000	6,928	19,400	37,860	45,330	299,100
2001	6,162	19,400	37,860	45,330	299,100
2002	6,195	20,420	49,550	61,810	349,992
2003	4,465	21,620	49,340	61,810	349,990
2004	3,094	20,740	52,070	63,840	375,950
2005	4,769	20,740	52,070	63,840	375,950
2006	7,641	19,972	51,450	62,418	365,766
2007	8,793	19,972	51,450	62,418	103,300
2008	9,708	22,256	60,989	74,364	436,590
2009	8,483	22,256	60,989	74,364	436,590
2010	5,410	20,062	56,242	67,768	398,961
2011	3,974	20,062	56,242	67,768	398,961
2012	4,022	37,029	50,683	61,681	329,217
2013	5,515	37,077	45,484	55,680	433,869
2014	3,917	33,679	40,805	50,007	384,134
2015	-	35,381	44,205	54,207	287,534

*Separated from "Flounders" category 1990.
[1] Catch data through November 2014.
[2]Biomass from annual SAFE report projections.

Fishery: Since 1988 the majority of shallow-water flatfish harvest has occurred on the continental shelf and slope east of Kodiak Island in the Central regulatory area. Shallow-water flatfish are generally harvested with trawl gear. Rock sole is the predominant target species in the complex.

Economics: The bottom trawl fishery in the GOA primarily targets rock soles, Rex Sole and Dover Sole. Primary products include whole fish, H&G and fillets. Ex-vessel value of all flatfish caught in the GOA in 2013 was $8.6 million. The price per pound for GOA shallow water flatfish products averaged $0.98/lb for shoreside processors. A total of 31 catcher vessels and 5 catcher processors prosecuted the GOA flatfish fishery in 2013.

Butter Sole
Washington DFW

Dover Sole
AFSC, NOAA Fisheries

Deepwater Flatfish

Stock assessment:

C. McGilliard 2014. Assessment of Deepwater Flatfish stock in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Biology: The GOA Deep-water flatfish complex is comprised of 3 flatfish species; Greenland Turbot *Reinhardtius hippoglossoides*, Dover Sole *Microstomus pacificus*, and Deep-Sea Sole *Embassichthys bathybius*. GOA Dover Sole constitutes the majority of the survey biomass and deep-water flatfish catch (generally over 98%). Dover sole move to deeper water as they age and older Dover sole migrate seasonally from deep water on the outer continental shelf and upper slope where spawning occurs to shallower water mid-shelf in summer time to feed. Dover Sole are especially adapted to feeding on small-detrital consuming invertebrates such as polychaetes, amphipods, mollusks, and brittle stars. Dover Sole are batch spawners, releasing around 83,000 advanced oocytes in about 9 batches per spawning season. The peak spawning period occurs from January through May. Female Dover Sole reach 50% maturity at 12-13 years of age. Dover Sole recruit to the fishery at 35 cm. The maximum age observed for Dover Sole in the GOA is 59 years. Greenland Turbot has a circumpolar distribution in the Atlantic and Pacific. Greenland Turbot are typically found from 200-1600 m. Biological data is limited for GOA Greenland Turbot and Deep-Sea Sole.

Catch History: Deep-water flatfish catches peaked in 1992 at 11,379 mt, and then declined in 1993, remaining fairly stable from 1993-1999 (average 2,800 mt). After 1999, catches declined, reaching a low of 225 mt in 2013.

Total catches, pre-season catch specifications, and exploitable biomass of Deep Water Flatfish* in the GOA, 1990-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL	Biomass[2]
1990	2,380	22,000	108,400	-	-
1991	10,195	15,000	50,500	-	201,500
1992	8,495	19,740	39,280	51,500	169,132
1993	6,705	19,740	45,530	59,650	227,656
1994	3,077	11,080	16,510	19,280	132,030
1995	2,211	11,080	14,590	17,040	116,710
1996	2,190	11,080	14,590	17,040	116,570
1997	3,659	7,170	7,170	9,440	101,430
1998	2,286	7,170	7,170	9,440	101,430
1999	2,282	6,050	6,050	8,070	78,300
2000	981	5,300	5,300	6,980	74,370
2001	803	5,300	5,300	6,980	74,460
2002	559	4,880	4,880	6,430	68,623
2003	951	4,880	4,880	6,430	68,260
2004	686	6,070	6,070	8,010	99,620
2005	418	6,820	6,820	8,490	102,395
2006	405	8,665	8,665	11,008	132,297
2007	281	8,707	8,707	10,431	103,300
2008	573	8,903	8,903	11,343	132,625
2009	475	9,168	9,168	11,578	133,025
2010	544	6,190	6,190	7,680	89,682
2011	466	6,305	6,305	7,823	89,691
2012	290	5,126	5,126	6,834	77,531
2013	242	5,126	5,126	6,834	173,853
2014	346	13,472	13,472	16,159	182,727
2015		13,334	13,334	15,993	182,160

*Separated from "Flounders" category 1990.
[1] Catch data through November 2014.
[2]Biomass from annual SAFE report projections.

Stock Assessment: The Deep-water flatfish complex assessment uses a split-sex, age-structured model for Dover Sole and mean historical catch data from 1978-1995 for Greenland Turbot and Deep-Sea Sole. Dover Sole catch limits are set by a Tier 3a control rule, and Greenland Turbot and Deep-Sea Sole fall under Tier 6 due to highly variable survey biomass estimates. The 2015 projected Deepwater Flatfish biomass is 182,160 mt. Catch specifications for 2015 are as follows; OFL=15,993 mt, ABC= 13,334 mt, TAC= 13,334 mt.

Abundance estimates for Greenland Turbot and Deep-Sea Sole are highly uncertain. Dover sole survey biomass estimates have ranged from approximately 71,624 to 107,286 mt since 1990. Survey biomass estimates in the 1980s were low, but considered less reliable because survey methodology was different in those years.

Fishery: Deep-water flatfish are harvested with trawl gear. Dover Sole is the predominant target species in the complex.

Rex Sole
AFSC, NOAA Fisheries

Rex Sole

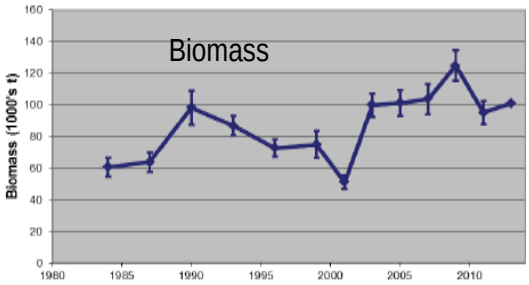
Biology: Rex Sole *Glyptocephalus zachirus* are distributed from Baja California to the BS, with concentrations in the GOA. Rex Sole closely associate with soft bottom benthic communities and are generally found at depths from less than 100 m to 800 m. Adult Rex Sole overwinter near the shelf margins and migrate onto the mid and outer continental shelf each year in April/May. Rex Sole exhibit latitudinal changes in growth rates and size at sexual maturity. Size at sexual maturity was greater for Rex Sole in the GOA than for those in Oregon. Rex Sole feed on polychaetes, euphausiids, amphipods and shrimp and are prey for skates, Spiny Dogfish, and Arrowtooth Flounder.

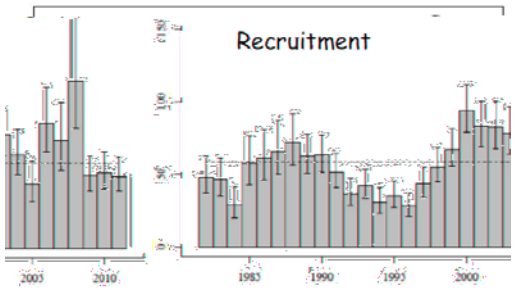
Stock assessment:

C. McGilliard 2014. Assessment of the Rex Sole stock in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Recruitment to the fishery is estimated to occur at ages 8-10. Age at 50% maturity for females was estimated at 5.6 years (35.2 cm) in Alaska. Natural mortality is thought to be around M=0.17, and the oldest observed GOA Rex Sole was 27 years old. Rex Sole are batch spawners with a protracted spawning period in the GOA (peak spawning period occurs April/May).





Total catches, pre-season catch specifications, and exploitable biomass of Rex Sole* in the GOA, 1994-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL	Biomass[2]
1994	3,642	10,140	11,950	13,960	95,630
1995	4,021	9,690	11,210	13,091	89,660
1996	5,945	9,690	11,210	13,091	89,660
1997	3,296	9,150	9,150	11,920	72,330
1998	2,671	9,150	9,150	11,920	72,330
1999	3,059	9,150	9,150	11,920	72,330
2000	3,592	9,440	9,440	12,300	74,600
2001	2,942	9,440	9,440	12,300	81,020
2002	3,016	9,470	9,470	12,320	71,326
2003	3,499	9,470	9,470	12,320	71,330
2004	1,467	12,650	12,650	16,480	99,950
2005	2,179	12,650	12,650	16,480	99,950
2006	3,295	9,200	9,200	12,000	83,600
2007	2,851	9,100	9,100	12,000	82,403
2008	2,707	9,132	9,132	11,933	82,801
2009	4,753	8,996	8,996	11,756	81,572
2010	3,635	9,729	9,729	12,714	88,221
2011	2,876	9,565	9,565	12,499	86,729
2012	2,426	9,612	9,612	12,561	87,162
2013	3,706	9,560	9,560	12,492	86,684
2014	3,565	9,341	9,341	12,207	84,702
2015		9,150	9,150	11,957	82,972

*Separated from Deep Water Flatfish category 1994
[1]Catch data through November 2014.
[2]Biomass data corresponds to the annual SAFE report projections issued the preceding year.

Catch History: Prior to 1981, Rex Sole was caught incidentally in foreign fisheries targeting higher value species. Catches of Rex Sole have remained fairly stable since 1994, ranging from 1,464 mt in 2004 to a peak of 5,874 mt in 1996.

Stock Assessment: Rex Sole limits are set by a Tier 5 control rule. The 2015 projected biomass is 82,972 mt. Catch specifications for 2015 are as follows; OFL=11,957 mt, ABC= 9,150 mt, TAC= 9,150 mt. The ABC and TAC specifications are further subdivided among GOA subareas.

Fishery: GOA Rex Sole are caught using trawl gear in a directed fishery and fisheries targeting other species such as POP, Pacific Cod and Pollock. Fishing seasons are dictated by seasonal halibut PSC apportionments, with approximately 7 months of fishing occurring between January and November. Catches of Rex Sole occur primarily in the Central management area in the GOA.

Arrowtooth Flounder
AFSC, NOAA Fisheries

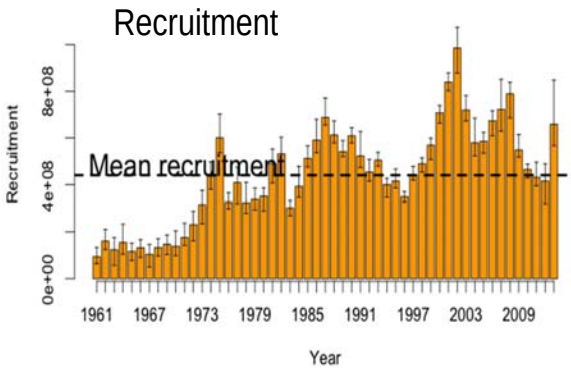
Arrowtooth Flounder

Stock assessment:

I. Spies and B. Turnock. 2014. Assessment of Arrowtooth Flounder stock in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Biology: Arrowtooth Flounder *Atheresthes stomias* are distributed from the Kamchatka Peninsula, through the BSAI down to central California. Arrowtooth Flounder are most abundant at depths from 100-500 m. Adults migrate seasonally from shelf margins in the winter to the inner and middle shelf in April/May with the onset of warmer waters temperatures. Smaller GOA Arrowtooth Flounder predate on euphausiids, capelin and herring while fish over 40 cm rely primarily on pollock. Predators of Arrowtooth Flounder include Pacific Cod, Pollock and skates



Arrowtooth Flounder recruitment to the fishery begins at about 3 years, and females are fully recruited by age 10. The estimated length at 50% maturity is 28 cm for males (4 years) and 37 cm for females (5 years) based on samples collected from Washington, and longevity extends to 21 years. Female natural mortality is estimated at M=0.2. Male natural mortality has a range estimate (M=0.27-0.36). Adult males range in size from 30-50 cm, and females range in size from 30-70 cm. The spawning period for Arrowtooth Flounder occurs from December to February at depths of 100-360 m. Spawning in the GOA occurs from Kodiak to Yakutat Bay.

Total catches, pre-season catch specifications, and exploitable biomass of Arrowtooth Flounder* in the GOA, 1990-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL	Biomass[2]
1990	7,705	32,000	194,600	-	-
1991	10,035	20,000	340,100	-	2,000,800
1992	15,970	25,000	303,800	427,000	1,787,583
1993	15,560	30,000	321,290	451,690	1,889,922
1994	23,560	30,000	236,240	275,930	1,889,920
1995	18,430	35,000	198,130	231,416	1,585,040
1996	22,183	35,000	198,130	231,416	1,640,000
1997	16,319	35,000	197,840	280,800	1,971,170
1998	12,974	35,000	208,340	295,570	2,062,740
1999	16,209	35,000	217,110	308,880	2,126,714
2000	24,252	35,000	145,360	173,910	1,571,670
2001	19,964	38,000	148,150	173,550	1,586,830
2002	21,230	38,000	146,260	171,060	1,760,000
2003	23,320	38,000	155,140	181,390	1,302,000
2004	15,304	38,000	194,930	228,130	2,453,390
2005	19,770	38,000	216,900	253,900	2,453,390
2006	27,653	38,000	177,844	207,678	2,140,170
2007	25,364	43,000	184,008	214,828	2,146,360
2008	29,293	43,000	226,470	266,914	2,244,870
2009	24,937	43,000	221,512	261,022	1,295,050
2010	23,015	43,000	215,882	254,271	2,139,000
2011	30,890	43,000	213,150	251,068	2,139,000
2012	20,714	103,300	212,882	250,100	2,161,690
2013	21,620	103,300	210,451	247,196	2,055,560
2014	35,026	103,300	195,358	229,248	1,978,340
2015		103,300	192,921	226,390	1,957,970

*Separated from "Flounders" category 1990.
[1] Catch data through November 2014.
[2]Biomass from SAFE report projections.

Catch History: Prior to 1981, Arrowtooth Flounder was caught incidentally in foreign fisheries targeting higher value species. From 1991-2000, Arrowtooth Flounder catches ranged from 10,034 mt-22,583 mt, and have since increased with a 2014 catch of 35,026 mt.

Stock Assessment: The Arrowtooth Flounder assessment uses an automatic differentiation software developed as a set of libraries under C++ (AD Model Builder). This model incorporates fishery data and fishery independent data from NMFS and IPHC trawl surveys. Arrowtooth Flounder catch limits are set by a Tier 3a control rule. The 2015 projected biomass is 1,978,340 mt.

Arrowtooth Flounder biomass has increased steadily since the early 1990s. Estimated biomass averaged 1.7 million mt annually from 2000-2004 and about 2 million mt from 2004-2014.

Fishery: A directed fishery has recently developed in the GOA. In addition, Arrowtooth Flounder are an important byproduct of more valuable target trawl and longline fisheries, such as Pacific Cod and Pollock.

Flathead Sole
AFSC, NOAA Fisheries

Flathead Sole

Stock assessment:

C. McGilliard 2014. Assessment of Flathead Sole stock in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Biology: Flathead Sole *Hippoglossoides elassodon* are distributed in the Kuril Islands, BS, GOA and south to California. Adult Flathead Sole exhibit a benthic lifestyle and overwinter near the shelf margins before migrating to the mid and outer continental shelf in April or May each year for feeding. They occur primarily on mixed mud and sand bottoms in depths less than 300 m. Pandalid shrimp and brittle stars are the most important prey for adult Flathead Sole in the GOA, while euphausiids and mysids constitute the most important prey items for juvenile Flathead Sole. Pacific Cod and Pacific Halibut are major predators on adults, while Arrowtooth Flounder, sculpins, Walleye Pollock and Pacific Cod are major predators on juveniles. However, 65% of adult mortality and 20% of juvenile mortality is unexplained.

Flathead Sole recruitment to the fishery is estimated to occur between the ages of 5 and 10, and longevity extends to 32 years. Estimated length at 50% maturity is 33 cm (8.7 years). Natural mortality is thought to be around M=0.20. Flathead Sole spawn in March and April, in deeper waters near the margins of the continental shelf, and feed on the mid- and outer-continental shelf in the summertime. Females release from 70,000-600,000 eggs.

Catch History: Flathead Sole catches increased from 452 mt in 1978 to 2,068 mt in 1980, and subsequently declined to a low of about 150 mt in 1986. After 1986, catches increased and reached a peak catch of 3,842 mt in 2010.

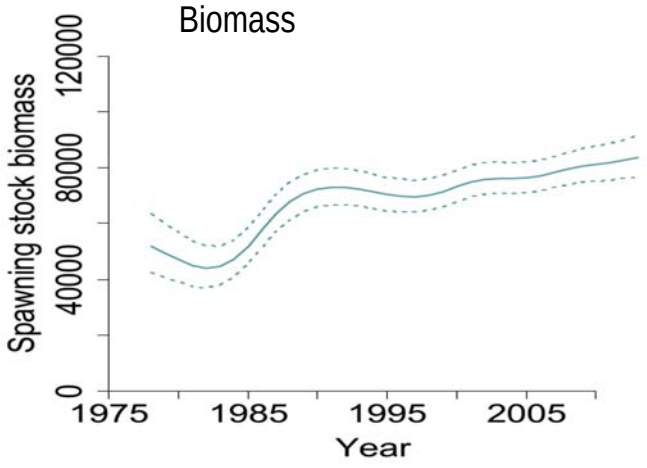
Stock Assessment: The Flathead Sole assessment uses a split-sex, age-based model with estimated age-based fishery and survey selectivity. This model incorporates fishery data and fishery independent data from triennial (1984-1999) and biennial (2001-2009) surveys. Flathead Sole catch limits are set by a Tier 3a control rule. Estimated Flathead Sole biomass is thought to have increased slowly and steadily since 1990.

Fishery: GOA Flathead Sole are caught using trawl gear in a directed fishery and fisheries targeting other species such as POP, Pacific Cod and Pollock. The majority of Flathead Sole in the GOA is taken in the Shelikof Strait and on Albatross Bank. About 90% of the catch is retained.

Total catches, pre-season catch specifications, and exploitable biomass of Flathead Sole* in the GOA, 1991-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL	Biomass[2]
1991	1,237	10,000	50,300	-	251,800
1992	2,315	10,000	48,280	63,100	240,615
1993	2,824	10,000	49,450	64,780	247,250
1994	2,525	10,000	35,850	39,310	199,000
1995	2,180	10,000	28,790	31,557	198,470
1996	3,074	9,740	28,790	31,557	198,470
1997	2,441	9,040	26,110	34,010	206,340
1998	1,731	9,040	26,110	34,010	206,340
1999	897	9,040	26,110	34,010	206,340
2000	1,548	9,060	26,270	34,210	207,520
2001	1,912	9,060	26,270	34,210	207,520
2002	2,146	9,280	22,690	29,530	170,915
2003	2,459	11,150	41,390	51,560	132,260
2004	2,398	10,880	51,270	64,750	292,670
2005	2,552	10,390	45,100	56,500	292,670
2006	3,142	9,077	37,820	47,003	291,441
2007	3,130	9,148	39,110	48,658	297,353
2008	3,446	11,054	44,735	55,787	103,300
2009	3,663	11,181	46,464	57,911	323,937
2010	3,841	10,411	47,422	59,295	328,862
2011	2,729	10,587	49,133	61,412	325,367
2012	2,167	30,316	47,407	59,380	292,189
2013	2,816	30,496	48,738	61,036	288,536
2014	2,525	27,746	41,231	50,664	252,361
2015		27,756	41,349	50,792	254,602

[1] Catch data through November 2014.
[2]Biomass from annual SAFE report projections.



Pacific Ocean Perch
AFSC, NOAA Fisheries

Pacific Ocean Perch

Biology: Pacific Ocean Perch (POP) *Sebastes alutus* distribution extends from Japan around the Pacific Rim, the BS and south to California. POP are most abundant in AI, GOA and British Columbia and are found primarily offshore along the continental slope at depths from 150-420 m. POP are generally considered a demersal species and are found over sandy and cobble substrate. Seasonal changes in depth distribution occur, and adults migrate farther offshore to deeper waters during winter. During late spring and summer, POP migrate to shallower waters inshore for summer feeding. Adults perform diel migrations off the sea floor to feed. POP populations occur in patchy aggregations, and POP are generally planktivorous. Smaller POP feed on calanoid copepods, whereas larger POP rely on euphausiids, shrimp and squids. POP are prey for Pacific Halibut, Sablefish, Pacific Cod and Arrowtooth Flounder.

SeaAlliance/AGDB

POP is a slow-growing, long lived species. Recruitment to trawl fisheries begins at age 5, and full recruitment to the fishery occurs around age 8. Females reach 50% maturity at 10.5 years in the GOA, and longevity extends to 80 plus years (oldest recorded 84 years in the GOA). Natural mortality is estimated to be M=0.06. Females are viviparous, retaining fertilized eggs within the ovary until larval extrusion. Mating takes place in late fall, and larval extrusion occurs in early spring. Females release from 10,000-300,000 larvae each year, depending on size.

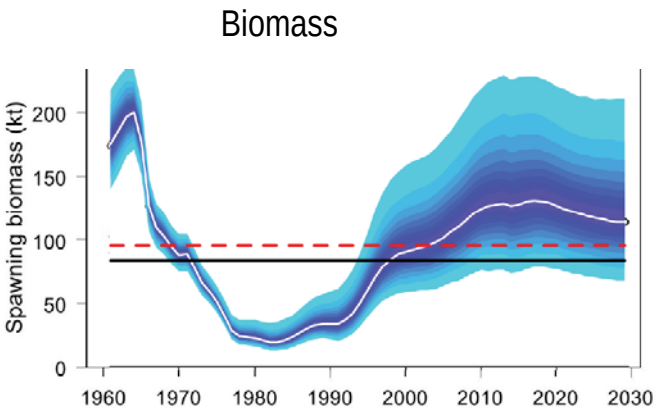
Stock assessment:

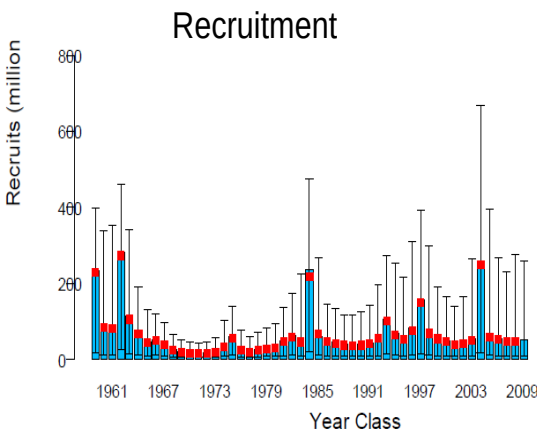
P-J. Hulson, D. Hanselman, S. K. Shotwell, C. Lunsford, and J. Ianelli 2014. Assessment of Pacific Ocean Perch stock in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Catch History: POP was harvested in the GOA by the USSR and Japan beginning in the early 1960s. The fishery developed rapidly, and catches peaked in 1965 at 350,000 mt. High fishing effort by the foreign fleet caused a major decline in POP abundance/catches through the late 1960s. Catches continued to decline, and in 1985 foreign trawling in the GOA was prohibited.

The domestic fishery for POP in the GOA began in the early 1980s and expanded each year until 1991. POP catches remained relatively low through the 1990s, averaging 7,072 mt annually from 1991-2000. Catches have increased since 2000. The largest U.S. catch in the time series was in 2014 at 17,368 mt.





Fishery Management: In 1991, POP and the Shortraker/Rougheye complex were separated from the "Slope Rockfish" complex to prevent overfishing. A reduction in TACs after 1991 to promote POP stock rebuilding was also implemented. In 2004, Shortraker and Rougheye Rockfish were separated into their own management units due to disproportionally high harvests of Shortraker Rockfish. GOA rockfish stocks and complexes are managed with area-specific ABC and TAC apportionments to avoid the potential for localized depletions. Amendment 41, effective in 2000, prohibited trawling in the Eastern area east of 140°W longitude, an area previously fished for POP.

The Central GOA Rockfish Pilot Program, effective for 2007 through 2011, rationalized the rockfish and related trawl fisheries. The program provides cooperatives with exclusive catch shares (95% of the CGOA TAC) for target species of POP, Northern Rockfish, and pelagic shelf rockfish, as well as a allocated a portion of the TAC for suite of secondary species (Sablefish, cod, and thornyhead, Shortraker and Rougheye Rockfish), and a halibut prohibited species catch limit allocation. Cooperatives receive allocations based on catch history of cooperative member vessels. Sideboard limits for the target rockfish species are established in the Western GOA. A slightly revised program was adopted by the Council in 2010 for implementation in 2012.


Mark Fina, NPFMC

Total catches, pre-season catch specifications, and exploitable biomass of Pacific Ocean Perch* in the GOA, 1990-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL	Biomass[2]
1991	6,632	5,800	5,800	-	-
1992	6,158	5,200	5,730	5,730	229,100
1993	2,119	2,560	3,378	3,378	156,300
1994	1,853	2,550	3,030	3,940	101,800
1995	5,742	5,630	6,530	8,232	142,465
1996	8,459	6,960	8,060	10,165	163,220
1997	9,531	9,190	12,990	19,760	301,084
1998	9,266	10,780	12,820	18,090	242,300
1999	10,802	12,590	13,120	18,490	228,190
2000	10,157	13,020	13,020	15,390	200,310
2001	10,860	13,510	13,510	15,390	211,160
2002	11,729	13,190	13,190	15,670	293,240
2003	10,911	13,660	13,660	16,240	298,820
2004	11,528	13,340	13,340	15,840	266,960
2005	11,440	13,575	13,575	16,266	286,367
2006	13,590	14,261	14,261	16,927	312,968
2007	13,046	14,635	14,636	17,158	315,507
2008	12,400	14,999	14,999	17,807	317,511
2009	12,985	15,111	15,111	17,940	318,336
2010	15,520	17,584	17,584	20,243	334,797
2011	14,211	16,997	16,997	19,566	330,480
2012	14,911	16,918	16,918	19,498	348,168
2013	13,183	16,412	16,412	18,919	345,260
2014	17,368	19,309	19,309	22,319	410,712
2015		21,012	21,012	24,360	416,140

* Separated from Slope Rockfish in 1991.
[1] Catch data through November 2014.
[2]Biomass from annual SAFE report projections.

Stock Assessment: The POP assessment uses an age-structured model using AD Model Builder software. POP catch limits are set under Tier 3a OFL and ABC control rules. This model incorporates fishery data and fishery independent data from biennial trawl surveys. The 2015 projected biomass is 416,140 mt.

Estimated total biomass of POP was relatively low during the early 1990s, averaging 158,577 mt from 1991-1995. Since then, biomass has steadily increased from 211,160 mt in 2000 to 416,140 mt in 2015.

Fishery: POP are caught primarily in directed bottom trawl fisheries. The percentage of POP in the GOA taken in pelagic trawls increased from 2% in 1990 to 31% in 2008. The majority of POP are caught in the Central regulatory area, and TACs allocated for each area are generally met (except Southeastern area due to prohibited trawling).

Economics: In 2013, production was 12,300 mt for GOA rockfish products. Ex-vessel value of the rockfish catch in the GOA was $11.2 million.

Northern Rockfish
AFSC, NOAA Fisheries

Northern Rockfish

Biology: Northern Rockfish *Sebastes polyspinus* distribution extends from the Kamchatka Peninsula, through the BSAI, GOA and British Columbia. The species is most abundant in the central GOA to the western end of the AI. Adults concentrate at discrete sites along the outer continental shelf from 75-150 m. Northern Rockfish are demersal and are generally found in aggregations with patchy distributions. Northern Rockfish prey on calanoid copepods, euphausiids and chaetognaths. Based on stomach content data, Pacific Halibut and Sablefish likely prey on Northern Rockfish.

Northern Rockfish is a slow-growing, long-lived species. Age at 50% maturity is 12.8 years in the GOA, and longevity extends to 50 years (oldest recorded 67 in the GOA). GOA Northern Rockfish grow faster and reach a larger maximum length than the AI Northern Rockfish. Natural mortality is estimated to be M=0.06. Females are viviparous, retaining their fertilized eggs within the ovary until larval extrusion.

Catch History: Northern Rockfish were initially harvested by Soviet and Japanese trawlers in the early 1960s. Foreign fishing effort increased quickly in the 1960s, and catches of rockfish in the GOA peaked in 1965 at 350,000 mt. It is likely that GOA Northern Rockfish comprised some portion of the early foreign catch (exact Northern Rockfish catch unknown for this period). Northern Rockfish was separated from the slope rockfish assemblage in 1993, and catches have remained fairly stable since 1994, ranging from a low of 2,947 mt in 1997 to a high of 5,968 in 1994 (average annual catch equals 4,262 mt from 1994-2009).

Stock Assessment: The Northern Rockfish assessment uses a separable, age-structured model using AD Model Builder software. This model incorporates fishery data and fishery independent data from biennial trawl surveys. Northern Rockfish catch limits are set under Tier 3a of the ABC/OFL control rules. The 2014 projected biomass is 102,893 mt.

Fishery: Northern Rockfish are fully allocated as a target species in the CGOA trawl rockfish program, with 95-98% of the CGOA TAC and sideboarded at 74.3% of the WGOA TAC.

Stock assessment:

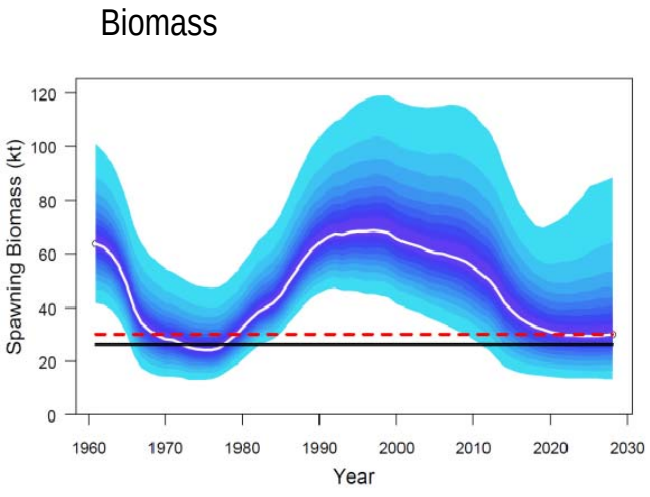
P-J. Hulson, C. Lunsford, J. Heifitz, D. Hanselman, K. Shotwell, and J. Ianelli. 2014. Assessment of Northern Rockfish stock in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Total catches, pre-season catch specifications, and exploitable biomass of Northern Rockfish* in the GOA, 1993-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL	Biomass[2]
1993	4,846	5,760	5,760	10,360	76,800
1994	5,968	5,760	5,760	10,360	76,800
1995	5,634	5,270	5,270	9,926	87,845
1996	3,356	5,270	5,270	9,926	87,850
1997	2,947	5,000	5,000	9,420	83,890
1998	3,058	5,000	5,000	9,420	83,870
1999	5,412	4,990	4,990	9,420	83,870
2000	3,325	5,120	5,120	7,510	85,360
2001	3,150	4,880	4,880	5,780	93,850
2002	3,337	4,980	4,980	5,910	94,350
2003	5,349	5,530	5,530	6,560	108,830
2004	4,806	4,870	4,870	5,790	95,150
2003	4,806	5,091	5,091	6,050	108,274
2006	4,956	5,091	5,091	7,673	136,311
2007	4,187	4,938	4,938	5,890	94,271
2008	4,052	4,549	4,549	5,430	93,391
2009	3,925	4,362	4,362	5,204	90,557
2010	3,871	5,098	5,098	6,070	103,300
2011	3,440	4,854	4,854	5,784	100,463
2012	5,063	5,507	5,507	6,574	104,155
2013	4,880	5,130	5,130	6,124	99,089
2014	4,212	5,322	5,322	6,349	102,893
2015		4,998	4,998	5,961	98,409

Separated from Other Slope Rockfish category 1993.
[1]Catch data through November 2014.
[2]Biomass from annual SAFE report projections.



Shortraker Rockfish
AFSC, NOAA Fisheries

Shortraker Rockfish

Biology: Shortraker Rockfish *Sebastes borealis* are distributed from Japan around the Pacific Rim to Southern California, including the BSAI and the GOA. In Alaska, adults are especially concentrated along the continental slope in the 300-500 m depth interval. Shortraker Rockfish prey on shrimps, squids, and myctophids. Shortrakers attain the largest size of all *Sebastes*, with a maximum reported length of 120 cm. Shortraker Rockfish is one of the most long-lived species in the northeast Pacific, and longevity may exceed 120 years. Natural mortality is estimated to be M=0.03. Information on early life history stages of Shortraker Rockfish is limited.

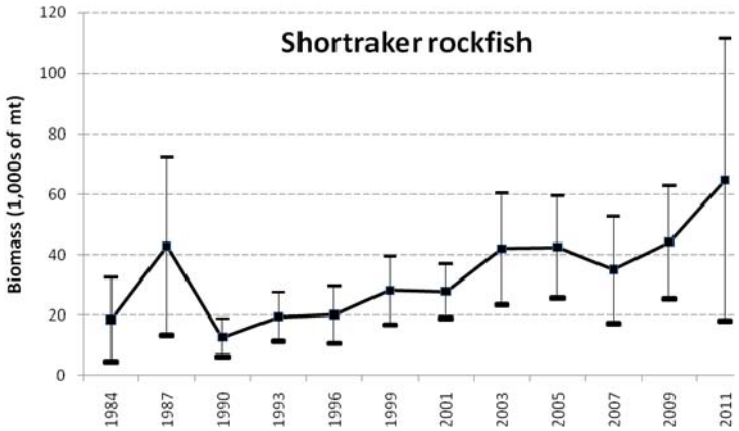
Stock assessment:

K. Echave and S. K. Shotwell 2014. Assessment of Shortraker Rockfish and "Other Slope Rockfish" stocks in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Catch History: From 1991 to 2004, the NPFMC managed Shortraker Rockfish in the GOA together with Rougheye Rockfish as an assemblage. Combined catches for the two species ranged from 702 to 2,250 mt, averaging 1,617 mt annually. Shortraker was separated into a single species management unit in 2005, and catches of Shortraker Rockfish averaged 584 mt annually from 2005-2009.

Biomass



Stock Assessment: Due to limited biological data, the Shortraker Rockfish assessment uses a biomass-based approach for calculating ABCs, incorporating fishery independent data from trawl surveys. Shortraker Rockfish catch limits are set under Tier 5 ABC/OFL control rules. The 2015 projected biomass is 58,797 mt.

Total catches, pre-season catch specifications, and exploitable biomass of Shortraker Rockfish* in the GOA, 2005-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL	Biomass[2]
2005	498	753	753	982	32,723
2006	664	843	843	1,124	37,461
2007	608	843	843	1,124	37,461
2008	598	898	898	1,197	39,905
2009	550	898	898	1,197	39,905
2010	457	914	914	1,219	40,626
2011	546	914	914	1,219	40,626
2012	728	1,081	1,081	1,441	48,048
2013	730	1,081	1,081	1,441	48,048
2014	649	1,323	1,323	1,764	58,797
2015		1,323	1,323	1,764	58,797

Separated from Slope Rockfish in 1991 and Shortraker/Rougheye in 2004.
[1]Catch data through November 2014.
[2]Biomass from annual SAFE report projections.

Fishery: Shortraker Rockfish in the GOA are taken in both longline and trawl fisheries; each gear comprises about 50% of the annual catch. Shortrakers in the CGOA are allocated as a secondary species in the CGOA rockfish program. A total of 40% of the CGOA Shortraker TAC is allocated to the catcher processor sector.

Other Rockfish

Sharpchin Rockfish
AFSC, NOAA Fisheries

Stock assessment:

C. Tribuzio and K. Echave 2014. Assessment of "Other Rockfish" stock complex in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Biology: The Other Rockfish complex consists of 25 rockfish species, although Sharpchin, Harlequin, Silvergray, Redstripe, and Redbanded Rockfish comprise the majority of the biomass in the GOA. The center of abundance for most of these species is farther south off British Columbia or the U.S. west coast. However, Harlequin Rockfish are most common in Alaskan waters, and Silvergray Rockfish appear to be most abundant in southeast Alaska and British Columbia. Within the GOA, Other Rockfish are most abundant in the eastern GOA and become increasingly scarce in areas farther west.

Blackgill Rockfish	*Sebastes melanostomus*
Bocaccio	*Sebastes paucispinis*
Canary Rockfish	*Sebastes pinniger*
Chilipepper	*Sebastes goodei*
China Rockfish	*Sebastes nebulosus*
Copper Rockfish	*Sebastes caurinus*
Darkblotched Rockfish	*Sebastes crameri*
Greenstriped Rockfish	*Sebastes elongatus*
Harlequin Rockfish	*Sebastes variegatus*
Northern Rockfish	*Sebastes polyspinis*
Pygmy Rockfish	*Sebastes wilsoni*
Quillback Rockfish	*Sebastes maliger*
Redbanded Rockfish	*Sebastes babcocki*
Redstripe Rockfish	*Sebastes proriger*
Rosethorn Rockfish	*S. helvomaculatus*
Sharpchin Rockfish	*Sebastes zacentrus*
Silvergray Rockfish	*Sebastes brevispinis*
Splitnose Rockfish	*Sebastes diploproa*
Stripetail Rockfish	*Sebastes saxicola*
Tiger Rockfish	*Sebastes nigrocinctus*
Vermilion Rockfish	*Sebastes miniatus*
Widow Rockfish	*Sebastes entomelas*
Yelloweye Rockfish	*Sebastes ruberrimus*
Yellowmouth Rockfish	*Sebastes reedi*
Yellowtail Rockfish	*Sebastes flavidus*

Life history data is limited for most Other Rockfish species. For Sharpchin Rockfish, size at 50% maturity is 26.5 cm (10 years). Natural mortality is estimated to be M=0.05 for Sharpchin and Silvergray Rockfish, M=0.10 for Redstripe Rockfish, and M=0.06 for harlequin and Redbanded Rockfish and all the minor species in the group.

Catch History: In 2012, additional species were added to the Other Rockfish complex including the former pelagic shelf rockfish species (not Dusky Rockfish), and the demersal shelf rockfish complex not in the Eastern Gulf. The current catch is a combination of former Other Slope and Pelagic Shelf Rockfish catches, and catch estimates of non-eastern GOA Demersal Shelf Rockfish. Since the mid-1990s, catches for Other Rockfish in the GOA have generally been less than 1,000 mt. The EGOA trawl closure that has been in effect since 1998 has limited the catch of Other Rockfish in the GOA.

Total catches, pre-season catch specifications, and exploitable biomass of Other Rockfish in the GOA, 1993-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL	Biomass[2]
1993	2,810	5,383	8,300	9,850	134,400
1994	1,613	2,235	8,300	9,850	76,500
1995	1,397	2,235	7,110	8,395	112,812
1996	881	2,020	7,110	8,395	112,810
1997	1,217	2,170	5,260	7,560	103,710
1998	861	2,170	5,260	7,560	103,710
1999	788	5,270	5,270	7,560	103,710
2000	577	4,900	4,900	6,390	102,510
2001	559	1,010	4,900	6,390	102,510
2002	774	990	5,040	6,610	107,960
2003	1,078	990	5,050	6,610	107,960
2004	885	670	3,900	5,150	89,460
2005	715	670	3,900	5,150	103,300
2006	931	1,480	4,152	5,394	93,552
2007	690	1,482	4,154	5,394	93,552
2008	809	1,730	4,297	5,624	90,283
2009	881	1,730	4,297	5,624	90,283
2010	798	1,192	3,749	4,881	76,867
2011	872	1,195	3,752	4,881	76,867
2012	760	1,080	4,045	5,305	85,774
2013	819	1,080	4,045	5,305	85,774
2014	1,030	1,811	4,081	5,347	83,383
2015		1,811	4,080	5,347	83,383

[1] Catch data through November 2014.
[2]Biomass from annual SAFE report projections.

Stock Assessment: Other Rockfish are managed under Tier 5 (Sharpchin Rockfish are managed under Tier 4). The 2015 projected biomass is 83,383 mt.

Fishery: There is no directed fishery for Other Rockfish in the GOA. Other Rockfish in the GOA are taken in trawl fisheries targeting higher value species.

Dusky Rockfish
AFSC, NOAA Fisheries

Dusky Rockfish

Biology: Dusky Rockfish *Sebastes variabilis* is an abundant species in the GOA. Adult Dusky Rockfish are concentrated around offshore banks and near gullies on the outer continental shelf at depths of 100 to 200 m. It is likely that Dusky Rockfish benthic distribution is associated with hard, rocky bottoms and epibenthic habitats. Dusky Rockfish prey on Pacific Sandlance and euphausiids. Dusky Rockfish age at 50% maturity is approximately 11.3 years. Mortality is estimated to be M=0.07, and longevity extends to 60 years. Dusky Rockfish are ovoviviparous with fertilization, embryonic development, and larval hatching occurring inside the mother. Parturition is believed to occur in the spring in the GOA.

Stock assessment:

C. Lunsford, S. K. Shotwell, P-J. Hulson, and D. Hanselman. 2014. Assessment of Dusky Rockfish in the Gulf of Alaska.

Catch History: Dusky Rockfish catch in the GOA generally increased after the rockfish management groups were first separated in 1988. Catches have remained fairly stable since 1994 and peaked in 1999 at 4,826 mt.

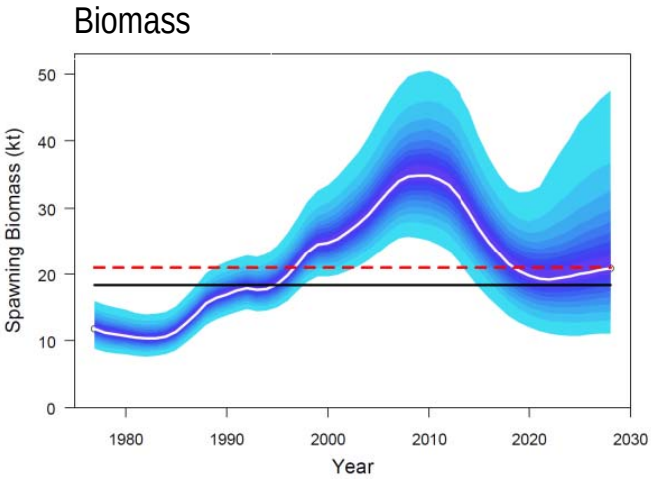
Stock Assessment: In 2012, Dusky Rockfish became a separate management category. Dusky Rockfish were formally grouped with Yellowtail Rockfish *S. flavidus* and Widow Rockfish *S. entomelas* in the Pelagic Shelf Rockfish stock complex. Since 2012, Yellowtail and Widow Rockfish have been managed in the Other Rockfish category. Dusky Rockfish are managed under Tier 3 of the ABC/OFL control rules. The 2015 projected biomass is 66,629 mt.

Fishery: In the CGOA, 95% of the Dusky Rockfish TAC is allocated to the CGOA Rockfish program. Catches of Dusky Rockfish are concentrated at a number of offshore banks of the outer continental shelf, west of Yakutat and around Kodiak in areas such as Portlock Bank and Albatross Bank.

Total catches, pre-season catch specifications, and exploitable biomass of Dusky Rockfish* in the GOA, 1988-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL	Biomass[2]
1988	1,086	3,300	3,300	-	169,700
1989	1,739	3,300	6,600	-	164,300
1990	1,647	8,200	8,200	-	164,000
1991	2,342	4,800	4,800	-	96,300
1992	3,440	6,890	6,890	11,360	75,110
1993	3,193	6,740	6,740	11,300	74,900
1994	2,990	6,890	6,890	11,550	76,500
1995	2,891	5,190	5,190	8,704	57,644
1996	2,302	5,190	5,190	8,704	56,502
1997	2,629	5,140	5,140	8,400	54,220
1998	3,111	5,260	5,260	8,040	55,580
1999	4,826	4,880	4,880	8,190	54,220
2000	3,730	5,980	5,980	9,040	66,440
2001	3,008	5,980	5,980	9,040	66,440
2002	3,318	5,490	5,490	8,220	62,489
2003	2,975	5,490	5,490	8,220	62,500
2004	2,674	4,470	4,470	5,570	57,400
2005	2,235	4,553	4,553	5,680	103,300
2006	2,446	5,436	5,436	6,662	97,368
2007	3,318	5,542	5,542	6,458	99,829
2008	3,634	5,227	5,227	6,400	70,823
2009	3,057	4,781	4,781	5,803	66,603
2010	3,097	5,059	5,059	6,142	66,603
2011	2,531	4,754	4,754	5,770	66,498
2012	4,012	5,118	5,118	6,257	66,771
2013	3,159	4,700	4,700	5,746	63,515
2014	3,050	5,486	5,486	6,708	69,371
2015		5,109	5,109	6,246	66,629

*Separated from Other Rockfish 1988. Dusky only since 2012.
[1]Catch data through November 2014.
[2]Biomass from annual SAFE report projections.



Blackspotted Rockfish
AFSC, NOAA Fisheries

Rougheye and Blackspotted Rockfish

Biology: The Rougheye and Blackspotted Rockfish (RE/BS) complex consists of 2 species; Rougheye Rockfish *Sebastes aleutianus* and Blackspotted Rockfish *Sebastes melanostictus*, recently identified by genetic research as distinct from Rougheye. The species are often difficult to differentiate from each other at sea. RE/BS distribution extends from Japan, through the BSAI, GOA to southern California. Adults primarily inhabit a narrow band along the upper continental slope at depths from 300-500 m. Although the two species distributions overlap, Blackspotted Rockfish are predominant in the AI, while Rougheye Rockfish are more common in the GOA and southeastern BS.

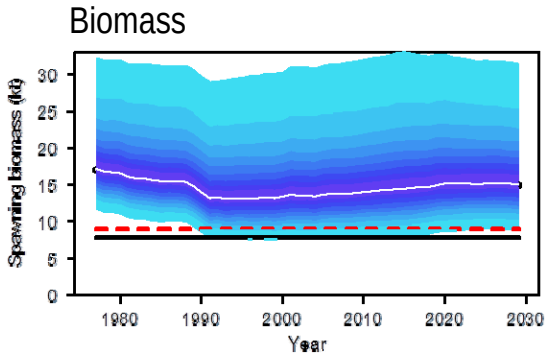
Rougheye Rockfish length at 50% maturity is 44 cm, and longevity may extend to 200 years. Natural mortality for RE/BS is estimated to be M=0.03. As with other rockfish, RE/BS are presumed to be viviparous. RE/BS Rockfish prey on pandalid shrimps, euphausiids, lanternfishes, and crabs. Predators of RE/BS include Pacific Halibut, Pacific Cod and Sablefish.

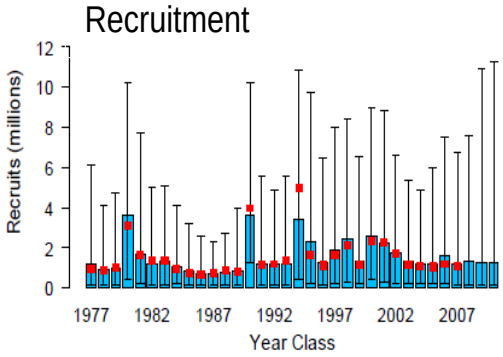
Stock assessment:

S. K. Shotwell, D. Hanselman, P. Hulson, and J. Heifetz. 2014. Assessment of Rougheye and Blockspotted Rockfish stock in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Catch History: Gulf- wide catches of the Rougheye Rockfish and Blackspotted Rockfish ranged from 130-2,418 mt. from 1977-1990. RE/BS Rockfish are generally caught with either bottom trawls or longline gear. RE/BS Rockfish have been managed as a "bycatch" only species since the creation of the Shortraker/Rougheye Rockfish management subgroup in the Gulf of Alaska in 1991. RE/BS Rockfish were separated into their own management unit in 2004, and catches of RE/BS Rockfish averaged 345 mt annually from 2005- 2009.





Total catches, pre-season catch specifications, and exploitable biomass of Rougheye and Blackspotted Rockfish* in the GOA, 2005-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL	Biomass[2]
2005	294	1,007	1,007	1,531	40,281
2006	358	983	983	1,180	37,449
2007	417	988	988	1,148	39,506
2008	389	1,286	1,286	1,548	46,121
2009	280	1,284	1,284	1,545	46,385
2010	447	1,302	1,302	1,568	45,751
2011	543	1,312	1,312	1,579	45,907
2012	593	1,223	1,223	1,472	42,856
2013	574	1,232	1,232	1,482	42,883
2014	733	1,244	1,244	1,497	42,810
2015		1,122	1,122	1,345	36,584

*Separated from Slope Rockfish in 1991 and Shortraker/Rougheye Rockfish in 2004.
[1]Catch data through November 2014.
[2]Biomass from annual SAFE report projections.

Stock Assessment: The RE/BS Rockfish assessment uses a separable age-structured model that incorporates fishery data and fishery independent data from biennial trawl and annual longline surveys. RE/BS Rockfish limits are set by a Tier 3a control rule.

Fishery: RE/BS Rockfish in the GOA are primarily taken in rockfish bottom trawl fisheries and longline fisheries targeting Sablefish and Pacific Halibut.

Rougheye Rockfish
AFSC, NOAA Fisheries

Yelloweye Rockfish
ADF&G

Demersal Shelf Rockfish

ology: The Demersal Shelf Rockfish (DSR) complex consists of 7 species and are a management unit in the Southeast Outside area only (east of 140 W longitude). Elsewhere in the Gulf of Alaska, these species are managed as part of the "Other rockfish" complex. DSR are generally nearshore, bottom-dwelling species, located on the continental shelf and associated with rugged, rocky habitat. DSR species exhibit K-selected life history traits including slow growth and extreme longevity. DSR are viviparous, and parturition occurs from February through September with the majority of the species extruding larvae in spring.

Canary Rockfish	*Sebastes pinniger*
China Rockfish	*Sebastes nebulosus*
Copper Rockfish	*Sebastes caurimus*
Quillback Rockfish	*Sebastes maliger*
Rosethorn Rockfish	*Sebastes helvomaculatus*
Tiger Rockfish	*Sebastes nigrocinctus*
Yelloweye Rockfish	*Sebastes ruberrimus*

Stock assessment:

K. Green and K. Van Kirk. 2014. Assessment of the Demersal Shelf Rockfish stock in the SEO District of the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

The primary species of the fishery is Yelloweye Rockfish. The oldest recorded Yelloweye Rockfish is 118 years, and natural mortality is estimated at M=0.02. Yelloweye reach a maximum length of about 91 cm with the length at 50% maturity at 45 cm (18 years). Yelloweye feed on shrimp, small crabs and a variety of fishes including small rockfish, herring and sandlance. Yelloweye are in turn prey for larger rockfish, lingcod, salmon and Pacific Halibut.

Catch History: The directed fishery for DSR began in 1979 as a small, shore-based, hook and line in Southeast Alaska, which targeted the entire DSR complex. Total DSR catch increased from 120 mt in 1982 to a peak of 778 mt in 1987.

Exploitable biomass, pre-season catch specifications, and total catches (including discards) of Demersal Shelf Rockfish* in the Southeast Outside sub-district of the GOA, 1992-2015 (in mt).

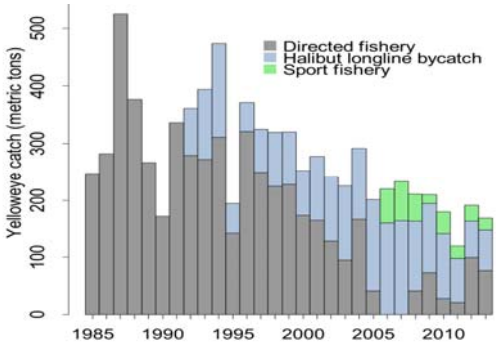
Year	Catch[1]	TAC	ABC	OFL	Biomass[2]
1992	511	550	550	732	-
1993	558	800	800	1,600	48,366
1994	540	960	960	1,680	49,280
1995	219	580	580	1,044	26,093
1996	401	950	950	1,702	42,552
1997	406	950	950	1,450	42,552
1998	552	560	560	950	25,031
1999	297	560	560	950	25,031
2000	406	340	340	420	15,100
2001	301	330	330	410	14,695
2002	292	350	350	480	15,615
2003	229	390	390	540	17,510
2004	260	450	450	690	20,168
2003	187	410	410	640	18,508
2006	166	410	410	650	19,558
2007	250	410	410	650	19,558
2008	149	382	382	611	18,329
2009	138	362	362	580	17,390
2010	127	295	295	472	14,321
2011	82	300	300	479	14,395
2012	180	240	293	467	14,307
2013	218	249	303	487	14,588
2014	104	274	274	438	13,274
2015		225	225	361	10,933

*Separated from Rockfish in 1991.
[1] Catch data through November 2014.
[2]Biomass from annual SAFE report projections.

Fishery Management: DSR are managed jointly by ADF&G and NMFS. Directed fishery quotas are set by management area and are based on the remaining ABC after subtracting the estimated DSR incidental catch (landed and at sea discard) in other fisheries. If there is sufficient directed quota available for DSR to hold a fishery, then this will be opened in late January and will be closed prior to the start of the halibut season in March.

Stock Assessment: Yelloweye Rockfish biomass is estimated from submersible transect density and area estimates of DSR habitat. DSR catch limits managed as a Tier 4 species, but the catch limits are set below maximum permissible by setting F=M.

Fishery: The directed fishery for DSR is almost entirely prosecuted by longline gear.



Shortspine Thornyhead
AFSC, NOAA Fisheries

Thornyhead Rockfish

Biology: The Thornyhead Rockfish Complex consists of 3 species; Shortspine *Sebastolobus alascanus*, Longspine *Sebastolobus altivelis*, and Broadfin *Sebastolobus macrochir* Thornyheads. Thornyheads are distinguished from "true" rockfish (*Sebastes*) due to their reproductive biology. Whereas *Sebastes spp*. rockfish are viviparous, thornyheads are oviparous, releasing fertilized eggs in floating gelatinous masses. Thornyheads are also differentiated from *Sebastes spp.* in lacking a swim bladder.

NOAA Fisheries Service

Shortspine Thornyheads are distributed in deep-water habitats throughout the North Pacific, and are concentrated between 150-450 m in the cooler, northern part of their range and are generally found in deeper habitats up to 1000 m in the warmer waters of their southern range. Females reach 50% maturity at about 22 cm, and longevity extends to 100 years or more. Natural mortality is estimated to be M=0.03. Shortspine Thornyheads feed on shrimps, crabs, zooplankton and amphipods and are in turn prey for Arrowtooth Flounder, Sablefish, sperm whales and sharks. Longspine Thornyheads are found only in the eastern North Pacific, around the Shumagin Islands, GOA and south to California. Longspines are generally found in deeper habitats from 200-1,750 m.

Stock assessment:

S. K. Shotwell, J. Ianelli, and J. Heifetz. 2014. Assessment of the Thornyhead Stock Complex in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Catch History: The greatest reported harvest of Thornyheads in the GOA occurred from 1979-1983. Catches declined in 1984 and 1985 due to U.S. management restrictions and a transition to domestic fisheries. U.S. catches continued to increase through 1989, peaking at 3,055 mt.

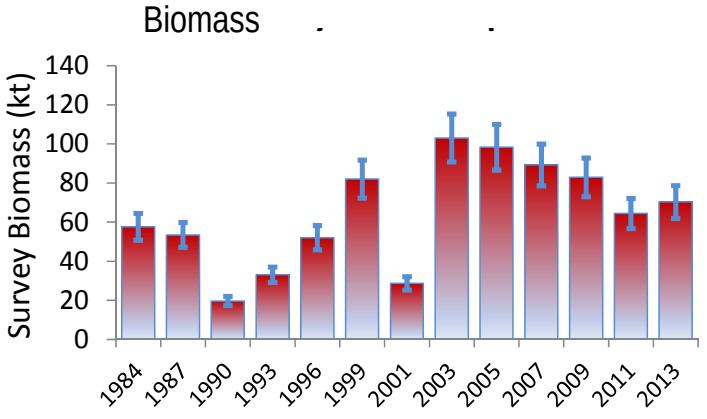
Total catches, pre-season catch specifications, and exploitable biomass of age 5+ Thornyhead Rockfish* in GOA, 1992-2015 (mt).

Year	Catch[1]	TAC[2]	ABC	OFL	Biomass
1992	2,020	1,800	1,800	2,440	25,700
1993	1,369	1,062	1,180	1,441	26,207
1994	1,320	1,180	1,180	1,440	103,300
1995	1,113	1,900	1,900	2,660	30,341
1996	1,100	1,248	1,560	2,200	26,244
1997	1,240	1,700	1,700	2,400	46,108
1998	1,136	2,000	2,000	2,840	52,271
1999	1,282	1,990	1,990	2,800	53,216
2000	1,307	2,360	2,360	2,820	52,950
2001	1,339	2,310	2,310	2,770	52,100
2002	1,125	1,990	1,990	2,330	77,840
2003	1,159	2,000	2,000	3,050	85,760
2004	818	1,940	1,940	2,590	86,200
2005	719	1,940	1,940	2,590	86,200
2006	779	2,209	2,209	2,945	98,158
2007	701	2,209	2,209	2,945	98,158
2008	741	1,910	1,910	2,540	84,774
2009	666	1,910	1,910	2,540	84,775
2010	553	1,770	1,770	2,360	78,795
2011	612	1,770	1,770	2,360	78,795
2012	746	1,665	1,665	2,220	73,990
2013	1,153	1,665	1,665	2,220	73,990
2014	1,121	1,841	1,841	2,454	81,816
2015		1,841	1,841	2,454	81,816

* includes Longspine and Shortspine Thornyheads.
[1]Catch data through November 2014.
[2]TAC, ABC and OFL from annual Federal Register.

Stock Assessment: Thornyhead rockfish catch limits are set using a Tier 5 control rule. The 2015 projected biomass is 81,816 mt. Catch specifications for 2015 are as follows; OFL=2,454 mt, ABC= 1,841 mt, TAC= 1,841 mt.

Fishery: Thornyheads are caught by bottom trawl as a secondary target species in the CGOA Rockfish program and are also taken incidentally in the Sablefish longline fishery. Thornyheads are a valuable rockfish species, and most of the domestic harvest is exported to Japan.



Atka Mackerel

Atka Mackerel
AFSC, NOAA Fisheries

Biology: Atka Mackerel *Pleurogrammus monopterygius* are distributed along the continental shelf. Atka Mackerel is a schooling, semi-demersal species most commonly found in the AI, but also in the Western and Central GOA. Adult Atka Mackerel occur in large localized aggregations at depths less than 200 m over rough, uneven bottom areas with high tidal currents. Atka Mackerel feed on euphausiids and copepods and are prey for Pacific Cod, Arrowtooth Flounder, Stellar sea lions, and seabirds.

Atka Mackerel begin to recruit to the fishery at age 3 and longevity can extend to 15 years. Females reach 50% maturity at 38.2 cm (3.6 years). Natural mortality is estimated at M=0.30.

Jackie Patt, UAF

Atka Mackerel is a substrate-spawning fish with male parental care. Behavioral studies have shown that the Atka Mackerel mating system is very complex. A significant characteristic is the bright and distinct coloration developed by territorial males during the spawning season. Spawning occurs from July to October, peaking in early September. Atka Mackerel have relative low fecundity, with females releasing around 30,000 eggs each year. Eggs are adhesive and deposited in rock crevices in nests guarded by males until hatching, which occurs about 40-45 days later.

Stock assessment:

S. Lowe. 2014. Assessment of Atka Mackerel stock in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Catch History: Atka Mackerel supported a targeted foreign fishery (primarily Soviet vessels) in the Central GOA during the 1970s and 1980s. Catches peaked in 1975 at about 27,000 mt then declined dramatically to less than 5 mt in 1986. Joint venture operations participated in the Atka Mackerel fishery from 1983-1985, and the fishery was fully domestic by 1986.

Total catches, and pre-season catch specifications of Atka Mackerel* in the GOA, 1994-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL
1994	3,538	3,500	4,800	19,040
1995	701	3,240	3,240	11,700
1996	1,580	3,240	3,240	9,800
1997	331	1,000	1,000	6,200
1998	317	600	600	6,200
1999	262	600	600	6,200
2000	170	600	600	6,200
2001	76	600	600	6,200
2002	85	600	600	6,200
2003	578	600	600	6,200
2004	819	600	600	6,200
2005	799	600	600	6,200
2006	876	1,500	4,700	6,200
2007	1,453	1,500	4,700	6,200
2008	2,109	1,500	4,700	6,200
2009	2,222	3,328	3,328	6,200
2010	2,409	2,000	4,700	6,200
2011	1,615	2,000	4,700	6,200
2012	1,187	2,000	4,700	6,200
2013	1,277	2,000	4,700	6,200
2014	981	2,000	4,700	6,200
2015		2,000	4,700	6,200

*Added to Other Species category in 1988 and separated from Other Species in 1994.
[1]Catch data through November 2014.

Fishery Management:. In 1988, Atka Mackerel were combined with the Other Species category due to low abundance. In 1994, Atka Mackerel were removed from the Other Species category and treated once again as a single species target stock. There has not been a directed Atka Mackerel fishery in the GOA since 1996.

Stock Assessment: The existing GOA bottom trawl survey data has limited utility for either absolute abundance estimates or indices for Atka Mackerel. Atka Mackerel fall under the Tier 6 control rule. The 2015 catch specifications for Atka Mackerel are as follows; OFL=6,200 mt, ABC=4,700 mt, TAC=2,000 mt.

Fishery: Atka Mackerel has been a "bycatch" only fishery in the GOA since 1996.

Ecosystem Components: Because Atka Mackerel is a common prey item for Steller sea lions, all directed fishing for Atka Mackerel is prohibited in the GOA.

Jackie Patt, UAF

Big Skates, Longnose Skates, Other Skates

Biology: The GOA Skate complex is comprised of at least 15 skate species. Big Skate and Longnose Skate dominate the skate biomass in the GOA. *Bathyraja sp*. compose about a third of total GOA skate biomass, with the majority of these being the Aleutian Skate and Bering Skate. Skate biomass is concentrated in the Central GOA. Skates feed on bottom invertebrates, such as crustaceans, mollusks and polychaetes and fish. Skates are prey for sharks, Steller sea lions and sperm whales.

The highest biomass of skates in the GOA is found in continental shelf waters less than 100 m deep, and is dominated by the Big Skate. In continental shelf waters from 100-200 m depth, Longnose Skate dominates skate biomass, and *Bathyraja* skate species are dominant in the deeper waters extending from 200 to 1000 m or more in depth. Big and Longnose Skate are generally found in shallower waters in the GOA, and their distribution extends from the Bering Sea to southern Baja California. The Aleutian Skate ranges throughout the north Pacific from northern Japan to northern California and has been found at depths between 16-1602 m. The Alaska Skate is restricted to higher latitudes from the Sea of Okhotsk to the eastern GOA at depths from 17-392 m.

Big Skate	*Beringraja binoculata*
Longnose Skate	*Raja rhina*
Other skates	
Aleutian Skate	*Bathyraja aleutica*
Bering Skate	*Bathyraja interrrupta*
Alaska Skate	*Bathyraja parmifera*
Deepsea Skate	*Bathyraja abyssicola*
Commander Skate	*Bathyraja lindbergi*
Whiteblotched Skate	*Bathyraja maculata*
Butterfly Skate	*Bathyraja mariposa*
Whitebrow Skate	*Bathyraja minispinosa*
Leopard Skate	*Bathyraja pamifera sp.*
Mud Skate	*Bathyraja taranetzi*
Roughtail Skate	*Bathyraja trachura*
Okhotsk Skate	*Bathyraja violacea*
Roughshoulder Skate	*Bathyraja badia*

Stock assessment:

O. Ormseth. 2014. Assessment of the skate stock complex in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Big Skate
Megan Peterson, UAF

Skates are generally K-selected, with slow-growth, low fecundity and relatively large body size. Skates are oviparous; fertilization is internal, and eggs are deposited in horny cases for incubation. There are 1-7 embryos per egg case in locally occurring *Raja sp*., but little is known about the frequency of breeding or egg deposition for any of the local species. It is estimated that annual fecundity per females may be less than 50 eggs per year. The Big Skate is the largest skate in the GOA, with maximum sizes observed over 200 cm in the directed fishery in 2003. Observed sizes for the Longnose Skate range from 165-170 cm. The maximum observed lengths for *Bathyraja* species from bottom trawl surveys of the GOA range from 86-154 cm. Life history parameter data are limited for GOA skates. The AFSC Age and Growth Program has recently reported a maximum observed age of 25 years for the Longnose Skate in the GOA and a maximum observed age for GOA Big Skate of 15 years.

Catch History: Skates were caught as a bycatch only species in the GOA at about 1,000-2,000 mt per year from 1992-1995, principally by the longline Pacific Cod and bottom trawl pollock and flatfish fisheries. Most skates during this time period were not retained. A directed skate fishery developed in the GOA in 2003 due to an increase in the ex-vessel value of skates. The skate fishery was

prosecuted generally by longline vessels less than 60 feet around Kodiak Island. Lower ex-vessel prices and a possible reduction in skate catch-per-unit effort resulted in a sharp decline in skate catches in 2004-2005.

Directed fishing for skates in the GOA has been prohibited since 2005. Annual average catches of Big Skate, Longnose Skate and other skates from 2005- 2014 have averaged 1,811 mt, 1,150 mt, and 1,280 mt respectively. Catches are highest in the central GOA regulatory area.

Fishery Management: Since the beginning of domestic fishing in the late 1980s through 2003, all species of skates in the GOA were managed under the Other Species FMP category (skates, sharks, squids, sculpins, and octopuses). Catch limits were determined for all Other Species as 5% of the sum of the TACs for GOA target species. Under Amendment 63 in 2003, GOA skates were removed from the Other Species category in 2004 for separate management in response to a developing fishery. Big and Longnose Skate were managed together under a single TAC in the Central GOA. The remaining skates were managed as an "Other Skates" species complex in the Central GOA, and all skates were managed as an "Other Skates" species complex in the Western and Eastern GOA.

In 2005, Big Skate and Longnose Skate were separated into single species management groups due to concerns about disproportionate harvests. The remaining skates (genus *Bathyraja*) continue to be managed as a gulf-wide species complex because they were not the targets of the fishery and are more difficult to identify. There has been no directed fishing for skates in the GOA since 2005.

Stock Assessment: The Skates stock assessment used estimated biomass data from NMFS summer bottom trawl surveys from 2003-fwd. Skates are managed under Tier 5 of the ABC/OFL control rule, based on an overall natural mortality rate of 0.10 applied to survey biomass estimates for each species group. Gulf wide catch specifications (mt) for 2015 are as follows.

	2015 Biomass	OFL	ABC	TAC	2014 Catch
Big Skate	43,398	4,340	3,225	3,225	1,379
Longnose Skate	42,911	4,291	3,218	3,218	1,148
Other skates	29,797	2,980	2,235	2,235	1,559

Note that the ABC and TAC are further broken out into Western, Central, and Eastern Gulf of Alaska for Big Skate and Longnose skate.

Fishery: GOA Skates have been a bycatch only fishery since 2005. Skates are generally caught as bycatch in Pacific Halibut and Pacific Cod longline fisheries and flatfish trawl fisheries, especially in the GOA Central regulatory area. The incidental catch of Big Skate in the Central area has the potential to constrain fisheries.

Ecosystem Components: Skates have few natural predators. In the GOA, skate predators include marine mammals such as Steller sea lions and sperm whales (which may consume adult or juvenile skates), and Spiny Dogfish (which likely consume juvenile skates).

Spiny Dogfish
AFSC, NOAA Fisheries

Sharks

Biology: The GOA Shark complex is composed of 8 shark species. The most abundant species in the GOA are the Spiny Dogfish, the Salmon Shark and the Pacific Sleeper Shark. GOA sharks exhibit K-selected life history traits including slow growth to maturity, low fecundity and large size. Spiny dogfish, Pacific sleeper shark and Salmon Sharks reproduce through aplacental vivipary. Shark diets vary with species and in general sharks are opportunistic feeders, but forage fish, crustaceans, squid and salmon are among the most common prey items.

Spiny dogfish	*Squalus acanthias*
Salmon shark	*Lamna ditropis*
Pacific sleeper shark	*Somniosus pacificus*
Brown cat shark	*Apristurus brunneus*
White shark	*Carcharodon carcharias*
Basking shark	*Cetorhinus maximus*
Sixgill shark	*Hexanchus griseus*
Blue shark	*Prionace glauca*

Stock assessment:

C. Tribuzio, P. Hulson, K. Echave, and C. Rodgeveller. 2014. Assessment of the shark stock complex in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Spiny Dogfish are distributed from California to Alaska, through the Aleutian chain to the Asian coast and south to Japan. Spiny Dogfish are found at depths ranging from the intertidal to 900 m. Spiny Dogfish growth rates are among the slowest of all shark species. Estimates of Spiny Dogfish age-at-50%-maturity are 20 years for males to 34 years for females. Longevity is estimated to reach between 80 and 100 years. Natural mortality is estimated at M=0.097. Spiny Dogfish have one of the longest known gestation periods, approximately 18-24 months.

Spiny Dogfish, Mark Fina, NPFMC

Pacific Sleeper Sharks are found along the North Pacific continental shelf and slope, ranging from Japan to the Bering Sea. Distribution extends as far north as the Chukchi Sea and as far south as Baja California. At higher latitudes, Pacific Sleeper Sharks are found shallower from littoral zones to surface waters. At lower latitudes, they reside much deeper and down to 2000 m. Pacific Sleeper Sharks make extensive, nearly continuous vertical movements. The maximum lengths of captured Pacific Sleeper Sharks are 440 cm for females and 400 cm for males. Pacific Sleeper Sharks 150-250 cm in length are most common in Alaska. Pacific Sleeper Shark age and reproduction data are limited.

Salmon Shark, Ken Goldman, ADF&G

Salmon Shark distribution in the northern Pacific extends from Japan into the Sea of Okhotsk to the Bering Sea and possibly south as far as Baja California Mexico. Salmon Sharks live in areas with sea-surface temperatures between 5˚C and 18˚C and in depths up to 150 m. However, Salmon Sharks are primarily found in waters less than 50 m deep. While some Salmon Sharks migrate south during the winter months, others remain in the GOA

throughout the year. Longevity estimates for Salmon Sharks are between 20-30 years with maturity occurring at 3-5 years for males and 6-9 years for females. Natural mortality is estimated at M=0.18.

Catch History: There are currently no directed commercial fisheries for shark species in federal or state managed waters of the GOA, and most incidentally caught sharks are not retained. A small number of Spiny Dogfish landings in Kodiak were reported in 2004, 2005 and 2007 (approximately 1 mt each year). Spiny Dogfish and Salmon Sharks are also caught in recreational fisheries in the GOA. Estimates of historic catches of sharks range from 308 mt in 1995 to a peak of 2,390 mt in 1998. Catches annually averaged 895 mt from 1992-1999 and 982 mt from 2000-2014.

Spiny dogfish, Cindy Tribuzio, AFSC, NOAA Fisheries

Total catches, and pre-season catch specifications of Sharks* in the GOA, 1994-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL
1994	360	-	-	-
1995	308	-	-	-
1996	484	-	-	-
1997	1,041	-	-	-
1998	2,390	-	-	-
1999	1,036	-	-	-
2000	1,117	-	-	-
2001	853	-	-	-
2002	427	-	-	-
2003	751	-	-	-
2004	573	-	-	-
2005	1,101	-	-	-
2006	1,603	-	-	-
2007	1,406	-	-	-
2008	619	-	-	-
2009	1,167	-	-	-
2010	603	-	-	-
2011	523	6,197	6,197	8,262
2012	636	6,028	6,028	8,037
2013	2,166	6,028	6,028	8,037
2014	1,188	5,989	5,989	7,986
2015		5,989	5,989	7,986

*Split from Other Species in 2011.
[1]Catch data through November 2014.

Fishery Management: Until 2011, sharks were managed under the Other Species FMP category (sharks, squids, sculpins, and octopuses). Beginning in 2011, sharks have been managed in a separate complex.

Stock Assessment: Catch specifications for sharks are based on Tier 6. A Tier 5-like method is used for dogfish sharks, with natural mortality (M=0.097) applied to biomass estimate (79,257 mt). Standard tier 6 methodology is used for other sharks based on average historical catch from 1997-2007. Catch specifications for sharks in 2015 are as follows; OFL=7,986 mt, ABC=5,989 mt, and TAC=5,989 mt.

Fishery: GOA sharks are managed as a bycatch only fishery. On average, over 90% of the sharks are discarded. Spiny Dogfish were caught primarily in the longline Pacific Cod and bottom trawl flatfish fisheries. Over 90% of Pacific Sleeper Sharks and Salmon Sharks were caught in the Pollock fishery.

AFSC, NOAA Fisheries

Squid

Biology: There are at least 15 species of squid in the Gulf of Alaska and these are managed as a squid complex. The most common squid near the continental shelf are in the genus *Berryteuthis*. Further offshore, Boreopacific Armhook Squid and *Gonatus* squids appear to be the most common. Much more research is needed to adequately characterize squid distribution in the Gulf of Alaska.

Squids are active predators that swim by jet propulsion, reaching swimming speeds of up to 40 km/hr, the fastest of any aquatic invertebrate. Squids are short-lived (<4 years), maturing just prior to spawning and dying afterwards. Squid populations consist of multiple cohorts that school with similar sized individuals, and may occupy different areas of the shelf and slope.

Chiroteuthid sp.	*Chiroteuthis calyx*
Glass squid sp.	*Belonella borealis*
Glass squid sp.	*Galiteuthis phyllura*
Minimal Armhook Squid	*Berryteuthis anonychus*
Magistrate Armhook Squid	*Berryteuthis magister*
Armhook Squid	*Eogonatus tinro*
Boreopacific Armhook Squid	*Gonatopsis borealis*
Berry Armhook Squid	*Gonatus berryi*
Armhook squid sp.	*Gonatus madokai*
Armhook squid sp.	*Gonatus middendorffi*
Clawed Armhook Squid	*Gonatus onyx*
Robust Clubhook Squid	*Moroteuthis robusta*
Boreal Clubhook Squid	*Onychoteuthis borealijaponicus*
Red Flying Squid	*Ommastrephes bartramii*
North Pacific Bobtail Squid	*Rossia pacifica*

Stock assessment:

O. Ormseth. 2014. Assessment of the squid stock complex in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Fishery Management: Squid were defined as an "other species" in the GOA until 2011 when the "other species" complex was separated out into distinct species groupings.

Stock Assessment: Catch specifications for Squid are set using a modified Tier 6 control rule, with catch specifications are based on the highest catch during 1997-2008. Squid estimated biomass in unknown. Catch specifications for squid in 2015 were as follows; OFL=1,530 mt, ABC=1,148 mt, TAC=1,148 mt.

Total catches, and pre-season catch specifications of Squid* in the GOA, 1997-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL
1997	97	-	-	-
1998	59	-	-	-
1999	41	-	-	-
2000	19	-	-	-
2001	91	-	-	-
2002	43	-	-	-
2003	97	-	-	-
2004	162	-	-	-
2005	636	-	-	-
2006	1,530	-	-	-
2007	416	-	-	-
2008	98	-	-	-
2009	345	-	-	-
2010	139	-	-	-
2011	238	1,148	1,148	1,530
2012	22	1,148	1,148	1,530
2013	321	1,148	1,148	1,530
2014	92	1,148	1,148	1,530
2015		1,148	1,148	1,530

*Split from Other Species in 2011.
[1]Catch data through November 2014.

Fishery: There is currently no target fishery for squid in the GOA. GOA squid are primarily (> 90%) taken as incidental catch in the pelagic trawl pollock fishery. They are also taken in smaller numbers in bottom trawl fisheries. About 90% of the squid catch has been retained in recent years.

Tim Evers

Ecosystem Components: Squid are not currently a commercially valuable species in the North Pacific. However they play a critical prey role in ecosystems, as squid are important components in the diets of many seabirds, fish and marine mammals. Overall fishing removals of squid are low (especially relative to natural predation).

Giant Pacific Octopus
Linda Kozak

Biology: There are at least 7 species of octopus present in federal waters of the GOA, and the species composition both of natural communities and commercial harvest is unknown. At depths less than 200 meters, the giant Pacific octopus *E. dofleini* appears to be the most abundant species. Octopus life spans are either 1-2 years or 3-5 years depending on the species. *E. dofleini* are estimated to mature at 1.5 – 3 years. male *E. dofleini* were found to mature at around 12.5 kg with females thought to mature at larger sizes. *E. dofleini* is a terminal spawner, females die after the eggs hatch while males die shortly after mating. The fecundity of this species in Japanese waters has been estimated at 30,000 to 100,000 eggs per female. There are two other common species of octopus in the GOA: the smoothskin octopus and the flapjack devilfish. The smoothskin octopus occurs from 250-1400 m. and produces few eggs that remain benthic after hatching. The flapjack devilfish is found from 300-1000m deep and spawn up to 2,400 eggs in multiple batches.

Giant Pacific octopus	*Enteroctopus dofleini*
Smoothskin octopus	*Benthoctopus leioderma*
Flapjack devilfish	*Opisthoteuthis californiana*
Pelagic octopus	*Japatella diaphana*
Red octopus	*Octopus californicus*
Black octopus	*Vampyroteuthis infernalis*
a small octopus	*Octopus sp. A*

Stock assessment:

M.E. Conners and C. Conrath. 2014. Assessment of the Octopus Stock Complex in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm

Fishery Management: Until 2011, octopus were managed as part of the "Other species" management category within the GOA FMP. Beginning in 2011, octopuses have been managed as a single complex with its own ABC and OFL.

Megan Peterson, UAF

Stock Assessment: Octopus catch limits are specified using a modified Tier 6 control rule, with an estimate of natural mortality (M=0.53) applied to the biomass of the three most recent NMFS bottom trawl surveys. While the biomass is deemed unreliable for purposes of Tier 5, it does provide a minimum estimate of biomass. Catch specifications for octopus in 2015 are as follows; OFL=2,009 mt, ABC=1,507 mt, TAC=1,507 mt.

Total catches, and pre-season catch specifications of Octopus* in the GOA, 1997-2015 (in mt).

Year	Catch[1]	TAC	ABC	OFL
1997	232	-	-	-
1998	112	-	-	-
1999	166	-	-	-
2000	156	--	-	-
2001	88	-	-	-
2002	298	-	-	-
2003	210	-	-	-
2004	286	-	-	-
2005	151	-	-	-
2006	159	-	-	-
2007	262	-	-	-
2008	339	-	-	-
2009	310	-	-	-
2010	324	-	-	-
2011	917	954	954	1,272
2012	421	1,455	1,455	1,941
2013	441	1,455	1,455	1,941
2014	1,057	1,507	1,507	2,009
2015		1,507	1,507	2,009

*Split from Other Species in 2011.
[1]Catch data through November 2014.

Fishery: There is currently no target fishery for octopus in federal waters of the GOA. About 90% of the octopus catch is taken as incidental catch in the Pacific Cod pot fisheries in the western and central GOA. In 2014, approximately 529 mt of octopus were retained for human consumption or for bait for the halibut fishery. The species composition of the octopus catch is unknown, but based on research trawl data, the giant Pacific octopus is most abundant in shelf waters and predominates in commercial catch. Preliminary research suggests high survival for octopus released from pot gear.

Great Sculpin
AFSC, NOAA Fisheries

Sculpins

Biology: There are 39 species of sculpins identified in the Gulf of Alaska and managed as a sculpin complex. The most common sculpin species taken incidentally in GOA fisheries are the Yellow Irish Lord *Hemilepidotus jordani* making up over 60% of the catch, followed by Great Sculpin *Myoxocephalus polyacanthocephalus* , Bigmouth Sculpin *Hemitripterus bolini* and Plain Sculpin *M. joak*. Sculpins lay adhesive eggs in nests, and many exhibit parental care for eggs. Irish lords and great sculpins have an age at 50% maturity of about 7 years.

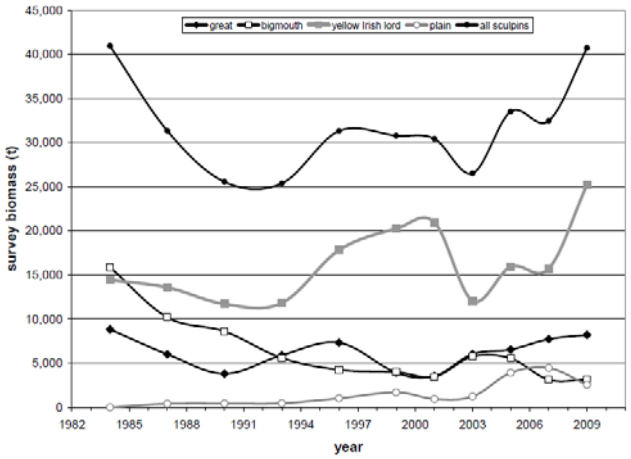
Catch history: There is no directed fishing for any sculpin species in the GOA at this time. Catch of sculpins in the last 15 years has been averaged about 900 mt per year, reaching a peak in 2008 of 1,943 mt.

Fishery Management: Prior to 2011, sculpins were managed as part of the GOA Other Species complex that included sculpins, skates, sharks, squid and octopus, with an aggregate OFL, ABC, and TAC. Beginning in 2011 sculpins were removed from Other Species and managed as a separate group, as were the remaining species groups. Sculpins are currently taken only as incidental catch in fisheries directed at other target species, and it is likely that catch of sculpins in the near future will continue to be dependent on the distribution and limitations placed on target fisheries, rather than on any harvest level established for this category.

Stock assessment authors:

I. Spies, D. Nichol, and T. Tenbrink. 2014. Assessment of the Sculpin Stock Complex in the Gulf of Alaska.

http://www.afsc.noaa.gov/refm/stocks/assessments.htm



Catches, pre-season catch specifications and estimated biomass (t) of Sculpins in the GOA, 1997-2015.

Year	Catch	ABC	OFL	Biomass[2]
1997	898	-	-	-
1998	526	-	-	-
1999	544	-	-	30,783
2000	940	-	-	-
2001	587	-	-	30,418
2002	919	-	-	-
2003	629	-	-	26,514
2004	816	-	-	-
2005	626	-	-	33,519
2006	583	-	-	-
2007	960	-	-	32,468
2008	1,943	-	-	-
2009	1,146	-	-	40,726
2010	735	-	-	-
2011	691	5,496	7,328	33,307
2012	875	5,731	7,641	34,610
2013	1,959	5,884	7,614	34,732
2014	1,075	5,569	7,448	33,550
2015	5,569	5,569	7,448	33,550

*Sculpins removed from Other Species in 2011
[1] Estimated catch data through November 2014.
[2] Biomass estimate (t) from trawl surveys.

Stock Assessment: Sculpins are managed under Tier 5 of the OFL/ABC guidelines, and catch specifications are based on natural mortality for the complex (M=0.22) applied to average survey biomass.

Fishery: There is currently no target fishery for sculpins in the GOA, and virtually all are either discarded or made into meal. Incidental catches of sculpins are taken in the Pacific Cod, shallow water flatfish, and rockfish fisheries, as well as the halibut longline fishery.

Bigmouth Sculpin,
AFSC, NOAA Fisheries

Plan Team Members and Lead Assessment Authors

Bering Sea/Aleutian Islands Groundfish Plan Team

Grant Thompson, Chair (AFSC)
Diana Stram, Coordinator (NPFMC)
Kerim Aydin (AFSC)
David Barnard (ADF&G)
Elizabeth Chilton (AFSC)
Bill Clark (IPHC)
Lowell Fritz (AFSC)
Mary Furuness (NMFS)
Dana Hanselman (AFSC)
Alan Haynie (AFSC)
Brenda Norcross (UAF)
Chris Siddon (ADFG)
Leslie Slater (USF&W)

Gulf of Alaska Groundfish Plan Team

Jim Ianelli, Chair (AFSC)
Jim Armstrong, Coordinator (NPFMC)
Michael Dalton (AFSC)
Obren Davis (NMFS)
Craig Faunce (AFSC)
Nancy Friday (AFSC)
Kristin Green (ADF&G)
Jon Heifetz (AFSC)
Sandra Lowe (AFSC)
Chris Lunsford (AFSC)
Janet Rumble (ADFG)
Leslie Slater (USF&W)
Paul Spencer (AFSC)
Ian Stewart (IPHC)

Bering Sea/Aleutian Islands Stock Assessments

Steve Barbeaux (AFSC)
Elizabeth Connors (AFSC)
Dana Hanselman (AFSC)
Jim Ianelli (AFSC)
Sandra Lowe (AFSC)
Carey McGilliard (AFSC)
Olav Ormseth (AFSC)
Paul Spencer (AFSC)
Ingrid Spies (AFSC)
Grant Thompson (AFSC)
Cindy Tribuzio (AFSC)
Tom Wilderbuer (AFSC)

Gulf of Alaska Stock Assessments

Teresa A'mar (AFSC)
Martin Dorn (AFSC)
Katy Echave (AFSC)
Kristen Green (ADF&G)
Dana Hanselman (AFSC)
Peter-John Hulson (AFSC)
Sandra Lowe (AFSC)
Chris Lunsford (AFSC)
Carey McGilliard (AFSC)
Olav Ormseth (AFSC)
Kalei Shotwell (AFSC)
Ingrid Spies (AFSC)
Cindy Tribuzio (AFSC)
Jack Turnock (AFSC)

Council, SSC, AP Members and Staff

Council Members

Dan Hull, Chair, Anchorage, AK
John Henderschedt, Vice-Chair, Seattle, WA
Jim Balsiger/Glenn Merrill, NMFS, Juneau, AK
Craig Cross, Seattle WA
Ed Dersham, Anchor Point, AK
Duncan Fields, Kodiak, AK
Roy Hyder/Roy Elicker ODFW, Portland, OR
Simon Kinneen, Nome, AK
Dave Long, Wasilla, AK
Bill Tweit/Jim Unsworth, WDFW, Seattle, WA
Sam Cotten/Nicole Kimball, ADF&G, Juneau, AK
Dave Hanson, PSMFC, Lake Oswego, OR
CAPT Phil Thorne/ RADM Daniel Able USCG, AK
Doug McBride/Geoff Haskett, USFWS, Anchorage, AK
Mike Clark, US State Dept, Washington DC

Staff

Chris Oliver, Executive Director
David Witherell, Deputy Director
Jim Armstrong, Plan Coordinator
Gail Bendixen, Administrative Officer
Sam Cunningham, Economist
Diana Evans, Fishery Analyst
Peggy Kircher, Administrative Assistant
Steve MacLean, Protected Species
Jon McCracken, Economist
Sarah Marrinan, Economist
Maria Shawback, IT Specialist
Joy Stein, Finance Officer
Diana Stram, Plan Coordinator
Michael Fey, Data Manager, PSMFC

Scientific and Statistical Committee Members

Chris Anderson, University of Washington
Jennifer Burns, University of Alaska
Bob Clark, Vice Chair, Alaska Dept. Fish and Game
Alison Dauble, Oregon Department Fish and Wildlife
Sherri Dressel, Alaska Dept. Fish and Game
Anne Hollowed, NOAA Fisheries, AFSC
George Hunt, University of Washington
Gordon Kruse, University of Alaska
  Alternate: Milo Adkison, University of Alaska
Seth Macinko, University of Rhode Island
Steve Martell, Int. Pacific Halibut Commission
Franz Mueter, University of Alaska
Brad Harris, Alaska Pacific U.
Lew Queirolo, NOAA Fisheries, AKRO
Terry Quinn, University of Alaska
Katherine Reedy, Idaho State University
Matt Reimer, University of Alaska
Farron Wallace, NOAA Fisheries, AFSC

Advisory Panel Members

Ruth Christiansen
Kurt Cochran
John Crowley
Jerry Downing
Patrick O'Donnell
Jeff Kauffman
Jeff Farvour
John Gruver
Becca Robbins Gisclair
Mitch Kilborn
Alexus Kwachka
Craig Lowenberg
Chuck McCallum
Andy Mezirow
Joel Peterson
Theresa Peterson
Jeff Stephan
Matt Upton
Anne Vanderhoeven
Ernie Weiss
Sinclair Wilt

North Pacific Fishery Management Council
605 W. 4th Avenue, Suite 306
Anchorage, AK 99501
(907) 271-2809
www.npfmc.org

Produced by NPFMC under NOAA Award # NA10NMF4410005