

Harvest Projection Assessments

GOA Groundfish Plan Team



November, 2023

Arrowtooth flounder - Shotwell
Rex sole - McGilliard
Shallow water flatfish and N/S rock sole - Bryan
Flathead sole - Kapur
Dusky rockfish - Omori
Northern rockfish - Williams
Thornyheads - Echave

Arrowtooth Flounder (Tier 3a)

Not overfishing, overfished or approaching overfished



- Fishery Trends: catch remains low as in 2022, majority in ATF fishery, ~8-9% in rockfish and pollock fishery
- Survey Trends: 5% increase in bottom trawl survey, VAST estimates similar
- Update Projection Catch:
 - 2023: 9,029 t, 2024: 17,576 t, 2025: 15,516 t
 - Catch/Biomass decreasing since 2021, now lowest in time series
- ABC: 119,249 t, OFL: 142,485 t

Quantity/Status	As estimated or <i>specified</i>		As estimated or	
	2023	2024	2024*	2025*
M (natural mortality)	0.2	0.2	0.2	0.2
Tier	3a	3a	3a	3a
Projected total (age 1+) biomass (t)	1,265,950	1,269,510	1,295,410	1,311,810
Projected female spawning biomass	702,074	690,799	698,842	695,299
B _{100%}	1,018,700	1,018,700	1,018,700	1,018,700
B _{40%}	407,478	407,478	407,478	407,478
B _{35%}	356,544	356,544	356,544	356,544
F _{OFL}	0.225	0.225	0.225	0.225
maxF _{ABC}	0.185	0.185	0.185	0.185
F _{ABC}	0.185	0.185	0.185	0.185
OFL (t)	142,749	141,008	142,485	142,074
maxABC (t)	119,485	118,014	119,249	118,912
ABC (t)	119,485	118,014	119,249	118,912
Status	As determined <i>last</i> year for:		As determined <i>this</i> year for:	
	2022	2023	2023	2024
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

Rex sole

- Fishery Trends: lower than average catches for 2021-2023
- Survey Trends: lower than in 2021
- Last full/update assessment 2021, next 2025
- 2023 spawning biomass 60,486
- ABC: 21,364 t, OFL: 21,303 t

Quantity	As estimated or specified this year for:		As estimated or recommended this year for:					
	2023	2024	2024	2025				
<i>M</i> (natural mortality rate)	0.17	0.17	0.17	0.17				
Tier	3a	3a	3a	3a				
Projected total (3+) biomass (t)	127,297	128,207	129,611	129,296				
Female spawning biomass (t)	56,965	59,734	60,486	61,413				
<i>B</i> _{100%}	See area-specific tables below		See area-specific tables below					
<i>B</i> _{40%}								
<i>B</i> _{35%}								
<i>F</i> _{OFL}								
<i>maxF</i> _{ABC}	See area-specific tables below		See area-specific tables below					
<i>F</i> _{ABC}								
OFL (t)					25,135	25,652	25,978	25,900
maxABC (t)					20,664	21,097	21,364	21,303
ABC (t)	20,664	21,097	21,364	21,303				
Status	As determined last year for:		As determined this year for:					
	2021	2022	2022	2023				
Overfishing	no	n/a	no	n/a				
Overfished	n/a	no	n/a	no				
Approaching overfished	n/a	no	n/a	no				



Rex sole

- Western-Central GOA Projections
- Fish are larger at age in the Western-Central GOA than in the Eastern GOA

Quantity: (Western-Central GOA)	As estimated or specified this year for:		As estimated or recommended this year for:	
	2023	2024	2024	2025
M (natural mortality rate)	0.17	0.17	0.17	0.17
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	101,963	102,913	104,316	104,219
Female spawning biomass (t)	46,412	48,834	49,586	50,458
$B_{100\%}$	46,850	46,850	46,850	46,850
$B_{40\%}$	18,740	18,740	18,740	18,740
$B_{35\%}$	16,398	16,398	16,398	16,398
F_{OFL}	0.28	0.28	0.28	0.28
$maxF_{ABC}$	0.23	0.23	0.23	0.23
F_{ABC}	0.23	0.23	0.23	0.23
OFL (t)	19,865	20,335	20,660	20,635
maxABC (t)	16,346	16,739	17,006	16,987
ABC (t)	16,346	16,739	17,006	16,987
Status	As determined last year for:		As determined this year for:	
	2021	2022	2022	2023
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no



Rex sole

- Eastern GOA Projections
- Almost no catch in the Eastern GOA

Quantity: (Eastern GOA)	As estimated or specified this year for:		As estimated or recommended this year for:	
	2023	2024	2024	2025
<i>M</i> (natural mortality rate)	0.17	0.17	0.17	0.17
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	25,334	25,294	25,295	25,077
Female spawning biomass (t)	10,553	10,900	10,900	10,955
<i>B</i> _{100%}	8,998	8,998	8,998	8,998
<i>B</i> _{40%}	3,599	3,599	3,599	3,599
<i>B</i> _{35%}	3,149	3,149	3,149	3,149
<i>F</i> _{OFL}	0.31	0.31	0.31	0.31
<i>maxF</i> _{ABC}	0.25	0.25	0.25	0.25
<i>F</i> _{ABC}	0.25	0.25	0.25	0.25
OFL (t)	5,270	5,317	5,318	5,265
maxABC (t)	4,318	4,358	4,358	4,316
ABC (t)	4,318	4,358	4,358	4,316
Status	As determined last year for:		As determined this year for:	
	2021	2022	2022	2023
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no



Thanks to Carey McGilliard

Rex sole

- Area Apportionment uses area-specific model and projection results for Western-Central and Eastern GOA
- Uses predicted proportion in Western and Central GOA from REMA
- Uses survey biomass proportions calculated by RACE for W.Yak and SE

Quantity	Western	Central	Total Western-Central	West Yakutat	Southeast	Total Eastern
Area Apportionment	19.80%	80.20%	100.00%	33.64%	66.66%	100.00%
2024 ABC (t)	3,367	13,639	17,006	1,466	2,905	4,358
2025 ABC (t)	3,363	13,624	16,987	1,452	2,877	4,316



Thanks to Carey McGilliard

Shallow water flatfish and N/S rock sole

- Rock soles
 - Fishery Trends: Catch trend has been declining in central-eastern GOA (majority of catch), stable and low in western GOA
 - Survey Trends:
 - Central-eastern: NRS declining, SRS variable and slight decline in 2023
 - Western: NRS declining, SRS stable
 - Last full assessment 2021, next in 2025



Shallow water flatfish and N/S rock sole

Northern rock sole, Central-Eastern GOA	As estimated or recommended last year for:		As estimated or recommended this year for:	
	2023	2024	2024	2025
Quantity				
<i>M</i> (natural mortality rate; female, male)	0.2, 0.232*	0.2, 0.232*	0.2, 0.232*	0.2, 0.232*
Tier	3a	3a	3a	3a
Projected total (age 0+) biomass (t)	37,080	38,502	38,855	40,172
Projected Female spawning biomass (t)	13,431	15,845	16,054	17,427
<i>B</i> _{100%}	20,913	20,913	20,913	20,913
<i>B</i> _{40%}	8,365	8,365	8,365	8,365
<i>B</i> _{35%}	7,320	7,320	7,320	7,320
<i>F</i> _{OFL}	0.181	0.181	0.181	0.181
<i>maxF</i> _{ABC}	0.153	0.153	0.153	0.153
<i>F</i> _{ABC}	0.153	0.153	0.153	0.153
OFL (t)	4,934	5,175	5,227	5,419
maxABC (t)	4,214	4,421	4,466	4,631
ABC (t)	4,214	4,421	4,466	4,631
	As determined last year for:		As determined this year for:	
Status	2021	2022	2022	2023
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

Northern rock sole, Western GOA	As estimated or recommended last year for:		As estimated or recommended this year for:	
	2023	2024	2024	2025
Quantity				
<i>M</i> (natural mortality rate; female, male)	0.2, 0.254*	0.2, 0.254*	0.2, 0.254*	0.2, 0.254*
Tier	3a	3a	3a	3a
Projected total (age 0+) biomass (t)	66,512	67,083	67,086	67,327
Projected Female spawning biomass (t)	26,525	29,301	29,303	30,348
<i>B</i> _{100%}	28,702	28,702	28,702	28,702
<i>B</i> _{40%}	11,481	11,481	11,481	11,481
<i>B</i> _{35%}	10,045	10,045	10,045	10,045
<i>F</i> _{OFL}	0.385	0.385	0.385	0.385
<i>maxF</i> _{ABC}	0.313	0.313	0.313	0.313
<i>F</i> _{ABC}	0.313	0.313	0.313	0.313
OFL (t)	10,259	10,749	10,749	11,047
maxABC (t)	8,508	8,916	8,916	9,168
ABC (t)	8,508	8,916	8,916	9,168
	As determined last year for:		As determined this year for:	
Status	2021	2022	2022	2023
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No



Shallow water flatfish and N/S rock sole

Southern rock sole, Central-Eastern GOA	As estimated or recommended last year for:		As estimated or recommended this year for:	
	2023	2024	2024	2025
Quantity				
M (natural mortality rate; female, male)	0.2, 0.253*	0.2, 0.253*	0.2, 0.253*	0.2, 0.253*
Tier	3a	3a	3a	3a
Projected total (age 0+) biomass (t)	133,391	134,647	134,978	135,672
Projected Female spawning biomass (t)	43,539	49,696	49,889	54,623
$B_{100\%}$	53,439	53,439	53,439	53,439
$B_{40\%}$	21,376	21,376	21,376	21,376
$B_{33\%}$	18,703	18,703	18,703	18,703
F_{OFL}	0.268	0.268	0.268	0.268
$maxF_{ABC}$	0.224	0.224	0.224	0.224
F_{ABC}	0.224	0.224	0.224	0.224
OFL (t)	16,874	17,733	17,787	18,322
maxABC (t)	14,246	14,978	15,024	15,483
ABC (t)	14,246	14,978	15,024	15,482
	As determined last year for:		As determined this year for:	
Status	2021	2022	2022	2023
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

Southern rock sole, Western GOA	As estimated or recommended last year for:		As estimated or recommended this year for:	
	2022	2023	2023	2024
Quantity				
M (natural mortality rate; female, male)	0.2, 0.271*	0.2, 0.271*	0.2, 0.271*	0.2, 0.271*
Tier	3a	3a	3a	3a
Projected total (age 0+) biomass (t)	114,420	114,480	114,483	113,960
Projected Female spawning biomass (t)	40,457	45,479	45,481	49,057
$B_{100\%}$	43,788	43,788	43,788	43,788
$B_{40\%}$	17,515	17,515	17,515	17,515
$B_{33\%}$	15,326	15,326	15,326	15,326
F_{OFL}	0.222	0.222	0.222	0.222
$maxF_{ABC}$	0.185	0.185	0.185	0.185
F_{ABC}	0.185	0.185	0.185	0.185
OFL (t)	14,029	14,718	14,718	14,926
maxABC (t)	11,840	12,430	12,430	12,612
ABC (t)	11,840	12,430	12,430	12,612
	As determined last year for:		As determined this year for:	
Status	2021	2022	2022	2023
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No



Shallow water flatfish and N/S rock sole

- Fishery Trends: Catch trend has been declining (driven by rock sole trend); English sole catch generally increasing (almost equal to rock sole catch)
- Survey Trends:
 - Butter sole and NRS declining, English sole increasing
- Last full assessment 2021, next in 2025
- 2024 spawning biomass 453,606 t, trend stable
- ABC: 55,655 t, OFL: 68,121 t

Quantity/Status	As estimated or <i>specified last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2023	2024	2024	2025
M (natural mortality)	0.2**	0.2**	0.2**	0.2**
Tier	3a, 5	3a, 5	3a, 5	3a, 5
Biomass (t)	449,607	452,916	453,606	455,335
F _{OFL}	*	*	*	*
maxF _{ABC}	*	*	*	*
F _{ABC}	*	*	*	*
OFL (t)	65,736	68,015	68,121	69,354
maxABC (t)	53,537	55,474	55,565	56,623
ABC (t)	53,537	55,474	55,565	56,623
	As determined <i>last year for:</i>		As determined <i>this year for:</i>	
Status	2022	2023	2023	2024
Overfishing	No	n/a	No	n/a



Thanks to Meaghan Bryan

Flathead sole

- Fishery Trends: approaching bycatch (<5% of TAC)
- Survey Trends:
 - 2023: 27% lower than the 10-year average
 - next survey in 2025
- Last full assessment 2022, update in 2025
- 2024 spawning biomass 96,604, trend stable
- ABC: 40,503 t, OFL: 49,414 t

Quantity/Status	As estimated or specified last year for:		As estimated or recommended this year for:	
	2023	2024	2024*	2025*
Projected total (3+) biomass (t)	294,188	293,277	294,616	292,639
Projected Female spawning biomass (t)	94,059	95,932	96,604	98,468
B _{100%}	92,582	92,582	92,582	92,582
B _{40%}	37,033	37,033	37,033	37,033
B _{35%}	32,404	32,404	32,404	32,404
F _{OFL}	0.36	0.36	0.36	0.36
maxF _{ABC}	0.29	0.29	0.29	0.29
F _{ABC}	0.29	0.29	0.29	0.29
OFL (t)	48,161	49,073	49,414	50,322
maxABC (t)	39,480	40,222	40,503	41,258
ABC (t)	39,480	40,222	40,503	41,258
Status	As determined last year for:		As determined this year for:	
	2022	2023	2023	2024
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching Overfished	n/a	No	n/a	No



Dusky rockfish

- Fishery Trends: relatively stable
 - Catch < 50% of TAC
- Survey Trends: overall increase, but minor decline in past few years
 - last survey 2023, next 2025
- Last full/update assessment 2022, next 2024
- 2024 spawning biomass 43,197; trend decreasing
- ABC: 7,624 t, OFL: 9,281 t

Quantity	As estimated or specified <i>last</i> year for:		As estimated or recommended <i>this</i> year for:	
	2023	2024	2024*	2025*
M (natural mortality)	0.07	0.07	0.07	0.07
Tier	3a	3a	3a	3a
Projected total (age 4+) biomass (t)	107,160	104,627	103,997	100,827
Projected female spawning biomass (t)	44,651	44,651	43,197	41,200
$B_{100\%}$	65,565	65,565	65,565	65,565
$B_{40\%}$	26,226	26,226	26,226	26,226
$B_{35\%}$	22,948	22,948	22,948	22,948
F_{OFL}	0.11	0.11	0.112	0.112
$maxF_{ABC}$	0.09	0.09	0.091	0.091
F_{ABC}	0.09	0.09	0.091	0.091
OFL (t)	9,638	9,154	9,281	8,796
$maxABC$ (t)	7,917	7,520	7,624	7,225
ABC (t)	7,917	7,520	7,624	7,225
Status	As determined <i>last</i> year for:		As determined <i>this</i> year for:	
	2022	2023	2023	2024
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No



Thanks to Kristen Omori

Northern rockfish

- Fishery Trends: relatively stable
 - Catch < 50% of TAC
- Survey Trends: decrease in past few years
 - last survey 2023, next 2025
- Last full/update assessment 2022, next 2024
- 2024 spawning biomass 38,118; trend decreasing
- ABC: 4,816 t, OFL: 5,750 t

Quantity/Status	As estimated or specified last year for:		As estimated or recommended this year for:	
	2023	2024	2024*	2025*
M (natural mortality)	0.059	0.059	0.059	0.059
Tier	3a	3a	3a	3a
Projected total (age 2+) biomass (t)	95,452	93,022	94,319	93,088
Projected female spawning biomass (t)	39,445	37,470	38,118	36,510
B _{100%}	82,350	82,350	82,350	82,350
B _{40%}	32,940	32,940	32,940	32,940
B _{35%}	28,822	28,822	28,822	28,822
F _{OFL}	0.074	0.074	0.074	0.074
$m_{c\&F_{ABC}}$	0.061	0.061	0.061	0.061
F _{ABC}	0.061	0.061	0.061	0.061
OFL (t)	5,927	5,661	5,750	5,548
$m_{c\&ABC}$ (t)	4,965	4,742	4,816	4,647
ABC (t)	4,965	4,742	4,816	4,647
Status	As determined last year for:		As determined this year for:	
	2022	2023	2023	2024
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No



End



EXAMPLE Tier 1 or 3 - Pacific Ocean Perch (Tier 3a)

Not overfishing, overfished or approaching overfished

- Fishery Trends: catch increasing following increases in ABC
 - Unusual trends/observations?
- Survey Trends: Persistent large biomass,
 - last survey 2021, next 2023
- Last full/update assessment 2020, next 2022
- 2023 spawning biomass 210,795, trend decreasing
- ABC: 37,193 t, OFL: 44,302 t

Quantity	As estimated or specified <i>last</i> year for:		As estimated or recommended <i>this</i> year for:	
	2022	2023	2023*	2024*
<i>M</i> (natural mortality)	0.075	0.075	0.075	0.075
Tier	3a	3a	3a	3a
Projected total (age 2+) biomass (t)	650,832	634,907	636,129	621,249
Projected Female spawning biomass	216,635	210,257	210,795	205,713
<i>B</i> _{100%}	331,917	331,917	331,917	331,917
<i>B</i> _{40%}	132,767	132,767	132,767	132,767
<i>B</i> _{35%}	116,171	116,171	116,171	116,171
<i>F</i> _{OFL}	0.120	0.120	0.120	0.120
<i>maxF</i> _{ABC}	0.100	0.100	0.100	0.100
<i>F</i> _{ABC}	0.100	0.100	0.100	0.100
OFL (t)	45,580	44,196	44,302	43,117
maxABC (t)	38,268	37,104	37,193	36,196
ABC (t)	38,268	37,104	37,193	36,196
Status	As determined <i>last</i> year for:		As determined <i>this</i> year for:	
	2020	2021	2021	2022
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No



EXAMPLE Mixed Tiers - Skates (Tier 3a/5)

Not overfishing, overfished or approaching overfished

- Fishery Trends: catch of AK skate up in 2022, others stable
 - Unusual trends/observations?
- Survey Trends: Slight decrease in AK skate, others up slightly
 - last survey 2021, next 2022
- Last full/update assessment 2021, next 2023
- ABC: 38,605 t, OFL: 46,220 t
 - Tier 3a ABC: 30, 567 t, OFL: 35,503 t
 - Tier 5 ABC: 8,038 t, OFL: 10,717 t

aggregate harvest recommendations for the BSAI complex					
Quantity		As estimated or specified <i>last</i> year for:		As estimated or recommended this year for:	
		2022	2023	2023	2024
	OFL (t)	47,790	46,475	46,220	44,168
	maxABC (t)	39,958	38,824	38,605	36,837
	ABC (t)	39,958	38,824	38,605	36,837



EXAMPLE Tier 4 or 5 - roundfish (Tier 4 or 5)

Not overfishing

- Fishery Trends: Overall catch has been declining
 - Increased use of pots in sablefish fishery
- Survey Trends: slow decline
 - Survey in 2021, next 2023
- Last full/update assessment 2021, next 2023
- ABC: 1,628 t, OFL: 2,170 t

Quantity	As estimated or specified last year for:		As estimated or recommended this year for:	
	2022	2023	2023	2024
M (natural mortality rate)	0.03	0.03	0.03	0.03
Tier	5	5	5	5
Biomass (t)	86,802	86,802	72,349	72,349
F_{OFL}	$F=M=0.03$	$F=M=0.03$	$F=M=0.03$	$F=M=0.03$
$\max F_{ABC}$	$0.75M=0.0225$	$0.75M=0.0225$	$0.75M=0.0225$	$0.75M=0.0225$
F_{ABC}	0.0225	0.0225	0.0225	0.0225
OFL (t)	2,604	2,604	2,170	2,170
$\max ABC$ (t)	1,953	1,953	1,628	1,628
ABC (t)	1,953	1,953	1,628	1,628
Status	As determined <i>last</i> year for:		As determined <i>this</i> year for:	
	2020	2021	2021	2022
Overfishing	No	n/a	No	n/a



EXAMPLE Tier 6 - Octopus (Tier 6)

- Fishery Trends: Increasing
 - Unusual fishery observations?
- Last full/update assessment 2021, next 2025
- Alt. Tier 6 - conservative est. of total mortality = octopus consumed by P. cod (AFSC food habits data)
- ABC: 3,576 t, OFL: 4,769 t

Quantity	As estimated or specified last year for:		As estimated or recommended this year for:	
	2022	2023	2023	2024
Tier 6 (consumption estimate)				
OFL (t)	4,769	4,769	4,769	4,769
ABC (t)	3,576	3,576	3,576	3,576
Status	As determined in last year		As determined this year for:	
Overfishing	2019	2020	2021	2022
	n/a	n/a	n/a	n/a

