GOA Deepwater Flatfish

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Executive Summary

- Projection model for Dover sole using output from age-structured model (Model 19.3)
- Used age 3 recruits
- 2021 catch estimated as 2021 current catch up to Sept 26+ 5-yr average Sept 26-Dec 31 catch
- 2022-2023 catch estimated as recent 5 year average catch for Dover sole
- Includes PT and SSC recommended OFL for Kamchatka flounder
- Last year specifications were rolled over from the year before (therefore there were no updated projected biomass estimates)

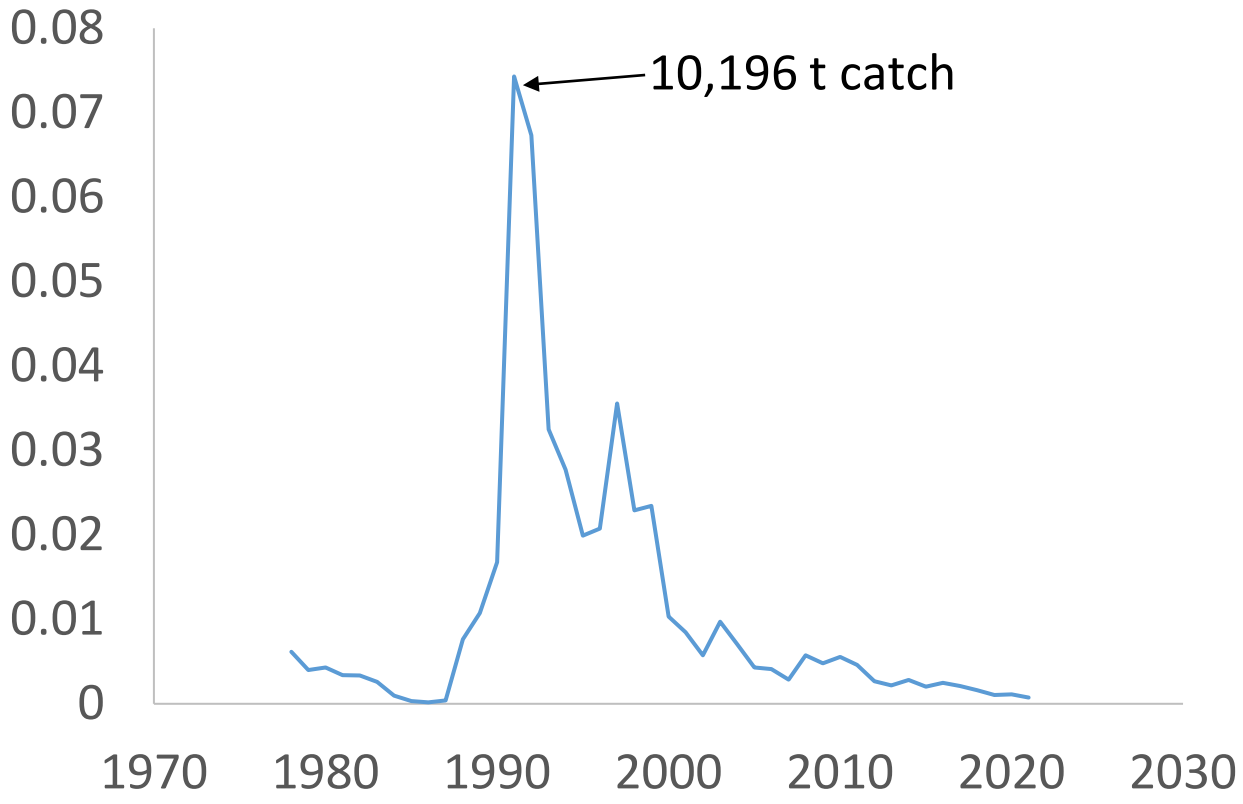
Species	Quantity	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
		2021	2022	2022*	2023
Dover sole	*M* (natural mortality rate)	0.113(f), 0.119(m)	0.113(f), 0.119(m)	0.113(f), 0.119(m)	0.113(f), 0.119(m)
	Tier	3a	3a		
	Projected total (3+) biomass (t)	84,771		83,131	81,350
	Projected Female spawning biomass (t)	27,011		26,349	25,727
	$B_{100\%}$	19,032	19,032	19,032	19,032
	$B_{40\%}$	7,613	7,613	7,613	7,613
	$B_{35\%}$	6,661	6,661	6,661	6,661
	F_{OFL}	0.11	0.11	0.11	0.11
	$maxF_{ABC}$	0.09	0.09	0.09	0.09
	F_{ABC}	0.09	0.09	0.09	0.09
	OFL (t)	6,796	6,796	6,713	6,607
	maxABC (t)	5,743	5,743	5,673	5,583
	ABC (t)	5,743	5,743	5,673	5,583
Greenland turbot	Tier	6	6	6	6
	OFL (t)	238	238	238	238
	maxABC (t)	179	179	179	179
	ABC (t)	179	179	179	179
Kamchatka flounder	Tier			6	6
	OFL (t)			69	69
	maxABC (t)			52	52
	ABC (t)			52	52
Deepsea sole	Tier	6	6	6	6
	OFL (t)	6	6	6	6
	maxABC (t)	4	4	4	4
	ABC (t)	4	4	4	4
Deepwater Flatfish Complex	OFL (t)	7,040	7,040	7,026	6,920
	maxABC (t)	5,926	5,926	5,908	5,818
	ABC (t)	5,926	5,926	5,908	5,818
	Status	As determined *last* year for:		As determined *this* year for:	
		2019	2020	2020	2021
	Overfishing	no	n/a	no	n/a
	Overfished	n/a	no	n/a	no

Area Apportionment (PT chose method in 2016)

- Dover sole proportions from area- and depth-specific random effects models to smooth survey biomass and fill in depth/area gaps
- Greenland turbot, Kamchatka flounder, and deepsea sole proportions based on average survey biomass for each species since 2001
- ABCs are applied at the complex level

Species	Year	Western	Central	West Yakutat	Southeast	Total
		0.8%	37.3%	25.2%	36.7%	100.0%
Dover Sole	2022	45	2,116	1,430	2,082	5,673
	2023	45	2,082	1,407	2,049	5,583
		100.0%	0.0%	0.0%	0.0%	100.0%
Greenland Turbot	2022	179	0	0	0	179
	2023	179	0	0	0	179
		62.0%	38.0%			100.0%
Kamchatka Flounder	2022	32	20	0	0	52
	2023	32	20	0	0	52
		0.6%	71.8%	14.7%	12.9%	100.0%
Deepsea Sole	2022	0	3	1	0	4
	2023	0	3	1	0	4
Deepwater Flatfish	**2022**	**256**	**2,139**	**1,431**	**2,082**	**5,908**
	2023	**256**	**2,105**	**1,408**	**2,049**	**5,818**

Ratio of catch to age 3+ biomass



Historical catches

Year	Greenland turbot	Dover sole	Unidentified	Total
1978	51	827		878
1979	24	530		554
1980	57	570		627
1981	8	457		465
1982	23	457		480
1983	145	354		499
1984	18	132		150
1985	0	43		43
1986	0	23		23
1987	44	56		100
1988	256	1,087		1,343
1989	56	1,521		1,577
1990	0	2,348		2,348
1991			10,196	10,196
1992			8,497	8,497
1993	19	1,869	1,935	6,706
1994	3	2,538	537	3,078
1995	78	1,416	721	2,215
1996	6	1,485	704	2,195
1997	3	2,676	996	3,674
1998	10	2,111	168	2,289
1999	6	1,833	447	2,285
2000	5	813	167	985
2001	4	654	146	804
2002	4	411	146	560
2003	3	899	51	902
2004	1	646	41	647
2005	1	378	41	379
2006	10	327	74	337
2007	1	235	47	236
2008	4	517	53	521
2009	0	435	42	435
2010	0	546		546

Year	Greenland turbot	Dover sole	Kamchatka Flounder	Total
2011	3	453	12	467
2012	0	260	4	265
2013	15	216	15	245
2014	3	284	69	356
2015	26	198	35	259
2016	4	231	5	240
2017	8	188	67	263
2018	3	144	40	186
2019	7	92	12	111
2020	0	97	11	108
2021	10	61	18	89

Other notes

- Document includes specification tables without Kamchatka flounder included in case this is needed.
- Most recent assessment estimates M, two time blocks, most recent time block estimates higher M; higher M used in projections (same time blocks for q)
- Maturity is at ~12 years old, plus group at age 59
- Fishery closure this year for non-Pollock, non-Rockfish Program CVs March-August (but deepwater catches are typically very low anyway)
- Challenges: ontogenetic movement + time-varying, cohort-specific growth rates + spatially varying growth rates, potentially different movement behavior for males and females