Interagency Halibut DMR Workgroup[1] Recommendations for GOA and BSAI Groundfish Fisheries in 2023 and 2024

Summary

This document provides halibut DMR estimates for in-season management of BSAI and GOA groundfish fisheries in 2023 and 2024 (Table 1), as recommended by the Interagency Halibut DMR Workgroup.

Other updates include:

1. Observer data and corresponding updated annual DMRs through 2021
2. Updates on current research activity related to halibut DMRs
3. Additional workgroup comments and discussion summary

Introduction

Halibut discard mortality rates (DMRs) are reviewed each year as part of the North Pacific Fishery Management Council's (Council) groundfish harvest specifications process and are used for in-season management of halibut prohibited species catch (PSC) relative to limits[2] established for GOA and BSAI groundfish fisheries. DMRs are currently specified for twelve operational groups with unique combinations of area, gear, and handling characteristics that affect halibut mortality (see listings in Figure 1 and Table 1). DMRs are estimated based on observer data for eleven of the operational groupings while for the pelagic trawl fisheries, the DMR is fixed at 100% (see Table 1). Prior to Council specification, draft DMRs are updated by an interagency workgroup that includes staff from Alaska Fisheries Information Network (AKFIN), the Council, International Pacific Halibut Commission (IPHC), National Marine Fisheries Service (NMFS), and Pacific States Marine Fisheries Commission (PSMFC). The workgroup's recommendations are reviewed by the Council's GOA and BSAI Groundfish Plan Teams, and by the Science and Statistical Committee (SSC) along with other annual BSAI and GOA SAFE documents[3].

DMR Estimation Methods

A detailed description of halibut DMR estimation methods was provided at the November 2016 Groundfish Plan Team meeting[4] and those methods continue to be applied in the current update. Briefly, data are collected by onboard observers who sample halibut according to established protocols including physical examination of individual halibut just prior to the discarding event (see AFSC 2020 for details). Based on injury type and overall vitality, halibut are assigned to gear-specific condition categories (e.g., minor injuries, moderate, serious, among others) that correspond to fixed mortality probabilities derived from the literature (e.g., Clark et al. 1992, Williams 1997, and Kaimmer and Trumble 1998).

Expansion of condition data from samples to hauls, trips, and ultimately to the defined operational group is structurally consistent with the statistical sampling hierarchy. Expansion of discard estimates is done

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[2] https://www.fisheries.noaa.gov/alaska/sustainable-fisheries/alaska-groundfish-harvest-specifications

[3] https://www.fisheries.noaa.gov/alaska/population-assessments/north-pacific-groundfish-stock-assessments-and-fishery-evaluation

[4] http://npfmc.legistar.com/gateway.aspx?M=F&ID=45b7bd87-3d47-4bac-80d4-f769dd4fc74b.pdf

within each sampling strata (e.g., full coverage or gear-specific partial coverage) before estimates are combined across strata to produce fishery-level DMRs.

Specified DMRs are averages of the estimated DMRs for the two most recent complete fishing years. The appropriateness of different reference timeframes was evaluated by the workgroup and reviewed by the Plan Teams and SSC in 2016. A two-year period was chosen to keep PSC accounting consistent with recent DMR levels and fishery operational practices. Additionally, from a management/policy perspective, frequently updating applied DMRs may, in the presence of other contributing factors, provide incentives for operations to adjust handling practices to improve halibut survival.

Workgroup recommendations:

The workgroup recommends the DMRs provided in Table 1 be used for in-season management of halibut PSC in 2023, noting that groundfish harvest specifications are for two-year periods, and these DMRs would also be specified for 2024 until recalculated for the 2024/2025 harvest specifications. Annual DMR estimates and additional supporting information (numbers of vessels, trips, hauls, and condition assessments) for the selected operational groups are provided in Tables 2-4. Note that pelagic trawl DMRs are not estimated, but are instead specified at 100%. In cases where data from very few vessels contributed to DMR estimates, proxy operational groupings with similar halibut handling characteristics were identified (see footnotes in Table 1). The workgroup recommends proxy DMR values based on analogous fisheries for the following operational group:

- The BSAI hook-and-line CV operational group would use the rate estimated for BSAI hook-and-line CPs.
- The GOA non-pelagic trawl CP operational group would use the rate estimated for BSAI non-pelagic trawl CPs.

Additional workgroup comments

Deck sorting

As in previous years, the DMR estimates provided here do not pertain to deck-sorted halibut. PSC mortalities for deck-sorted halibut are accounted for through independent processes that are not part of the Council specification cycle. Because deck-sorted halibut do not enter the factory and are discarded relatively quickly, discarded halibut are presumed to have lower post-capture mortality. However, the presence of killer whales feeding on discarded halibut is a concern. Observers recorded 209 instances of marine mammals feeding on discards by Amendment 80 vessels in 2021, a 33% decrease from the previous year (see Table 6). The 209 instances is still significantly higher than the 2015-2019 average of 92. While some of this activity may be associated with non-deck-sorted hauls, this increase in feeding on discard interactions warrants further investigation. The Workgroup suggests that the methods used to estimate halibut mortality be reviewed with a particular focus on marine mammal feeding on discards.

Directed halibut fishery

Halibut DMRs needed for calculating discards in the directed halibut fishery are also not provided here. Capture rates and DMRs for those halibut are addressed independently as part of the IPHC ’s stock assessment process. In characterizing non-halibut commercial bycatch mortalities of halibut in regulatory areas off Alaska, the IPHC does use mortality estimates provided by the NMFS AKRO which are based on the specified DMRs.

The Workgroup will be reviewing the current DMR estimation methods for potential use in assessing mortality in the directed halibut fisheries.

Variance of DMR estimation

The Workgroup will be developing methods to estimate the variance of the 2-year DMR estimates with results not anticipated to be available before 2023. These variance estimates could help to inform the workgroup on the impacts of sample size and estimation methods on the uncertainty of the estimates. The current estimation methods have been in use for 5 years and hence data will be available at the end of 2022 to support this type of analysis.

Pelagic trawl samples

For the pelagic trawl gear operational group, the DMR is fixed at 100% and samples from hauls on these vessels are not used in the DMR estimation process. The workgroup concluded that these data collections were no longer necessary and therefore observers no longer collect halibut condition data on pelagic trawl vessels; however, all other data related to halibut continue to be collected (e.g., halibut length data).

Model based DMRs

The Workgroup supports continued research into the feasibility of modeling DMRs based on variables expected to impact post-capture survival (hook-release method, time-out-of-water). Using modeled DMRs would reduce the data collection burden on observers and would dovetail with the expansion of Electronic Monitoring. (see #4 in ongoing research).

Existing research related to halibut discard mortality

The workgroup looks forward to reporting on any research findings that could be incorporated into alternative calculations of DMR. The IPHC and FMA are currently conducting research in support of improved estimation of DMRs and halibut post-capture mortality. These projects are summarized below.

1. The IPHC recently completed research investigating post-release mortality in the directed commercial halibut fishery. This work was published in 2021: Loher, T., Dykstra, C.L., Hicks, A.C., Stewart, I.J., Wolf, N., Harris, B.P., and Planas, J.V. 2021. Estimation of Postrelease Longline Mortality in Pacific Halibut Using Acceleration-Logging Tags. North American Journal of Fisheries Management **42**(1): 37-49. doi:10.1002/nafm.10711.

Abstract: Pacific Halibut Hippoglossus stenolepis captured in directed commercial longline fisheries in Canada and the USA that are below the legal minimum size for retention must be returned to the sea without incurring additional injury. Estimates of mortality caused by discarding sublegal-sized fish are included in annual estimates of total mortality from all sources and affect the results of stock assessment and the yield available to fisheries. Currently, an average discard mortality rate (DMR) of 16% is applied to all sublegal-sized longline discards. These discards consist of fish that suffer injuries ranging from minor to severe. The 16% DMR that is currently applied was derived by averaging injury-specific DMRs that in turn assume 3.5% mortality of Pacific Halibut that are released to the sea with only minor injuries. The latter has been derived experimentally but only in captivity. Here, we used acceleration-logging pop-up archival transmitting tags to infer individual survival outcomes for Pacific Halibut that were released in situ following capture on longline gear. Postrelease behavioral data were evaluated for 75 fish that were at liberty for 2– 96 d. Three fish were confidently inferred to have died after periods at liberty of 41–80 d, and another three fish may have died 96 d after release, resulting in minimum and maximum estimated 96-d postrelease DMRs of 4.2% (range = 0.0–8.7%) and 8.4% (range = 1.7–14.6%), respectively. These ranges are consistent with the currently applied value of 3.5%. However, the observation that no mortalities occurred until after 40 d postrelease departs from the findings of captive studies, in which the majority of capture-induced mortality occurred within 20 d of release.

2. Improving the characterization of discard mortality of Pacific halibut in the guided recreational fishery (IPHC).

Experimental fishing was conducted in the summer of 2021 using charter recreational gear (12/0 and 16/0 circle hooks) and handling practices aboard charter vessels operating out of Sitka and Seward, AK. A combined total of 361 Pacific halibut were captured, sampled, tagged, and released. For all Pacific halibut captured, we recorded the time from hooking to release, length, weight, the injury code and release viability category using the standard IPHC criteria, and air and fish temperature. In addition, from each fish we collected a blood sample by caudal puncture, measured somatic fat content with the use of a Distell Fat Meter, took a picture of the hooking injury, collected a fin clip for genetic sexing and tagged the fish with an opercular wire tag prior to release. Eighty (80) Pacific halibut captured in IPHC Regulatory Area 3A were tagged with acceleration-logging survivorship pop-up archival transmitting (sPAT) tags instead of wire tags. These fish were selected from fish that were classified in the 'Excellent' viability category and did not have a blood sample taken to minimize handling-related stress. The deployed sPAT tags were programmed to be released after 96 days.

Seventy-six (76) of the 80 electronic accelerometer-based survivorship pop-up archival transmitting (sPAT) tags provided useable data reports. Survival analysis (R package = "survival") produces a mortality rate estimate of 2.04% with a 95% CI of 0.0-5.92%. These are the first field corroborated estimates of recreational discard mortality and are consistent with currently applied recreational mortality estimates. Analysis of physical properties, blood stress parameters, and environmental influences are ongoing.

3. Model-based discard mortality rates based on alternatives to halibut condition data (FMA).

Previous research by FMA in assessing whether DMRs may be estimated from models that incorporate factors that impact post-capture mortality (e.g., such as time out of water, hook release method) showed promising results; however, the dataset included data from a limited range of fisheries. As a result, modeling results are not applicable to most fisheries (operational groupings) and additional field work is ongoing in 2022. In this study, observers are collecting data from trawl vessels participating in a broader range of fisheries than those represented in the study data currently available. With additional data, well-trained models may provide reliable DMR estimates that can replace the need for observers to assess the condition of discarded halibut and may be applied to larger commercial fisheries.

References

AFSC (Alaska Fisheries Science Center). 2020. 2021 Observer Sampling Manual. Fisheries Monitoring and Analysis Division, North Pacific Groundfish Observer Program. AFSC, 7600 Sand Point Way NE, Seattle, WA 98115. Current manual available at https://www.fisheries.noaa.gov/resource/document/north-pacific-observer-sampling-manual

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Tables

Table 1. Halibut DMRs specified for fishery operational types defined for halibut PSC management in GOA and BSAI groundfish fisheries in 2022 and workgroup recommendations for application in 2023 and 2024.

Area	Gear	Operation	2022 DMRs (specified)	2023/24 DMRs (recommended)
BSAI	Pot	All	33%	26%
	Hook-and-line	CP	10%	9%
	Hook-and-line	CV	10% [a]	9% [a]
	Non-pelagic trawl	Mothership / CP	84%	85%
	Non-pelagic trawl	CV	62%	62%
GOA	Pot	All	29%	27%
	Hook-and-line	CP	15%	13%
	Hook-and-line	CV	12%	9%
	Non-pelagic trawl	Mothership / CP	83%	85% [b]
	Non-pelagic trawl	CV	69%	74%
	Non-pelagic trawl	CV-Rockfish Prog	66%	55%
All	Pelagic trawl	All	100%*	100%*

[a] Based on BSAI HAL CP

[b] Based on BSAI NPT CP

*Fixed, not estimated

*Table 2. **BSAI HAL and trawl** vessels, trips, hauls, viability assessments and corresponding DMRs from 2012 – 2021 observer data. The bottom rows for each panel provides the recommended specified DMRs based on either two-year averages or interpolated values (*) from similar operations. Source: AKFIN Data.*

BSAI Hook and Line CPs

Year	Vessels	Trips	Hauls	Viabilities	Spec DMR	Est DMR
2012	30	185	2,596	13,880		9%
2013	30	257	3,427	17,164		9%
2014	29	223	2,966	11,055		8%
2015	28	259	2,884	10,224		8%
2016	28	242	2,242	7,130		8%
2017	27	221	1,931	6,345		9%
2018	23	141	1,065	3,617	8%	9%
2019	20	125	694	1,925	8%	8%
2020	18	95	441	1,190	9%	11%
2021	16	87	508	1,348	9%	7%
				2022 Specs	10%	10%
				WG recom. for 2023 Specs	9%	9%

BSAI Hook and Line CVs

Year	Vessels	Trips	Hauls	Viabilities	Spec DMR	Est DMR
2012						
2013						
2014	1	2	5	21		21%
2015	1	1	1	6		4%
2016						
2017	1	1	1	2		4%
2018	2	4	17	83	17%	4%
2019	1	1	5	15	4%	11%
2020					9%*	
2021					9%*	
				2022 Specs	10%*	
				WG recom. for 2023 Specs	9%*	

BSAI Nonpelagic Trawl CPs

Year	Vessels	Trips	Hauls	Viabilities	Spec DMR	Est DMR
2012	16	67	600	1,410		82%
2013	19	93	892	2,868		86%
2014	20	66	535	1,928		86%
2015	10	22	186	463		81%
2016	14	96	881	3,685		84%
2017	11	61	517	2,003		74%
2018	20	165	1,049	2,426	84%	85%
2019	20	164	1,101	2,879	78%	84%
2020	15	114	945	2,578	75%	85%
2021	16	106	744	2,167	84%	85%
				2022 Specs	84%	
				WG recom. for 2023 Specs	85%	

BSAI Nonpelagic Trawl CVs

Year	Vessels	Trips	Hauls	Viabilities	Spec DMR	Est DMR
2012	35	127	430	2,228		66%
2013	24	129	459	2,090		45%
2014	22	169	581	2,780		53%
2015	34	146	446	1,977		58%
2016	43	163	660	2,677		65%
2017	49	205	1,555	10,199		54%
2018	40	165	1,389	11,085	60%	62%
2019	47	177	2,093	16,781	59%	57%
2020	35	139	1,100	9,063	58%	68%
2021	26	38	369	2,858	59%	56%
				2022 Specs	62%	
				WG recom. for 2023 Specs	62%	

*Table 3. **GOA HAL and trawl** vessels, trips, hauls, viability assessments and corresponding DMRs from 2012 – 2021 observer data. The bottom row for each panel provides the recommended specified DMRs based on either two-year averages or interpolated values (*) from similar operations. Source: AKFIN Data.*

GOA Hook and Line CPs

Year	Vessels	Trips	Hauls	Viabilities	Spec DMR	Est DMR
2012	5	18	75	343		18%
2013	5	10	102	643		10%
2014	8	17	285	1,345		9%
2015	6	25	382	1,570		8%
2016	9	18	185	1,399		10%
2017	8	21	217	1,539		15%
2018	2	3	29	232	10%	19%
2019	3	5	15	106	11%	19%
2020	3	4	7	39	11%	10%
2021	2	4	16	147	15%	16%
				2022 Specs	15%	
				WG recom. for 2023 Specs	13%	

GOA Hook and Line CVs

Year	Vessels	Trips	Hauls	Viabilities	Spec DMR	Est DMR
2012	2	6	42	127		27%
2013	11	33	165	801		16%
2014	10	36	123	398		8%
2015	19	26	97	449		14%
2016	19	24	69	324		23%
2017	14	20	80	367		19%
2018	18	21	74	284	17%	7%
2019	18	20	52	243	21%	19%
2020	3	3	6	20	13%	5%
2021	9	12	51	195	13%	13%
				2022 Specs	12%	
				WG recom. for 2023 Specs	9%	

GOA Nonpelagic Trawl CPs

Year	Vessels	Trips	Hauls	Viabilities	Spec DMR	Est DMR
2012	5	8	78	591		82%
2013	6	18	167	424		81%
2014	2	12	73	164		74%
2015	1	1	1	1		90%
2016	7	13	76	232		84%
2017	5	38	424	2,367		75%
2018	4	25	114	709	84%	83%
2019	5	40	359	1,669	79%	86%
2020	6	40	613	7543	75%*	80%
2021	1	3	100	2292	83%	43%
				2022 Specs	84%	
				WG recom. for 2023 Specs	85%*	

GOA Nonpelagic Trawl CVs

Year	Vessels	Trips	Hauls	Viabilities	Spec DMR	Est DMR
2012	36	138	443	2,726		57%
2013	27	48	111	533		66%
2014	21	35	99	487		66%
2015	19	33	66	346		64%
2016	36	94	239	1,433		66%
2017	28	59	144	778		68%
2018	25	46	105	641	67%	69%
2019	23	64	152	1,022	67%	69%
2020	13	35	93	515	68%	69%
2021	11	24	34	207	69%	79%
				2022 Specs	69%	
				WG recom. for 2023 Specs	74%	

Table 4. ***BSAI and GOA POT and GOA Rockfish Program trawl*** *vessels, trips, hauls, viability assessments and corresponding DMRs from 2012 – 2021 observer data. The bottom rows for each panel provides the recommended specified DMRs based on either two year averages or interpolated values (*) from similar operations. Source: AKFIN Data*

BSAI Pot CPs and CVs

Year	Vessels	Trips	Hauls	Viabilities	Spec DMR	DMR
2012	26	78	428	1,502		15%
2013	21	45	259	491		10%
2014	20	52	264	498		6%
2015	24	78	310	723		6%
2016	24	66	245	424		11%
2017	14	33	191	335		25%
2018	22	34	101	197	9%	8%
2019	19	28	73	140	19%	39%
2020	9	13	51	60	27%	28%
2021	7	21	83	181	32%	24%
				2022 Specs	33%	
				WG recom. for 2023 Specs	26%	

GOA Pot CPs and CVs

Year	Vessels	Trips	Hauls	Viabilities	Spec DMR	DMR
2012	15	67	228	1,070		15%
2013	26	56	163	363		8%
2014	17	31	68	179		15%
2015	32	82	210	895		5%
2016	37	62	158	732		8%
2017	20	25	50	168		0%
2018	9	11	20	69	7%	0%
2019	11	16	40	82	4%	21%
2020	6	10	33	128	0%	43%
2021	38	62	220	730	10%	12%
				2022 Specs	29%	
				WG recom. for 2023 Specs	27%	

GOA Nonpelagic Trawl Rockfish Pgm CVs

Year	Vessels	Trips	Hauls	Viabilities	Spec DMR	Est DMR
2012	15	33	63	156		56%
2013	16	28	50	124		54%
2014	12	16	23	58		44%
2015	10	17	30	94		70%
2016	16	46	108	375		41%
2017	17	47	99	400		58%
2018	14	23	57	246	62%	47%
2019	14	19	29	73	49%	73%
2020	12	13	29	105	52%	59%
2021	3	5	11	37	60%	50%
				2022 Specs	66%	
				WG recom. for 2023 Specs	55%	

Table 5. Total vessels associated with operational groupings and vessels in the electronic monitoring (EM) pool.

AREA-GEAR	SECTOR	2015	2016	2017	2018	2019	2020	2021
BSAI-HAL	CP	31	32	29	26	24	21	17
	CV	17	13	13	13	11	15	9
Total BSAI HAL		48	45	42	39	35	36	26
GOA-HAL	CP	12	12	11	7	7	4	5
	CV	333	327	289	283	274	216	206
Total GOA HAL		341	338	300	290	281	220	211
	Total All Areas HAL	**374**	**364**	**325**	**316**	**303**	**248**	**230**
	EM All Areas HAL	**16**	**33**	**61**	**93**	**187**	**77**	**76**
	% EM All Areas HAL	**4%**	**9%**	**19%**	**29%**	**62%**	**31%**	**33%**

AREA-GEAR	SECTOR	2015	2016	2017	2018	2019	2020	2021
BSAI-POT	CP,CV	51	59	69	82	86	101	75
GOA-POT	CP,CV	116	119	129	79	90	139	217
	Total All Areas POT	**154**	**166**	**179**	**142**	**156**	**216**	**259**
	EM All Areas POT	0	0	25	1	51	63	80
	% EM All Areas POT	**0%**	**0%**	**14%**	**1%**	**33%**	**29%**	**31%**

Table 6. Observed instances of marine mammals feeding on Amendment 80 discards in the BSAI.

Year	Hauls	MM Feeding on Discards	Percent
2021	16,637	209	1.26%
2020	18,205	310	1.70%
2019	21,569	184	0.85%
2018	20,032	113	0.56%
2017	18,465	142	0.77%
2016	18,006	15	0.08%
2015	16,266	7	0.04%