

## GROUND FISH MANAGEMENT TEAM INFORMATIONAL REPORT ON UPDATED NEARSHORE DISCARD MORTALITY RATES FOR ROCKFISH

### BACKGROUND

Discard mortality rates (DMRs) applicable to the nearshore commercial fisheries off California and Oregon are provided by the Groundfish Management Team (GMT) to the West Coast Groundfish Observer Program (WCGOP). These discard mortality rates are used by WCGOP to estimate discard mortality each year (for the Groundfish Total Mortality reports) and are also used by the GMT in the nearshore model to project future discard mortality.

### DISCARD MORTALITY RATES

Discard mortality rates for rockfish caught in the nearshore fishery are dependent on the species, depth, and type of gear used.

For rockfish caught with “sport-like” jig and pole gears, the nearshore fishery uses the same depth-dependent surface discard mortality rates as those utilized by the recreational fisheries ([Table 1-13 from the Groundfish SAFE](#)), which were endorsed by the Science and Statistical Committee (SSC) in 2008 ([Agenda Item I.2.a, GMT Report 2, March 2017](#)). Using the exact same rates as the recreational fisheries was a recent Council decision ([March 2017 Decision Summary](#)). Previously, discard mortality in the nearshore fishery was estimated assuming a 100 percent mortality rate in depths greater than 20 fathoms, whereas discard mortality in the recreational fisheries was estimated using discard mortality rates between 25 to 63 percent in the 20-30 fathom depth bin depending on species.

For rockfish caught with other gears (e.g., longlines, pots, dingle bar, etc.), 100 percent mortality is assigned regardless of depth ([2009-2010 Final Environmental Impact Statement](#)). This 100 percent mortality assumption was a precautionary approach given a lack of research to inform discard mortality rates for other gear types.

### GENERAL APPROACH FOR APPLICATION OF DISCARD MORTALITY RATES

The purpose of discard mortality rates is to convert total discards into the portion that survived and did not survive. Since WCGOP estimates discards by depth bin and species but not by gear type, the GMT used the following weighted gear proportion formula established during the [2009-2010 Final Environmental Impact Statement](#) for the depth bin and species for which WCGOP estimates discards.

$DMR = (\textit{Proportion of jig/pole} \times \textit{surface mortality rate}) + (\textit{proportion other gears} \times 100\% \textit{ mortality})$

However, the data inputs have not been refreshed since that time (i.e., proportions not updated since the 2009-2010 Final Environmental Impact Statement) and Oregon data was used as a proxy for California due to limited WCGOP set level data available at the time.

The GMT therefore provided the following updates to reflect needed changes: (1) updated the gear proportions by depth with recent data; (2) calculated regional discard mortality rates to match the WCGOP estimation strata (i.e., north and south of 40°10' N. latitude); (3) utilized the Council approved changes to the “sport-like” surface discard mortality rates (described above); and (4) incorporated a bias modifier to calibrate the gear proportions from WCGOP (a sub-sample of landings) to reflect the gear proportions from fish tickets in PacFIN (a census of landings).

A detailed description of the methods used is described in the Appendix. The R script and input files are available upon request – noting that only those with access to confidential PacFIN and WCGOP observer data would be able to run the script. The updated discard mortality rates to be provided to WCGOP are for north and south of 40°10' N. latitude (Tables 1 and 2, respectively).

**Table 1. Updated Nearshore discard mortality rates for north of 40°10' N. latitude.**

WCGOP Strata	Species	Depth bin (fm)	Proportion Jigpole	Proportion Other	Jigpole DMR	Other DMR	Final DMR
N of 4010	Black and Yellow Rockfish	0 to 10	0.92	0.08	0.13	1.00	0.20
N of 4010	Black and Yellow Rockfish	10 to 20	0.90	0.10	0.24	1.00	0.31
N of 4010	Black and Yellow Rockfish	20 to 30	0.75	0.25	0.37	1.00	0.52
N of 4010	Black and Yellow Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Black Rockfish	0 to 10	0.92	0.08	0.11	1.00	0.18
N of 4010	Black Rockfish	10 to 20	0.90	0.10	0.20	1.00	0.28
N of 4010	Black Rockfish	20 to 30	0.75	0.25	0.29	1.00	0.46
N of 4010	Black Rockfish	30+	1.00	0.00	0.63	1.00	0.63
N of 4010	Blue Rockfish	0 to 10	0.92	0.08	0.18	1.00	0.25
N of 4010	Blue Rockfish	10 to 20	0.90	0.10	0.30	1.00	0.37
N of 4010	Blue Rockfish	20 to 30	0.75	0.25	0.43	1.00	0.57
N of 4010	Blue Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Bocaccio	0 to 10	0.92	0.08	0.19	1.00	0.26
N of 4010	Bocaccio	10 to 20	0.90	0.10	0.32	1.00	0.39
N of 4010	Bocaccio	20 to 30	0.75	0.25	0.46	1.00	0.59
N of 4010	Bocaccio	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Brown Rockfish	0 to 10	0.92	0.08	0.12	1.00	0.19
N of 4010	Brown Rockfish	10 to 20	0.90	0.10	0.22	1.00	0.30
N of 4010	Brown Rockfish	20 to 30	0.75	0.25	0.33	1.00	0.49
N of 4010	Brown Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Calico Rockfish	0 to 10	0.92	0.08	0.24	1.00	0.30
N of 4010	Calico Rockfish	10 to 20	0.90	0.10	0.43	1.00	0.49
N of 4010	Calico Rockfish	20 to 30	0.75	0.25	0.60	1.00	0.70
N of 4010	Calico Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Canary Rockfish	0 to 10	0.92	0.08	0.21	1.00	0.27
N of 4010	Canary Rockfish	10 to 20	0.90	0.10	0.37	1.00	0.43
N of 4010	Canary Rockfish	20 to 30	0.75	0.25	0.53	1.00	0.65
N of 4010	Canary Rockfish	30+	1.00	0.00	1.00	1.00	1.00

WCGOP Strata	Species	Depth bin (fm)	Proportion Jigpole	Proportion Other	Jigpole DMR	Other DMR	Final DMR
N of 4010	China Rockfish	0 to 10	0.92	0.08	0.13	1.00	0.20
N of 4010	China Rockfish	10 to 20	0.90	0.10	0.24	1.00	0.31
N of 4010	China Rockfish	20 to 30	0.75	0.25	0.37	1.00	0.52
N of 4010	China Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Copper Rockfish	0 to 10	0.92	0.08	0.19	1.00	0.26
N of 4010	Copper Rockfish	10 to 20	0.90	0.10	0.33	1.00	0.40
N of 4010	Copper Rockfish	20 to 30	0.75	0.25	0.48	1.00	0.61
N of 4010	Copper Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Gopher Rockfish	0 to 10	0.92	0.08	0.19	1.00	0.26
N of 4010	Gopher Rockfish	10 to 20	0.90	0.10	0.34	1.00	0.40
N of 4010	Gopher Rockfish	20 to 30	0.75	0.25	0.49	1.00	0.62
N of 4010	Gopher Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Grass Rockfish	0 to 10	0.92	0.08	0.23	1.00	0.29
N of 4010	Grass Rockfish	10 to 20	0.90	0.10	0.45	1.00	0.50
N of 4010	Grass Rockfish	20 to 30	0.75	0.25	0.63	1.00	0.72
N of 4010	Grass Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Kelp Rockfish	0 to 10	0.92	0.08	0.11	1.00	0.18
N of 4010	Kelp Rockfish	10 to 20	0.90	0.10	0.19	1.00	0.27
N of 4010	Kelp Rockfish	20 to 30	0.75	0.25	0.29	1.00	0.46
N of 4010	Kelp Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Olive Rockfish	0 to 10	0.92	0.08	0.34	1.00	0.39
N of 4010	Olive Rockfish	10 to 20	0.90	0.10	0.45	1.00	0.50
N of 4010	Olive Rockfish	20 to 30	0.75	0.25	0.57	1.00	0.68
N of 4010	Olive Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Quillback Rockfish	0 to 10	0.92	0.08	0.21	1.00	0.27
N of 4010	Quillback Rockfish	10 to 20	0.90	0.10	0.35	1.00	0.41
N of 4010	Quillback Rockfish	20 to 30	0.75	0.25	0.52	1.00	0.64
N of 4010	Quillback Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Tiger Rockfish	0 to 10	0.92	0.08	0.20	1.00	0.26
N of 4010	Tiger Rockfish	10 to 20	0.90	0.10	0.35	1.00	0.41
N of 4010	Tiger Rockfish	20 to 30	0.75	0.25	0.51	1.00	0.63
N of 4010	Tiger Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Treefish	0 to 10	0.92	0.08	0.14	1.00	0.21
N of 4010	Treefish	10 to 20	0.90	0.10	0.25	1.00	0.32
N of 4010	Treefish	20 to 30	0.75	0.25	0.39	1.00	0.54
N of 4010	Treefish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Vermilion Rockfish	0 to 10	0.92	0.08	0.20	1.00	0.26
N of 4010	Vermilion Rockfish	10 to 20	0.90	0.10	0.34	1.00	0.40
N of 4010	Vermilion Rockfish	20 to 30	0.75	0.25	0.50	1.00	0.62
N of 4010	Vermilion Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Widow Rockfish	0 to 10	0.92	0.08	0.21	1.00	0.27

WCGOP Strata	Species	Depth bin (fm)	Proportion Jigpole	Proportion Other	Jigpole DMR	Other DMR	Final DMR
N of 4010	Widow Rockfish	10 to 20	0.90	0.10	0.36	1.00	0.42
N of 4010	Widow Rockfish	20 to 30	0.75	0.25	0.52	1.00	0.64
N of 4010	Widow Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Yelloweye Rockfish	0 to 10	0.92	0.08	0.22	1.00	0.28
N of 4010	Yelloweye Rockfish	10 to 20	0.90	0.10	0.39	1.00	0.45
N of 4010	Yelloweye Rockfish	20 to 30	0.75	0.25	0.56	1.00	0.67
N of 4010	Yelloweye Rockfish	30+	1.00	0.00	1.00	1.00	1.00
N of 4010	Yellowtail Rockfish	0 to 10	0.92	0.08	0.10	1.00	0.17
N of 4010	Yellowtail Rockfish	10 to 20	0.90	0.10	0.17	1.00	0.25
N of 4010	Yellowtail Rockfish	20 to 30	0.75	0.25	0.25	1.00	0.43
N of 4010	Yellowtail Rockfish	30+	1.00	0.00	0.50	1.00	0.50

**Table 2. Updated Nearshore discard mortality rates for south of 40°10' N. latitude.**

WCGOP Strata	Species	Depth bin (fm)	Proportion Jigpole	Proportion Other	Jigpole DMR	Other DMR	Final DMR
S of 4010	Black and Yellow Rockfish	0 to 10	0.53	0.47	0.13	1.00	0.54
S of 4010	Black and Yellow Rockfish	10 to 20	0.47	0.53	0.24	1.00	0.65
S of 4010	Black and Yellow Rockfish	20 to 30	0.44	0.56	0.37	1.00	0.72
S of 4010	Black and Yellow Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Black Rockfish	0 to 10	0.53	0.47	0.11	1.00	0.53
S of 4010	Black Rockfish	10 to 20	0.47	0.53	0.20	1.00	0.63
S of 4010	Black Rockfish	20 to 30	0.44	0.56	0.29	1.00	0.69
S of 4010	Black Rockfish	30+	0.12	0.88	0.63	1.00	0.96
S of 4010	Blue Rockfish	0 to 10	0.53	0.47	0.18	1.00	0.57
S of 4010	Blue Rockfish	10 to 20	0.47	0.53	0.30	1.00	0.67
S of 4010	Blue Rockfish	20 to 30	0.44	0.56	0.43	1.00	0.75
S of 4010	Blue Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Bocaccio	0 to 10	0.53	0.47	0.19	1.00	0.57
S of 4010	Bocaccio	10 to 20	0.47	0.53	0.32	1.00	0.68
S of 4010	Bocaccio	20 to 30	0.44	0.56	0.46	1.00	0.76
S of 4010	Bocaccio	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Brown Rockfish	0 to 10	0.53	0.47	0.12	1.00	0.54
S of 4010	Brown Rockfish	10 to 20	0.47	0.53	0.22	1.00	0.64
S of 4010	Brown Rockfish	20 to 30	0.44	0.56	0.33	1.00	0.71
S of 4010	Brown Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Calico Rockfish	0 to 10	0.53	0.47	0.24	1.00	0.60
S of 4010	Calico Rockfish	10 to 20	0.47	0.53	0.43	1.00	0.73
S of 4010	Calico Rockfish	20 to 30	0.44	0.56	0.60	1.00	0.82
S of 4010	Calico Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Canary Rockfish	0 to 10	0.53	0.47	0.21	1.00	0.58
S of 4010	Canary Rockfish	10 to 20	0.47	0.53	0.37	1.00	0.71

WCGOP Strata	Species	Depth bin (fm)	Proportion Jigpole	Proportion Other	Jigpole DMR	Other DMR	Final DMR
S of 4010	Canary Rockfish	20 to 30	0.44	0.56	0.53	1.00	0.79
S of 4010	Canary Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	China Rockfish	0 to 10	0.53	0.47	0.13	1.00	0.54
S of 4010	China Rockfish	10 to 20	0.47	0.53	0.24	1.00	0.65
S of 4010	China Rockfish	20 to 30	0.44	0.56	0.37	1.00	0.72
S of 4010	China Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Copper Rockfish	0 to 10	0.53	0.47	0.19	1.00	0.57
S of 4010	Copper Rockfish	10 to 20	0.47	0.53	0.33	1.00	0.69
S of 4010	Copper Rockfish	20 to 30	0.44	0.56	0.48	1.00	0.77
S of 4010	Copper Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Gopher Rockfish	0 to 10	0.53	0.47	0.19	1.00	0.57
S of 4010	Gopher Rockfish	10 to 20	0.47	0.53	0.34	1.00	0.69
S of 4010	Gopher Rockfish	20 to 30	0.44	0.56	0.49	1.00	0.78
S of 4010	Gopher Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Grass Rockfish	0 to 10	0.53	0.47	0.23	1.00	0.59
S of 4010	Grass Rockfish	10 to 20	0.47	0.53	0.45	1.00	0.74
S of 4010	Grass Rockfish	20 to 30	0.44	0.56	0.63	1.00	0.84
S of 4010	Grass Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Kelp Rockfish	0 to 10	0.53	0.47	0.11	1.00	0.53
S of 4010	Kelp Rockfish	10 to 20	0.47	0.53	0.19	1.00	0.62
S of 4010	Kelp Rockfish	20 to 30	0.44	0.56	0.29	1.00	0.69
S of 4010	Kelp Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Olive Rockfish	0 to 10	0.53	0.47	0.34	1.00	0.65
S of 4010	Olive Rockfish	10 to 20	0.47	0.53	0.45	1.00	0.74
S of 4010	Olive Rockfish	20 to 30	0.44	0.56	0.57	1.00	0.81
S of 4010	Olive Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Quillback Rockfish	0 to 10	0.53	0.47	0.21	1.00	0.58
S of 4010	Quillback Rockfish	10 to 20	0.47	0.53	0.35	1.00	0.70
S of 4010	Quillback Rockfish	20 to 30	0.44	0.56	0.52	1.00	0.79
S of 4010	Quillback Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Tiger Rockfish	0 to 10	0.53	0.47	0.20	1.00	0.58
S of 4010	Tiger Rockfish	10 to 20	0.47	0.53	0.35	1.00	0.70
S of 4010	Tiger Rockfish	20 to 30	0.44	0.56	0.51	1.00	0.78
S of 4010	Tiger Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Treefish	0 to 10	0.53	0.47	0.14	1.00	0.55
S of 4010	Treefish	10 to 20	0.47	0.53	0.25	1.00	0.65
S of 4010	Treefish	20 to 30	0.44	0.56	0.39	1.00	0.73
S of 4010	Treefish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Vermilion Rockfish	0 to 10	0.53	0.47	0.20	1.00	0.58
S of 4010	Vermilion Rockfish	10 to 20	0.47	0.53	0.34	1.00	0.69
S of 4010	Vermilion Rockfish	20 to 30	0.44	0.56	0.50	1.00	0.78

WCGOP Strata	Species	Depth bin (fm)	Proportion Jigpole	Proportion Other	Jigpole DMR	Other DMR	Final DMR
S of 4010	Vermilion Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Widow Rockfish	0 to 10	0.53	0.47	0.21	1.00	0.58
S of 4010	Widow Rockfish	10 to 20	0.47	0.53	0.36	1.00	0.70
S of 4010	Widow Rockfish	20 to 30	0.44	0.56	0.52	1.00	0.79
S of 4010	Widow Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Yelloweye Rockfish	0 to 10	0.53	0.47	0.22	1.00	0.59
S of 4010	Yelloweye Rockfish	10 to 20	0.47	0.53	0.39	1.00	0.72
S of 4010	Yelloweye Rockfish	20 to 30	0.44	0.56	0.56	1.00	0.81
S of 4010	Yelloweye Rockfish	30+	0.12	0.88	1.00	1.00	1.00
S of 4010	Yellowtail Rockfish	0 to 10	0.53	0.47	0.10	1.00	0.53
S of 4010	Yellowtail Rockfish	10 to 20	0.47	0.53	0.17	1.00	0.61
S of 4010	Yellowtail Rockfish	20 to 30	0.44	0.56	0.25	1.00	0.67
S of 4010	Yellowtail Rockfish	30+	0.12	0.88	0.50	1.00	0.94

PFMC  
06/10/17

## APPENDIX

### DETAILED METHODOLOGY OF THE DISCARD MORTALITY RATE UPDATE

The following approach was taken to update discard mortality rates for the nearshore fishery:

(1) Since the nearshore discard mortality rates are to be used by WCGOP to convert discards to discard mortality, the GMT mimicked the procedures utilized by WCGOP to estimate discards as closely as possible.

(1A) Since WCGOP discard estimates are stratified by areas north and south of 40° 10' N. latitude, the GMT used these same strata when updating discard mortality rates. Noting that because the nearshore model uses three area strata (i.e., south of 40° 10' N. latitude, 40° 10' - 42°, and north of 42°), the discard mortality rates generated for WCGOP for their 40° 10' N. strata will be used for both the 40° 10' - 42° and north of 42° model strata.

(1B) Since WCGOP discard estimates are based on bycatch rates of species X to landings of select target stocks (aptly named as denominator stocks) from observed trips applied to total landings of denominator stocks from PacFIN, the GMT used landings of the same denominator stocks when determining the proportions of landings by gear type to be use to update discard mortality rates

(1C) Although WCGOP estimates their discards on an annual basis (using year-specific) bycatch rates, the GMT pooled WCGOP landings from observed trips from 2013-2015 since those are the most recent years that reflect the current RCA structure (e.g., RCAs extended to shallower depths prior to 2013). This pooling helps improve the sample size as nearshore coverage rates are relatively low. The GMT cannot directly mimic WCGOP in this case since the observer data used by WCGOP to estimate discards in the most recent year are provided to the GMT on a one-year lag.

(2) Before the proportions of WCGOP landings by depth bin and gear were computed, **a bias correction factor was developed**. Although WCGOP does their best to obtain representative coverage, there are logistical limitations to their selection criteria (e.g., unable to sample small vessels due to safety concerns) that introduce the possibility for bias. A bias correction factor was consequently added with methods and rationale describe below.

(2A) The bias correction factor modifies the observed WCGOP landings by gear type (across all depths) in order to achieve the same overall gear proportions from PacFIN. PacFIN landings provide a near census of landings by gear type (although still estimates at the species level due to market categories) and thus provide the best ground-truthing of WCGOP gear proportions for bias detection and calibration.

The bias correction formulas provided modifiers to adjust WCGOP jig/pole vs. other observed landings via the following formulas shown below. While the bias correction formula may seem complicated, it is not. For example in the north, it modifies the percent of WCGOP jig/pole lbs. (92.1 percent) to match the percent of PacFIN jig/pole lbs. (90.3 percent) and modifies the percent of WCGOP other gear lbs. (7.9 percent) to match the percent of PacFIN other gear lbs. (9.7 percent).

*Jig/pole modifier* =  
(Total WCGOP lbs. x % of PacFIN jig/pole lbs.) / WCGOP jig/pole lbs.

*Other gear modifier* =  
(Total WCGOP lbs. x % of PacFIN (other gear lbs.) / WCGOP other gear lbs.

(2B) The modifiers were then applied to original WCGOP observer pounds at the “haul” level respective to the gear type used.

(3) The proportion of modified WCGOP lbs. caught with jig/pole vs. other gear types were then determined for each of the four depth bins.

(4) These proportions were then used in the main formula for applying the gear-, depth-, and species-specific discard mortality rates:

= (***Proportion of jig/pole*** x *surface discard mortality rate*) + (***proportion other gears*** x 100% *mortality*)