SOUTH OF HUMBUG PACIFIC HALIBUT WORKGROUP PRELIMINARY MANAGEMENT MEASURE ANALYSES

Contents

Conclusions

1. **The Workgroup was able to quantitatively analyze data to produce projected catch estimates for Alternatives 1, 3, 4, 5 and 6, and season length estimate for Alternative 7**
2. **The analysis relied on several assumptions and did not attempt to incorporate potential changes in angler behavior, therefore there is a degree of uncertainty around the expected results**
3. **Expected catch could be reduced by up to 27 percent when retention of halibut on salmon and groundfish trips is prohibited (Alt. 1)**
4. **Expected catch could be reduced more when the number of months that the season is open (Alt 3) is reduced, but significantly shorter seasons than currently allowed would be needed to achieve catch that is close to the recent years' subarea allocations (Alt 5)**
5. **Alternative 6 would allow Oregon and California to develop different management approaches for their respective subareas**
6. **Alternative 7 shows that the season would need to be reduced from 184 days to 32 days to keep catch at the status quo subarea allocation**
7. **Alternatives could be combined or mix and matched to achieve different results, the Workgroup did not analyze combining alternatives**

Workgroup Assignment

In March 2013, the Pacific Fishery Management Council (Council) discussed potential fishery management measures to constrain Pacific halibut catches for the South of Humbug Mountain Subarea (southern Oregon and California; Figure 1) recreational fishery for 2014. The Council requested the South of Humbug Mountain Workgroup (Workgroup) analyze the amount of Pacific halibut catch that would result from the following management measure alternatives:

Alternative 1. Prohibit retention of Pacific halibut on
   a. Both salmon and groundfish trips
   b. Salmon trips
   c. Groundfish trips

Alternative 2. Restrict the days of the week; include at least one weekend day

Alternative 3. Restrict season dates including the following scenarios
   a. Open May through July and September through October
   b. Open May through July 15 and September through October
   c. Open May through June and August through September
   d. Open May through June and September through October

Alternative 4. Evaluate and, if possible, quantify the catch savings resulting from new Marine Protected Areas off the north coast of California that were effective in 2012.

Alternative 5. Examine the potential for harvest reduction of other time and area closures off California.

Alternative 6. Separate the South of Humbug Mountain Subarea at the Oregon/California Border
   a. Incorporate the Oregon portion of South of Humbug Subarea into the Central Coast Subarea
   b. Create new Southern Oregon Subarea

Alternative 7. Additional analysis
   a. Season length based on expected catch per day (Puget Sound methodology)

Figure 1. Map of the West Coast of the United States, with management lines, the Oregon/California Border, and major ports.

The Oregon and California members of the Workgroup conducted analyses and prepared a draft of the report between March and May 2013. The entire Workgroup held a publicly accessible webinar/conference call on June 12, 2013 to discuss the results of the analyses and the draft report. The results of that call were then incorporated into this report, for use by the South of Humbug Pacific Halibut Policy Committee at their July 30, 2013 meeting.

Data Used in Analyses and Assumptions

Oregon Data:

The Oregon Department of Fish and Wildlife's (ODFW) sampling program, the Oregon Recreational Boat Survey (ORBS), is described in detail at:
http://www.dfw.state.or.us/MRP/salmon/docs/ORBS_Design.pdf.

ORBS produces estimates of effort and catch from the ocean boat fisheries. In addition, length and weight measurements from some species are collected. Presently ORBS samples at the top ten to twelve ocean access points on the Oregon coast. In the top five ocean access points, sampling begins earlier in the season than in the other ports, to account for more of the effort. For unsampled ports and times, catch and effort estimates are produced based on previous temporal patterns or catch and effort estimates produced for similar ports. The goal sample rate is approximately 20 percent, to meet salmon coded wire tag requirements. Often the realized sample rate is higher than that, sometimes approaching 40 percent of halibut trips. For most species, effort and catch estimates are produced monthly on a month lag. However, due to the management requirements of salmon and halibut fisheries, those estimates are produced weekly.

California Data:

The California Department of Fish and Wildlife's (CDFW) recreational sampling program, the California Recreational Fisheries Survey (CRFS), provides a comprehensive approach to marine recreational fishery data collection along the entire state coastline. The program operates on a randomly stratified sampling schedule for multiple boat-based or shore modes of angling such as private skiffs, commercial charter vessels, beach and bank, and/or jetties. Anglers are intercepted at these various modes by CRFS samplers on the water or on shore to collect fishing information. This raw data set is referred to as "sample data" and includes: the number, length, and weight (if possible) of fish observed in the catch, along with the angler's demographic and fishing activity information (including fishing location), and angler effort. In addition, the number and condition of discarded fish (alive or dead) is reported by anglers and recorded. Since sample data only cover a portion of the actual fishing effort that takes place, a peer-reviewed statistical method of expanding (or extrapolating) the sample data results in "catch estimates." Catch estimates are statistically generated monthly for all recreationally-caught fish species by mode for each of the five management areas in California. For complete details of the CRFS program, please see the CRFS Methods document available at:
http://www.recfin.org/sites/default/files/documents/CRFS_METHODS_6_9_2011.pdf.

Average Annual Catch 2008-2012 (Baseline Data)

For the analyses in this report, the most recent five years (2008-2012) of catch estimates were used to evaluate predicted catch amounts under each alternative. This time period includes years

with high and low catches of Pacific halibut (especially in California), as well as varying availability of other fishing opportunities, such as salmon and groundfish. In addition, it includes the period when catches of Pacific halibut exceeded the South of Humbug allocation. Estimates are updated from those provided to the Council in September 2012.[1]

The South of Humbug Mountain Subarea annual allocations and average annual catches for the subarea and by individual state are shown in Table 1. The catches are based on catch information from 2008-2012 provided by ODFW and CDFW. The South of Humbug allocation averaged about 6,000 net pounds during this period. A reduction in catch of approximately 75 percent is needed if the Council wishes to keep catches within the Catch Sharing Plan (CSP) subarea allocation (based on the five-year average annual landings).

Table 1. Annual total and average recreational catch of Pacific halibut in the South of Humbug Mountain Subarea from 2008-2012. Data from ODFW and CDFW. Data have been updated since the September 2012 Workgroup report. Data for 2012 are preliminary.

Year	SOH	South of Humbug Catch (net pounds)		
	Allocation	Oregon	California	Total
2008	7,541	-	13,303	13,303
2009	5,872	48	34,847	34,895
2010	5,007	280	23,936	24,216
2011	5,625	9,648	13,637	23,285
2012	6,056	5,130	25,394	30,524
Average	**6,020**	**3,021**	**22,223**	**25,244**

Assumptions:

Due to the variable nature of recreational fishing, combined with the differences between Oregon and California's catch estimation programs, the analysts were required to adopt several assumptions to produce projected catch amounts under each alternative. Not all analyses used the same methods for both states, due to differences in sampling and estimation procedures. For the purposes of this report, each alternative required an evaluation of both Oregon and California datasets from 2008 to 2012 to determine whether estimate or sample data were the most appropriate to use given the temporal and/or spatial nature of the recommended alternatives. If data analysis required finer scale information than was available from estimates, sample data were used. The priority was to use the best available data set for each alternative. However, some alternatives used a combination of sample data for one state and estimate data for the other state when estimates were not available for both. This approach is not expected to have a substantive effect on the results. In other cases, only estimate or sample data were used for both states, or only California information was used. Except where specifically noted, it was assumed that sample data were from a random sample and represented unbiased information. Because most of the catch came from California, in cases where Oregon information was not available, it was

[1] Previously reported in the Workgroup report titled *Ad Hoc South Of Humbug Pacific Halibut Workgroup Report on Biological, Monitoring, Assessment, and Apportionment Issues in Area 2A,* available at http://www.pcouncil.org/wp-content/uploads/F1b_ATT1_SHPHW_SEP2012BB.pdf .

assumed that California information would reflect the entire South of Humbug Mountain Subarea.

The use of catch estimates takes into account potential biases in the actual data collected (missing data, uneven sampling, etc.) as much as possible. When sample data were used, analysts attempted to minimize any apparent biases by weighting the sample data so it would more closely reflect reality. Any potential biases and/or underlying assumptions are discussed as appropriate for individual analyses.

In general, changes in angler behavior due to the imposition of fishery restrictions were not taken into account when determining predicted catch amounts for each alternative. There are a multitude of factors that alter or motivate angler behavior and fishing practices for which data analysis cannot quantify, but affect how closely the estimated impacts will reflect future fishing catch and effort. These factors include but are not limited to: weather, economic expenses (fuel, travel, gear, etc.), regulations, geographic distribution of target fish, availability of other targets, changing fishing areas, and/or social or cultural values. In addition, management changes can have an effect on fishing effort and practices. The perception of a potential constraint to existing regulations can cause unanticipated changes to current fishery effort. All of these factors have the possibility to over- or underestimate the predicted catch amounts under each alternative. The assumptions associated with each alternative are discussed within each section in more depth.

Pacific Halibut Regulations by State

The International Pacific Halibut Commission (IPHC) and National Marine Fisheries Service (NMFS) have authority to regulate all recreational Pacific halibut fisheries on the United States west coast (Washington, Oregon, and California, also known as IPHC Area 2A). Recreational Pacific halibut regulations are set yearly and vary by state (Table 2). Current South of Humbug Mountain Subarea recreational regulations for Pacific halibut provide for an open season from May 1 through October 31, a daily bag limit of one fish, and no minimum size limit or depth restrictions. Additionally, the CSP[2] specifies what regulatory changes can be made inseason. Some recreational regulations for Pacific halibut fisheries in Oregon are coastwide while others depend on the area and/or fishery being prosecuted. A summary is presented in Table 2.

[2] http://www.nwr.noaa.gov/publications/fishery_management/halibut/2013_catch_sharing_plan_area_2a_final.pdf

Table 2. Current (2013) recreational Pacific halibut regulations by state.

State	Bag Limit/ Day	Possession Limit	Annual Bag Limit	Size Limit	Gear Restrictions	Depth Restrictions	Other Restrictions
Washington	1	2 daily limits in any form, except only 1 limit is allowed on a fishing vessel	none	none	one line with up to two hooks	none	**Coastal seasons close when the quota is attained. North Coast (MCAs 3 & 4):** Bottomfishing is restricted to the area inside 20 fathoms May 1- Sept. 30 except, lingcod, Pacific cod and sablefish can be retained seaward of 20 fathoms on days open for halibut fishing. **South Coast (MCA 2):** Bottomfishing is prohibited (except rockfish) seaward of 30 fathoms March 15-June 15 except, lingcod can be retained on days open to halibut fishing. **Columbia River (MCA 1):** Retention of bottomfish except, Pacific cod and sablefish is prohibited if a halibut is onboard. **Puget Sound** seasons have set opening and closing dates established to keep catch within the quota.
Oregon	1	1 daily at sea; 3 daily limits on land	6	none	may be taken by angling with single line, no more than 2 hooks; and by spear	Central Oregon Coast Subarea Nearshore fishery restricted to inside of a line approximating the 40-fm curve, defined by waypoints. All other areas/fisheries are open to all-depth	**Columbia River** and **Central Coast Subareas** close when quota is attained, no bottomfish except sablefish and Pacific cod on all-depth dates. **Central Coast** nearshore bottomfishing and retention prohibited outside of 30 fathoms. **South of Humbug Mountain** season open May 1 through October 31, seven days per week, bottomfishing and retention prohibited outside of 30 fathoms.
California	1	1	none	none	may be taken with hook and line gears; and by spear	none	Season is open from May 1 through October 31

Alternative 1. Prohibit retention of Pacific halibut on salmon and/or groundfish trips

The Council requested an examination of the impact on catch by prohibiting retention of Pacific halibut on salmon and/or groundfish trips.

Data:

Oregon and California recreational sampling programs document information on what specie(s) anglers were targeting while fishing which is used to generate catch estimates. Analysts evaluated how frequently Pacific halibut were landed on trips targeting salmon or groundfish, and whether Oregon and California information was similar enough to be combined into one analysis. There were no expectations about changes in angler behavior as a result of prohibiting mixed target trips that were incorporated into the analysis. Due to the differences in catch estimation methods between the two states, the Oregon and California portions of the analysis were conducted separately. Regarding discards, it is important to note that anglers planning to target groundfish or salmon could continue to target those species and any incidentally-caught Pacific halibut would be discarded. In Area 2A, halibut sport fishery discard mortality is currently not estimated.

Oregon

The trip types where Pacific halibut were caught included "bottomfish," "salmon," "Pacific halibut," and "combo" (salmon plus anything else). For the purposes of the analysis, Oregon's "bottomfish" category was considered to be analogous to a "groundfish" category, and Oregon's "combo" trip type was included in the salmon category. Oregon estimate data were used in the analysis because these trip types provided specific enough information about angler's intent when fishing to separate effort and catch appropriately.

Oregon's Pacific halibut annual catch estimates were summarized within the trip types "Pacific halibut," "salmon," "combo," or "bottomfish" for the five-year period, and from which the proportion of Pacific halibut in each trip type was determined. Those proportions were applied to the Oregon five-year average catch (Table 1) to get an estimated weight of landings in each trip type. These amounts were used to determine predicted catch amounts of Pacific halibut in Oregon under this alternative (Table 3).

California

California trip types are broad, and include "bottomfish" (which encompasses Pacific halibut, all Federal groundfish, plus some additional species) and "salmon." Since the trip type categories used in the estimation process are too broad to delineate between a groundfish and a Pacific halibut trip, sample data were used. This approach assumed that sample data were representative of estimates, and that there were no differences in angler behavior or fish caught between the primary target trip types in this analysis.

The total number of sampled Pacific halibut was summed across all five years within each primary target type category. The proportion of fish that occurred on trips where anglers designated their primary target as "Pacific halibut," "salmon," and/or "groundfish" was

determined, and then those proportions were applied to the average California landings (Table 1) to produce an estimate of Pacific halibut catches in California under the different prohibition options (Table 3**Error! Reference source not found.**).

Table 3. Predicted catch amounts (net pounds) of recreational Pacific halibut associated with the prohibition of retention of Pacific halibut on salmon and/or groundfish trips. Data from ODFW and CDFW.

Alternatives	Predicted Catch Amount (net pounds)		
	Oregon	California	Entire Subarea
1a. Halibut prohibited on salmon and groundfish trips	2,297	16,187	18,484
1b. Halibut prohibited on salmon trips	2,439	17,988	20,427
1c. Halibut prohibited on groundfish trips	2,878	20,423	23,301

Alternative 1a: Prohibit retention of Pacific halibut on salmon and groundfish trips

The analysis showed that the prohibition of Pacific halibut retention on salmon and groundfish trips could result in a predicted catch of 18,484 net pounds for the entire South of Humbug Subarea, which is a 27 percent reduction compared to the average catch estimates (Table 1). The actual reduction in catch may be less than predicted because of unanticipated changes in angler preference. If anglers choose to fish for Pacific halibut over salmon or groundfish, predicted catch amounts could be substantially higher than estimated. Conversely, availability of other highly desirable species may cause anglers to switch targets. Angler preference to target one species or species group over another can be difficult to predict, especially amongst highly prized target species such as Pacific halibut, salmon, and some groundfish (i.e., lingcod). Prohibiting retention of Pacific halibut and salmon and/or groundfish on the same trip could also lead to an increase in regulatory discarding.

Based on anecdotal information, many anglers who encounter rockfish (included in the "groundfish" category) and Pacific halibut on the same trip are encountering the Pacific halibut incidentally to targeting rockfish. Recreational anglers on California's north coast are restricted to fishing no deeper than 20 fathoms (120 feet) when fishing for groundfish (including rockfish) when boat-based groundfish angling is open (generally mid-May to August or October). Pacific halibut are generally encountered in waters 50 fathoms (300 feet) and deeper, so anglers targeting rockfish are generally not fishing in areas where high abundances of Pacific halibut occur. In addition, a closer look at the groundfish category indicated that rockfish are a smaller category within groundfish, so any reductions in catch amounts associated with prohibition of Pacific halibut and rockfish on the same trip would be less than the predicted catch amounts associated with prohibiting Pacific halibut and groundfish on the same trip.

Alternative 1b: Prohibit retention of Pacific halibut on salmon trips

The analysis showed that the prohibition of Pacific halibut retention on salmon trips could result in a predicted catch amount of 20,427 net pounds for the entire South of Humbug Subarea, which

is an 18 percent reduction in catch amounts (Table 3) compared to the average catch estimates (Table 1). Realized changes to catch amounts may differ from those reported in Table 3 for the same reasons relating to salmon provided above under Alternative 1a: Prohibit retention of halibut on salmon and groundfish trips.

Alternative 1c: Prohibit retention of Pacific halibut on groundfish trips

The analysis showed that the prohibition of Pacific halibut retention on groundfish trips could result in a predicted catch amount of 23,301 net pounds for the entire South of Humbug Subarea, which is a nine percent reduction in catch amounts (Table 3) compared to the average catch estimates (Table 1). Realized changes to catch amounts may differ from those reported in Table 3 for the same reasons relating to groundfish and rockfish provided above under Alternative 1a: Prohibit retention of halibut on salmon and groundfish trips.

Additionally, the predicted catch amounts specifically for the "Prohibit retention of halibut on groundfish trips" category may be more uncertain due to the use of sample trip data for California and the need to assume no differences in weight of fish among primary targets. Since anglers fishing for preferred groundfish are restricted to shallow water (less than 20 fathoms), and Pacific halibut in shallow waters would be expected to be smaller, it is likely that if weights of fish had been available, then the actual reduction in catch would be lower.

Enforcement Concerns:

Prohibiting species groups with vastly different regulations may be challenging for enforcement purposes. In California, groundfish and salmon have very clear regulations for stowing groundfish gear when targeting salmon inside Rockfish Conservation Areas (RCA). Conversely, if salmon is brought onboard first and anglers choose to stay inside the RCA to target groundfish, fishing gear is restricted to the use of barbless hooks only. The current balance between groundfish and salmon regulations in California could be further complicated by the prohibition of Pacific halibut in either or both the groundfish and salmon fishery, however, it is noted that these types of regulations have been implemented successfully in Washington and Oregon.

In the Oregon Columbia River Subarea and Central Coast Subarea all-depth fisheries, retention of bottomfish (groundfish) is already prohibited. In the Central Coast Subarea nearshore fishery (inside 40 fathoms), retention of groundfish is allowed, but only in areas open to retention of groundfish (inside 30 fathoms). Retention of salmon is currently allowed during all halibut seasons in Oregon. However, like in California, once a salmon is onboard the vessel, anglers are restricted to use barbless hooks.

Alternative 2. Restrict the days of the week; include at least one weekend day

Currently the South of Humbug Mountain Subarea fishery is open seven days per week. In order to reduce catches and prevent exceeding the South of Humbug Mountain Subarea allocation, the Council requested an examination of the impact on the catch by reducing the number of open fishing days per week. There is precedent in setting recreational Pacific halibut regulations in Area 2A such that fishing is only allowed two days per week, including only Friday and Saturday, or Thursday and Saturday.

Methods for Calculating the Proportion of Catch by Day of Week:

Calculating the proportion of catch by day of the week requires data on daily catch, as well as angler effort. Certain assumptions may also be required which account for any effort shift or change in angler behavior that may be associated with a reduction in the days per week open. In addition, any effort shift that does occur may not be consistent among months.

The following steps would be taken to calculate the proportion of catch by day of week:

1. Determine the total number of Pacific halibut reported for each individual day of the week (DOW).
2. Compare DOW totals from Step 1 to the cumulative total for all days to estimate a proportion of catch per DOW. This assumes that there is no difference in angler behavior by DOW that could affect the number of fish that were caught.
3. Determine the total number of samples by DOW.
4. Compare the DOW totals from Step 3 to the cumulative total for all days to estimate a proportion of samples by DOW.
5. Take the inverse proportion of sampling assignments by DOW.
6. Multiply the inverse proportion of the number of sample assignments by DOW was to produce an adjusted proportion of catch by DOW.

Similar steps would need to be taken to calculate the proportion of angler effort by day of week.

Data Available

An evaluation of available data indicated that the required data elements were not available to complete this analysis in time for inclusion in this report. Catch estimates were not available in Oregon or California on a daily basis; neither state currently produces estimates of angler effort by day of the week. Sample data by day of the week were also not available for Oregon in time to be included in this report. Therefore, only sample catch data from California could be used to analyze this option, assuming that predicted catch amounts represent the entire South of Humbug Mountain Subarea. Using the currently available data will likely provide results that are more uncertain, do not fully account for differences in angler effort by DOW, and may be less likely reflective of actual fishing practices.

Staff attempted to conduct a preliminary analysis on this alternative, but results were felt to be highly uncertain and therefore are not presented in this report. More work is necessary to dig into available data sources to determine whether the additional data exists to inform this alternative. If tasked by the Council, the workgroup could continue to examine this alternative with a goal of providing quantitative predicted catch amounts.

The information that was available did indicate that catch is slightly higher at the end of the week and on Saturdays. Pacific halibut managers in other subareas have anecdotal reports that effort and catch is greatest on Saturday, followed by Sunday, then Friday, with Tuesday and Wednesday having the lowest effort. However, data are not currently available to confirm this.

Alternative 3. Restricted Season Dates

Currently, Pacific halibut in the South of Humbug Mountain Subarea is open from May 1 through October 31 seven days per week. The Council requested the Workgroup attempt to determine predicted catch amounts for four different season structure alternatives:

Alternative 3a. Open May through July and September through October
Alternative 3b. Open May through July 15 and September through October
Alternative 3c. Open May through June and August through September
Alternative 3d. Open May through June and September through October

Data:

Oregon's recreational estimation program is capable of producing catch estimates on a weekly basis, therefore, no modeling limitations were encountered for any of the below alternatives and Oregon estimate information was used unmodified. California's recreational estimation program is limited to producing catch estimates on a monthly basis so an assumption of equal catch and effort distribution during the month was made to analyze option 3b.

The Workgroup examined the pounds of landed catch (in net pounds) by month for Oregon, California, and the entire subarea (Table 4). Using the last five years of data (2008-2012), the cumulative monthly catch was calculated, and then the percentage of the total catch for each month was determined. Additionally, the average catch per month for those same five years was calculated (Table 4 and Figure 2). The results assume that there is no effort shift from closed to open months when calculating predicted catch amounts.

Table 4. Recreational Pacific halibut catch (net pounds) by month. Data for the entire South of Humbug Mountain Subarea, and by state, 2008-2012.

Oregon

Month	2008	2009	2010	2011	2012	Cumulative Monthly Catch (net pounds)	% Total Catch	Avg. Monthly Catch (net pounds)
May	0	48	0	38	774	861	5.7%	172
June	0	0	0	480	715	1,196	7.9%	239
July	0	0	0	1,958	566	2,524	16.7%	505
Aug	0	0	128	5,280	1,592	6,999	46.3%	1,400
Sept	0	0	153	1,891	1,429	3,473	23.0%	695
Oct	0	0	0	0	54	54	0.4%	11
Total	0	48	280	9,648	5,130	15,107		3,021

California

Month	2008	2009	2010	2011	2012	Cumulative Monthly Catch (net pounds)	% Total Catch	Avg. Monthly Catch (net pounds)
May	1,150	510	2,362	501	1,453	5,976	5.4%	1,195
June	1,977	10,600	890	3,154	3,916	20,537	18.5%	4,107
July	3,062	8,019	8,911	1,347	4,552	25,891	23.3%	5,178
Aug	5,503	11,315	9,570	5,170	11,522	43,080	38.8%	8,616
Sept	1,611	4,403	2,202	2,663	3,107	13,986	12.6%	2,797
Oct	0	0	0	801	844	1,645	1.5%	329
Total	13,303	34,847	23,935	13,636	25,394	111,115		22,223

Entire Subarea

Month	2008	2009	2010	2011	2012	Cumulative Monthly Catch (net pounds)	% Total Catch	Avg. Monthly Catch (net pounds)
May	1,150	558	2,362	539	2,227	6,837	5.4%	1,367
June	1,977	10,600	890	3,634	4,631	21,733	17.2%	4,347
July	3,062	8,019	8,911	3,305	5,118	28,415	22.5%	5,683
Aug	5,503	11,315	9,698	10,450	13,114	50,079	39.7%	10,016
Sept	1,611	4,403	2,355	4,554	4,536	17,459	13.8%	3,492
Oct	0	0	0	801	898	1,699	1.3%	340
Total	13,303	34,895	24,215	23,284	30,524	126,222		25,244

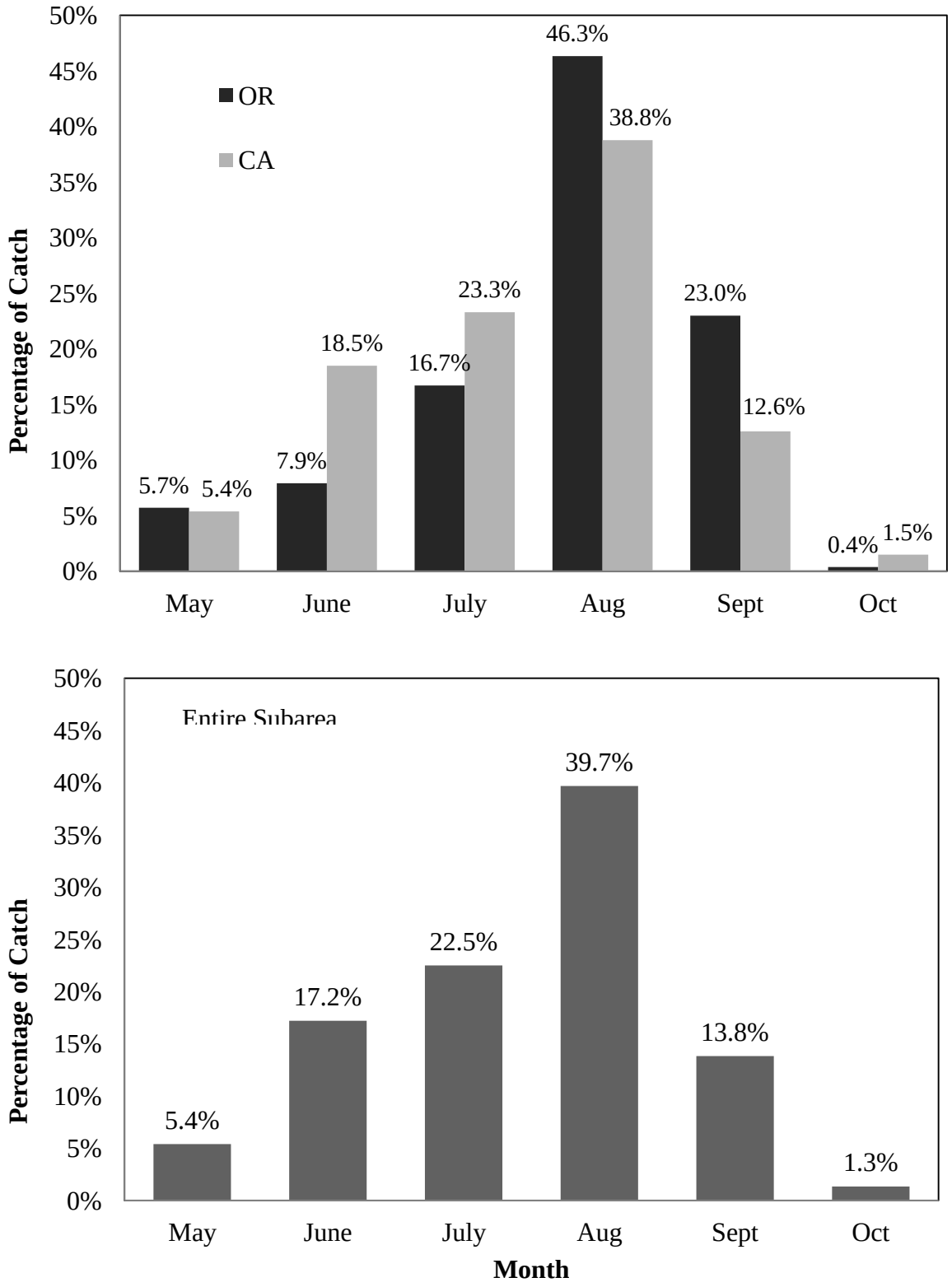

Figure 2. Average monthly percentage of catch for Oregon and California (top panel) and the entire subarea (bottom panel) 2008-2012.

The Workgroup looked at the average monthly catch in net pounds (Table 4) for the Council requested alternatives (3a-d), to determine what the annual predicted catch could be (Table 5).

Table 5. Monthly predicted catch amounts (net pounds) for Council requested season structure alternatives (3a-d) for the entire SOH area and by state. (Black cells indicate closed months, gray cells indicate part of the month being open).

Oregon				
Month	**Alt. 3a. May-July & Sept-Oct**	**Alt. 3b. May-July 15 & Sept-Oct**	**Alt. 3c. May-June & Aug-Sept**	**Alt. 3d. May-June & Sept-Oct**
May	172	172	172	172
June	239	239	239	239
July	505	252		
Aug			1,400	
Sept	695	695	695	695
Oct	11	11		11
Total	1,621	1,369	2,506	1,117

California				
Month	**Alt. 3a. May-July & Sept-Oct**	**Alt. 3b. May-July 15 & Sept-Oct**	**Alt. 3c. May-June & Aug-Sept**	**Alt. 3d. May-June & Sept-Oct**
May	1,195	1,195	1,195	1,195
June	4,107	4,107	4,107	4,107
July	5,178	2,589		
Aug			8,616	
Sept	2,797	2,797	2,797	2,797
Oct	329	329		329
Total	13,607	11,018	16,716	8,429

Entire Subarea				
Month	**Alt. 3a. May-July & Sept-Oct**	**Alt. 3b. May-July 15 & Sept-Oct**	**Alt. 3c. May-June & Aug-Sept**	**Alt. 3d. May-June & Sept-Oct**
May	1,367	1,367	1,367	1,367
June	4,347	4,347	4,347	4,347
July	5,683	2,841		
Aug			10,016	
Sept	3,492	3,492	3,492	3,492
Oct	340	340		340
Total	15,228	12,387	19,221	9,545

As with other analysis conducted in other sections of this report, no attempt was made to account for possible shifts or changes in angler behavior. The analysis makes no attempt to account for shifts in angler effort due to potential closed time periods, but it is very likely some level of shift would occur. While there are no data to estimate such a shift, the very potential for it makes it reasonable to state that the reductions noted are overestimates.

Alternative 3a (May-July & Sept-Oct)

This alternative would retain the majority of recreational halibut fishing opportunity that exists under the current season structure except that recreational halibut fishing would be closed during the month of August. There are generally fishing opportunities for other target species during the proposed closed period (August).

No changes to sampling or estimation programs for either state would be required under this option, as the closure would be a full month.

Alternative 3b (May-July 15 & Sept-Oct)

This alternative calls for a partial closure of one month. The recreational catch estimation programs for California produces estimates of catch on a monthly basis. Modification to the estimation programs will add workload to limited staff and may prevent estimates from being produced in a timely manner. Pacific halibut catch estimation already occurs on a weekly basis for Oregon ports, therefore there would be no increase in workload.

Alternative 3c (May-June & Sept-Oct)

No changes to sampling or estimation programs for either state would be required under this option, as the closure would be a full month.

Alternative 3d (May-June & Sept-Oct)

This alternative could produce the largest decrease to predicted catch amounts under Alternative 3 but would still preserve opportunity at the beginning and end of the season, over Memorial Day and Labor Day and when other opportunities may be less available.

No changes to sampling or estimation programs for either state would be required under this option, as the closure would be a full month.

Alternative 4. Evaluate and, if possible, quantify the catch savings resulting from new Marine Protected Areas off the north coast of California that were effective in 2012

The Council requested the Workgroup evaluate and, if possible, quantify the catch savings resulting from the new Marine Projected Areas (MPAs) off the north coast of California that went into effect on December 19, 2012.

The Marine Life Protection Act was implemented in 1999 and required the CDFW to redesign its system of MPAs to create a network of MPAs and increase its coherence and effectiveness at protecting the state's marine life, habitats, and ecosystems. In late 2012, 28 MPAs north of Alder Creek, near Point Arena (38°57.5’ N. lat) in Mendocino County, California were implemented.

There are three types of MPAs, with varying levels of protection from recreational and commercial fishing. Fishing for Pacific halibut is not allowed inside any of the MPAs, thus all MPAs are treated equally for this analysis.

This analysis builds on information previously assembled by the Workgroup[3]. CRFS sample data that included corresponding catch location information for Pacific halibut were used to determine what percentage of catch occurred in areas that are now newly-created MPAs (Figure 3).

Of the approximately 1,300 Pacific halibut in the California data set that had location information, only 40 fish (2.98 percent of the total; Table 6) were caught in areas which are now MPAs, and closed to recreational Pacific halibut fishing. The calculation of projected catch savings from new MPAs and predicted catch amounts (Table 6) relied on the assumption that recreational anglers will not shift effort into the remaining open areas. Therefore, the catch would be foregone. In addition, the Workgroup assumed that the location of sampled Pacific halibut is representative of all anglers' catch and that anglers accurately reported catch locations.

Table 6. Average recreational Pacific halibut catch (net pounds) and projected catch savings from new MPAs in California from 2008-2012.

Avg. California Catch (net lbs.)	Projected Reductions from MPAs	Expected Catch (net lbs.)
22,223	2.98%	21,561

Given that the majority of Pacific halibut reported by anglers occurred north of Cape Mendocino and not caught in areas that later became MPAs (Figure 3), minimal catch savings could be expected. These data are consistent with information provided in an economic analysis prepared for the North Coast MPA process. In addition, the location of Pacific halibut encounters is also consistent with information previously reviewed by the workgroup from the West Coast Groundfish Observer Program.

It is important to note that these MPAs went into effect in late 2012, so any catch savings associated with the new closed areas is occurring during the 2013 fishery, but would not have affected the data used in this analysis. As a result, these catch savings should be accounted for when selecting any additional measures to reduce Pacific halibut catches in the South of Humbug Mountain subarea.

[3] Previously reported in the Workgroup report titled *Ad Hoc South Of Humbug Pacific Halibut Workgroup Report on Biological, Monitoring, Assessment, and Apportionment Issues in Area 2A*, available at http://www.pcouncil.org/wp-content/uploads/F1b_ATT1_SHPHW_SEP2012BB.pdf.

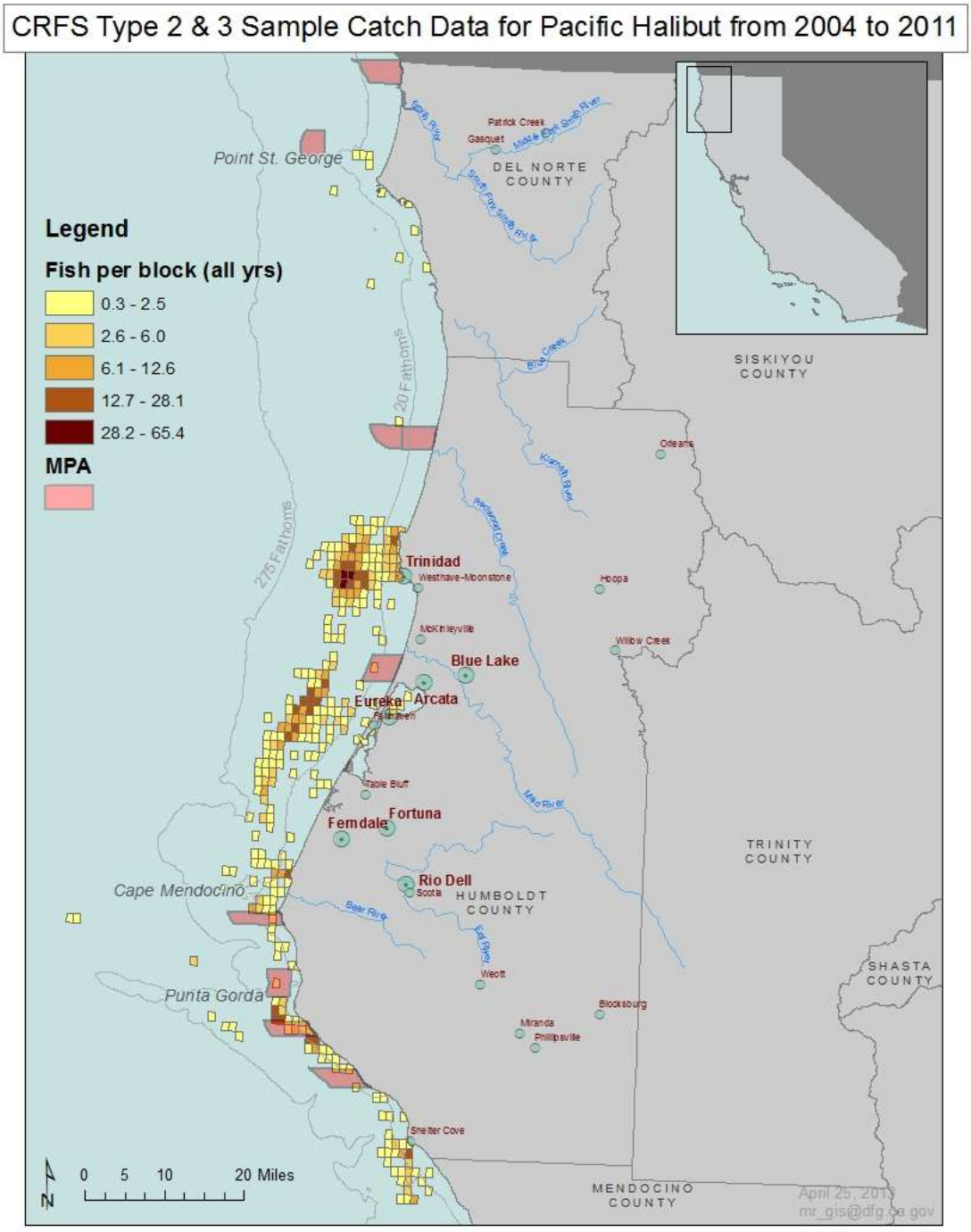

Figure 3. Map of new California north coast MPAs and locations of recreational Pacific halibut catch from 2004-2011. Recreational catch data based on CRFS information from CDFW.

Alternative 5. Examine the potential for harvest reduction of other time and area closures off California

The Council requested that the Workgroup also consider any other alternatives deemed appropriate in reducing predicted catch amounts. With that in mind, the Workgroup investigated additional modifications to the season structure with the goal of reducing predicted catch amounts to recent years' allocation amounts (Table 1).

Using the methodology and assumptions presented in Alternative 3, three additional season structure scenario alternatives (5a-c, below) were developed to evaluate open month combinations that would result in predicted catch amounts (Table 7) that are similar to the recent average subarea catch set-aside (approximately 6,000 net pounds).Those seasons would be:

- Alternative 5a.—Open May and September-October
- Alternative 5b.—Open July and October
- Alternative 5c.—Open May-June and October

Table 7. Monthly and total catch (in pounds net weight) for Alternatives 5a-c, resulting in predicted catch amounts that are similar to the last few years' SOH subarea set aside. (Black cells indicate closed months.)

Oregon			
Month	**Alt. 5a. May & Sept-Oct**	**Alt. 5b. July & Oct**	**Alt. 5c. May-June & Oct**
May	172		172
June			239
July		505	
Aug			
Sept	695		
Oct	11	11	11
Total	878	516	422

California			
Month	**Alt. 5a. May & Sept-Oct**	**Alt. 5b. July & Oct**	**Alt. 5c. May-June & Oct**
May	1,195		1,195
June			4,107
July		5,178	
Aug			
Sept	2,797		
Oct	329	329	329
Total	4,321	5,507	5,632

Entire Subarea			
Month	**Alt. 5a. May & Sept-Oct**	**Alt. 5b. July & Oct**	**Alt. 5c. May-June & Oct**
May	1367		1,367
June			4,347
July		5,683	
Aug			
Sept	3492		
Oct	340	340	340
Total	5,199	6,023	6,054

For the Oregon portion of the South of Humbug Mountain Subarea, all of the season structure alternatives analyzed (Table 7) result in catches less than half of the current subarea allocation. For the California portion of the South of Humbug Mountain Subarea, similar to the subarea as a whole, only season structure alternatives 5a-c (Table 7) result in catches below the current subarea allocation.

Alternative 5a
No changes to sampling or estimation programs for either state would be required under this option, as the closure would be a full month.

Alternative 5b
No changes to sampling or estimation programs for either state would be required under this option, as the closure would be a full month.

Alternative 5c
No changes to sampling or estimation programs for either state would be required under this option, as the closure would be a full month.

Alternative 6. Separate the South of Humbug Mountain Subarea at the Oregon/California Border and Incorporate the Oregon Portion into the Central Oregon Coast Subarea

The Council requested that the Workgroup look at splitting the South of Humbug Mountain Subarea at the Oregon/California Border. The Oregon portion, between Humbug Mountain and the border, could then be included in the Central Oregon Coast Subarea (Alternative 6a.) or become a separate southern Oregon subarea (Alternative 6b.). The area south of the Oregon/California border would then be a separate California Subarea.

From 1990 to 1998, the CSP provided a separate subarea allocation for California (South of 42° N. lat.) based on expectations of incidental catch. In 1999, the portion of Oregon south of Humbug Mountain was subsumed into the California subarea to provide anglers in the southern portion of Oregon, where catches of Pacific halibut were also very low, a longer fishing season.

Alternative 6a. Incorporating the Oregon portion of South of Humbug Subarea into the Central Coast Subarea
Incorporating the Oregon portion into the Central Coast subarea (Figure 4) would require anglers in those ports (Gold Beach and Brookings) to follow the regulations for the Central Coast, which are much different than are currently in place for South of Humbug subarea. These changes would be: separate nearshore and all-depth fisheries, limited number of open days each week, and no retention of groundfish on days open to all-depth fishing. Additionally, the total number of fishing days per week for those ports would be reduced.

The impact to the Central Oregon Coast Subarea fisheries, in most years, would be minimal due to the low effort and harvest coming from the addition of the ports south of Humbug Mountain. If a similar pattern to 2011 were to occur again, the addition of those two ports could reduce the total number of days open for the Central Oregon Coast Subarea, likely by only one or two days.

If included in the Central Oregon Coast Subarea, the impact to the ports south of Humbug Mountain would be much greater. This would be due to the substantially fewer number of fishing days from what is currently available. The Central Coast Subarea All-depth fisheries have been open 15-20 days per year for the last four years, and the nearshore fishery has been closing in

mid-July. Currently the South of Humbug Mountain Subarea is open seven days per week, for a total of 184 open days.

As ORBS already does weekly tracking for Gold Beach and Brookings, there would be no increased workload associated with this change. If California became its own subarea again, the CDFW does not plan to modify current catch tracking procedures.

Figure 4. New subareas under Alternative 6a, in which the Oregon portion of the South of Humbug Mountain Subarea is included in the Central Oregon Coast Subarea, and a new California Subarea is created.

Alternative 6b. New Southern Oregon Subarea

If a new Southern Oregon Subarea were created (south of Humbug Mountain to the Oregon/California Border; Figure 5), ODFW would have the ability to monitor inseason on a weekly basis, the same as other areas in Oregon. The ports contained in this new area are already sampled and reported as part of the ORBS sampling and data program. No changes or modifications would be required. This new management area would add one more area to monitor, which would lead to some additional, likely minor, management requirements (i.e. public meetings, conference calls). These additional management requirements would likely not add significantly to the workload of the state managers.

Creating a new southern Oregon subarea would allow for the potential for regulations to be different than those for the Central Oregon Coast Subarea, such as open dates, retention of bottomfish, and depth restrictions that are similar to what currently occurs. This would create the least amount of change from the current fishery occurring in those ports. It should have minimal impact to the Central Oregon Coast Subarea. However, the Council would need to modify the CSP to account for this new area.

Figure 5. New subareas under Alternative 6b, in which the South of Humbug Mountain Subarea is divided into a new Southern Oregon Subarea and a new California Subarea is created.

Separate California Management Area (South of 42°)

Catch tracking and management would be more straightforward if the waters off California were made a separate subarea, given the differences between the states in creel sampling, catch estimation, and regulatory processes and timelines. A separate management subarea for California could be accompanied by changes to the present CDFW catch tracking and estimation programs, if more active management of Pacific halibut is deemed appropriate for California. Currently, California does not conduct inseason tracking of Pacific halibut and catch estimates

are reviewed post-season (usually available by spring of the following year). Additional staff resources would be needed to begin any inseason tracking, although this need would be independent of the need for a separate California management area. Although modifications to the CRFS estimation programs could allow for more refined Pacific halibut management in California, California's CRFS program presently does not have a separate trip type for anglers targeting Pacific halibut. This modification may be warranted if more active management was considered by the Council. Additionally, should inseason management actions for Pacific halibut become necessary for the California recreational fishery, amendments to state regulations would likely be required.

As a combined region (the status quo), in which the majority of the catch originates from California waters, southern Oregon anglers would be subjected to more restrictive management measures mainly needed to control California catch. However, if California was its own management area, then northern California and southern Oregon anglers might have more options for fishing available to them in different areas depending on the regulations in place at the time. Under current regulations, central Oregon anglers may head south to fish when their areas close – due to the longer South of Humbug season. If southern Oregon is subsumed into central Oregon, those anglers might have to head further south to fish in California when their fishery is closed. Conversely, if southern Oregon were its own separate area, central Oregon anglers might go there, or California anglers might head north in search of better fishing opportunities.

Alternative 7. Additional Analysis: Season Length Based on Expected Catch per Day (Puget Sound Methodology)

Inseason management of the Pacific halibut quota is not possible in the Washington Puget Sound subarea. As such, set season opening and closing dates are established preseason using data from the most recent year's recreational fisheries such as catch per unit of effort and average weight by month and area. The Puget Sound season setting process occurs after the IPHC Annual Meeting when the Area 2A catch limit (CL) and allocations are announced, which allows seasons to be set appropriately to that year's halibut quota. Stakeholder input is gathered through public meetings to evaluate trade-offs with alternative season structures and maximize the number of fishing days that are available for the subarea. The CSP language for this subarea is written in a way that provides the flexibility to develop season dates that are in balance with the current season's quota. The workgroup felt the similarities between the management approach in the Puget Sound subarea and the California portion of the South of Humbug warranted exploration of the Puget Sound season-setting process as an alternative for the South of Humbug area.

Currently, 184 days per year are open to fishing for Pacific halibut in the South of Humbug Subarea. The CSP states that a fixed season for the South of Humbug subarea will be established preseason "based on projected catch per day and number of days to achievement of the subquota." As the Council directed the Workgroup to also consider other alternatives, the Workgroup attempted to evaluate the Puget Sound methodology, and develop a catch per day model for the South of Humbug Mountain Subarea.

Analyses to determine the expected catch per day were conducted following the methodology used in the Puget Sound area, and described in the Workgroup Report from September 2012[4]. An assumption was made that catch rates were the same throughout the season so that a day in July would have the same expected catch as a day in May or October.

The expected number of days available to fishing depends on the quota allocated to this subarea. Since the 2014 TAC will not be known until late January 2014, analyses were conducted to determine the days available to fishing associated with a range of subarea quota amounts (Table 8).

Separate analyses were conducted using California and Oregon estimate data combined, or only California data; catch per day was calculated as total weight or total number of fish per day. Catch estimates by weight were divided by the available days to determine weight by day. To calculate expected number of fish catch per day, the weight by day values were divided by the average weight of fish.

The results indicate an expected catch per day of approximately 189 pounds in both areas, but due to differing average weight per fish for the two areas, 10 fish per day are expected in the South of Humbug Mountain Subarea, and 11 fish per day are expected in the California-only area.

The number of days available to fishing under any of the options in Table 9 is considerably less than is currently available. If the subarea allocation for 2014 were to remain the same as the 2013 amount, only 32 days would be available for fishing. Table 9 shows a range of days available to fishing under varying South of Humbug subarea allocations for the entire area and for California only. There is no difference in number of days available to fishing between the two areas because the amount of catch coming from Oregon is relatively small.

[4] http://www.pcouncil.org/wp-content/uploads/F1b_ATT1_SHPHW_SEP2012BB.pdf

Table 8. Expected number of days available to fishing in 2014 for a range of potential South of Humbug Mountain Subarea allocation amounts. Data from ODFW and CDFW.

Percent Change to Subarea Allocation	Allocation Amount (net pounds)	Days Available to Fishing	
		South of Humbug Area	CA Only
+25%	7,579	40	40
+20%	7,276	38	38
+10%	6,669	35	35
+5%	6,366	34	34
SQ (no reduction)	6,063	32	32
-5%	5,760	32	32
-10%	5,457	29	29
-15%	5,154	27	27
-20%	4,850	26	26
-25%	4,547	24	24

Applying the methodology used in Puget Sound to the South of Humbug subarea would require additional work to evaluate catch per day and variability in catch rates by month. Stakeholder input would be needed to determine preferred dates and a season structure that balances fishing interests with variability in catch rates throughout the season in a way that keeps catch under the subarea allocation.

For example, the number of days available to fishing could be higher or lower depending on what days of the week or month are chosen to be open to fishing. If days in May, September, or October are chosen, actual catch per day may be lower than predicted, so additional days could be available to fishing to attain the subarea quota. If days during June, July, or August are chosen to be open to fishing, actual catch per day may be higher than predicted, and the subarea quota could be attained earlier than predicted.

Additional Options Considered but Rejected

Additional options were discussed by the work group but rejected for the following reasons:

1. Re-implementation of a minimum size limit
    a. Other west coast states do not currently have a minimum size limit for recreationally-caught Pacific halibut.
    b. Preliminary analysis suggested a minimum size limit of 40 inches would be required before any reductions to predicted catch amounts could be realized.
2. Implementation of depth restrictions
    a. Lack of data to provide a basis for the analysis.
    b. Differing depth restrictions that currently exist in Oregon and California for rockfish retention.

Conclusions

The findings of the analysis conducted by the Workgroup are summarized Table 9 below.

Based on the above analysis, the workgroup provides the following conclusions:

1. **The Workgroup was able to quantitatively analyze data to produce projected catch estimates for Alternatives 1, 3, 4, 5 and 6, and season length estimate for Alternative 7.**
2. **The analysis relied on several assumptions and did not attempt to incorporate potential changes in angler behavior, therefore there is a degree of uncertainty around the expected results.**
3. **Expected catch could be reduced by up to 27 percent when retention of halibut on salmon and groundfish trips is prohibited (Alt. 1).**
4. **Expected catch could be reduced more when the number of months that the season is open (Alt 3) is reduced; but significantly shorter seasons than currently allowed would be needed to achieve catch that is close to the recent years' subarea allocations (Alt 5).**
5. **Alternative 6 would allow Oregon and California to develop different management approaches for their respective subareas.**
6. **Alternative 7 shows that the season would need to be reduced from 184 days to 32 days to keep catch at the status quo subarea allocation.**
7. **Alternatives could be combined or mix and matched to achieve different results, the Workgroup did not analyze combining alternatives.**

Table 9. Summary of Alternatives analyzed and predicted catch amounts for each Alternative and the 2013 South of Humbug Mountain allocation and average 2008-2012 catch estimates.

Alternative		Expected Catch		
		Oregon	**California**	**Entire Subarea**
Alternative 1: Prohibit Retention halibut on Salmon or Groundfish Trips	1a. Prohibit halibut on salmon and groundfish trips 1b. Prohibit halibut on salmon trips 1c. Prohibit halibut on groundfish trips	2,297 2,439 2,878	16,187 17,988 20,423	18,484 20,427 23,301
Alternative 2: Days of the Week		Data not sufficient/available to produce a projected estimate of expected catch		
Alternative 3: Season Structure	3a. May – July, Sep – Oct 3b. May – July 15, Sep – Oct 3c. May – June, Aug – Sep 3d. May – June, Sep – Oct	1,621 1,369 2,505 1,116	13,607 11,018 16,716 8,429	15,228 12,387 19,221 9,545
Alternative 4: MPA Savings	Effective 2012	3,021	21,561	24,582
Alternative 5: Additional Time/Area Closures	5a. May, Sep – Oct 5b. July, Sep 5c. May – June, Oct	878 516 422	4,321 5,507 5,632	5,199 6,023 6,054
Alternative 6: Separate the S. of Humbug Mt. Subarea at the OR/CA border	6a. Incorporate the Oregon portion of S. of Humbug subarea into the Central OR coast subarea 6b. Create a new southern OR subarea	Expected catch would be dependent on alternatives implemented in conjunction with this alternative		
Alternate 7: Puget Sound Methodology	The number of days the fishery would be open would be reduced from 184 to 32 to keep the expected catch to the 2013 subarea allocation.	Expected catch would be dependent on additional analysis and stakeholder input.		
2013 SOH allocation				6,063
Average 2008-2012 Catch		3,021	22,223	25,224

Additional Background Information

At the July 30, 2013 South of Humbug Mountain Policy Group meeting and webinar, the Policy Group requested the Workgroup provide some additional background information. The additional information is presented in tables below.

Table 10. Average weight (in pounds) of landed Pacific halibut by state and the entire subarea, 2008-2012.

Year	Oregon	California	Entire Subarea
2008	N/A	14.9	14.9
2009	24.0	20.2	20.2
2010	25.5	19.9	20.0
2011	21.1	18.1	19.2
2012	20.3	19.7	19.8
5-year Avg.	20.9	18.9	19.2

Table 11. Oregon number of landed fish per angler trip (top panel) and pounds of landed fish per angler trip by month and trip target type. Data from 2008-2012 combined. In Oregon, "combo" trip types means the angler was targeting salmon plus "something" else.

Fish per Angler Trip

Month	Halibut	Bottomfish	Salmon/Combo
May	0.16	0.13	0.11
June	0.24	0.10	0.04
July	0.36	N/A	0.02
Aug	0.38	0.01	0.09
Sept	0.22	0.04	0.05
Oct	0.15	N/A	0.00
Total	0.30	0.02	0.04

Pounds of Halibut per Angler Trip

Month	Halibut	Bottomfish	Salmon/Combo
May	3.41	1.49	2.26
June	6.10	1.99	0.83
July	7.43	N/A	0.40
Aug	7.85	0.13	1.71
Sept	4.47	1.35	0.93
Oct	2.01	N/A	0.00
Total	6.18	0.65	0.71

Table 12. California number of landed fish per angler trip (top panel) and pounds of landed fish per angler trip by month and trip target type. Data from 2008-2012 combined. In California, "bottomfish" trip types includes: Pacific halibut, federally-managed groundfish, and several other groundfish-related species.

Fish per Angler Trip

Month	Salmon	Bottomfish	Other
May	0.006	0.016	-
June	0.008	0.030	0.013
July	0.004	0.028	0.043
August	0.015	0.046	0.570
September	0.012	0.064	0.025
October	N/A	0.017	N/A
Total	0.005	0.023	0.023

Pounds of Halibut per Angler Trip

Month	Salmon	Bottomfish	Other
May	0.097	0.277	-
June	0.158	0.571	0.240
July	0.075	0.570	0.881
August	0.268	0.832	10.357
September	0.214	1.121	0.437
October	N/A	0.199	N/A
Total	0.103	0.428	0.427

Table 13. Average number of angler trips by month and trip target type for Oregon, 2008-2012. In Oregon, "combo" trip types means the angler was targeting salmon plus "something" else.

Month	Halibut	Bottomfish	Salmon/Combo
May	57	3	22
June	17	31	51
July	60	0	201
Aug	148	259	219
Sept	82	5	52
Oct	5	0	297
Total	369	299	842

Table 14. Average number of angler trips by month and trip target type for California, Mendocino and Humboldt management areas only, 2008-2012. In California, "bottomfish" trip types includes: Pacific halibut, federally-managed groundfish, and several other groundfish-related species.

Month	Salmon	Bottomfish	Other
May	1,487	1,819	8
June	2,404	3,659	182
July	2,971	5,677	349
August	2,375	5,140	4
September	856	1,497	43
October	-	448	-
Total	10,093	18,240	585

PFMC
08/14/13