REVIEW OF THE OREGON COMMERCIAL AND RECREATIONAL HALIBUT FISHERY IN 2016 AND ECONOMIC IMPACTS OF THE PROPOSED CATCH LIMIT ALTERNATIVES FOR 2017

Version 1.4

prepared by

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prepared for

Marine Resources Program
Oregon Department of Fish and Wildlife

December 2016

Suggested Citation

The Research Group, LLC. Review of the Oregon Commercial and Recreational Halibut Fishery in 2016 and Economic Impacts of the Proposed Catch Limit Alternatives for 2017. Prepared for Marine Resources Program, Oregon Department of Fish and Wildlife. December 2016.

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Glossary

Biomass	Weight in net pounds (eviscerated, head-off, slimed, de-iced). Female spawning biomass is comprised only of sexually mature female halibut. Sexual maturity begins at age 8, reaches 50% at age 13 and 100% at age 20. Exploitable biomass is the portion of the stock to which the current harvest policy target harvest rates apply.
Bycatch	The mortality (measured in weight) of halibut caught and discarded in non-halibut fisheries. The context when the term is used could apply to halibut discarded, but not predicted to die as a result of being captured.
C&S	Tribal use of halibut for ceremonial and subsistence purposes.
CEY	Constant Exploitation Yield. CEY can be Total CEY (TCEY), which is the total amount of removals greater than 26 inches in length in an area, and Fishery CEY (FCEY), which is the amount available for halibut fisheries. FCEY is synonymous with the term "catch limits" used in this report.
CSP	Catch sharing plan. A management program, administered by a national agency, which allocates available yield among specific user groups.
Coastwide	The total Pacific halibut population habitat area administered by the IPHC. It includes the Bering Sea and Aleutian Islands, Gulf of Alaska, and oceans adjacent to British Columbia and the three continental west coast states. The coastwide area is divided up into eight regulation areas. Ocean Area 2A is adjacent to Washington (includes Puget Sound), Oregon, and California.
Decision table	A table developed by the IPHC staff, in collaboration with external scientific review, in which the probabilities for specific metrics of stock and fishery performance are estimated for various levels of harvest. Blue line is a row in the decision table (highlighted in blue) which provides the harvest available when the Commission's target harvest rates are applied to the current estimate of exploitable biomass.
Economic consequences	An economic contribution metric that relates to a short-term perspective for how an industry is represented in the local economy. If there is a change in the economy's industry activity, there may very well be adjustments in the longer term that may cause increased economic contributions. For example, a tourism business start-up may replace a fishing industry business closure.
Economic metric	The economic contribution measurement selected for this study is personal income. It could just as well been other metrics that would describe the same economic direct and secondary effects, but in a different dimension. Other example metrics are business output (analogous but different than sales), value added, generated government taxes, and jobs.

EEZ	An exclusive economic zone (EEZ) is a sea zone prescribed by the United Nations Convention on the Law of the Sea over which a country has special rights regarding the exploration and use of marine resources, including energy production from water and wind. The U.S. EEZ extends no more than 200 nautical miles from the territorial sea baseline and is adjacent to the 12 nautical mile U.S. territorial sea. For application by the Magnuson-Stevens Fishery Conservation and Management Act, the EEZ is defined as having an inner boundary that is coterminous with the seaward (or outer) boundary of each of the coastal states territorial sea. For West Coast states, the inner limit is coterminous at three nautical miles.
FEAM	Fishery Economic Assessment Model was used to calculate fishing industry economic contributions. The FEAM is a derivation of the IMPLAN input-output model.
Fletch	A large halibut fillet.
Home-port	Home-port is defined as the port group where a vessel made the most landings by ex-vessel value.
IBQ	Individual bycatch quota
IFQ	Individual fishing quota
IPHC	International Pacific Halibut Commission
MSA	Magnuson Stevens Act
MSC	Marine Stewardship Council
Multiplier effect	The economic effects from subsequent rounds of spending (indirect and induced effects) that occur before money has leaked from the economy.
NEPA	National Environmental Policy Act
Net economic benefit	The sum of positive and negative economic values (NEV) typically used in benefit-cost analysis (BCA) framework. NEV is measured by the most someone is willing to give up in other goods and services less the actual costs in order to obtain a good, service, or state of the environment. The accounting of benefits in a BCA would include valuations for not only extracting or disturbing natural resources like fish, but also appreciating their non-use. The accounting for costs in a BCA would include opportunity costs, such as for the next best use of the investment being studied. One summary statistic for the BCA is net present value (NPV) which is the sum of discounted net between benefits and costs over the period being analyzed. A BCA has the advantage for including economic effects from decisions made in a current year that are staged over future years. It is important to declare an accounting stance when applying a BCA to understand which user and non-user groups are being

	included. A national economy accounting stance is generally declared for an analysis when decision actions affect non-users.
Net weight pounds	Net weight pounds are dressed, head-off, slime and ice deducted. To obtain round weight from net weight of Pacific halibut, divide net weight by 0.75 or multiply by 1.33333.
NMFS	National Marine Fisheries Service
NPHA	Northern Pacific Halibut Act of 1982
ODFW	Oregon Department of Fish and Wildlife
PacFIN	Pacific Fisheries Information Network
Personal income	Income accruing to households in the form of net earnings from wages, salaries, proprietorship income, etc. For example, it would include the contract payments based on share of catch value that is made to a commercial fishing vessel crewman and the net income after operating and fixed expenses for the vessel owner. Total personal income includes the multiplier effect.
PFMC	Pacific Fishery Management Council, headquartered in Portland, Oregon. A U.S. federal board which oversees management of marine fisheries in federal waters off Washington, Oregon and California. With halibut, the PFMC's role is to decide on allocations between user groups and development of programs to manage and reduce halibut bycatch.
Processors	These businesses include operators of processing plants, buyers that may do little more than hold the fish prior to their shipment to a primary or secondary processor, and consumers buying directly from vessels. First purchasers can be buyers that sell to processors, businesses that do process fish into seafood products, restaurants, and the public buying directly from vessels.
Regional economic impact (REI)	Economic contribution and REI are different concepts, but in this report the two terms are used interchangeably. A stricter use of the term "contribution" would be for an economic activity that exists. The use of the term "impact" would be when an economic activity is to be subtracted or added. It is the share of the regional economy supported by the expenditures made by the industry being analyzed. It can be expressed in terms of a variety of economic metrics. The geographic economy level used to calculate the REI is important to know. There is significant early dollar flow leakage from the Oregon coastal economy to the Oregon economy level. So the same industry activity expressed at the coastwide level will be less than when expressed at the statewide level.
RFA	Regulatory Flexibility Act
RIR	Regulatory impact review

Resource rent	The term resource rent (or just the one word rent) introduces opportunity and expectation costs to a commercial fisheries profit equation. There would be subtractions from the fishery earnings from not only the prosecution costs, but also from using the capital investment and labor investment in a next best substitute manner, and the subtraction for the perceived amount of profit to be made in the fishery. Resource rent calculations typically do not include external effects outside the fishery, such as ecosystem effects.
SPR	is spawning potential ratio. SPR compares the spawning ability of a stock in the fished condition to the stock's spawning ability in the unfished condition.
SSA survey	Standardized stock assessment survey, conducted annually by IPHC since 1996.
TAC	Total allowable catch. The term is used synonymously with the term catch limit.
TURF	Territorial use right in fisheries
U&A	Tribal usual and accustomed fishing grounds.
Wastage	The mortality (measured in weight) of fish that are captured but not landed during the commercial tribal and non-tribal halibut fishery. This includes discards (primarily undersize halibut), as well as fish estimated to have been captured by lost and abandoned fishing gear.
WCGOP	West Coast Groundfish Observer Program

Introduction

This report provides a brief economic review of Oregon's commercial and recreational Pacific halibut fishery in recent years.[1] The report also shows the estimated regional economic impacts (REI) to Oregon from the International Pacific Halibut Commission (IPHC) proposed catch limits for regulation Area 2A in Year 2017.[2] Area 2A includes Puget Sound and the ocean adjacent to the three continental West Coast states. The REI's are for the proposed catch limits in Year 2017 as compared to a "status quo" catch limit that occurred in Year 2016.[3] The IPHC examined catch limit alternatives during an interim meeting in November 2016.[4] The alternatives included a "blue line" catch limit that assumes IPHC target harvest rate is applied to the current method for estimating exploitable biomass and a new method for applying the target harvest rate to an exploitable biomass that maintains the 2014-16 spawning potential ratio (SPR). Another alternative included in this review is for a coastwide 50 million net pound removal which corresponds to a level of fishing intensity that reduces the SPR to 40 percent. The IPHC will meet in January 2017 to select the final catch limits which may be different from any of the proposed alternatives.

The Oregon commercial halibut fishery provides a small amount of harvest revenue to a relatively large number of participants. A few vessels are dependent on the fishery for a majority of their annual revenue. The explanation for the large number of participants includes the low gear-up costs for participation and open access licensing. Many of the directed fishery participants already have groundfish fishery longline gear deployed and it is a minor cost to switch out to halibut gear.[5] In addition to directed fishery participation, there are many participants in the incidental halibut salmon troll fishery. A salmon troller may annually participate in this incidental fishery or in the directed commercial fishery targeting halibut, but not in both. While the average per vessel harvest revenue is minor in recent years for the directed halibut fishery, there could be some participation motivated by wanting to continue a landing history if this open-access, derby fishery is switched to a property rights management approach in the future.

The Oregon recreational halibut fishery generates 15-20 thousand trips per year (TRG 2015b). When the first spring fishery opening occurs on days of acceptable fishing weather, ports are clogged with boaters craving this valued species. Fishing regulations control effort which results in access being spread over summer months when there is improved weather conditions.

1. A more full explanation of the fishery including detailed analysis method statements was completed by TRG (2014).
2. The IPHC is the international body that determines acceptable exploitable biomass and harvest rate conservation standards for the Pacific Ocean coastwide halibut range. There are eight regulation areas within the range.
3. This report often refers to the fishery for Pacific halibut as just the halibut fishery for brevity. There is also a fishery for California halibut and this report's use of the term "halibut" is not inclusive of both.
4. The Alaska, British Columbia, and West Coast halibut fishery history, species biological traits, current management regime, and abundance issues are described in information at the IPHC website (www.iphc.int). A historical accounting of the halibut fishery through middle 1970's is colorfully described in Bell (1981).
5. Many vessels use the same groundlines and it is only necessary to use different snap-on gangions and hooks for the halibut fishery.

Data and Methods

The commercial fishery used in the analysis is from PacFIN fish ticket data extractions in November 2016. The tickets are for preliminary landing completions through October for Oregon and through September in Washington. Fishery statistics exclude vessel counts and a small amount of catch that was harvested for research purposes. Fishery statistics also exclude vessel participation and catch from areas outside the EEZ, discard disposition, and when halibut is landed with groundfish gear categories. Vessel counts exclude data with no unique vessel identifier ("NONE" or "ZZ..."). These vessels are typically delivering in treaty fisheries. Oregon halibut landings in 2016 did not have vessels with identification of "ZZ...", but did have vessels with identification of "NONE" that was all research disposition.

Recreational fishing trip data is from the Oregon Recreational Boating Survey (ORBS) program. One fishing trip is synonymous with one angler day. Trip mode can either be charter or private boat. Average angler day expenditures for the different modes are quite different and are tracked independently in the REI model. Trip estimates for the proposed alternatives are provided by ODFW (personal communication December 2016). The estimate method is a linear regression fit of years 2005-2016 effort (dependent variable) and Area 2A FCEY (single predictor variable) data. The regression has a forced zero intercept.

Economic contribution includes the upstream linkages from the supplies and services produced within the region to support the fishing industry and the downstream linkages related to primary processing and distributing fish products for the consumer, hence it includes the "multiplier" effect. Commercial fishery harvest and processor sectors expenditures and net income used to calculate economic impacts are from the Fisheries Economic Assessment Model (FEAM) (TRG 2015a). The recreational expenditure categories per trip and resident/non-resident share are from Gentner and Steinback (2008). The expenditures are for a fishing trip's variable cost. This means the economic contributions do not include effects from capital purchase items like boats.[6] Commercial and recreational economic response coefficients are based on IMPLAN 2011 base data (TRG 2015a and 2015b).[7]

Harvesting

The IPHC estimates a coastwide exploitable biomass for managing the fishery. The exploitable biomass is then apportioned to IPHC regulation areas. The apportionment is based on stock assessment survey catch rates and presence of halibut habitat. The IPHC harvest rate in Area 2A

6. This omission is for two reasons. The economic analysis is for a change in trip numbers and a participant is not likely to have made capital purchases related to the change. The second reason is an assumption that capital purchases would have been made anyway for other ocean fisheries whether or not there was access to a halibut fishery. Gentner and Steinback (2008) do include capital purchases in their analysis of all of Oregon's marine recreational fisheries.
7. The FEAM is a derivative of the IMPLAN input/output model. The FEAM was originally developed by Hans Radtke and William Jensen for a project sponsored by the West Coast Fisheries Development Foundation in 1988. The FEAM has been continuously maintained for Oregon fisheries with the most recent iteration described in TRG (2015a). The IMpact Analysis for PLANning (IMPLAN) is a software and dataset system for input-output models applicable to the nation, states, and counties. Datasets for U.S. zip codes are also available. IMPLAN is maintained by the IMPLAN Group, LLC (formerly MIG, Inc.) located in Huntersville, North Carolina.

is 21.5 percent. The application of the apportionment rate and the harvest rate results in an Area 2A TCEY. Accounting for other mortality (such as groundfish fishery bycatch) reduces the TCEY to a FCEY which is synonymous to fishery catch limits. The PFMC CSP Area 2A FCEY shares are for non-tribal (65 percent) and tribal (35 percent). The non-tribal commercial sub-share is 30.7 percent which is allocated 85 percent directed and 15 percent salmon fishery incidental.

The Area 2A commercial directed halibut fishery in 2016 had three 10-hour fishing periods (June 22, July 6, and July 20). The fishery is regulated for season and daily catch limits. The daily catch limit varies by vessel size class. The season catch limit in 2016 was 193.3 thousand net pounds and actual catch was 198.5 thousand net pounds. The Area 2A commercial salmon incidental fishery was open from April 1 to November 7. The fishery is regulated for a halibut-salmon ratio. The ratios in 2016 were one per four Chinook plus one halibut with a maximum of 12 per trip. The ratio changed in July to be one per three plus one per trip and a maximum of 20 per trip. The season catch limit was 34.1 thousand net pounds and the actual catch was 25.7 thousand net pounds.

Oregon landings in 2015 from the Area 2A combined directed and incidental fisheries harvest are 75.5 percent. Oregon harvest volume is 96 percent directed and four percent incidental in 2015.[8] This is in contrast to Washington where 67 percent is directed and 33 percent is incidental in 2015.

The combined directed and incidental fisheries landings in Oregon were 233.8 thousand round weight pounds at an ex-vessel value of $1.3 million in 2016. Halibut ex-vessel prices averaged $5.61 per round weight pound in 2016. The price in 2016 is slightly down from a 30 year record inflation adjusted high of $5.78 in 2014 (Figure 1). There were research landings of 14 thousand round pounds in 2016. Halibut landings using trawl gear were 891 round pounds in the shoreside groundfish fishery in 2016. (The Pacific whiting fishery is a maximized retention fishery. Harvesters are not paid for the landings and processors typically distribute the fish to food banks or destroy them.) There are U.S. West Coast halibut landings from catch areas outside the EEZ. Most in recent years are delivered to Bellingham Bay, Washington, but there have been historically large deliveries in Oregon.[9]

8. Reported landings of troll-caught halibut in Oregon from Area 1 averaged about 12,700 pounds annually from 1932 to 1965 and that gear accounted for about 6.6 percent of the halibut catch taken off the Oregon coast. Landings of troll-caught halibut at Washington coast ports averaged about 25,700 pounds annually from 1932 to 1965 and represent about 51 percent of the total halibut landed in Washington from Area 1 during this period (Bell and Best 1968).
9. U.S. West Coast halibut landings from catch areas outside the EEZ in 2015 were 881 thousand round pounds, mostly landed at Bellingham Bay (653 thousand), with 26 thousand at Astoria, and 202 thousand at Puget Sound and north Washington coast ports from Puget Sound catch areas. In 2016 through October there were 715 thousand round pounds landed at Bellingham Bay, 171 thousand at Puget Sound and north Washington coast ports from Puget Sound catch areas, and none in Oregon. There have been Oregon landings in the past for halibut caught outside of the West Coast EEZ. There were none in 1981 to 1986, then from 1987 to 1996 the landings were more than landings inside the EEZ and some years higher than seven times the landings inside the EEZ, and since then landings outside the EEZ have been less than inside. There were no Oregon landings with non-EEZ area-of-catch in 2001, 2006-2008, 2011-2014, or 2016. Anecdotal information about area-of-catch explains that the harvests are from Alaska waters and are delivered to West Coast ports by commuting vessels because of a higher price being offered.

There were a total of 146 unique vessels that had shoreside halibut landings in Oregon in 2016. Of the 146 vessels, there were 81 vessels that landed halibut with troll gear, 66 that landed halibut with longline gear, and six that used other hook and line gear. One vessel used both longline and other hook and line gear. There were also 20 vessels that landed halibut in the shoreside Pacific whiting fishery. There were 262 deliveries in the directed fishery, 430 deliveries in the incidental fishery, and 88 deliveries in the shoreside whiting fishery in 2016.

Table 1 shows the directed and incidental halibut fishery vessel revenue frequency distribution in 2016. Fifty four percent of the vessels in the directed fishery had less than $10,000 in revenue in 2016. For the vessels with more than $25,000 directed fishery halibut revenue, about two-thirds of their total Oregon fisheries' revenue is from the directed halibut fishery.

Table 2 shows halibut fishery landings by port groups in 2016. Most of the vessels (53 percent in 2016) made landings in Newport. Newport is close to productive halibut fishing grounds and there are many home-port vessels already participating in the groundfish fixed gear (longline and pot gear) fishery and salmon troll fishery.

The commercial halibut fishery is an opportunistic fishery given its low cost for entry and open access nature. There were years in the late 2000's decade when the salmon fishery was essentially closed on Oregon's central coast that reduced participation in the incidental fishery. The improved salmon abundances in 2014 and 2015 attracted many more vessels into this fishery, but 2016 troll Chinook landings are down, and many vessels did not participate in the incidental fishery.

The Oregon recreational halibut fishing catch limit in 2016 was 29.7 percent of the non-tribal FCEY. The allocated amount was 220.1 thousand net pounds and 206.7 thousand net pounds (93.9 percent) was caught. The number of angler trips in 2016 was about 18 thousand (ODFW personal communication December 2016).

The comparison of the recreational halibut fishery to other recreational fisheries is shown in Table 3 (TRG 2015b). The halibut fishery in 2014 (latest date estimates are available) was about eight percent of all ocean fishing economic contributions and was about two percent of all marine and anadromous fish inland economic contributions. The fishery has subarea catch quotas and is managed by season interval closures, days-per-week openings, ocean depth restrictions, and per-day/possession bag limits. In-season monitoring will prompt adaptive management changes to the fishing regulations.

Processing

Ten processors or buyers purchased over $10 thousand of Oregon landed halibut each in 2016 and this comprised over 96 percent of all landings. The top three processors or buyers purchased about 58 percent of all Oregon halibut landings.[10]

10. Processor receipts of halibut include research, discard, trawl, and catch from outside the EEZ.

Nearly the entire production of the northern Pacific halibut fishery is consumed in the U.S. market (Herrmann and Criddle 2006). The introduction of a property rights system in the Alaska and B.C. fisheries elongated the "fresh" halibut domestic whole fish market to more than one-third of the production by 2004.[11] The fresh fish domestic market fetches a premium price as compared to frozen product forms. Halibut product forms are usually fresh or frozen fletches or steaks. Smaller "chicken" halibut (10 to 20 pounds) is sometimes sold whole (headed and gutted). A delicacy is halibut cheeks with size ranging from three ounces to more than a pound each (Seafood Choices Alliance 2007). The Pacific halibut fishery is Marine Stewardship Council (MSC) certified starting in 2006 at the request of the Fishing Vessels Owners Association. The fishery was recertified in 2015.

Oregon and Washington are in a price taking position from Alaska's lead in market position. Only about 2.2 percent of the halibut population that can be fished is apportioned to Oregon and Washington, about 14.1 percent to British Columbia, and the remaining 83.7 percent to Alaska.

Bycatch

If the number of harvesting participants was defined as those that discard halibut, the number would be much higher than what this report shows for participants in the directed and incidental halibut fisheries. There are significant discards in the trawl and fixed gear groundfish fisheries where halibut is a prohibited species.[12] Groundfish fishery (includes all tribal and non-tribal trawl and fixed gear fisheries) discard mortality as a share of all removals in Area 2A was 11 percent or 129 thousand net weight pounds in 2013 (IPHC 2014). The halibut discard encounters (the catch discarded which are modeled to live as well as die) about equaled the commercial tribal fishery catch in 2013.[13]

Discard mortality in the groundfish trawl fishery decreased dramatically from 2010 to 2011 following the issuance of individual bycatch quota (IBQ) for the first year implementation of the groundfish trawl fishery individual fishing quota (IFQ) program.[14] The penalty disincentive for exceeding the assigned IBQ resulted in a remarkable decrease from 399 thousand round weight

11. Harvesters are paid by fish grade which corresponds to size. Grades are in 20 pound increments starting with 20 pounds. It is typical in recent years that each successive grade has a 25 cent price differential. The higher ex-vessel price is due to higher yields from larger fish.
12. Discard mortalities are from Stewart (2014) and Jannot et al. (2014). Jannot et al. (2014) used information from the West Coast Groundfish Observer Program (WCGOP). Expansion factors are used to account for fisheries that do not have observers. The WCGOP data takes into account potential survival after being discarded. An observer notes size and physical condition (excellent, poor, dead) of the discard. A modeled mortality rate that depends on gear and other variables is applied. For example, the bottom trawl fishery assumed discard rates are 20 percent for excellent, 55 percent for poor, and 90 percent for dead. The pot gear fishery discard rates are zero percent, 100 percent, and 100 percent for the three conditions.
13. Removals are retained catch, discard mortalities in non-halibut fisheries, and wastage mortality in halibut fisheries. Wastage are the discards that principally come from minimum harvest size restrictions.
14. The shoreside trawl fishery north of 40º10' N latitude is managed using a system of IBQ's. For 2012 through 2014, 15 percent of the Area 2A TCEY for legal sized halibut and not to exceed 130,000 net weight pounds is subtracted from the TCEY to account for expected trawl bycatch mortality. Beginning in 2015, the amount to be subtracted will be capped at 100,000 net weight pounds. A set-aside for 10 mt is to cover bycatch mortality in the at-sea whiting fishery and trawl fishery south of 40º10' N latitude. The remainder is issued as IBQ.

pounds in the 2010 bottom trawl limited entry fishery before the program to 68 thousand round weight pounds the first year of the IFQ program (Jannot et al. 2014).

The obvious directed fisheries participants' concern for bycatch is the opportunity cost they incur for lowered catch limits to account for these discard mortalities from an exploitable biomass. Accounting for the growth and natural mortality of the sublegals, the IPHC estimates one pound of discard mortality in Area 2A for the current year means about a one pound lost harvest production in future directed fisheries in Area 2A (Hare and Williams 2013).

Proposed Alternatives Economic Impact

Table 4 shows the REI to Oregon from two IPHC catch limits proposed alternatives (blue line and maintain 2014-2016 SPR) in regulation Area 2A. Another alternative showing is for a coastwide 50 million net pounds removal. The three alternatives are compared to a status quo 2016 alternative. The decreased REI for the "blue line" alternative would be $707 thousand personal income in 2017 if prices, fisherman behavior as a result of catch limit changes, and other economic modeling assumptions were unchanged from 2016. The decreased harvest earnings are $438 thousand. The decreased REI and harvest earnings are minus 34 percent. The "blue line" alternative catch limit would be the lowest harvest since 2010 (Figure 1). The two other proposed alternatives would have minus 11 percent and minus 26 percent economic impact.

The recreational fishery 2017 proposed alternatives economic impacts are shown on Table 5. The decreased REI for the "blue line" alternative at the statewide economic level would be $881 thousand. Similar to the commercial fishery impacts because both fisheries are linear assignments of the same FCEY, the "blue line" alternative would be a minus 34 percent in statewide REI from Year 2016. The other two alternatives economic impacts are the same percent decreases as well at minus 11 percent and minus 26 percent.

The large estimated negative economic impacts will happen when the IPHC has determined coastwide stock biomass is increasing (IPHC November 2016). The primary influence for the decrease is the IPHC recommended apportionment of coastwide removals be changed from 2.8 percent in 2016 to 2.2 percent in 2017.

Commercial Fishing Industry Challenges and Opportunities

The Pacific halibut directed and incidental fisheries provide minor revenues in comparison to Oregon's other fisheries, but can be important and timely during an individual's vessel annual operations. The lowering of earnings in any one of a portfolio of fisheries without opportunity for increasing revenue in another fishery may affect the overall viability of the fishing business. Moreover, further restrictions in the halibut fishery could redirect participants to other fisheries that are already in an over capacity status. Processors have invested capital and secured markets for halibut seafood products. The continued reductions in deliveries undermines their ability to

recoup investment costs and can harm distributor and retailer market relationships who expect diversified and time predictable product offerings.[15]

The Oregon commercial halibut fishery takes place in a backdrop of: (a) an allocation scheme whose basis was crafted when catch limits were much higher; (b) inflexible regulatory programs that are international and national; and (c) new science findings about species habitat, migration, and biology. If the property rights management system for the commercial non-tribal halibut fisheries in Alaska and British Columbia has economic lessons, then the West Coast fishery is not optimally managed for net economic benefits.[16] However, state agencies singularly on the West Coast have limited influence on changing management approaches.

The offered economic contribution information in this report, albeit brief and limited, is an important addition to the halibut fishery management decision making process. The IPHC does not accompany their apportionment alternatives with descriptions for economic efficiencies nor REI. Further, the PFMC does not provide economic analysis descriptions for annual CSP decision making processes.[17,18]

15. Large chain restaurants, cruise ship companies, and multi-state retailers comprise the bulk of the seafood market. They want a steady supply so they can streamline their menus or advertise specials well in advance. Processors have risks when negotiating deals, having to fulfill orders by purchasing fish on the global marketplace when their own processed fish is not available.
16. Casey et al. (1995) and Herrmann and Criddle (2006) discuss improved profitability from moving first the British Columbia and soon after the Alaska commercial halibut fisheries to property rights systems.
17. An early CSP adopted for the 1990 season did have economic descriptions for regional economic impacts and net economic benefits (Radtke 1989). A National Environmental Policy Act (NEPA) environmental assessment (EA) and Regulatory Flexibility Act (RFA) regulatory impact review (RIR) document for the current CSP adopted in 1994 also was presented with economic analysis descriptions. Recent successive changes to the Area 2A CSP have made references to other NEPA documentation for the West Coast groundfish fishery management that have included economic analysis of other fisheries including the halibut fishery.
18. The IPHC and PFMC have provided direct value measurements in describing management alternatives. However, direct value measurements such as commercial harvest pounds and available recreational days can be misleading when decision makers are trying to understand economic effects. The direct values do not provide information about how these fishing activities drive the economy. Commercial fisheries economic effects are driven by the ex-vessel value and processing margin per unit of fish landed. Recreational fisheries economic effects are driven by the amount and distribution of expenditures made by recreational anglers fishing in different modes (private boat or charter vessels). It is the indirect and induced economic effect information that is needed to show regional economic impacts. For example, the commercial fisheries indirect effects are from the businesses who supply fuel, gear, ice, bait, food, electricity, water, equipment, etc. to vessels and processors. Induced effects include the economic activity driven by the spending of income by fishing and processing crews, owners of the vessels and plants, and employees of the suppliers. Adding up all the rounds of re-spending in the economy produces the estimate of total economic contribution. The amount of the total output paid for labor determines total personal income measurement for economic contribution.

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Table 1
Oregon Commercial Directed and Incidental Halibut Fishery
Vessel Revenue Frequency Distribution in 2016

	Directed	
Revenue Category	Share of Vessel Counts	Share of Oregon Revenue
>$50,000	10%	66%
<$50,000 and >$25,000	18%	64%
<$25,000 and >$10,000	18%	62%
<$10,000 and >$1,000	48%	83%
<$1,000 and >$0	6%	100%
Total	100%	66%
Vessels	67	

	Incidental	
Revenue Category	Share of Vessel Counts	Share of Oregon Revenue
>$2,000	6%	40%
<$2,000 and >$1,000	12%	45%
<$1,000 and >$0	81%	38%
Total	100%	40%
Vessels	81	

Notes: 1. "Share of Oregon revenue" is the directed or incidental halibut revenue in a particular frequency distribution bin divided by the total revenue from all of Oregon landings for the vessels represented in the bin.
Source: PacFIN.

Table 2
Oregon Commercial Halibut Fishery Vessel Participation by Port Group in 2016

	Vessels		Harvest	
Port Group	Directed	Incidental	Volume	Value
Astoria	8	0	50,903	281,061
Tillamook	c	c	3,547	20,080
Newport	24	55	98,624	557,829
Coos Bay	20	30	58,144	326,393
Port Orford	12	0	22,525	125,776
Brookings	c	c	52	315
Total	67	81	233,795	1,311,454

Notes: 1. Volume is measured in round pounds.
2. Counts with a "c" are not shown to avoid revealing confidential information.
3. Vessel counts may not sum to total because vessels may land at more than one port group.
Source: PacFIN.

Table 3
Oregon Ocean and Inland Recreational Fisheries Economic Contributions in 2014

	Location					
		Coast Inland		Lower		
Target Fishery	Ocean	Salmon/ Steelhead	Marine Species	Columbia River	Total	Fishery Share
Ocean salmon	$6.25				$6.25	9.1%
Inland fall salmon		$32.59		$0.36	$32.94	47.8%
Inland steelhead		$9.89		$0.05	$9.94	14.4%
Inland spr./sum. Chinook		$4.55		$0.37	$4.93	7.2%
Mainstem fall salmon				$3.08	$3.08	4.5%
Ocean halibut	$1.19				$1.19	1.7%
Ocean tuna	$1.01				$1.01	1.5%
Ocean bottomfish	$6.04				$6.04	8.8%
Other marine species			$3.34	$0.03	$3.37	4.9%
Sturgeon			$0.09	$0.04	$0.13	0.2%
Total	$14.49	$47.03	$3.43	$3.94	$68.89	100.0%
Shares	21.0%	68.3%	5.0%	5.7%	100.0%	

Notes: 1. Economic contributions are expressed as personal income in millions of 2014 dollars and are at the coastwide economic level.
2. Fall Columbia River mainstem salmon is sometimes referred to as the Buoy 10 salmon fishery. Other marine species is sometimes referred to as bottomfish when it takes place in the ocean. The ocean bottomfish category includes trips when crabbing is the stated purpose and all trips when the mode is diving.
3. Trips with purpose for freshwater resident fish fishing are not included.

Source: TRG (2015b).

Table 4
Oregon Commercial Halibut Fishery Harvest and Economic
Impacts From Proposed Management Alternatives in 2017

IPHC Management Alternative	IPHC Coastwide Removals (net pounds, millions)	Area 2A FCEY (net pounds, millions)	Estimated Oregon Harvest Volume (round pounds, thousands)	Value (thousands)	Oregon Economic Impacts Harvest Value (thousands)	Personal Income (thousands)	Change
FCEY = 0					-1,282	-2,067	-100%
Blue Line	37.9	0.75	150	843	-438	-707	-34%
Directed			144	810	-421	-680	
Incidental			6	33	-17	-27	
Maintain 2014-16 Average SPR	41.6	0.84	168	944	-337	-544	-26%
Directed			162	908	-324	-523	
Incidental			7	37	-13	-21	
50 Million lbs Coast-wide Removals	50.0	1.02	204	1,147	-135	-218	-11%
Directed			196	1,102	-130	-209	
Incidental			8	45	-5	-8	
Status Quo 2016	54.5	1.14	228	1,282	0	0	0%
Directed			220	1,232	0	0	
Incidental			9	50	0	0	

Notes: 1. Economic impacts are the difference in the proposed alternatives in 2017 less status quo in 2016, at the statewide economic level. The difference is based on comparison to 2016 catch limits and not actual catch.
2. The Oregon share of landings in 2015 for the Area 2A commercial non-tribal harvests was 75.5%. The share is computed after excluding non-EEZ catch area, research, bycatch, and sablefish incidental catch. The share includes the directed fishery (96%) and salmon incidental fishery (4%) harvests.
3. The Year 2017 harvest value assumes Year 2016 prices.

Source: Study, 2016 IPHC Interim Meeting Handout, TRG (2015a), and PacFIN.

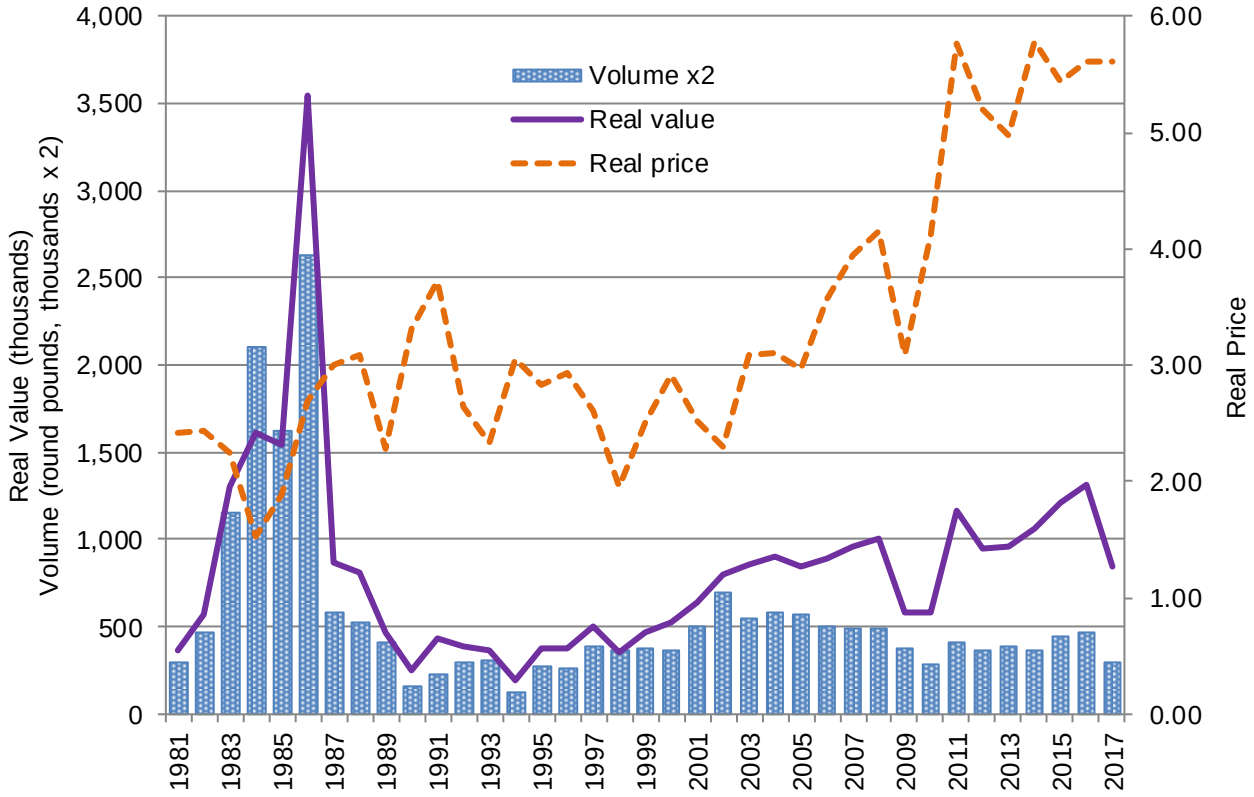
Table 5
Oregon Halibut Recreational Trips and Economic Impacts From Proposed Management Alternatives in 2017

IPHC Management Alternative	IPHC Coastwide Removals	Area 2A FCEY	Projected Angler Trips (thousands)			Expenditures (thousands)			Economic Impacts (thousands) Oregon Coast	Statewide	Statewide Change
			Charter	Private	Total	Charter	Private	Total			
FCEY = 0									-1,848	-2,574	-100%
Blue Line	37.9	0.75	2.43	9.72	12.15	926	1,166	2,092	-632	-881	-34%
Maintain 2014-16 Average SPR	41.6	0.84	2.72	10.89	13.61	1,037	1,306	2,343	-486	-677	-26%
50 Million lbs Coast-wide Removals	50	1.02	3.30	13.22	16.52	1,259	1,586	2,845	-195	-271	-11%
Status Quo 2016	54.5	1.14	3.69	14.77	18.47	1,407	1,773	3,180	0	0	0%

Notes:
1. Coastwide removals and Area 2A FCEY are in millions of net pounds.
2. Projected angler trips are based on Area 2A FCEY times the factor 0.0162. The factor is a linear regression fit of years 2005-2016 trip (dependent variable) and Area 2A FCEY (single predictor variable) data. Charter trips are assumed to be 20% of total trips.
3. Economic impacts (thousands of nominal dollars) are the difference in the proposed alternatives in 2017 less 2016 adopted. The difference is based on comparison to 2016 CSP allocation and not actual catch. Economic impacts are measured by personal income at the statewide or coastwide economic level.

Sources:
1. Trips per pound and trip share for charter and private mode are from ODFW (personal communication December 2016).
2. Economic response coefficients are from Fisheries Economic Assessment Model (FEAM) based on IMPLAN 2011 base data.

Figure 1
Oregon Commercial Halibut Fishery Harvest Volume, Value, and Price in 1981 to 2016
With Year 2017 Projected Blue Line Proposed Alternative



Notes:
1. Real value is in thousands of 2016 dollars and real price is in 2016 dollars, adjusted using the GDP implicit price deflator developed by U.S. Bureau of Economic Analysis.
2. Volume is in thousands of round pounds. Year 2016 is estimated complete through October.
3. Excludes landings with research disposition (13 thousand pounds in 2015 and 14 thousand pounds in 2016 to-date), and discards (1,148 pounds in 2015 and 891 pounds in 2016 to-date). Excludes landings from catch areas outside the EEZ (26 thousand pounds in 2015 and none in 2016 to-date).
4. Oregon landings for Year 2017 projected are study estimates based on IPHC proposed Area 2A FCEY blue line alternative for volume. The Year 2017 price is assumed to be unchanged from Year 2016.

Sources: PacFIN annual vessel summary data, March 2008, April 2009, March 2010, July 2011, April 2013, March 2014, April 2015, and November 2016 extractions; study; 2016 IPHC Interim Meeting Handout; TRG (2015a).

Appendix A

Oregon Commercial Fishing Industry Economic Contributions

Table A.1
Oregon Commercial Economic Contributions by Major Fishery in 1981 to 2015

	Onshore Landings									
Years	Salmon	D. Crab	Pink Shrimp	Groundfish	Pacific Whiting	Pacific Halibut	Other Finfish and Shellfish	Total Landed Fish	Distant Water Fisheries	Total
1981	42.5	16.3	30.3	76.9	-	0.6	55.8	222.5	-	222.5
1982	51.4	16.6	16.4	88.0	-	1.0	29.8	203.1	-	203.1
1983	12.5	16.2	9.3	78.0	-	2.2	19.8	138.0	-	138.0
1984	20.2	15.4	4.8	62.6	-	3.1	20.0	125.9	-	125.9
1985	35.4	21.1	13.4	65.9	-	2.8	24.3	162.9	-	162.9
1986	60.0	13.5	35.8	60.5	-	5.9	32.6	208.4	128.1	336.4
1987	81.2	16.8	51.1	80.7	-	4.3	41.1	275.2	119.0	394.2
1988	128.0	21.8	37.6	82.7	-	2.6	46.9	319.5	112.1	431.6
1989	46.7	24.5	43.8	87.1	-	3.8	55.7	261.6	106.7	368.3
1990	31.5	24.7	31.4	78.0	1.3	3.0	48.8	218.7	138.4	357.1
1991	21.1	12.8	21.8	89.3	10.5	2.7	28.3	186.4	93.9	280.3
1992	9.0	30.7	48.6	75.5	27.1	2.3	22.0	215.3	91.2	306.5
1993	6.0	26.5	25.4	76.7	14.7	2.3	19.7	171.4	89.3	260.7
1994	3.4	30.7	22.0	71.2	31.1	2.5	15.1	176.0	94.6	270.6
1995	9.0	43.2	19.9	77.5	47.0	2.3	16.5	215.3	98.7	314.0
1996	8.6	60.3	22.4	75.6	43.1	1.6	23.7	235.3	109.6	344.8
1997	7.1	32.0	20.8	68.4	52.7	1.6	28.2	210.8	126.4	337.2
1998	5.8	30.0	8.3	50.4	37.2	0.8	24.4	157.0	141.0	297.9
1999	4.9	54.3	23.2	56.3	45.7	1.6	15.7	201.8	170.7	372.5
2000	11.2	55.6	28.9	62.8	39.9	1.6	40.2	240.1	143.0	383.1
2001	15.7	45.1	24.7	51.2	29.3	1.1	46.6	213.9	151.6	365.5
2002	18.2	49.7	36.1	34.6	18.9	2.3	51.1	211.1	160.8	371.8
2003	20.7	87.4	16.5	42.7	25.9	1.8	65.2	260.2	169.3	429.5
2004	26.1	98.0	12.2	39.6	38.4	1.8	88.3	304.4	161.9	466.3
2005	20.0	59.7	16.5	42.3	42.1	1.7	99.7	282.1	175.6	457.7
2006	8.8	113.8	11.2	43.9	43.2	1.4	77.9	300.2	162.5	462.6
2007	7.9	72.7	20.6	44.3	30.1	1.5	89.7	266.8	185.5	452.3
2008	7.4	53.1	26.2	51.3	21.9	1.5	63.7	225.0	277.9	502.9
2009	6.6	78.2	16.4	54.0	22.5	1.1	60.1	238.9	218.6	457.5
2010	12.8	58.7	24.5	48.3	25.9	1.2	63.0	234.4	235.1	469.5
2011	10.8	74.5	45.6	48.2	67.2	1.7	53.3	301.4	290.5	591.8
2012	10.8	45.3	45.2	40.8	52.3	1.4	96.0	291.9	288.2	580.1
2013	19.4	116.8	44.5	39.4	72.0	1.5	76.5	370.1	289.6	659.7
2014	31.9	72.4	51.0	37.3	61.9	1.7	39.9	296.1	286.7	582.7
2015	18.2	17.3	63.0	48.0	31.0	2.1	25.7	205.2	283.8	489.0
Avg10-14	17.2	73.5	42.1	42.8	55.9	1.5	65.7	298.8	278.0	576.8

Notes:
1. Economic contributions are expressed as personal income in millions of 2015 dollars. Adjustments to 2015 dollars use the GDP implicit price deflator developed by the U.S. Bureau of Economic Analysis.
2. Year 2015 is preliminary. Distant water for 2015 is not a model result and just repeats 2014.
3. The economic contributions from salmon fisheries include ocean troll and Columbia River gillnet fisheries, so the estimates will be greater than ocean salmon fisheries as reported by the PFMC.
4. Groundfish in 2015 includes (personal income in thousands) sablefish ($20,065), flatfish ($16,630), cod/rockfish (other than sablefish) ($9,552), and sharks/skates ($1,729).
5. "Other" in 2015 includes (personal income in thousands) albacore tuna ($16,352), Pacific sardines ($3,765), sea urchins ($361), sturgeon ($10), and other species ($5,183).
6. Economic contributions from fish meal production are included in Pacific whiting. The largest source of fish carcasses in past years has been mostly from surimi production. Pacific whiting demand has shifted to H&G and fillet product forms which have higher resource yields and lesser material available for fish meal production.
7. The economic contribution from distant water fisheries includes the effects of vessel revenue returned to Oregon's economy from U.S. West Coast at-sea fisheries, Oregon home-port vessels landing in other U.S. West Coast states and Alaska, southern Pacific Ocean, and other fisheries. New fishing vessel construction, fishery management, and fishery research and training are not included.

Source: TRG (2016).