Minutes of the Gulf of Alaska Groundfish Plan Team

November 16-19, 2010
North Pacific Fishery Management Council
605 W 4th Avenue, Suite 306
Anchorage, AK 99501

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Missing GOA PT members: Bob Foy, Ken Goldman, Steven Hare

The GOA Groundfish Plan Team convened their meeting on November 16, 2010. The agenda for this meeting is contained in the Joint Groundfish Plan Team minutes. The Team welcomes new member Kristen Green (ADF&G).

GOA Walleye Pollock

Martin Dorn presented the stock assessment for Gulf of Alaska walleye pollock. New data included 2009 total catch and catch at age from the fishery, 2010 biomass and age composition from the Shelikof Strait EIT survey, 2009 age composition from the NMFS bottom trawl survey, and 2010 biomass and length composition from the ADF&G crab/groundfish trawl survey. The Shelikof Strait EIT survey biomass was up 62% from 2009, 220,000 t were found in the new survey areas of Prince William Sound and Kenai. The ADFG survey biomass also decreased by 15%, but was still up 60% from the three year mean. The model structure and data inputs were the same as in 2009. The recommended 2011 ABC is 88,620 t, which is a 15% increase from 2010 and is lower than the maximum permissible ABC. Biomass and yields are projected to increase in 2011.

Bycatch and incidental catch: FMP species bycatch consists of mostly (94%) pollock. Non-targets in 2009 were dominated by squid, eulachon, various shark species (e.g., Pacific sleeper sharks, spiny dogfish, salmon shark), jellyfish, and grenadiers. There is no trend in the bycatch of prohibited species for this period (but note that 2010 Chinook salmon bycatch was unusually high, see below for discussion).

The winter survey showed a broader distribution in Shelikof Strait and a possible shift more eastward. Survey biomass estimates were similar to assessment model predictions which is encouraging. There was also an increase in weight at age for mature fish (>5yrs) and this appears to increase the spawning stock biomass estimates. The reason for this increase in body weight is unknown, but could be due to density dependant growth or selective predation. The Team discussed whether Shelikof Strait is representative of other areas, and if sampling had changed over the years possibly also affecting variance.

As in the past, the NMFS bottom trawl survey catchability was examined and a comparison over the last decade was made. Estimates have varied between 0.64 and 0.85. Because of the uncertainty in the estimate and because changes in the catchability can result in large changes to the ABC, the assessment authors continued to recommend assuming a fixed catchability equal to 1.0 as a risk-averse assumption. This added conservation was proposed because: 1) the stock is at relatively low abundance levels, 2) general uncertainty in the stock assessment including some conflicting survey trends, 3) potential increased predation on pollock, and 4) the importance of pollock in the Gulf of Alaska ecosystem. In addition, the authors decided that it was better to wait to change the model until a formal framework for considering scientific uncertainty and risk is implemented under new ABC requirements.

The Team discussed the number of parameters, the practice of penalizing parameters and how that affects the effective number of parameters in the model. In particular, the topic of "blocking" periods where selectivity parameters would be the same might be more parsimonious. The Team also discussed that natural mortality, M, is likely set lower than it is in reality.

The model generally fits well. As in previous years, the model estimates fall well below the high estimates from surveys in Shelikof Strait during the early years. Selectivity on younger fish has been higher since 2004; apparently smaller pollock are used for crab bait. Spawning biomass was estimated to be less than $B_{40\%}$ and less than $B_{35\%}$. The model predicts that a set of moderately sized year classes are recruiting. The assessment is fairly stable over time, but does have runs of highs and of lows. The assessment authors are concerned that the even though the stock has not been fished at the F40% rate or higher, the stock remains below $B_{40\%}$. For Steller sea lion concerns, the probability of the stock dropping below $B_{20\%}$ will be negligible in the near term. The stock is increasing, but is estimated to be at the $B_{35\%}$ by 2012. It was noted that projections in the past 10 years or so have tended to be overly optimistic.

The assessment of pollock in southeast Alaska is the same as last year since there was no new survey in 2010.

The Team discussed the seasonal and geographic apportionment of the ABC. The seasonal apportionment amount (25%/season) is fixed to temporally distribute the effects of fishing on other pollock consumers (i.e., Steller sea lions), potentially reducing the overall intensity of any adverse effects. The catch must also be spatially distributed, but the method used to determine this distribution is determined by the assessment authors. The authors developed a method which used the biomass estimates from the most recent four survey years, which will reflect the current distribution but also smooth year to year variability. Marmot and Mozhovoi were added to the analysis this year since they have been surveyed three times now. The Team discussed that even within regions, there are multiple spawning stocks which are not fished at the same level.

The main changes that affect ABC relative to last year include increased mean-wt-at-age, changes in selectivity, and changes in relative biomasson the sloping part of the harvest rate control rule (below target stock size). It was noted that several conservative assumptions are built into assessment yet the response to uncertainty should occur at a policy level. Transition to risk-neutral assessment will require careful deliberations (e.g., using a more realistic M may impact both biomass and harvest rate estimates that could be considerably increase risk under present harvest control rules).

Discussion of salmon bycatch in GOA

Mary Furuness provided an overview of the Chinook bycatch in the GOA pollock fishery. The group discussed how observer data are used (i.e., from data collected at sea or in a plant). It was clarified that both sources are used and that if there is no delivery then extrapolation of hauls for that vessel at sea is used. Rates apply to unsampled vessels from census data.

The hierarchy of the six different rates used for the estimation was presented. It was noted that perhaps 15% of all bycatch is observed directly (the rest relies on extrapolation). Martin Loefflad noted that a large proportion of western GOA bycatch arose from unobserved vessels and this will be resolved with observer restructuring. Some 72% of the 2010 bycatch estimate occurred during October 1-18.

It was noted that this could be highlighted in GOA as an evolving hot topic and include it in Ecosystem SAFE introduction. Rationalizing the pollock fishery might be a first step towards addressing this problem but doing so requires the Council initiating that action which it has yet to do. In the past Chinook bycatch measures were considered in conjunction with the comprehensive GOA Rationalization package that is currently not moving forward in the Council process.

The Team was briefed on the upcoming Council discussion paper evaluating this issue and highlighted that for future considerations analysts should evaluatethe size distribution of salmon being caught, seasonality and consistency across years and weeks, and compare these with characteristics of bycatch in the Bering Sea. It was noted that the difficulty of having 4 seasons (due to SSL measures) exacerbates the problem.

GOA Pacific cod

The Plan Team accepts model B, and the associated ABC and OFL levels with the caveats and concerns about the discrepancy between the pattern of last years numbers at age and those estimated in this assessment. The Team appreciated the authors effort in reducing the number of models for presentation.

The Team questioned why the pattern in numbers at age is so different this year compared to last year's assessment given that very little data has been added. In particular, the 2009 survey showed lots of one-year olds but they do not appear to be reflected in the model estimates. This appears to result in a declining trend in the projection model compared to a rapidly increasing trend from last year's version. It was noted that the numbers at age used in last years projection model will be different than the numbers at age for this years model. The difference may be in the demographic parameters as specified (there were some difficulties converting stock synthesis output to age-specific schedules required for the projection model) but should be explained.

For all models, the recruitment deviation in 2008 appears to go to zero (as reflected in Figure 2.2b) and that appears contrary to the 2009 survey data. The senior author noted that the selected model had survey catchability deviations set to zero in 2009 (along with the recruitment deviation). Also, size at age 1 is really different last couple of years.

The Team noted that it would be useful to have a presentation of the estimates relative to the data, particularly for the most recent survey (and sub-27 cm abundance index). The ABCs in historical perspective indicate that even with a 2012 ABC of 78,200 it would be third highest catch in history (noting that the TAC drops below the ABC due to the state fishery).

GOA sablefish

Sablefish discussion is captured during the Joint Team minutes (no further discussions were had during separate Team meetings).

Shallow water flatfish

The Team discussed how to manage northern/southern rock sole next year and whether to manage in a complex or separately. The Team recommends that authors highlight this issue for the Team regarding historical catch in proportion to individual components of ABC. The assumption is that northern and southern rock sole will be a Tier 3 assessment next year. It was recommended authors follow a similar assessment, PSR, for guidance on how to present the complex in the assessment chapter. The Team requested additional information on the complex and relative risks and benefits of retaining a Tier 5 complex with Northern/Southern rock sole (Tier 4) components versus placing the remaining Tier 5 species in a separate complex (and thus also a separate assessment chapter). The Team requested additional information on relative M values for flatfish to evaluate the potential for different productivity across flatfish stocks. The Team discussed the guidance in the ACL regulations regarding the appropriate placement of stocks into stock complexes in conjunction with this issue.

Rex sole

The rex sole assessment is an executive summary. An age-structured model is used for rex sole. The Team recommended ABC and OFL from last year's assessment based on Tier 5 calculations applied to the assessment model estimates of adult biomass, because estimates for $F_{35\%}$, $F_{40\%}$, and $B_{40\%}$ continue to be considered unreliable. The author explained there was uncertainty in how the Team calculated adult biomass last year which was the biomass that was applied to the Tier 5 calculations. The method for calculating biomass was different than what was presented in the 2010 assessment. The calculation used by the author was based on survey biomass whereas the Team used the Baranof catch equation which utilizes the adult biomass estimated by the model at the beginning of the year. The author has now updated the document for this year to be consistent with the Team calculations from last year. Catch is less than ABC and OFL. The majority of catch comes from the central Gulf. The summary table was presented with a 2011 OFL recommendation of 12,499 t and ABC of 9,565 t. These values are very similar to 2010 and 2012 recommendations. A table of prohibited species caught in the rex sole fishery was shown. The main discussion point was that in 2009 there were a lot of Chinook and non-chinook salmon taken in the fishery. The Team noted that there was also an usually high number of Tanner crab caught in 2009. There was also discussion that the golden king crab extrapolation was suspect. The author was encouraged to look into the PSC catch for the rex sole fishery.

Flathead sole

Flathead sole are a Tier 3 species and an executive summary was presented. Catches are increasing but remain below ABC and OFL levels. The summary table was presented with a 2011 OFL recommendation of 61,412 mt and ABC of 49,133 mt. The 2011 and 2012 recommendations are slightly higher than the 2010 numbers. The majority of the catch is in the central Gulf. The PSC catches were shown for the flathead fishery and the prohibited species catch is much lower in comparison to the rex sole fishery.

Arrowtooth Flounder

Arrowtooth are in Tier 3 and an executive summary was presented. Recent catches are lower than the associated ABCs and TACs. The summary table was presented with a 2011 OFL recommendation of 251,068 mt and ABC of 213,150 mt. Biomass seems to have leveled off and the OFL and ABC for 2011 are slightly lower compared to those recommended in 2010. The apportionment is based on survey biomass and the proportions by area are identical to those recommended in 2010.

Deepwater flatfish

Deepwater flatfish complex includes Greenland turbot, Dover sole, and Deepsea sole. Dover sole is managed under Tier 3, using an age-structured model. Deepsea sole and Greenland turbot are managed under Tier 6. Historical catch records from 1978-1995 was used to calculate the OFL for Tier 6 calculations for Greenland turbot and Deepsea sole. The OFL and ABC are calculated by species, and then these values are summed for a total complex ABC and OFL. ABCs and OFLs are similar for all three species for the past three years (2009-2012). The total catch has been declining since the early 1990s (mostly Dover sole) but the catch may have increased slightly last year. ABC is apportioned by area.

Rockfish-general

The distribution of fishery effort by area under the rockfish pilot program began in 2007 were presented. There were some distributional changes in fishery effort. Fishery changes appear to be more prevalent in where northern rockfish were caught compared to other rockfish species. The survey distribution appears to be different than that seen from fishery data. The fact that mid-water doors are commonly used in the fishery may be the source of the difference. Applying the stock structure template to rockfish species was discussed and the Team encouraged rockfish authors to use the template for at least one GOA rockfish species (and also one flatfish species). The Team noted that Dusky rockfish would be a good candidate for GOA rockfish and either flathead sole or rocksole as a candidate for GOA Flatfish. The author will bring forward a proposal to the Team in September regarding revised groupings of rockfish by complex, especially in regards to separating dusky rockfish from the other pelagic shelf species. This may include a recommendation to break out shortraker from other slope species, add yellowtail and widow to the remaining "other slope" species. This would result in an "other rockfish" complex made up of minor species. Julie noted concerns about rockfish identification issues and that this may be exacerbated by modifying the composition of this species complex . Management under the new RPP regulations relative to a modified species complex could affect practical aspects of the RPP.

The Team recommended authors consult species allocation regulations under the RPP with RO staff prior to the September discussion. The Team also recommends that the rockfish authors bring back in September a vulnerability assessment to go along with the revised complex management concepts. Consideration of potential new rockfish species complexes should be accompanied by a Productivity-Susceptibility Analysis to evaluate whether individual species in management complexes share similar productivity and vulnerability to fishing pressure. There was also a recommendation that authors follow up with AFSC staff doing POP maturity studies in Kodiak prior to updated assessments next year.

The Team discussed the different catch assumptions made across assessments. Rockfish assessments employ a consistent assumption in that catch estimates through a specific date (i.e. not estimated through the end of the year) are employed in making the projections (for those stocks where a projection is appropriate). This differs from the rockfish catch assumption in the BSAI where it is assumed the fishery will catch the whole ABC thus this is the estimate used for total catch. The Team discussion centered on whether or not assessments need to be consistent in catch estimation for current and future years as rockfish assessments differ from others in how catch for a projection is estimated. For species where TAC likely to be taken then it seems appropriate to assume that TAC can be used, but for a species where this does not appear to be a valid assumption, than average catch over a time period would be a better assumption. The purpose of this was to ensure an accurate estimate of the entire year is used rather than an estimate through a certain date. How this is done will vary depending upon the author's specific rationale and estimation procedure. The Team noted that authors should be clear in how catch is projected and what assumptions are made to make the catch estimate for the projection. The Team expressed concern that there may be some indication that rockfish populations are declining. The authors noted that despite a slight decline from last year's model projections this was anticipated.

Northern Rockfish

Northern rockfish are in Tier 3a; this off-year summary was updated with the 2009 projection model. The 2010 catch cut off in October represented a 9% decrease from 2009 catch. The projection model predicted that spawning biomass had decreased slightly, resulting in slightly lower Northern rockfish ABCs and OFLs for 2011 and 2012 relative to last year. It was noted that dusky and Northern maturity estimates will be updated next year. A requested analysis was presented that looked at how the rockfish fishery has changed since 2007. Northern rockfish are caught east of Kodiak but the bottom trawl survey does not catch them there. Julie Bonney noted that the fishery uses midwater doors, and fly the net, moving it up and down in the water column. The gear is best described as semi-pelagic gear. Rockfish come up off the bottom and with this gear fishers can get the net under them, so they can fish in rougher areas, unlike the bottom trawl surveys. Julie Bonney noted that the midwater doors offer an advantage for fuel consumption, and also potentially reduce any EFH impacts. The Team noted that it would be interesting to look at current bycatch compared to bycatch in the period before they switched to this new gear configuration.

The Team noted that methods for cutting off 2010 catch in early October may be inconsistent with estimating a full year's catch for 2011 in projections, especially for Northern rockfish where October and full year catch may differ by 10%. The Plan Teams suggested that total current year catch be estimated for projections to the extent possible.

Pelagic Shelf Rockfish

Yellowtail and widow rockfish are both managed under Tier 5. The Team recommended ABC and OFL for 2011 at 91 t and 121t respectively. The 2011 ABC and OFL values have not changed from 2010, but for an unknown reason these values were not transferred to the GOA status and catch specifications (please see http://www.afsc.noaa.gov/REFM/docs/2009/GOApelshelf.pdf). Instead, the specified values of 102 t and 136 t came from a preliminary version of the Pelagic Shelf Rockfish SAFE. These are incorrect, and 91 t for ABC and 121 t for OFL are the correct values.

Dusky rockfish are managed under Tier 3a, and the 2009 projection model was updated using the new 2010 catch. The projection model showed a decrease of 6% from last year. The author recommends a 2011 ABC of 4, 663 t. The total PSR recommended ABC for 2011 is 4,754 t. The spatial pattern of the dusky rockfish fishery has shifted some between 2007 and 2009. Next year the authors' plan to respond to the SSC comments to compare rockfish catchability between dusky and rougheye and blackspotted rockfish. The authors will try to provide information on maturity and growth curve updates for dusky rockfish.

Demersal shelf rockfish

Funding is currently unavailable for a survey this summer (2011). The availability of the Delta submersible is also uncertain. The Team notes that the submersible survey is necessary in order to complete a full assessment and expressed concern regarding the potential lack of funding for this long-loived, vulnerable species. The Team discussed the potential to drop DSR down from Tier 4 to 5 if no additional survey data were available but discussed that this is not a necessity based solely on lack of survey data. The Team requested additional information for the next assessment on the historical timing of regional management area surveys (i.e. which years were surveys conducted in each area). The Team also requests additional information on impacts of halibut sport regulations of yelloweye bycatch.

Dave Carlile provided an update on efforts to develop an age structured model for yelloweye. The Team discussed the selectivity curves and the observed dip in the curve. It was noted that this model is the generic rockfish model using yelloweye data. There are two alternative selectivity curves, both have recent predicted catch higher than observed. The model fits to fishery age compositions appear to be off on the plus-size group each year. There also appears to be a discrepancy in the 46 category each year. This may be related to some truncation error or mis-match in the model. The plan is for the model to be updated for next year and reviewed by the Team in September.

Thornyheads

Sandra gave a presentation of the thornyhead assessment executive summary. No major changes were noted. The Team approved the recommended ABCs and OFLs for 2011 and 2012.

Atka mackerel

Sandra gave a presentation on the executive summary of the Atka mackerel assessment. No major changes were noted and catch remains well below ABC levels although the Team noted that catch has increased in recent years due to increasing incidental catch levels above the TAC. The Team approved the recommended ABCs and OFLs for 2011 and 2012.

General Tier 6 discussion

The Team had extensive discussion regarding the Tier 6 criteria and the differential standards for considering a reliable biomass estimate for Tier 5 purposes. The Team notes that it seems prudent under the current Tier system to allow for different standards for non-target stocks that are not a target fishery than for target stocks where the management goal is different. The Team discussed that in cases of non-target stocks some estimate of biomass (e.g. minimum biomass estimates) could and should be employed to establish specifications for these stocks when average catch is insufficient. The Team noted that Tier 6 stocks require different considerations due to diverse life history characteristics and relative vulnerabilities.

Skates

Olav Ormseth presented an updated assessment, however no new survey data were available but the assessment includes updated catch. There was a substantial change to fishery catch data due to an error discovered in the regional database. This accounting did not affect inseason catch. The author presented a summary of the state-waters skate fishery that occurs in Prince William Sound. 2009 was the first year this fishery occurred. High catch rates resulted in harvests of big skates exceeding the GHL. In 2010, trip limits were imposed and total harvest of big skates were closer to GHL. The author and the Team commented on poor species identification in the fishery. The Team agreed with the authors ABC recommendations based on Tier 5 calculations.

Squid

Olav Ormseth presented new work on evaluating seasonal patterns of squid bycatch in fisheries. Catch of squid is highest in area 620. The catch patterns appear consistent over different years and there appears to be a possibility of a depth-related catch. The Team questioned whether there has been any evaluation of relative species mix in the GOA versus the BSAI. It was noted that in the GOA it is primarily *Berryteuthis* sp. The Team discussed the differences in the depth-stratum of the fishery and the acoustic survey. Julie noted that in 2006, the area along the shelf-break is where the larger pollock aggregated. However, the biomass no longer appears to be there and it might have been in that year only.

The Team discussed the utility of examining Tier 5 specifications given that it appears likely that biomass estimates are better for squid that other Tier 6 species. The Team requests Tier 5 calculations for next year's assessment.

GOA Sharks

For GOA sharks, discussion centered around trying to use a biomass-based approach to determine ABC and OFL. The Team discussed the distinction between a "reliable" estimate of biomass or the use of the dogfish biomass estimate as representative of a "minimum" estimate as an alternative as it's likely to be higher than what the GOA trawl survey estimates are. Using that approach as a pseudo Tier 5 approach would therefore make the best use of the available scientific information. The Team agreed with a pseudo Tier 5 approach because there is sufficient information from that trawl survey and this approach utilizes that information. The Team stated that the 90% percentile approach is hard to justify from a conservation standpoint so adopting the trawl survey estimates as minimum biomass represents an improvement over that approach. It was also pointed out that sharks as a complex could be placed on bycatch only status if the Teams recommended a higher ABC recommendation. Discussion centered around adopting a minimum biomass approach as the Team considers this to be a reliable minimum biomass estimate. Olav mentioned that the SSC suggested that Tier 5 should be considered for dogfish. Therefore, a Tier 5 approach for dogfish and a Tier 6 for other species should be considered and all sharks should be placed on bycatch status only.

The Team agreed to go with a minimum biomass approach for spiny dogfish but questioned whether F=M was appropriate and discussed using the sustainable F approach as an alternative. The 0.04 value is based on a Leslie matrix model from Cindy Tribuzio's PhD dissertation fishery rate based on a closed population. This approach assumes a closed population and utilizes life history parameter s for fecundity and survival and is more like a marine mammal approach which is may be appropriate for sharks that how low fecundity, high pup survival, and likely stable recruitment . The Team agreed this would be a more precautionary approach rather than using F=M. Therefore, the Team recommends the OFL be based on Tier 5 calculations (M * Biomass where M = 0.097) and the ABC based on Tier 5 calculations (F * Biomass where F is 0.04 or the sustainable F rate provided in the assessment). This ABC is less than the Tier 5 maximum permissible ABC of 0.75 *M* Biomass. For other sharks, the Team concurred with the author and recommended the Tier 6 approach of average catch. The Team does not agree with considering alternative Tier 6 options such as the percentile approaches discussed in the Joint Team meeting. However, the Team agreed that rather than averaging individual shark species the average catch should be computed as a complex (not including dogfish). All sharks will be on a bycatch only status.

Discussion occurred regarding how to calculate dogfish biomass estimates from the bottom trawl surveys. It was noted by the authors that the 2007 survey estimate and variance was relatively high. The author used a straight average of the last three surveys to compute biomass. Discussion occurred whether or not an inverse variance weighted method might be more appropriate. This was also pointed out that it can be done for octopus. After further discussion the Team agreed that using a consistent approach is desirable and comparable assessments like GOA rockfish use a straight average of the three previous survey biomasses. Therefore, the Team agreed to use this approach for spiny dogfish.

The Team encourages the authors to look closer at the IPHC survey and the NMFS longline survey as possible survey indexes for spiny dogfish and to provide more analyses regarding the reliability of biomass estimates of the bottom trawl survey. Further, the bottom trawl survey index for sleeper sharks should be analyzed and any estimates of M that can be derived should be presented. The Team also looks forward to seeing estimated shark catches from the halibut fishery in next year's document.

Octopus

Liz Conners presented an update of the octopus assessment. Octopuses were included in recent amendments that eliminate the "other species" category in 2011, and move the component groups "in the fishery." The biomass estimates for octopuses from trawl surveys are not reliable. Octopuses are commonly caught in pot and trawl fisheries, especially in the Pacific cod pot fishery. The assessment authors computed ABC and OFL values using Tier 6 average and maximum 1997-2007 catch.

The Teams discussed both modifying the catch time frame as well as using biomass-estimates from the trawl survey. The Team noted that a natural mortality estimate is necessary. This approach would diverge from standard Tier 6 and would use the available information to employ a Tier 5 calculation.

The Team recommends that octopus be retained in in Tier 6 but specifications use the available information to calculate a Tier 5-like estimate based on the last 3 surveys and employ a natural mortality estimate of 0.53. The Team further recommended that octopus be on bycatch-only status. The Team noted that this does not affect current retention. Julie Bonney noted that in the GOA octopus are currently not on bycatch status, so this would be a change in 2011 fishery. The MRAs are at 20% for all other species in aggregate but are not individually specified.

Sculpins

Olav Ormseth presented an update on gulf sculpins. While there is no new biological data, sculpins will now be managed as an independent complex due to ACL regulations. There are many sculpin species, but only 4 species make up the majority of the survey biomass. Yellow Irish lord are consistently the most abundant sculpin. Sculpin species in the gulf have varied life history characteristics and varied vulnerability scores. Most of the catch is incidental in the Pacific cod and flatfish fisheries. There is some mismatch between proportions of species composition versus survey composition.

The author recommended changing M based on recent research conducted in the BSAI. In addition, the author recommended weighting individual M rates by survey biomass to estimate a 'complex biomass'. The Team discussed some possible confusion with this approach, but agreed this calculation was reasonable. The author noted that using the BSAI M rates increases the ABCs. The Team agreed with the author's recommendations and suggested that research into sculpin life history in the Gulf should be a high priority.

Gulf of Alaska groundfish 2010 OFLs, ABCs, TACs, and catch (reported through November 6th, 2010) and GOA Plan Team recommended 2011-1012 OFLs and ABCs.

Stock/ Assemblage	Area	OFL	ABC	TAC	2010 Catch	2011 OFL	2011 ABC	2012 OFL	2012 ABC
Pollock	W (61)		26,256	26,256	26,047		27,031		34,932
	C (62)		28,095	28,095	28,269		37,365		48,293
	C (63)		19,118	19,118	19,236		20,235		26,155
	WYAK		2,031	2,031	1,637		2,339		3,024
	Subtotal	103,210	75,500	75,500	75,189	118,030	86,970	151,030	112,404
	EYAK/SEO	12,326	9,245	9,245		12,326	9,245	12,326	9,245
	Total	115,536	84,745	84,745	75,189	130,356	96,215	163,356	121,649
Pacific Cod	W		27,685	20,764	20,971		30,380		27,370
	C		49,042	36,782	36,808		53,816		48,484
	E		2,373	2,017	881		2,604		2,346
	Total	94,100	79,100	59,563	58,660	102,600	86,800	92,300	78,200
Sablefish	W		1,660	1,660	1,329		1,620		1,484
	C		4,510	4,510	4,434		4,740		4,343
	WYAK		1,620	1,620	1,561		1,990		1,818
	SEO		2,580	2,580	2,674		2,940		2,700
	Total	12,270	10,370	10,370	9,998	13,340	11,290	12,232	10,345
Shallow-water flatfish	W		23,681	4,500	75		23,681		23,681
	C		29,999	13,000	5,333		29,999		29,999
	WYAK		1,228	1,228	1		1,228		1,228
	EYAK/SEO		1,334	1,334	1		1,334		1,334
	Total	67,768	56,242	20,062	5,410	67,768	56,242	67,768	56,242
Deep-water Flatfish	W		521	521	2		529		541
	C		2,865	2,865	490		2,919		3,004
	WYAK		2,044	2,044	7		2,083		2,144
	EYAK/SEO		760	760	3		774		797
	Total	7,680	6,190	6,190	502	7,823	6,305	8,046	6,486
Rex sole	W		1,543	1,543	101		1,517		1,490
	C		6,403	6,403	3,284		6,294		6,184
	WYAK		883	883	2		868		853
	EYAK/SEO		900	900			886		869
	Total	12,714	9,729	9,729	3,387	12,499	9,565	12,279	9,396
Arrowtooth Flounder	W		34,773	8,000	2,270		34,317		33,975
	C		146,407	30,000	20,532		144,559		143,119
	WYAK		22,835	2,500	140		22,551		22,327
	EYAK/SEO		11,867	2,500	73		11,723		11,606
	Total	254,271	215,882	43,000	23,015	251,068	213,150	248,576	211,027
Flathead Sole	W		16,857	2,000	317		17,442		17,960
	C		27,124	5,000	3,141		28,104		28,938
	WYAK		1,990	1,990			2,064		2,125
	EYAK/SEO		1,451	1,451			1,523		1,568
	Total	59,295	47,422	10,441	3,458	61,412	49,133	63,202	50,591

GOA specifications cont.

Stock/ Assemblage	Area	2010 OFL	2010 ABC	2010 TAC	2010 Catch	2011 OFL	2011 ABC	2012 OFL	2012 ABC
Pacific ocean perch	W	3,332	2,895	2,895	3,133	3,221	2,798	3,068	2,665
	C	12,361	10,737	10,737	10,461	11,948	10,379	11,379	9,884
	WYAK		2,004	2,004	1,926		1,937		1,845
	SEO		1,948	1,948			1,883		1,793
	E(subtotal)	4,550	3,952	3,952	1,926	4,397	3,820	4,188	3,638
	Total	20,243	17,584	17,584	15,520	19,566	16,997	18,635	16,187
Northern rockfish[3]	W		2,703	2,703	2,033		2,573		2,446
	C		2,395	2,395	1,838		2,281		2,168
	E								
	Total	6,070	5,098	5,098	3,871	5,784	4,854	5,498	4,614
Shortraker	W		134	134	64		134		134
	C		325	325	136		325		325
	E		455	455	257		455		455
	Total	1,219	914	914	457	1,219	914	1,219	914
Other slope[3]	W		212	212	362		212		212
	C		507	507	275		507		507
	WYAK		273	273	128		276		275
	EYAK/SEO		2,757	200	33		2,757		2,757
	Total	4,881	3,749	1,192	798	4,881	3,752	4,881	3,751
Pelagic Shelf rockfish	W		650	650	530		611		570
	C		3,249	3,249	2,481		3,052		2,850
	WYAK		434	434	75		407		380
	EYAK/SEO		726	726	11		684		638
	Total	6,142	5,059	5,059	3,097	5,570	4,754	5,387	4,438
Rougheye and blackspotted rockfish	W		80	80	91		81		81
	C		862	862	217		868		868
	E		360	360	139		363		363
	Total	1,568	1,302	1,302	447	1,579	1,312	1,581	1,312
Demersal rockfish	Total	472	295	295	127	479	300	479	300
Thornyhead Rockfish	W		425	425	129		425		425
	C		637	637	275		637		637
	E		708	708	149		708		708
	Total	2,360	1,770	1,770	553	2,360	1,770	2,360	1,770
Atka mackerel	Total	6,200	4,700	2,000	2,409	6,200	4,700	6,200	4,700
Big Skate	W		598	598	140		598		598
	C		2,049	2,049	2,155		2,049		2,049
	E		681	681	142		681		681
	Total	4,438	3,328	3,328	2,437	4,438	3,328	4,438	3,328
Longnose Skate	W		81	81	103		81		81
	C		2,009	2,009	816		2,009		2,009
	E		762	762	124		762		762
	Total	3,803	2,852	2,852	1,043	3,803	2,852	3,803	2,852
Other skates	Total	2,791	2,093	2,093	1,464	2,791	2,093	2,791	2,093
Squid	GOA-wide				131	1,530	1,148	1,530	1,148
Sharks	GOA-wide				603	8,263	3,601	8,263	3,601
Octopus	GOA-wide				324	1,272	954	1,272	954
Sculpins	GOA-wide				735	7,328	5,496	7,328	5,496
Other spp total	Total	9,432	7,075	4,500	1,793	18,393	11,205	18,393	11,205
Total		693,253	565,499	292,087	213,635	723,929	587,525	743,424	601,394

AGENDA C-7(a)(4)
Supplemental
DECEMBER 2010

Total Catch Accounting Working Group

Groundfish Plan Teams

November 3, 2010, 9 – 10 am

Participants:

Plan Teams: Jane DiCosimo (NPFMC), Mary Furuness (NMFS AKRO), Tom Pearson (NMFS AKRO), Chris Lunsford (NMFS AFSC), Sarah Gaichas (NMFS AFSC), Dave Carlile (ADF&G), Kristen Green (ADF&G), Nick Sagalkin (ADF&G), Bill Clark (IPHC)

Invited: Bob Ryznar (AKFIN), Michael Fey (AKFIN), Scott Meyer (ADF&G), Lee Hulbert (ADF&G), Jason Gasper (NMFS AKRO), Heather Gilroy (IPHC)

Jane DiCosimo summarized the background on how and why the group was created. Total catch accounting (TCA) for all groundfish stocks that are managed under the BSAI and GOA Groundfish FMPs is now required under annual catch limits (ACLs) and associated requirements. In September 2010, NMFS AKRO staff reported on progress towards compiling a comprehensive database for use by stock assessment authors to account for total removals. Federal and state commercial harvests and state sport and subsistence harvests have been compiled; however, compilation of research (survey) data is incomplete due to some technical issues related to incomplete data for converting numbers of fish to pounds. During a discussion of the status of TCA with the Plan Team, a working group was requested to address outstanding issues so that use of the database would be ready for the stock assessments for determining the 2012 ACLs.

Mary Furuness reviewed the status of data collection for TCA. She provided a list of data categories for inclusion in the database (attached). Participants discussed the status of the different sector databases and the collective interest in housing the TCA database with AKFIN. AKFIN already pulls in data from the Catch Accounting System, CFEC, and ADF&G. Bob Ryznar described the dual levels of access: Users are able to directly access the database for their own queries and a summary table can be created to produce a standard of queried data.

The group focused on several issues:

1) Survey data
   a) conversions from numbers to lb
   b) Time period for historical data
2) Inside State waters harvests
3) Report out to Plan Teams

Survey data

Chris Lunsford led a discussion of attempts to integrate survey data in TCA regarding two technical issues: 1) historical time period and 2) converting numbers to pounds.

Conversions: Jason Gasper reported that the NMFS-AKRO regularly converts crab survey numbers to pounds for monitoring incidental catch. Scott Meyer reported ADF&G Sportfish Division collects size data and has provided sport harvests converted to pounds for rockfish, cod, sablefish, and sharks. Sarah Gaichas suggested that the Observer Program could provide size data from their catch sampling for converting survey data to pounds. **The group recommended that a subgroup be formed to develop draft conversion protocols for incomplete (size data) data sets. Chris Lunsford, Jason Gasper, Sarah Gaichas, Jennifer Mondragon, and Heather Gilroy agreed to work on this issue and report to the group at its next meeting.**

Historical Data Mary Furuness noted that the requirements for TCA begin in 2011, even though it might be preferable to account for historical total removals. Reliable estimates of halibut bycatch data go back to 1998, reliable estimates of commercial data go back to 1991, and the stock assessments go back to 1977. The group noted this was not a technical issue, **but the question of what historical time period should be covered under TCA should be referred to policy makers.**

State waters

The group discussed several inside water fisheries (e.g., Chatham sablefish, PWS pollock, SEO DSR, Pacific cod) and whether they are included in assessment for federal groundfish "stocks." Dave Carlile asked if state inside water harvests should be included in estimates of TCA. Bill Clark suggested that inside and outside waters could be treated as separate stocks. He reported that while the IPHC treats Pacific halibut throughout its entire range as one stock, there is no apparent biological harm to groundfish under the current (ad hoc) approach. Stock definitions are addressed under the Magnuson-Stevens Act.

The working group concluded that **inside water harvests should not be included in TCA since those populations are not included in the biomass estimate in the stock assessments**. The group discussed how stocks are defined in the groundfish FMPS and SAFE Reports and concluded that the group should inventory cases when inside water populations do and do not factor into federal stock assessments. Dave Carlile recommended that an information matrix of all sources of mortality be prepared by the group. This information will assist the group in recommending approaches for developing the TCA database. Dave Carlile will coordinate the State of Alaska contributions and Mary Furuness will coordinate the NMFS contributions to the inventory. Bob Ryznar will assist with organizing the inventory fields. A draft inventory will be reviewed by the working group at its next meeting.

Process for database development

Mary Furuness is the lead for contributing federal data. Dave Carlile is the lead for State data. Bob Ryznar is the lead for housing and developing the database. Bill Clark recommended that original data (including numbers and weights as some models internally generate weights) be included in the database (not just summary data). Scott Meyer recommended that metadata be included. Nick Sagalkin asked about the frequency and timing of database updates. Chris Lunsford identified that stock assessment authors need access to the data each fall for development of their models. The group recommended that the entire dataset be updated, when appropriate, rather than just adding the most recent year's data, to account for any data revisions. The general rule for annual data submission will be flexible. Chris Lunsford noted that the database must account for different statistical areas, species codes, etc. used by the agencies.

Reporting

The TCA working group will meet again by teleconference on February 9, 10, or 11, 2011 (TBA) to review sub-group reports on conversion methodologies and the stock inventory. Those sub-groups will meet independently and are open to additional participants than those identified in this report.

Total groundfish accounting from all sources of removals (Source: M. Furuness)

Repository: AKFIN

Sources of mortality:

1. Commercial fisheries
   a. State GHL fisheries –fish ticket
   b. Federal groundfish fisheries – catch accounting system
   c. IPHC – fish ticket
2. Surveys
   a. State
   b. Federal
   c. IPHC
3. Research
   a. Federal – Scientific research permit, Exempted fishing permit, Letter of Acknowledgement
   b. State
   c. IPHC
4. Recreational
   a. State – Pacific cod, sablefish, rockfish, sharks
5. Subsistence/personal use
   a. State
6. Bycatch in halibut fishery
   a. State/Federal – fish ticket/catch accounting system
   b. HFICE working group
7. Pacific cod in crab fisheries
   a. State – fish ticket

11.8.2010 November Groundfish Plan Team Document

Methods for the estimation of non-target species catch in the unobserved halibut IFQ fleet

Working Group Participants:
Cleo Brylinsky (ADF&G), Jane DiCosimo (NPFMC), Sarah Gaichas (AFSC), Jason Gasper (AKRO), Kristen Green (ADF&G), Mary Furuness (AKRO), Heather Gilroy (IPHC), Tom Kong (IPHC), Olav Ormseth (AFSC), Haixue Shen (ADF&G), Cindy Tribuzio (ABL)

1.0 Introduction

The discarded catch of non-target species in the halibut IFQ fishery is largely unobserved, undocumented and has not previously been incorporated into most of the BSAI and GOA stock assessments. Bycatch of some groundfish species in the halibut IFQ fishery has been estimated using the IPHC annual longline survey as a proxy for observer data (Gaichas et al. 2005, Courtney et al. 2006, Brylinsky et al. 2009, Ormseth et al. 2009, Tribuzio et al. 2009). However, there has been no consensus among authors as to the best method to account for removals for all groundfish species.

At its December 2009 meeting, the SSC requested improvements to estimation methods of discard and continued monitoring of estimated bycatch in the halibut IFQ fishery (NPFMC 2009). Specifically, the SSC recommended monitoring at-sea discard of rockfish species, skates and sharks:.

Rougheye Rockfish: "In particular, the authors should monitor the bycatch trends in the sablefish, halibut longline fisheries, and look for evidence of "topping off" in the POP fishery."

Skate complex: "The new method of bycatch estimation used the IPHC halibut survey bycatch data to estimate skate bycatch in the commercial fishery and used only those survey stations with the highest one-third of halibut catch rates. The rationale for this approach is the expectation that most of the commercial effort in the halibut fishery is likely to be in the high CPUE areas. The plan team was uncomfortable with this new approach, noting that the impact on the estimate of skate bycatch, which is primarily taken in the halibut fishery, is to reduce that estimate by an order of magnitude. The SSC concurs with the plan team's request for an investigation of alternative methods of estimating skate bycatch in the commercial halibut fishery, to include stratification based on the geographic distribution of the commercial fishery, as well as depth and area stratification."

Shark complex: "The SSC supports further development of both proposed methods to estimate shark bycatch in halibut fisheries reported in the Appendix. When completed, reconstructed historical estimates of shark catch should be added to the historical catch time series for sharks."

To address these recommendations, a working group composed of scientists from AFSC, AKRO, ADF&G, IPHC and NPFMC was formed in January of 2010. The goal of the working group is to investigate quantitative methods to estimate incidental catches in the unobserved halibut IFQ fishery. The purpose of this document is to provide Plan Team and SSC members with an overview of the analytical methods and associated estimates for several example species: Pacific cod, spiny dogfish, Pacific sleeper shark and salmon shark within the GOA. The working group has focused on three areas: 1) estimation of variance for extrapolated survey catch and CPUE; 2) data filters of annual survey data to better represent commercial fishing behavior; and 3) ratio estimators to extrapolate survey catch to commercial effort.

1.1 Timeline

January-August 2010: Working group meetings and method developments
September 2010: Presentation of methods to joint Plan Teams, discussion and feedback, selection of best method
November 2010: Presentation of best method with catch estimates of example species to joint Plan Teams
December 2010: Presentation of best method to SSC for approval
January 2011: Institutionalization of best method
August 2011: Estimation of catches for non-target species prepared and provided to stock assessment authors

2.0 Methods

Survey and commercial effort data were provided by the IPHC. To preserve confidentiality, commercial effort data (effective skates and total landings) were grouped by year into NMFS reporting areas (541, 542, 543, 610, 620, 630, 640+649, 650, 659), all Bering Sea areas combined, and binned into three depth categories (0-99, 100-199, and 200+ fathoms). Further, because some areas had a limited number of vessels some depth categories were binned within an area, for example areas 542 and 543 had all depths combined. Survey stations were similarly grouped by year/area/depth stratum.

2.1 Survey Catch and CPUE Variance

Catch estimates and catch rates (CPUE) from the IPHC annual longline survey are point estimates only, without estimates of variance. The goal here was to estimate approximate 95% confidence intervals for the extrapolated catch (numbers) and the CPUE (numbers of fish/hooks). Following the IPHC assumptions that the 20% stratified subsample of hooks is an adequate representation of the total hooks fished at each station for bycatch of common species, we assumed that the subsample of observed hooks was representative of the station and was in essence a complete census of the hooks. Stations within strata were resampled with replacement and the mean CPUE for each species within a stratum were calculated. The upper and lower 95th percentile of the replicates were taken as the approximate confidence interval around the species specific average CPUE. One potential deficiency with this methodology occurs if there is serious bias in the bootstrap estimate, resulting in under coverage of the confidence interval. This potential source of error will be discussed later.

Estimating rare species presents a problem due to low detection probabilities, resulting in zero observations that cause over dispersion and potential bias in estimates. In other words, species that are estimated, but do not occur in the subsample result in an estimate of zero catch and CPUE despite likely occurrence in the area. Conversely, if individuals are clustered, the catch and CPUE may be over estimated. In both situations, estimates of variance are likely not accurate.

2.2 Filtering Survey Data

During the September 2010 Joint Plan Team meeting, the teams and working group participants discussed three options for filtering the survey data to more accurately represent commercial behavior: no filter, the top 1/3rd of survey stations (based on halibut CPUE within a strata) and a proportional filter where stations are weighted based on the proportion of commercial effort that occurs in that area (described below). The joint Plan Teams recommended the working group "use the proportional to catch filtering method, which was considered most likely to reflect spatial differences in species composition while sacrificing little survey data compared with the top-third method." (Groundfish Plan Team minutes, September 2010). This proportional method retains more survey stations, broader spatial coverage than the top 1/3rd filter (figure 1), and may more accurately represent commercial effort.

Here we are presenting catch estimates based on the recommended proportional data filter as well as catch estimations made with the full survey data set for comparison. Detailed methods for each of the data filters are below.

1) No filter: All the survey stations were included.
2) Proportional to catch filter: (note: depth was not available for commercial data at this spatial resolution, therefore the proportions are stratified by year/area not year/area/depth)
    a. Additional data: halibut commercial catch by ADF&G stat area for each year (1995-2009), provides commercial effort at the lowest resolution possible
    b. Map IPHC survey stations into ADFG stat areas used in catch reporting
    c. Stratify both IPHC survey and commercial catch by NMFS area and year
    d. Calculate proportion of commercial catch in ADFG stat area within a NMFS area and year
    e. Match to survey dataset (not all areas with survey have catch)
    f. Renormalize proportion of commercial catch (setting surveyed areas with no catch to 0) to get the weighted proportion for each station

2.3 Average Weight

A separate issue that is enveloped in this catch estimation procedure is data quality of species specific average weights for converting numbers to biomass. For the purposes of this report we are not proposing a universal method for calculating species specific average weight, but for the four example species, we have attempted to find the best available data. Observer data from longline vessels was used to calculated mean weights for three shark species and Pacific cod and were compared between reporting areas, depth strata, and by year to look for significant differences between strata. Strata (year, area, and depth combinations) were the same as those used on the catch estimation analysis, further comparisons of mean weight between "shallow" (< = 99 fathoms) and "deep" (> 99 fathoms), FMP (BSAI vs. GOA) and regions (BSAI, WGOA, CGOA and EGOA) were also conducted.

The extrapolated weights and numbers used to derive the mean weights are calculated by FMA (North Pacific Observer Program) and take into account sampling fractions. Mean weights were derived from the extrapolated weights divided by the extrapolated numbers. Data was pulled from the Alaska Region Catch Accounting System, which contains the necessary data fields from the observer database (NORPAC).

For spiny dogfish and Pacific cod, a non-parametric bootstrap was used to compare means, 95 percentile intervals between post strata, and bias. Results from this analysis showed that the year/area/depth strata categories resulted in certain categories having small sample sizes (e.g., 3 sets) and are thus not robust to the population caught on hook-an- line gear.. Further investigation of alternative data groupings (deep vs. shallow, WGOA vs. CGOA vs. EGOA) found that fairly robust sample sizes with strata specified by year, GOA, and deep (>99.1 fathoms) vs shallow (<99.1 fathoms). For both cod and dogfish, weight differences were observed for the depths (Table 1). Thus, this analysis uses mean weights for spiny dogfish and Pacific cod that are stratified by year, FMP, and depth (deep or shallow).

Observer data was not used to estimate weights for salmon sharks and sleeper sharks. The number of samples was very low for both species and the weights collected by observers may not represent the true population of shark bycatch. Further, the larger specimens of these shark species are generally not brought aboard a vessel due to safety and logistical reasons, resulting in smaller sharks in the weighed samples. For both species, mean weights were calculated based on targeted research surveys.

Salmon shark are rarely encountered in federal surveys, especially on longline gear. However, weight data is available from targeted research surveys in Prince William Sound (seine and hook and line gear, Goldman and Musik 2006) and from sport fishery data (S. Meyer pers. comm.). Sport fish data were not used in this case because it is possible that it is biased towards larger animals. Salmon shark are highly migratory and data collected in Prince WilliamSound may be an appropriate proxy for GOA caught salmon shark.

Weight data on Pacific sleeper shark is difficult to obtain due to the large size of the animal and generally larger individuals are not brought on board to be sampled for safety and logistical reason. In addition, the weight of some specimens may be estimated by the observer or proxy weights (for trawl data) are used from RACEBASE. For this analysis weight data collected during a targeted longline survey near Kodiak, in which all sharks were weighed, is assumed to be the best available data for this species and gear type (M. Sigler, unpublished data).

2.4 Ratio Estimators

Catch Per Unit Effort Method

Commercial fishery data were used to estimate the number of effective hooks fished. Commercial logbook data were reported by weight (landings), effective skates hauled (skate is defined as 1,800 feet of groundline with 100 hooks), and number of vessels by depth bin within each year/area/depth strata. Fish ticket data were reported by weight and number of vessels by year/area/depth strata. Logbook coverage provides a view of how effort is proportioned by depth and was used to proportion the fish ticket landings into depth categories. We assumed that fishing gear was universal in that all skates consisted of 100 hooks (Gaichas et al. 2005, Courtney et al. 2006), consistent with the survey, and estimated the number of effective hooks fished from the number of effective skates hauled in each grouped statistical area and depth category. The species specific survey CPUE in each stratum was multiplied by the number of effective hooks in the fishery to estimate the total number of the species of interest caught. Biomass for a species was estimated as the product of the estimated number and the average weight..

Weight Ratio Method

The IPHC stock assessment survey data are used to determine the weight ratio of the species of interest to halibut weight by depth and area. The catch (in numbers) of the species of interest observed in the 20% of subsampled hooks was extrapolated to the entire set, and a total weight of species of interest is estimated by multiplying the average weight of the species of interest by the number caught on each survey set that occurred in a particular area. The ratio estimator is then the weight of the species of interest to the total weight of legal sized halibut for each stratum. Note that we are using the round weight of the species of interest to the net weight (dressed, head-off) of halibut. However, since these weight ratios are consistent through the calculations, this is not a problem. This weight ratio is then applied to the commercial halibut landings in the same stratum, resulting in bycatch pounds of the species of interest.

3.0 Results and Discussion

Average CPUE were calculated for each stratum based on the full survey dataset and the proportionally weighted dataset. Bootstrapped average CPUE and upper and lower 95th percentile intervals were calculated and compared to the survey estimates to determine bias. For all species and all strata, the bootstrapped full dataset produced less biased estimates than the proportionally weighted dataset, however, on average the bias was close to zero for both datasets and there was no evidence of systematic bias (Figure 2, only results for Pacific cod from 2006-2008 shown here for the sake of brevity). Thus, a bias correction for the bootstrap interval was not necessary. The CPUE results based on the full survey dataset were used to calculate total estimated survey catch of each species, in numbers, with approximate confidence intervals. The extrapolated total estimated survey catch will be used by all assessment authors in the future as part of accounting for research catch (Table 2).

The CPUE results from both datasets and the average weights were used in the procedures described above to estimate total fishery catch of the species of interest. Estimates of catch for Pacific sleeper shark were the greatest of the four species examined (ranging from 3,387 mt to 9,599 mt, depending on method/filter and year, Table3). Pacific cod and spiny dogfish catch estimates were similar in range (from 2,191 mt up to 6,756 mt, and 1,994 mt to 5,547 mt, respectively, depending on method/filter and year, Table 2). Catch estimates for salmon shark were much lower, ranging from 0 mt to 181 mt, and in most catch estimation scenarios the lower confidence bound for the catch estimate included zero, reflecting uncertainty due to rare occurrences (Table 2). For all species catch estimates made using the weight ratio method, regardless of the data filter, were greater than those made using the CPUE method, although the approximate confidence intervals were overlapping. Likewise, catch estimates based on non-filtered survey data were generally greater than those estimates based on filtered survey data, but again, the 95% confidence intervals were overlapping, indicating statistical similarity.

The purpose of this analysis was to determine the best method for estimating incidental catch of non-target species. Because no statistical tests were conducted, and data do not exist to groundtruth these estimates, the "best" method is to be determined by qualitative means.

1. Should the full survey dataset be used or should the survey data be "filtered" to better represent the commercial fishery?
    a. IPHC annual survey is designed to survey halibut habitat, not fishery areas, thus the survey efforts may not reflect commercial effort.
    b. The proportional filter proposed here attempts to account for commercial effort by spatially weighting each survey station based on the effort that occurs in that area.
    c. It is likely a better spatial representation of commercial effort than both the full survey data set and the top 1/3rd filter used in the IPHC stock assessments.
2. Which catch estimation method is most appropriate?
    a. Each catch estimation procedure has caveats.
        i. CPUE method bases the extrapolation on estimated effective hooks, calculated from fishticket and log book data for effective skates and landings.
        ii. CPUE method assumes that all effective skates consist of 100 hooks, similar to the IPHC survey design, which may or may not be similar to commercial gear configuration.
        iii. Weight ratio method is based on the actual fishticket landings, and require no assumptions about gear
        iv. Weight ratio method assumes a biological relationship between the species of interest and halibut. Because the linkages between species are elastic and species specific habitat needs are different, this assumption may be easily violated.
        v. Uncertainty in average weight estimates for rare or difficult to sample species (e.g. salmon and Pacific sleeper sharks) is not taken into account in either method, but the average weight estimates are integral to the weight ratio method, it likely has a greater impact in that method. The CPUE method is not reliant on average weights, except to convert estimated catch to weight if desired.

For the reasons described above, the working group recommends moving forward with the CPUE catch estimation procedure and using the proportionally weighted survey data. If this method is approved, catch estimates should be available for stock assessment authors for the next assessment cycle. Also, an alternative bootstrap approach may be possible to estimate confidence intervals around the catch estimates, but results are not available at this time.

4.0 Sources

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5.0 Tables and Figures

Table 1. Average weight parameters, with upper and lower confidence bounds used in this analysis. In this case, n represents the number of sets with observer data.

		Depth	Avg wt (kg)	LL	UL	n
Pacific cod	2006	< = 99 fa	3.56	3.49	3.64	755
	2006	> 99 fa	2.43	2.05	2.76	8
	2007	< = 99 fa	3.65	3.55	3.73	534
	2007	> 99 fa	2.92	2.72	3.17	23
	2008	< = 99 fa	3.56	3.47	3.66	470
	2008	> 99 fa	2.21	1.95	2.52	12
Spiny dogfish	2006	< = 99 fa	2.67	2.60	2.73	560
	2006	> 99 fa	1.91	1.80	2.04	232
	2007	< = 99 fa	2.59	2.52	2.67	382
	2007	> 99 fa	2.06	1.94	2.20	198
	2008	< = 99 fa	2.52	2.37	2.67	95
	2008	> 99 fa	2.05	1.94	2.16	179
Pacific sleeper shark			79.63	74.32	84.94	186
Salmon shark			146.90			146

Table 2. Summary of extrapolated survey catches (in numbers) with approximate confidence intervals and boostrap bias for the four example species.

	No Data Filtering Extrapolated Numbers Caught by the IPHC Survey	Survey Est	Boot Est	Bias %
Pacific Cod	1997	23,276	23,579(18,322-29,367)	1%
	1998	27,042	27,277(21,387-33,447)	1%
	1999	19,783	20,036(15,743-24,883)	1%
	2000	24,103	24,404(19,026-30,472)	1%
	2001	13,665	13,925(10,467-17,880)	2%
	2002	19,166	19,236(14,886-24,158)	0%
	2003	28,024	28,128(21,206-36,104)	0%
	2004	23,102	23,661(18,542-29,256)	2%
	2005	25,470	25,683(19,602-32,544)	1%
	2006	21,639	21,717(16,590-27,237)	0%
	2007	21,516	21,486(16,772-26,722)	0%
	2008	25,049	25,057(20,347-30,082)	0%
	2009	46,615	47,105(39,708-55,191)	1%
Spiny Dogfish	1997	13,013	12,962(8,816-17,771)	0%
	1998	38,976	38,785(29,166-49,419)	0%
	1999	17,963	18,043(11,321-25,892)	0%
	2000	24,221	24,388(16,851-32,781)	1%
	2001	30,185	29,889(23,015-37,310)	-1%
	2002	17,989	17,792(12,263-24,208)	-1%
	2003	61,960	62,071(48,436-76,809)	0%
	2004	41,379	41,779(31,183-53,417)	1%
	2005	40,265	40,325(29,579-52,108)	0%
	2006	38,186	38,276(28,749-48,590)	0%
	2007	31,683	31,912(24,703-39,635)	1%
	2008	22,331	22,355(16,523-28,907)	0%
	2009	27,133	27,107(19,745-35,378)	0%
Salmon Shark	1997	27	27(0-78)	1%
	1998	19	19(0-51)	2%
	1999	5	5(0-17)	9%
	2000	25	25(0-70)	0%
	2001	5	5(0-15)	-1%
	2002	5	5(0-15)	-1%
	2003	8	8(0-24)	1%
	2004	0	0(0-0)	0%
	2005	0	0(0-0)	0%
	2006	20	20(0-50)	0%
	2007	5	5(0-15)	-7%
	2008	1	1(0-3)	-2%
	2009	10	10(0-30)	4%
Pacific Sleeper Shark	1997	1,084	1,111(491-1,873)	3%
	1998	3,642	3,686(2,068-5,688)	1%
	1999	3,775	3,922(2,376-5,788)	4%
	2000	4,034	4,214(2,414-6,274)	4%
	2001	3,237	3,603(2,168-5,290)	11%
	2002	3,425	3,597(2,130-5,382)	5%
	2003	5,090	5,757(3,598-8,541)	13%
	2004	3,202	3,919(2,169-6,072)	22%
	2005	3,343	3,464(1,626-5,789)	4%
	2006	2,487	2,632(1,242-4,390)	6%
	2007	2,035	2,043(854-3,524)	0%
	2008	1,595	1,590(685-2,710)	0%
	2009	1,739	1,884(785-3,309)	8%

Table 3. Estimates of catch for each method (CPUE or Weight Ratio) and both data sets (not filtered, i.e. full dataset, or proportionally weighted).

		CPUE		Weight Ratio	
	Year	No Filter	Proportional	No Filter	Proportional
Pacific Cod	2006	2,194 (1,645-2,802)	2,191 (1,545-3,033)	3,671 (2,735-4,726)	3,761 (2,585-5,243)
	2007	2,610 (2,021-3,268)	2,534 (1,570-3,847)	3,862 (2,927-4,963)	3,908 (2,286-6,031)
	2008	3,676 (3,011-4,393)	3,332 (2,321-4,498)	6,756 (5,514-8,085)	6,002 (4,136-8,174)
Spiny Dogfish	2006	4,183 (3,042-5,449)	3,871 (2,783-5,225)	5,214 (3,678-6,951)	4,652 (3,248-6,468)
	2007	3,590 (2,753-4,565)	3,149 (2,342-4,136)	5,547 (4,124-7,206)	4,796 (3,504-6,383)
	2008	2,070 (1,490-2,731)	1,994 (1,210-2,956)	3,263 (2,298-4,367)	3,083 (1,828-4,724)
Salmon Shark	2006	90 (0-231)	61 (3-172)	181 (0-469)	117 (5-329)
	2007	21 (0-64)	3 (0-17)	34 (0-100)	5 (0-26)
	2008	9 (0-28)	0 (0-0)	14 (0-42)	0 (0-0)
Pacific Sleeper Shark	2006	5,583 (2,160-10,595)	4,765 (1,574-11,187)	9,599 (3587-18,442)	9,143 (2,407-20,790)
	2007	6,192 (2,448-10,849)	3,781 (927-9,285)	13,900 (3,622-25,993)	6,764 (1,321-24,826)
	2008	4,366 (1,779-7,601)	3,387 (981-6,744)	7,944 (3,145-13,819)	6,493 (1,819-13,177)

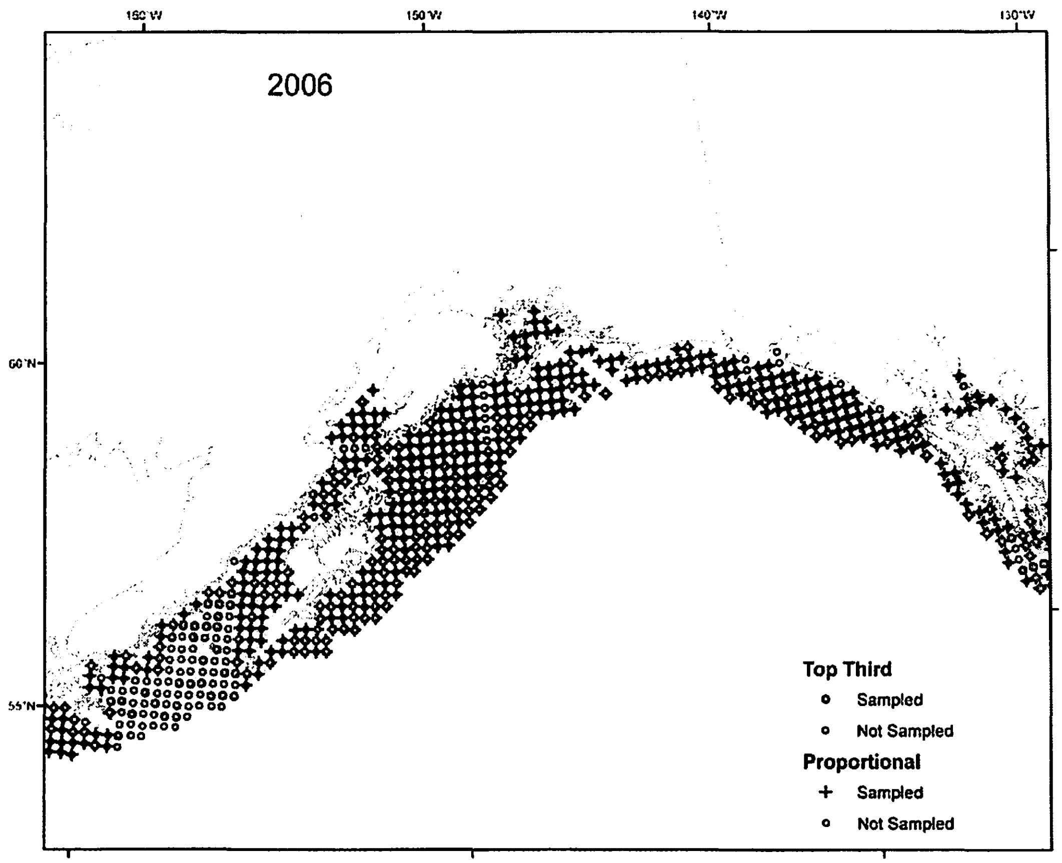

Figure 1. Map of IPHC survey stations (2006 shown here as an example) showing stations that were in the top 1/3rd of stations based on halibut CPUE (red circles) and stations that were given a proportional weight based on commercial effort (black crosses). Stations that were excluded from analysis based on both filters are in the open circles.

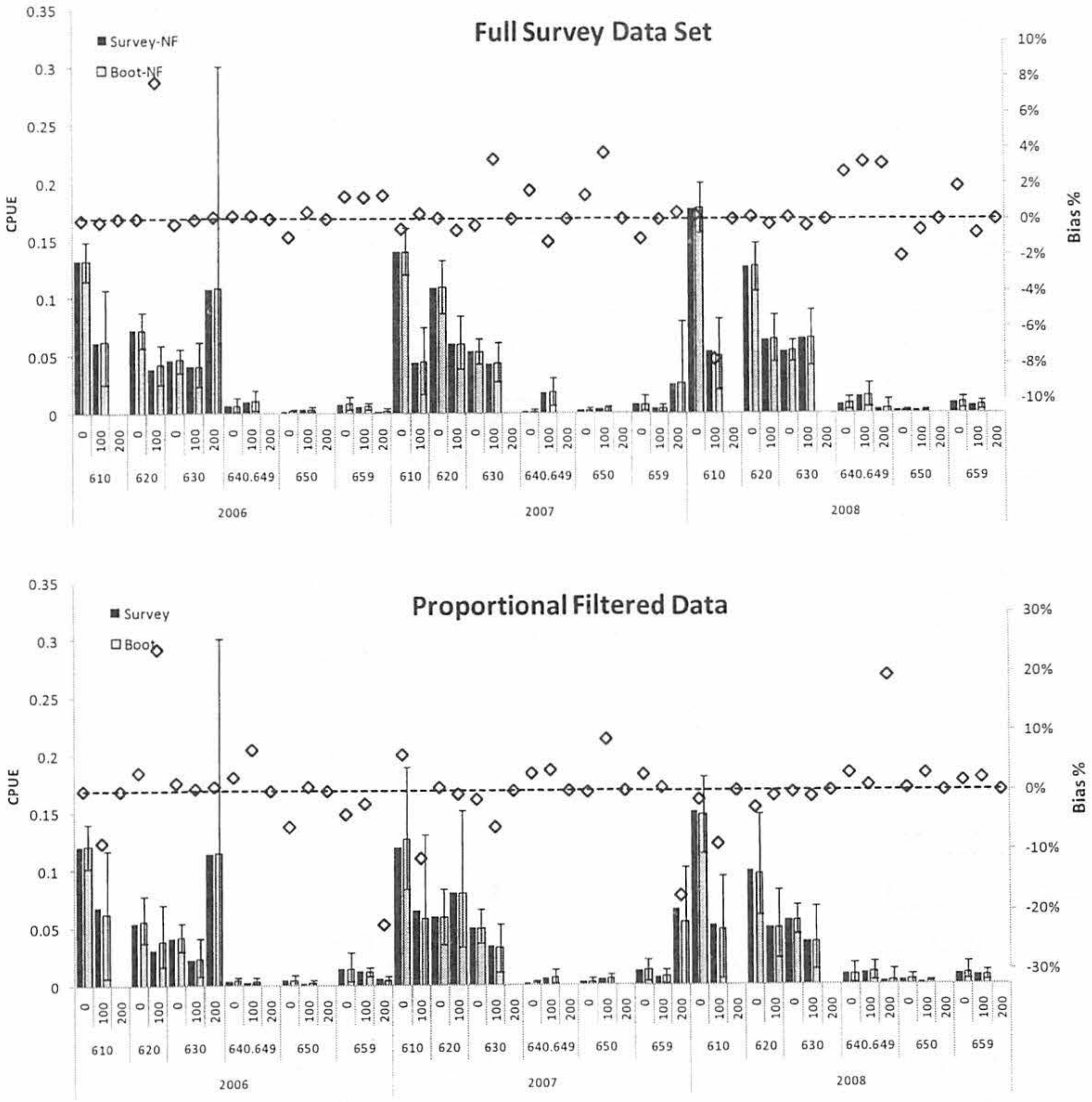

Figure 2. Example showing survey CPUE of Pacific cod (black bars) and estimated average CPUE and 95th percentile confidence intervals (grey bars) from the bootstrapping procedure. Open diamonds show the percent bias for the bootstrap estimates. Estimates are shown by year/area/depth strata. The CPUE estimates made with the full survey dataset is on top and estimates made with the proportionally weighted dataset are on bottom.

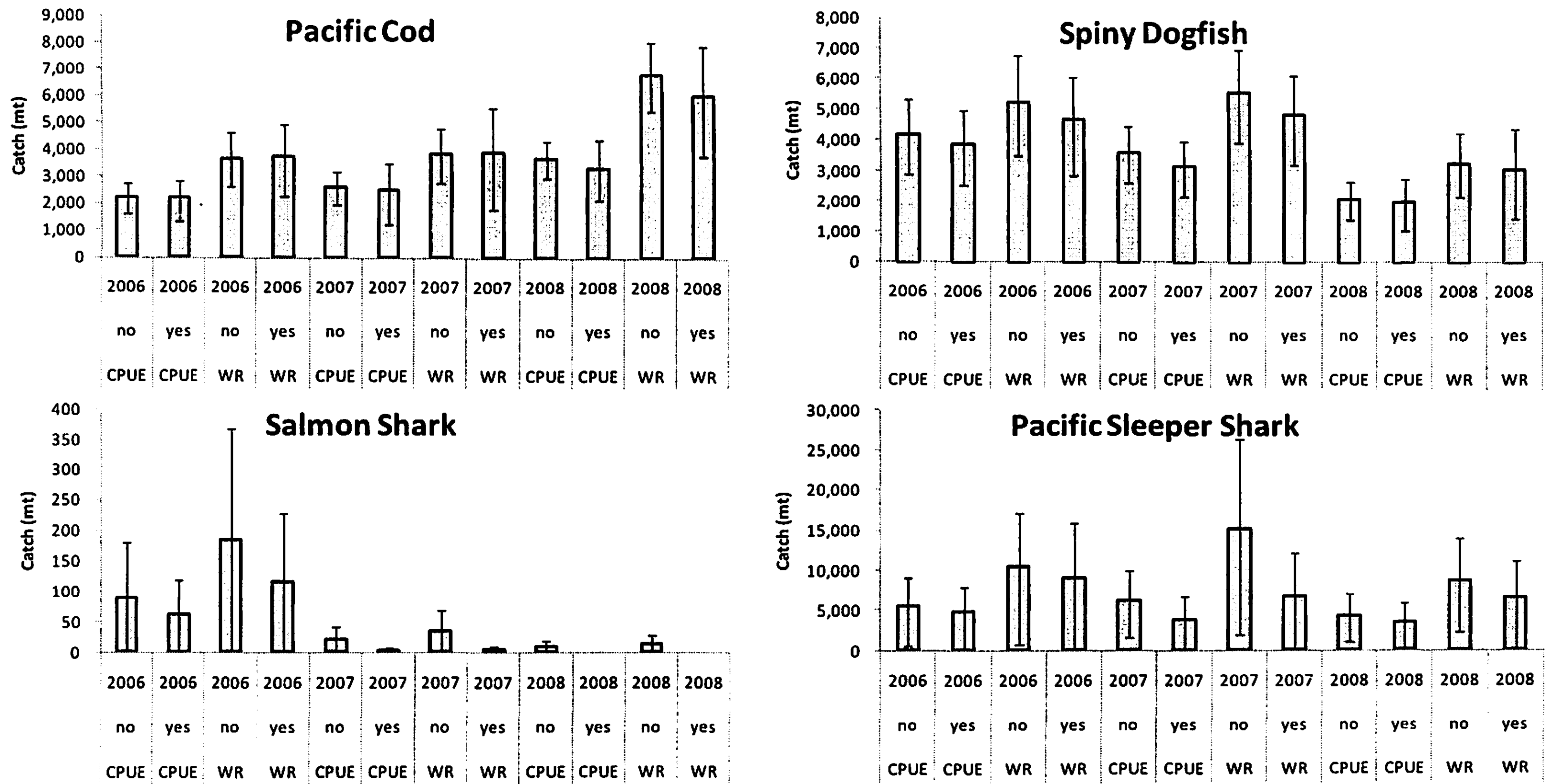

Figure 3. Estimates of catch in metric tons for each of the four example species. Each bar represents a different method/dataset scenario with 95th percentile confidence intervals (based on the CPUE estimates). The x-axis is composed of year, filtered (no=full dataset, yes=proportionally weighted dataset) and method of estimation (CPUE or Weight Ratio).

C-7(a)(3)
Supplemental

Atka mackerel

Sandra Lowe presented an update of the Atka mackerel stock assessment. Significant changes to the assessment inputs included data from the 2010 Aleutian Islands bottom trawl survey (including survey abundance at age), 2009 and 2010 fishery catch data, and 2009 fishery catch- and weight-at-age data. There were no significant changes in the assessment methodology, though there was a refinement made in the change points for the blocks of years with constant selectivity.

Atka mackerel abundance is high and decreasing from a peak supported by a series of strong year classes (1999-2002 and 2006), but remains above $B_{40\%}$. In this year's assessment, addition of the 2009 fishery data and the 2010 Aleutian Island bottom trawl survey data increased the magnitude of four year-classes spawned since 1999. The projected female spawning biomass for 2011 using the catch levels in the proposed SSL RPAs is estimated to be 146,000 t which is 56% of unfished spawning biomass and above $B_{40\%}$ (104,400t). The 2011 estimate of spawning biomass is up 31% from last year's estimate for 2010 (111,300t). The projected age 3+ biomass at the beginning of 2011 is estimated at 437,600 t, up 13% from last year's estimate for 2009. This is due to increases (+17%, +17%, +22%, and +12% from the 2009 assessment) in the estimated magnitudes of the 1999, 2000, 2001, and 2006 year classes, respectively, with the addition of the 2009 fishery age data into the model. In addition, mean recruitment from 1978 through 2008 increased 10% over last year's estimate (from 1978-2007), which increased all biological reference point biomass levels ($B_{100\%}$, $B_{40\%}$, and $B_{35\%}$) by approximately 10%.

The projected female spawning biomass under the SSL RPA harvest strategy is estimated to be 56% of unfished spawning biomass in 2011 and above $B_{40\%}$, thereby placing BSAI Atka mackerel in Tier 3a. The projected 2011 yield (ABC) at $F_{40\%}$= 0.38 is 85,300 t, up 15% from last year's estimate for 2010. The projected 2011 overfishing level at $F_{35\%}$ (F = 0.47) is 101,200 t, up 15% from last year's estimate for 2010. The stock is not currently overfished, nor is it approaching an overfished condition. Atka mackerel female spawning biomass in 2012 (130,500 t) is projected to remain above $B_{40\%}$. The projected 2012 yield (ABC) under Tier 3a ($F_{40\%}$= 0.38) and the proposed SSL RPAs is 77,900 t; the projected 2012 overfishing level at $F_{35\%}$ (F = 0.47) and the proposed SSL RPAs is 92,200 t. The population is projected to remain above $B_{40\%}$ through 2023 assuming the catch reductions contained in the proposed SSL RPAs are likely to occur and remain in place.

The Aleutian Islands subareas are divided into 3 districts at 177° E and 177° W longitude, providing the mechanism to apportion the Atka mackerel TACs. The Council used a 4-survey weighted average to apportion the 2010 ABC, and the authors recommend using the same method but updating the survey data to include the 2010 (and drop the 2000) Aleutian Island bottom trawl survey biomass estimates to apportion the 2011 and 2012 ABCs. The recommended ABC apportionment by subarea for both 2011 and 2012 is 47.3% for Area 541 and the southern Bering Sea region, 28.1% for Area 542, and 24.6% for Area 543.

The Steller sea lion population continues to decrease at relatively high rates (-7%/yr) in the western Aleutians, and trends improve to the east (increasing at ~3%/yr in the region between Samalga and Unimak Passes). Reasonable and prudent alternatives in the sea lion biological opinion are likely to reduce catches of Atka mackerel in the Aleutians, estimated by the assessment authors to be 36%: area 543 will likely be closed to directed mackerel fishing, and additional measures are proposed for areas 541 and 542.

The Plan Team requested a report on Aleutian trawl survey trends in 2011. The recommended that an analysis of bottom trawl survey of the Aleutian Islands region be conducted in 2010.

AGENDA C-7(a)(4)
Supplemental
DECEMBER 2010

Total Catch Accounting Working Group

Groundfish Plan Teams

November 3, 2010, 9 – 10 am

Participants:

Plan Teams: Jane DiCosimo (NPFMC), Mary Furuness (NMFS AKRO), Tom Pearson (NMFS AKRO), Chris Lunsford (NMFS AFSC), Sarah Gaichas (NMFS AFSC), Dave Carlile (ADF&G), Kristen Green (ADF&G), Nick Sagalkin (ADF&G), Bill Clark (IPHC)

Invited: Bob Ryznar (AKFIN), Michael Fey (AKFIN), Scott Meyer (ADF&G), Lee Hulbert (ADF&G), Jason Gasper (NMFS AKRO), Heather Gilroy (IPHC)

Jane DiCosimo summarized the background on how and why the group was created. Total catch accounting (TCA) for all groundfish stocks that are managed under the BSAI and GOA Groundfish FMPs is now required under annual catch limits (ACLs) and associated requirements. In September 2010, NMFS AKRO staff reported on progress towards compiling a comprehensive database for use by stock assessment authors to account for total removals. Federal and state commercial harvests and state sport and subsistence harvests have been compiled; however, compilation of research (survey) data is incomplete due to some technical issues related to incomplete data for converting numbers of fish to pounds. During a discussion of the status of TCA with the Plan Team, a working group was requested to address outstanding issues so that use of the database would be ready for the stock assessments for determining the 2012 ACLs.

Mary Furuness reviewed the status of data collection for TCA. She provided a list of data categories for inclusion in the database (attached). Participants discussed the status of the different sector databases and the collective interest in housing the TCA database with AKFIN. AKFIN already pulls in data from the Catch Accounting System, CFEC, and ADF&G. Bob Ryznar described the dual levels of access: Users are able to directly access the database for their own queries and a summary table can be created to produce a standard of queried data.

The group focused on several issues:

1) Survey data
    a) conversions from numbers to lb
    b) Time period for historical data
2) Inside State waters harvests
3) Report out to Plan Teams

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Survey data

Chris Lunsford led a discussion of attempts to integrate survey data in TCA regarding two technical issues: 1) historical time period and 2) converting numbers to pounds.

Conversions: Jason Gasper reported that the NMFS-AKRO regularly converts crab survey numbers to pounds for monitoring incidental catch. Scott Meyer reported ADF&G Sportfish Division collects size data and has provided sport harvests converted to pounds for rockfish, cod, sablefish, and sharks. Sarah Gaichas suggested that the Observer Program could provide size data from their catch sampling for converting survey data to pounds. **The group recommended that a subgroup be formed to develop draft conversion protocols for incomplete (size data) data sets. Chris Lunsford, Jason Gasper, Sarah Gaichas, Jennifer Mondragon, and Heather Gilroy agreed to work on this issue and report to the group at its next meeting.**

Historical Data Mary Furuness noted that the requirements for TCA begin in 2011, even though it might be preferable to account for historical total removals. Reliable estimates of halibut bycatch data go back to 1998, reliable estimates of commercial data go back to 1991, and the stock assessments go back to 1977. The group noted this was not a technical issue, **but the question of what historical time period should be covered under TCA should be referred to policy makers.**

State waters

The group discussed several inside water fisheries (e.g., Chatham sablefish, PWS pollock, SEO DSR, Pacific cod) and whether they are included in assessment for federal groundfish "stocks." Dave Carlile asked if state inside water harvests should be included in estimates of TCA. Bill Clark suggested that inside and outside waters could be treated as separate stocks. He reported that while the IPHC treats Pacific halibut throughout its entire range as one stock, there is no apparent biological harm to groundfish under the current (ad hoc) approach. Stock definitions are addressed under the Magnuson-Stevens Act.

The working group concluded that **inside water harvests should not be included in TCA since those populations are not included in the biomass estimate in the stock assessments.** The group discussed how stocks are defined in the groundfish FMPS and SAFE Reports and concluded that the group should inventory cases when inside water populations do and do not factor into federal stock assessments. Dave Carlile recommended that an information matrix of all sources of mortality be prepared by the group. This information will assist the group in recommending approaches for developing the TCA database. Dave Carlile will coordinate the State of Alaska contributions and Mary Furuness will coordinate the NMFS contributions to the inventory. Bob Ryznar will assist with organizing the inventory fields. A draft inventory will be reviewed by the working group at its next meeting.

Process for database development

Mary Furuness is the lead for contributing federal data. Dave Carlile is the lead for State data. Bob Ryznar is the lead for housing and developing the database. Bill Clark recommended that original data (including numbers and weights as some models internally generate weights) be included in the database (not just summary data). Scott Meyer recommended that metadata be included. Nick Sagalkin asked about the frequency and timing of database updates. Chris Lunsford identified that stock assessment authors need access to the data each fall for development of their models. The group recommended that the entire dataset be updated, when appropriate, rather than just adding the most recent year's data, to account for any data revisions. The general rule for annual data submission will be flexible. Chris Lunsford noted that the database must account for different statistical areas, species codes, etc. used by the agencies.

Reporting

The TCA working group will meet again by teleconference on February 9, 10, or 11, 2011 (TBA) to review sub-group reports on conversion methodologies and the stock inventory. Those sub-groups will meet independently and are open to additional participants than those identified in this report.

Total groundfish accounting from all sources of removals (Source: M. Furuness)

Repository: AKFIN

Sources of mortality:

1. Commercial fisheries
    a. State GHL fisheries –fish ticket
    b. Federal groundfish fisheries – catch accounting system
    c. IPHC – fish ticket
2. Surveys
    a. State
    b. Federal
    c. IPHC
3. Research
    a. Federal – Scientific research permit, Exempted fishing permit, Letter of Acknowledgement
    b. State
    c. IPHC
4. Recreational
    a. State – Pacific cod, sablefish, rockfish, sharks
5. Subsistence/personal use
    a. State
6. Bycatch in halibut fishery
    a. State/Federal – fish ticket/catch accounting system
    b. HFICE working group
7. Pacific cod in crab fisheries
    a. State – fish ticket

11.8.2010 November Groundfish Plan Team Document

Methods for the estimation of non-target species catch in the unobserved halibut IFQ fleet

Working Group Participants:
Cleo Brylinsky (ADF&G), Jane DiCosimo (NPFMC), Sarah Gaichas (AFSC), Jason Gasper (AKRO), Kristen Green (ADF&G), Mary Furuness (AKRO), Heather Gilroy (IPHC), Tom Kong (IPHC), Olav Ormseth (AFSC), Haixue Shen (ADF&G), Cindy Tribuzio (ABL)

1.0 Introduction

The discarded catch of non-target species in the halibut IFQ fishery is largely unobserved, undocumented and has not previously been incorporated into most of the BSAI and GOA stock assessments. Bycatch of some groundfish species in the halibut IFQ fishery has been estimated using the IPHC annual longline survey as a proxy for observer data (Gaichas et al. 2005, Courtney et al. 2006, Brylinsky et al. 2009, Ormseth et al. 2009, Tribuzio et al. 2009). However, there has been no consensus among authors as to the best method to account for removals for all groundfish species.

At its December 2009 meeting, the SSC requested improvements to estimation methods of discard and continued monitoring of estimated bycatch in the halibut IFQ fishery (NPFMC 2009). Specifically, the SSC recommended monitoring at-sea discard of rockfish species, skates and sharks:.

Rougheye Rockfish: "In particular, the authors should monitor the bycatch trends in the sablefish, halibut longline fisheries, and look for evidence of "topping off" in the POP fishery."

Skate complex: "The new method of bycatch estimation used the IPHC halibut survey bycatch data to estimate skate bycatch in the commercial fishery and used only those survey stations with the highest one-third of halibut catch rates. The rationale for this approach is the expectation that most of the commercial effort in the halibut fishery is likely to be in the high CPUE areas. The plan team was uncomfortable with this new approach, noting that the impact on the estimate of skate bycatch, which is primarily taken in the halibut fishery, is to reduce that estimate by an order of magnitude. The SSC concurs with the plan team's request for an investigation of alternative methods of estimating skate bycatch in the commercial halibut fishery, to include stratification based on the geographic distribution of the commercial fishery, as well as depth and area stratification."

Shark complex: "The SSC supports further development of both proposed methods to estimate shark bycatch in halibut fisheries reported in the Appendix. When completed, reconstructed historical estimates of shark catch should be added to the historical catch time series for sharks."

To address these recommendations, a working group composed of scientists from AFSC, AKRO, ADF&G, IPHC and NPFMC was formed in January of 2010. The goal of the working group is to investigate quantitative methods to estimate incidental catches in the unobserved halibut IFQ fishery. The purpose of this document is to provide Plan Team and SSC members with an overview of the analytical methods and associated estimates for several example species: Pacific cod, spiny dogfish, Pacific sleeper shark and salmon shark within the GOA. The working group has focused on three areas: 1) estimation of variance for extrapolated survey catch and CPUE; 2) data filters of annual survey data to better represent commercial fishing behavior; and 3) ratio estimators to extrapolate survey catch to commercial effort.

1.1 Timeline

January-August 2010: Working group meetings and method developments

September 2010: Presentation of methods to joint Plan Teams, discussion and feedback, selection of best method

November 2010: Presentation of best method with catch estimates of example species to joint Plan Teams

December 2010: Presentation of best method to SSC for approval

January 2011: Institutionalization of best method

August 2011: Estimation of catches for non-target species prepared and provided to stock assessment authors

2.0 Methods

Survey and commercial effort data were provided by the IPHC. To preserve confidentiality, commercial effort data (effective skates and total landings) were grouped by year into NMFS reporting areas (541, 542, 543, 610, 620, 630, 640+649, 650, 659), all Bering Sea areas combined, and binned into three depth categories (0-99, 100-199, and 200+ fathoms). Further, because some areas had a limited number of vessels some depth categories were binned within an area, for example areas 542 and 543 had all depths combined. Survey stations were similarly grouped by year/area/depth stratum.

2.1 Survey Catch and CPUE Variance

Catch estimates and catch rates (CPUE) from the IPHC annual longline survey are point estimates only, without estimates of variance. The goal here was to estimate approximate 95% confidence intervals for the extrapolated catch (numbers) and the CPUE (numbers of fish/hooks). Following the IPHC assumptions that the 20% stratified subsample of hooks is an adequate representation of the total hooks fished at each station for bycatch of common species, we assumed that the subsample of observed hooks was representative of the station and was in essence a complete census of the hooks. Stations within strata were resampled with replacement and the mean CPUE for each species within a stratum were calculated. The upper and lower 95th percentile of the replicates were taken as the approximate confidence interval around the species specific average CPUE. One potential deficiency with this methodology occurs if there is serious bias in the bootstrap estimate, resulting in under coverage of the confidence interval. This potential source of error will be discussed later.

Estimating rare species presents a problem due to low detection probabilities, resulting in zero observations that cause over dispersion and potential bias in estimates. In other words, species that are estimated, but do not occur in the subsample result in an estimate of zero catch and CPUE despite likely occurrence in the area. Conversely, if individuals are clustered, the catch and CPUE may be over estimated. In both situations, estimates of variance are likely not accurate.

2.2 Filtering Survey Data

During the September 2010 Joint Plan Team meeting, the teams and working group participants discussed three options for filtering the survey data to more accurately represent commercial behavior: no filter, the top 1/3rd of survey stations (based on halibut CPUE within a strata) and a proportional filter where stations are weighted based on the proportion of commercial effort that occurs in that area (described below). The joint Plan Teams recommended the working group "use the proportional to catch filtering method, which was considered most likely to reflect spatial differences in species composition while sacrificing little survey data compared with the top-third method." (Groundfish Plan Team minutes, September 2010). This proportional method retains more survey stations, broader spatial coverage than the top 1/3rd filter (figure 1), and may more accurately represent commercial effort.

Here we are presenting catch estimates based on the recommended proportional data filter as well as catch estimations made with the full survey data set for comparison. Detailed methods for each of the data filters are below.

1) No filter: All the survey stations were included.
2) Proportional to catch filter: (note: depth was not available for commercial data at this spatial resolution, therefore the proportions are stratified by year/area not year/area/depth)
    a. Additional data: halibut commercial catch by ADF&G stat area for each year (1995-2009), provides commercial effort at the lowest resolution possible
    b. Map IPHC survey stations into ADFG stat areas used in catch reporting
    c. Stratify both IPHC survey and commercial catch by NMFS area and year
    d. Calculate proportion of commercial catch in ADFG stat area within a NMFS area and year
    e. Match to survey dataset (not all areas with survey have catch)
    f. Renormalize proportion of commercial catch (setting surveyed areas with no catch to 0) to get the weighted proportion for each station

2.3 Average Weight

A separate issue that is enveloped in this catch estimation procedure is data quality of species specific average weights for converting numbers to biomass. For the purposes of this report we are not proposing a universal method for calculating species specific average weight, but for the four example species, we have attempted to find the best available data. Observer data from longline vessels was used to calculated mean weights for three shark species and Pacific cod and were compared between reporting areas, depth strata, and by year to look for significant differences between strata. Strata (year, area, and depth combinations) were the same as those used on the catch estimation analysis, further comparisons of mean weight between "shallow" (< = 99 fathoms) and "deep" (> 99 fathoms), FMP (BSAI vs. GOA) and regions (BSAI, WGOA, CGOA and EGOA) were also conducted.

The extrapolated weights and numbers used to derive the mean weights are calculated by FMA (North Pacific Observer Program) and take into account sampling fractions. Mean weights were derived from the extrapolated weights divided by the extrapolated numbers. Data was pulled from the Alaska Region Catch Accounting System, which contains the necessary data fields from the observer database (NORPAC).

For spiny dogfish and Pacific cod, a non-parametric bootstrap was used to compare means, 95 percentile intervals between post strata, and bias. Results from this analysis showed that the year/area/depth strata categories resulted in certain categories having small sample sizes (e.g., 3 sets) and are thus not robust to the population caught on hook-an- line gear.. Further investigation of alternative data groupings (deep vs. shallow, WGOA vs. CGOA vs. EGOA) found that fairly robust sample sizes with strata specified by year, GOA, and deep (>99.1 fathoms) vs shallow (<99.1 fathoms). For both cod and dogfish, weight differences were observed for the depths (Table 1). Thus, this analysis uses mean weights for spiny dogfish and Pacific cod that are stratified by year, FMP, and depth (deep or shallow).

Observer data was not used to estimate weights for salmon sharks and sleeper sharks. The number of samples was very low for both species and the weights collected by observers may not represent the true population of shark bycatch. Further, the larger specimens of these shark species are generally not brought aboard a vessel due to safety and logistical reasons, resulting in smaller sharks in the weighed samples. For both species, mean weights were calculated based on targeted research surveys.

Salmon shark are rarely encountered in federal surveys, especially on longline gear. However, weight data is available from targeted research surveys in Prince William Sound (seine and hook and line gear, Goldman and Musik 2006) and from sport fishery data (S. Meyer pers. comm.). Sport fish data were not used in this case because it is possible that it is biased towards larger animals. Salmon shark are highly migratory and data collected in Prince WilliamSound may be an appropriate proxy for GOA caught salmon shark.

Weight data on Pacific sleeper shark is difficult to obtain due to the large size of the animal and generally larger individuals are not brought on board to be sampled for safety and logistical reason. In addition, the weight of some specimens may be estimated by the observer or proxy weights (for trawl data) are used from RACEBASE. For this analysis weight data collected during a targeted longline survey near Kodiak, in which all sharks were weighed, is assumed to be the best available data for this species and gear type (M. Sigler, unpublished data).

2.4 Ratio Estimators

Catch Per Unit Effort Method

Commercial fishery data were used to estimate the number of effective hooks fished. Commercial logbook data were reported by weight (landings), effective skates hauled (skate is defined as 1,800 feet of groundline with 100 hooks), and number of vessels by depth bin within each year/area/depth strata. Fish ticket data were reported by weight and number of vessels by year/area/depth strata. Logbook coverage provides a view of how effort is proportioned by depth and was used to proportion the fish ticket landings into depth categories. We assumed that fishing gear was universal in that all skates consisted of 100 hooks (Gaichas et al. 2005, Courtney et al. 2006), consistent with the survey, and estimated the number of effective hooks fished from the number of effective skates hauled in each grouped statistical area and depth category. The species specific survey CPUE in each stratum was multiplied by the number of effective hooks in the fishery to estimate the total number of the species of interest caught. Biomass for a species was estimated as the product of the estimated number and the average weight..

Weight Ratio Method

The IPHC stock assessment survey data are used to determine the weight ratio of the species of interest to halibut weight by depth and area. The catch (in numbers) of the species of interest observed in the 20% of subsampled hooks was extrapolated to the entire set, and a total weight of species of interest is estimated by multiplying the average weight of the species of interest by the number caught on each survey set that occurred in a particular area. The ratio estimator is then the weight of the species of interest to the total weight of legal sized halibut for each stratum. Note that we are using the round weight of the species of interest to the net weight (dressed, head-off) of halibut. However, since these weight ratios are consistent through the calculations, this is not a problem. This weight ratio is then applied to the commercial halibut landings in the same stratum, resulting in bycatch pounds of the species of interest.

3.0 Results and Discussion

Average CPUE were calculated for each stratum based on the full survey dataset and the proportionally weighted dataset. Bootstrapped average CPUE and upper and lower 95th percentile intervals were calculated and compared to the survey estimates to determine bias. For all species and all strata, the bootstrapped full dataset produced less biased estimates than the proportionally weighted dataset, however, on average the bias was close to zero for both datasets and there was no evidence of systematic bias (Figure 2, only results for Pacific cod from 2006-2008 shown here for the sake of brevity). Thus, a bias correction for the bootstrap interval was not necessary. The CPUE results based on the full survey dataset were used to calculate total estimated survey catch of each species, in numbers, with approximate confidence intervals. The extrapolated total estimated survey catch will be used by all assessment authors in the future as part of accounting for research catch (Table 2).

The CPUE results from both datasets and the average weights were used in the procedures described above to estimate total fishery catch of the species of interest. Estimates of catch for Pacific sleeper shark were the greatest of the four species examined (ranging from 3,387 mt to 9,599 mt, depending on method/filter and year, Table3). Pacific cod and spiny dogfish catch estimates were similar in range (from 2,191 mt up to 6,756 mt, and 1,994 mt to 5,547 mt, respectively, depending on method/filter and year, Table 2). Catch estimates for salmon shark were much lower, ranging from 0 mt to 181 mt, and in most catch estimation scenarios the lower confidence bound for the catch estimate included zero, reflecting uncertainty due to rare occurrences (Table 2). For all species catch estimates made using the weight ratio method, regardless of the data filter, were greater than those made using the CPUE method, although the approximate confidence intervals were overlapping. Likewise, catch estimates based on non-filtered survey data were generally greater than those estimates based on filtered survey data, but again, the 95% confidence intervals were overlapping, indicating statistical similarity.

The purpose of this analysis was to determine the best method for estimating incidental catch of non-target species. Because no statistical tests were conducted, and data do not exist to groundtruth these estimates, the "best" method is to be determined by qualitative means.

1. Should the full survey dataset be used or should the survey data be "filtered" to better represent the commercial fishery?
    a. IPHC annual survey is designed to survey halibut habitat, not fishery areas, thus the survey efforts may not reflect commercial effort.
    b. The proportional filter proposed here attempts to account for commercial effort by spatially weighting each survey station based on the effort that occurs in that area.
    c. It is likely a better spatial representation of commercial effort than both the full survey data set and the top 1/3rd filter used in the IPHC stock assessments.
2. Which catch estimation method is most appropriate?
    a. Each catch estimation procedure has caveats.
        i. CPUE method bases the extrapolation on estimated effective hooks, calculated from fishticket and log book data for effective skates and landings.
        ii. CPUE method assumes that all effective skates consist of 100 hooks, similar to the IPHC survey design, which may or may not be similar to commercial gear configuration.
        iii. Weight ratio method is based on the actual fishticket landings, and require no assumptions about gear
        iv. Weight ratio method assumes a biological relationship between the species of interest and halibut. Because the linkages between species are elastic and species specific habitat needs are different, this assumption may be easily violated.
        v. Uncertainty in average weight estimates for rare or difficult to sample species (e.g. salmon and Pacific sleeper sharks) is not taken into account in either method, but the average weight estimates are integral to the weight ratio method, it likely has a greater impact in that method. The CPUE method is not reliant on average weights, except to convert estimated catch to weight if desired.

For the reasons described above, the working group recommends moving forward with the CPUE catch estimation procedure and using the proportionally weighted survey data. If this method is approved, catch estimates should be available for stock assessment authors for the next assessment cycle. Also, an alternative bootstrap approach may be possible to estimate confidence intervals around the catch estimates, but results are not available at this time.

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5.0 Tables and Figures

Table 1. Average weight parameters, with upper and lower confidence bounds used in this analysis. In this case, n represents the number of sets with observer data.

		Depth	Avg wt (kg)	LL	UL	n
Pacific cod	2006	< = 99 fa	3.56	3.49	3.64	755
	2006	> 99 fa	2.43	2.05	2.76	8
	2007	< = 99 fa	3.65	3.55	3.73	534
	2007	> 99 fa	2.92	2.72	3.17	23
	2008	< = 99 fa	3.56	3.47	3.66	470
	2008	> 99 fa	2.21	1.95	2.52	12
Spiny dogfish	2006	< = 99 fa	2.67	2.60	2.73	560
	2006	> 99 fa	1.91	1.80	2.04	232
	2007	< = 99 fa	2.59	2.52	2.67	382
	2007	> 99 fa	2.06	1.94	2.20	198
	2008	< = 99 fa	2.52	2.37	2.67	95
	2008	> 99 fa	2.05	1.94	2.16	179
Pacific sleeper shark			79.63	74.32	84.94	186
Salmon shark			146.90			146

Table 2. Summary of extrapolated survey catches (in numbers) with approximate confidence intervals and boostrap bias for the four example species.

		No Data Filtering		
		Extrapolated Numbers Caught by the IPHC Survey		
		Survey Est	Boot Est	Bias %
Pacific Cod	1997	23,276	23,579(18,322-29,367)	1%
	1998	27,042	27,277(21,387-33,447)	1%
	1999	19,783	20,036(15,743-24,883)	1%
	2000	24,103	24,404(19,026-30,472)	1%
	2001	13,665	13,925(10,467-17,880)	2%
	2002	19,166	19,236(14,886-24,158)	0%
	2003	28,024	28,128(21,206-36,104)	0%
	2004	23,102	23,661(18,542-29,256)	2%
	2005	25,470	25,683(19,602-32,544)	1%
	2006	21,639	21,717(16,590-27,237)	0%
	2007	21,516	21,486(16,772-26,722)	0%
	2008	25,049	25,057(20,347-30,082)	0%
	2009	46,615	47,105(39,708-55,191)	1%
Spiny Dogfish	1997	13,013	12,962(8,816-17,771)	0%
	1998	38,976	38,785(29,166-49,419)	0%
	1999	17,963	18,043(11,321-25,892)	0%
	2000	24,221	24,388(16,851-32,781)	1%
	2001	30,185	29,889(23,015-37,310)	-1%
	2002	17,989	17,792(12,263-24,208)	-1%
	2003	61,960	62,071(48,436-76,809)	0%
	2004	41,379	41,779(31,183-53,417)	1%
	2005	40,265	40,325(29,579-52,108)	0%
	2006	38,186	38,276(28,749-48,590)	0%
	2007	31,683	31,912(24,703-39,635)	1%
	2008	22,331	22,355(16,523-28,907)	0%
	2009	27,133	27,107(19,745-35,378)	0%
Salmon Shark	1997	27	27(0-78)	1%
	1998	19	19(0-51)	2%
	1999	5	5(0-17)	9%
	2000	25	25(0-70)	0%
	2001	5	5(0-15)	-1%
	2002	5	5(0-15)	-1%
	2003	8	8(0-24)	1%
	2004	0	0(0-0)	0%
	2005	0	0(0-0)	0%
	2006	20	20(0-50)	0%
	2007	5	5(0-15)	-7%
	2008	1	1(0-3)	-2%
	2009	10	10(0-30)	4%
Pacific Sleeper Shark	1997	1,084	1,111(491-1,873)	3%
	1998	3,642	3,686(2,068-5,688)	1%
	1999	3,775	3,922(2,376-5,788)	4%
	2000	4,034	4,214(2,414-6,274)	4%
	2001	3,237	3,603(2,168-5,290)	11%
	2002	3,425	3,597(2,130-5,382)	5%
	2003	5,090	5,757(3,598-8,541)	13%
	2004	3,202	3,919(2,169-6,072)	22%
	2005	3,343	3,464(1,626-5,789)	4%
	2006	2,487	2,632(1,242-4,390)	6%
	2007	2,035	2,043(854-3,524)	0%
	2008	1,595	1,590(685-2,710)	0%
	2009	1,739	1,884(785-3,309)	8%

Table 3. Estimates of catch for each method (CPUE or Weight Ratio) and both data sets (not filtered, i.e. full dataset, or proportionally weighted).

		CPUE		Weight Ratio	
	Year	No Filter	Proportional	No Filter	Proportional
Pacific Cod	2006	2,194 (1,645-2,802)	2,191 (1,545-3,033)	3,671 (2,735-4,726)	3,761 (2,585-5,243)
	2007	2,610 (2,021-3,268)	2,534 (1,570-3,847)	3,862 (2,927-4,963)	3,908 (2,286-6,031)
	2008	3,676 (3,011-4,393)	3,332 (2,321-4,498)	6,756 (5,514-8,085)	6,002 (4,136-8,174)
Spiny Dogfish	2006	4,183 (3,042-5,449)	3,871 (2,783-5,225)	5,214 (3,678-6,951)	4,652 (3,248-6,468)
	2007	3,590 (2,753-4,565)	3,149 (2,342-4,136)	5,547 (4,124-7,206)	4,796 (3,504-6,383)
	2008	2,070 (1,490-2,731)	1,994 (1,210-2,956)	3,263 (2,298-4,367)	3,083 (1,828-4,724)
Salmon Shark	2006	90 (0-231)	61 (3-172)	181 (0-469)	117 (5-329)
	2007	21 (0-64)	3 (0-17)	34 (0-100)	5 (0-26)
	2008	9 (0-28)	0 (0-0)	14 (0-42)	0 (0-0)
Pacific Sleeper Shark	2006	5,583 (2,160-10,595)	4,765 (1,574-11,187)	9,599 (3587-18,442)	9,143 (2,407-20,790)
	2007	6,192 (2,448-10,849)	3,781 (927-9,285)	13,900 (3,622-25,993)	6,764 (1,321-24,826)
	2008	4,366 (1,779-7,601)	3,387 (981-6,744)	7,944 (3,145-13,819)	6,493 (1,819-13,177)

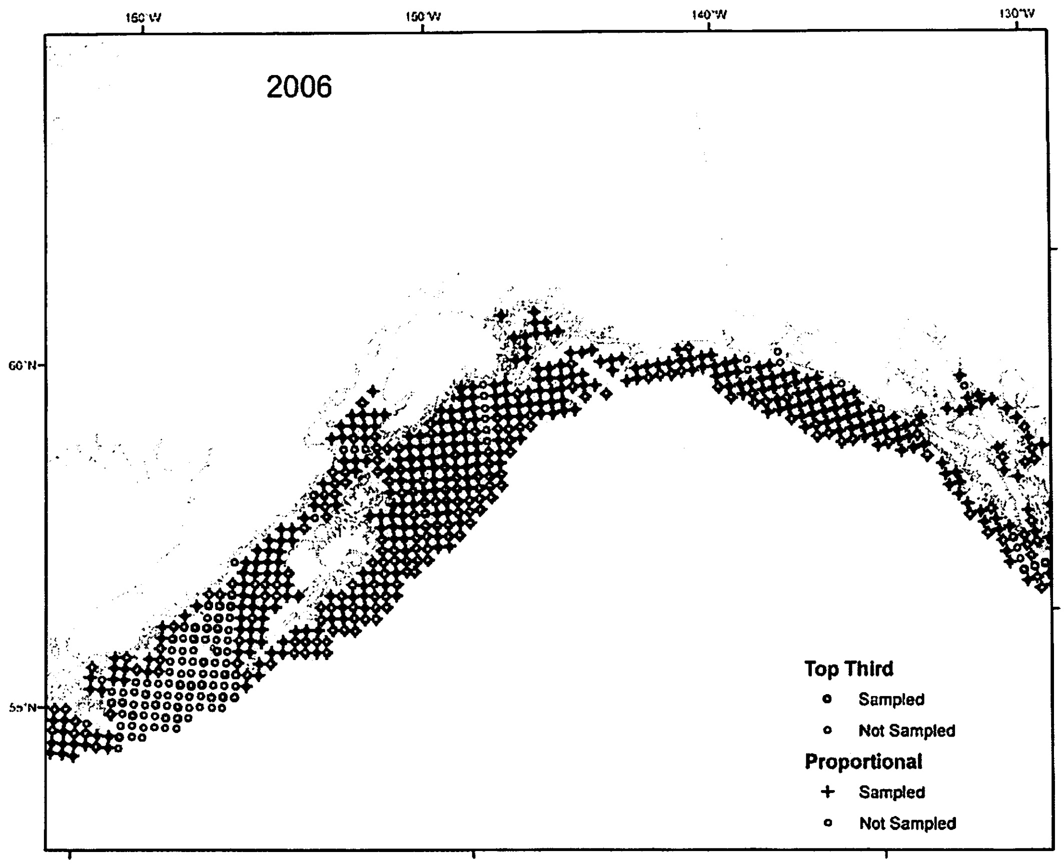

Figure 1. Map of IPHC survey stations (2006 shown here as an example) showing stations that were in the top 1/3rd of stations based on halibut CPUE (red circles) and stations that were given a proportional weight based on commercial effort (black crosses). Stations that were excluded from analysis based on both filters are in the open circles.

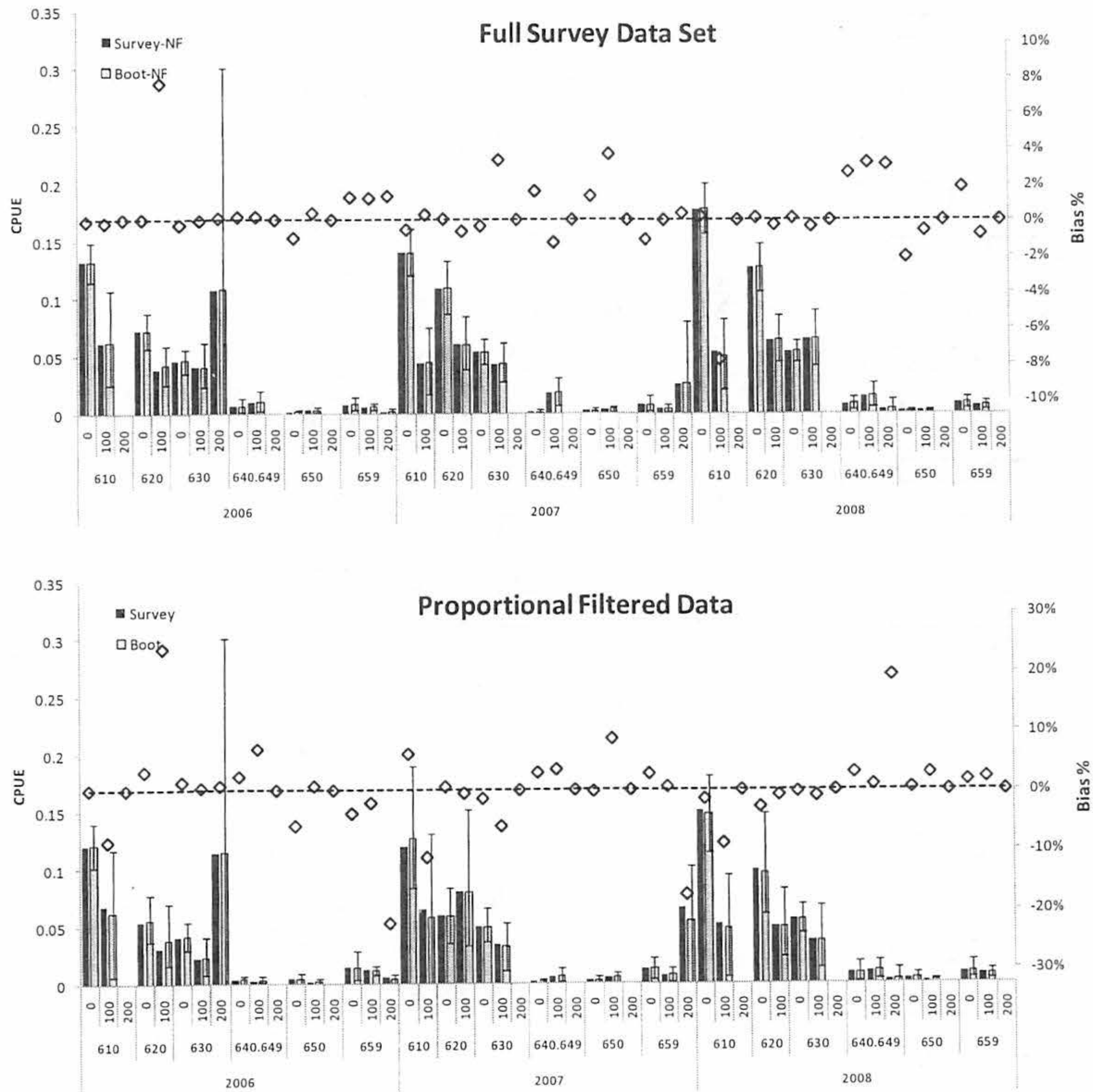

Figure 2. Example showing survey CPUE of Pacific cod (black bars) and estimated average CPUE and 95th percentile confidence intervals (grey bars) from the bootstrapping procedure. Open diamonds show the percent bias for the bootstrap estimates. Estimates are shown by year/area/depth strata. The CPUE estimates made with the full survey dataset is on top and estimates made with the proportionally weighted dataset are on bottom.

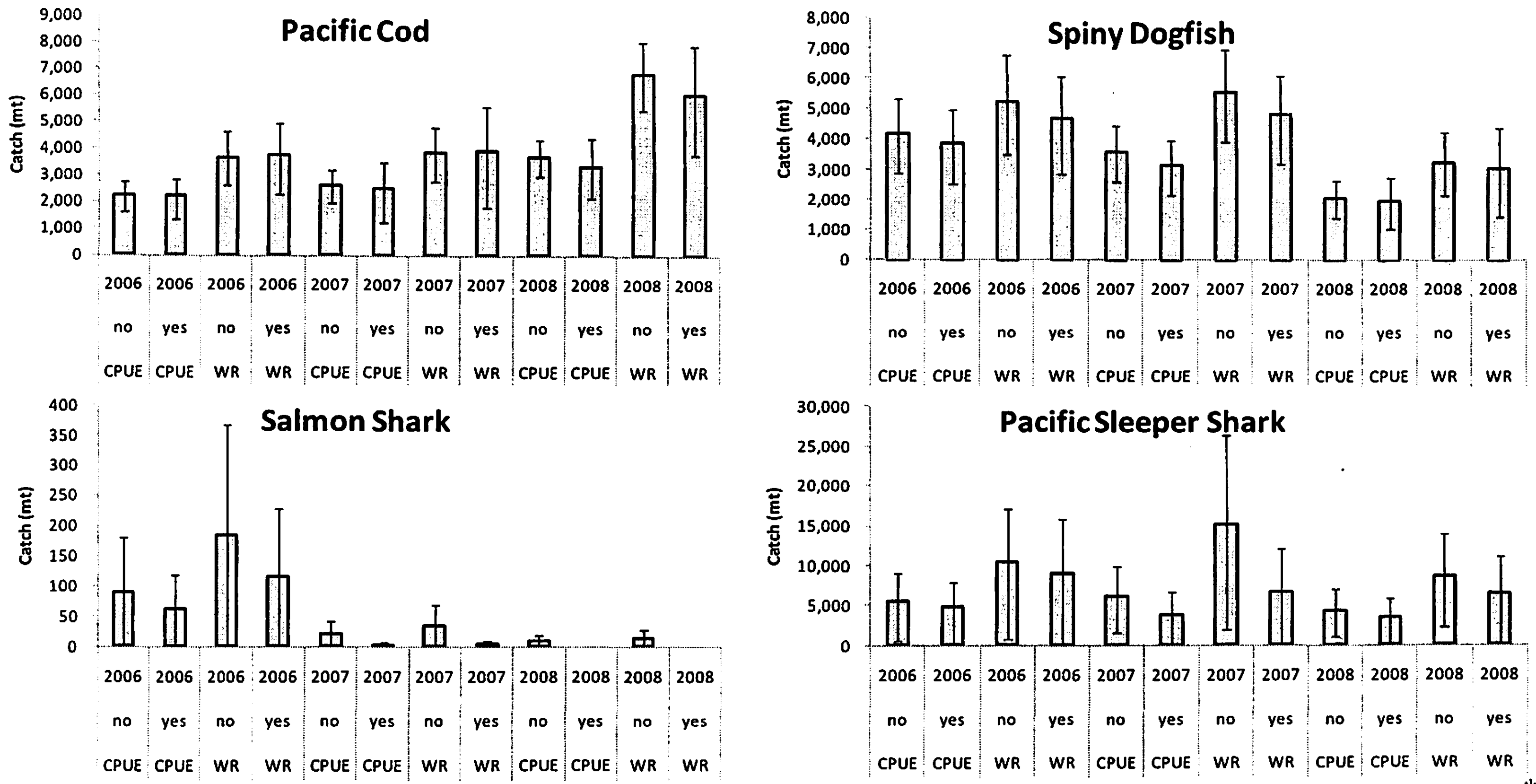

Figure 3. Estimates of catch in metric tons for each of the four example species. Each bar represents a different method/dataset scenario with 95th percentile confidence intervals (based on the CPUE estimates). The x-axis is composed of year, filtered (no=full dataset, yes=proportionally weighted dataset) and method of estimation (CPUE or Weight Ratio).

Amendment 80 Sector
Retention Compliance Standard Agreement

The North Pacific Fishery Management Council established regulatory retention levels based on historic retention performance for the Amendment 80 fleet. However, while the Amendment 79 analysis in front of the Council examined historic retention rates based on observer estimates in the blend and catch accounting system, the Council ultimately chose to measure retention using groundfish retention standard (GRS) methodology.

Implementation of the GRS resulted in the discovery that the retention calculation methodologies used in the Amendment 79 analysis and the GRS were not equal. As described in the Appendix to this document, these differences averaged 9 percent for the Alaska Seafood Cooperative (AKSC). In 2008, the first year of the program, the AKSC retained 91 percent of its groundfish as measured by the Amendment 79 calculation methodology, far beyond the 65 percent required by regulation. However, the GRS calculation methodology only measured retention at 77 percent.

At its June 2010 meeting, the North Pacific Fishery Management Council recommended that NMFS implement an emergency rule to temporarily remove groundfish retention standard regulations. The emergency rule would be in effect while a permanent FMP amendment solution is developed that addresses issues associated with Amendment 79 implementation and enforcement.

To continue to meet Council bycatch reduction goals during development of an alternative retention program, Amendment 80 participants have voluntarily agreed to maintain current high groundfish retention levels by complying with the following retention compliance standard (RCS). In this document, the term "parties" refers to any Amendment 80 cooperative and individual entities assigned to the Amendment 80 limited access fishery.

1. <u>Retention Compliance Standard</u>. Parties agree to meet or exceed an annual RCS of 85 percent (see appendix) using the following calculation methodology:

$$RCS = \frac{\text{Retained Groundfish Catch (Production RWE)}}{\text{Observed Total Groundfish Catch (CAS)}} + 9\%$$

   This is the same calculation methodology currently used by NMFS to calculate the GRS, and is annually calculated using the following data inputs:

- Retained groundfish catch is calculated as the total annual round weight equivalent of all retained groundfish species as reported in production data.
- Groundfish catch includes those species listed in Table 2a to 50 CFR 679.
- Observed total groundfish catch is calculated by flow scale measurements, less any non-groundfish, PSC species or groundfish species on prohibited species status.

  The RCS is measured on an annual basis. Each Amendment 80 cooperative agrees to meet or exceed the RCS of 85 percent. Each entity participating in the Amendment 80 limited access fishery agrees to operate each of its vessels in such a manner that they meet or exceed the RCS of 85 percent.

2. Monitoring Service. Parties agree that Seastate, Inc. will calculate each vessel or cooperative's annual RCS. Parties agree to take all actions and execute all documents that may be necessary to enable the Monitoring Service to calculate the RCS. In the event of a disputed RCS, an entity or cooperative may verify that data and calculations are correct. However, parties agree to Seastate, Inc. RCS calculations for purposes of compliance with this agreement.

3. Liquidated Damages Calculation. Liquidated damages described below are based on the recommended range of penalties found in the *Draft Policy for the Assessment of Civil Administrative Penalties and Permit Sanctions, NOAA Office of the General Council - Enforcement and Litigation*. That document can be found at http://www.nmfs.noaa.gov/ole/draft_penalty_policy.pdf.

Number of Offenses	Liquidated Damages Amount
1st	$25,000
2nd	$50,000
3rd and every thereafter	$100,000

4. Notice of Apparent Breach. The Monitoring Service shall monitor compliance with the terms and conditions of this Agreement. The Monitoring Service shall notify each party of any party who is out of compliance with the RCS.

5. Liquidated Damages Collection and Related Expenses. A party will pay liquidated damage amounts within ten (10) days of the end of the meeting described above. Liquidated damages will be remitted to:

   SeaShare

600 Erickson Avenue NE, Suite 310
Bainbridge Island, WA 98100

Liquidated damages amounts not paid when due shall accrue interest at a rate of interest equal to the prime rate of interest announced by Bank of America as of the last day of the voluntary compliance period plus twelve percent (12%). In addition to liquidated damages, parties shall be entitled to an award of the reasonable fees and expenses, including attorney's fees, a party incurs in connection with any action the party pursues to collect liquidated damages from the party in breach of this Agreement.

6. Annual third party audit. Each party agrees to conduct an annual audit of the RCS calculation and the data used within the calculation. Results of this audit will be reported to the parties, and the Council (see below.)

7. NMFS and Council reporting. Each party agrees to report its annual RCS to the Council at each April Council meeting. Cooperatives will include the RCS in their annual cooperative report, and Amendment 80 limited access participants shall create an RCS report. Each report will include the results of the third party audit above.

8. Agreement Term and Termination. This Agreement shall take effect January 20, 2011 and shall remain in effect until replaced by regulations implementing a Council approved groundfish retention program or until amended by the parties.

9. Miscellaneous.

    a. This Agreement contains the entire understanding of the parties as to the matters addressed herein, and supersedes all prior agreements related to the same. No amendment to this Agreement shall be effective against a party hereto unless in writing and duly executed by such party.

    b. This Agreement shall be governed by and construed in accordance applicable federal law and the laws of the State of Washington. Venue for any action related to this Agreement shall be in King County, Washington

    c. This Agreement may be executed in counterparts which, when taken together, shall have the same effect as a fully executed original. Delivery of a signed copy of this Agreement by telefacsimile shall have the same effect as delivering a signed original.

d. The parties agree to execute any documents necessary or convenient to give effect to intents and purposes of this Agreement.

e. All notices to be given hereunder shall be in writing and shall be deemed given upon the earlier of when received or three days after mailing addressed in accordance with the attached contact information.

f. This Agreement shall be binding on the successors and assigns of all parties hereto.

g. In the event that any provision of this Agreement is held to be invalid or unenforceable, such provision shall be deemed to be severed from this Agreement, and such holding shall not affect in any respect whatsoever the validity of the remainder of this Agreement.

h. Any dispute related to this Agreement shall be submitted to arbitration in Seattle, Washington upon written request of any party. The party's written request shall include the name of the arbitrator selected by the party requesting arbitration. The other party shall have twenty (20) days to provide written notice of the name of the arbitrator it has selected. If the other party timely provides such notice, the two arbitrators shall select a third arbitrator within twenty (20) days. If the other party fails to select an arbitrator within such period, then arbitration shall be conducted by the single arbitrator originally designated. However, if the other party responds within such period and designates an arbitrator, the three arbitrators so selected shall schedule the arbitration hearing as soon as possible thereafter. Every arbitrator, however chosen, shall have experience in, or experience advising entities that have experience in, the commercial fishing industry of the Bering Sea, shall have no material ties to either party to the dispute, or to any other Amendment 80 QS holder unless the parties agree otherwise, and shall have executed a confidentiality agreement satisfactory to the parties. The decision of the arbitrator, or, in the case of a three-arbitrator panel, the decision of the majority, shall be final and binding. The arbitrator, or, in the case of a three-arbitrator panel, the majority of the arbitrators, shall select the rules of arbitration.

i. Nothing contained in this Agreement shall be construed to make the parties to this Agreement partners, joint ventures, co-owners or participants in a joint or common undertaking. The parties may otherwise engage in or possess an interest in other business ventures of every nature and description, independently or with others, including but not limited to, the ownership, financing, management, employment by, lending to or otherwise participating in businesses which are similar to the business of the other parties, and no party shall have any right by virtue of this Agreement in and to such independent ventures or to the income or profits therefrom, nor shall any party by virtue of this Agreement be subject to any obligations or liabilities arising out of or related to such businesses. The parties agree that their mutual obligations under this Agreement extend only to their groundfish retention activities, and nothing in this Agreement shall be construed as permitting or obligating its parties to collaborate in any other manner.

Appendix 1

Analysis of Proposed Retention Compliance Standards

Amendment 79 currently requires that the Amendment 80 sector meet a retention standard that increases from 65% in 2008 to 85% in 2011. The Amendment 79 analysis examined the changes in retention percentages by looking at historical data. Throughout the analysis, computations of historical retention percentages and increased retention tonnages were made using "blend" and/or catch accounting system (CAS) data. Total catch and retained catch were derived from these data sources, both of which use a mixture of production and observer data as the basis for calculations. Thus, retention percentage based on the blend (from here on "blend" refers to either the older blend formula or the post-2003 CAS estimate) would be determined as:

$$Rb = \frac{Retained\ catch\ (blend)}{Total\ catch\ (blend)}$$

where (*blend*) indicates a data source that is comprised of a mix of observer and production data. The Council ultimately chose to define a groundfish retention standard expressed as the ratio of the round weight equivalent of retained product to total catch, or:

$$GRS = \frac{Retained\ catch\ (production\ RWE)}{Total\ catch\ (blend)}$$

Throughout the Amendment 79 analysis, there exists an implied assumption that the retention percentage calculated by the new GRS method would be the same as the retention percentage calculated by Rb. However, this assumption was not examined in the analysis and no production round-weight equivalents were presented that would allow a reader to compute the GRS standard that was adopted. Data presented below indicate that the GRS formula returns a significantly lower number than the Rb retention percentage calculation used throughout the analysis. The effect of this difference is to require much greater retention of catch by the Amendment 80 fleet than was anticipated by the Council.

The Amendment 80 sector had, preparatory to coop formation, requested blend, CAS, and WPR information from NMFS. An analysis of those historic data shows a marked contrast to results and conclusions on the effects of the various Amendment 79 alternatives presented in the analysis. In the first year of operation under Amendment 79, vessel operators were able to increase both Rb and GRS dramatically. The GRS is consistently less than Rb, and BUC vessels were still only able to achieve 77% under the GRS calculation. Using the Amendment 79 analysis methodology (ie. with Rb as a proxy for GRS), Rb increases from 77% to 91% between 2007 and 2008. However, the fleet's apparent retention is still only 77% because it's now measured by GRS rather than Rb.

Harvest and retention by Blend/CAS and produce RWE for BUC vessels. Tremont (<125') excluded 2005-2007 because of incomplete data. Seastate data received from NMFS.

Year	Blend / CAS total catch	Blend / CAS retained catch	Production report retained retained catch	Blend / CAS retention (Rb) %	Groundfish retention standard retention (GRS) %	Difference: CAS-GRS
1999	155,667	101,856	88,633	65%	57%	8%
2000	178,563	120,474	98,705	67%	55%	12%
2001	158,781	116,455	102,434	73%	65%	9%
2002	190,247	132,061	116,800	69%	61%	8%
2003	188,257	129,620	114,116	69%	61%	8%
2004	217,658	145,767	130,801	67%	60%	7%
2005	201,586	153,673	136,311	76%	68%	9%
2006	196,360	151,422	133,929	77%	68%	9%
2007	211,325	163,437	147,119	**77%**	**70%**	8%
2008	260,296	235,580	200,161	**91%**	**77%**	14%
2009	251,602	226,886	203,673	**90%**	**81%**	9%
Average	200,940	152,476	133,880	75%	66%	9%

The average difference between the1999-2009 blend and GRS calculations is 9%. Therefore, GRS percentages would need to be adjusted downward to meet Council intended retention goals as they understood them during deliberations of Amendment 79. These adjustments are reflected in the following table.

GRS Schedule	Annual GRS	Annual RCS
2010	80%	71%
2011 and each year thereafter	85%	76%

C-7(a) Supplemental

BSAI Scientific and Statistical Committee Recommendations for final OFL, ABC and Advisory Panel Recommendations for TAC (mt) for 2011 and 2012.

		2010				2011			2012		
Species	Area	OFL	ABC	TAC	Catch	OFL	ABC	TAC	OFL	ABC	TAC
Pollock	EBS	918,000	813,000	813,000	809,238	2,450,000	1,270,000	1,252,000	3,170,000	1,600,000	1,253,658
	AI	40,000	33,100	19,000	1,266	44,500	36,700	19,000	50,400	41,600	19,000
	Bogoslof	22,000	156	50	131	22,000	156	50	22,000	156	50
Pacific cod	BSAI	205,000	174,000	168,780	159,012	272,000	235,000	227,950	329,000	281,000	229,608
Sablefish	BS	3,310	2,790	2,790	721	3,360	2,850	2,850	3,080	2,610	2,610
	AI	2,450	2,070	2,070	1,049	2,250	1,900	1,900	2,060	1,740	1,740
Yellowfin sole	BSAI	234,000	219,000	219,000	114,600	262,000	239,000	196,000	266,000	242,000	197,660
Greenland turbot	Total	7,460	6,120	6,120	3,589	7,220	6,140	5,050	6,760	5,750	4,950
	BS	n/a	4,220	4,220	1,706	n/a	4,590	3,500	n/a	4,300	3,500
	AI	n/a	1,900	1,900	1,883	n/a	1,550	1,550	n/a	1,450	1,450
Arrowtooth flounder	BSAI	191,000	156,000	75,000	38,098	186,000	153,000	26,000	191,000	157,000	26,000
Kamchatka flounder	BSAI	n/a	n/a	n/a	n/a	23,600	17,700	17,700	23,600	17,700	17,700
Northern rock sole	BSAI	243,000	240,000	90,000	53,111	248,000	224,000	85,000	243,000	219,000	85,000
Flathead sole	BSAI	83,100	69,200	60,000	19,863	83,300	69,300	41,548	82,100	68,300	41,548
Alaska plaice	BSAI	278,000	224,000	50,000	15,771	79,100	65,100	16,000	83,800	69,100	16,000
Other flatfish	BSAI	23,000	17,300	17,300	2,179	19,500	14,500	3,000	19,500	14,500	3,000
Pacific Ocean perch	BSAI	22,400	18,860	18,860	16,567	36,300	24,700	24,700	34,300	24,700	24,700
	BS	n/a	3,830	3,830	2,267	n/a	5,710	5,710	n/a	5,710	5,710
	EAI	n/a	4,220	4,220	4,033	n/a	5,660	5,660	n/a	5,660	5,660
	CAI	n/a	4,270	4,270	4,033	n/a	4,960	4,960	n/a	4,960	4,960
	WAI	n/a	6,540	6,540	6,234	n/a	8,370	8,370	n/a	8,370	8,370
Northern rockfish	BSAI	8,640	7,240	7,240	4,039	10,600	8,670	4,000	10,400	8,330	4,000
Blackspotted/Rougheye	BSAI	669	547	547	232	549	454	454	563	465	465
	EBS/EAI	n/a	n/a	n/a	n/a	n/a	234	234	n/a	240	240
	CAI/WAI	n/a	n/a	n/a	n/a	n/a	220	220	n/a	225	225
Shortraker rockfish	BSAI	516	387	387	252	524	393	393	524	393	393
Other rockfish	BSAI	1,380	1,040	1,040	676	1,700	1,280	1,000	1,700	1,280	1,000
	BS	n/a	485	485	179	n/a	710	500	n/a	710	500
	AI	n/a	555	555	497	n/a	570	500	n/a	570	500
Atka mackerel	Total	88,200	74,000	74,000	68,643	101,000	85,300	53,080	92,200	77,900	48,593
	EAI/BS	n/a	23,800	23,800	23,599	n/a	40,300	40,300	n/a	36,800	36,800
	CAI	n/a	29,600	29,600	26,387	n/a	24,000	11,280	n/a	21,900	10,293
	WAI	n/a	20,600	20,600	18,657	n/a	21,000	1,500	n/a	19,200	1,500
Squid	BSAI	2,620	1,970	1,970	402	2,620	1,970	425	2,620	1,970	425
Other species	BSAI	88,200	61,100	50,000	16,614	n/a	n/a	n/a	n/a	n/a	n/a
Skate	BSAI	n/a	n/a	n/a	16,419	37,800	31,500	16,500	37,200	31,000	16,500
Shark	BSAI	n/a	n/a	n/a	47	1,360	1,020	50	1,360	1,020	50
Octopus	BSAI	n/a	n/a	n/a	149	528	396	150	528	396	150
Sculpin	BSAI	n/a	n/a	n/a	5,168	58,300	43,700	5,200	58,300	43,700	5,200
Total	BSAI	2,462,945	2,121,880	1,677,154	1,347,836	3,954,111	2,534,729	2,000,000	4,731,995	2,911,610	2,000,000