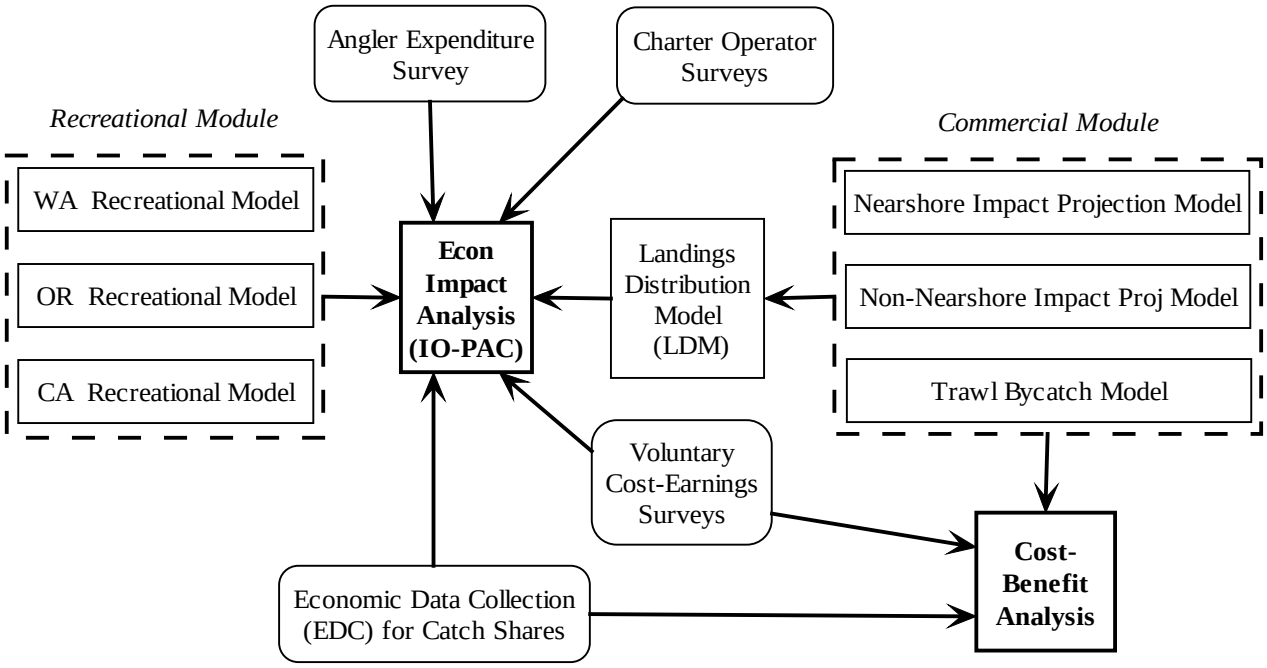
STATEMENT OF THE SSC ECONOMICS AND GROUNDFISH SUBCOMMITTEES' REVIEWS CONDUCTED IN 2012-13 OF DATA AND MODELS TO BE USED IN THE SOCIOECONOMIC ANALYSIS FOR THE 2015-16 GROUNDFISH BIENNIAL SPECIFICATIONS PROCESS

The Council's groundfish harvest specification (Spex) process requires preparation of an extensive regulatory analysis. The socioeconomic portion of that analysis is broad in scope – covering all relevant commercial and recreational fishery sectors – and relies on a sizeable number of datasets and models. In 2012-2013 the SSC Economics and Groundfish Subcommittees (SSC-E/GF) conducted a series of reviews of the datasets and models that underlie the Spex socioeconomic analysis. The purpose of those reviews was to provide a more thorough evaluation of each socioeconomic component than could be accomplished within a single Spex cycle.

Two types of analyses are desirable for analyzing the socioeconomic effects of management alternatives considered in the Spex process: (1) an analysis of community effects, including economic impacts on regional employment and income that occur as money generated in commercial and recreational fisheries circulates through the regional economy, and (2) an analysis of costs and benefits incurred in affected commercial fisheries (measured by net revenues) and recreational fisheries (measured by net revenues for charter boat operators, and consumer surplus for recreational anglers). In past Spex cycles, the socioeconomic analysis focused largely on economic impacts. In recent years, economic survey data have become available that allow costs and benefits of management alternatives to be analyzed for the trawl, fixed gear, catcher-processor and processor sectors of the commercial fishery.

The following chart describes the data and models that will serve as the basis for the economic impact analysis and the cost-benefit analysis in the 2015-16 Spex process.



In 2012-13 the SSC-E/GF reviewed a number of the datasets and models shown in the chart, as follows:

- Oregon Recreational Model – reviewed March 3, 2012
- Washington and California Recreational Models – reviewed September 15, 2012
- Non-Nearshore and Nearshore Impact Projection Models – reviewed March 8, 2013
- IO-PAC Model and Economic Data Collection (EDC) Program – reviewed April 7, 2013

SSC recommendations regarding components of the chart that were not reviewed in 2012-13 are as follows:

- The SSC Economics Subcommittee reviewed the Landings Distribution Model in September 2011. Results of that review are provided in the SSC Minutes in the Council's November 2011 Briefing Book. **Based on that review, the SSC-E/GF recommends that the 2015-16 Spex socioeconomic analysis include information regarding the predictive performance of LDM projections by port area and sector.**
- The SSC reviewed the voluntary cost-earnings surveys in November 2009. Further review of these surveys is a low priority at this time, given that the methodologies have not changed substantially since 2009.
- The SSC reviewed an earlier version of the Trawl Bycatch Model a decade ago. Due to major changes in the fishery since that time (most notably catch shares), **review of the current Trawl Bycatch Model is a high priority.**
- The most recent NMFS angler expenditure survey was completed in 2011. A charter operator survey was completed in Oregon and Washington in 2007 and a similar survey is currently underway in California. **Reviews of the angler expenditure and charter**

operator surveys remain to be done, but are a lower priority than the Trawl Bycatch Model.

SSC statements regarding each of the reviews conducted during 2012-13 are attached. In addition to the specific recommendations in these reviews, the SSC-E/GF has some additional procedural recommendations as follows:

- The attached reviews include recommendations regarding analyses that the SSC-E/GF would like to see in the EIS for the 2015-16 Spex. **The SSC-E/GF recommends that planning for the 2015-16 Spex EIS include identification of responsible parties and a schedule that provides adequate opportunity to review the socioeconomic analyses.**
- The attached reviews identify data and modeling issues that could more feasibly be resolved over the longer term. The Council has a process for considering technical issues to be addressed in off-years of the Spex cycle. **The SSC-E/GF recommends that some of the longer-term issues identified in the 2012-13 reviews be included among the candidate topics for off-year discussion.**
- The SSC-E/GF met with the GMT on April 2, 2012 to discuss issues raised by the GMT regarding socioeconomic as well as biological effects of rebuilding plans. **The SSC-E/GF recommends that technical issues raised by the GMT in the context of rebuilding also be considered as candidates for discussion in off-years of the Spex cycle.**
- The GMT and NWFSC have provided considerable documentation regarding the data and models reviewed in 2012-13. **The SSC recommends that these documents be made publicly available on the Council website or some other suitable venue.**

The SSC-E/GF thanks all of the individuals who provided documentation and participated in reviews, and also thanks Council staff for their involvement in the planning these reviews.

ATTACHMENT 1
Statement of SSC Economics and Groundfish Subcommittees
Oregon Recreational Model

The Economic and Groundfish Subcommittees of the Scientific and Statistical Committee (SSC-E/GF)[1] met on 3 March 2012 in Sacramento, California to review a report on models for estimating groundfish impacts by the recreational fisheries off the coast of Oregon. The *Oregon Recreational Groundfish Model* report, prepared by staff from the Oregon Department of Fish and Wildlife (ODFW), was circulated to the SSC-E/GF several weeks prior to the meeting. Mr. Patrick Mirick (ODFW) presented slides summarizing the ODFW report, and answered questions about Oregon's recreational groundfish models. During the first few hours of the meeting Ms. Lynn Mattes, ODFW's representative on the Groundfish Management Team (GMT), and some other members of the GMT were also available to address questions. The SSC-E/GF discussed topics for future socioeconomic model reviews prior to concluding the meeting.

The ODFW report discussed several models involved in calculating harvest impacts (landings plus mortal discards). Most of these models are used internally by ODFW to inform pre- and in-season management decisions, but some of them also feed into the IO-PAC model. Included in the report, and discussed during the review meeting, were models for (1) estimating harvest and discard mortality, (2) projecting harvest and discard mortality in the recreational fishery for non-halibut groundfish, (3) projecting harvest and discard mortality in the recreational fishery for halibut, and (4) projecting the impacts of changes to bag limits. There was also an exploration of models that used multiple independent variables (e.g., gas prices, weather conditions, and landings in other recreational fisheries) to predict harvest impacts for yelloweye rockfish, a major constraining species. The report and presentation included example applications of the models and some evaluations of model performance.

Oregon's Recreational Boat Survey

The fundamental source of information for all the Oregon recreational fishery models is the Oregon Recreational Boat Survey (ORBS). The survey crews interview anglers at Oregon ports to collect data by species on angler catch rates and discard rates (fish per angler-day), as well as to measure biological characteristics of the landed fish. Daily logbooks from charter vessels and counts of bar crossings by private boats together provide a near census of the boat-level fishing effort. However, the ORBS program conducts limited sampling from minor ports or during winter months. Also, ODFW has not collected data on estuary or bank fishing activities since 2002.

Estimating harvest and discard mortality

The ORBS samplers have collected information on fishing depths since March 2009. Prior to March 2009, data on fishing depths were only available from a limited number of observed charter boat trips. The availability of fishing depth information has allowed ODFW to use the

[1] SSC participants included Vladlena Gertseva, Owen Hamel, André Punt, David Sampson, Cindy Thomson, and Theresa Tsou.

GMT's "death-by-depth" mortality rate table to estimate the depth-specific numbers of released fish that subsequently died. To estimate the overall weight of the dead fish by species, the mortality numbers for a species are multiplied by the average weight of released fish for that species. The average fish weights by species, which are based on a long-term accumulation of data, are periodically re-estimated as more data become available.

The ODFW calculations of harvest and discard mortality do not include estimates of standard errors or other measures of variability. Given the design of the ORBS system, it should be feasible to develop approximate variance estimators that could then be used to evaluate sampling efficiency. It may be possible to achieve increased sampling efficiency by rebalancing of sampling effort (e.g., shifting sampling effort among months or ports). **The SSC-E/GF therefore recommends that measures of uncertainty be developed and reported.**

Projecting harvest and discard mortality

The availability of fishing depth information from ORBS also allowed ODFW to project the potential effects of changing the maximum fishing depth restriction, which is the primary management tool that ODFW uses to reduce impacts by the recreational fishery on overfished species, particularly yelloweye rockfish. For example, if fishing were to be restricted to waters shallower than 30 fathoms, the proportion of fishing effort that ORBS found in depth-bins deeper than 30 fathoms would be redistributed to the shallower depth-bins to project the resulting landings and associated release mortalities. The model does not attempt to project changes in fishing effort resulting from a new depth restriction, but instead uses the average value from recent years. This procedure may over-estimate impacts if the number of angler days declines when regulations become more restrictive. However, the procedure is intended for purposes of conservative management rather than accuracy in effort projections. Also, the model works on a statewide basis rather than projecting port-level impacts. **The SSC-E/GF recommends that ODFW consider whether the distribution of effort by depth-bin varies by port. If so, effort projections may be better done at the port level, with port-specific results aggregated to derive statewide estimates.**

Projecting harvest and discard mortality in the halibut fishery

The recreational fishery for halibut in the waters off Oregon, which is limited to a few short open seasons each year, has some impacts on the overfished stocks of yelloweye rockfish and canary rockfish. However, linear regressions of yelloweye rockfish bycatch versus halibut harvest and canary rockfish bycatch versus halibut harvest indicate no significant relationships. Given that the halibut fishery would not catch rockfish if there was no halibut season, it would be sensible to force the regression line to go through the origin. Nonetheless, the scatterplot of the data indicates that the projections of rockfish bycatch during the halibut fishery will be highly uncertain irrespective of the chosen model.

Projecting the effects of bag limit changes

The ODFW also uses daily bag-limits to regulate the pace of the marine recreational fishery off Oregon. There is an overall bag-limit for an angler's daily landed catch of rockfish, greenling and cabezon (the RGC limit), and there are separate daily bag-limits for lingcod and flatfish

other than Pacific halibut. Given that Oregon's recreational fisheries are primarily constrained by the catch limits available for yelloweye rockfish and canary rockfish, the RGC bag-limit is the one most pertinent for current conditions. The RGC bag-limit was 10 fish-per-angler-day for all of 2004, 8 fish-per-angler-day at the start of 2005, 6 fish-per-angler-day at the starts of 2006-2009, and 7 fish-per-angler-day at the starts of 2010 and 2011. There were mid-season downward adjustments of the bag-limit in 2005 and 2008, and an upward adjustment in 2009.

The ODFW report described an approach for predicting the effects of bag-limit changes that used a multiplier table derived from observed angler catches under different bag-limits. The approach produced some unusual predictions. The multiplier table for black rockfish, for example, predicted that dropping the bag-limit from 5 fish to 4 fish would produce an increase in the harvests of black rockfish. **A smoothing or interpolating model should be applied to the observed angler catch data to fill in cells in the multiplier table for which there were no data and thereby avoid illogical results.** However, predictions for cells that lie outside the range of the observed data are likely to be highly uncertain no matter what prediction method is used.

Predicting how anglers will react to a change in bag-limit is difficult. Past fishing seasons only provide observations for a limited number of particular bag-limit change combinations (e.g., from 10 fish to 8 fish, but not from 10 to 9, 10 to 7, or 10 to 6, etc.). Further, with an aggregate bag-limit such as the RGC group of species, the limit is most likely to affect fishing behavior associated with the most abundant species, for which the bag-limit is most likely to become binding. The aggregate limit will have only an indirect effect on rare species. Also, a decrease in a bag-limit may have little effect on fishery impacts of constraining species if anglers discard the fish that put them over the bag-limit or if they high-grade their retained catch. **The SSC-E/GF recommends that ODFW consider the effects of bag limit changes on discarded as well as retained catch.**

There are relatively few published works that address the issue of predicting the effects of changes in bag-limits. The workshop that explored Recreational CPUE Statistics, held in Santa Cruz during June 2004, included a presentation by Dr. Alec MacCall that reviewed several approaches to adjusting CPUE data for changes in bag-limits. Predictions outside of the range of the observed data are likely to be highly uncertain, however.

Overall conclusion of review

Of the three ODFW projection models reviewed during this meeting, the SSC-E/GF conclude that **the model for projecting harvest and discard mortality uses appropriate data and methods and provides a sound basis for making management decisions. The model for projecting harvest and discard mortality in the halibut fishery, with some small modifications as indicated above, also uses appropriate data and methods and provides a sound basis for management decisions.** Projecting the effects of bag limit changes, however, is a difficult task for which there is little theory and limited empirical data. **This projection model requires additional development and review.** Of the recommendations made above, the **highest priority is the development of variance estimates for harvest and discard mortalities**.

Issues for future reviews

Several questions arose during the meeting that could not be answered by anyone present. It would be beneficial if the questions below could be addressed during the process of documenting the Council's groundfish harvest specification process.

- What information (e.g., raw data, estimates of impacts and effort, or projected impacts for different scenarios) do the state fishery agencies provide to the IO-PAC model? What is the process used for moving the states' data into IO-PAC?
- How does RecFIN estimate the recreational fishery landings of groundfish for each of the states? Are RecFIN estimates of impacts and effort different from the data that underlie the IO-PAC projections? The SSC-E/GF understands that ODFW staff had been unable to exactly reproduce the discard mortality that RecFIN had estimated for Oregon.
- How do methods used by the GMT for pre-season projections differ from the methods used for projections in the IO-PAC model?

ATTACHMENT 2
Statement of the SSC Economics and Groundfish Subcommittees
Washington and California Recreational Groundfish Models

The SSC Economics and Groundfish Subcommittees (SSC-E/GF)[2] met on September 15, 2012 in Boise, Idaho to review the Washington and California recreational groundfish models. These models are important inputs to the estimation of groundfish economic impacts, and their review is part of a continuing SSC review process that began with the Oregon recreational groundfish model in March 2012. There were three separate presentations at the review meeting. Dr. Ed Waters described how fishery projections from the state models feed into regional (community) economic impact assessments. Ms. Heather Reed of the Washington Department of Fish and Wildlife (WDFW) presented the Washington model. Mr. John Budrick of the California Department of Fish and Wildlife (CDFW) presented the California RecFISH model. The SSC-E/GF thanks all three presenters for providing review materials and for their clear and informative presentations.

Information and Process Used for Regional Impact Estimation

Dr. Ed Waters provided the SSC-E/GF with a presentation to clarify the information and process used to estimate regional economic impacts. These include the key inputs to the NWFSC's IO-PAC model, which is the model used in the Council process to estimate regional economic impacts. The IO-PAC model itself will be reviewed by the SSC at the April 2013 Council meeting.[3]

For recreational fisheries, the regional economic impacts resulting from alternative management actions are driven by changes in angler trips, which in turn drive changes in angler expenditures, which are then fed into the IO-PAC model. Thus, changes in IO-PAC outputs (income and employment) are only affected by alternatives that affect (or are modeled to affect) the number of angler trips (days fished).

Each state forecasts changes in angler trips by mode for each management alternative. Total trip expenditures are estimated by multiplying the angler trip forecast for each state and mode by an estimate of expenditures per angler trip for the same state and mode. The per-angler-trip estimates are based on an angler expenditure survey conducted by NMFS Headquarters, with the assistance of NMFS Science Centers, and license files provided by the states. The most recently available survey data are from 2008. The survey was updated in 2011, and thus more current expenditure data are expected to be available for the next Spex cycle (2015-16). One potential source of bias in the expenditure data is incomplete license files for some modes in some states. For example, charter operators in the state of Washington may issue licenses to charter anglers without recording the angler's address or other contact information. If anglers who purchase their licenses through the charter operator have different expenditure profiles (e.g., are more likely to reside out of state or to be less avid) than anglers who purchase licenses through the

[2] SSC participants included Dan Huppert, Todd Lee, André Punt, David Sampson, Cindy Thomson,

[3] The review of the IO-PAC Model is contained in Attachment 4.

state's computerized system, their expenditure profile will be biased. The size and direction of any possible bias is not known.

Recommendations:

- In order to facilitate future SSC reviews of recreational economic impacts, **all analyses and procedures need to be fully documented.** The documentation should be sufficient to allow a third party to replicate the analysis and results. **Such documentation should include a description of state effort projections and any modifications made to those projections before they are relayed to the NWFSC for input into the IO-PAC model.** This work would likely need to be coordinated by Council staff and should be completed in time to be included in the draft EIS for the 2015-16 Spex.

- Angler expenditure data collected during 2011 will be used to estimate regional economic impacts for the recreational fishery in the 2015-16 Spex process. **Documentation should include a description of potential sources of bias in the data and bias correction procedures – or an explanation why such procedures cannot be applied.**

Washington Model

The SSC-E/GF reviewed the WDFW report "Recreational Impact Projection Methods", dated August 2012. Ms. Heather Reed provided the SSC-E/GF with a presentation.

WDFW's Ocean Sampling Program (OSP) is the primary data input to Washington estimates of catch (retained and released) and effort. Sampling is stratified by port (primarily four ports) and day type (weekday and weekend), and post-stratified by state management area (Areas 1-4) and trip type. Yelloweye and canary rockfish are the most constraining stocks in the Washington recreational fishery. Catch of these species is managed through ACLs, depth restrictions and area closures. Regulations tend to be more restrictive in the North Coast area, due to higher yelloweye encounter rates. Regulations within each management area have been fairly stable in recent years.

Washington has relied on an *ad hoc* approach to estimate the effects of management measures on catch and effort, based on historical data. If the ACLs for overfished species do not change, it is assumed that catch will not change. This was the approach used in the 2013-14 Spex cycle. If the ACLs changes, or if depth or area restrictions change, as was the case during the 2011-12 Spex cycle, changes in catch, driven by changes in overfished species catch, are projected using historical data.

Effort projections are not linked to catch. Instead, changes in depth restrictions are assumed to affect the spatial distribution of effort but leave the overall level of effect unchanged. Thus, effort projections tend to be very similar from one year to the next.

The SSC-E/GF agrees that this approach is reasonable so long as fishery-related drivers of effort are relatively constant. These drivers include not just area/depth restrictions but also catch rates, bag limits, size distribution, catch composition, season length, and conditions in

other (substitute or complimentary) fisheries. Economic impacts are also insensitive to fishery-related drivers and thus relatively invariant among the alternatives because the effort projections are the basis for estimating the regional economic impacts of management alternatives considered in the Spex cycle,

Recommendations:

- **The SSC-E/GF recommends a retrospective analysis of how effort projections based on this approach compare with post-season effort estimates for past Spex cycles to better understand the past performance of Washington's *ad hoc* approach to projecting effort. The SSC-E/GF would like to see the results of this retrospective analysis when it reviews the draft EIS for the 2015-16 Spex.**
- Even if the *ad hoc* approach has projected effort fairly well in recent Spex cycles (due to stable trends in fishery-related drivers), the approach may not work so well if area/depth restrictions and other drivers were to change more substantially in future years. **Over the longer term, it would be useful to develop models that predict the effect of fishery-related drivers on angler effort.** Such models would allow the Council to more accurately consider the economic impacts of management alternatives.

California RecFISH Model

The SSC-E/GF reviewed the "California Recreational Groundfish Model for 2013/14". Mr. John Budrick provided the Economic Subcommittee with a presentation.

The California RecFISH model is a catch-based model which is used to estimate catch (mortality) and effort for alternative management scenarios, or conversely determine what season and depth restrictions would be necessary to constrain mortality within management limits. The data for the model are primarily from the Marine Recreational Fishery Statistics Survey (1980-2003) and the California Recreational Fisheries Survey (CRFS) (2004-present), supplemented with some data from Oregon to provide sufficient data coverage for California's Northern management area.

The general catch projection framework involves determining what the baseline catch would have been without depth and time closures. Baseline catch is determined for each of the five management areas, four modes and six two-month waves on the basis of historical catch data collected in years prior to depth and time closures. The depth and time closures are then applied, which redistribute catch to open depths within a management area. Mortality is calculated using depth-dependent mortality rates.

The effects of effort shifts on mortality are calculated only when depth closures occur at 30 fathoms (fm) or less. Specifically, effort and mortality are assumed to increase in open shallower-water areas by 27.6% and 39.3% when depth restrictions occur inside 30 fm and 20 fm, respectively. This is intended to help predict potential effects of such closures on shallow water species. Effort also changes when the duration of the season changes, based on the assumption that effort that would have occurred in a management area during closed months disappears rather than shifting to an open month. Other factors that affect catch such as size and

bag limits and area closures (e.g., Yelloweye Rockfish Conservation Area) may be taken into account, though not in a systematic manner.

Recommendations:

- The California RecFISH model includes a number of assumptions regarding how effort is influenced by regulations pertaining to season length, depth restrictions, and the like. These assumptions are important, as the effort projections are what drive the projections of regional economic impacts of management alternatives considered in the Spex cycle. The assumption that **certain types of depth closures cause effort to increase in shallower waters by specific percentages** originates with the contractor who developed the RecFISH model; the basis for this assumption is unclear. The assumption that **all of the effort that historically occurred in a given month would disappear if the fishery were closed in that month** is rather restrictive. **Both of these assumptions should be validated. This validation could be extended to more broadly examine how the proportion of effort varies by time (month) and depth, using recent historical data.**
- The SSC-E/GF appreciated the work that went into the retrospective analysis, which was very informative. However, to better understand how the model performs in relation to its use in IO-PAC, it would be necessary to **redefine the areas so that they correspond to the areas used in the Spex process and focus the analysis on effort rather than catch.** The SSC-E/GF also recommends other model diagnostics and reporting as follows:
  - Since there are a large number of projections (bins) in the model, **a useful summary statistic is the number of correct predictions (with "correct" defined within a given bound).**
  - **Since there are CVs associated with the data used in the model, these could be carried through the model to show measures of uncertainty in the final output.**

The SSC-E/GF would like to receive an analysis showing progress-to-date for implementing the above recommendations when it reviews the draft EIS for the 2015-16 Spex.

ATTACHMENT 3
Statement of the SSC Economics and Groundfish Subcommittees
Non-Nearshore and Nearshore Impact Projection Models

Members of the SSC Economics and Groundfish Subcommittees (SSC-E/GF)[4] met on March 8, 2013 in Tacoma, Washington to review the Non-Nearshore and Nearshore Impact Projection Models used by the Groundfish Management (GMT). Key participants at the meeting included Messrs. Corey Niles (WDFW), Dan Erickson (ODFW), and Bob Leos (CDFW). Additional substantive input was also provided by Ms. Marlene Bellman and Mr. Jason Jannot (NWFSC West Coast Groundfish Observer Program). The SSC appreciates the time spent by each of these individuals in preparing for and participating in these reviews.

Non-Nearshore Impact Projection Model

Mr. Corey Niles (WDFW) provided the SSC-E/GF with documentation regarding the Non-Nearshore Impact Projection Model (*Description of the Groundfish Management Team's Non-Nearshore Bycatch Projection Model, Prepared for the SSC Economics Subcommittee Review*) as well as a presentation summarizing highlights of the Model. The purpose of the model is to project bycatch under alternative Rockfish Conservation Area (RCA) configurations. The management use is to determine the smallest closed areas that are likely possible without exceeding the allocation of overfished species. Yelloweye is the most important overfished species addressed by the model, though projections for other species, primarily canary, are also calculated. The bycatch projections are for fixed gear vessels targeting sablefish (hook-and-line and pot) seaward of the RCA north of 36^{o} N, though the model is primarily used to project changes in the RCA in four management areas north of 40^{o} 10'. It covers both the limited entry and the open access fisheries. To date, the model has been successful at ensuring allocation of overfished species are not exceeded.

The model projections are currently based on observer data from 2002-11. The key mathematical calculation for the model projections is the ratio of observed catch of a particular bycatch species to the observed retained sablefish catch. Currently this ratio is calculated as a grand mean for the entire time span of the data (2002-11). The grand mean was used in the model initially because, when the model was first constructed, there was not an adequate sample of data without aggregating across all years. The practice of using the grand mean has continued.

Output from this model does not currently affect economic measures that are used as part of the biennial specification process, including IO-PAC regional economic impacts and vessel profitability. This is due to the fact that it is assumes the entire allocation of target species is caught. However, the SSC-E/GF notes that changes in the RCA could affect several variables that have a bearing on economic performance. These include changes in the ports of landing, fish quality or size, and the cost of fishing. A more complete analysis of these changes would better clarify the effects of changes in the RCA.

[4] SSC participants included Daniel Huppert, Todd Lee, André Punt, David Sampson and Cindy Thomson.

The SSC-E/GF has the following recommendations for investigating model performance and improving model reporting:

- **The SSC-E/GF recommends that further data analysis be conducted to determine if there is a trend in the data, and to also better understand the year-to-year variation in the data.** The outcome of this analysis should be used to determine which years of the data should be used and if data weighting should be used (e.g., weight more recent years higher that more distant years).
- **A measure of variability should be developed and included with the projection estimates.** This could be accomplished through a Monte Carlo analysis.
- The model uses retained sablefish catch. **Due to possible highgrading of the catch, this could be a source of error if retained catch has a different bycatch rate than discarded catch. This issue should be explored to the extent possible.**

Nearshore Impact Projection Model

Messrs. Dan Erickson (ODFW) and Bob Leos (CDFW) provided the SSC-E/GF with documentation regarding the Nearshore Impact Projection Model (*Groundfish Management Team's Commercial Nearshore Bycatch Projection Model, 02-13-2013*) as well as a presentation summarizing highlights of the model. The Nearshore Model is used to estimate bycatch, discard and discard mortality of overfished species that constrain fixed gear vessels operating shoreward of the non-trawl RCA in Oregon and California. Yellowtail and canary rockfish are the major constraining species for these vessels.

Bycatch estimates for overfished species are derived on the basis of landings of nearshore species in three area strata (from PacFIN). Landings in each area are allocated among three depth bins based on depth distribution data collected in the NWFSC's West Coast Groundfish Observer Program (WCGOP). Catch of overfished species as a proportion of total landings is estimated for each area and depth from available WCGOP data (currently 2003-2011) as a grand mean, that is by dividing the cumulative weight of each overfished species by the cumulative weight of retained nearshore species. Discard mortality by depth is estimated by applying recreational discard mortality rates to overfished species caught with 'recreation-like' gear (jig, rod-and-reel, pole) and a 100% mortality rate to catches made with 'non recreation-like' gear (i.e., all other commercial fixed gears). The proportion of 'recreation-like' versus 'non recreation-like' gear deployed at each depth is estimated for Oregon and California on the basis of 2004-2006 Oregon logbook data.

Due to the high degree of variability in nearshore species landings, multi-year averages are deemed to provide better estimates of future year's landings than landings in a single previous year. For the 2013-14 Spex, Oregon and California nearshore landings were projected by dropping the year with the lowest landings during 2008-2011 for each state and calculating an average for the remaining three years. This average was then adjusted upward as warranted to reflect fishing conditions expected for 2013-14 (e.g., if the 2013-14 annual catch limit for a particular species was higher than what was experienced during 2008-2011). This exercise was intended to help ensure that overfished species limits are not exceeded.

Comparison of Nearshore Model projections versus WCGOP estimates of yelloweye and canary rockfish mortalities (Table 2 of the Nearshore Model documentation) reveals an unusually large discrepancy for canary in 2011 (3.2 mt based on the Nearshore Model, 15.5 mt based on the WCGOP). However, the ability of CDFW to determine the cause of such discrepancy is limited by their lack of access to WCGOP data.

The SSC-E/GF has the following comments and recommendations regarding the Nearshore Model:

- Coverage of nearshore vessels in the WCGOP is hampered by factors such as the inability of some vessels to carry an observer. **The SSC E/GF recommends that the GMT consider ways of evaluating the representativeness of nearshore vessels included in the WCGOP – for instance, by comparing the species composition of their landed catch with species comps for non-WCGOP vessels.**
- Using a grand mean to estimate overfished species catch ratios implicitly gives greater weight to years with more WCGOP samples, and is not helpful for evaluating trends or determining what drives model outcomes. A better way to evaluate trends would be to take running averages of annual ratios. However, due to small sample sizes, outliers could have an undue influence on such calculations and also make interpretation of trends difficult.
- While the Non-Nearshore Model bases overfished species catch estimates on landings of a single and highly desired species (sablefish), the Nearshore Model bases its overfished species catch estimates on landings of multiple nearshore target species. Thus, interpreting changes in overfished species catch ratios is complicated by the fact that the denominator includes a mix of species that are differentially priced in the market and whose availability to the fishery is affected by depth restrictions that change over time.
- Small samples of nearshore vessels in the WCGOP have hampered the GMT's ability to evaluate and improve the performance of the Nearshore Model. Lack of access to WCGOP data is also an issue for CDFW.
- Increasing the number of area strata may allow management to be more finely tuned in terms of protecting overfished stocks while reducing negative community effects. However, finer stratification may also suggest that the model can do more than it actually can, given the sample size constraints.
- Relying on 2004-2006 Oregon gear compositions by depth to characterize the California fishery may be problematic, due to the interaction between gear type and depth-dependent mortality. However, CDFW lacks the data needed to make similar calculations of its own.
- The practice of deleting the lowest-of-four recent landing years in projecting future nearshore landings is an indirect way of demonstrating risk tolerance. **A more transparent way to do this would be to identify explicit buffers (e.g., one standard deviation) that are sufficiently wide to avoid exceeding allocations for overfished species.**
- Given the high degree of uncertainty in the Nearshore Model, it is important to explicitly address how that uncertainty affects the overfished species catch estimates. The GMT has devised a method of calculating coefficients of variation that are being reviewed by

the WCGOP. **The SSC-E/GF welcomes this development and would like to review the method as well.**

ATTACHMENT 4
Statement of the SSC Economics and Groundfish Subcommittees
IO-PAC Model and the Economic Data Collection Program

Members of the SSC Economics and Groundfish Subcommittees (SSC-E/GF)[5] met with Northwest Fisheries Science Center (NWFSC) economists on April 7, 2013 in Portland, Oregon to review the IO-PAC model and the Economic Data Collection (EDC) Program.

IO-PAC Model

The IO-PAC model is used in the groundfish Spex process to evaluate the regional economic impacts of management alternatives. In October 2009, the NWFSC sponsored a CIE review of an earlier version of IO-PAC, which the SSC also reviewed in November 2009. Subsequent changes to the model have been substantial enough to warrant a new review at this time. Dr. Jerry Leonard (NWFSC) provided the SSC-E/GF with documentation and a presentation of the updated IO-PAC model.

A number of changes to IO-PAC have occurred since the SSC's last review. These changes include addition of a recreational component, data updates, addition of more commercial fisheries (at-sea groundfish, crab, salmon, and shrimp) and a processing sector, major changes in model construction, and some changes in model assumptions. **The SSC-E/GF supports these changes as improvements to the model and endorses use of the model for management.**

SSC-E/GF review focused on the accuracy of specific assumptions in IO-PAC, the sensitivity of model results to those assumptions, and which assumptions are likely to have the greatest influence on model outputs.

The SSC-E/GF makes the following recommendations regarding documentation and application of the IO-PAC Model:

- IO-PAC can be used to estimate income and employment impacts at port group, State and coastwide levels**. Impacts estimated for each port group within a state do not add up to state-level impacts, nor do state-level impacts add up to coastwide impacts.** This is a logical function of how IO-PAC (as well as other regional impact models) are structured. **This should be clearly explained whenever IO-PAC results are provided.**
- The geographical distribution of purchases by processors and the distribution of sales are difficult to track. **The SSC-E/GF recommends that the IO-PAC authors conduct a sensitivity analysis showing which assumptions regarding the underlying distribution of fishing and processing costs have the greatest influence on the economic impact estimates.**
- **Whenever major changes are made to the IO-PAC model, the SSC recommends that the authors demonstrate the effects of these changes by running the same fishery change through the older and newer versions of the model.**

[5] SSC participants included Martin Dorn, Daniel Huppert, Todd Lee, André Punt, David Sampson and Cindy Thomson.

- IO-PAC (like other regional impact models) is based on assumptions such as constant returns to scale, no input substitution, no supply constraints, and no price or wage adjustments. Thus employment and income impacts produced by IO-PAC should be interpreted as a short-term response rather than a long-term adjustment to infusions of money into the economy. **This should be clearly explained whenever IO-PAC results are provided.**
- IO-PAC is sensitive to assumptions regarding fishing behavior (e.g., whether regulatory restrictions cause a decline in angler spending or a diversion of spending to other activities, whether spending on alternative activities occurs inside versus outside the local economy). **The IO-PAC analysis used in the 2015-16 Spex should include documentation and justification of the behavioral assumptions underlying the model.**

Economic Data Collection Program

The SSC-E/GF received presentations from Dr. Todd Lee and Ms. Erin Steiner (NWFSC) on the Economic Data Collection (EDC) Program, and discussed with them the progress the program has made to date. The EDC Program was established as part of the Council's trawl catch shares program, specifically to monitor the economic effects of the catch share program. The EDC Program has been collecting information from four classes of participants in the catch share program: (1) catcher vessels, (2) motherships, (3) catcher-processor vessels, and (4) first receivers and shore-based processors. All participants must submit economic information as requested by the EDC Program as a condition of the catch shares program. The EDC information base includes annual economic data submissions collected using survey forms, with follow-up interviews to resolve questions regarding the data. The EDC Program is a significant advance in scope and quality over previous activities to gather economic data, which were conducted using voluntary surveys of costs and earnings. The SSC-E/GF commends the hard work and diligence of the EDC staff members for developing this ambitious program and its impressive system for data quality assurance and quality control.

The SSC-E/GF reviewed five EDC draft reports: an *Administration and Operations Report*; a *Catcher-Vessel Report*; a *Mothership Report*; a *Catcher-Processor Report*; and a *First Receiver and Shorebased Processor Report*. The EDC Program will regularly publish similar reports as additional information accumulates. The types of summary information and analyses provided in the EDC reports, which have never previously been available, should be very useful in the Council's biennial process for developing groundfish management specifications.

The SSC-E/GF offers the following comments, suggestions, and recommendation to further improve the quality of the data that the EDC Program collects and the usefulness of the reports it produces.

Data Quality Assurance / Quality Control

- In general it is difficult to verify the accuracy of self-reported information, whether the data are collected by in-person interviews or by means of an on-line survey. One mechanism for verifying self-reported data is to collect information that can be cross-

checked against other sources. For example, self-reported information on annual landings and value of groundfish could be compared to fish ticket information, and discrepancies could lead to follow-up interviews to resolve potential problems. The EDC program currently uses a cross-check approach for data from motherships, first receivers and shore-based processors. **The SSC-E/GF recommends that the EDC Program implement some similar validation approach for the catcher vessels and catcher-processors.**

- **Ratios of different categories of costs could be used to flag potential outliers or misreported data in the collected information.**

Categories of Fisheries

- Because most fishing activities catch multiple species of fish, there is no single best approach for tabulating economic information by "fishery". The EDC reports summarize the available data for a relatively small number of different fisheries (e.g., at-sea whiting, shoreside whiting, DTS trawl, shrimp, crab, Alaska).
- It seems likely that many potential users of the EDC information would have their own special fisheries for which they would like summarized data. A flexible web-based system for querying the database would be advantageous to such users, but the software would need to be carefully constructed to protect the confidentiality of the information. **The SSC encourages the EDC Program to work towards providing the information as flexibly as possible.**

Disaggregating Costs to Fisheries

- The information on annual costs, which for catcher vessels is reported at the level of 23 expense categories (e.g., fuel, food, ice, freight, observer costs), cannot generally be assigned to a single type of fishing activity, such as fishing for canary rockfish. However, the anticipated future catches of limiting species such as canary rockfish provide the framework for analyzing the potential impacts of management alternatives. Hence, cost disaggregation is an important technical aspect of the biennial specifications analysis that underpins the Council's decisions for groundfish management. Cost disaggregation is also fundamental in calculations of fishery profitability (profits = net revenues = landed value minus costs).
- The EDC Program's cost accounting system does not assign to West Coast fisheries any of a vessel's transit costs for those vessels that operate in both West Coast and Alaskan fisheries. Nor does the program account for administrative costs (e.g., finance costs, taxes, legal fees). Thus estimates of net revenue provided by the EDC Program are over-estimates, since the only costs collected are those directly related to the operation of the vessels.
- The EDC Program staff explored four methods for developing estimates of the disaggregated costs of the fishing operations of catcher vessels, based on: (1) days-at-sea (trip-level assignment to fishery based on the dominant landed value); (2) ex-vessel landed value; (3) landings (weight); and (4) a mixed method that uses: (a) ex-vessel revenues to disaggregate one set of cost categories (e.g., wages for captain and crew); (b) retained catch weight to disaggregate a second set of cost categories (e.g., offload

fees, trucking expenses); and (c) days-at-sea to disaggregate a third set of cost categories (e.g., food, ice, insurance). When applied to three fisheries (at-sea Pacific whiting, shoreside Pacific whiting, and DTS trawl), three of the four methods produced very similar estimates for fixed costs, variable costs, and net revenue. The days-at-sea approach produced somewhat divergent results.

- Cost disaggregation for the other classes of catch share participants (catcher-processors, motherships, and first receivers and shorebased processors) requires slightly different methods because of the types of information that are available. The weight of the fish caught or processed is the only data type that is available across all four classes of catch share participants.
- The EDC Program currently treats first receivers and shorebased processors as a single class of participants, but it seems likely that first receivers versus shorebased processors could have quite different economic impacts, especially at a regional scale. **The SSC-E/GF recommends that analyses of costs and net revenues of first receivers and shorebased processors be conducted separately to the extent practicable.**
- The SSC-E/GF recognizes the technical challenges associated with estimating disaggregated costs and endorses the approaches being considered by the EDC Program. Disaggregating processing costs by fishery or by individual species is particularly challenging. In addition to the methods explored to date by the EDC Program, there may be benefits to developing statistical models to estimate some cost categories, especially when information becomes available for additional years. **The SSC-E/GF recommends that analyses of costs and net revenue include some measure of the sensitivity of the results to the methodology used for cost-disaggregation** because there is unlikely to ever be a clear-cut "best" approach**.**

Reporting

- The tables in the draft reports that summarized the survey data did not include any measures of variability. **The SSC-E/GF recommends that future reports include some simple metric of dispersion, such as a code depicting the magnitude of the coefficient of variation.**