# GROUNDFISH MANAGEMENT TEAM REPORT ON PROGRESS ON UPDATES TO MODELS PREVIOUSLY REVIEWED BY THE SCIENTIFIC AND STATISTICAL COMMITTEE

The Groundfish Management Team (GMT) continues to work with the Scientific and Statistical Committee (SSC) to review the models used for projecting groundfish impacts and to update discard mortality rates. The Council formalized the model review process last year through the development of Council Operating Procedure 25 (COP 25). This report summarizes the various models that the GMT uses, the updates to these models either already made based on recommendations from the SSC, or that may be underway or yet to be considered. This information is intended to provide the Council, SSC, advisory bodies, and the public with an understanding of the GMT-recommended model updates proposed for review by the SSC next year. GMT Report 2 will provide more specifics on the proposed changes as described in Agenda Item F.2.a, Supplemental GMT Report, September 2016 for the nearshore and non-nearshore models. This information should provide the Council and SSC the information needed to prioritize and set schedules. Reference documents include Agenda Item F.7.b., Supplemental SSC Report, June 2013 and Agenda Item G.7.b. Supplemental GMT Report 1, September 2013.

## Recreational Projection Models

The SSC Economic and Groundfish Subcommittee reviewed the recreational projection models for Washington, Oregon, and California in 2013, and endorsed them for use in the 2015-2016 and beyond harvest specifications and management measures analysis. The SSC subcommittee recommended updates needed in the near term as well as improvements to the models that could be considered in the future.

Recreational models are used to project catch of target and non-target groundfish species under a range of annual catch limits (ACLs) and management measures, but are not necessarily designed to project effort. However, effort estimates are fed into the Input-Output for Pacific Coast Fisheries (IOPAC) model that produces the projected economic impacts to coastal communities. A recommendation from the 2013 recreational model reviews was to develop a model that better predicts the effect of management measures on angler effort. The GMT and SSC did meet to discuss potential methodologies following the recreational model reviews, but no clear method rose to the surface (Agenda Item F.7.b, Supplemental SSC Report June 2013, Agenda Item G.7.b, Supplemental GMT Report, September 2013). While the GMT sees merit in further exploration of this issue, we do not see it as an immediate priority nor do we believe sufficient resources are available to address the recommendation at this time. In the future, there may be opportunities to collaborate with the Recreational Fisheries Information Network (RecFIN) or the Northwest Fisheries Science Center (NWFSC) socio-economic branch to explore ways to incorporate effort or other factors into the models.

The SSC also recommended that variance estimates (e.g., CVs) be developed for the recreational data used in models in order to provide a means to bracket uncertainty associated with model projections. Each state is on a different timeline to produce these values. In the meantime, Oregon has provided measures of uncertainty surrounding point projections for their recreational groundfish fishery model (i.e., prediction intervals using CVs from sample data) and Pacific

halibut fisheries (using bootstrap simulations to define distributions/quantiles). The GMT is interested in continuing to work on the development of CVs, or some measure of uncertainty, for recreational models, but sees the value of each state working on this independently before taking it to the RecFIN technical committee for review prior to bringing it to the SSC in the future. Given the various levels of analysis by the three states, the GMT does not see this as a priority for SSC review and approval for the 2019-2020 analysis.

**At-Sea Whiting Bycatch Model (Catcher-Processor and Mothership)**

The SSC reviewed a new bootstrap simulation approach to model potential bycatch of constraining species for the at-sea whiting fisheries in November 2015 (Agenda Item I.4, Supplemental Attachment 9, November 2015). The bootstrap model was deemed an improvement over the previous bycatch rate model since the bootstrap model is capable of producing measures of uncertainty to better reflect the variable and unpredictable bycatch patterns in the fisheries. Since all SSC-recommended changes to the bootstrap model have been accounted for (e.g., sector-specific randomized draws), no further SSC review is believed to be necessary by the GMT.

**Individual Fishing Quota Model**

The Individual Fishing Quota (IFQ) model projects future catch based on recent historical attainment and catch patterns, and can utilize data from other historical periods to inform catch levels and catch ratios among species, under different fishery conditions. However, it does not explicitly project non-target species based on bycatch rates. The SSC reviewed the IFQ model in 2015 and endorsed its use with a few recommended improvements that were made before its use in the 2017-2018 and beyond biennial harvest specifications analysis. Prior to 2015-2016, a bycatch rate model (Matson et al. 2011) was used to predict impacts.

During the 2017-2018 biennial harvest specifications analysis, additional analysis and changes to model inputs were required due to recent changes in stock status for bocaccio, canary, darkblotched, and widow rockfish. As the current model is largely attainment-based, and focused on recent data, it did not initially allow for projections to be informed by out-of-scale increases in ACL for co-occurring species. For example, the canary rockfish ACL increase in the final preferred alternative initially showed no impact on widow or yellowtail rockfish catch. Bycatch of canary rockfish in 2017 and beyond is also quite uncertain due to the lack of recent targeting data and the future trends of the midwater non-whiting trawl fishery, with the canary rockfish ACL increasing from 120 mt to over 1,500 mt. Therefore, the GMT had to go outside the normal historical parameters typically used in the IFQ model in order to predict levels of catch that might be more representative of the future, and performed ad-hoc analysis on the potential for bycatch of canary rockfish to be constraining on other target species.

Based on this experience, the GMT is interested in combining the current attainment-based IFQ model with the previously used bycatch based model for non-target species. This would provide the GMT with a more complete picture of projected impacts for target and bycatch species. In consultation with the model developer, we do not think these changes would require SSC review given that we are not proposing changes to the models themselves. The models have already been reviewed and endorsed by the SSC, and/or used to inform previous harvest specifications Environmental Impact Statement (EIS). Additionally, the basic bycatch projection approach has a long history of use in the harvest specifications process for the groundfish trawl fishery, from the limited entry trawl bycatch model (Hastie 2003), which was used for many years; that model was also reviewed by the SSC.

**Sablefish Trip Limit Models**

The sablefish daily trip limit (DTL) model has not been reviewed by the SSC; however, the GMT does not see the review of this model as a priority. In 2017, electronic fish tickets will be required for all sablefish fisheries, which may improve estimates for inseason monitoring. Currently, the Quota Species Monitoring (QSM) Best Estimate Report (BER) is used to estimate landings by period in each sector. The GMT believes that updates and review of this model should occur in the future after the electronic fish tickets are regularly used and there is adequate time to understand the influences of outside forces, including salmon and Dungeness crab opportunities. Finally, unlike the recreational models, where effort drives the estimated economic–impacts to coastal communities, the IO-PAC model assumes that the full sablefish ACL is achieved each year and therefore, improvements to the model will likely have very little impact on the economic analysis.

**Other Trip Limit Models**

The GMT has various other trip limit models for species such as big skate in the IFQ fishery and black rockfish in California. While these models have not been reviewed by the SSC, the GMT has placed a low priority on reviewing these models given that the socioeconomic impact analysis is based on past landings since trip limit increases are often projected to result in small increases in catch. Few of the species explored in this model have high attainment rates therefore, the cost of being wrong is low (i.e., a mis-specified model is unlikely to result in an ACL overage).

**Nearshore Model**

The nearshore model is used to estimate discard mortality of overfished species and target stocks based on predicted landing inputs. As with other models, bycatch of overfished species may limit landings of target species, making it important that projection estimates are correct and reasonable. This model was reviewed by the SSC in 2013 and endorsed for use in the 2015-2016 and beyond analysis. There were a number of recommendations that came out of the 2013 review, including: an exploration of the proportion of gear types used, mortality estimates greater than 20 fathoms, and consideration of variance estimates.

The GMT has identified this model as a priority for updating prior to its use in the 2019-2020 biennial process analysis. As described in September, (Agenda Item F.2.a, Supplemental GMT Report, September 2016) the GMT planned to explore the following general changes: (1) examination of the gear-specific discard mortality rates and their application for both the model and WCGOP estimation procedures; (2) refinement of model inputs for better point projections; (3) address model uncertainty via various approaches (e.g., CVs for prediction intervals or bootstrap simulation distributions); (4) use of new model structure/techniques (e.g., GLM instead of ratio estimator); and (5) new model attributes to better meet management needs (e.g., additional area and depth strata). More detail on the specific changes that are being proposed are described in Agenda Item F.2.a, GMT Report 2. The GMT sees these changes as significant enough to require SSC review.

During the joint WCGOP and GMT meeting, it was determined that the general structure and methods of the nearshore model mirror those used by WCGOP to estimate total mortality (e.g., ratio estimators); therefore, the source of model inaccuracy is mainly attributed to the model inputs (e.g., projected landings, discard ratios) differing from those used by WCGOP to estimate total mortality. As such, the GMT focus for improving the model in 2017 will include: (1) using the same model structure; (2) refining model inputs to better match those used by WCGOP to

improve accuracy; and (3) utilize the variation of the model inputs as produced by WCGOP to frame model uncertainty.

In addition, a GMT focus for 2017 will be to update the proportions of gear used in the nearshore fishery since they have not been updated in a decade and are used by the GMT to apply gear-specific discard mortality rates for both the nearshore model and WCGOP estimates of total mortality. The GMT and WCGOP discussed alternative methodologies for applying gear-specific discard mortality rates, but these would take longer term development and are not a focus of review for 2017.

Similarly, additional desired model attributes would not be a focus for review in 2017 because: (1) WCGOP indicated sample sizes are insufficient for additional area strata; and (2) ability to model greater depths is not a GMT priority at this time since the additional yelloweye rockfish impacts associated with greater depths would not be possible given current bycatch constraints.

The GMT sees these proposed changes that were honed with assistance of WCGOP as being significant enough to warrant SSC review.

**Non-Nearshore Model**

The non-nearshore model is used to project bycatch estimates in the limited entry and open access fixed gear fisheries north of 36° N. lat. based on the sablefish ACL and allocations. This model was reviewed by the SSC in 2013 and endorsed for use in the 2015-2016 and beyond analysis. However, as described in F.2.a, GMT Report 2, the GMT thinks updates to this model should be considered prior to its use for the 2019-2020 biennial cycle.

**Basis for Lingcod and Sablefish Discard Mortality Rates**

The annual estimates of groundfish mortality, prepared by WCGOP, include discard survival credits for sablefish and lingcod (i.e., 50 percent for trawl for both species; 20 percent for fixed gear sablefish; 7 percent for fixed gear lingcod). The 7 percent discard mortality for lingcod is based on hooking mortality in the Ablin and Karpov (1995) study, and forms the basis of all discard mortality rates for species without swim bladders. The GMT believes this rate was last reviewed by the SSC in 2008 for the 2009-2010 harvest specifications and management measures cycle.

The GMT has been unable to locate documentation on exactly how the discard mortality rates for sablefish were developed. Current GMT members reached out to former GMT members, who recalled that a literature review was conducted, which indicated that discard mortality is a function of surface temperature vs. temperature at depth, air temperature, time on deck, and gear used. At the time, the GMT did not conduct in depth modeling, instead some gross assumptions were made, and the GMT tried to err on the conservative side, assigning a 20 percent mortality rate to fixed gear and a 50 percent rate to trawl gear. Therefore, the GMT recommends that at a minimum the sablefish discard mortality rates be reexamined and possibly updated. The GMT notes that the Council has reserved time at the June 2017 Council meeting for this topic.

**Reference**

Albin, D. and K. Karpov. 1995. Northern California sport fish project lingcod hooking mortality study. CDFG Cruise Report 95-M-10. 12p.

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