



**NOAA**  
**FISHERIES**

Alaska Fisheries  
Science Center

# CIE review of the BS and AI Pacific cod assessments, and follow-up

Grant Thompson

September 15, 2016

# CIE review



# Background: Team(s)/SSC on longline surveys

- SSC (6/10): "The SSC encourages continued ... acquisition of length composition from the IPHC survey."
- JPT (8/11): "The Teams recommend that the IPHC continue to collect cod length frequencies on its survey."
- SSC (6/13): "To improve biomass estimates in the Aleutians, we further encourage an examination of existing longline survey data (sablefish and IPHC)."
- BPT (11/13): "The Team recommended ... examining the usefulness of IPHC longline survey data"
- JTS (5/15): "Examine ... IPHC longline survey data, AFSC longline survey data, and commercial data to investigate the distribution ... relative to the NMFS trawl survey stations."

## Background: Team/SSC comments (1 of 3)

- Weighting of composition data:
  - Team: "The Team did not have a favorite."
  - SSC: "The SSC had no specific recommendation...."
- Setting survey catchability:
  - Team: "The fixed survey  $Q$  (0.77) based on archival tags ... has become less and less credible as careful experiments and analysis ... have produced no evidence that cod in the path of the survey trawl avoid capture by any means."
  - SSC: "The SSC has been on record encouraging the development of an alternative model that estimates  $Q$ , due to the very weak or non-existent evidence for net avoidance.... This makes the fixed value for  $Q$ , which was always based on weak evidence, even less tenable...."

## Background: Team/SSC comments (2 of 3)

- Modeling selectivity:
  - Team: “The estimated dome-shaped survey selectivity ... is also controversial, because of the same RACE work that appears to rule out trawl avoidance.... On the other hand the model estimates of lower survey selectivity at larger sizes/ages result from the ... commercial catches of larger fish..., so dome-shaped ... selectivity seems inescapable.”
  - SSC: “A related issue is the treatment of survey ... selectivity, which displays a pronounced peak.... This pattern implies that the survey detects far fewer large cod than are present in the population. The SSC suggests that at the time of the survey, some of these ‘missing cod’ may be in the northern Bering Sea ... outside the standard survey area.”

## Background: Team/SSC comments (3 of 3)

- Temporal variation in survey selectivity:
  - Team: "One issue is how much to allow, and the Team generally favors as little as needed...."
  - SSC: "The SSC concurs with the Plan Team to allow selectivity in the model to vary 'as little as needed.'"
- Large gradients:
  - Team: "The appearance of large values in the final gradient vector in fits of Model 15.5 remains a puzzle.... As long as this behavior is not fully understood, the Team prefers to reject Model 15.5."
  - SSC: "The SSC had no comment, but agrees with the Plan Team to eliminate Model 15.5 from consideration...."

# Terms of reference for the CIE review

1. Evaluate and provide recommendations on data used in the assessment models:
  - a. Should data from the IPHC longline survey be used in either assessment?
  - b. Should data from the NMFS longline survey be used in either assessment?
2. Evaluate and provide recommendations on model structure, assumptions, and estimation procedures:
  - a. How should the various data sets be weighted?
  - b. What form (i.e., SS “pattern”) should be used for the selectivity functions?
  - c. Should the models be structured with respect to season?
  - d. Should the models be structured with respect to gear type?
  - e. How much time variability should be allowed, and in which parameters?
  - f. What constraints, if any, should be placed on survey selectivity at older ages?
  - g. What constraints, if any, should be placed on survey Q?
  - h. How should large gradients be dealt with in otherwise apparently converged models?
  - i. Anything else on which the reviewers care to comment.

# The CIE review itself

- Reviewers:
  - Robin Cook (UK)
  - Neil Klaer (Australia)
  - Jean-Jacques Maguire (Canada)
- Meeting format:
  - Four days (Feb. 16-19, 2016) at AFSC in Seattle
  - First day and a half devoted to presentations and discussion
  - Remainder devoted to discussion, model development/review
  - Homework assignments each evening (into following week)
  - Discussion open to everyone present
  - All files posted on website: [www.tinyurl.com/Pcod-cie-2016](http://www.tinyurl.com/Pcod-cie-2016)
- Reviewer reports received on April 18 (available on website)



# Models reviewed by the CIE

- For the BS assessment, the reviewers examined:
  - Models 11.5 and 14.2 from the final 2015 BS assessment
  - Model 15.6 from the preliminary 2015 BS assessment (but updated so as to include the same data used in Model 14.2)
  - 17 new models (see the link labeled “List of Stock Synthesis models (Bering Sea)” on the website)
- For the AI assessment, the reviewers examined:
  - Model 15.7 from the final 2015 AI assessment
  - 10 new models (see the link labeled “List of Stock Synthesis models (Aleutian Islands)” on the website)
    - Steve Barbeaux ran all of the new AI models

# Overview of CIE comments (1 of 2)

- Each reviewer wrote his report independently
  - That is, no attempt to write a “consensus” report
- Approximately 157 unique comments in all
  - Individual reviewers would often make the same comment multiple (up to 4) times
  - Condensed into 135 summary comments
- Although lots of suggestions for things that could be done differently, overall review reports were constructive and positive
- No major blunders identified in existing models
- Some comments vague or consist of requests for more study
- Two background documents not addressed

## Overview of CIE comments (2 of 2)

- One important area where there was both agreement and disagreement between the Team/SSC and the CIE reviewers was the specification/estimation of catchability in the EBS assessment
  - Agreement among Team/SSC/CIE that  $Q$  should not be fixed at 0.77
  - Less agreement as to whether an estimated  $Q$  value significantly different from 1.0 is acceptable
    - Team/SSC: Field studies have essentially proven that  $Q$  should be close to 1.0
    - CIE: Field studies have been inconclusive; there are many reasons why  $Q$  might be very different from 1.0

# Follow-up by Joint Team Subcommittee



# History of the process

- We are now in 10<sup>th</sup> year of almost year-round assessments
  - 148 Bering Sea models fully vetted from 2007-2015
- 2007-2009: number of model proposals from the public increased to the point where the total became unwieldy
- 2010-2013: Joint Teams started meeting by WebEx teleconference in the spring to “winnow” number of models
- 2014-present: responsibility delegated to JT subcommittee
- How much longer should the process continue?
  - SSC (6/16): “The SSC recommends that the JTS continue to meet in the spring to discuss and select Pacific cod models.... However, we see no compelling need for the SSC to continue to review the proposed suite of models selected by the JTS.”

# Meeting details

- JTS met by WebEx teleconference on May 6
  - Minutes available on granicus site
- GOA assessment not included this time
  - CIE review did not include the GOA assessment
  - GOA assessment has new author this year, who wanted to opt out of the process, at least for this year
- JTS members: Dana Hanselman (BSAI), Jim Ianelli (GOA), Sandra Lowe (GOA)
  - Grant was presenter and rapporteur, but not member
- JTS recommended that the SSC appoint additional members to the BSAI Team with expertise in conducting age-structured assessments

# SSC recommendations (paraphrased)

- Standing recommendation (both areas):
  - Include current base model
- From 12/15 minutes on the Bering Sea assessment:
  - Examine NMFS and ADFG survey data from the northern BS and Norton Sound
  - Circulate manuscript on estimating standard deviations of time-varying parameters
  - Weight model fit and retrospective performance more heavily in selection criteria
  - Evaluate model changes incrementally; do not automatically prefer base model

# JTS proposals developed during the meeting

- Use empirical weight at age (Bering Sea only)
  - Instead of parametric  $W(L)$  and  $L(A)$  relationships
- Include IPHC longline survey, with “extra SD” (both areas)
  - “Extra SD” allows observation error standard deviations for a survey index time series to be scaled internally
  - Compare to CIE comments 1a.01-1a.10
- Include NMFS longline survey, with “extra SD” (both areas)
  - Compare to CIE comments 1b.01-1b.08
- Include IPHC and NMFS longline surveys, with “extra SD”
  - See previous two recommendations.
- Use reasonably time-varying, double normal selectivity (BS)
  - Compare to CIE comments 2e.01, 2e.09, 2e.12, and 2b.07



# Procedure

- Deliberations involved three “passes”
  1. Go through all proposals, choose those that should be addressed in the next 5 assessments
    - BS: 23, AI: 20
  2. Prioritize proposals chosen during Pass 1
    - High: include in 2016 (BS: 17, AI: 13)
    - Med: include in 2017 or 2018 (BS: 3, AI: 4)
    - Low: include in 2019 or 2020 (BS: 3, AI: 3)
  3. Assign “high” priority items to up to 5 models per area
    - JTS anticipates that comments currently ranked as “med” or “low” priority may be re-evaluated in the future
    - **Model numbers assigned by JTS were “placeholders”**

# Recommendations for the Bering Sea

- Model 11.5: The accepted model since 2011
- Model 16.1: Like BS Model 15.6, but “simplified”
- Model 16.2: Like BS Model 15.6, but including the IPHC longline survey and other features
- Model 16.3: Like Model 16.2, but including the NMFS longline survey instead of the IPHC longline survey
- Model 16.4: Like Models 16.2-16.3, but including both the IPHC and NMFS longline survey data and other features
- Model 16.5: Like Model 16.4, but including other features
- Non-model analysis: Verify that the trawl survey data sometimes include age 0 fish (CIE comment 2i.13)

# Recommendations for the Aleutian Islands

- Model 13.4: Final model from 2013-15 (Tier 5 random effects)
- Model 16.1: Like AI Model 15.7, but “simplified”
- Model 16.2: Like AI Model 15.7, but including the IPHC longline survey data and other features
- Model 16.3: Like Model 16.2, but including the NMFS longline survey instead of the IPHC longline survey
- Model 16.4: Like Models 16.2-16.3, but including both the IPHC and NMFS longline survey data
- Model 16.5: Like AI Model 15.7, but with 1991-1994 trawl survey data excluded and other features included

# Terms left to be defined by the analyst

- “Weight abundance indices **more heavily** than sizecomps”
  - Model 16.1 in both areas (CIE comment 2a.08)
- “Use the simplest selectivity form that gives a **reasonable fit**”
  - Model 16.1 in both areas (CIE comment 2b.08)
- “Do not allow **strange** selectivity patterns”
  - Models 16.1-16.5 in both areas (CIE comment 2f.06)
- “Estimate trawl survey  $Q$  with a **fairly non-informative prior**”
  - Models 16.1-16.5 in the AI (CIE comment 2g.03)

# Table 1 (p. 5): priority proposals and models

No.	Brief description of proposal	Bering Sea							Aleutian Islands										
		Pri.	SPM	1	2	3	4	5	6	NMA	Pri.	SPM	1	2	3	4	5	6	NMA
SSC1	Include current base model	high	11.5	x							high	13.4	x						
1.05	Use the post-1994 AI trawl survey time series	n/a									high	15.7						x	
2a.07	Use either Francis or harmonic mean weighting	high	15.6						x		n/a								
2a.08	Weight abundance indices more heavily than sizecomps	high	15.6		x						high	15.7		x					
2b.08	Use the simplest selectivity form that gives a reasonable fit	high	15.6		x						high	15.7		x					
2e.11	Do not allow survey selectivity ... to vary with time	high	15.6		x						high	15.7		x					
2e.18	Do not allow survey ... catchability to vary with time	high	15.6		x						high	15.7		x					
2f.03	Force trawl survey selectivity to be asymptotic	high	15.6		x						n/a								
2f.06	Do not allow ... "strange" selectivity patterns	high	15.6		x	x	x	x	x		high	15.7		x	x	x	x	x	
2g.03	Estimate catchability internally with a "fairly non-informative" prior	n/a									high	15.7		x	x	x	x	x	
2g.04	Estimate catchability of new surveys internally with non-restrictive priors	high	15.6			x	x	x	x		high	15.7			x	x	x		
2i.06	Explore age-specific M (e.g., using Lorenzen function)	high	15.6						x		n/a								
2i.13	Verify that the trawl survey data sometimes include age 0 fish	high	15.6							x	n/a								
2i.38	Include additional data sets to increase confidence in model results	high	15.6			x	x	x	x		high	15.7			x	x	x		
2i.39	Start including fishery agecomp data	high	15.6					x	x		n/a								
JTS1	Use empirical weight at age	high	15.6		x			x	x		n/a								
JTS2	Include IPHC longline survey, with "extra SD"	high	15.6			x					high	15.7			x				
JTS3	Include NMFS longline survey, with "extra SD"	high	15.6				x				high	15.7				x			
JTS4	Include IPHC and NMFS longline surveys, with "extra SD" for both	high	15.6					x	x		high	15.7					x		
SSC2	Examine NMFS and ADFG survey data from the northern BS and Norton Sound	med									n/a								
2a.07	Use either Francis or harmonic mean weighting	n/a									med								
2b.03	Investigate alternatives to double-normal selectivity	n/a									med								
2e.06	Allow time variability only where supported by external data	med									med								
2i.17	Investigate whether a simpler (than SS) model would be useful	n/a									med								
JTS5	Use reasonably time-varying, double normal selectivity	med									n/a								
2c.01	Use annually varying selectivity if it fits as well as season/gear structure	n/a									low								
2e.21	Consider time-varying growth if supported by data	low									low								
2g.03	Estimate catchability internally with a "fairly non-informative" prior	low									n/a								
2i.04	Do not include more model features than can be supported by the data	low									n/a								
2i.39	Start including fishery agecomp data	n/a									low								