



Assessment of the Pacific halibut stock at the end of 2016

PREPARED BY: IPHC SECRETARIAT (I. STEWART, A. HICKS AND D. WILSON; 11 JANUARY 2017)

PURPOSE

To provide the Commission with an opportunity to consider the stock status, stock outlook and harvest policy calculations arising from the 2016 Pacific halibut stock assessment.

BACKGROUND

In 2016 the International Pacific Halibut Commission (IPHC) undertook its annual stock assessment of Pacific halibut (*Hippoglossus stenolepis*) using a range of updated data sources. The IPHC Report of Assessment and Research Activities (2016), chapters 4.1-4.6, provide an overview of the data sources available for the Pacific halibut stock assessment (Chapter 4.1), the 2016 stock assessment methodology and result (Chapter 4.2), biomass apportionment among Regulatory Areas based on the IPHC fishery-independent setline survey (Chapter 4.3), application of the current IPHC harvest policy (Chapter 4.4), an investigation of the current IPHC harvest policy (Chapter 4.5), and recent developments in the IPHC Management Strategy Evaluation (MSE) process (Chapter 4.6).

A detailed description of the methodology used and the results is provided in Chapter 4.2 'Assessment of the Pacific halibut stock at the end of 2016' of the IPHC Report of Assessment and Research Activities (2016): <http://iphc.int/library/raras/485-rara2016.html>.

TABLE 1. Pacific halibut: Status of Pacific halibut (*Hippoglossus stenolepis*) in the IPHC Convention Area.

Area ¹	Indicators	2016 stock status determination ²
IPHC Convention Area	Catch 2016: 25,030,000 lbs; ~11,353 t ³ Average catch 2012–2016: 26,886,000 lbs; ~12,195 t ³ SPR ₂₀₁₆ : 47% (33-60%)	NOT OVERFISHED ⁴
	SB ₂₀₁₇ (Mlb): 212.2 (152.7–285.7) SB ₂₀₁₇ /SB ₀ : 41% (27-59%) P(SB ₂₀₁₇ <SB ₃₀): 5% P(SB ₂₀₁₇ <SB ₂₀): <1%	

¹ Boundaries for the IPHC stock assessment are defined as the IPHC Convention Area (see IPHC 1979).

² An ensemble of four stock assessment models, representing a two-way cross of short vs. long time series', and aggregated coastwide vs. Areas-As-Fleets (AAF) models was used to explore the range of plausible current stock estimates.

³ Weights in this document are reported as 'net' weights, head and guts removed; this is approximately 75% of the round (wet) weight).

⁴ Status determined relative to the IPHC's current harvest control rule biomass limit of SB_{20%}.

Stock status. In 2016, an ensemble of four (4) equally-weighted models, two long time-series models, and two short time-series models either using data sets by geographical region, or aggregating all data series into coastwide summaries, were applied to the Pacific halibut stock

in the IPHC Convention Area, using Stock Synthesis III software. The results here describe the approximate probability distributions derived from the ensemble of models, thereby incorporating the uncertainty within each model as well as the uncertainty among models. Female spawning stock biomass at the beginning of 2017 was estimated to be 41% (27–59%) of the SB_0 defined by the harvest policy (Table 1). There was only a 5% probability of the estimate being below the threshold level of SB_{30} , and less than a 1% probability of being below the limit value of $SB_{20\%}$. The level of spawning stock biomass at the beginning of 2017 is consistent with the recent slow increase in the primary stock abundance indices (IPHC fishery-independent setline survey WPUE indices and directed longline WPUE). Historical declining trends are attributable to changes in weight-at-age, recruitment, and catch levels. Total catch has stabilised in recent years with 25,030,000 lbs (~11,353 t) taken in 2016, up slightly from 24,670,000 lbs (11,190 t) in 2015 and 23,700,000 t (10,750 t) in 2014. The most recent five-year average (2012-16; 26,886,000 lbs; ~12,195 t) is substantially lower in comparison to the previous five-year average (2007-11; 52,544,000 lbs; 24,741 t). The assessment is slightly more pessimistic than the 2015 assessment due to the additional data from 2016 and the changes in assessment estimates regarding the recruitment processes. Fishing intensity estimated for 2016, measured via Spawning Potential Ratio, was 47% (33–60%); this is higher than the fishing intensity corresponding to recent harvest policy calculations. Thus, on the weight-of-evidence available in 2016, the Pacific halibut stock is determined to be **not overfished** ($SB_{2017} > SB_{20\%}$). The IPHC does not have an explicit coastwide fishing intensity target or limit reference point, thus it is **Uncertain** if current levels of fishing intensity are consistent with harvest policy objectives.

Outlook. Stock projections were conducted using the integrated results from the stock assessment ensemble (Chapter 4.2), summaries of the 2016 fishery (Chapter 4.1), and other sources of mortality, as well as the results of apportionment calculations (Chapter 4.3) and the target harvest rates from current IPHC harvest policy (Chapter 4.4). The IPHC harvest decision table (Table 4 in Chapter 4.2) provides a comparison of the relative risk (in times out of 100), using stock and fishery metrics, for a range of alternative harvest levels for 2017. The block of columns entitled “Stock Trend” provides for evaluation of the risks to short term trend in spawning biomass, without reference to a particular harvest policy. The remaining columns portray these risks relative to the spawning biomass reference points (“Stock Status”) and fishery performance identified in the current harvest policy. The stock is projected to decrease gradually over the period from 2018-20 for removals around 40 million pounds (~18,100 t). The risk of stock declines begins to increase rapidly for levels of harvest above 40 million pounds (~18,100 t) of total mortality, becoming more pronounced by 2020 (Table 2). The Blue Line (37.9 million pounds, ~17,200 t, total removals) corresponds to a 56/100 (56%) chance of stock decline in 2018 and a 77/100 (77%) chance in 2020. However, the risk of substantial stock decline (>5%) is much lower at only 3/100 (3%) in 2018 and a 53/100 (53%) in 2019. The status quo SPR line (41.6 million pounds, ~18,900 t) corresponds to a 68/100 (68%) chance of stock decline in 2018 and an 87/100 (87%) chance in 2020, again with much lower values of substantial decline. For stock status, fishery trend and fishery status metrics based on the current harvest policy, there is a relatively small chance (<37/100; 37%) that the stock will decline below the threshold ($SB_{30\%}$) reference point in projections for all the levels of removals evaluated over three years. For removals in excess of the Blue Line, there is a greater than a 50/100 (50%) chance that the fishery CEY would be smaller in 2018-20 if the current harvest policy were applied in those years.

IPHC Harvest Policy. To adhere to the IPHC's current harvest policy, 2017 catches would need to be reduced from those taken in 2016. Options for consideration are provided in the Harvest Decision Table 4 of Chapter 4.2 (Appendix 1).

- **Fishing intensity:** The Commission does not currently have a coastwide target or limit fishing intensity reference point.
- **Spawning biomass:** Current female spawning biomass has a very low probability of being below the IPHC threshold (trigger) reference point of SB₃₀, and thus, also the IPHC limit reference point of SB₂₀.

RECOMMENDATION/S

That the Commission **NOTE** paper IPHC-2017-AM093-07 which provided the Commission with an opportunity to consider the stock status, stock outlook and harvest policy calculations arising from the 2016 Pacific halibut stock assessment.

APPENDICES

[Appendix A](#): Harvest decision table



APPENDIX A HARVEST DECISION TABLE

Decision table of yield alternatives (rows) and risk metrics (columns). Values in the table represent the probability, in “times out of 100” of a particular risk.

2017 Alternative	Total removals (M lb)	Fishery CEY (M lb)	Fishing Intensity	Stock Trend				Stock Status				Fishery Trend				Fishery Status		
				Spawning biomass				Spawning biomass				Fishery CEY from the harvest policy				Harvest rate		
				In 2018		In 2020		In 2018		In 2020		In 2018		In 2020		In 2017		In 2017
				Is less than 2017	Is 5% less than 2017	Is less than 2017	Is 5% less than 2017	Is less than 30%	Is less than 20%	Is less than 30%	Is less than 20%	Is less than 2017	Is 10% less than 2017	Is less than 2017	Is 10% less than 2017	Is above target		
No removals	0.0	0.0	F _{100%}	<1	<1	<1	<1	3	<1	1	<1	<1	<1	<1	<1	0		
FCEY = 0	11.2	0.0	F _{77%} 61%-84%	1	<1	3	<1	3	<1	1	<1	<1	<1	<1	<1	<1		
	20.0	8.6	F _{66%} 49%-75%	5	<1	20	4	4	<1	3	<1	<1	<1	<1	<1	<1		
	30.0	18.4	F _{55%} 39%-67%	32	<1	53	31	5	<1	6	<1	6	3	8	4	8		
Blue Line	37.9	26.1	F _{48%} 33%-62%	56	3	77	53	6	<1	12	<1	47	33	48	39	50		
status quo SPR	41.6	29.7	F _{46%} 32%-60%	68	6	87	64	6	<1	15	<1	57	45	57	49	61		
	50.0	37.9	F _{40%} 27%-55%	92	29	98	88	7	<1	25	1	94	83	95	86	95		
	60.0	47.7	F _{35%} 23%-51%	>99	52	>99	99	9	<1	37	3	>99	>99	>99	>99	>99		
				a	b	c	d	e	f	g	h	i	j	k	l	m		