INTERNATIONAL PACIFIC HALIBUT COMMISSION

MSE objectives

Agenda Item 5

IPHC-2019-SRB015-07

Goals & General Objectives

- Biological sustainability
  1. Avoid critical stock sizes
- Optimize directed fishing opportunities
  2. Maintain spawning biomass around a target level
  3. Limit catch variability
  4. Maximize directed fishing yield
- Minimize discard mortality
- Minimize bycatch and bycatch mortality

Key outcomes of the *ad hoc* WG meeting

- AGREED that minimizing bycatch mortality may be specified as a general objective under the goal to optimize directed fishing opportunities
- AGREED to keep the primary objectives to a small number for simplicity
- AGREED that MSAB members undertake the following tasks before MSAB014 in October 2019 and report their findings at MSAB014
  - Discuss with stakeholders any specific fishery objectives they have for specific IPHC Regulatory Areas
- AGREED that the biological sustainability objectives are informed by science, hence IPHC Secretariat will provide possible options for biomass distribution tolerance, reviewed by the SRB, to be presented and discussed during MSAB014

A review of the elements of objectives

- **General objective**: a high-level statement reflecting a desired outcome.
- **Measurable objective**: A specific objective that can be measured using three elements
  - **Measurable outcome**: a threshold, limit, or quantity that is desired
  - **Time-frame**: a period of years and how far in the future to evaluate the objective
  - **Tolerance**: a level of risk

A review of the elements of objectives

- **Performance metric**: a metric calculated from the three elements of a measurable objective
  - Can be reported as meeting the objective or as a
  - **Statistic of interest**: a performance metric without the tolerance (a probability) or without the tolerance and threshlold/limit (a value).

Three levels of hierarchy in objectives

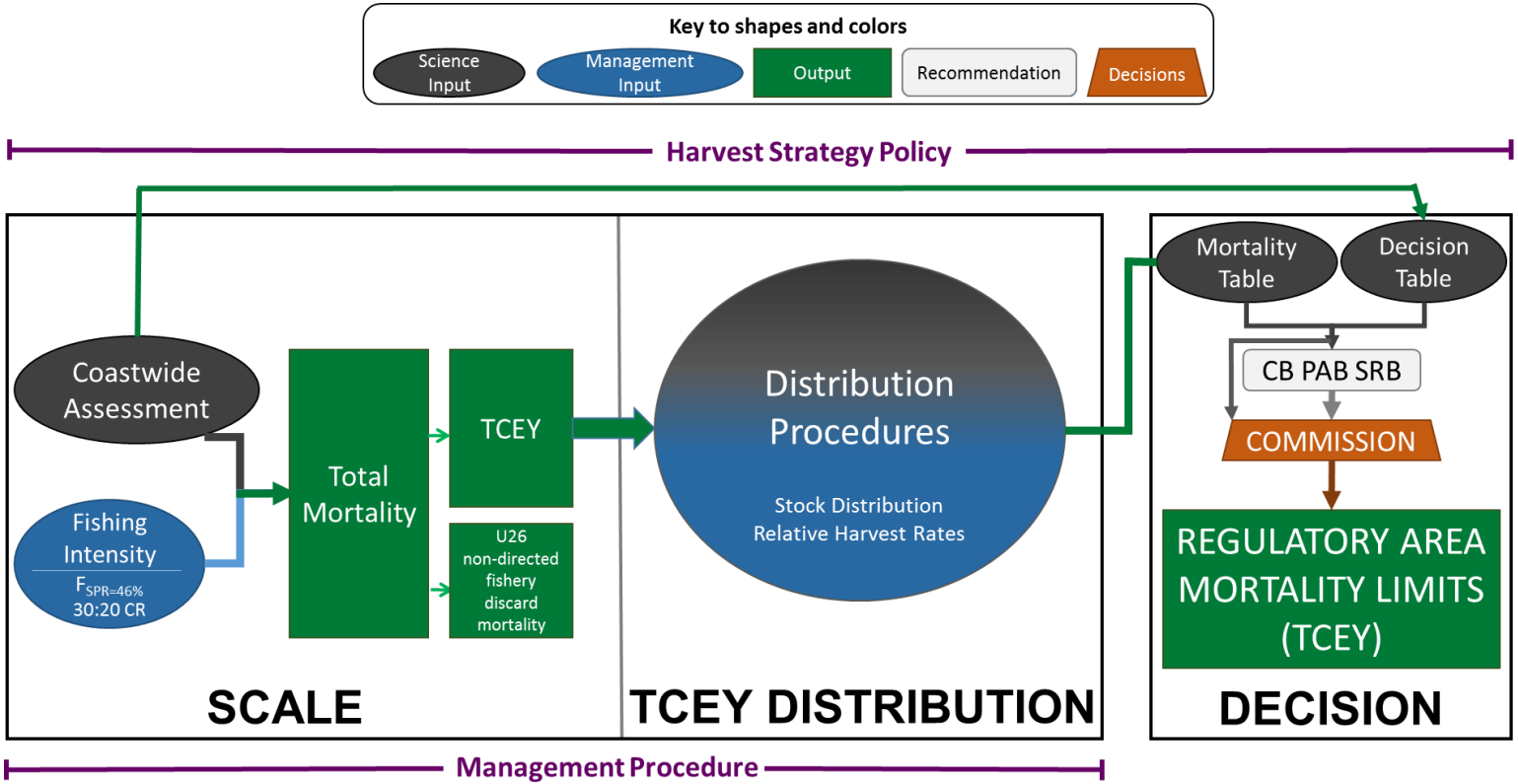
1. Objectives reflecting biological sustainability and stability of catch limits (as a result of natural variability and assessment uncertainty)
   - Occurs at coastwide or Biological Region level
2. Interaction objectives (the effect of one area on another)
   - Occurs at the Biological Region, management zone, or IPHC Regulatory Area level
3. Objectives within IPHC Regulatory Areas

Management zone

Prioritizing objectives

- Classify as primary (report to Commission) or additional
- A few area-specific should be chosen to complement the primary coastwide objectives
- Conservation objectives should be prioritized over fishery objectives
- Fishery objectives do not need to be prioritized because it is often useful to examine trade-offs
- Area-specific tolerances can prioritize among areas

IPHC harvest strategy policy (current interim)



https://www.iphc.int/the-commission/harvest-strategy-policy

Commission directives and recommendations

AM095-R, para 59a. *The Commission **ENDORSED** the primary objectives and associated performance metrics used to evaluate management procedures in the MSE process (as detailed in paper IPHC-2019-AM095-12)*

AM095-R, para 59c. *The Commission **RECOMMENDED** the MSAB develop the following additional objective, as well as prioritize this objective in the evaluation of management procedures, for the Commission's consideration.*

i. A conservation objective that meets a spawning biomass target.

Biological sustainability (Coastwide)

General Objective	Measurable Objective	Measurable Outcome	Time-frame	Tolerance
1.1. Keep spawning biomass above a limit to avoid critical stock sizes	Maintain a female spawning stock biomass above a biomass limit reference point at least 95% of the time	SB < Spawning Biomass Limit (SB_{Lim}) SB_{Lim}=20% unfished spawning biomass	Long-term	0.05

Fishery coastwide objective: target biomass

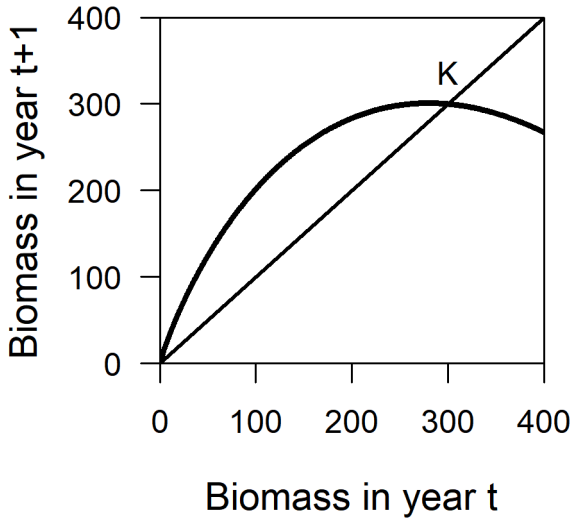
General Objective	Measurable Objective	Measurable Outcome	Time-frame	Tolerance
2.1 Maintain spawning biomass around a level that optimises fishing activities	2.1a Spawning Biomass Threshold Maintain SB above a threshold reference point at least 80% of the time	SB<Spawning Biomass Threshold (SB_{Thres}) $SB_{Thres}=SB_{30\%}$	Long-term	0.20
	2.1b Spawning Biomass Target Maintain SB above a biomass target reference point at least 50% of the time	SB<Spawning Biomass Target (SB_{Targ}) $SB_{Targ}=SB_{??-??\%}$	Long-term	0.50

MSAB Request

MSAB013–Req.02 (para. 38) The MSAB REQUESTED that the Scientific Review Board (SRB) and the IPHC Secretariat consider the draft objectives contained within Table 1 and to provide advice to the MSAB on potential MSY and MEY proxy target reference points for objective 2.1b

Equilibrium yield curve

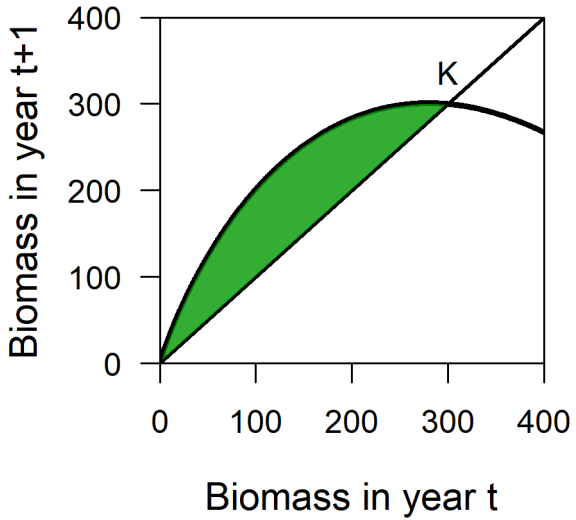
- Equilibrium
  - Will happen over and over again in the long-term



$$B_{t+1} = B_t + Production_t - C_t$$

Equilibrium yield curve

- Equilibrium
  - Will happen over and over again in the long-term
- Surplus production
  - The additional biomass above replacement



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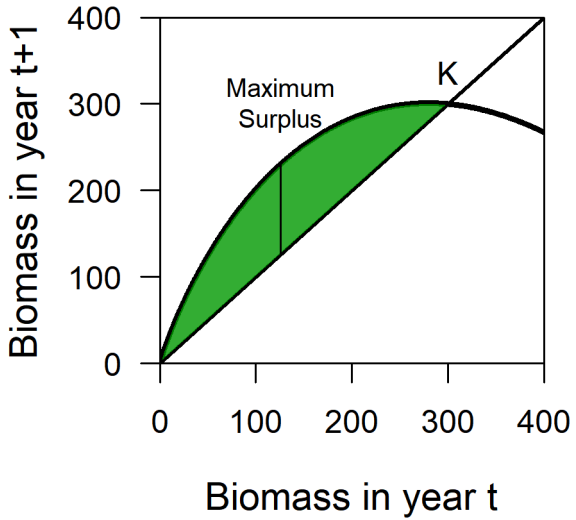
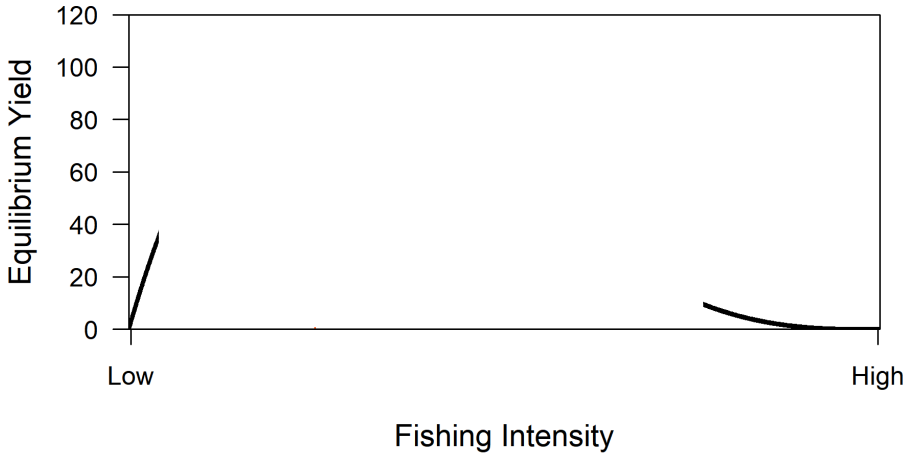
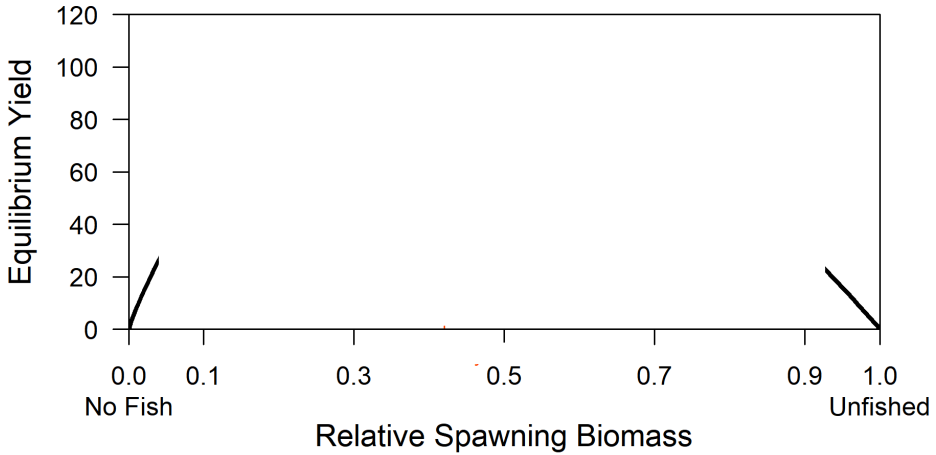


$$B_{t+1} = B_t + Production_t - C_t$$

Equilibrium yield curve

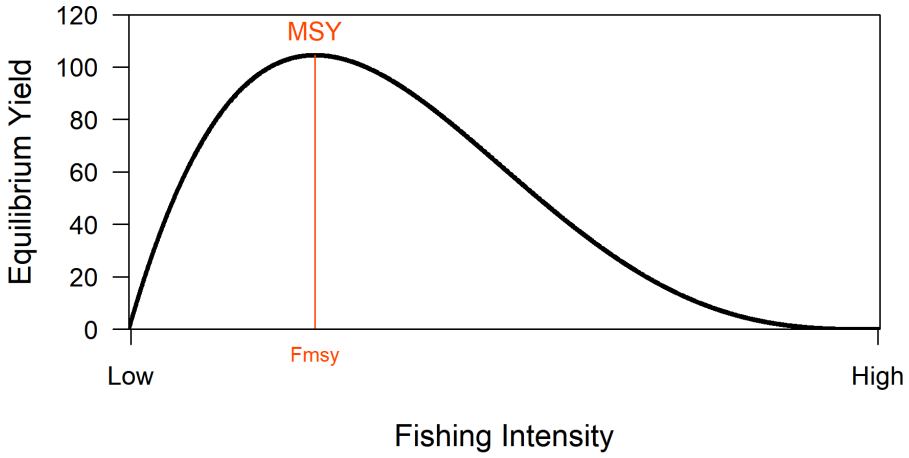
- With no fishing
  - Yield is zero
  - Unfished biomass
- With extremely high F
  - Yield is zero
  - No biomass

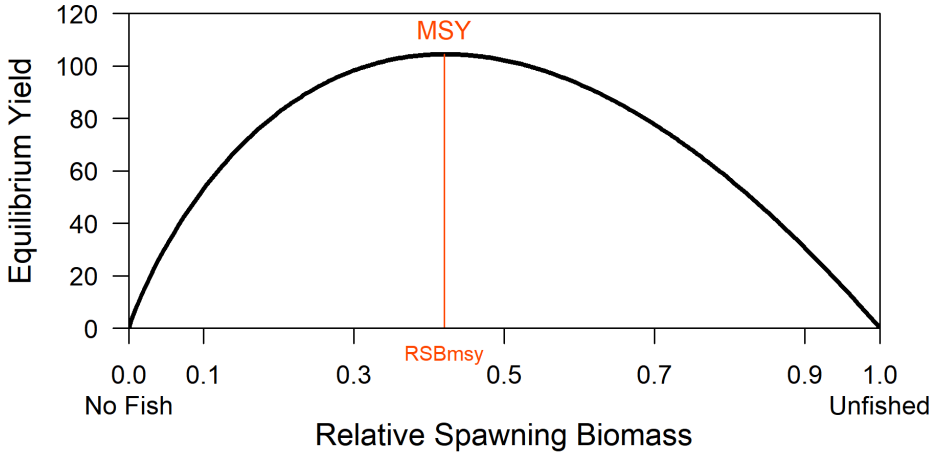




Equilibrium yield curve

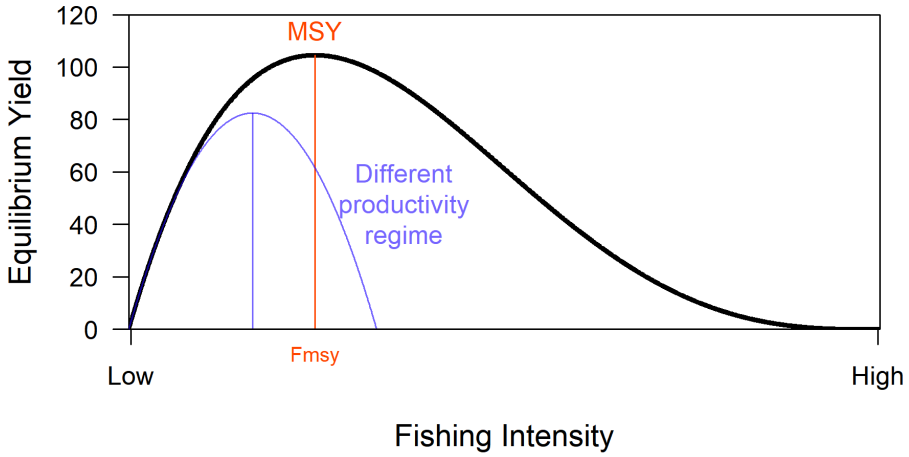
- MSY
  - Maximum Sustainable Yield
  - The maximum of the yield curve
- F_{MSY}
  - The fishing mortality rate that would result in MSY
- RSB_{MSY}
  - Typically less than 50%

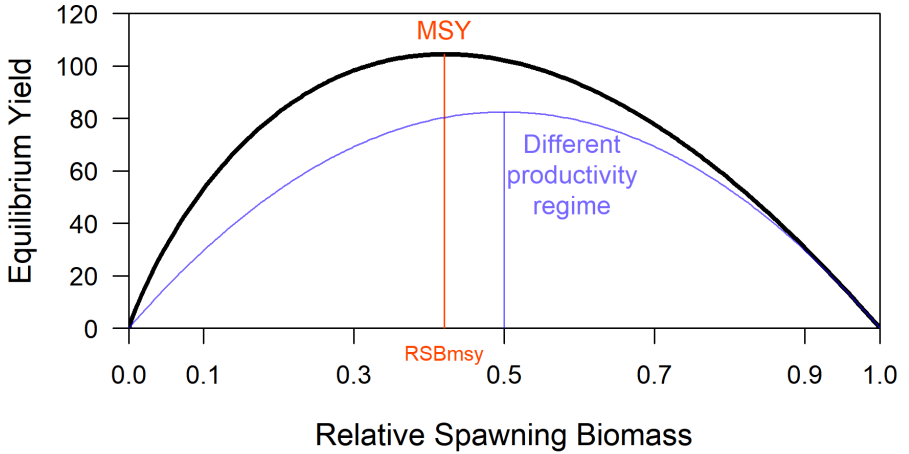




Equilibrium yield curve

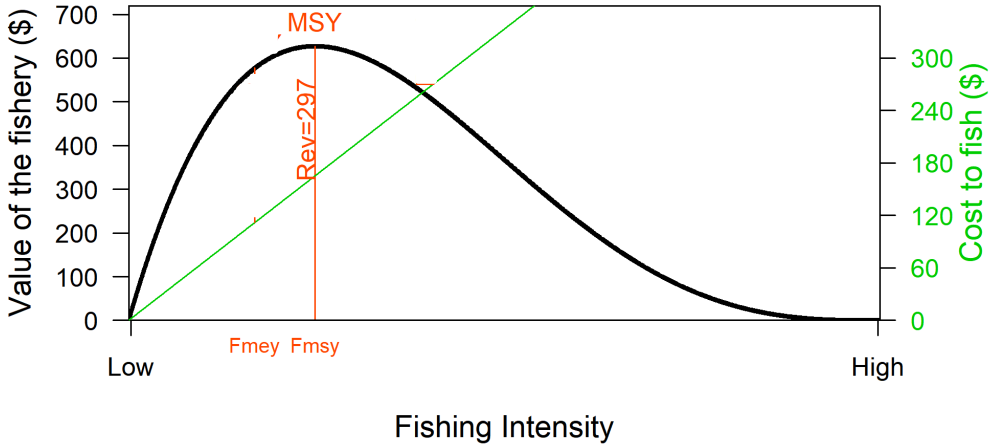
- Productivity regimes
  - Change the shape of the equilibrium yield curve

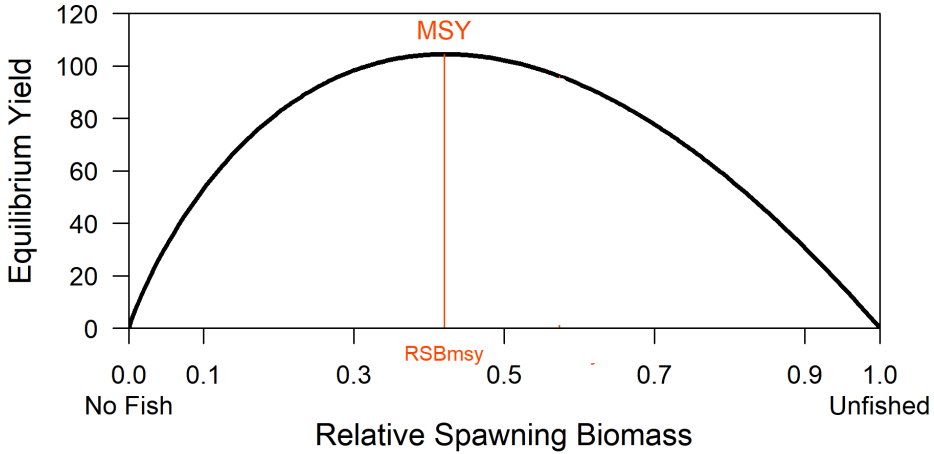




Economic yield

- Cost
  - There is a cost to fishing
- Revenue
  - The Value from the Yield minus the Cost to fish
- Maximum Revenue is not equal to Maximum Yield





Dynamic Reference Points

Purpose:

- provide a basis for defining a target reference point
- to investigate variability in reference points given
  - changes in productivity and selectivity
  - different types of uncertainty

Reference points considered: SB_0, MSY, RSB_{MSY}, SPR_{MSY}

Methodology:

- Equilibrium model
- 2018 assessment model
- Coastwide MSE operating model

Main sources of variability considered:

- Environmental regimes (high or low unfished average recruitment)
- Weight at age
- Selectivity
- Steepness
- Natural mortality

See paper: IPHC-2019-SRB015-11 Rev_1

Dynamic Reference Point: methods (1)

Equilibrium model:

- 2 fleets (directed commercial and non-directed discard mortality)
- 2 sex
- Grid of scenarios across selectivity, weight at age, steepness, environmental regimes and M

Dynamic Reference Point: methods (2)

2018 Ensemble Assessment model:

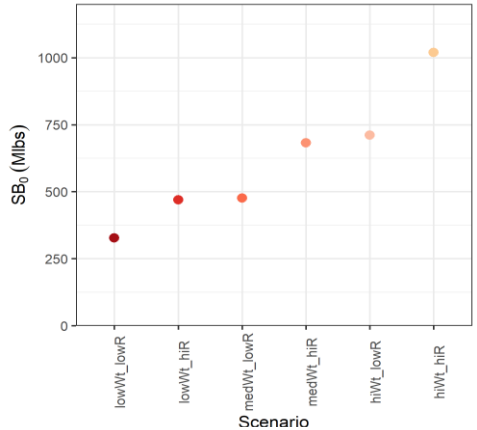
- Each one of the 4 assessment models used retrospectively
- Weight-at-age and selectivity for the associated year
- R0 from the current regime
- No estimated uncertainty for each year

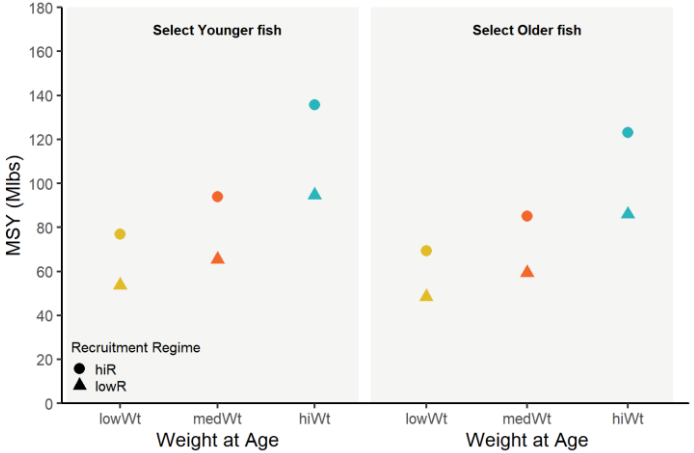
Dynamic Reference Point: methods (3)

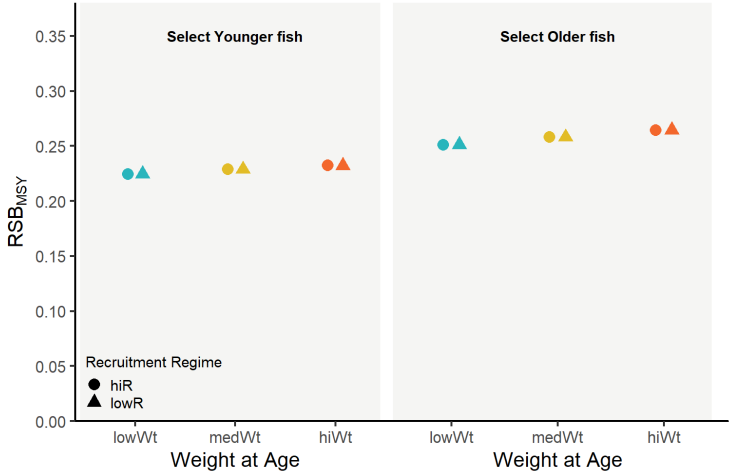
MSE Operating Model:

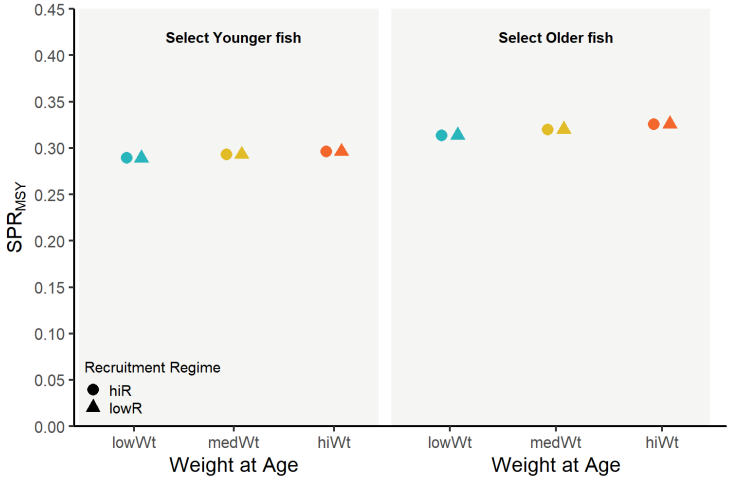
- Short and long coastwide model from 2018 ensemble
- Reference point estimation for the last 50 years of the long term projection
- 500 simulations using final year (uncertainty)
- Low and high regime
- Weight-at-age modelled as a random walk or scenarios
- Selectivity modelled as a random walk, and changes in selectivity as a function of weight at age

Equilibrium model

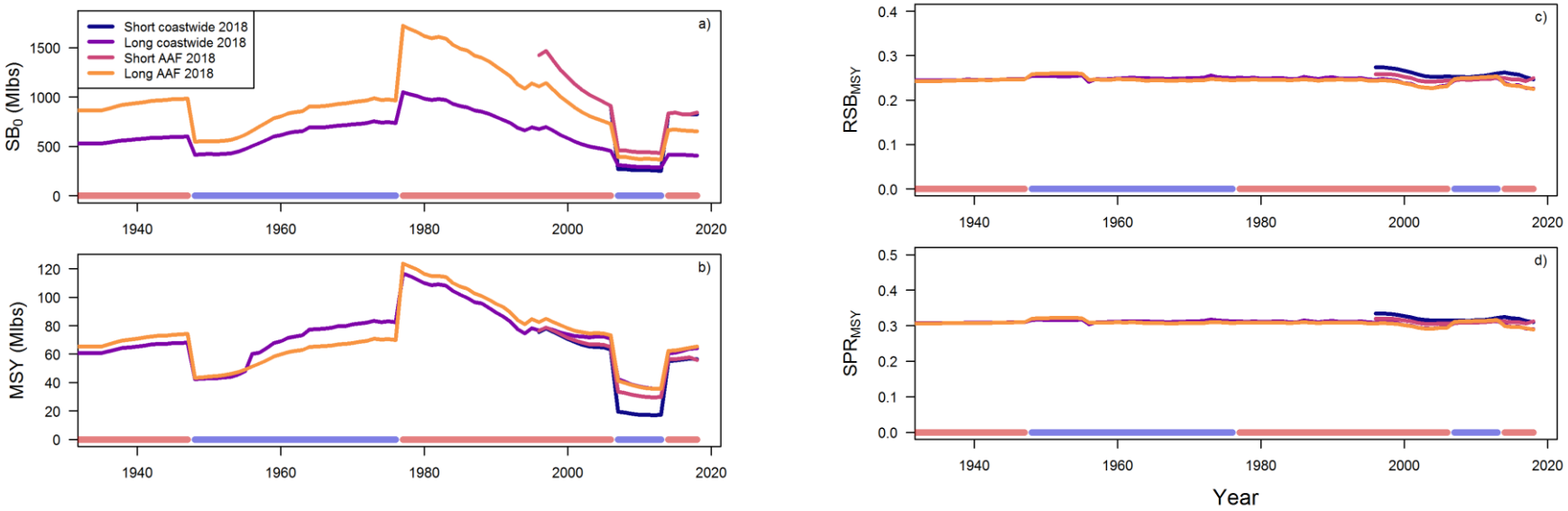




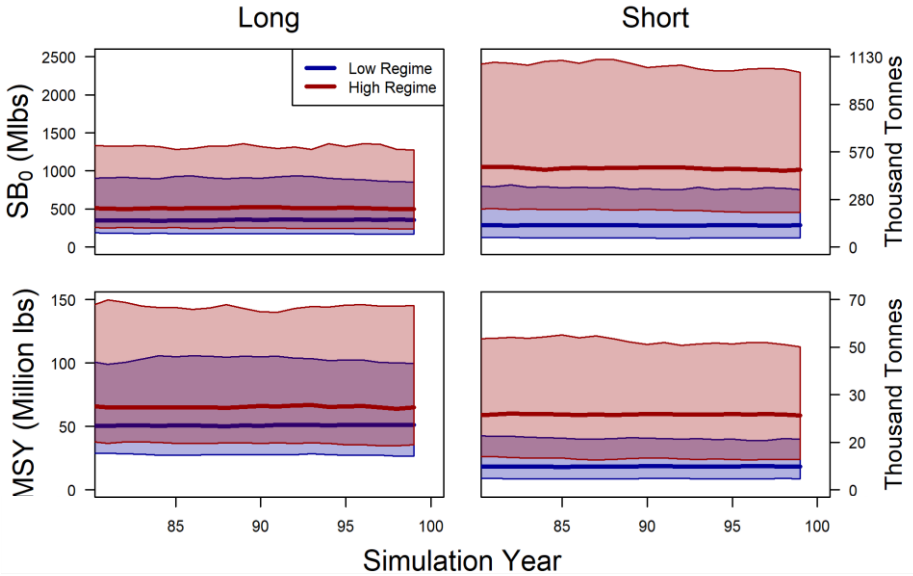


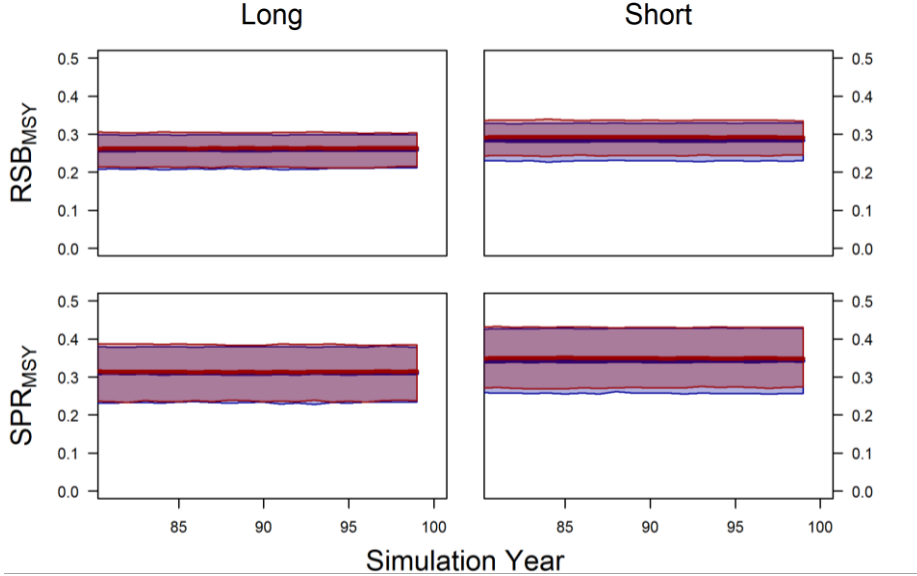


Results from stock assessment models



Results from MSE operating model





Range of Results

- Assuming a steepness of 0.75

	Method		
Reference Point	**Equilibrium**	**Assessment**	**MSE OM**
SB_0 (M lbs)	327–1,020	254–1,721	273–1,087
MSY (M lbs)	48–136	17–124	13–87
RSB_{MSY}	22–28%	22–27%	24–29%
SPR_{MSY}	29–34%	29–33%	29–34%

- Steepness has a large effect

Results on dynamic reference points analysis

- SB_0 and MSY vary depending on regime
- RSB_{MSY} and SPR_{MSY} are more consistent
  - RSB_{MSY} ~ 20-30%
  - SPR_{MSY} ~ 30-35%

- A reasonable RSB_{MSY} proxy, including a precautionary allowance for unexplored sources of uncertainty, would be 30%

- A proxy target defined as MEY
  - Lower end: 1.2 × RSB_{MSY} (~36%)
  - Upper end: 1.4 × RSB_{MSY} (~42%)

Fishery coastwide objective: target biomass

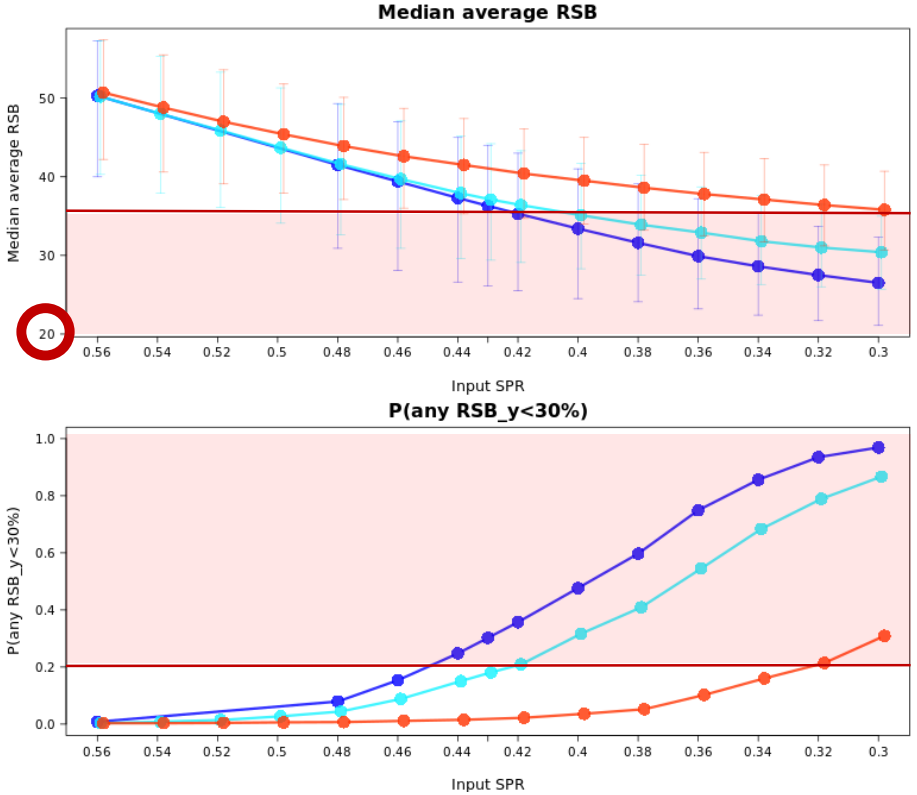
General Objective	Measurable Objective	Measurable Outcome	Time-frame	Tolerance
2.1 Maintain spawning biomass around a level that optimises fishing activities	2.1a Spawning Biomass Threshold Maintain SB above a threshold reference point at least 80% of the time	SB<Spawning Biomass Threshold (SB_{Thres}) $SB_{Thres}=SB_{30\%}$	Long-term	0.20
	2.1b Spawning Biomass Target Maintain SB above a biomass target reference point at least 50% of the time	SB<Spawning Biomass Target (SB_{Targ}) $SB_{Targ}=SB_{36\%}$	Long-term	0.50

Reasonable proxy for RSB_{MSY}

Reasonable proxy for RSB_{MEY}

Coastwide simulation results

- All above biomass limit
- An input SPR > 40% would satisfy target of 36%
- An input SPR > 42% would satisfy threshold of 30%



Catch variability and yield

General Objective	Measurable Objective	Measurable Outcome	Time-frame	Tolerance
2.2. Limit Catch Variability	Limit annual changes in the coastwide TCEY	Annual Change (AC) > 15% in any year	Short-term	0.25
2.3. Maximize Directed Fishing Yield	Maximize average TCEY coastwide	Median coastwide TCEY	Short-term	STATISTIC OF INTEREST

Note that Annual Change is used instead of Average Annual Variability (discussed at the Ad-Hoc WG, see IPHC-2019-SRB015-INF01)

Annual Change (AC) vs. AAV

- Annual Change (AC)
  - The percent change from one year to the next

$$AC_t = \frac{|TCEY_t - TCEY_{t-1}|}{TCEY_{t-1}}$$

- Average Annual Variability (AAV)
  - Average percent change between years over a ten-year period

$$AAV = \frac{\sum_{t=t_1}^{t_1+10} |TCEY_t - TCEY_{t-1}|}{\sum_{t=t_1}^{t_1+10} TCEY_t}$$

Medium-term performance metrics

Control Rule	30:20							
Constraint	No Constraint		maxChangeBoth15		slowUpFastDown		Multi-year (3)	
Input SPR	0.46	0.38	0.46	0.38	0.46	0.38	0.46	0.38
Biological Sustainability								
P(any RSB<20%)	0.02	0.02	0.07	0.07	0.02	0.03	0.02	0.02
Fishery Sustainability								
P(any RSB<30%)	0.11	0.31	0.14	0.27	0.08	0.23	0.13	0.4
Median absolute change TM	15.6%	19.1%	15.0%	15.0%	6.5%	7.7%	0.0%	0.0%
P(any1 AC TM > 15%)	1	1	0.11	0.10	0.61	0.76	0.94	0.96
P(any2 AC TM > 15%)	0.97	0.99	0.09	0.08	0.32	0.52	0.70	0.77
P(AAV > 15%)	0.69	0.84	0.04	0.06	0.07	0.15	0.14	0.30
Median average TM	46.8	51.8	46.1	50.9	45.0	51.1	46.5	51.2
Median AAV TM	17.9%	23.1%	11.2%	11.7%	7.0%	8.8%	8.0%	10.8%

Interpretation of results with AC

- Max Change15%
  - AC rarely exceeds 15%
  - AC is often at 15%
- SlowUpFastDown
  - AC is sometimes >15%
  - AC is often much less than 15%, but 1 year out of 10 is often greater than 15%

Annual Change objective

- Should define this measurable outcome more clearly
  - A question of willingness for exceeding 15% in 1, 2, … years
- Possible language
  - AC > 15% in any year out of a ten-year period
  - AC > 15% in X years out of a ten-year period
  - Median AC > 15%
  - Average AC > 15% (similar to AAV)

Priority coastwide objectives

General Objective	Measurable Objective	Measurable Outcome	Time-frame	Tolerance
1.1. SB above limit	Maintain SB > above limit reference point at least 95% of the time	SB < $SB_{20\%}$	Long-term	0.05
2.1 Maintain spawning biomass around a level that optimises fishing activities	2.1a Maintain SB above a threshold at least 80% of the time	SB < $SB_{30\%}$	Long-term	0.20
	2.1b Maintain SB above a target at least 50% of the time	SB < $SB_{36\%}$	Long-term	0.50
2.2. Limit Catch Variability	Limit annual changes in coastwide TCEY	Annual Change (AC) > 15% in 3 years	Short-term	0.25
2.3. Maximize Directed Fishing Yield	Maximize average TCEY coastwide	Median coastwide TCEY	Short-term	STATISTIC OF INTEREST

Objectives related to distributing the TCEY

- Biological sustainability
  1. Conserve spatial population structure
- Optimize directed fishing opportunities
  2. Maintain spawning biomass around a target level that optimizes fishing activities
  3. Limit catch variability
  4. Maximize directed fishing yield

Conservation Objective - distributing the TCEY

General Objective	Measurable Objective	Measurable Outcome	Timeframe	Tolerance
1.1a Conserve spatial population structure	Maintain a defined minimum proportion of spawning biomass in each Biological Region	$p_{SB,R} < p_{SB,R,min}$	Long-term	
	Proportion of Pacific halibut spawning biomass in each Biological Region	Proportion of Pacific halibut spawning biomass in each Biological Region	Long-term	STATISTIC OF INTEREST

Complementary to coastwide conservation objective (proportion)
The minimum proportion should sum to <1, and may be based on

- Historical estimates from modelled FISS data
- Percentage of estimated unfished biomass
- Agreement

Estimated proportion of regional O32 biomass

Region	Minimum Observed	Objective	Justification
2	11.3%	5%	Few spawning areas
3	46.1%	33%	Currently at low %; Many spawning areas
4	14.9%	10%	Has been consistent; Many spawning areas
4B	3.7%	2%	May partly be a separate stock
Sum	**76.0%**	**50%**	

Year	Region 2 (2A, 2B, 2C)	Region 3 (3A, 3B)	Region 4 (4A, 4CDE)	Region 4B
1993	15.1%	60.5%	14.9%	9.4%
1994	17.7%	57.7%	15.2%	9.5%
1995	19.3%	57.2%	14.6%	9.0%
1996	16.4%	58.3%	16.3%	8.9%
1997	15.1%	58.5%	17.5%	8.9%
1998	12.9%	57.1%	21.6%	8.5%
1999	11.3%	59.8%	21.5%	7.3%
2000	12.3%	59.5%	21.7%	6.5%
2001	15.1%	59.0%	20.5%	5.3%
2002	15.9%	61.0%	18.9%	4.2%
2003	14.3%	62.8%	19.0%	3.9%
2004	12.1%	66.7%	17.6%	3.7%
2005	14.2%	65.1%	16.7%	3.9%
2006	14.0%	63.7%	17.5%	4.8%
2007	14.8%	63.2%	16.1%	5.9%
2008	16.3%	58.5%	18.4%	6.7%
2009	17.9%	55.5%	20.4%	6.2%
2010	20.3%	53.8%	20.1%	5.9%
2011	23.1%	51.8%	19.1%	6.0%
2012	25.1%	52.3%	18.0%	4.6%
2013	28.4%	46.8%	19.1%	5.7%
2014	27.6%	47.4%	20.1%	4.8%
2015	29.2%	45.2%	20.8%	4.9%
2016	28.4%	48.0%	19.1%	4.5%
2017	28.3%	46.1%	20.5%	5.0%
2018	27.3%	46.2%	20.6%	5.9%

Conservation Objective - distributing the TCEY

General Objective	Measurable Objective	Measurable Outcome	Timeframe	Tolerance
1.1a Conserve spatial population structure	Maintain a defined minimum proportion of spawning biomass in each Biological Region	$p_{SB,2} < 0.05$ $p_{SB,3} < 0.33$ $p_{SB,4} < 0.10$ $p_{SB,4B} < 0.02$	Long-term	0.05
	Proportion of Pacific halibut spawning biomass in each Biological Region	Proportion of Pacific halibut spawning biomass in each Biological Region	Long-term	STATISTIC OF INTEREST

- It is difficult to define specific proportions
- It may be easier to distribute the TCEY according to stock distribution rather than defining percentages
  - This would harvest in proportion to the distribution of biomass

Fishery Objectives - distributing the TCEY (1)

General Objective	Measurable Objective	Measurable Outcome	Timeframe	Tolerance
2.1a Maintain biomass around a target that optimizes fishing activities	Maintain a proportion of coastwide O26 Pacific halibut in each area, estimated from modelled survey results, greater than a threshold	$p_{B_{AllSizes},A} > p_{B_{AllSizes},A,min}$	Short-term Long-term	
	Proportion of O26 Pacific halibut biomass in each area	Proportion of O26 Pacific halibut biomass in each area	Short-term Long-term	STATISTIC OF INTEREST

Not specifically discussed by *ad hoc* WG

Maintain exploitable biomass in each IPHC Regulatory Area

- O26 biomass (modelled survey results) as a proxy for exploitable biomass

Proportion of “all sizes” WPUE

Year	2A	2B	2C	3A	3B	4A	4B	4CDE
1993	1.4%	6.3%	7.0%	37.1%	25.9%	6.1%	9.4%	6.9%
1994	1.3%	7.7%	8.0%	34.1%	26.0%	6.9%	9.3%	6.7%
1995	1.2%	8.8%	8.7%	34.1%	25.8%	7.0%	8.7%	5.7%
1996	1.2%	7.4%	8.0%	32.5%	28.1%	8.5%	8.6%	5.7%
1997	1.2%	5.6%	8.1%	35.3%	25.1%	11.0%	8.4%	5.3%
1998	1.3%	4.8%	7.0%	28.1%	30.7%	13.6%	8.2%	6.3%
1999	1.4%	4.3%	6.0%	27.1%	34.6%	12.9%	7.1%	6.6%
2000	1.3%	4.9%	6.4%	32.6%	28.9%	12.7%	6.3%	7.0%
2001	1.3%	6.2%	7.8%	34.3%	26.0%	11.7%	5.1%	7.6%
2002	1.0%	6.2%	8.6%	40.4%	22.2%	10.6%	3.9%	7.1%
2003	1.0%	5.0%	7.8%	38.0%	26.7%	10.0%	3.5%	7.9%
2004	1.1%	4.8%	5.8%	44.5%	23.9%	9.0%	3.2%	7.7%
2005	1.3%	5.7%	7.1%	45.0%	19.9%	9.1%	3.3%	8.5%
2006	1.1%	5.7%	7.1%	41.7%	21.7%	8.3%	4.0%	10.5%
2007	1.0%	6.4%	7.3%	40.4%	22.3%	7.9%	4.9%	9.8%
2008	1.1%	7.1%	7.4%	37.6%	21.2%	9.7%	5.3%	10.6%
2009	0.9%	8.5%	7.3%	34.9%	21.7%	10.2%	4.8%	11.6%
2010	1.2%	9.0%	7.6%	36.3%	20.1%	9.1%	4.3%	12.4%
2011	1.5%	8.7%	8.8%	37.7%	18.5%	8.2%	4.5%	12.0%
2012	1.4%	9.5%	10.3%	39.6%	16.7%	7.7%	3.6%	11.3%
2013	1.6%	10.9%	12.0%	34.6%	16.0%	7.0%	4.9%	13.1%
2014	1.6%	10.3%	11.5%	38.0%	15.3%	6.8%	4.0%	12.6%
2015	1.9%	11.1%	11.6%	36.7%	15.3%	6.7%	4.0%	12.5%
2016	1.7%	10.7%	12.2%	37.1%	16.4%	6.0%	4.0%	12.0%
2017	1.4%	9.0%	14.2%	38.5%	12.3%	7.4%	4.4%	12.7%
2018	1.5%	9.8%	11.8%	39.2%	12.0%	7.0%	5.2%	13.4%

Fishery Objectives - distributing the TCEY (1)

General Objective	Measurable Objective	Measurable Outcome	Timeframe	Tolerance
2.1A MAINTAIN BIOMASS AROUND A TARGET THAT OPTIMIZES FISHING ACTIVITIES	Maintain a proportion of coastwide O26 Pacific halibut in each area, estimated from modelled survey results, greater than a threshold	$p_{B_{AllSizes},2A} > ?$ $p_{B_{AllSizes},2B} > ?$ $p_{B_{AllSizes},2C} > ?$ $p_{B_{AllSizes},3A} > ?$ $p_{B_{AllSizes},3B} > ?$ $p_{B_{AllSizes},4A} > ?$ $p_{B_{AllSizes},4B} > ?$ $p_{B_{AllSizes},4CDE} > ?$	Short-term Long-term	
	Proportion of O26 Pacific halibut biomass in each area	Proportion of O26 Pacific halibut biomass in each area	Short-term Long-term	STATISTIC OF INTEREST

May be best reported as a statistic of interest

- Reminder: this would be the “simulated/actual” biomass in the OM

Fishery Objectives - distributing the TCEY (2)

General Objective	Measurable Objective	Measurable Outcome	Timeframe	Tolerance
2.2A LIMIT CATCH VARIABILITY	Limit annual changes in the TCEY for each Regulatory Area	Annual Change by Regulatory Area (AC_A) > 15%	Long-term Short-term	0.25
		Maximum AC by Regulatory Area (AC_A)	Long-term Short-term	STATISTIC OF INTEREST
		Average Annual Variability by Regulatory Area (AAV_A)	Long-term Short-term	STATISTIC OF INTEREST

Same as coastwide, except specific to IPHC Regulatory Area

- The ad hoc WG felt that coastwide and area objectives are useful
  - Coastwide: recognizing estimation error
  - Area: recognizing distribution uncertainty

Fishery Objectives - distributing the TCEY (3)

General Objective	Measurable Objective	Measurable Outcome	Timeframe	Tolerance
2.3A MAXIMIZE DIRECTED FISHING YIELD	Maximize average TCEY by Regulatory Area	Median Reg Area TCEY	Long-term Short-term	STATISTIC OF INTEREST
	Maintain TCEY above a minimum absolute level by Regulatory Area	$TCEY_A < TCEY_{A,min}$	Long-term Short-term	
	Maintain a percentage of the coastwide TCEY above a minimum level by Regulatory Area	$\%TCEY_A > \%TCEY_{A,min}$	Long-term Short-term	
	TCEY changes with local abundance	To be discussed at MSAB014		
	Present the range of TCEY by Regulatory Area that would be expected	Range of TCEY by Regulatory Area	Long-term Short-term	STATISTIC OF INTEREST

Fishery Objectives - distributing the TCEY (3)

- Maximize average TCEY by Reg Area
  - May not be an objective across all IPHC Regulatory Areas
  - Report Median TCEY in each IPHC Regulatory Areas

- TCEY changes with local abundance
  - Can report correlation between TCEY and abundance
  - TCEY increases or decreases same as abundance
  - TCEY increases or decreases at a similar rate as abundance
  - **What is abundance?**

Fishery Objectives - distributing the TCEY (3)

- Maintain TCEY above a minimum percentage
  - Interaction objectives
- Maintain TCEY an minimum absolute value
  - IPHC Regulatory Area objective

Absolute minimum		Minimum percentage of coastwide TCEY	
Pro	**Con**	**Pro**	**Con**
Easily defined	May not be achievable at low biomass	Scales with changing biomass	Catch limit not defined and may be small
Objective met when all areas meet minimum.	Only rational when minimum can be achieved in all areas	Implies rational sharing between IPHC Regulatory Areas	Objective may be met at unacceptable catch limits
	Summation across areas may be greater than what is likely		Summation across areas may be greater than 100%.

Fishery Objectives - distributing the TCEY (3)

The Commission ADOPTED:

a) a coastwide target SPR of 47% for 2019;

b) a share-based allocation for IPHC Regulatory Area 2B. The share will be defined based on a weighted average that assigns 30% weight to the current interim management procedure's target TCEY distribution and 70% on 2B's recent historical average share of 20%. This formula for defining IPHC Regulatory Areas 2B's annual allocation is intended to apply for a period of 2019 to 2022. For 2019, this equates to a share of 17.7%; and

c) a fixed TCEY for IPHC Regulatory Area 2A of 1.65 mlbs is intended to apply for a period from 2019-2022, subject to any substantive conservation concerns.

Fishery Objectives - distributing the TCEY (3)

General Objective	Measurable Objective	Measurable Outcome	Timeframe	Tolerance
2.3A MAXIMIZE DIRECTED FISHING YIELD	Maintain TCEY above a minimum absolute level by Regulatory Area	$TCEY_A < TCEY_{A,min}$	Long-term Short-term	
	Maintain a percentage of the coastwide TCEY above a minimum level by Regulatory Area	$\%TCEY_A > \%TCEY_{A,min}$	Long-term Short-term	
	Maintain TCEY above a minimum absolute level by Regulatory Area	Median Reg Area TCEY	Long-term Short-term	STATISTIC OF INTEREST
	Maintain a percentage of the coastwide TCEY above a minimum level by Regulatory Area	Proportion of TCEY by Reg Area	Long-term Short-term	STATISTIC OF INTEREST

Fishery Objectives - distributing the TCEY (4)

- Minimize potential of a catch limit equal to zero for the directed fishery
  - Is this similar to maintain TCEY above an absolute level?
  - Is this necessary?

Priority distribution objectives

General Objective	Measurable Objective	Measurable Outcome	Timeframe	Tolerance
1.1A Conserve spatial population structure	Maintain a defined minimum proportion of spawning biomass in each Biological Region	$p_{SB,2} < 0.05$ $p_{SB,3} < 0.33$ $p_{SB,4} < 0.10$ $p_{SB,4B} < 0.02$	Long-term (Med-term)	0.05
2.1A Maintain biomass around a target that optimizes fishing activities	Proportion of O26 Pacific halibut biomass in each area	Proportion of O26 Pacific halibut biomass in each area	Short-term Long-term	STATISTIC OF INTEREST
2.2A Limit Catch Variability	Limit annual changes in the TCEY for each Regulatory Area	Annual Change by Regulatory Area (AC_A) > 15%	Long-term Short-term	0.25
2.3A Maximize Directed Fishing Yield	Maintain TCEY above a minimum absolute level by Regulatory Area	Median Reg Area TCEY	Long-term Short-term	STATISTIC OF INTEREST
	Maintain a percentage of the coastwide TCEY above a minimum level by Regulatory Area	Proportion of TCEY by Reg Area	Long-term Short-term	STATISTIC OF INTEREST

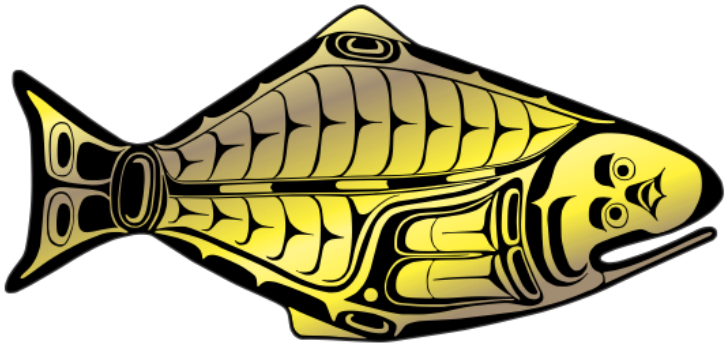
Ten priority objectives

- Coastwide
  - Biomass limit
  - Biomass target
  - Biomass threshold
  - Yield variability
  - Maximize yield
- Regions
  - Spatial population structure
- IPHC Regulatory Areas
  - Available Pacific halibut
  - Yield variability
  - Maintain TCEY above a minimum absolute level
  - Maintain a percentage of the coastwide TCEY above a minimum level

Tuning objective (SRB015-R, para. 51)

- Establish a criterion that will narrow down the management procedures
  - $B_{lim} = 20\%B_0$ is a criterion
  - Spatial population structure objective is also a criterion
  - Target and threshold objectives can also be criteria
- Then examine trade-offs between other objectives

INTERNATIONAL PACIFIC



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