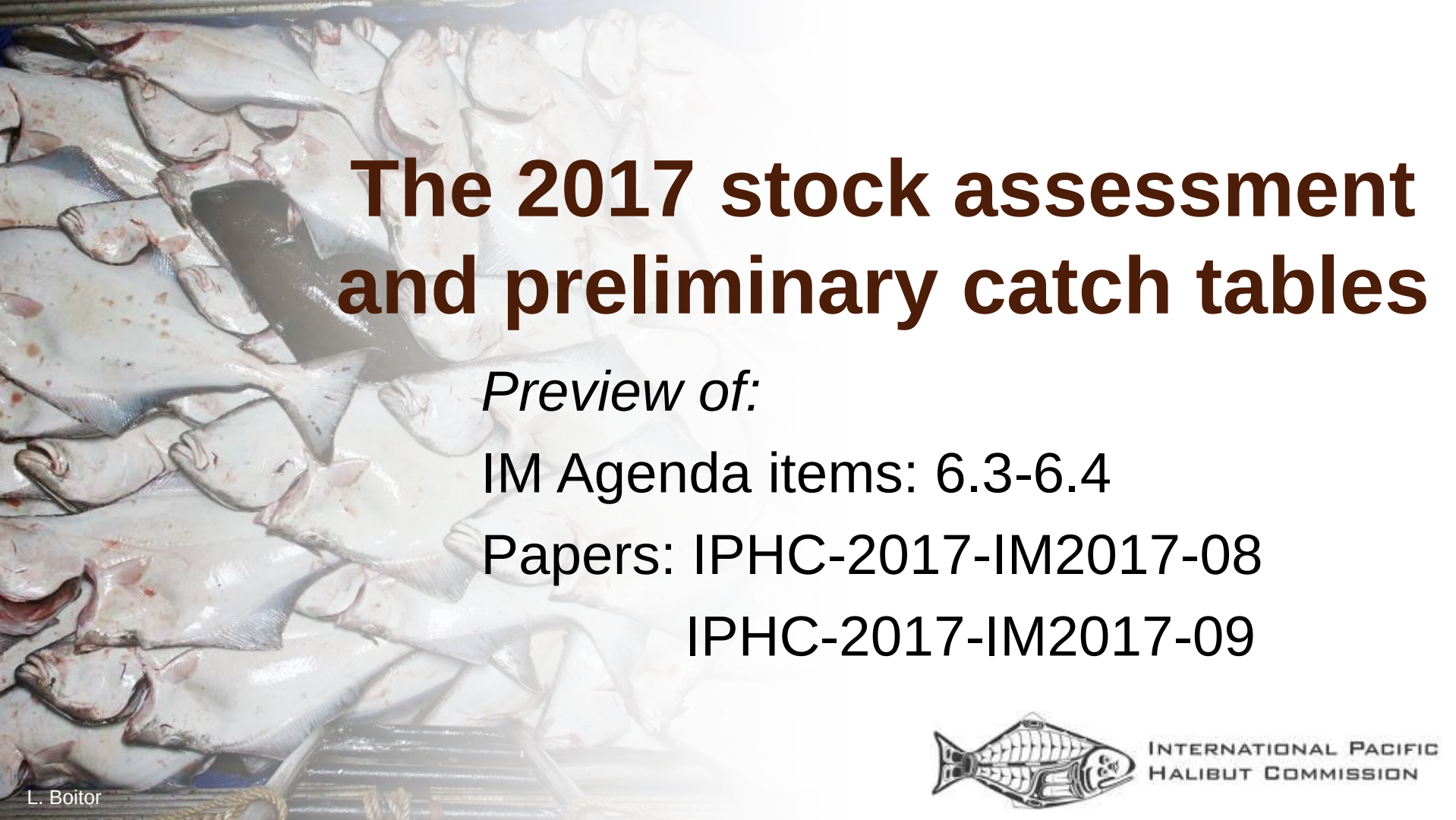


The 2017 stock assessment and preliminary catch tables

Preview of:

IM Agenda items: 6.3-6.4

Papers: IPHC-2017-IM2017-08

IPHC-2017-IM2017-09

INTERNATIONAL PACIFIC HALIBUT COMMISSION

L. Boitor

Summary

- Large drop in survey numbers (24%) and weight (10%) observed in 2017
- Fishery WPUE stable coastwide, but down in most Regulatory Areas
- 2017 stock size estimates close to last assessment (down only 2%)
- Projections indicate much less yield available in the near future

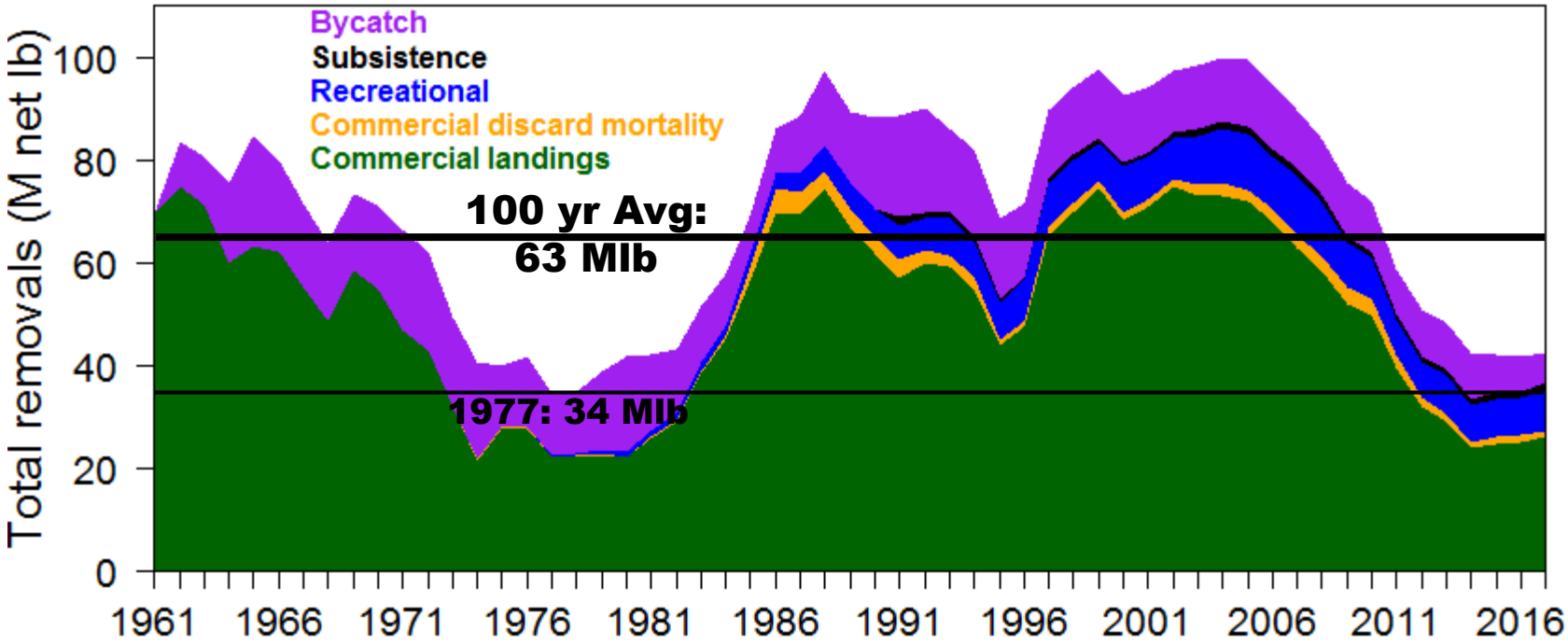
Outline

- Coastwide stock assessment
  - Data sources and summary
  - Modelling framework
  - Results
  - Decision table

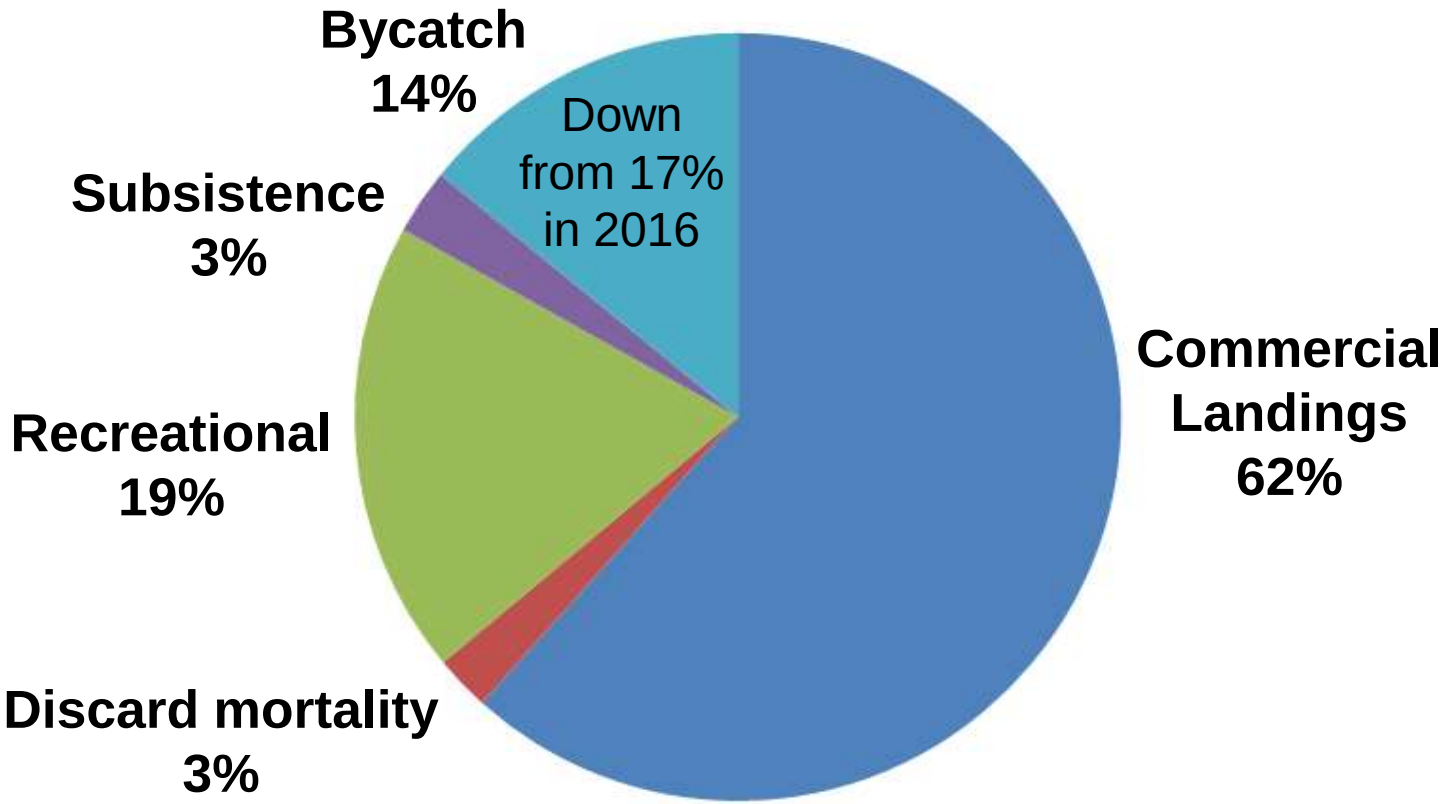
Break

- Catch tables
  - Regulatory Area-specific projections

Sources of mortality



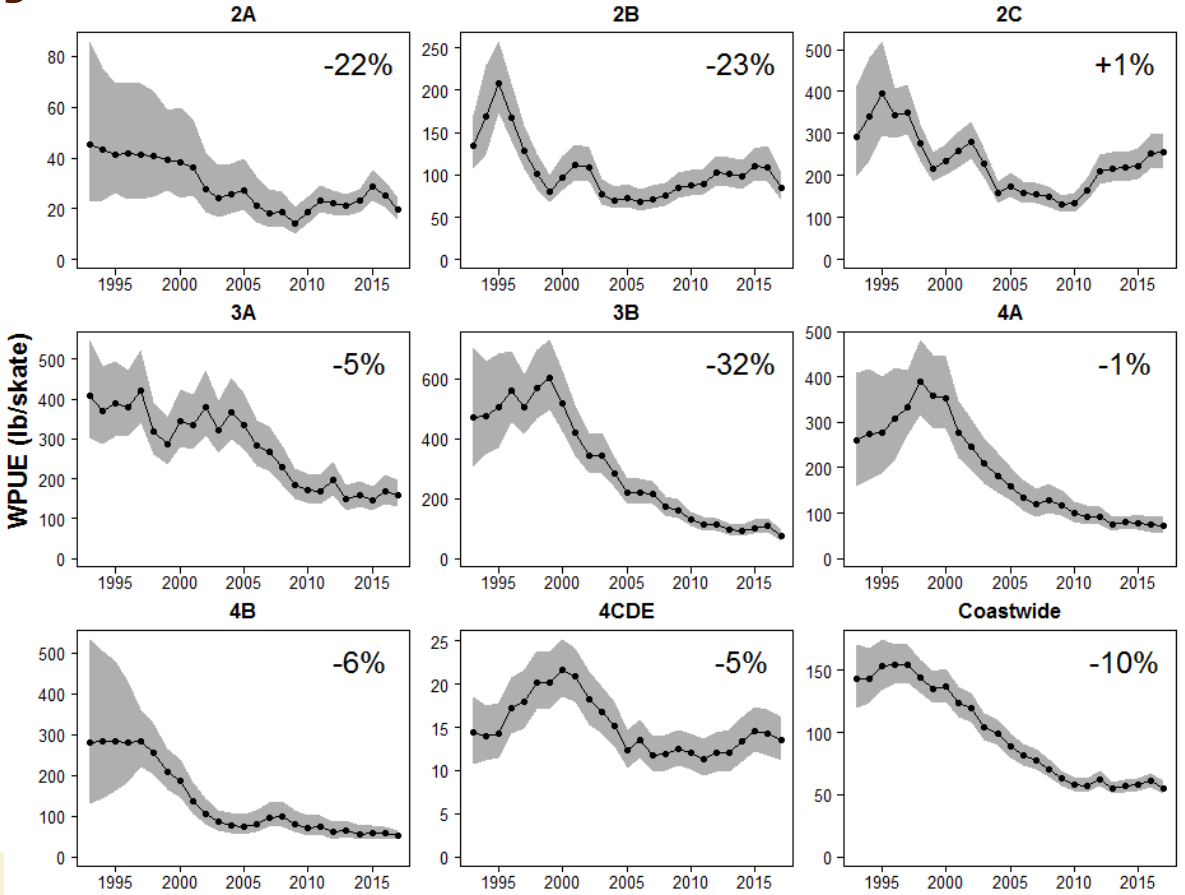
2017 Mortality (weight): 42.44 Mlb



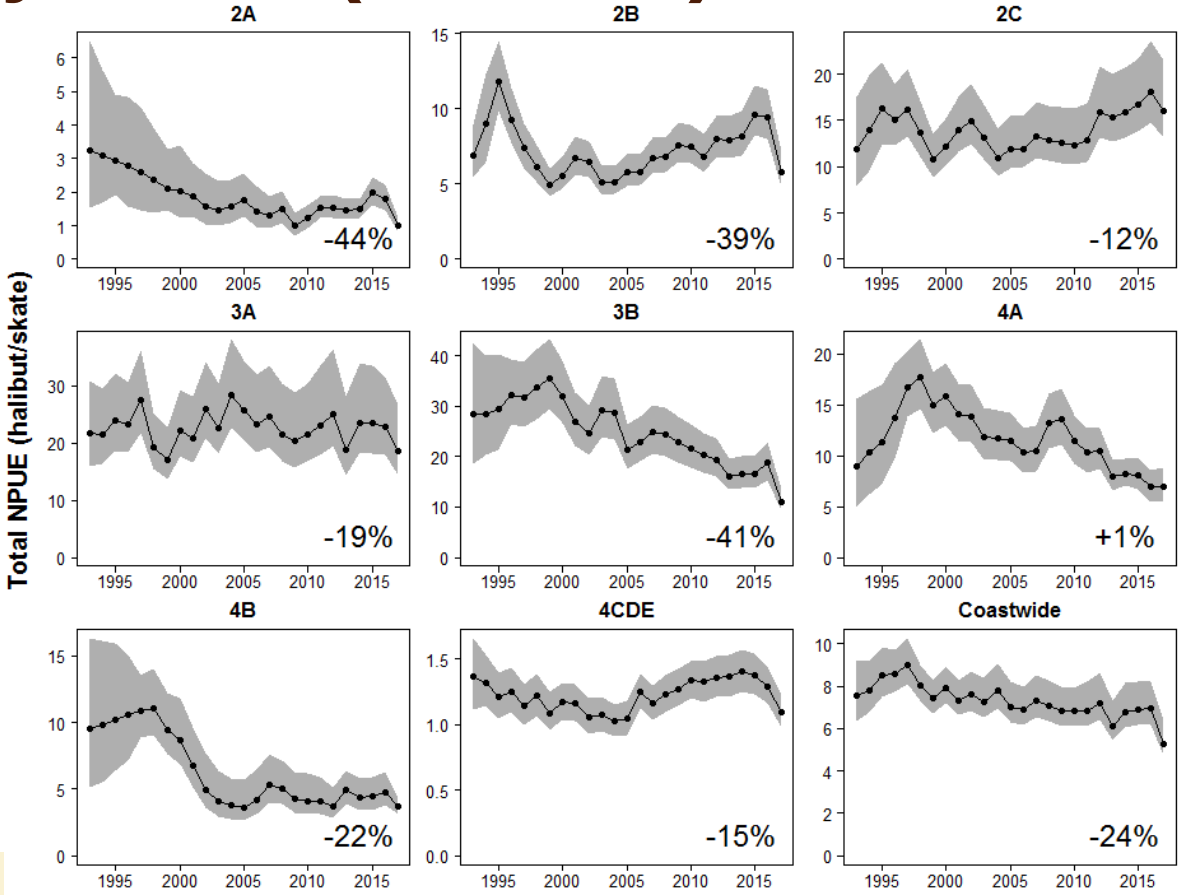
Recent mortality (M lbs net)

Year	Commercial Landings	Discard mortality	Recreational	Subsistence	Bycatch	Total
2013	29.04	1.43	7.63	1.13	8.83	48.07
2014	23.70	1.30	7.18	1.20	8.93	42.31
2015	24.67	1.29	7.46	1.20	7.47	42.10
2016	25.05	1.18	7.38	1.17	7.02	41.79
2017	26.16	0.99	8.13	1.17	6.00	42.44

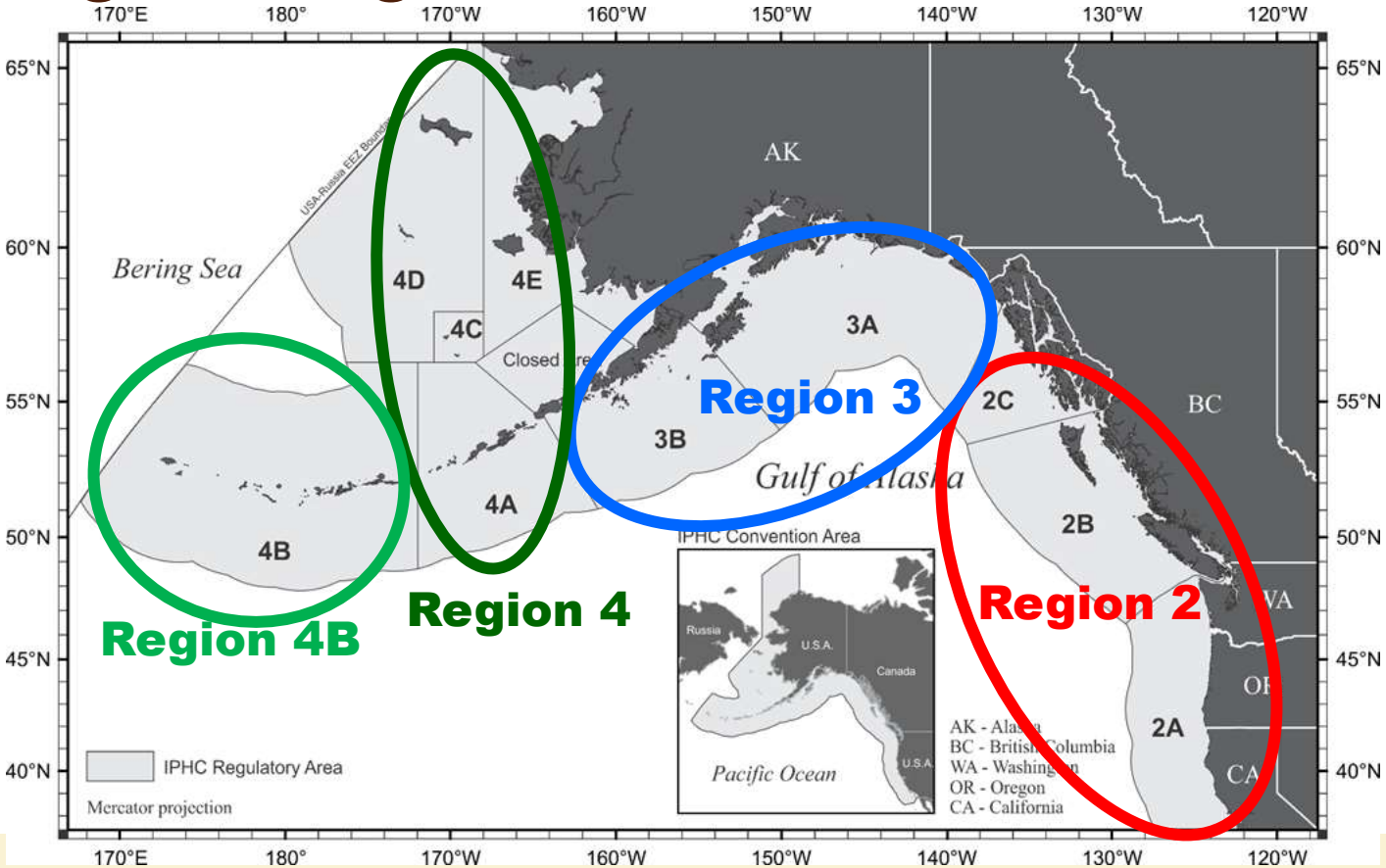
Survey O32 WPUE



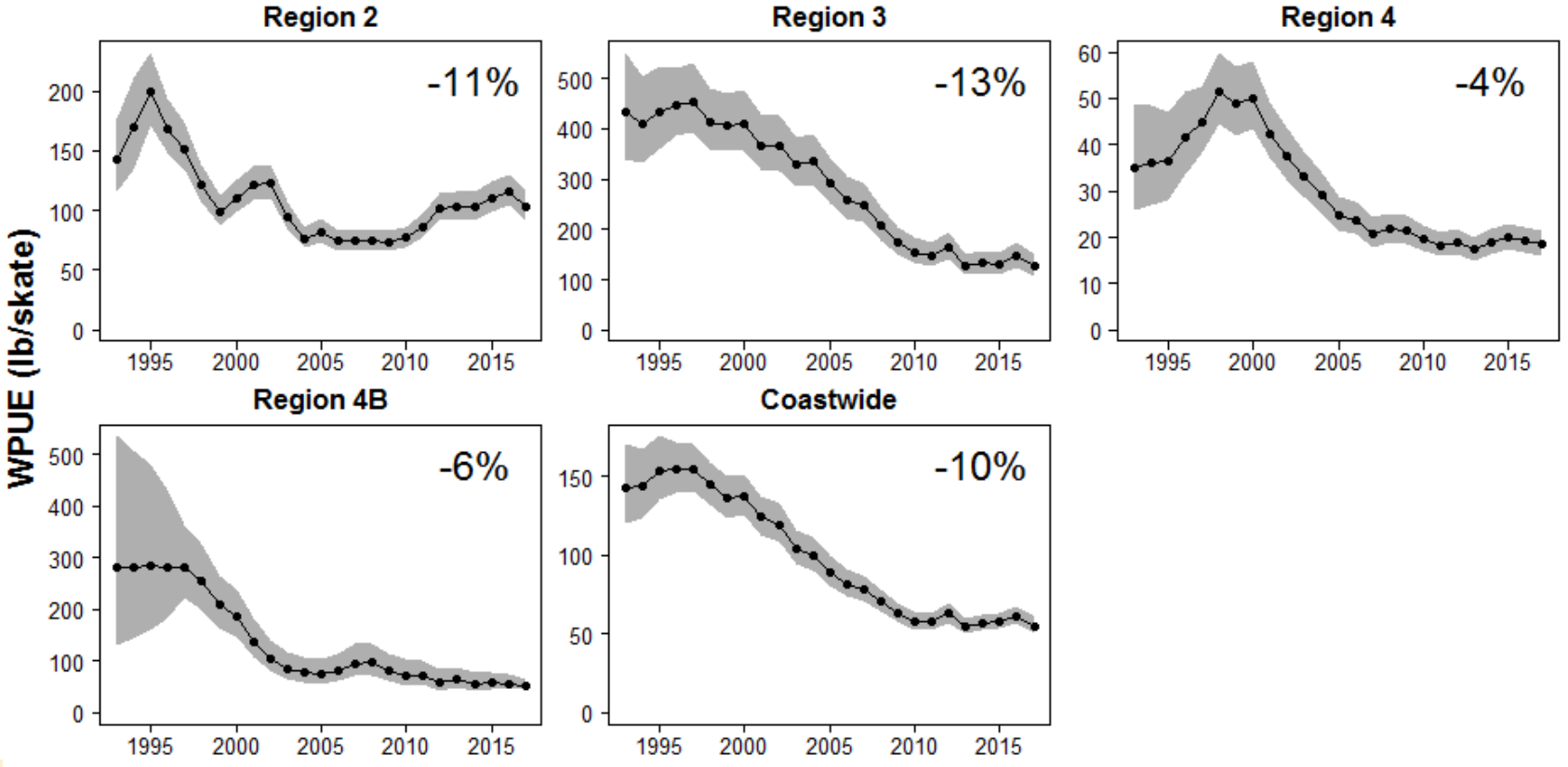
Survey NPUE (all sizes)



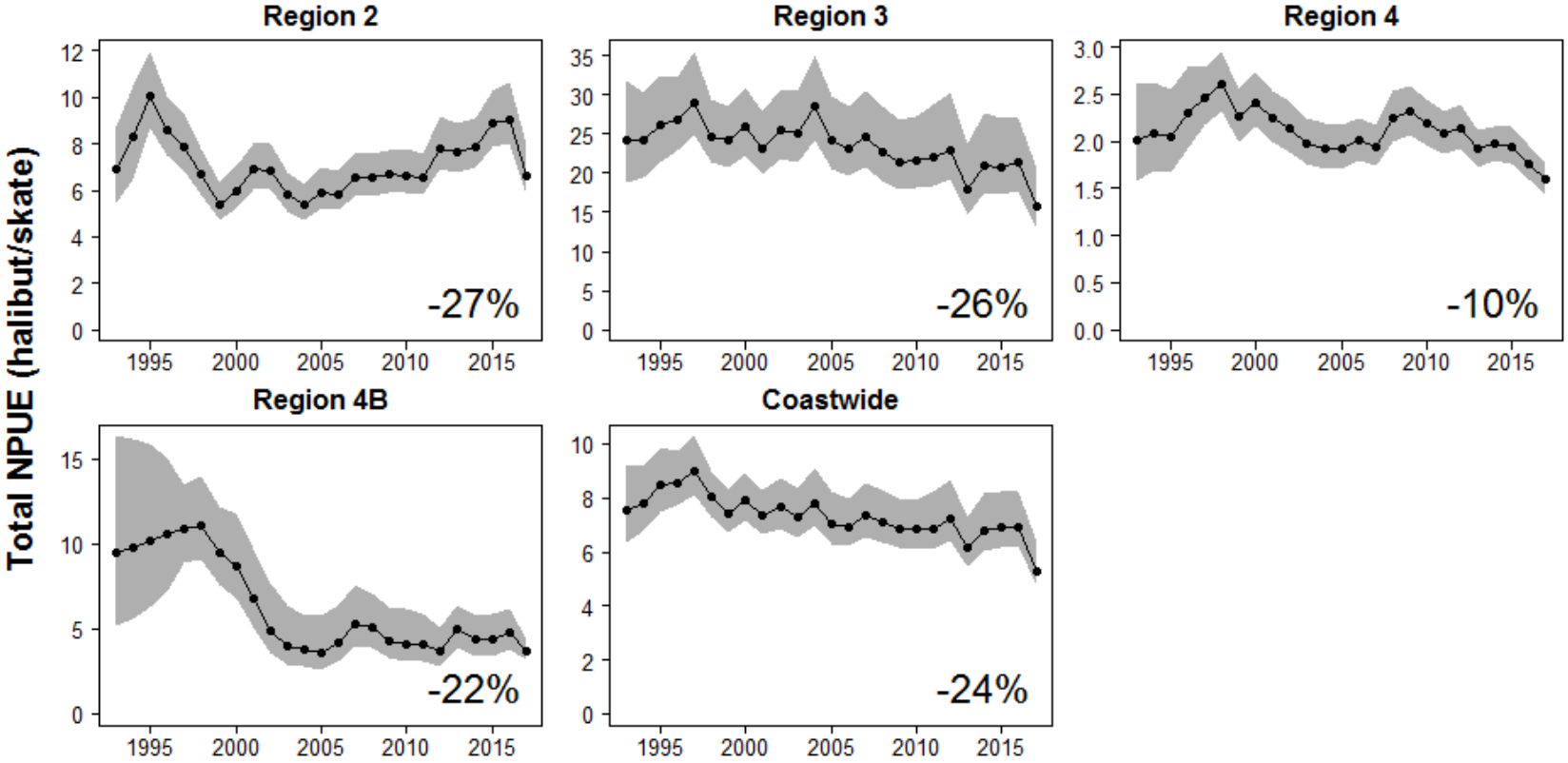
Biological regions



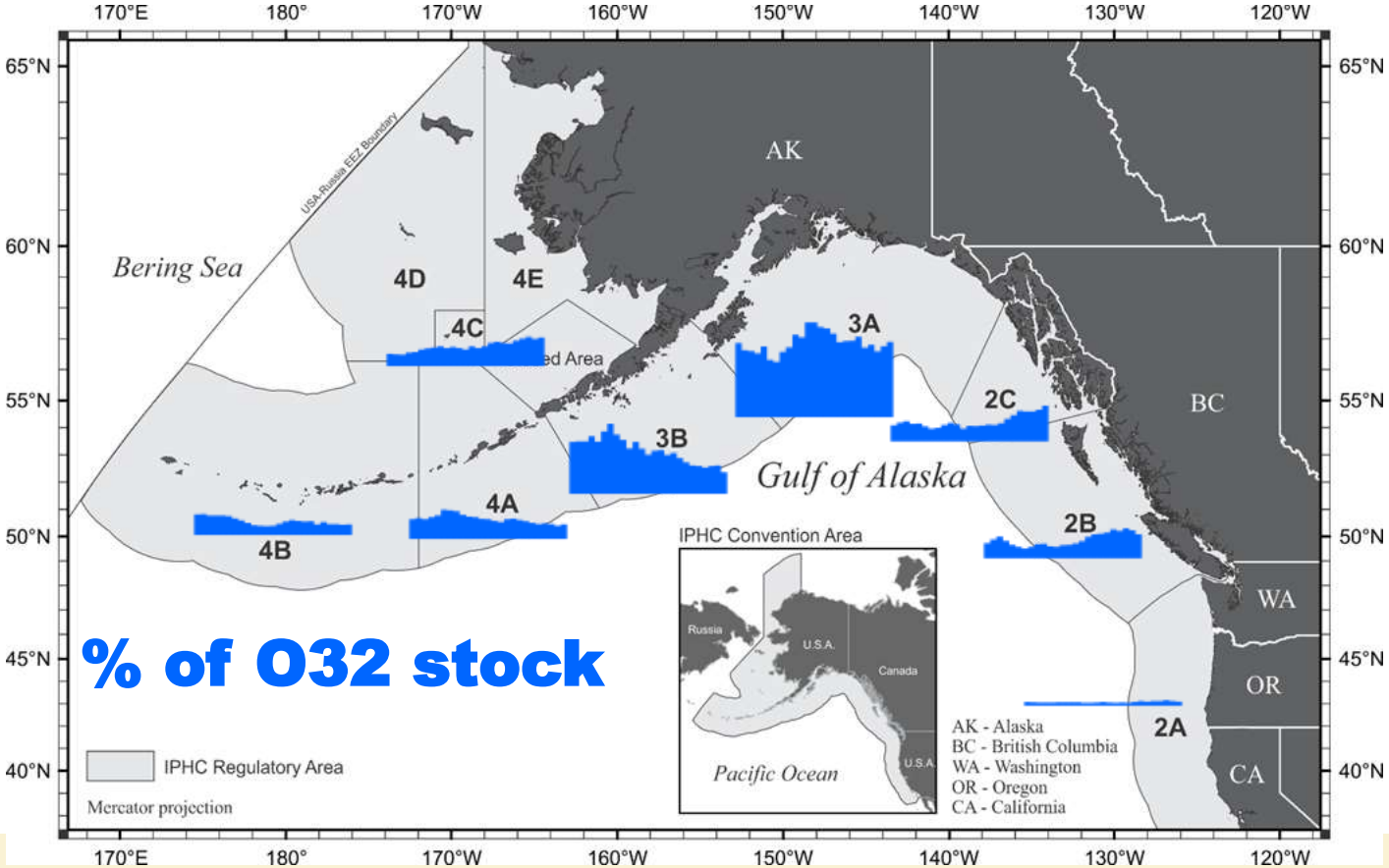
Survey O32 WPUE



Survey NPUE – All sizes



Stock distribution: 1993-2017



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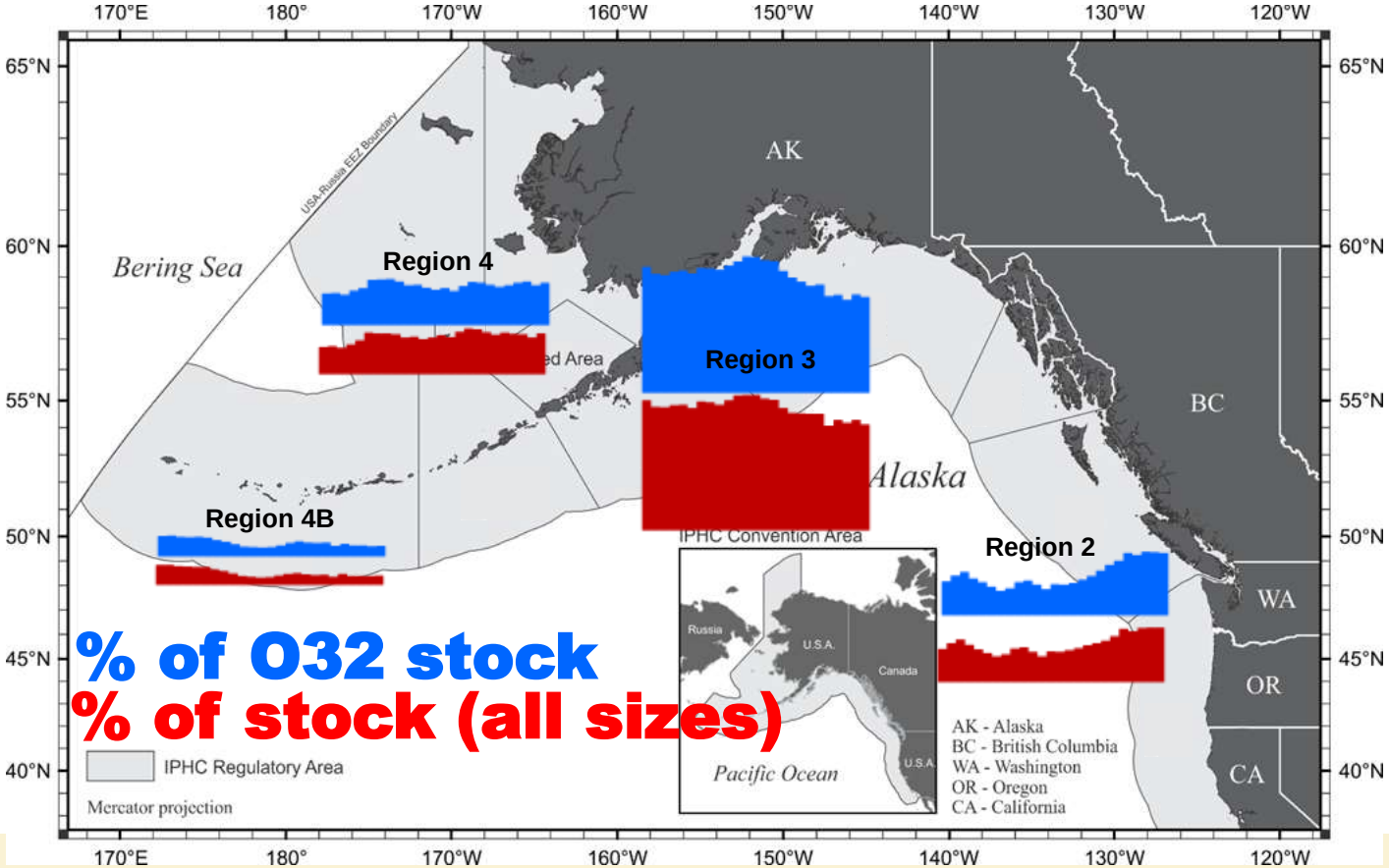

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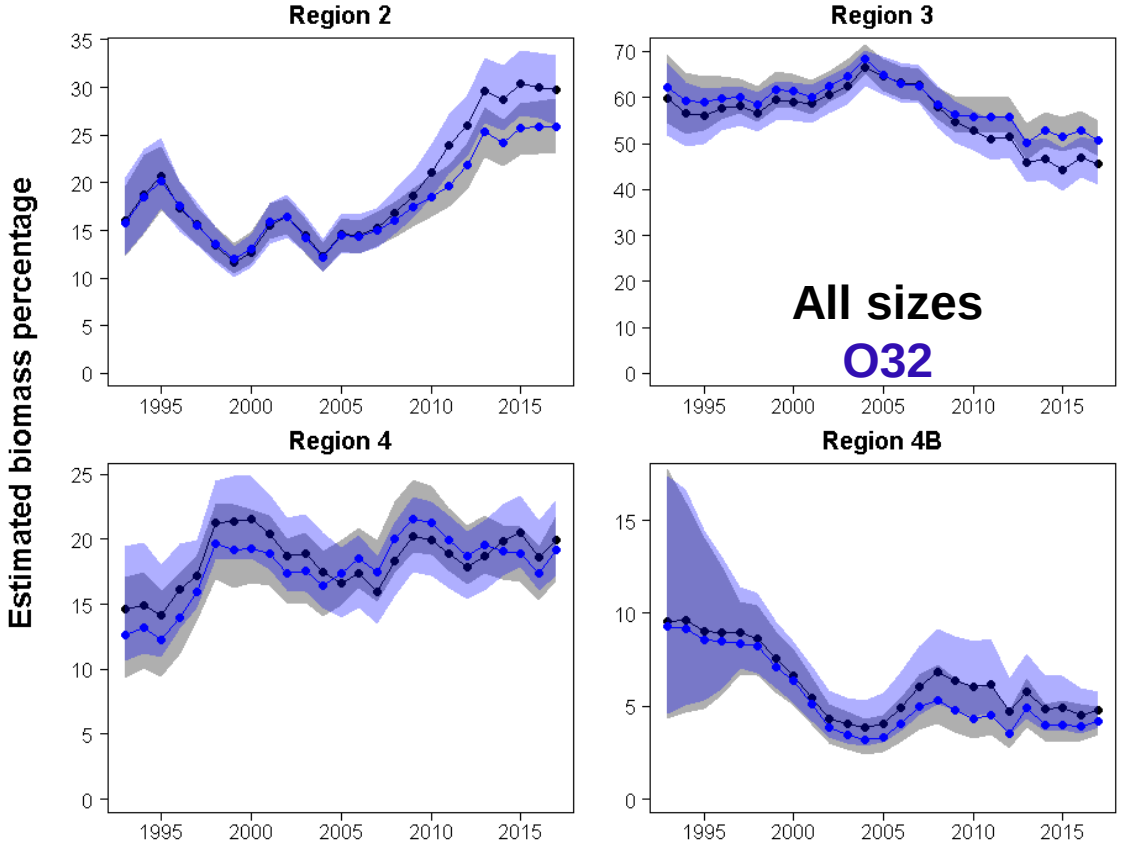
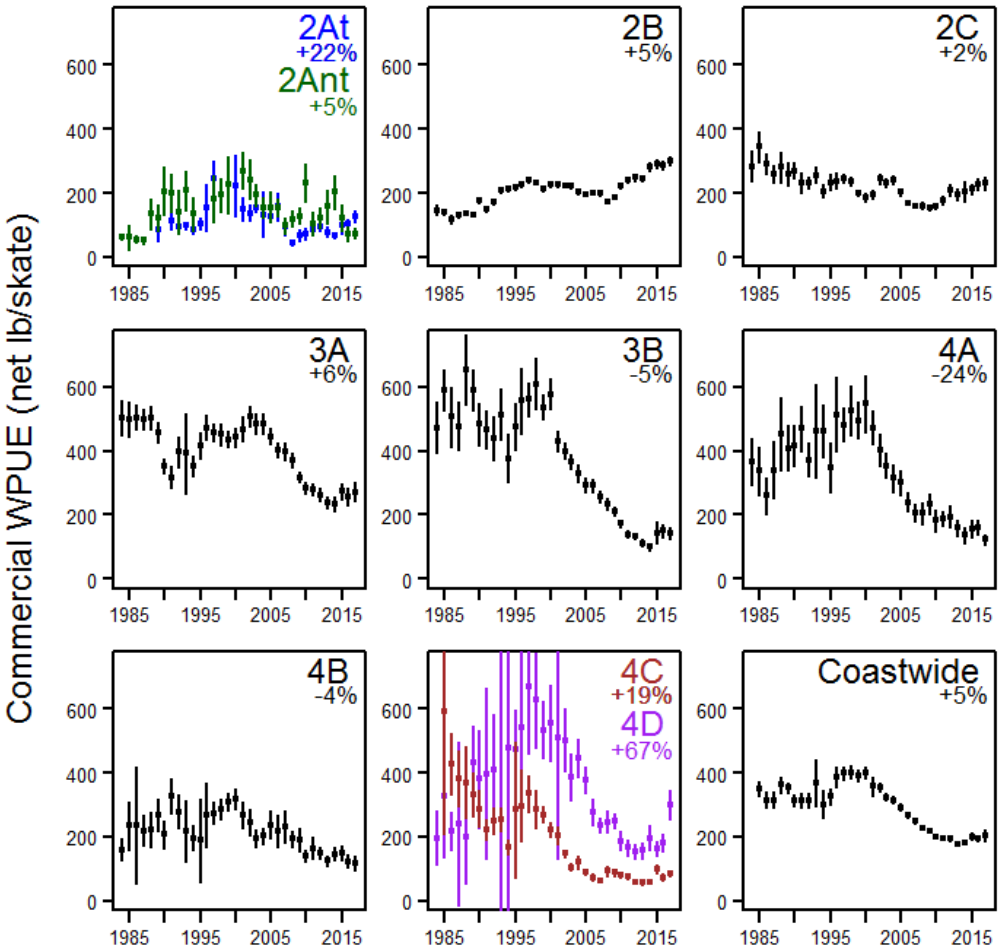


Commercial WPUE

- 2A: separating tribal and non-tribal trends
- 4D: change in spatial distribution (+25% of catch to St. Matthew)
- Logbooks are incomplete through November



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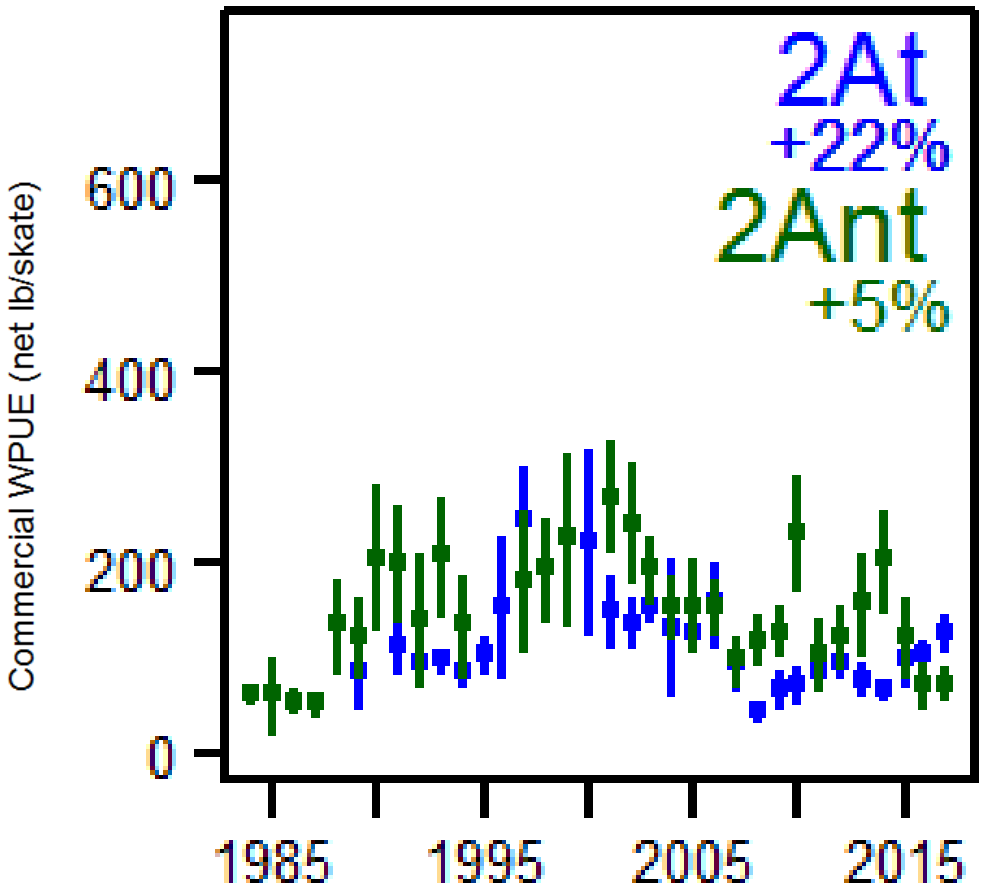

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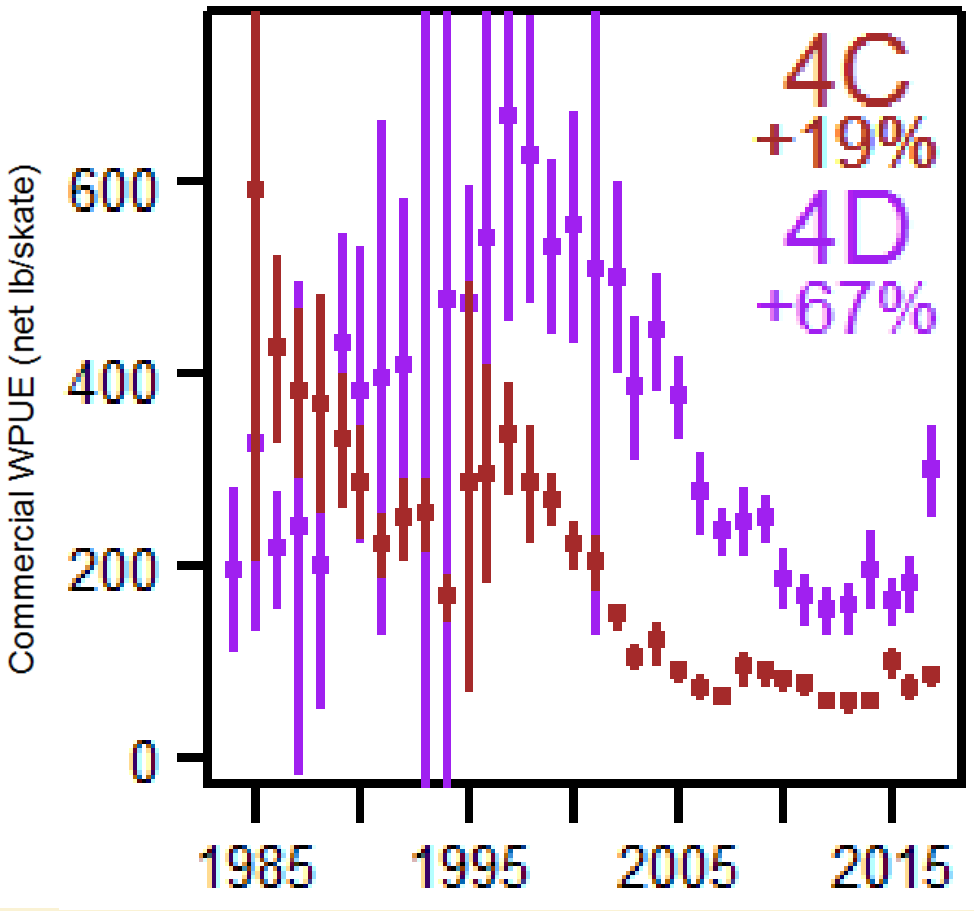

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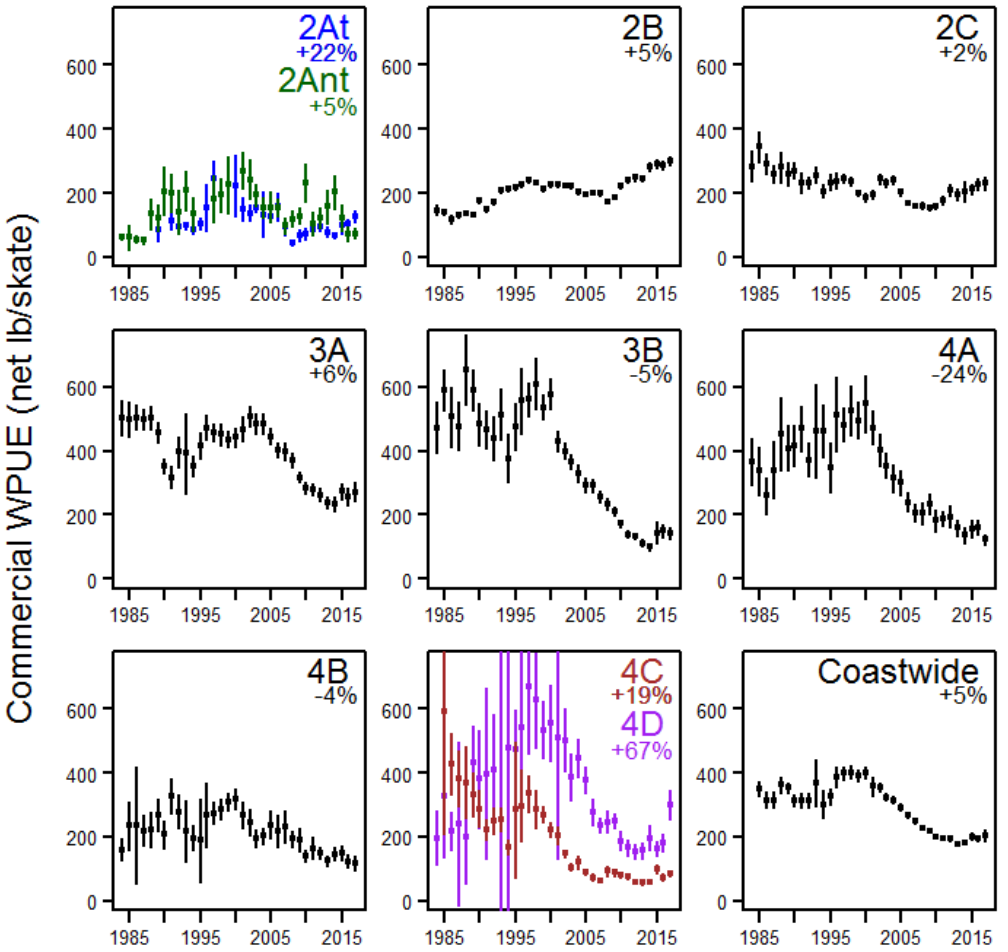
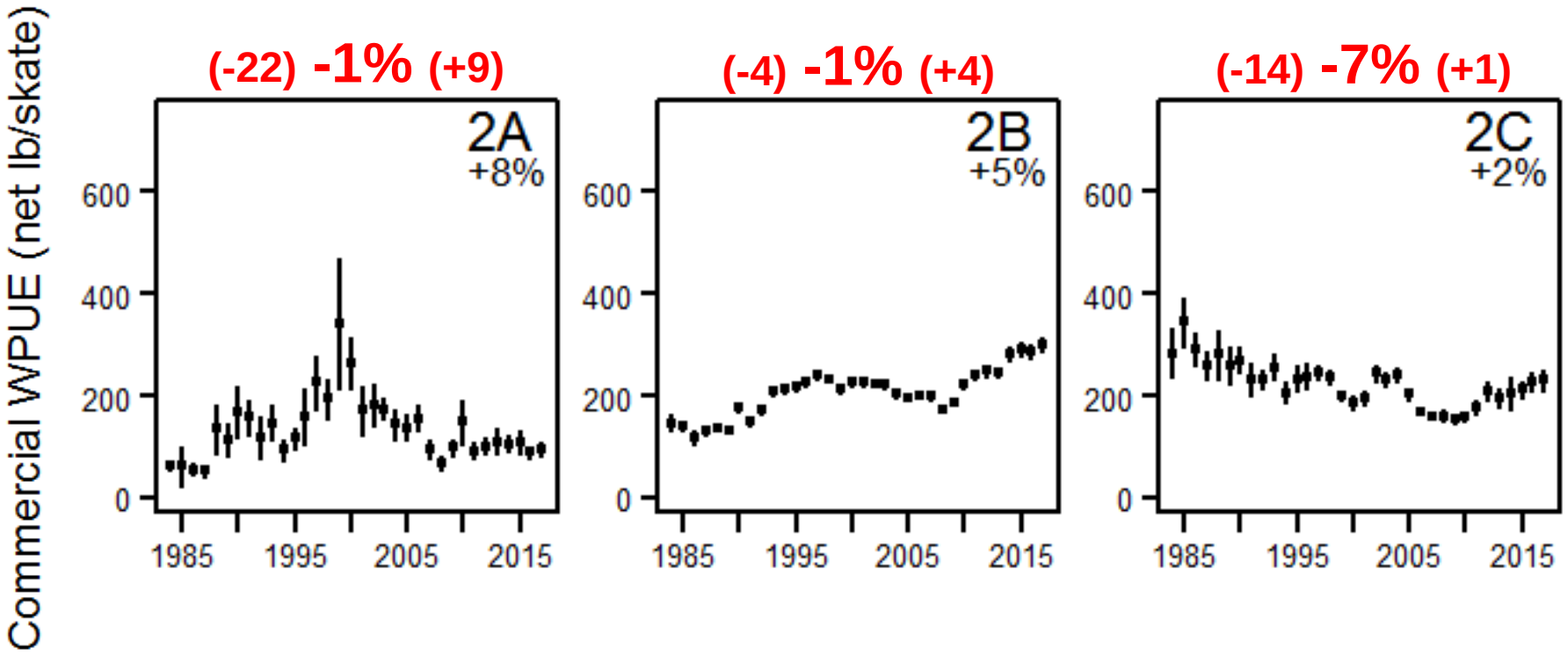


Commercial WPUE - Bias corrected



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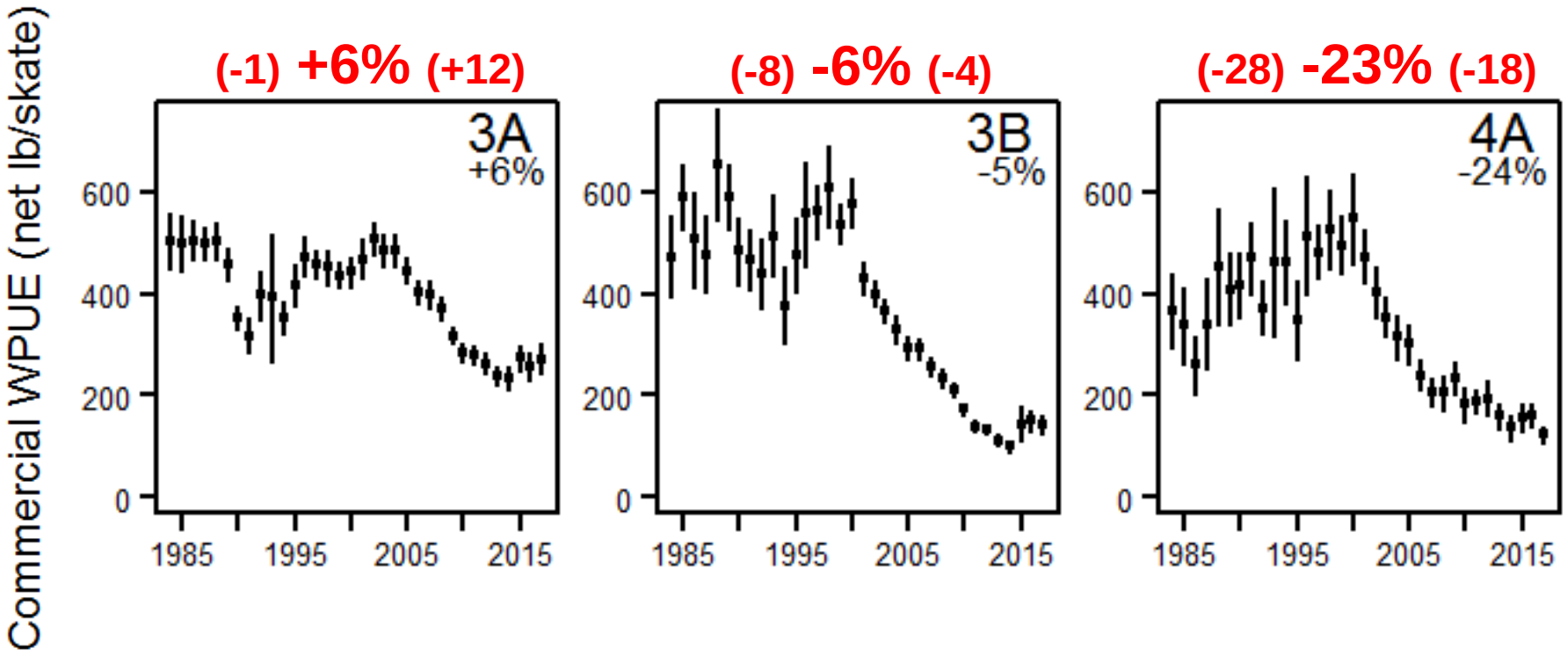
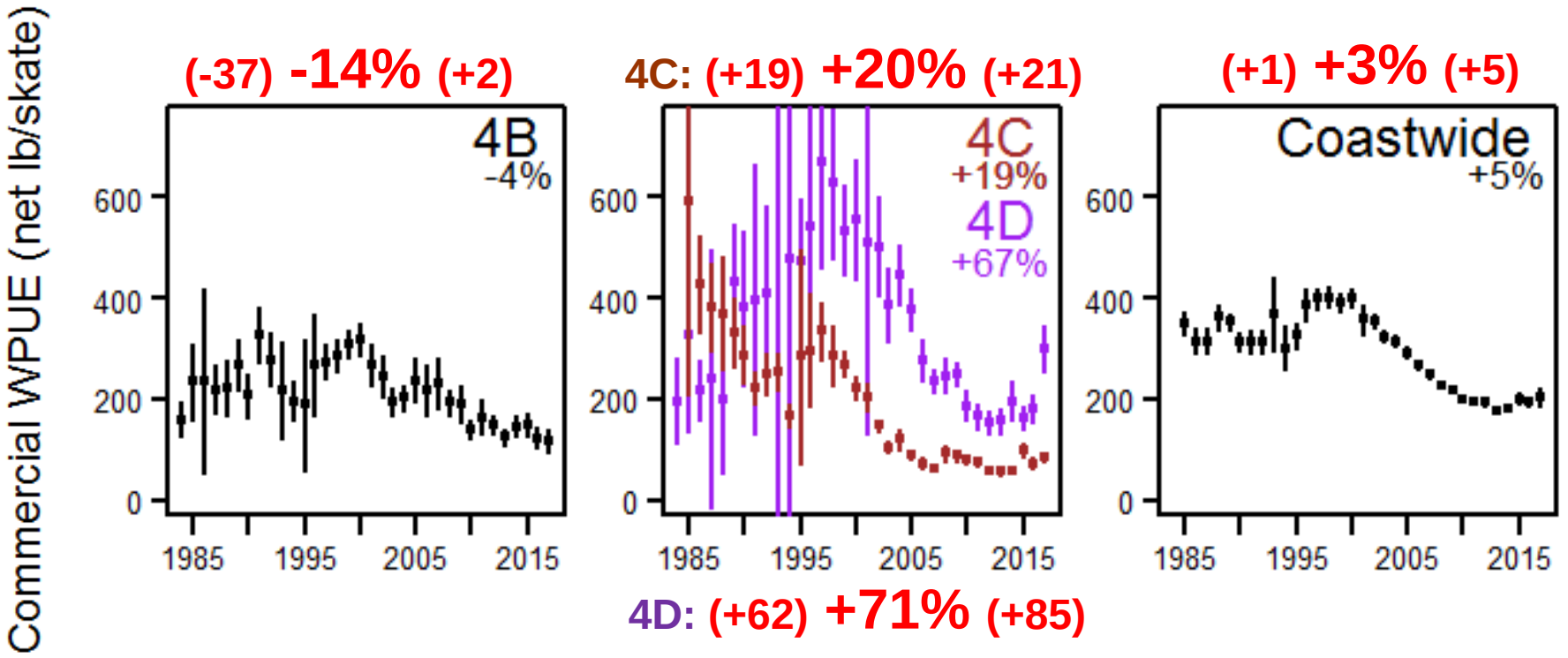
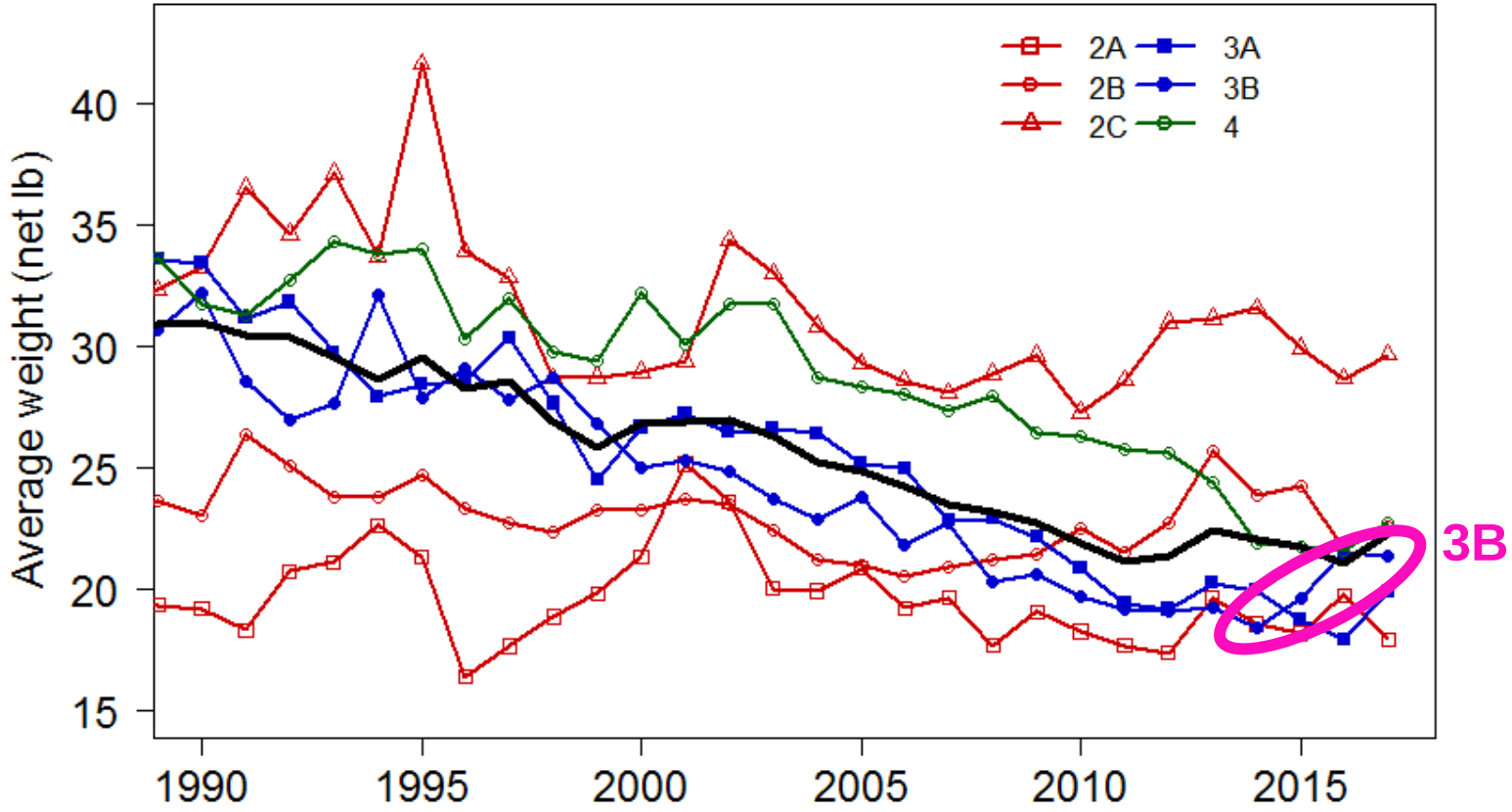


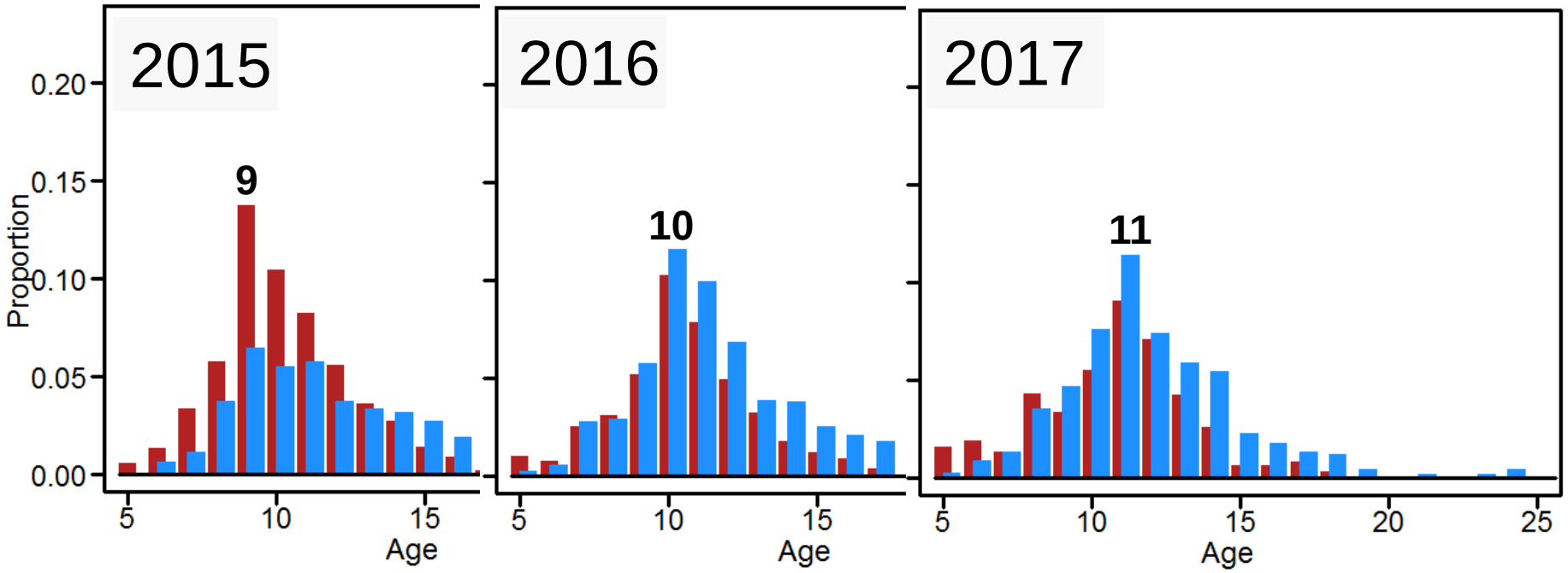
Commercial WPUE - Bias corrected



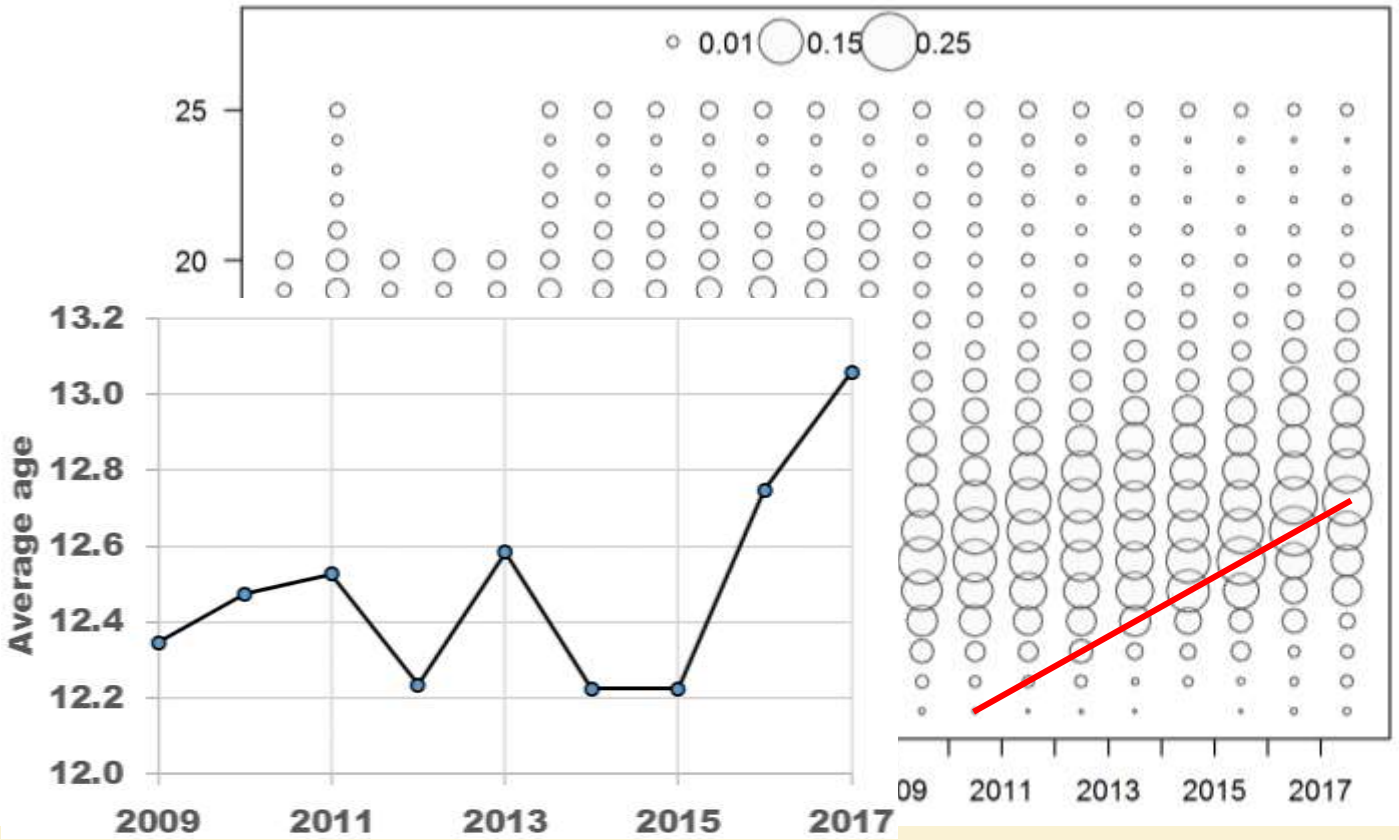
Fishery average fish weight



3B trends: Age



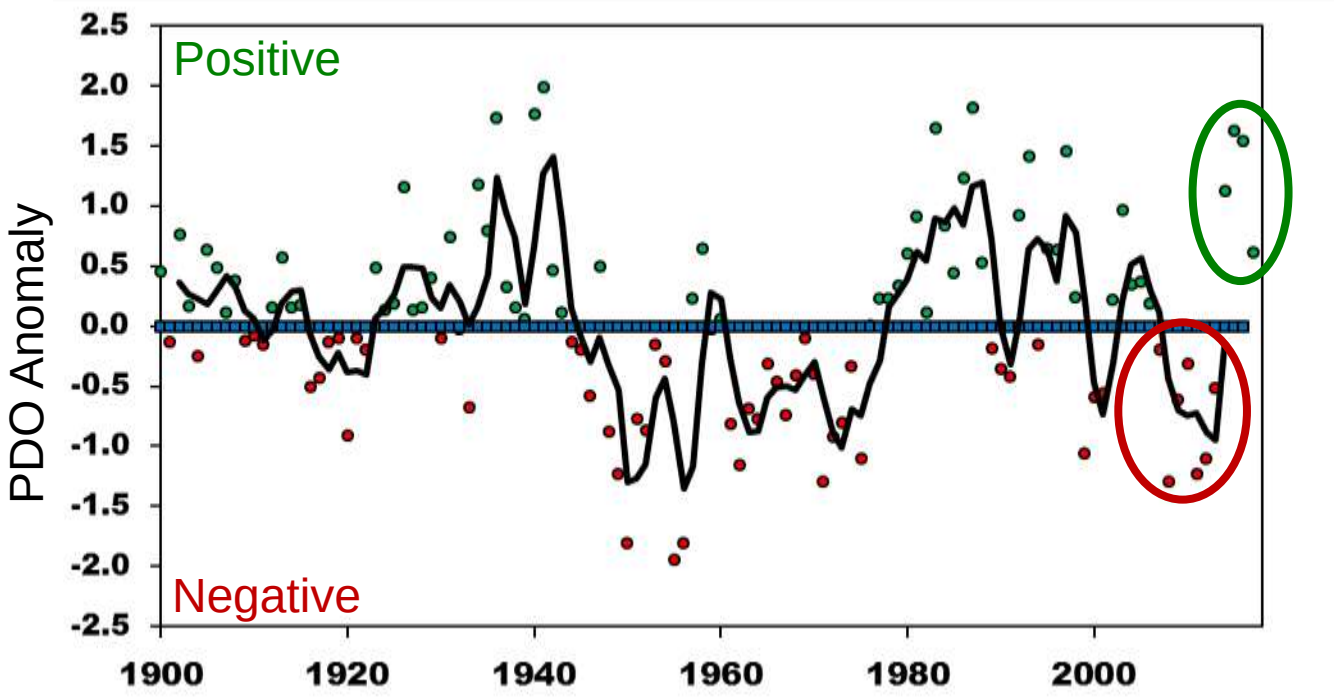
Survey proportions at age: coastwide



Ecosystem conditions (new)

- Observations on:
  - Environmental conditions/habitat
  - Biological phenomena
  - Other fisheries trends
- These are informational items

The Pacific Decadal Oscillation (PDO)



Annual averages through September 2017; http://research.jisao.washington.edu/pdo/

Ecosystem conditions

- Warm “blob” and other abnormal conditions 2014-2016+
  - Warm even into deeper waters of the Gulf of Alaska (GOA)
  - Pyrosomes (gelatinous zooplankton) observed in the NE Pacific
  - Seabird die-offs
  - Whale strandings
- GOA Pacific cod
  - Poor fish condition 2014 through 2017
  - Trawl survey down 58%: 2015 to 2017, 83%: 2013 -2017
- GOA arrowtooth flounder
  - Trawl survey biomass down by 36% (2015 to 2017)
- Sablefish
  - 2014 estimated to be a very large year-class (but still uncertain)

References: AFSC Ecosystem considerations reports, GOA Pacific cod stock assessment, GOA arrowtooth flounder stock assessment

Outline

- Coastwide stock assessment
  - Data sources and summary
  - Modelling framework
  - Results
  - Decision table

Break

- Catch tables
  - Regulatory Area-specific projections

Data improvements for 2017

- Additional ages from survey expansions
- Measured fish weights (port samples)
- Prior year's logbooks

Result:

Small positive effect on stock estimates (+3.6%)

(Reference document: ***IPHC-2017-SRB11-06***)

- 1993-1997 included in survey modelling
- All available 2017 data (and 2016 updates) included

The 2017 Assessment Ensemble

	Coastwide	Areas-As-Fleets
Short time-series (1996+)	**X**	**X**
Long time-series	**X**	**X**

The same four models used since 2014:

- Two treatments of the spatial data
- Two treatments of the historical data

Model development

- Equal model weighting re-evaluated with the SRB during 2017, based on retrospective behavior
  - Weights still consistent with recent model performance

Outline

- Coastwide stock assessment
  - Data sources and summary
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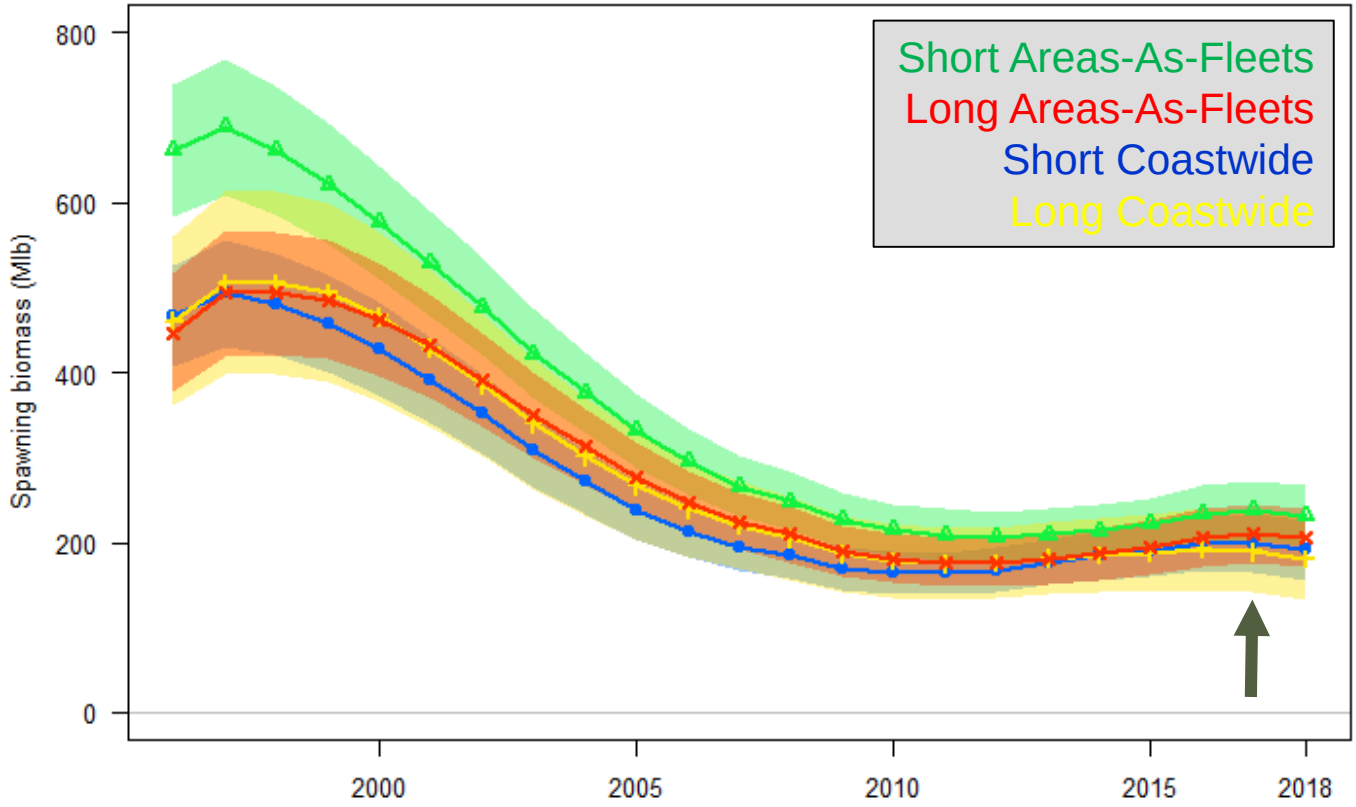
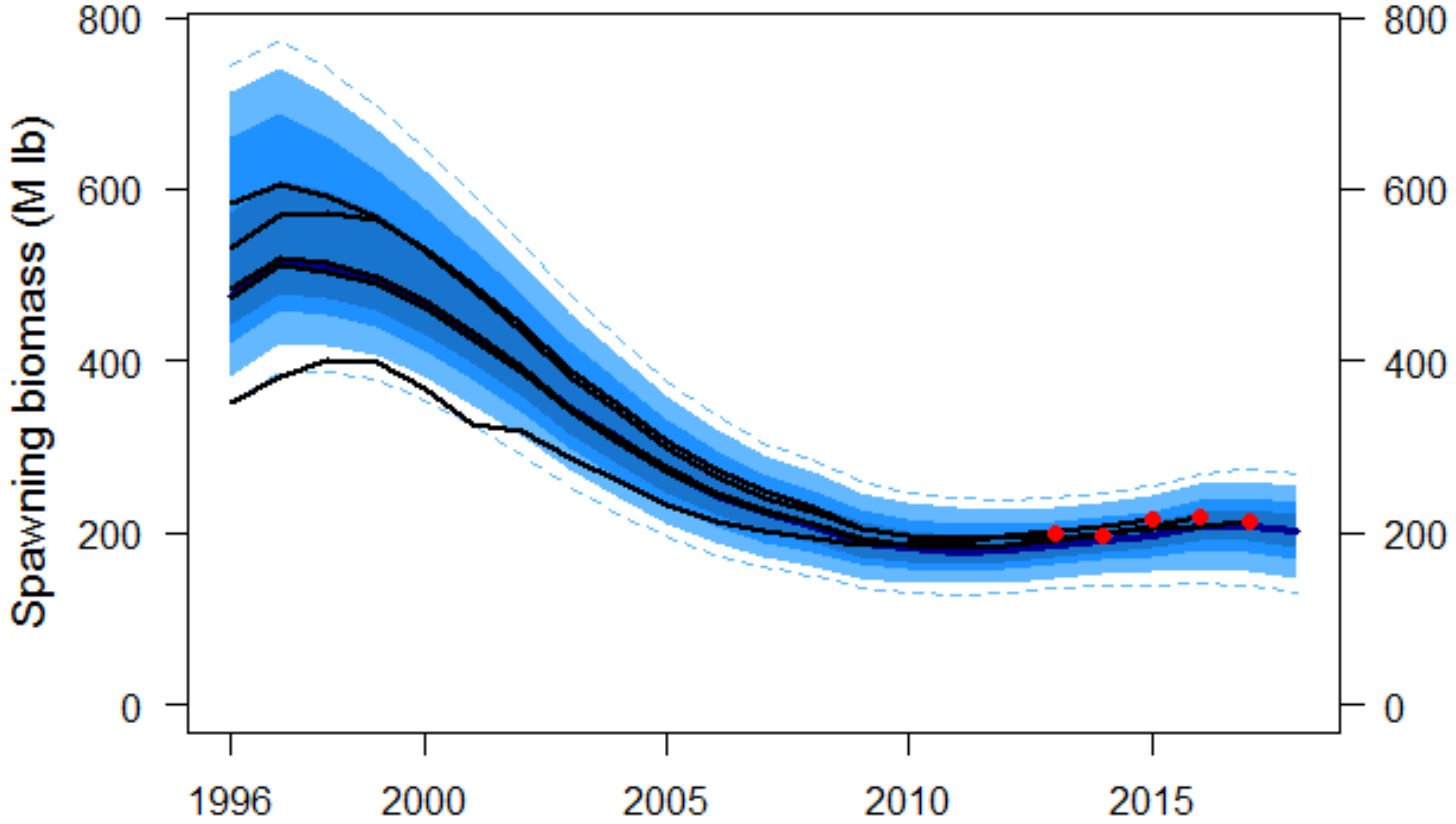
Break

- Catch tables
  - Regulatory Area-specific projections

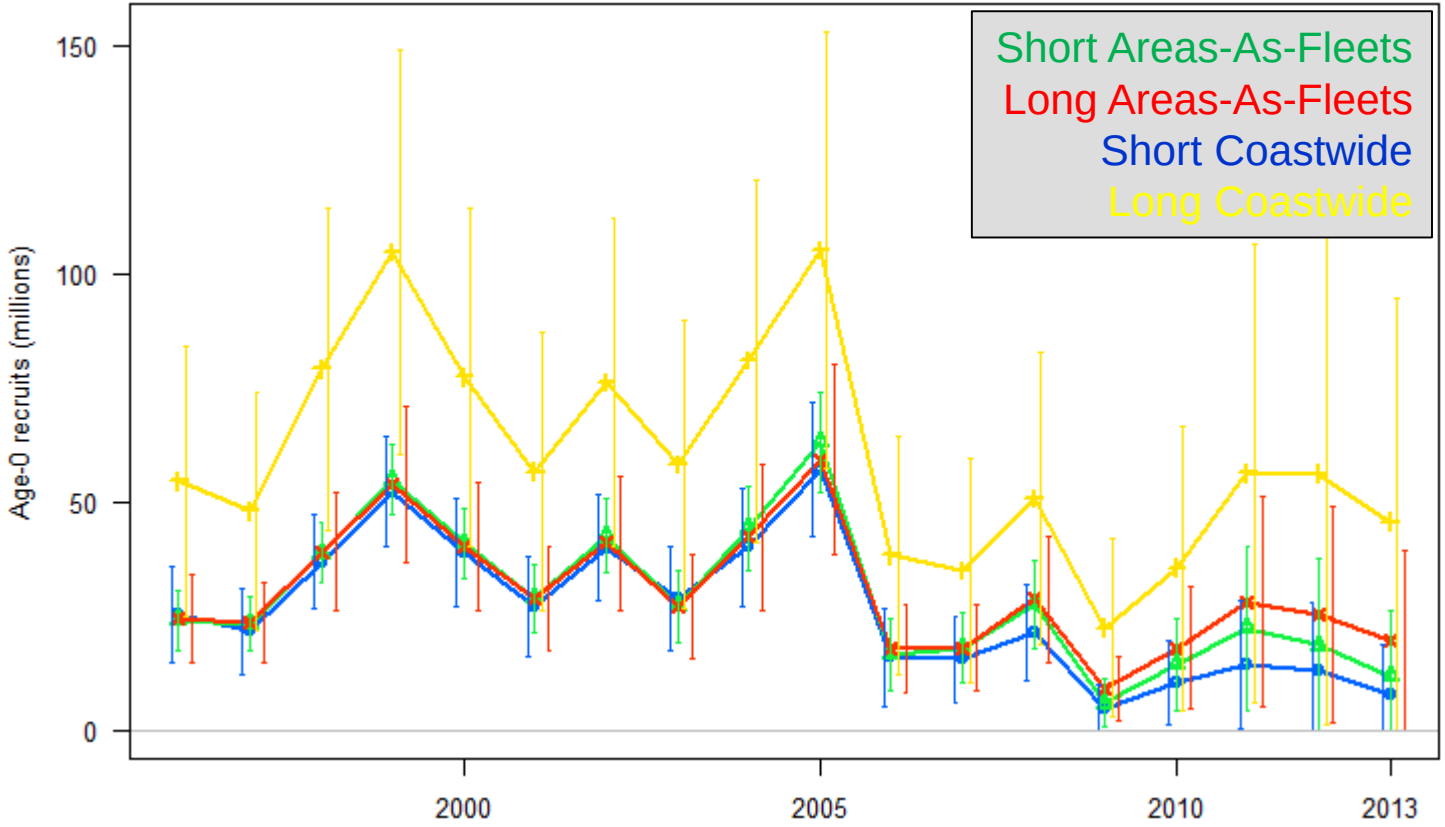
Individual models



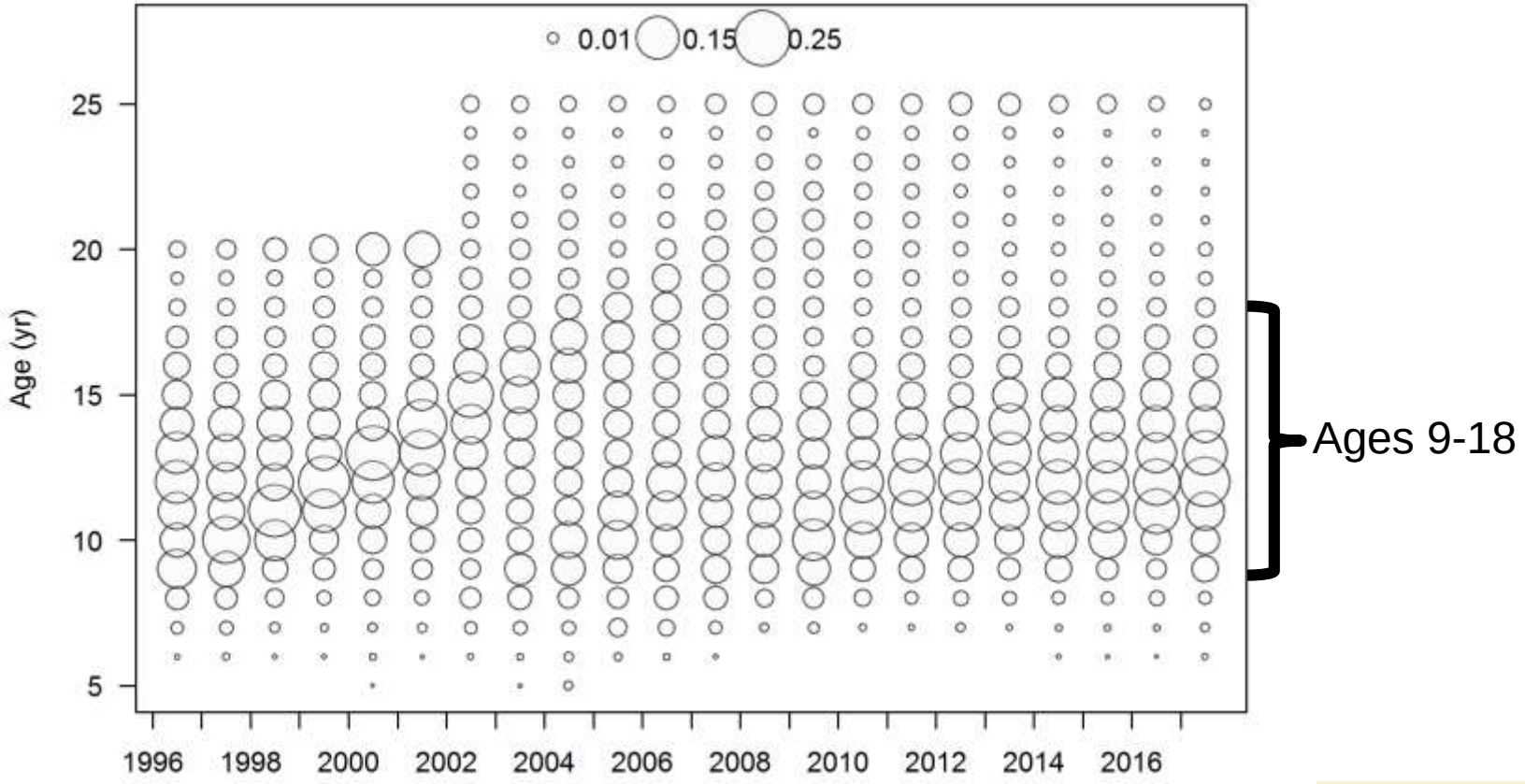
Retrospective comparison



Individual models - recruitment



Fishery ages: coastwide



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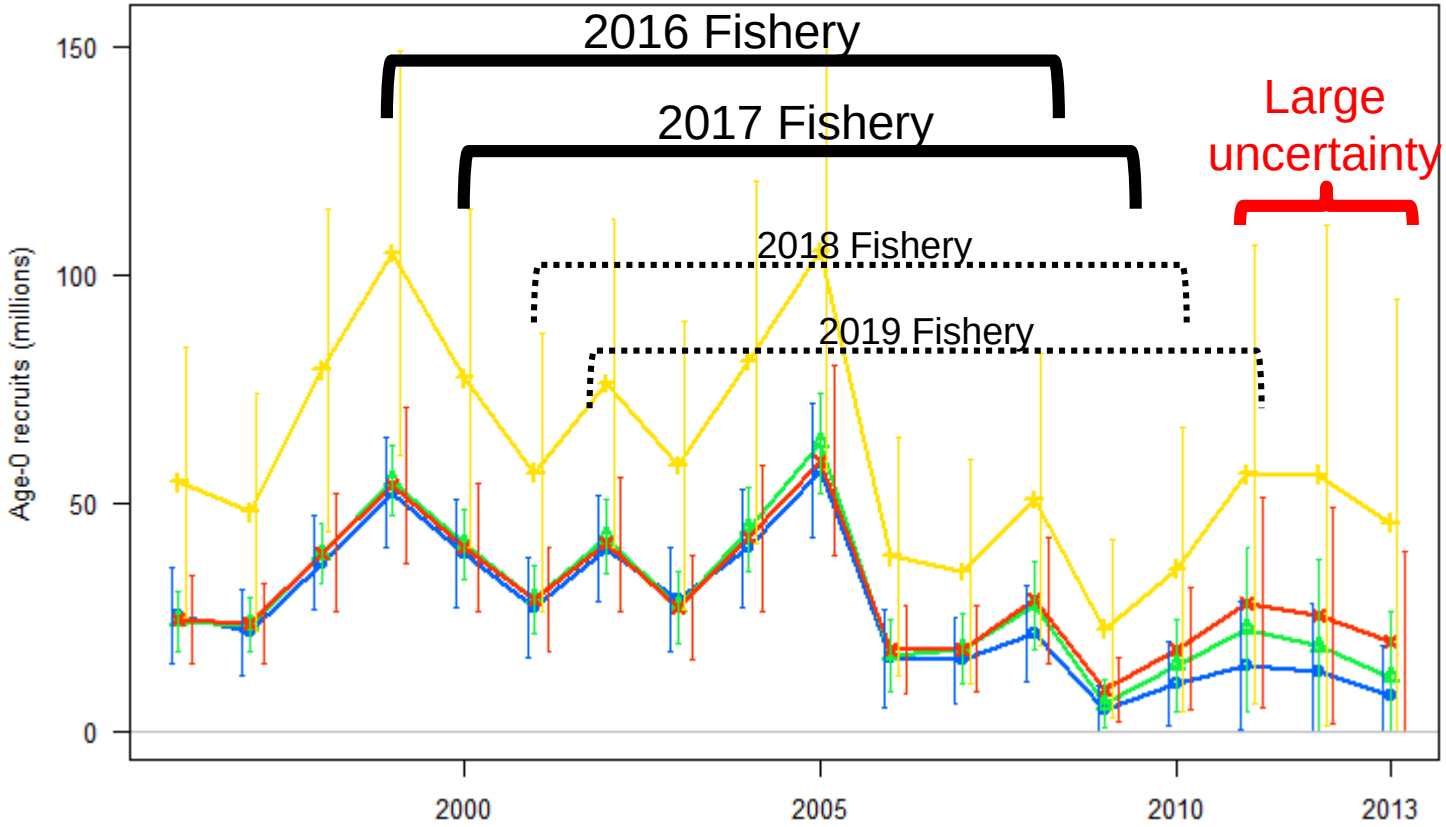
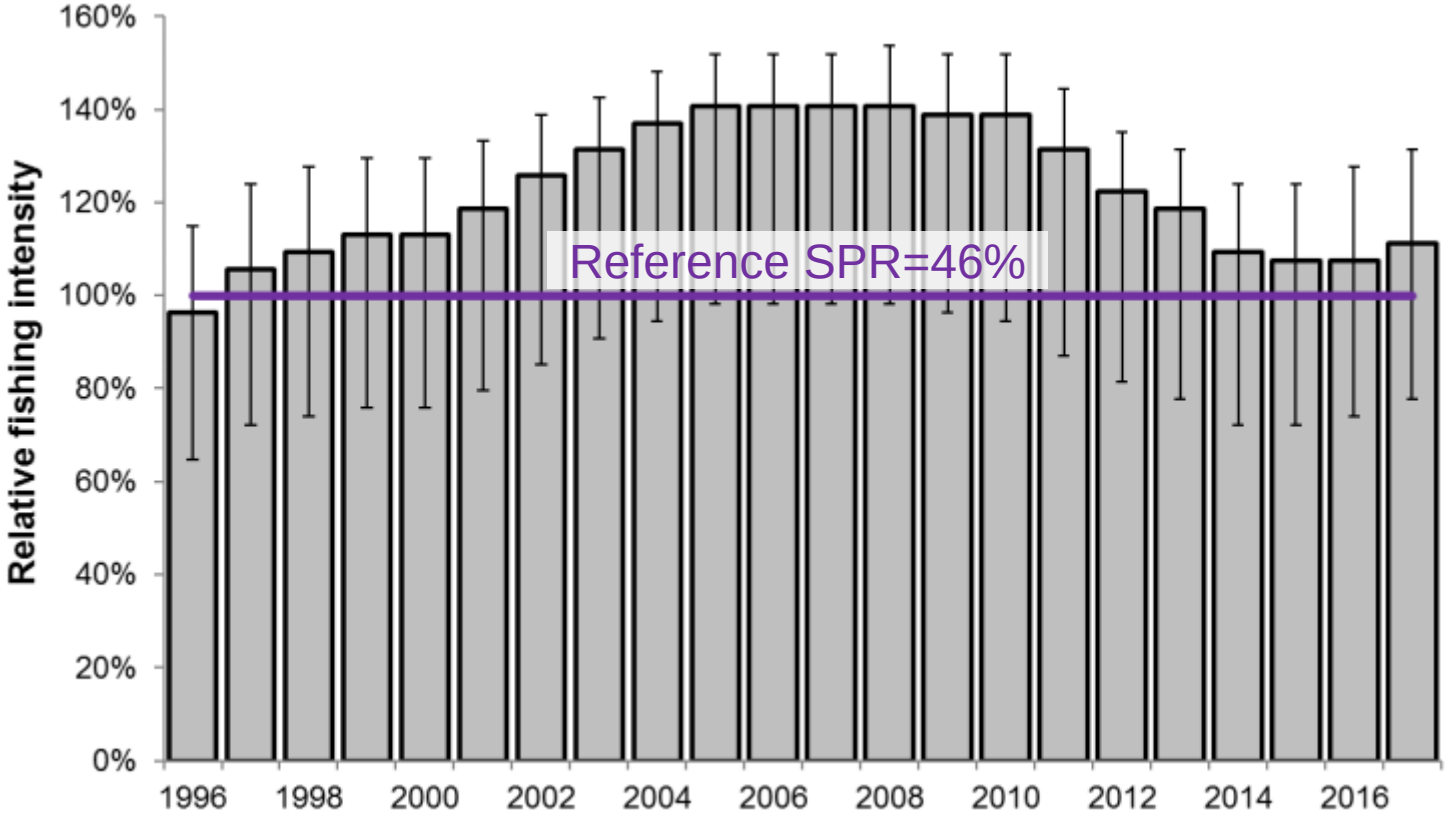


Fishing intensity (in hindsight)



Stock assessment results summary

- *New*: Concise section of management information
  - More comparable to other fishery systems
  - Creating a framework for improvements to come

- Four primary sources of information:
  - Sources of mortality
  - Fishing intensity
  - Spawning biomass
  - Stock distribution

Stock assessment summary

- For each source:
  1) Indicators – what are considered
  2) Values – current or recent level
  3) Trends – how they are changing
  4) Status – comparison to reference levels

Assessment summary table

Indicators	Values	Trends	Status
Total removals 2017: Retained catch 2017: Average removals 2013–17:	42.44 Mlbs, 19,250 t 35.29 Mlbs, 11,864 t 43.34 Mlbs, 19,659 t	Mortality stable 2014-17	**2017 MORTALITY BELOW 100-YEAR AVERAGE**
SPR_{2017}: P(SPR<46%): P(SPR<limit):	40% (29-58%) 75% Limit not specified	Fishing intensity increased from 2016 to 2017	**FISHING INTENSITY HIGHER THAN REFERENCE LEVEL**
SB_{2018} (Mlb): SB_{2018}/SB_0: $P(SB_{2018}<SB_{30})$: $P(SB_{2018}<SB_{20})$:	202 Mlbs (148–256) 40% (26-60%) 6% <1%	SB decreased from 2017 to 2018	**NOT OVERFISHED**
O32 stock distribution: All stock distribution:	See Table and Figure	Distribution stable 2013-17	**REGION 2 ABOVE, REGION 3 BELOW HISTORICAL VALUES**

Summary table

Indicators	Values	Trends	Status
Total removals 2017: Retained catch 2017: Average removals 2013–17:	42.44 Mlbs, 19,250 t 35.29 Mlbs, 11,864 t 43.34 Mlbs, 19,659 t	Mortality stable 2014-17	**2017 MORTALITY BELOW 100-YEAR AVERAGE**

Sources of mortality: In 2017, total removals were below the 100-year average, and have been stable near 42 million pounds (19,050 t) from 2014-17. In 2017, 83% of the total removals from the stock were retained compared to 80% in 2016.

Summary table

Indicators	Values	Trends	Status
SPR_{2017}:	40% (29-58%)	Fishing intensity	**FISHING INTENSITY**
P(SPR<46%):	75%	increased from	**HIGHER THAN**
P(SPR<limit):	Limit not specified	2016 to 2017	**REFERENCE LEVEL**

Fishing intensity: The 2017 mortality from all sources corresponds to a point estimate of SPR = 40% (there is a 75% chance that fishing intensity exceeded the IPHC's reference level of 46%). In order to reach the interim reference level, catch limits would need to be reduced for 2018. The Commission does not currently have a coastwide limit fishing intensity reference point.

Summary table

Indicators	Values	Trends	Status
SB_{2018} (Mlb):	202 Mlbs (148–256)	SB decreased from 2017 to 2018	**NOT OVERFISHED**
SB_{2018}/SB_0:	40% (26-60%)		
$P(SB_{2018}<SB_{30})$:	6%		
$P(SB_{2018}<SB_{20})$:	<1%		

Stock status (spawning biomass): Current female spawning biomass is estimated to be just above 200 million pounds (90,700 t), which corresponds to only a 6% chance of being below the IPHC threshold (trigger) reference point of $SB_{30\%}$, and less than a 1% chance of being below the IPHC limit reference point of $SB_{20\%}$. Therefore, no adjustment to the target fishing intensity is required, and the stock is not considered to be '**overfished**'. Projections indicate that the target fishing intensity is likely to result in similar, but declining biomass levels in the near future.

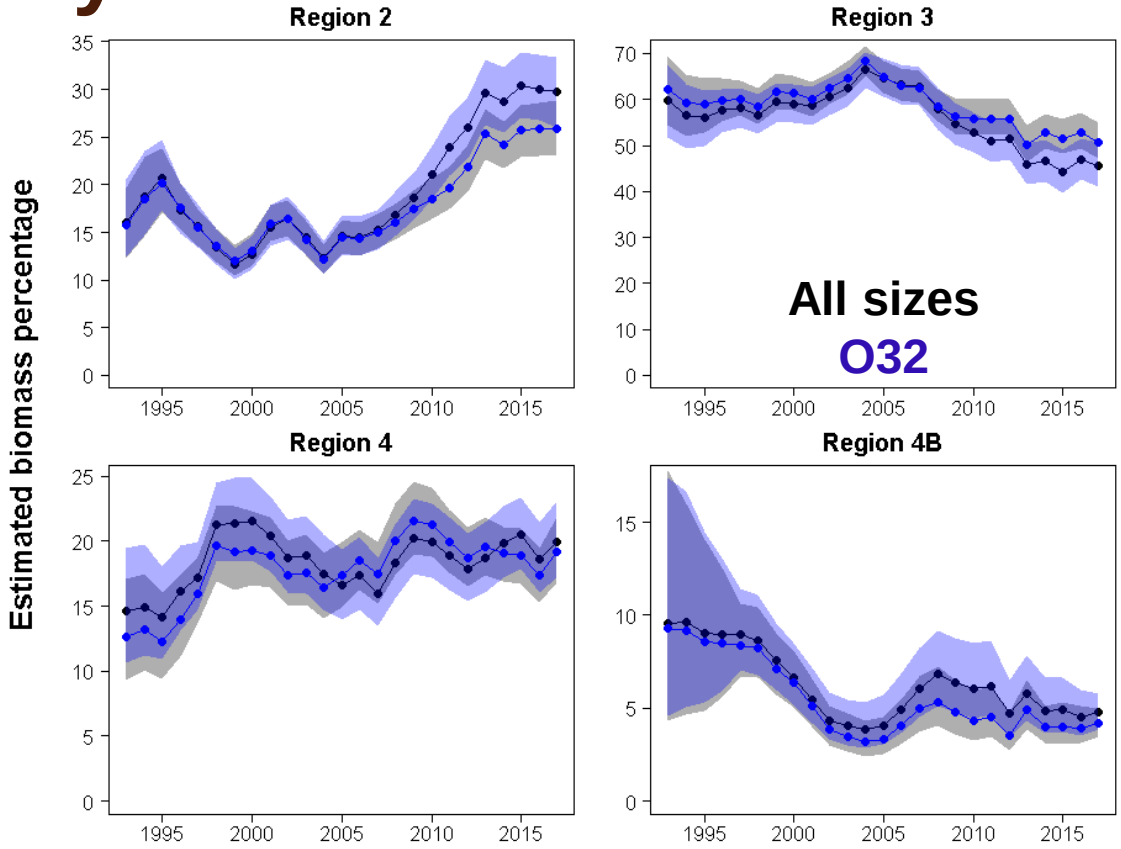
Summary table

Indicators	Values	Trends	Status
O32 stock distribution: All stock distribution:	See Table and Figure	Distribution stable 2013-17	REGION 2 ABOVE, REGION 3 BELOW HISTORICAL VALUES

Stock distribution: Regional stock distribution has been stable within estimated credibility intervals over the last five years. Region 2 currently represents a greater proportion, and Region 3 a lesser proportion of the coastwide stock than observed in previous decades.

	O32 stock distribution				All sizes distribution			
Year	Region 2 (2A, 2B, 2C)	Region 3 (3A, 3B)	Region 4 (4A, 4CDE)	Region 4B	Region 2 (2A, 2B, 2C)	Region 3 (3A, 3B)	Region 4 (4A, 4CDE)	Region 4B
2013	29.6%	45.9%	18.7%	5.8%	25.4%	50.1%	19.6%	4.9%
2014	28.8%	46.5%	19.8%	4.9%	24.2%	52.8%	19.1%	4.0%
2015	30.4%	44.2%	20.5%	4.9%	25.7%	51.4%	18.9%	4.0%
2016	30.0%	46.8%	18.6%	4.5%	25.9%	52.8%	17.4%	3.9%
2017	29.7%	45.6%	20.0%	4.8%	25.9%	50.7%	19.2%	4.2%

Summary table



Outline

- Coastwide stock assessment
  - Data sources and summary
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Break

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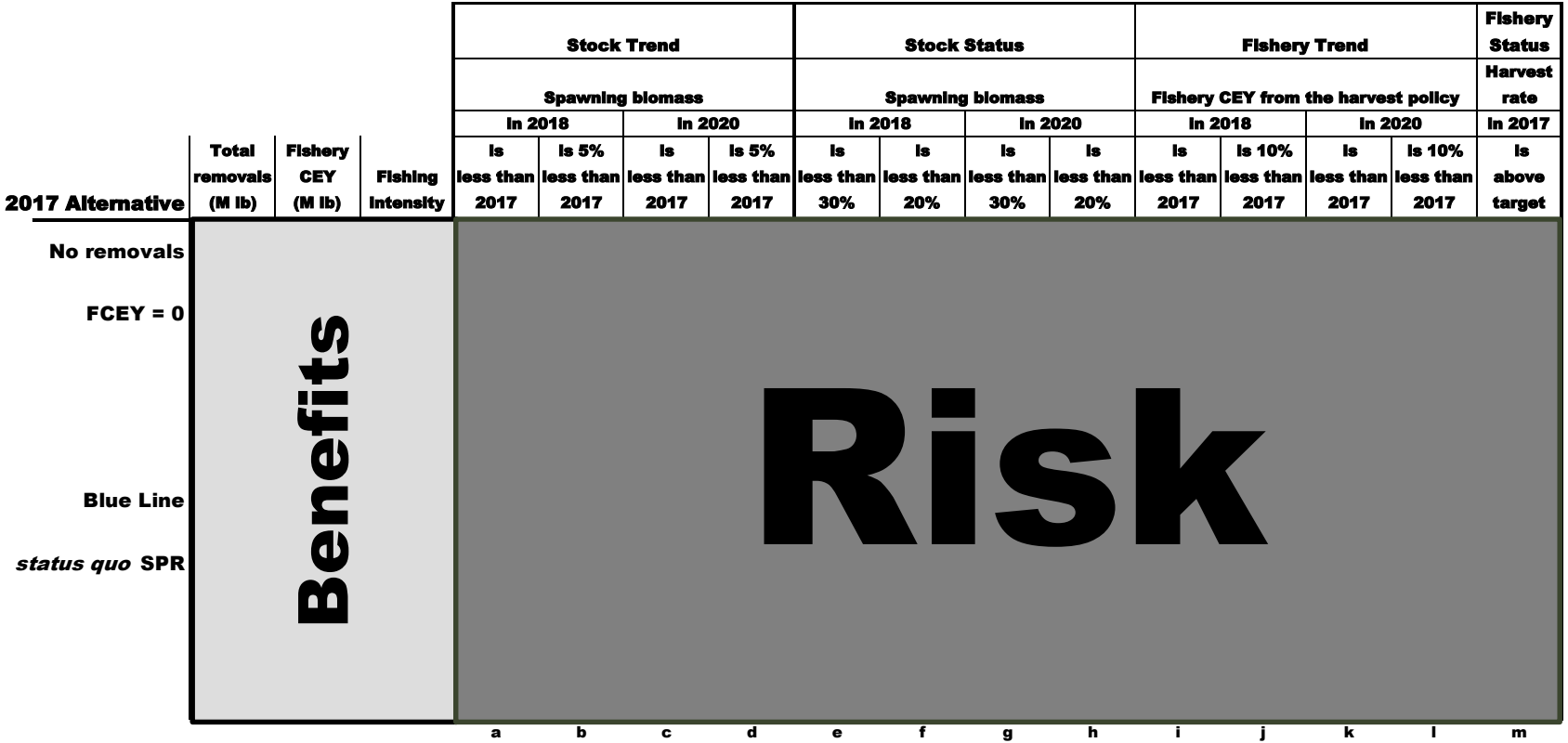
The 2017 harvest decision table

- Revised to include:
  - Easier format for risk metrics (vertical vs. horizontal)
    - Comparable to MSE results
  - Reference SPR instead of Blue Line
  - More detail: catch levels, projection years
  - TCEY for comparability with catch tables
- No other changes to projection methods

The 2016 harvest decision table



The 2017 harvest decision table

2018 Alternative		No removals	*Reference: SPR=46%*	
Total removals (M lb)			**Benefits**	
TCEY (M lb)				
Fishing intensity				
Fishing intensity interval				
Stock Trend (spawning biomass)	In 2019	Is less than 2018	**Risk**	a
		Is 5% less than 2018		b
	In 2020	Is less than 2018		c
		Is 5% less than 2018		d
	In 2021	Is less than 2018		e
		Is 5% less than 2018		f
Stock Status (Spawning biomass)	In 2019	Is less than 30%		g
		Is less than 20%		h
	In 2020	Is less than 30%		i
		Is less than 20%		j
	In 2021	Is less than 30%		k
		Is less than 20%		l
Fishery Trend (TCEY)	In 2019	Is less than 2018		m
		Is 10% less than 2018		n
	In 2020	Is less than 2018		o
		Is 10% less than 2018		p
	In 2021	Is less than 2018		q
		Is 10% less than 2018		r
Fishery Status (Fishing intensity)	In 2018	Is above $F_{46\%}$		s

The harvest decision table

2018 Alternative	No removals					*Reference: SPR=46%*						
Total removals (M lb)	0.0	11.8	21.8	29.8	30.8	31.8	32.8	33.8	34.8	35.8	41.8	51.8	61.9
TCEY (M lb)	0.0	10.0	20.0	28.0	29.0	30.0	31.0	32.0	33.0	34.0	40.0	50.0	60.0
Fishing intensity	$F_{100\%}$	$F_{73\%}$	$F_{58\%}$	$F_{49\%}$	$F_{48\%}$	$F_{47\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{39\%}$	$F_{32\%}$	$F_{27\%}$
Fishing intensity interval	--	61-84%	45-73%	36-66%	36-65%	35-65%	34-64%	33-63%	32-63%	32-62%	28-58%	23-53%	19-48%

Reference line down the center of the table

The harvest decision table

2018 Alternative	No removals					*Reference: SPR=46%*						
Total removals (M lb)	0.0	11.8	21.8	29.8	30.8	31.8	32.8	33.8	34.8	35.8	41.8	51.8	61.9
TCEY (M lb)	0.0	10.0	20.0	28.0	29.0	30.0	31.0	32.0	33.0	34.0	40.0	50.0	60.0
Fishing intensity	$F_{100\%}$	$F_{73\%}$	$F_{58\%}$	$F_{49\%}$	$F_{48\%}$	$F_{47\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{39\%}$	$F_{32\%}$	$F_{27\%}$
Fishing intensity interval	--	61-84%	45-73%	36-66%	36-65%	35-65%	34-64%	33-63%	32-63%	32-62%	28-58%	23-53%	19-48%

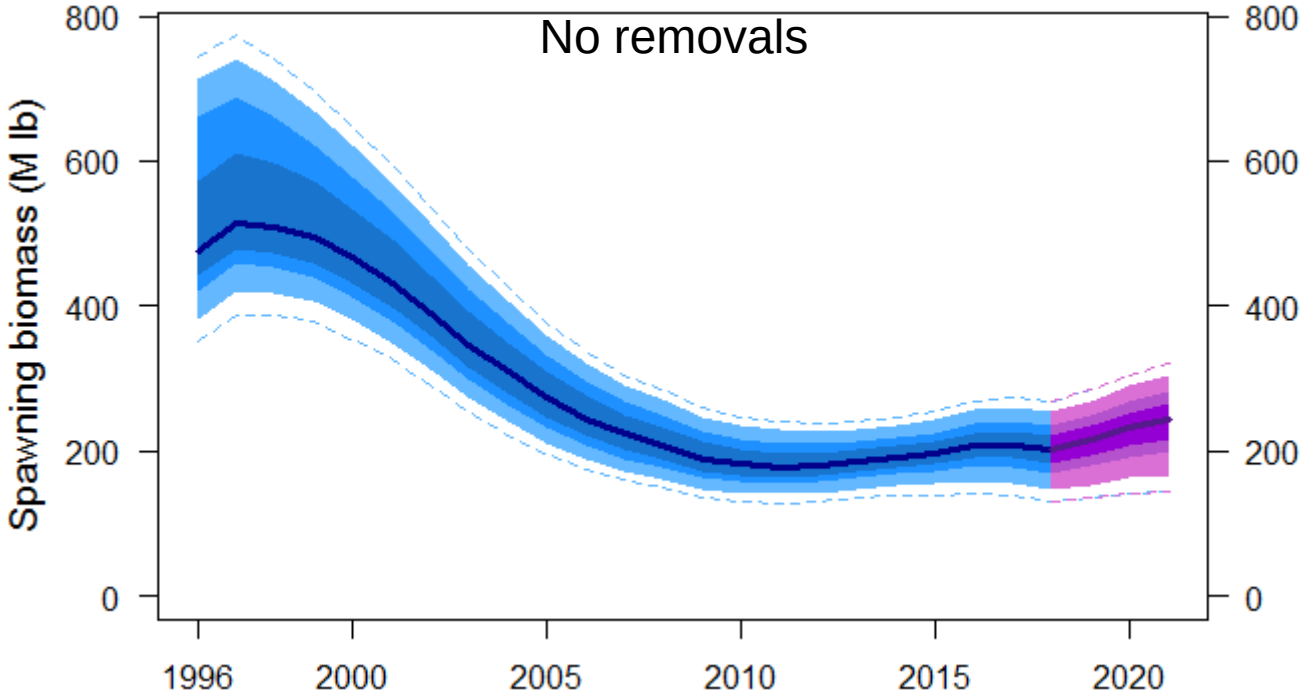
Alternatives to illustrate stock dynamics

The harvest decision table

2018 Alternative	No removals						*Reference: SPR=46%*						
Total removals (M lb)	0.0	11.8	21.8	29.8	30.8	31.8	32.8	33.8	34.8	35.8	41.8	51.8	61.9
TCEY (M lb)	0.0	10.0	20.0	28.0	29.0	30.0	31.0	32.0	33.0	34.0	40.0	50.0	60.0
Fishing intensity	$F_{100\%}$	$F_{73\%}$	$F_{58\%}$	$F_{49\%}$	$F_{48\%}$	$F_{47\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{39\%}$	$F_{32\%}$	$F_{27\%}$
Fishing intensity interval	--	61-84%	45-73%	36-66%	36-65%	35-65%	34-64%	33-63%	32-63%	32-62%	28-58%	23-53%	19-48%

Finer grid for decision-making

The harvest decision table

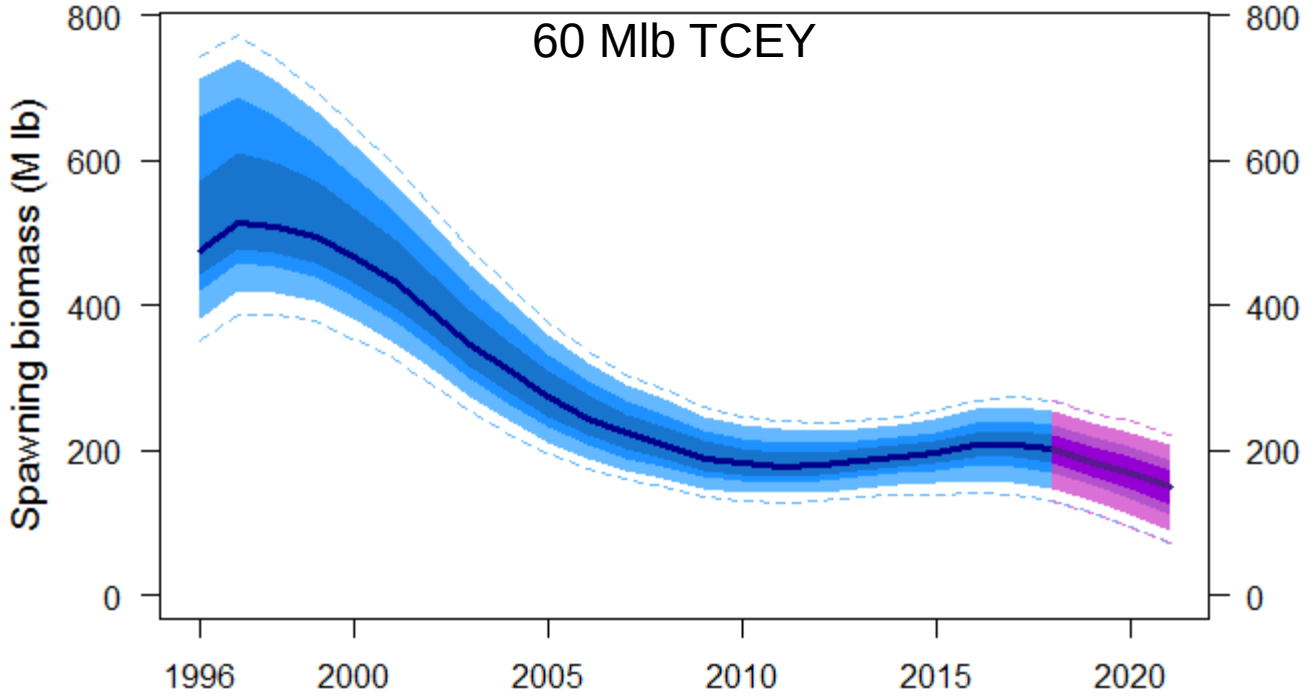


The harvest decision table

2018 Alternative	No removals					*Reference: SPR=46%*						
Total removals (M lb)	0.0	11.8	21.8	29.8	30.8	31.8	32.8	33.8	34.8	35.8	41.8	51.8	61.9
TCEY (M lb)	0.0	10.0	20.0	28.0	29.0	30.0	31.0	32.0	33.0	34.0	40.0	50.0	60.0
Fishing intensity	$F_{100\%}$	$F_{73\%}$	$F_{58\%}$	$F_{49\%}$	$F_{48\%}$	$F_{47\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{39\%}$	$F_{32\%}$	$F_{27\%}$
Fishing intensity interval	--	61-84%	45-73%	36-66%	36-65%	35-65%	34-64%	33-63%	32-63%	32-62%	28-58%	23-53%	19-48%

Finer grid for decision-making

The harvest decision table



The harvest decision table

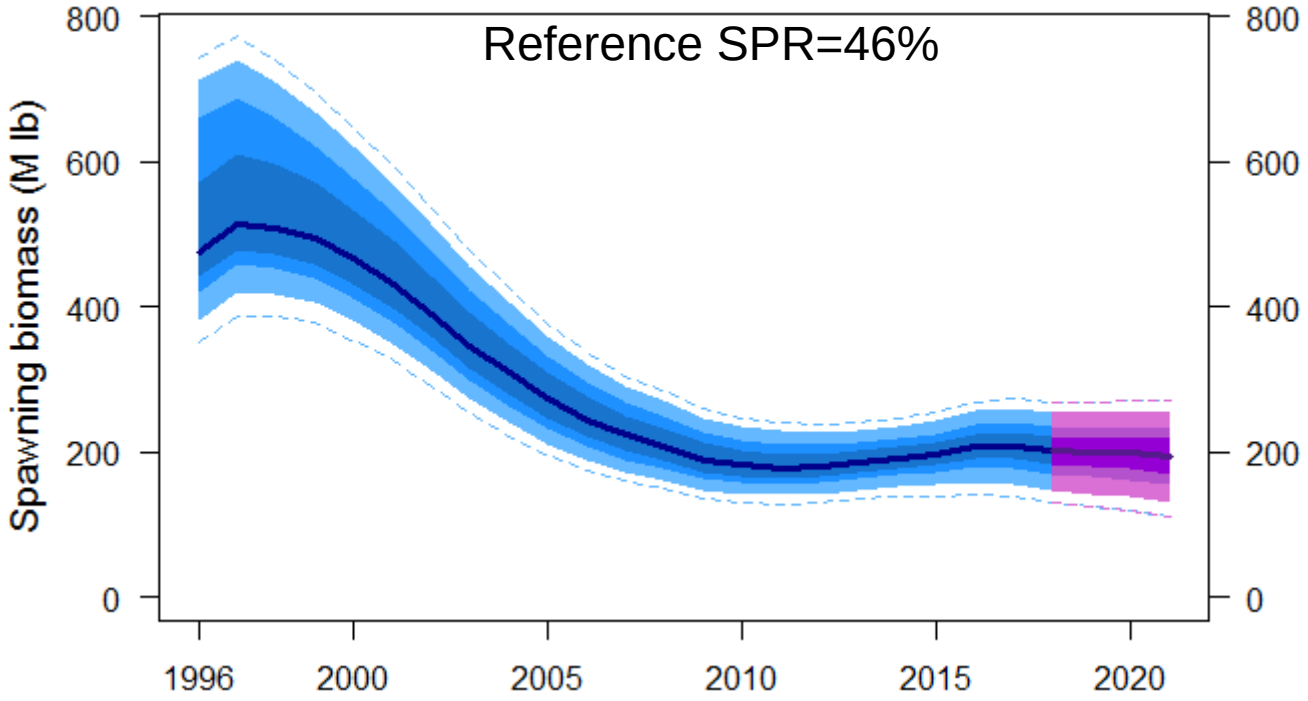
2017 TCEY: 40.7

2018 Alternative									
					Reference: SPR=46%				
Total removals (M lb)	**21.8**	**29.8**	**30.8**	**31.8**	**32.8**	**33.8**	**34.8**	**35.8**	**41.8**
TCEY (M lb)	**20.0**	**28.0**	**29.0**	**30.0**	**31.0**	**32.0**	**33.0**	**34.0**	**40.0**
Fishing intensity	$F_{58\%}$	$F_{49\%}$	$F_{48\%}$	$F_{47\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{39\%}$
Fishing intensity interval	45-73%	36-66%	36-65%	35-65%	34-64%	33-63%	32-63%	32-62%	28-58%
Stock Trend (spawning biomass) — **in 2019** — **is less than 2018**	**24**	**64**	**69**	**74**	**78**	**81**	**85**	**87**	**98**
Stock Trend (spawning biomass) — **in 2019** — **is 5% less than 2018**	**<1**	**2**	**3**	**4**	**5**	**7**	**9**	**11**	**29**
Stock Trend (spawning biomass) — **in 2020** — **is less than 2018**	**14**	**52**	**57**	**62**	**67**	**71**	**76**	**80**	**95**
Stock Trend (spawning biomass) — **in 2020** — **is 5% less than 2018**	**1**	**11**	**14**	**18**	**21**	**25**	**29**	**34**	**61**
Stock Trend (spawning biomass) — **in 2021** — **is less than 2018**	**23**	**63**	**68**	**72**	**76**	**79**	**83**	**86**	**97**
Stock Trend (spawning biomass) — **in 2021** — **is 5% less than 2018**	**5**	**32**	**36**	**41**	**46**	**50**	**55**	**59**	**83**

The harvest decision table

2018 Alternative					*Reference: SPR=46%*				
Total removals (M lb)		21.8	29.8	30.8	31.8	32.8	33.8	34.8	35.8	41.8
TCEY (M lb)		20.0	28.0	29.0	30.0	31.0	32.0	33.0	34.0	40.0
Fishing intensity		$F_{58\%}$	$F_{49\%}$	$F_{48\%}$	$F_{47\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{39\%}$
Fishing intensity interval		45-73%	36-66%	36-65%	35-65%	34-64%	33-63%	32-63%	32-62%	28-58%
Stock Trend (spawning biomass)	in 2019	is less than 2018	24	64	69	74	78	81	85	87	98
		is 5% less than 2018	<1	2	3	4	5	7	9	11	29
	in 2020	is less than 2018	14	52	57	62	67	71	76	80	95
		is 5% less than 2018	1	11	14	18	21	25	29	34	61
	in 2021	is less than 2018	23	63	68	72	76	79	83	86	97
		is 5% less than 2018	5	32	36	41	46	50	55	59	83

The harvest decision table



The harvest decision table

		2018 Alternative	*Reference: SPR=46%*
		Total removals (M lb)	32.8
		TCEY (M lb)	31.0
		Fishing intensity	$F_{46\%}$
		Fishing intensity interval	34-64%
Stock Status (Spawning biomass)	in 2019	is less than 30%	7
		is less than 20%	<1
	in 2020	is less than 30%	7
		is less than 20%	<1
	in 2021	is less than 30%	10
		is less than 20%	<1

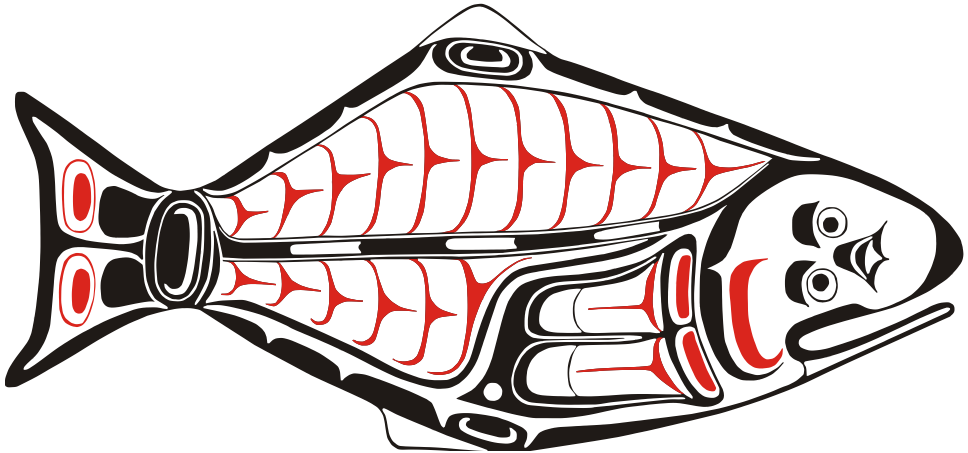
The harvest decision table

		2018 Alternative	*Reference: SPR=46%*
		Total removals (M lb)	32.8
		TCEY (M lb)	31.0
		Fishing intensity	$F_{46\%}$
		Fishing intensity interval	34-64%
Fishery Trend (TCEY)	in 2019	is less than 2018	55
		is 10% less than 2018	38
	in 2020	is less than 2018	59
		is 10% less than 2018	45
	in 2021	is less than 2018	63
		is 10% less than 2018	52
Fishery Status (Fishing intensity)	in 2018	is above $F_{46\%}$	50

The decision table

2018 Alternative			No removals					*Reference: SPR=46%*								
Total removals (M lb)			0.0	11.8	21.8	29.8	30.8	31.8	32.8	33.8	34.8	35.8	41.8	51.8	61.9	
TCEY (M lb)			0.0	10.0	20.0	28.0	29.0	30.0	31.0	32.0	33.0	34.0	40.0	50.0	60.0	
Fishing intensity			$F_{100\%}$	$F_{73\%}$	$F_{58\%}$	$F_{49\%}$	$F_{48\%}$	$F_{47\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{39\%}$	$F_{32\%}$	$F_{27\%}$	
Fishing intensity interval			--	61-84%	45-73%	36-66%	36-65%	35-65%	34-64%	33-63%	32-63%	32-62%	28-58%	23-53%	19-48%	
Stock Trend (spawning biomass)	In 2019	Is less than 2018	1	3	24	64	69	74	78	81	85	87	98	>99	>99	a
		Is 5% less than 2018	<1	<1	<1	2	3	4	5	7	9	11	29	69	96	b
	In 2020	Is less than 2018	<1	1	14	52	57	62	67	71	76	80	95	>99	>99	c
		Is 5% less than 2018	<1	<1	1	11	14	18	21	25	29	34	61	94	>99	d
	In 2021	Is less than 2018	<1	2	23	63	68	72	76	79	83	86	97	>99	>99	e
		Is 5% less than 2018	<1	<1	5	32	36	41	46	50	55	59	83	99	>99	f
Stock Status (Spawning biomass)	In 2019	Is less than 30%	3	4	5	6	7	7	7	7	7	7	9	11	15	g
		Is less than 20%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	h
	In 2020	Is less than 30%	2	2	4	6	6	7	7	8	8	9	12	21	32	i
		Is less than 20%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	1	j
	In 2021	Is less than 30%	1	1	4	8	8	9	10	11	12	13	21	37	54	k
		Is less than 20%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	2	7	l
Fishery Trend (TCEY)	In 2019	Is less than 2018	<1	<1	7	38	43	49	55	60	64	68	78	89	97	m
		Is 10% less than 2018	<1	<1	3	26	30	34	38	43	48	53	72	82	92	n
	In 2020	Is less than 2018	<1	<1	10	43	49	54	59	63	67	70	79	91	98	o
		Is 10% less than 2018	<1	<1	6	31	36	40	45	50	54	59	74	84	95	p
	In 2021	Is less than 2018	<1	<1	14	50	55	59	63	67	69	72	81	93	>99	q
		Is 10% less than 2018	<1	<1	9	38	43	48	52	56	60	63	75	86	99	r
Fishery Status (Fishing intensity)	In 2018	Is above $F_{46\%}$	0	<1	4	33	38	43	50	54	60	64	77	87	95	s

Break



Outline

- Coastwide stock assessment
  - Data sources and summary
  - Modelling framework
  - Results
  - Decision table

Break

- Catch tables
  - Regulatory Area-specific projections

Catch tables

- TCEY-based catch-limits

"AM093–**30.** *NOTING that the Commission has indicated its interest in clearer accounting for all mortality, and that Canada has put forward catch limit allocation principles proposing that catch limits include all sources of mortality for each regulatory area, the Commission RECOMMENDED that the presentation of harvest advice be changed to be based on the TCEY, which includes all O26 commercial, sport, personal use/subsistence, bycatch and wastage removals, for the 2018 Annual Meeting cycle, as a step towards more comprehensive and responsible management of the resource that will result in the negotiation of Regulatory Area-specific catch limits based on TCEYs."*

Catch tables based on TCEY

- Projections remain the same (2017 adopted table)

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial disc. mort.	**0.05**	**0.23**	**NA**	**NA**	**0.23**	**0.05**	**0.06**	**0.08**	**0.69**
Bycatch	**0.10**	**0.24**	**0.03**	**1.17**	**0.58**	**0.34**	**0.14**	**1.98**	**4.57**
Non CSP Recreational	**NA**	**NA**	**1.33**	**1.56**	**0.01**	**0.01**	**0.00**	**0.00**	**2.91**
Subsistence	**NA**	**0.41**	**0.43**	**0.23**	**0.02**	**0.01**	**0.00**	**0.08**	**1.17**
Total O26 non-FCEY	**0.14**	**0.87**	**1.79**	**2.96**	**0.84**	**0.41**	**0.20**	**2.14**	**9.34**
O26 FCEY									
Commercial disc. mort.	**NA**	**NA**	**0.12**	**0.37**	**NA**	**NA**	**NA**	**NA**	**0.49**
CSP Recreational	**0.53**	**1.15**	**0.92**	**1.89**	**NA**	**NA**	**NA**	**NA**	**4.49**
Subsistence	**0.03**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**0.03**
Commercial landings	**0.77**	**6.30**	**4.21**	**7.74**	**3.14**	**1.39**	**1.14**	**1.70**	**26.39**
Total FCEY	**1.33**	**7.45**	**5.25**	**10.00**	**3.14**	**1.39**	**1.14**	**1.70**	**31.40**
TCEY (Total O26)	**1.47**	**8.32**	**7.04**	**12.96**	**3.98**	**1.80**	**1.34**	**3.84**	**40.74**
U26									
Commercial disc. Mort.	**0.00**	**0.00**	**0.00**	**0.01**	**0.03**	**0.01**	**0.00**	**0.00**	**0.07**
Bycatch	**0.00**	**0.02**	**0.00**	**0.62**	**0.29**	**0.23**	**0.01**	**1.27**	**2.44**
Total U26	**0.00**	**0.02**	**0.00**	**0.63**	**0.33**	**0.24**	**0.01**	**1.27**	**2.51**
Total mortality	**1.48**	**8.35**	**7.04**	**13.60**	**4.30**	**2.04**	**1.35**	**5.11**	**43.25**

(FCEYs still used for catch allocation agreements within IPHC Regulatory Areas)

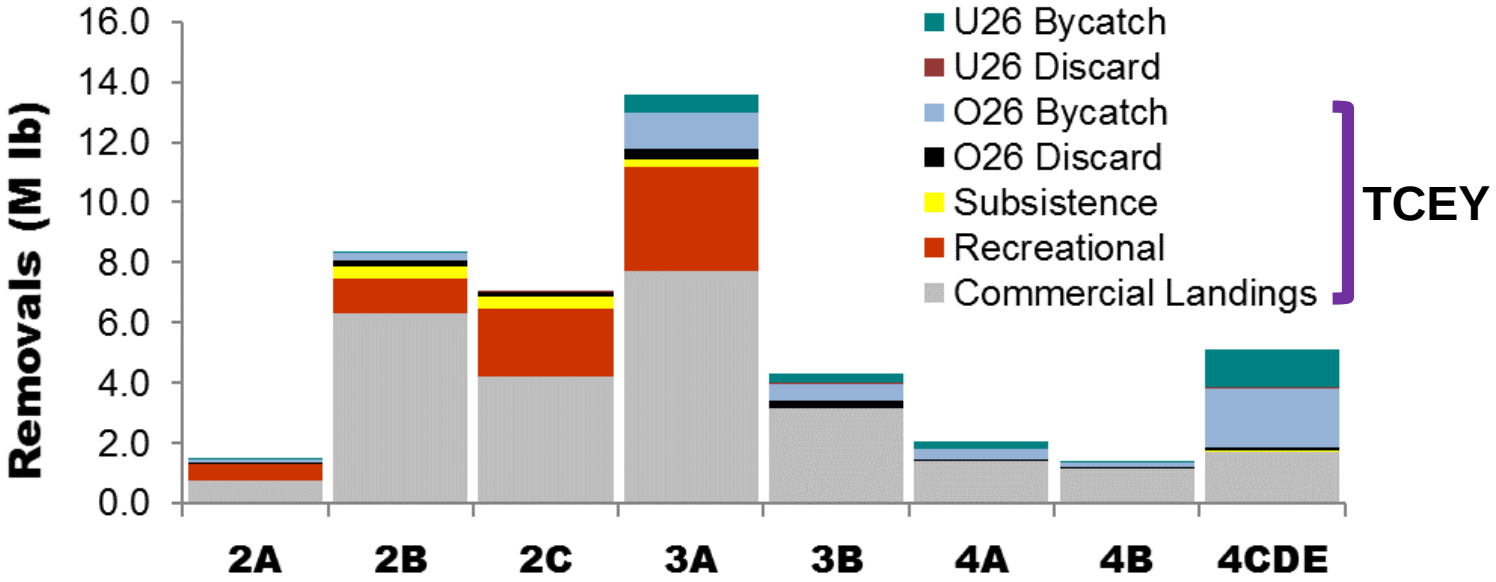
Catch tables

- Comparison is simpler (2017 adopted table):

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26									
Commercial	**0.82**	**6.53**	**4.34**	**8.11**	**3.37**	**1.44**	**1.20**	**1.78**	**27.58**
Recreational	**0.53**	**1.15**	**2.24**	**3.45**	**0.01**	**0.01**	**0.00**	**0.00**	**7.39**
Subsistence	**0.03**	**0.41**	**0.43**	**0.23**	**0.02**	**0.01**	**0.00**	**0.08**	**1.20**
Bycatch	**0.10**	**0.24**	**0.03**	**1.17**	**0.58**	**0.34**	**0.14**	**1.98**	**4.57**
TCEY → **Total O26**	**1.47**	**8.32**	**7.04**	**12.96**	**3.98**	**1.80**	**1.34**	**3.84**	**40.74**
U26									
Commercial	**0.00**	**0.00**	**0.00**	**0.01**	**0.03**	**0.01**	**0.00**	**0.00**	**0.07**
Bycatch	**0.00**	**0.02**	**0.00**	**0.62**	**0.29**	**0.23**	**0.01**	**1.27**	**2.44**
Total U26	**0.00**	**0.02**	**0.00**	**0.63**	**0.33**	**0.24**	**0.01**	**1.27**	**2.51**
Total	**1.48**	**8.35**	**7.04**	**13.60**	**4.30**	**2.04**	**1.35**	**5.11**	**43.25**

Catch tables

- Comparison is simpler (2017 adopted):



Catch table projections

- **Scale** from:
  - Reference SPR = 46%
  - *Or other coastwide level*
- **Distribution** from:
  - Stock distribution (O32 survey)
  - Relative harvest rates (1.0 in 2A-3A, 0.75 in 3B-4CDE)
    - These are exactly analogous to the historical 21.5% and 16.125%
  - *Or other TCEY distributions*

Recent TCEYs

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
2017 Reference (SPR=46%)	0.96	6.08	6.47	13.84	4.39	1.84	1.46	4.06	39.10
2017 Adopted	1.47	8.32	7.04	12.96	3.98	1.80	1.34	3.84	40.74
2018 Reference	0.59	3.84	5.65	12.07	2.56	1.69	1.21	3.39	31.00

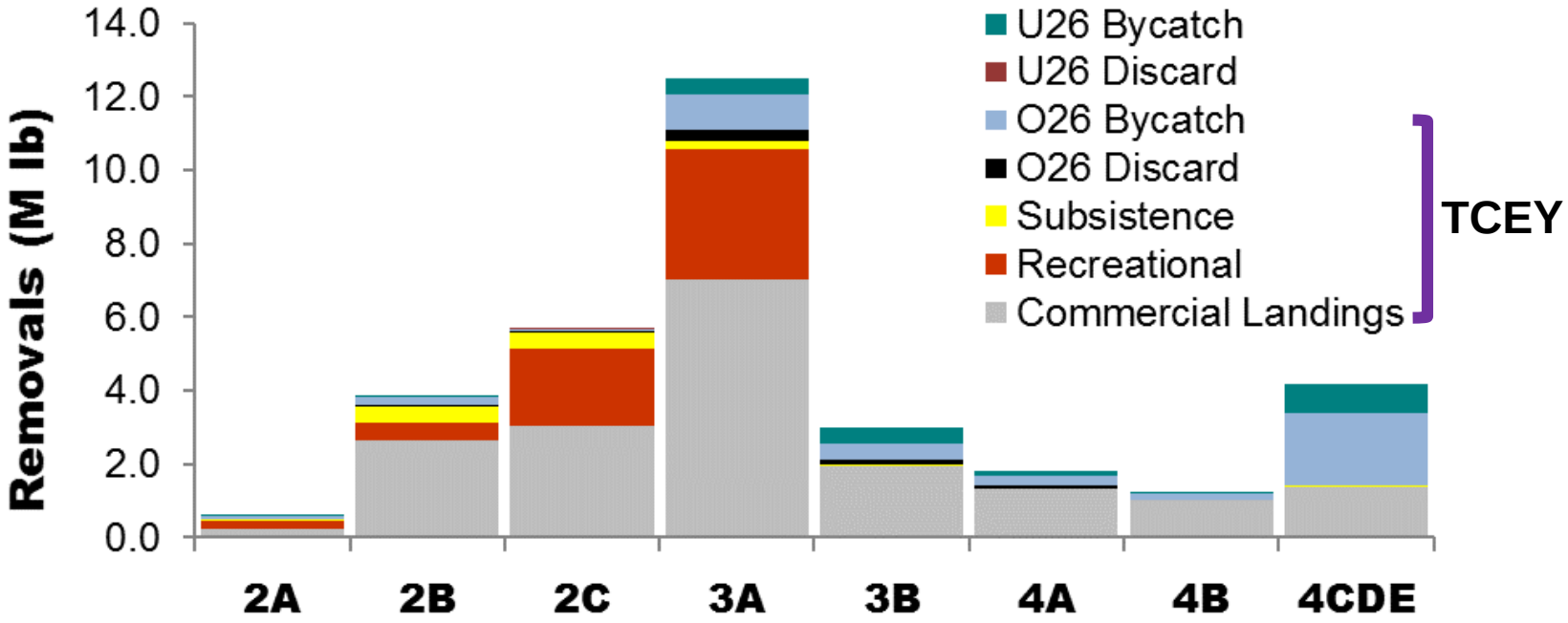
2018 Reference (SPR=46%) full catch table

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial discard mort.	0.01	0.07	NA	NA	0.13	0.06	0.03	0.02	0.32
Bycatch	0.11	0.23	0.02	0.98	0.45	0.29	0.19	1.96	4.22
Recreational (+discard mort.)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.12	0.71	1.89	3.06	0.61	0.37	0.21	2.04	8.99
O26 FCEY									
Commercial discard mort.	NA	NA	0.06	0.30	NA	NA	NA	NA	0.36
Recreational (+discard mort.)	0.21	0.48	0.69	1.70	NA	NA	NA	NA	3.09
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial landings	0.23	2.65	3.02	7.01	1.95	1.32	1.00	1.36	18.53
Total FCEY	0.47	3.14	3.76	9.01	1.95	1.32	1.00	1.36	22.00
TCEY	**0.59**	**3.84**	**5.65**	**12.07**	**2.56**	**1.69**	**1.21**	**3.39**	**31.00**
U26									
Commercial discard mort.	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.04
Bycatch	0.00	0.02	0.00	0.41	0.44	0.11	0.01	0.79	1.77
Total U26	0.00	0.02	0.00	0.42	0.45	0.12	0.01	0.79	1.81
Total Mortality	**0.59**	**3.87**	**5.65**	**12.49**	**3.01**	**1.81**	**1.22**	**4.18**	**32.81**

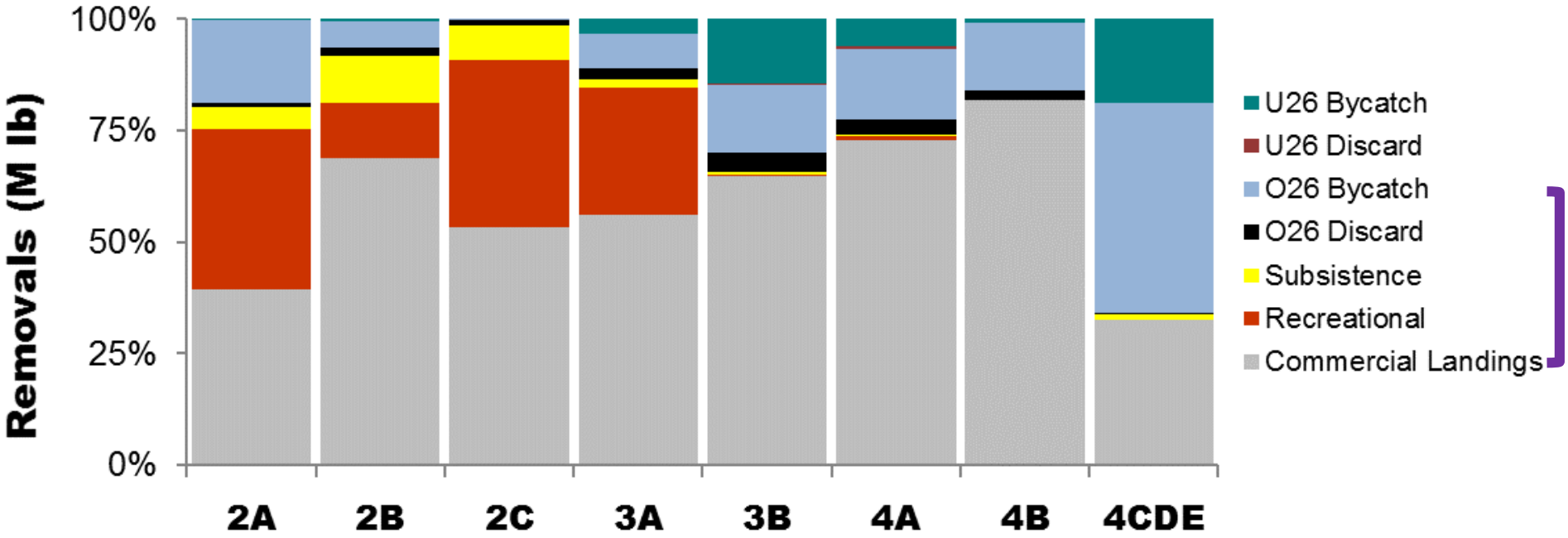
2018 Reference (SPR=46%) summary

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26									
Commercial	0.24	2.73	3.08	7.31	2.09	1.38	1.03	1.38	19.21
Recreational	0.21	0.48	2.12	3.56	0.01	0.02	0.00	0.00	6.39
Subsistence	0.03	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.17
Bycatch	0.11	0.23	0.02	0.98	0.45	0.29	0.19	1.96	4.22
TCEY → Total O26	0.59	3.84	5.65	12.07	2.56	1.69	1.21	3.39	31.00
U26									
Commercial	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.04
Bycatch	0.00	0.02	0.00	0.41	0.44	0.11	0.01	0.79	1.77
Total U26	0.00	0.02	0.00	0.42	0.45	0.12	0.01	0.79	1.81
Total	0.59	3.87	5.65	12.49	3.01	1.81	1.22	4.18	32.81

2018 Reference (SPR=46%) summary



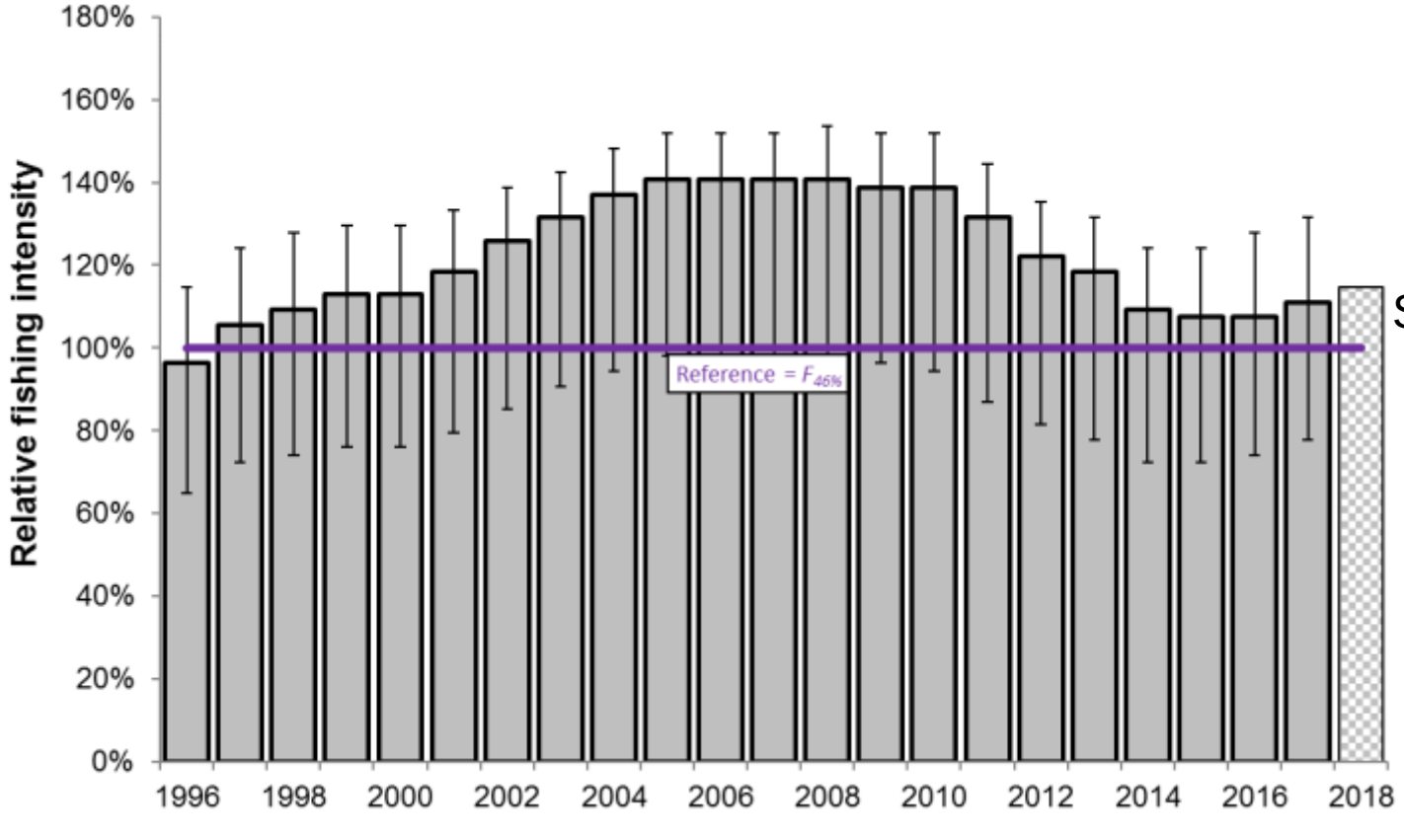
2018 Reference (SPR=46%) summary



Additional 2018 Catch tables

- Detailed results (full tables) for all alternatives under consideration will be available during AM

Alternative: Last year's (2017) catch limits



Projected SPR=38%

Alternative: Last year's (2017) catch limits

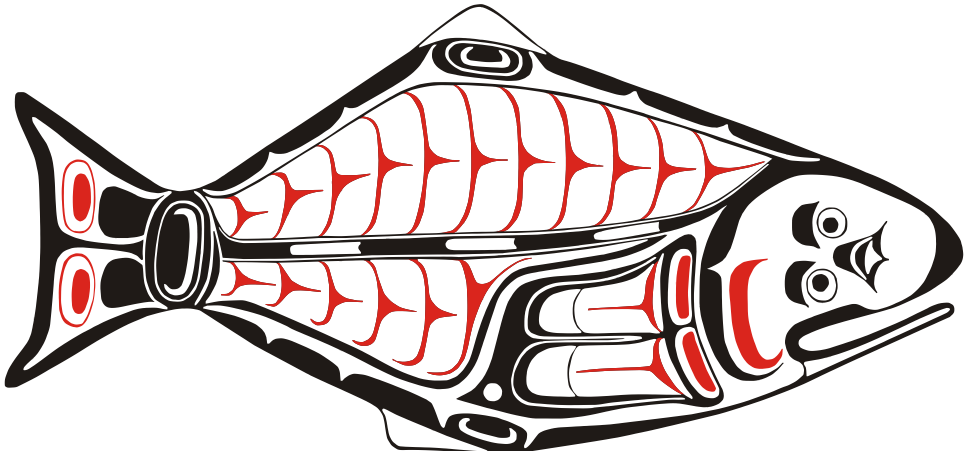
	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial discard mort.	0.02	0.17	NA	NA	0.23	0.07	0.03	0.03	0.55
Bycatch	0.11	0.23	0.02	0.98	0.45	0.29	0.19	1.96	4.22
Recreational (+discard mort.)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.13	0.81	1.89	3.06	0.70	0.38	0.22	2.04	9.22
O26 FCEY									
Commercial discard mort.	NA	NA	0.08	0.33	NA	NA	NA	NA	0.41
Recreational (+discard mort.)	0.54	1.15	0.92	1.87	NA	NA	NA	NA	4.48
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial landings	0.78	6.36	4.15	7.70	3.28	1.42	1.12	1.79	26.61
Total FCEY	1.34	7.52	5.15	9.90	3.28	1.42	1.12	1.79	31.52
TCEY	**1.47**	**8.32**	**7.04**	**12.96**	**3.98**	**1.80**	**1.34**	**3.84**	**40.74**
U26									
Commercial discard mort.	0.00	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.05
Bycatch	0.00	0.02	0.00	0.41	0.44	0.11	0.01	0.79	1.77
Total U26	0.00	0.03	0.00	0.42	0.46	0.12	0.01	0.79	1.82
Total Mortality	**1.47**	**8.35**	**7.04**	**13.38**	**4.43**	**1.92**	**1.35**	**4.62**	**42.57**

Alternative: SPR=46%, Full regulatory bycatch (PSC) in Alaska

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial discard mort.	0.01	0.07	NA	NA	0.11	0.05	0.02	0.00	0.25
Bycatch	0.11	0.23	0.02	1.40	0.64	0.50	0.32	3.41	6.63
Recreational (+discard mort.)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.12	0.70	1.89	3.48	0.77	0.57	0.35	3.46	11.34
O26 FCEY									
Commercial discard mort.	NA	NA	0.05	0.26	NA	NA	NA	NA	0.32
Recreational (+discard mort.)	0.20	0.45	0.63	1.49	NA	NA	NA	NA	2.76
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial landings	0.21	2.46	2.74	6.12	1.63	1.02	0.79	0.00	14.96
Total FCEY	0.44	2.91	3.42	7.87	1.63	1.02	0.79	0.00	18.06
TCEY	**0.55**	**3.61**	**5.31**	**11.34**	**2.40**	**1.58**	**1.14**	**3.46**	**29.40**
U26									
Commercial discard mort.	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.03
Bycatch	0.00	0.02	0.00	0.58	0.62	0.20	0.02	1.37	2.80
Total U26	0.00	0.02	0.00	0.59	0.63	0.20	0.02	1.37	2.83
Total Mortality	**0.55**	**3.63**	**5.31**	**11.93**	**3.03**	**1.79**	**1.16**	**4.83**	**32.23**

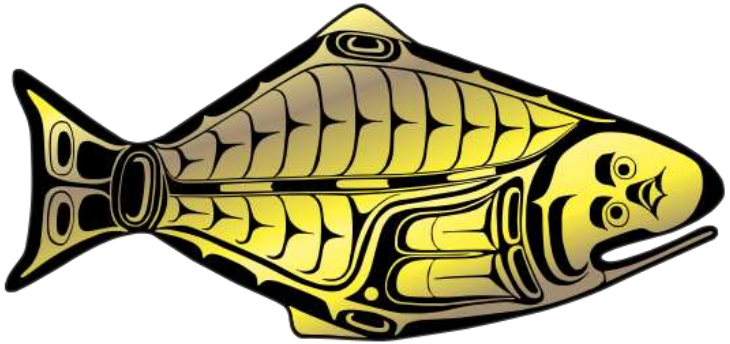
Recommendations

- **NOTE** these papers.
- **REQUEST** any modifications or additions necessary for use during the AM



Please stand by as we bring up the next presentation

INTERNATIONAL PACIFIC



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