INTERNATIONAL PACIFIC HALIBUT COMMISSION 100 years

Stock projections and the harvest decision table for 2024–2026

Agenda item: 7.1

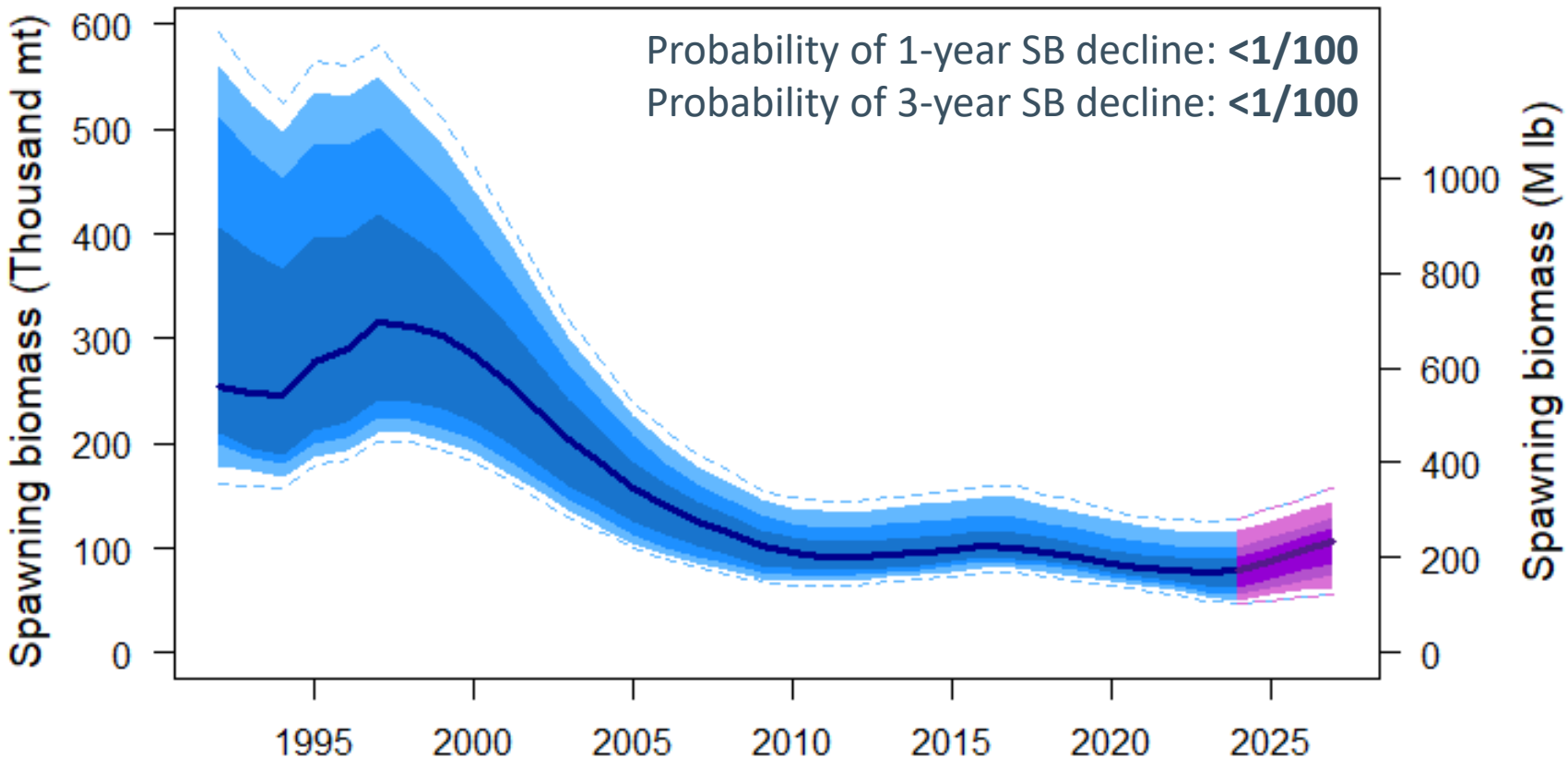
IPHC-2024-AM100-12

I. Stewart & A. Hicks

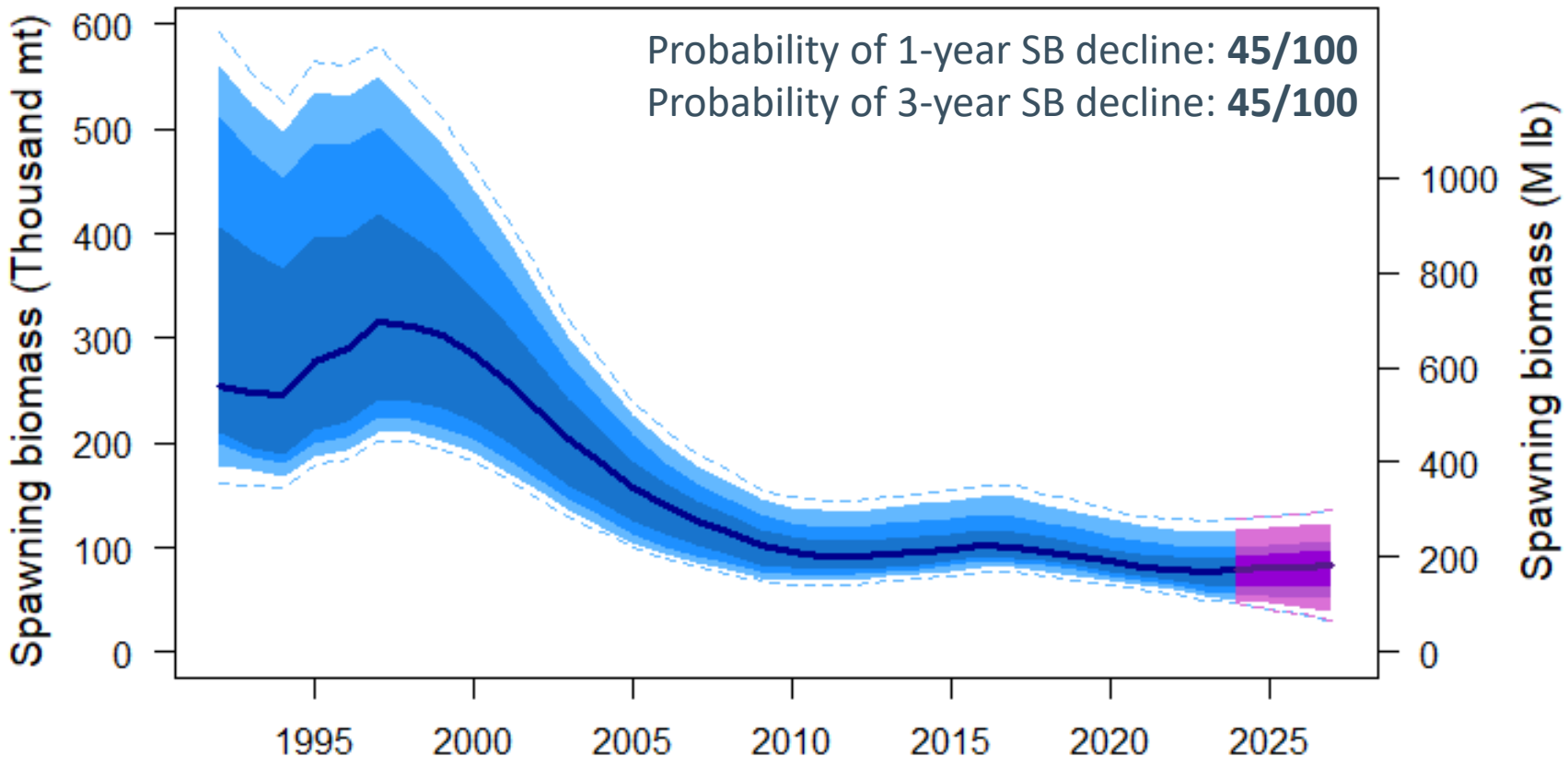
Projections and harvest decision table for 2024-2026

- Project a constant TCEY for the next 3 years across a range of mortality levels:
  - No fishing
  - *Status quo +/- 5 and 10%*
  - *1-year surplus production (<=50% chance of dropping below current SB)*
  - *3-year surplus production*
  - $F_{43\%}$ *Reference*
  - $F_{40\%}$ Maximum Economic Yield (*MEY*) proxy
  - $F_{35\%}$ Maximum Sustainable Yield (*MSY*) proxy
- Calculate the probabilities of: stock decline, dropping below stock reference points, fishery decline, exceeding the reference $F_{43\%}$ fishing intensity

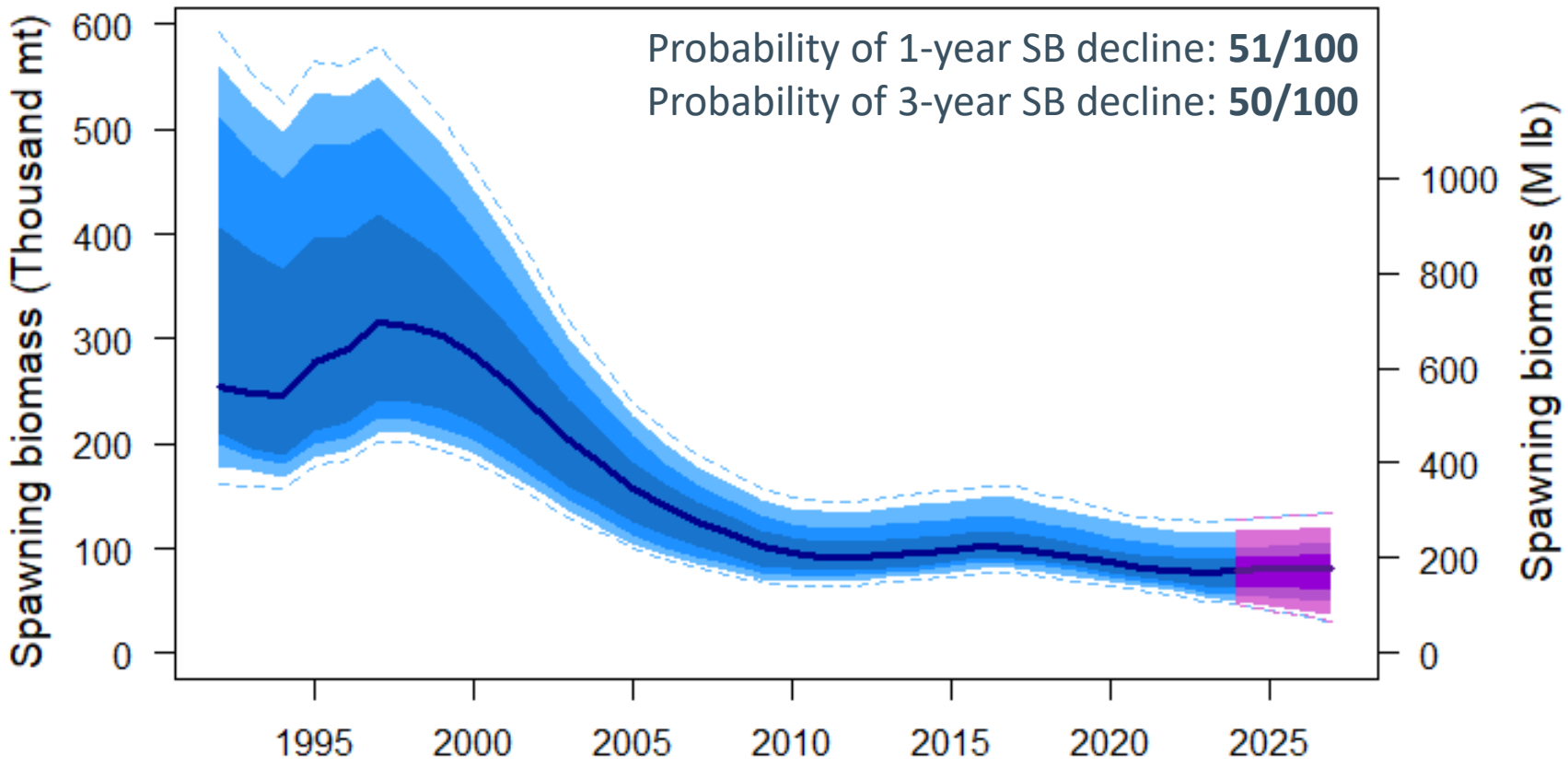
Projections: no fishing mortality



Projections: *status quo* (36.97 Mlb TCEY)



Projections: 3-year surplus (39.1 Mlb)



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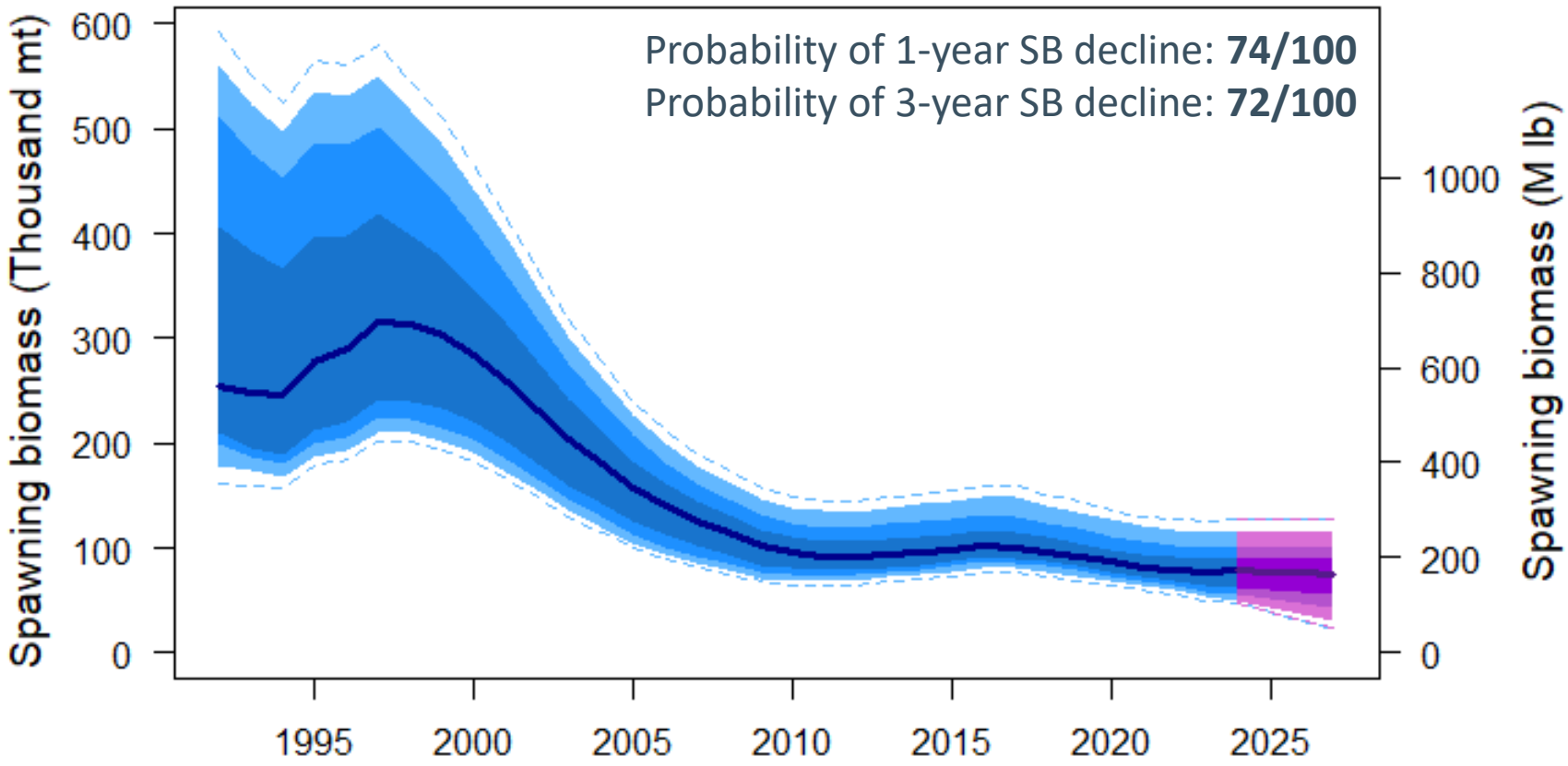
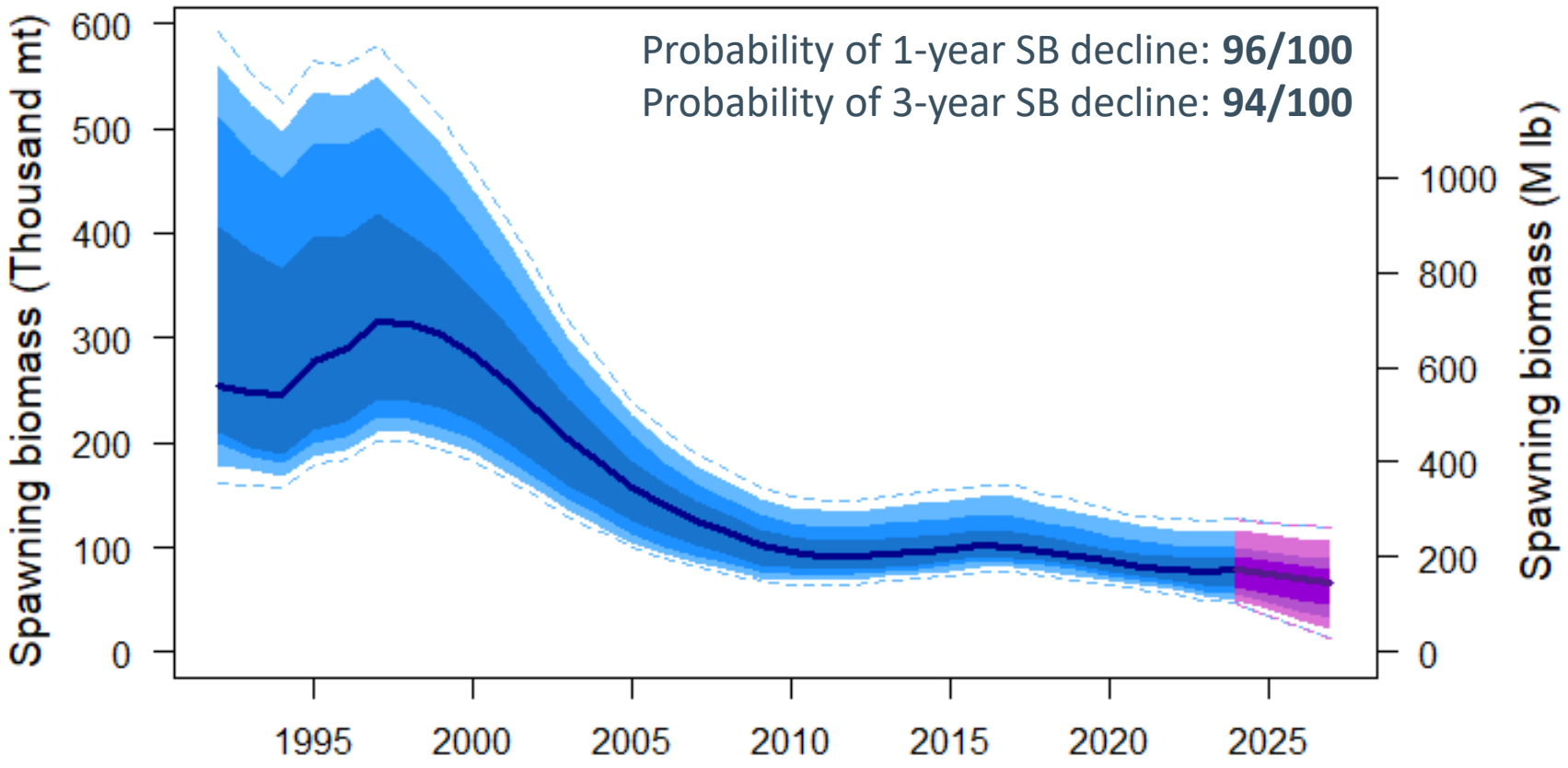
Projections: $F_{43\%}$ Reference (48.9 Mlb)



Projections: $F_{35\%}$ *MSY* proxy (65.7 Mlb)



Decision table

2024 Alternative			*Status quo -10%*	*Status quo -5%*	*Status quo*	*Status quo +5%*	3-Year Surplus	*Status quo +10%*		*Reference* $F_{43\%}$	*MEY proxy*	*MSY proxy*
Total mortality (M lb)	0.0	21.6	34.9	36.7	38.6	40.4	40.7	42.3	46.6	50.5	56.1	67.3
TCEY (M lb)	0.0	20.0	33.3	35.1	37.0	38.8	39.1	40.7	45.0	48.9	54.5	65.7
2024 fishing intensity	$F_{100\%}$	$F_{68\%}$	$F_{54\%}$	$F_{52\%}$	$F_{51\%}$	$F_{50\%}$	$F_{49\%}$	$F_{48\%}$	$F_{45\%}$	$F_{43\%}$	$F_{40\%}$	$F_{35\%}$
Fishing intensity interval	--	46-79%	32-68%	31-67%	29-65%	28-64%	28-64%	27-63%	25-60%	23-58%	20-55%	17-50%

Increasing mortality/fishing intensity →
Increasing risk →

Decision table

2024 Alternative					*Status quo -10%*	*Status quo -5%*	*Status quo*	*Status quo +5%*	3-Year Surplus	*Status quo +10%*		*Reference* $F_{43\%}$	*MEY proxy*	*MSY proxy*
Total mortality (M lb)			0.0	21.6	34.9	36.7	38.6	40.4	40.7	42.3	46.6	50.5	56.1	67.3
TCEY (M lb)			0.0	20.0	33.3	35.1	37.0	38.8	39.1	40.7	45.0	48.9	54.5	65.7
2024 fishing intensity			$F_{100\%}$	$F_{68\%}$	$F_{54\%}$	$F_{52\%}$	$F_{51\%}$	$F_{50\%}$	$F_{49\%}$	$F_{48\%}$	$F_{45\%}$	$F_{43\%}$	$F_{40\%}$	$F_{35\%}$
Fishing intensity interval			--	46-79%	32-68%	31-67%	29-65%	28-64%	28-64%	27-63%	25-60%	23-58%	20-55%	17-50%
Stock Trend (spawning biomass)	in 2024	is less than 2023	<1	7	35	40	45	50	51	55	66	74	85	96
		is 5% less than 2023	<1	<1	7	9	12	15	15	18	26	33	44	69
	in 2025	is less than 2023	<1	8	35	40	45	50	50	54	65	74	84	95
		is 5% less than 2023	<1	2	17	20	24	28	29	32	42	51	64	85
	in 2026	is less than 2023	<1	10	36	40	45	49	50	54	64	72	82	94
		is 5% less than 2023	<1	4	23	26	30	34	35	39	49	57	69	87

Risk of three-year SB decline

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Decision table

2024 Alternative					*Status quo -10%*	*Status quo -5%*	*Status quo*	*Status quo +5%*	3-Year Surplus	*Status quo +10%*		*Reference* $F_{43\%}$	*MEY proxy*	*MSY proxy*
Total mortality (M lb)			0.0	21.6	34.9	36.7	38.6	40.4	40.7	42.3	46.6	50.5	56.1	67.3
TCEY (M lb)			0.0	20.0	33.3	35.1	37.0	38.8	39.1	40.7	45.0	48.9	54.5	65.7
2024 fishing intensity			$F_{100\%}$	$F_{68\%}$	$F_{54\%}$	$F_{52\%}$	$F_{51\%}$	$F_{50\%}$	$F_{49\%}$	$F_{48\%}$	$F_{45\%}$	$F_{43\%}$	$F_{40\%}$	$F_{35\%}$
Fishing intensity interval			--	46-79%	32-68%	31-67%	29-65%	28-64%	28-64%	27-63%	25-60%	23-58%	20-55%	17-50%
Stock Status (Spawning biomass)	in 2024	is less than 30%	25	25	25	25	25	25	25	25	26	26	26	26
		is less than 20%	<1	<1	1	2	2	2	2	2	3	4	5	9
	in 2025	is less than 30%	21	24	25	25	25	25	25	25	25	25	26	26
		is less than 20%	<1	<1	2	2	2	3	3	3	5	7	9	16
	in 2026	is less than 30%	8	21	24	25	25	25	25	25	25	25	26	26
		is less than 20%	<1	<1	2	2	3	3	3	4	6	8	12	19

Three-year risks of dropping below $SB_{30\%}$ and $SB_{20\%}$

Full decision table

2024 Alternative					*Status quo -10%*	*Status quo -5%*	*Status quo*	*Status quo +5%*	3-Year Surplus	*Status quo +10%*		*Reference $F_{43\%}$*	*MEY proxy*	*MSY proxy*
Total mortality (M lb)			0.0	21.6	34.9	36.7	38.6	40.4	40.7	42.3	46.6	50.5	56.1	67.3
TCEY (M lb)			0.0	20.0	33.3	35.1	37.0	38.8	39.1	40.7	45.0	48.9	54.5	65.7
2024 fishing intensity			$F_{100\%}$	$F_{68\%}$	$F_{54\%}$	$F_{52\%}$	$F_{51\%}$	$F_{50\%}$	$F_{49\%}$	$F_{48\%}$	$F_{45\%}$	$F_{43\%}$	$F_{40\%}$	$F_{35\%}$
Fishing intensity interval			--	46-79%	32-68%	31-67%	29-65%	28-64%	28-64%	27-63%	25-60%	23-58%	20-55%	17-50%
Stock Trend (spawning biomass)	**In 2024**	**Is less than 2023**	**<1**	**7**	**35**	**40**	**45**	**50**	**51**	**55**	**66**	**74**	**85**	**96**
		Is 5% less than 2023	**<1**	**<1**	**7**	**9**	**12**	**15**	**15**	**18**	**26**	**33**	**44**	**69**
	In 2025	**Is less than 2023**	**<1**	**8**	**35**	**40**	**45**	**50**	**50**	**54**	**65**	**74**	**84**	**95**
		Is 5% less than 2023	**<1**	**2**	**17**	**20**	**24**	**28**	**29**	**32**	**42**	**51**	**64**	**85**
	In 2026	**Is less than 2023**	**<1**	**10**	**36**	**40**	**45**	**49**	**50**	**54**	**64**	**72**	**82**	**94**
		Is 5% less than 2023	**<1**	**4**	**23**	**26**	**30**	**34**	**35**	**39**	**49**	**57**	**69**	**87**
Stock Status (Spawning biomass)	**In 2024**	**Is less than 30%**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**26**	**26**	**26**	**26**
		Is less than 20%	**<1**	**<1**	**1**	**2**	**2**	**2**	**2**	**2**	**3**	**4**	**5**	**9**
	In 2025	**Is less than 30%**	**21**	**24**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**26**	**26**
		Is less than 20%	**<1**	**<1**	**2**	**2**	**2**	**3**	**3**	**3**	**5**	**7**	**9**	**16**
	In 2026	**Is less than 30%**	**8**	**21**	**24**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**26**	**26**
		Is less than 20%	**<1**	**<1**	**2**	**2**	**3**	**3**	**3**	**4**	**6**	**8**	**12**	**19**
Fishery Trend (TCEY)	**In 2024**	**Is less than 2023**	**0**	**<1**	**25**	**27**	**28**	**30**	**31**	**33**	**41**	**50**	**63**	**85**
		Is 10% less than 2023	**0**	**<1**	**23**	**25**	**26**	**27**	**27**	**29**	**34**	**41**	**52**	**75**
	In 2025	**Is less than 2023**	**0**	**1**	**25**	**26**	**28**	**30**	**31**	**33**	**42**	**51**	**65**	**87**
		Is 10% less than 2023	**0**	**<1**	**22**	**24**	**26**	**27**	**27**	**29**	**35**	**42**	**55**	**78**
	In 2026	**Is less than 2023**	**0**	**1**	**24**	**26**	**28**	**30**	**31**	**33**	**42**	**52**	**67**	**88**
		Is 10% less than 2023	**0**	**<1**	**21**	**23**	**25**	**27**	**27**	**29**	**35**	**43**	**57**	**81**
Fishery Status (Fishing intensity)	**In 2023**	**Is above $F_{43\%}$**	**0**	**<1**	**26**	**27**	**29**	**31**	**32**	**34**	**42**	**50**	**62**	**82**

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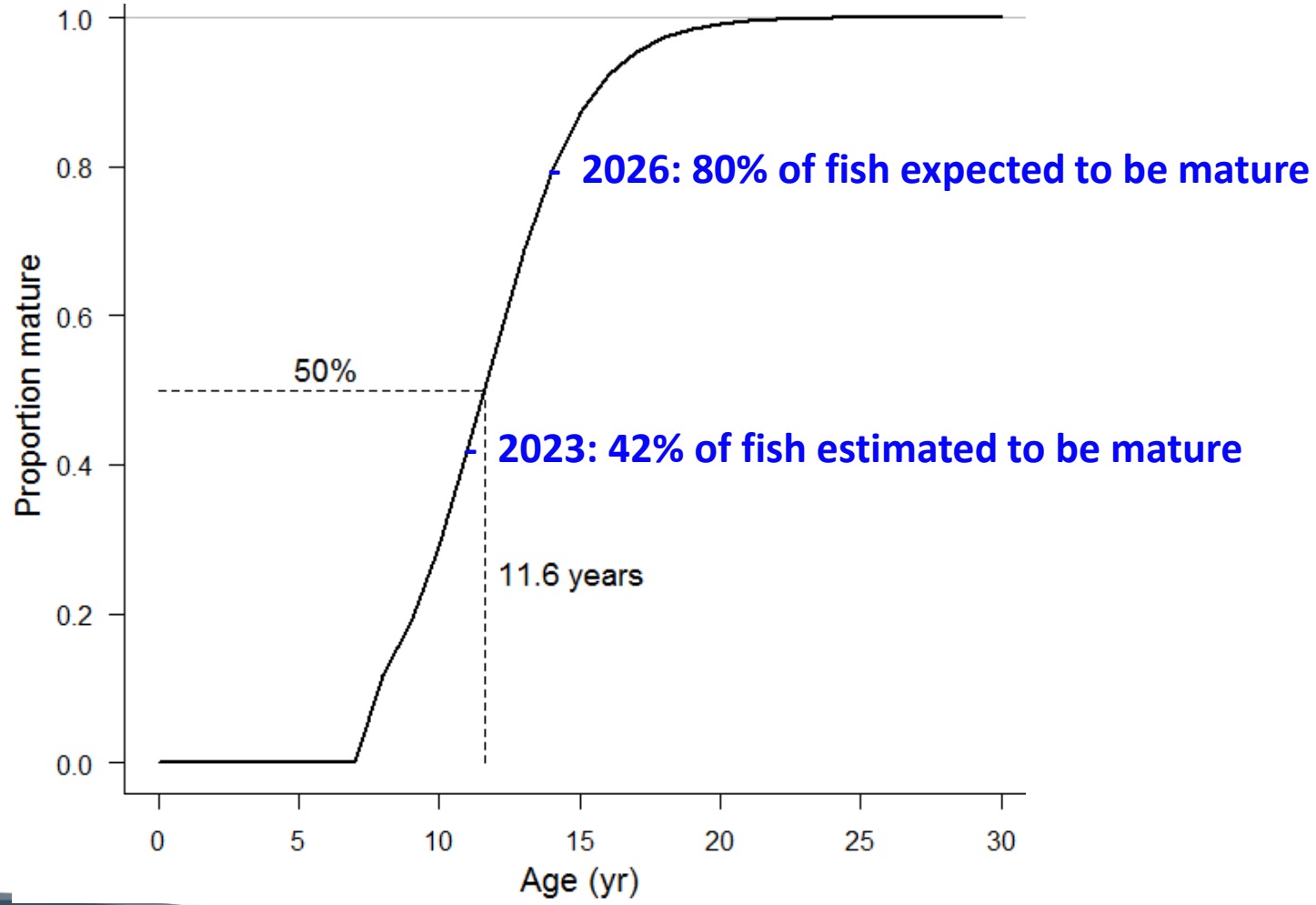
Risks not included in the decision table

- Stock is at the lowest absolute population level in the last 30+ years (actual numbers/biomass)
  - Recent poor recruitment and low weight-at-age have resulted in low productivity relative to the long-term average and low catch-rates in the FISS and directed commercial fisheries
- Biological Region 3 (the geographic center of the stock) is currently at the lowest observed proportion of the coastwide biomass since 1993
- Ecosystem/climate uncertainty remains high
  - Unclear when or if we should expect to see long term average productivity levels
- The 2012 year-class is not yet fully mature

The 2012 year-class – still rapidly maturing



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Additional management information

Recent adopted TCEYs

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
2013	1.11	7.78	5.02	17.07	5.87	2.43	1.93	4.28	45.48
2014	1.11	7.64	5.47	12.05	3.73	1.56	1.49	3.58	36.65
2015	1.06	7.91	6.20	13.00	3.72	1.96	1.53	4.27	39.63
2016	1.26	8.24	6.54	12.75	3.41	1.95	1.37	4.07	39.59
2017	1.47	8.32	7.04	12.96	3.98	1.80	1.34	3.84	40.74
2018	1.32	7.10	6.34	12.54	3.27	1.74	1.28	3.62	37.21
2019	1.65	6.83	6.34	13.50	2.90	1.94	1.45	4.00	38.61
2020	1.65	6.83	5.85	12.20	3.12	1.75	1.31	3.90	36.60
2021	1.65	7.00	5.80	14.00	3.12	2.05	1.40	3.98	39.00
2022	1.65	7.56	5.91	14.55	3.90	2.10	1.45	4.10	41.22
2023	1.65	6.78	5.85	12.08	3.67	1.73	1.36	3.85	36.97

Recent adopted TCEYs

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total	'Reference' TCEY Coastwide
2013	1.11	7.78	5.02	17.07	5.87	2.43	1.93	4.28	45.48	36.63
2014	1.11	7.64	5.47	12.05	3.73	1.56	1.49	3.58	36.65	33.48
2015	1.06	7.91	6.20	13.00	3.72	1.96	1.53	4.27	39.63	35.48
2016	1.26	8.24	6.54	12.75	3.41	1.95	1.37	4.07	39.59	36.31
2017	1.47	8.32	7.04	12.96	3.98	1.80	1.34	3.84	40.74	39.10
2018	1.32	7.10	6.34	12.54	3.27	1.74	1.28	3.62	37.21	31.00
2019	1.65	6.83	6.34	13.50	2.90	1.94	1.45	4.00	38.61	40.00
2020	1.65	6.83	5.85	12.20	3.12	1.75	1.31	3.90	36.60	31.90
2021	1.65	7.00	5.80	14.00	3.12	2.05	1.40	3.98	39.00	39.00
2022	1.65	7.56	5.91	14.55	3.90	2.10	1.45	4.10	41.22	41.22
2023	1.65	6.78	5.85	12.08	3.67	1.73	1.36	3.85	36.97	51.95
2024										48.88

"Blue line"

$F_{46\%}$

$F_{43\%}$

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Projection summary

- Yields less than or equal to 39.1 Mlbs have at least a 50% chance of maintaining the spawning stock at or above current levels over the next three years
  - *Status quo* mortality (36.97 Mlbs) results in 45% chance of further decline
- Projected trends rely heavily on the 2012 year-class continuing to mature at historical rates
- Biomass and productivity are currently low relative to the long-term average; this is likely to persist over at least the next several years

Recommendations

That the Commission:

1) **NOTE** paper IPHC-2024-AM100-12, which provides a summary of projections and the harvest decision table for 2024-2026.
2) **REQUEST** any detailed mortality projections for 2024 (by IPHC Regulatory Area and fishery sector) for evaluation.


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