



# Plan Team summary for BSAI Tier 3 rockfish stocks



**NOAA**  
**FISHERIES**

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# Pacific ocean perch

## *Change between years*

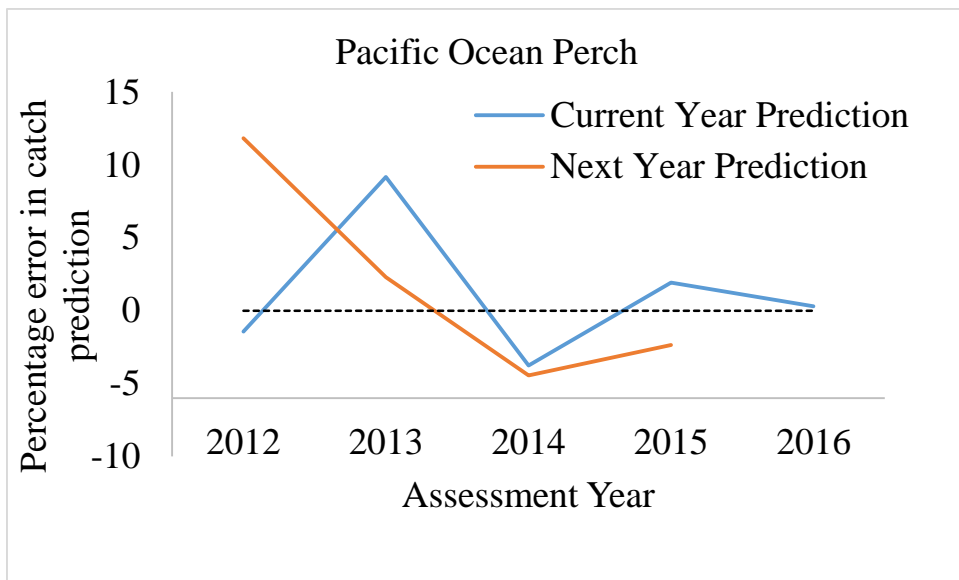
	2017	2018	Percent change
ABC	43,723	42,509	-2.78
OFL	53,152	51,675	-2.78
Total biomass	767,767	749,925	-2.32
Spawning biomass	314,489	305,804	-2.76

## *Change between 2016 and 2017 projections*

	2016 projection	2017 projection	Percent change
2016 catch	31,411	31,319	-0.29
2017 catch	30,835	34,280	11.17
2018 catch	30,139	33,324	10.57
2018 Total biomass	753,302	749,925	-0.45
2018 Spawning biomass	307,808	305,804	-0.65
2018 ABC	42,735	42,509	-0.53
2018 OFL	51,950	51,675	-0.53

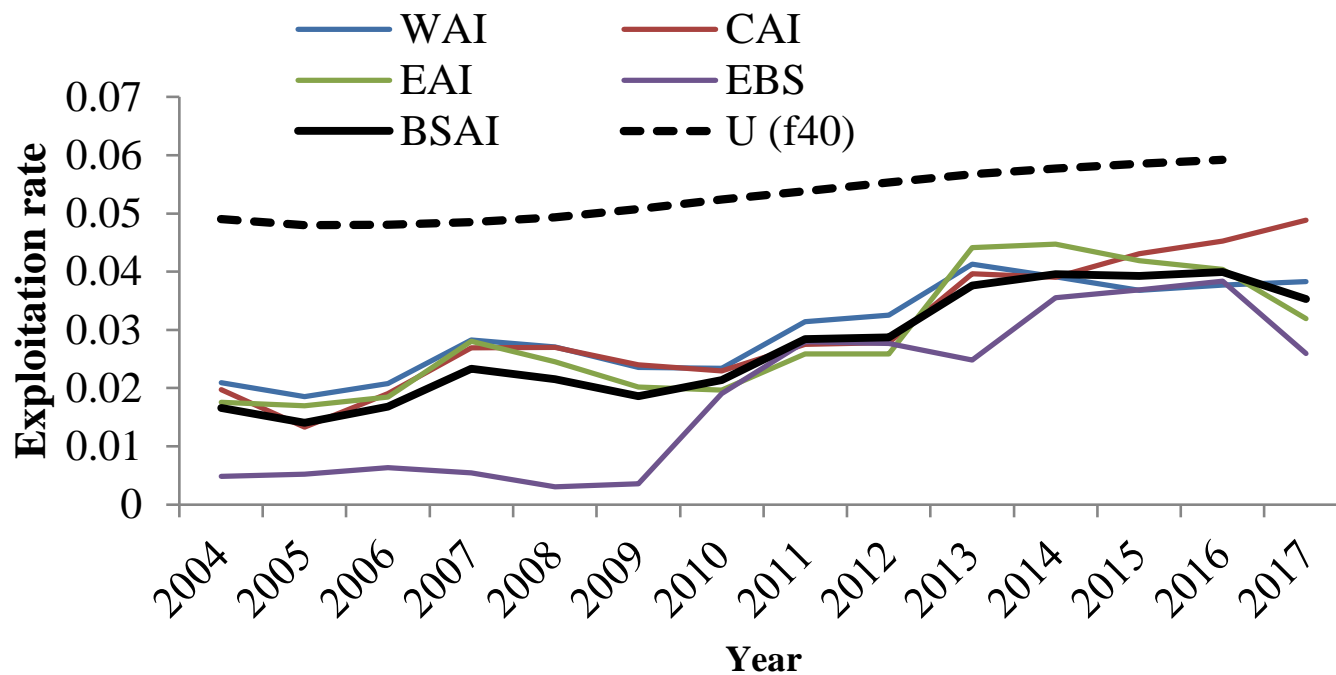


# Performance of catch prediction



	Projected from	Estimated in	
SSB for Year	previous year	current year	Percent change
2013	273,683	273,631	0.02
2015	234,426	234,222	0.09

# Exploitation rates by area

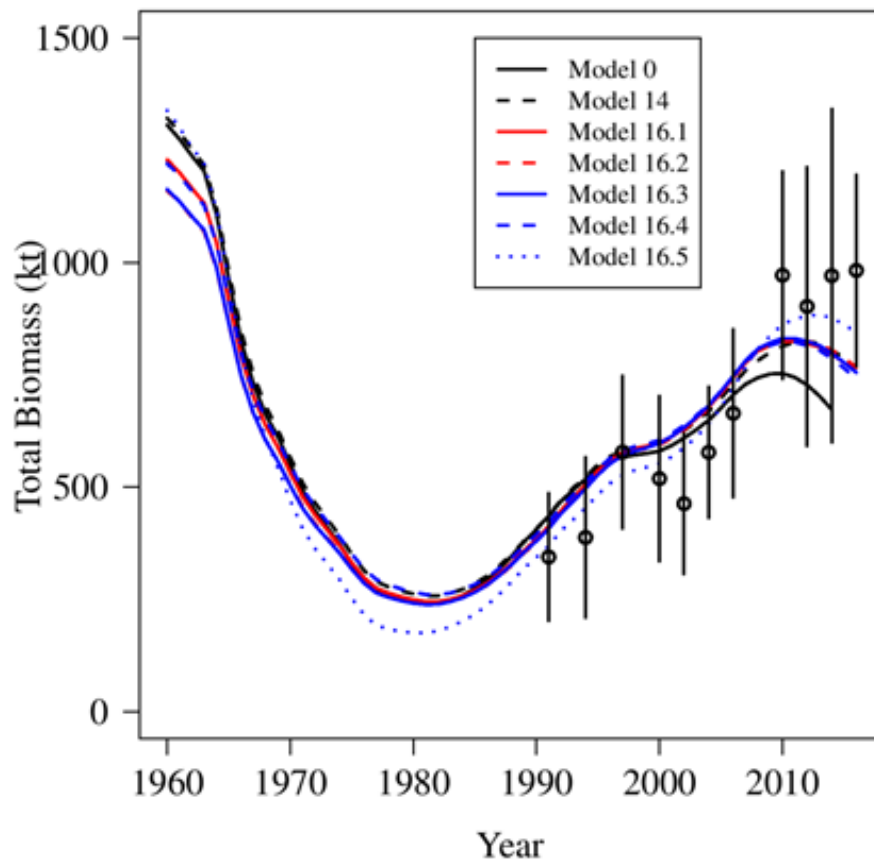


# Future Research Tasks

- Develop prior distribution for catchability based on field work in untrawlable grounds.
- Investigate natural mortality
- Investigate “*large and problematic*” retrospective pattern



# Jump in survey biomass estimates beginning in 2010 (graph from 2016 assessment)



Has sampling coverage, survey methodology, gear, etc., changed?

Has the availability to the survey has changed over time?

On the other hand, a retrospective pattern would be expected if the survey biomass increases cannot be explained by adding new cohorts to the population (and the change in biomass of existing cohorts)

# POP summary table

Quantity	As estimated or specified last year for:		As estimated or recommended this year for:	
	2017	2018	2018	2019
<i>M</i> (natural mortality rate)	0.058	0.058	0.058	0.058
Tier	3a	3a	3a	3a
Projected total (age 3+) biomass	767,767	753,302	749,925	734,431
Female spawning biomass (t)				
Projected	314,489	307,808	305,804	295,593
$B_{100\%}$	536,713	536,713	536,713	536,713
$B_{40\%}$	214,685	214,685	214,685	214,685
$B_{35\%}$	187,849	187,849	187,849	187,849
$F_{OFL}$	0.101	0.101	0.101	0.101
$maxF_{ABC}$	0.082	0.082	0.082	0.082
$F_{ABC}$	0.082	0.082	0.082	0.082
OFL (t)	53,152	51,950	51,675	50,098
maxABC (t)	43,723	42,735	42,509	41,212
ABC (t)	43,723	42,735	42,509	41,212
Status	As determined last year for:		As determined this year for:	
	2015	2016	2016	2017
Overfishing	No	n/a	No	n/a
Overfished	n/a		n/a	No
Approaching overfished	n/a		n/a	No

# POP area apportionments

	Area			
	WAI	CAI	EAI	EBS
Estimated 2016 biomass (from random effects model)	356,896	216,425	278,507	329,647
Percentage of Biomass	30.21%	18.32%	23.57%	27.90%





# Northern rockfish

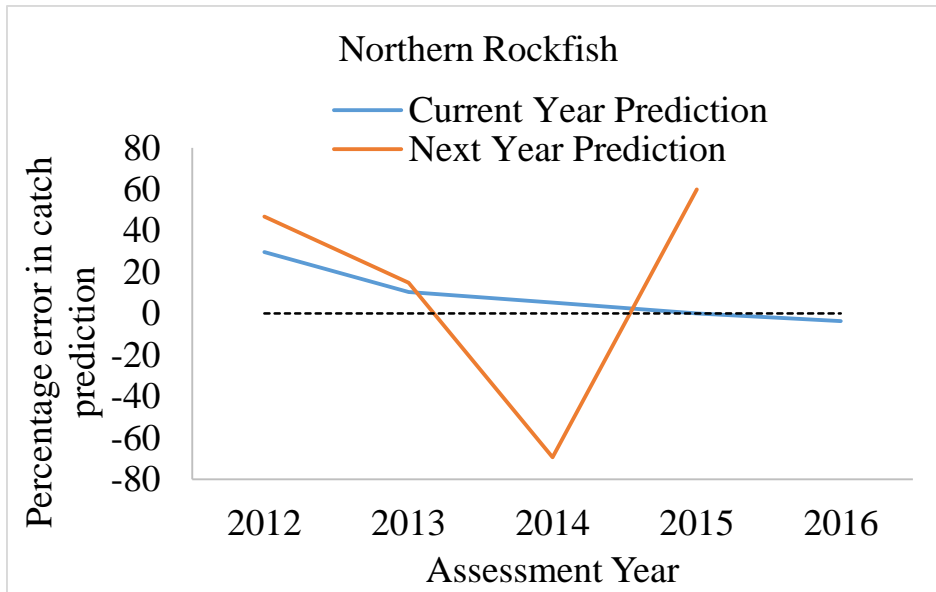
## *Change between years*

	2017	2018	Percent change
ABC	13,264	12,975	-2.18
OFL	16,242	15,888	-2.18
Total biomass	248,160	246,160	-0.81
Spawning biomass	107,660	106,486	-1.09

## *Change between 2016 and 2017 projections*

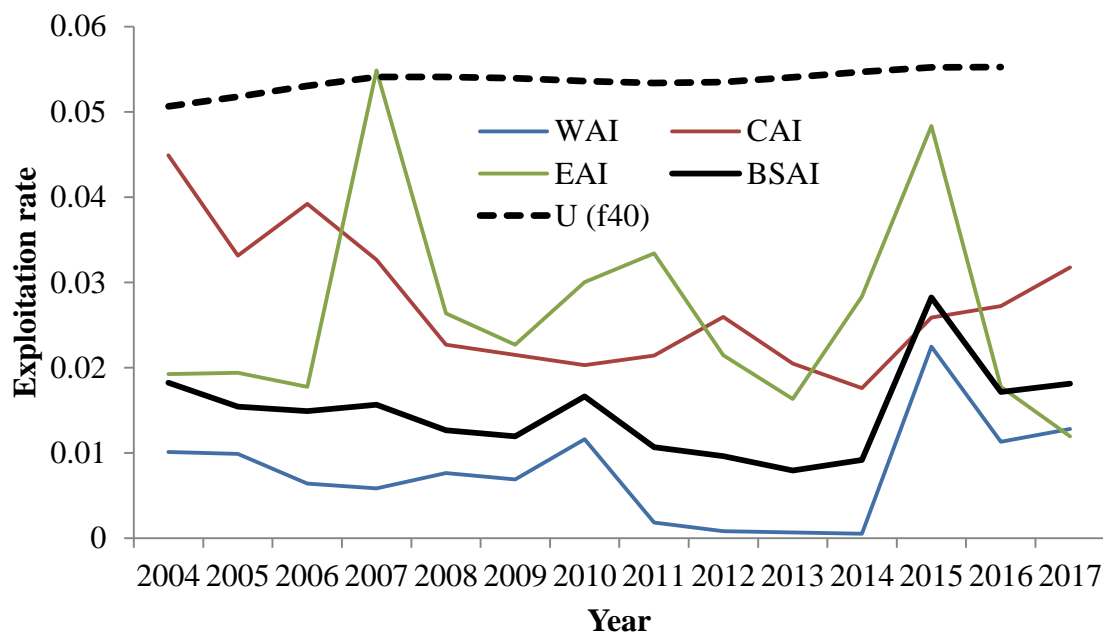
	2016 projection	2017 projection	Percent change
2016 catch	4,375	4,541	3.79
2017 catch	5,631	5,000	-11.21
2018 catch	5,497	4,895	-10.95
2018 Total Biomass	245,693	246,160	0.19
2018 Spawning biomass	106,184	106,486	0.28
2018 ABC	12,947	12,975	0.22
2018 OFL	15,854	15,888	0.21

# Performance of catch prediction



	Projected from	Estimated in	
SSB for Year	previous year	current year	Percent change
2013	86,792	85,666	1.31
2015	93,540	95,564	-2.12

# Exploitation rates by area

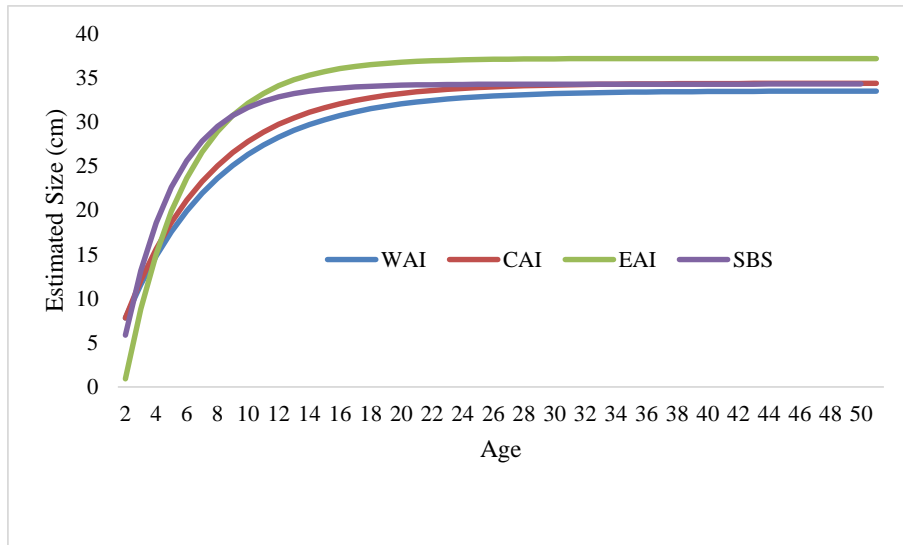


# Future research plans

- “Poor” retrospective pattern
- Size at age differs between AI subareas, but the model does not incorporate this
- Slow-growing fish may also affect aging error matrix



# Northern rockfish size at age, 2012



Examine whether different growth curves should be used for the fishery and population (most of the stock is in the western AI, but most of the catch is in the eastern and central AI)

Potential methods:

- a) use weighted average when computing length at age
- b) apply age-length keys by subarea

# Northern rockfish summary table

Quantity	As estimated or specified last year for:		As estimated or recommended this year for:	
	2017	2018	2018*	2019*
$M$ (natural mortality rate)	0.046	0.046	0.046	0.046
Tier	3a	3a	3a	3a
Projected total (age 3+) biomass	248,160	245,693	246,160	244,963
Female spawning biomass (t)				
Projected	107,660	106,184	106,486	104,699
$B_{100\%}$	164,674	164,674	164,674	164,674
$B_{40\%}$	65,870	65,870	65,870	65,870
$B_{35\%}$	57,636	57,636	57,636	57,636
$F_{OFL}$	0.080	0.080	0.080	0.080
$maxF_{ABC}$	0.065	0.065	0.065	0.065
$F_{ABC}$	0.065	0.065	0.065	0.065
OFL (t)	16,242	15,854	15,888	15,563
maxABC (t)	13,264	12,947	12,975	12,710
ABC (t)	13,264	12,947	12,975	12,710
Status	As determined last year for:		As determined this year for:	
	2015	2016	2016	2017
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No



# Blackspotted/rougheye rockfish

## *Change between years*

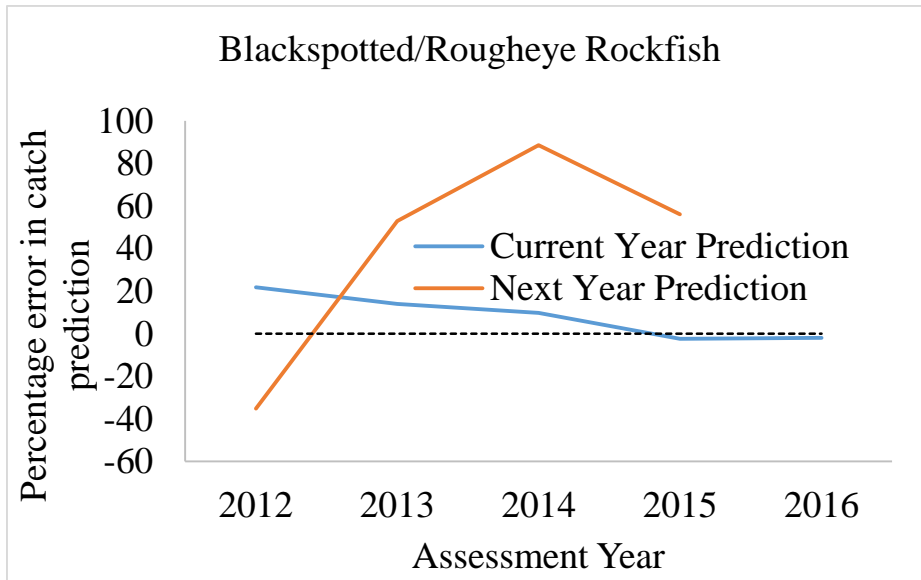
	2017	2018	Percent change
ABC	501	613	22.36
OFL	614	749	21.99
Total biomass	35,669	37,453	5.00
Spawning biomass	7,305	8,208	12.36

## *Change between 2016 and 2017 projections*

	2016 projection	2017 projection	Percent change
2016 catch	155	158	1.94
2017 catch	169	186	10.06
2018 catch	183	202	10.38
2018 Total Biomass	37,474	37,453	-0.06
2018 Spawning biomass	8,188	8,208	0.24
2018 ABC	614	613	-0.16
2018 OFL	750	749	-0.13

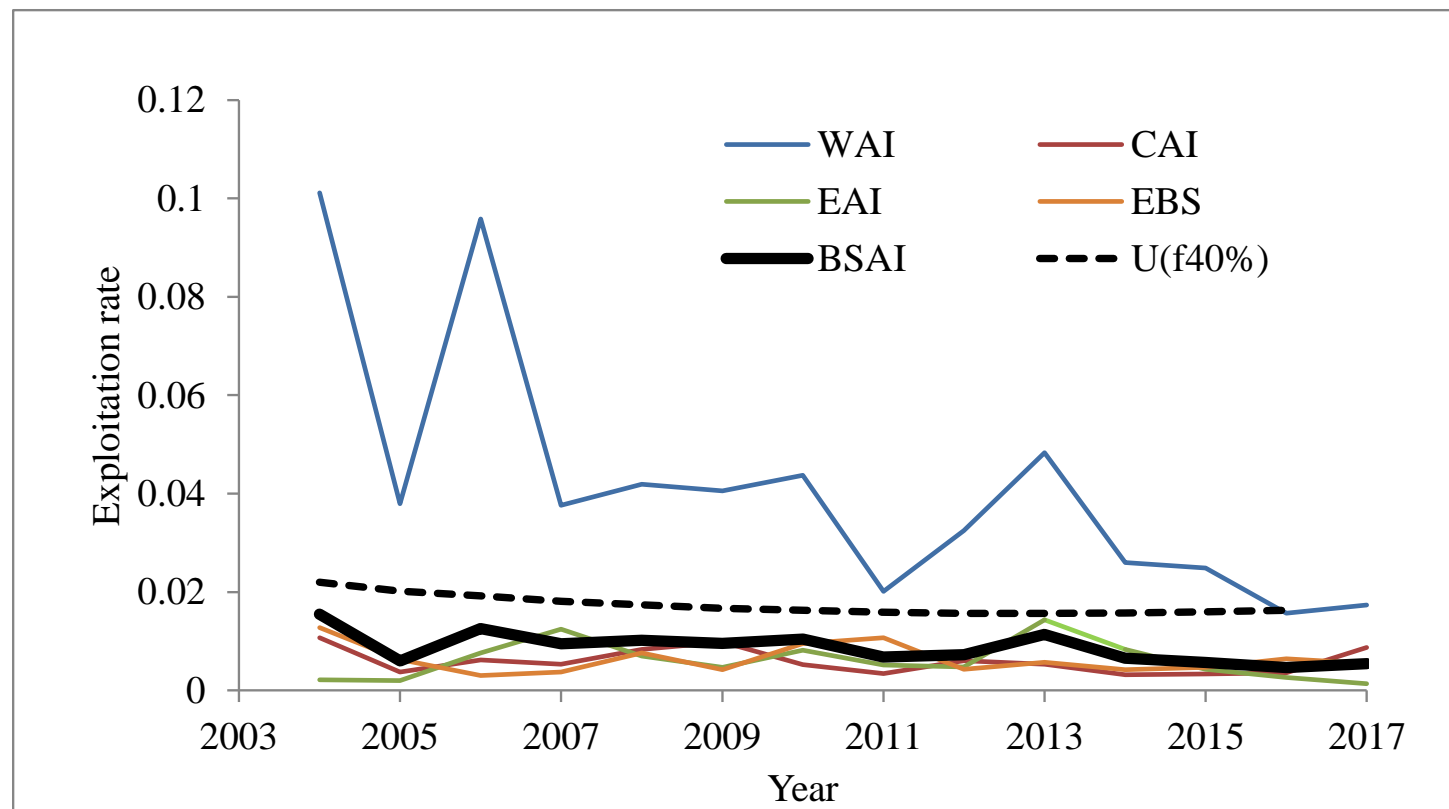


# Performance of catch prediction



	Projected from	Estimated in	
SSB for Year	previous year	current year	Percent change
2013	6,836	6,862	-0.38
2015	7,932	7,954	-0.28

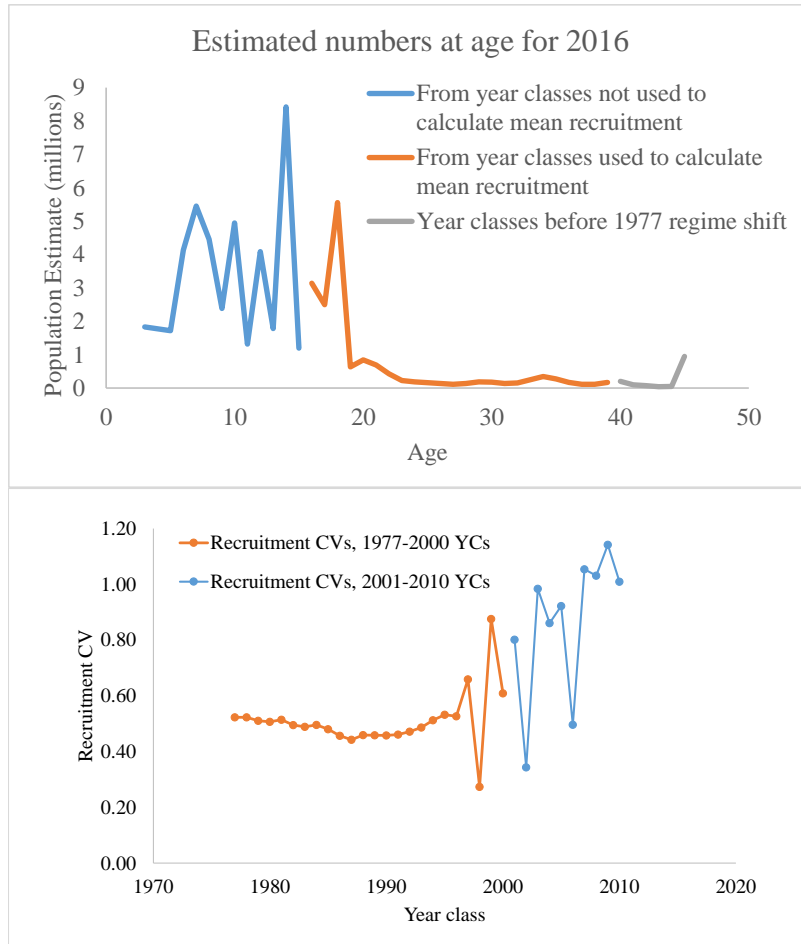
# Exploitation rates by area



# Future Research Tasks

- Re-evaluate inclusion of EBS slope data
  - Separate EBS and AI models
  - BSAI model, with re-evaluation of “*which aspects of adding the EBS . . . are most influencing the model results*”
- Investigate “*very large*” retrospective pattern
- Incorporate uncertainty from assessment model into stock projections.

# Current stock projection based on uncertain year class strength



The stock projections are based on cohorts with uncertain recruitment estimates.

Incorporating the uncertainty in numbers at age would be useful in producing a distribution of the projected ABC values.

# Blackspotted/roughey summary table

Quantity	As estimated or <i>specified</i> last year for:		As estimated or <i>recommended</i> this year for:	
	2017	2018	2018*	2019*
$M$ (natural mortality rate)	0.033	0.033	0.033	0.033
Tier	3b	3b	3b	3a
Projected total (age 3+) biomass	35,669	37,474	37,453	39,169
Female spawning biomass (t)				
Projected	7,305	8,188	8,208	9,163
$B_{100\%}$	20,777	20,777	20,777	20,777
$B_{40\%}$	8,311	8,311	8,311	8,311
$B_{35\%}$	7,272	7,272	7,272	7,272
$F_{OFL}$	0.048	0.054	0.054	0.055
$maxF_{ABC}$	0.039	0.044	0.044	0.045
$F_{ABC}$	0.039	0.044	0.044	0.045
OFL (t)	612	750	749	829
maxABC (t)	501	614	613	678
ABC (t)	501	614	613	678
Status	As determined last year for:		As determined this year for:	
	2015	2016	2016	2017
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

# Blackspotted/rougheye area apportionments

Area/subarea	Year	Total				
		Biomass (t) <sup>1</sup>	OFL	ABC	TAC	Catch <sup>2</sup>
BSAI	2016	43,944	693	561	300	158
	2017	35,669	612	501	225	183
	2018	37,453	749	613	n/a	n/a
	2019	39,169	829	678	n/a	n/a
Western/Central Aleutian Islands	2016			382	200	87
	2017			195	125	132
	2018			239	n/a	n/a
	2019			264	n/a	n/a
Eastern AI/Eastern Bering Sea	2016			179	100	71
	2017			306	100	51
	2018			374	n/a	n/a
	2019			414	n/a	n/a

	WAI MSSC	CAI MSSC
2018 MSSCs	35	204
2019 MSSCs	39	225

