

# **Assessment of the Other Rockfish stock complex in the Bering Sea/Aleutian Islands**

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# What are “Other Rockfish”?

- All species of *Sebastes* and *Sebastolobus*, EXCEPT:
  - Pacific ocean perch (POP, *Sebastes alutus*),
  - northern rockfish (*Sebastes polyspinis*),
  - rougheye rockfish (*S. aleutianus*),
  - blackspotted rockfish (*S. melanostictus*), and
  - shortraker rockfish (*S. borealis*)

# What are “Other Rockfish”?

- Most abundant:  
shortspine thornyhead; *Sebastolobus alascanus*,  
dusky rockfish; *Sebastes variabilis*,  
harlequin rockfish; *Sebastes variegatus*,  
redbanded rockfish; *Sebastes babcocki*,  
redstriped rockfish; *Sebastes proriger*,  
yelloweye rockfish; *Sebastes ruberrimus*, and  
sharpchin rockfish; *Sebastes zacentrus*

24 species, including unidentified.

# Methods

- M for SST = 0.03
- M for non-SST=0.09
- Biomass estimates for Other Rockfish were obtained by taking a weighted (4-6-9) biomass estimate of the most recent three surveys by area, with higher weights applied to more recent surveys (Bering Sea slope, Bering Sea shelf, and Aleutian Islands surveys).

# Summary of Results (entire complex)

<b>Quantity</b>	As estimated or <i>specified last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2014	2015	2015	2015
$M$ (natural mortality rate)	0.03	0.03	0.03	0.03
Tier	5	5	5	5
Biomass (t)	47,705	47,705	50,050	50,050
$F_{OFL}^*$	-	-	-	-
$maxF_{ABC}$	-	-	-	-
$F_{ABC}$	-	-	-	-
OFL (t)	1,550	1,550	1,696	1,696
maxABC (t)	1,163	1,163	1,272	1,272
ABC (t)	1,163	1,163	1,272	1,272
AI ABC (t)	473	473	570	570
EBS ABC (t)	690	690	702	702
<b>Status</b>	As determined <i>last year for:</i>		As determined <i>this year for:</i>	
	2012	2013	2013	2014
Overfishing		n/a		n/a

# Summary of Results (SST portion of complex)

<b>Quantity</b>	As estimated or <i>specified last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2014	2015	2015	2015
$M$ (natural mortality rate)	0.03	0.03	0.03	0.03
Tier	5	5	5	5
Biomass (t)	45,820	45,820	47,042	47,042
$F_{OFL}$	0.03	0.03	0.03	0.03
$maxF_{ABC}$	0.03	0.03	0.03	0.03
$F_{ABC}$	0.0225	0.0225	0.0225	0.0225
OFL (t)	1,375	1,375	1,411	1,411
maxABC (t)	1,031	1,031	1,058	1,058
ABC (t)	1,031	1,031	1,058	1,058
AI ABC (t)	367	367	376	376
EBS ABC (t)	664	664	682	682
	As determined <i>last year for:</i>		As determined <i>this year for:</i>	
<b>Status</b>	2012	2013	2013	2014
Overfishing		n/a		n/a

# Summary of Results (non-SST portion of complex)

<b>Quantity</b>	As estimated or <i>specified last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2014	2015	2015	2016
$M$ (natural mortality rate)	0.09	0.09	0.09	0.09
Tier	5	5	5	5
Biomass (t)	1,885	1,885	3,165	3,165
$F_{OFL}$	0.09	0.09	0.09	0.09
$maxF_{ABC}$	0.0675	0.0675	0.0675	0.0675
$F_{ABC}$	0.0675	0.0675	0.0675	0.0675
OFL (t)	170	170	285	285
maxABC (t)	128	128	214	214
ABC (t)	128	128	214	214
AI ABC (t)	106	106	194	194
EBS ABC (t)	22	22	20	20
<b>Status</b>	As determined <i>last year for:</i>		As determined <i>this year for:</i>	
	2012	2013	2013	2014
Overfishing		n/a		n/a

# Catch and TAC by region

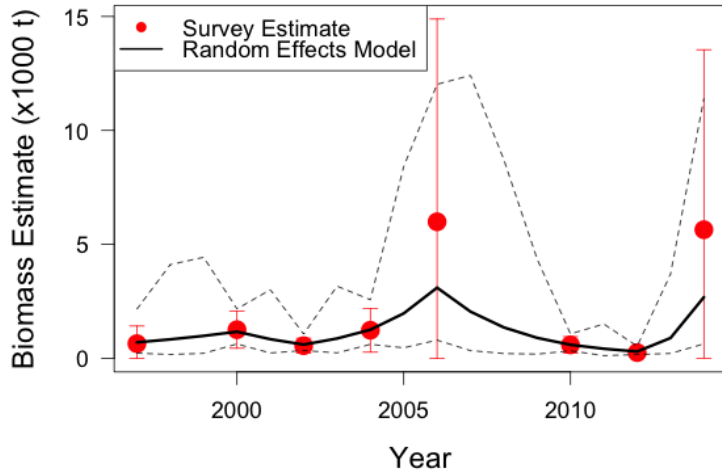
	BSAI	AI	EBS	Total
OFL (2012)	1,700			1,700
ABC (2012)		570	710	1,280
TAC (2012)		570	500	1,070
Catch (2012)		736	210	947
OFL (2013)	1,540			1,540
ABC (2013)		473	686	1,159
TAC (2013)		473	400	873
Catch (2013)		623	191	814
OFL (2014)	1,550			1,550
ABC (2014)		473	690	1,163
Catch (2014) <sup>1</sup>		601	304	905
TAC (2014)				686
OFL (2015)	1,550			1,550
ABC (2015)		473	690	1,163
OFL (2016)	1,550			1,550
ABC (2016)		473	690	1,163

<sup>1</sup>Updated October 25, 2014.

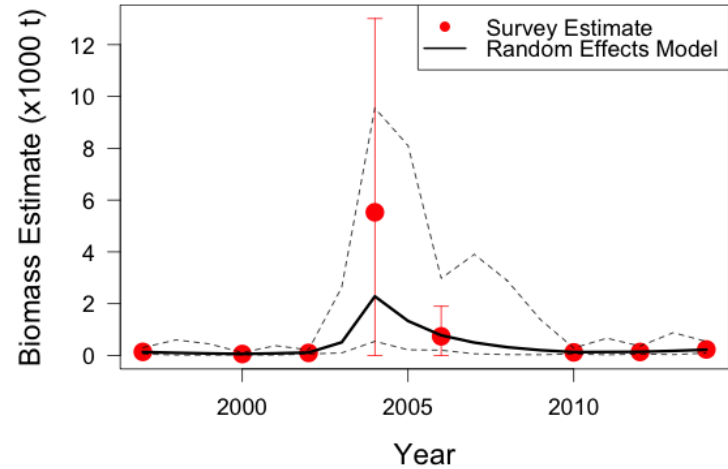


# Random effect model results

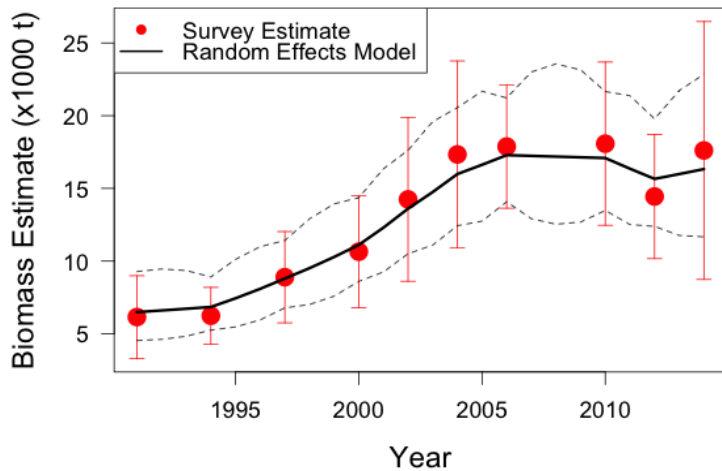
## Aleutian Islands non-SST Other Rockfish



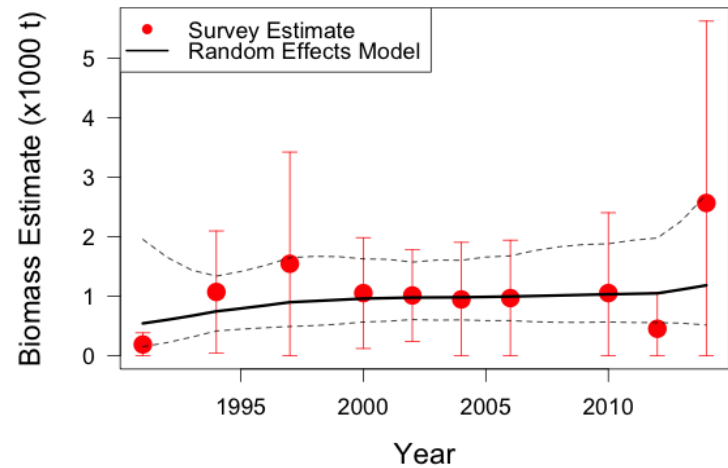
## Southern Bering Sea non-SST Other Rockfish



## Aleutian Islands SST

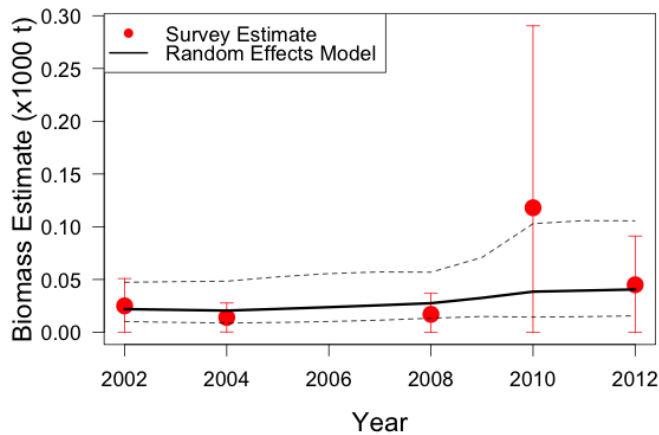


## Southern Bering Sea SST

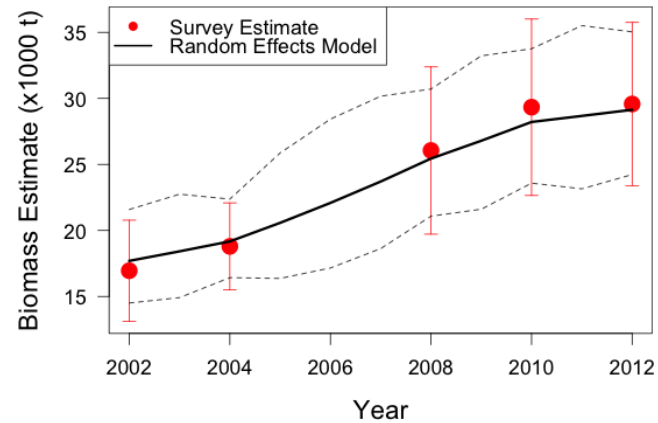


# Random effect model results

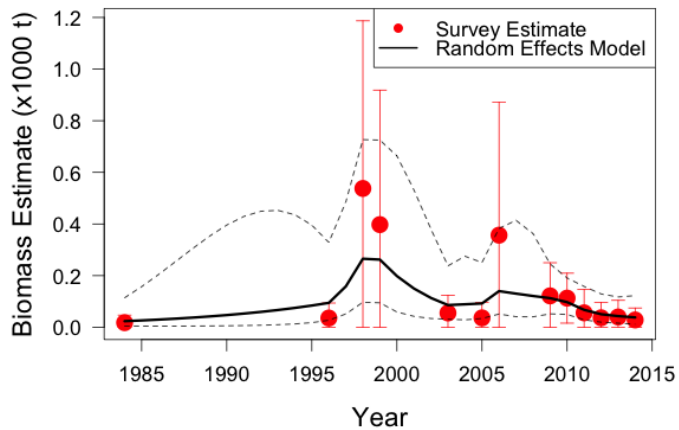
## Bering Sea slope non-SST Other Rockfish



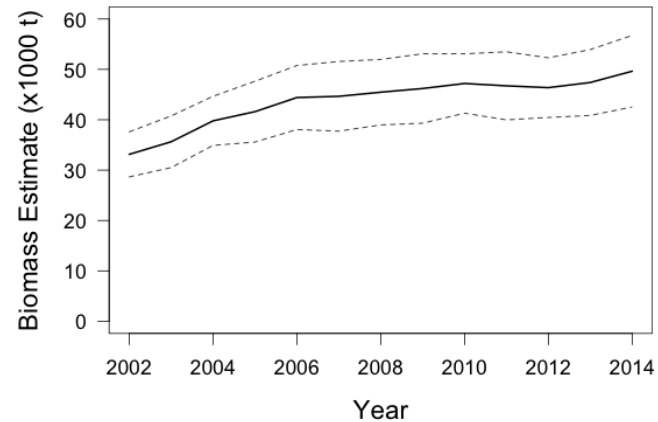
## Bering Sea slope SST



## Bering Sea shelf non-SST Other Rockfish

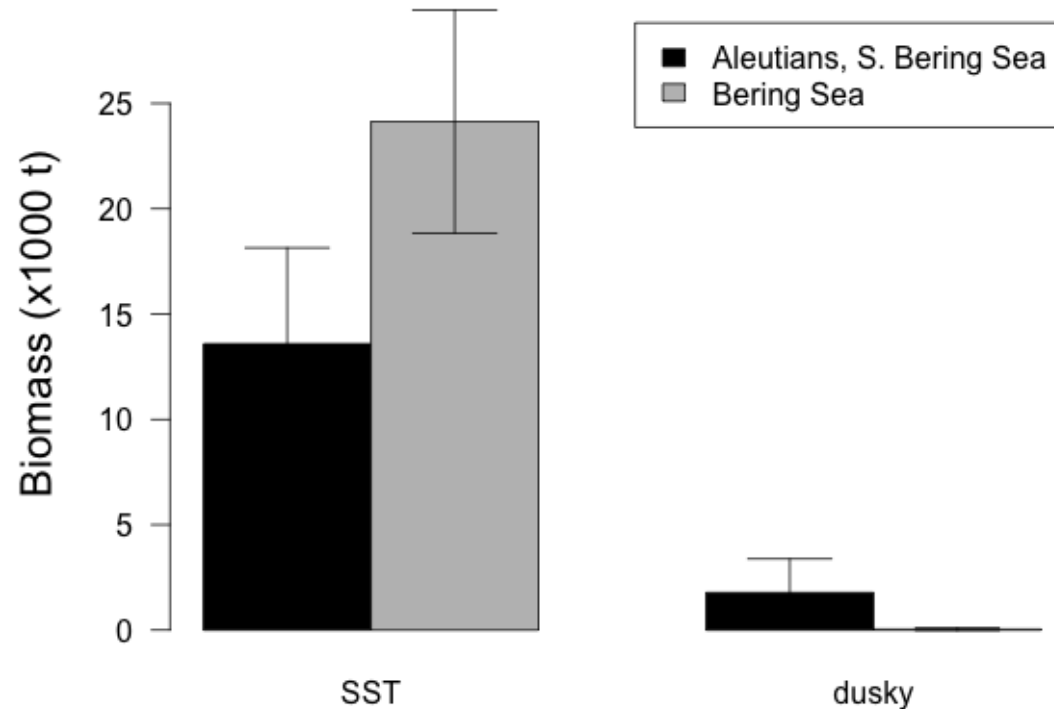


## Random effect estimate of Other Rockfish biomass (BSAI)

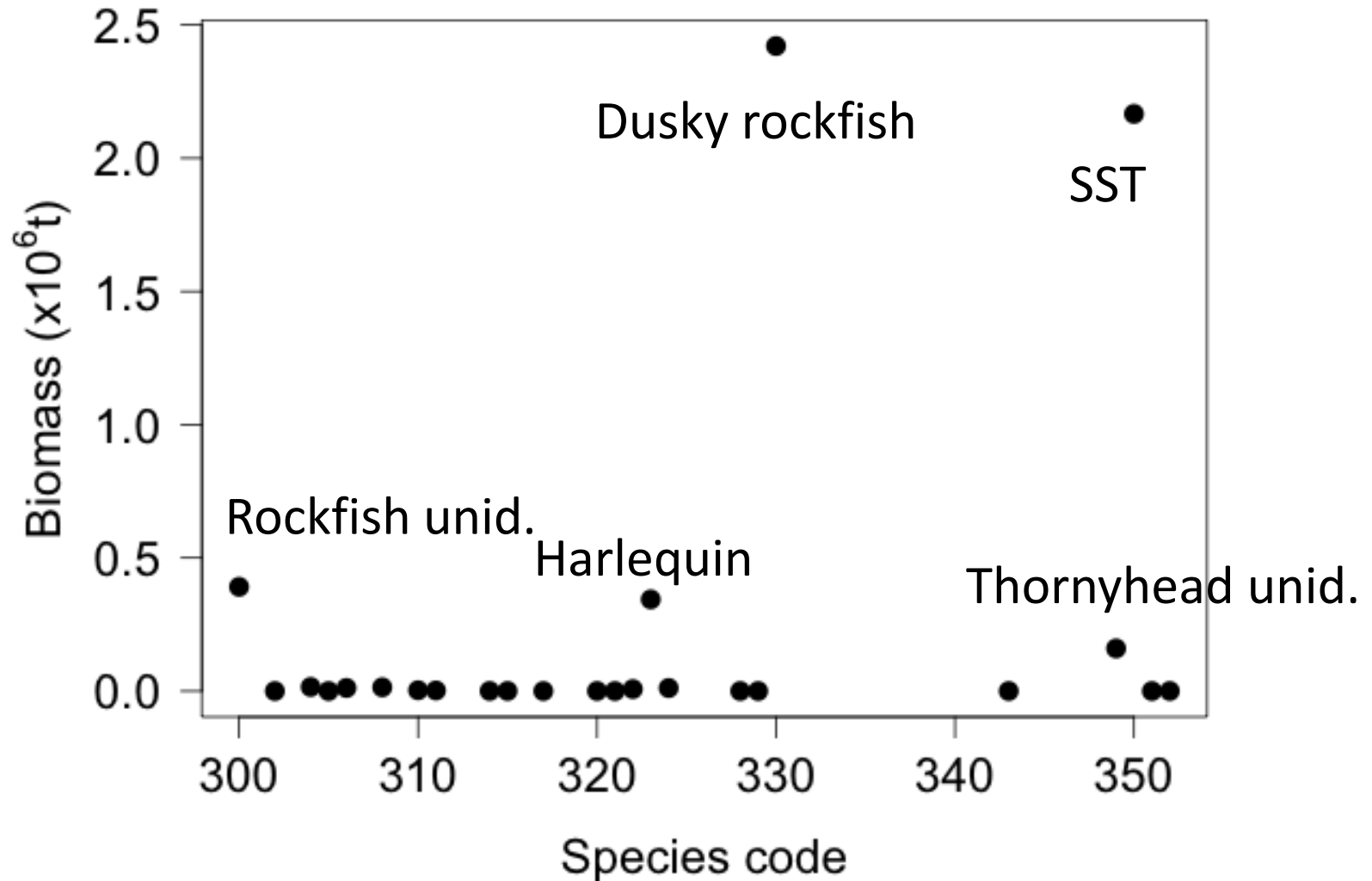


# Catch of dusky is not proportional to relative biomass

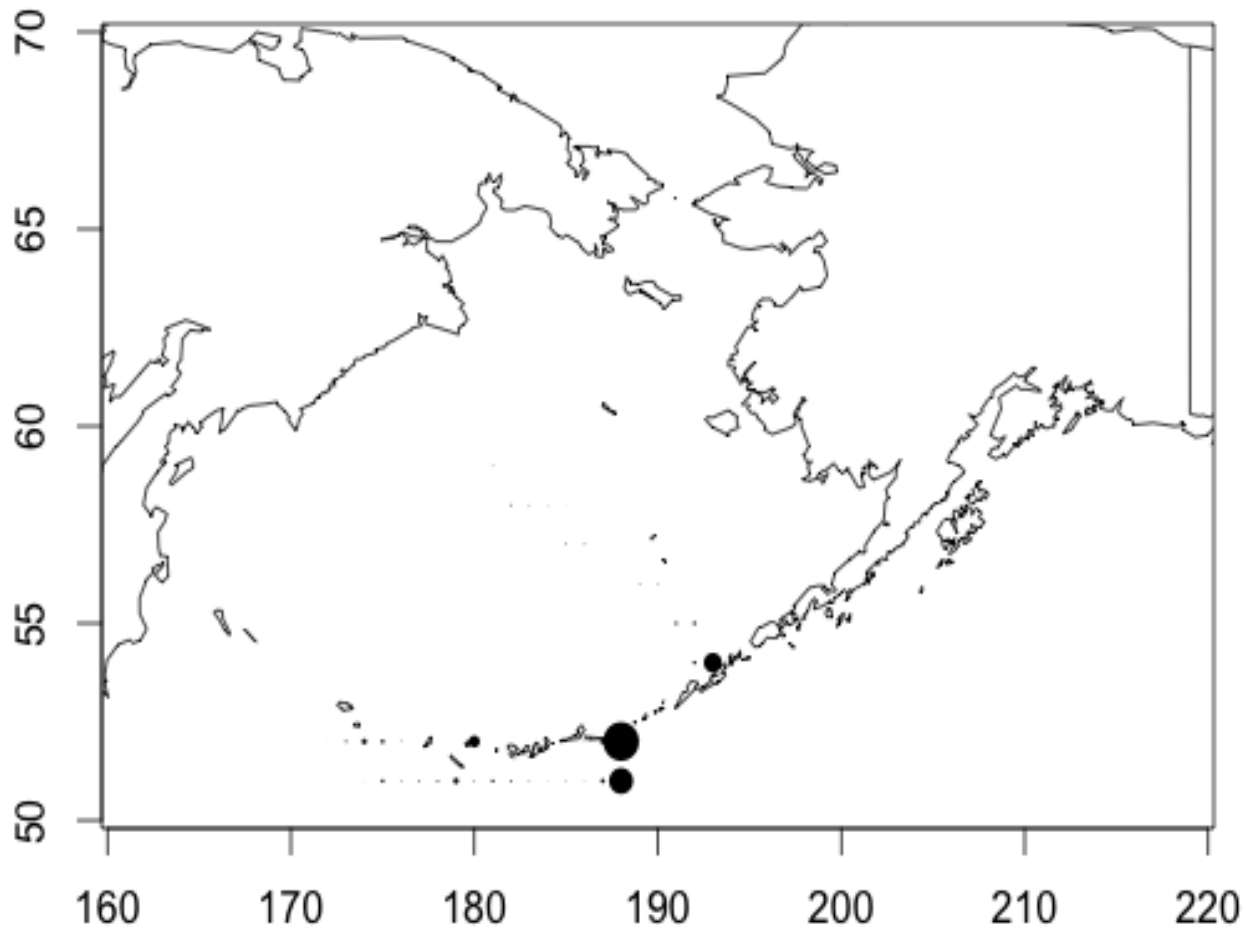
- AI and southern Bering Sea mean biomass 1991-2012:
  - SST: 13,578 t.
  - Dusky: 1,777 t.
- Bering Sea mean biomass 2002-2012:
  - SST: 24,139 t.
  - Dusky: 41 t.



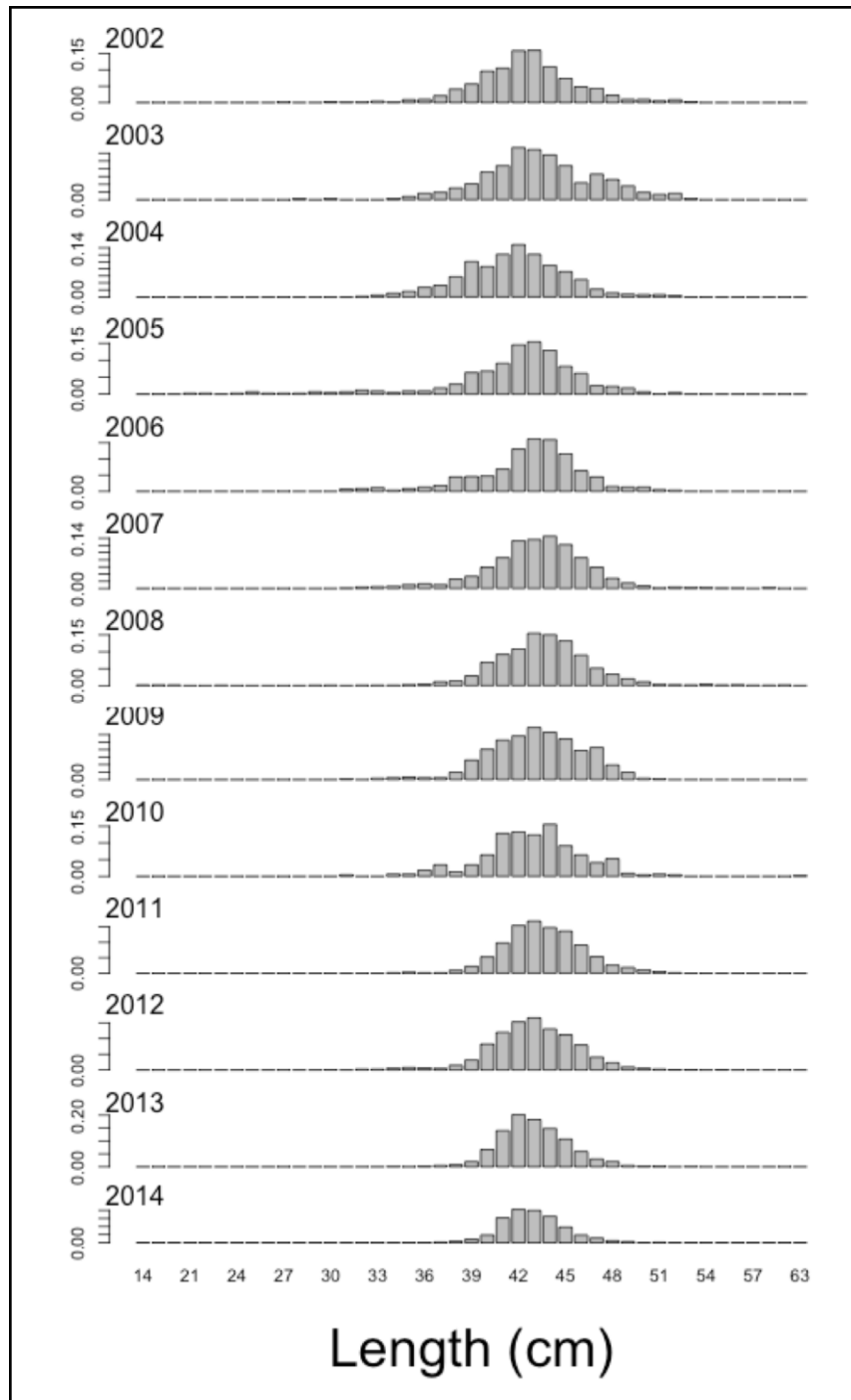
# Other Rockfish catch 2004-2013



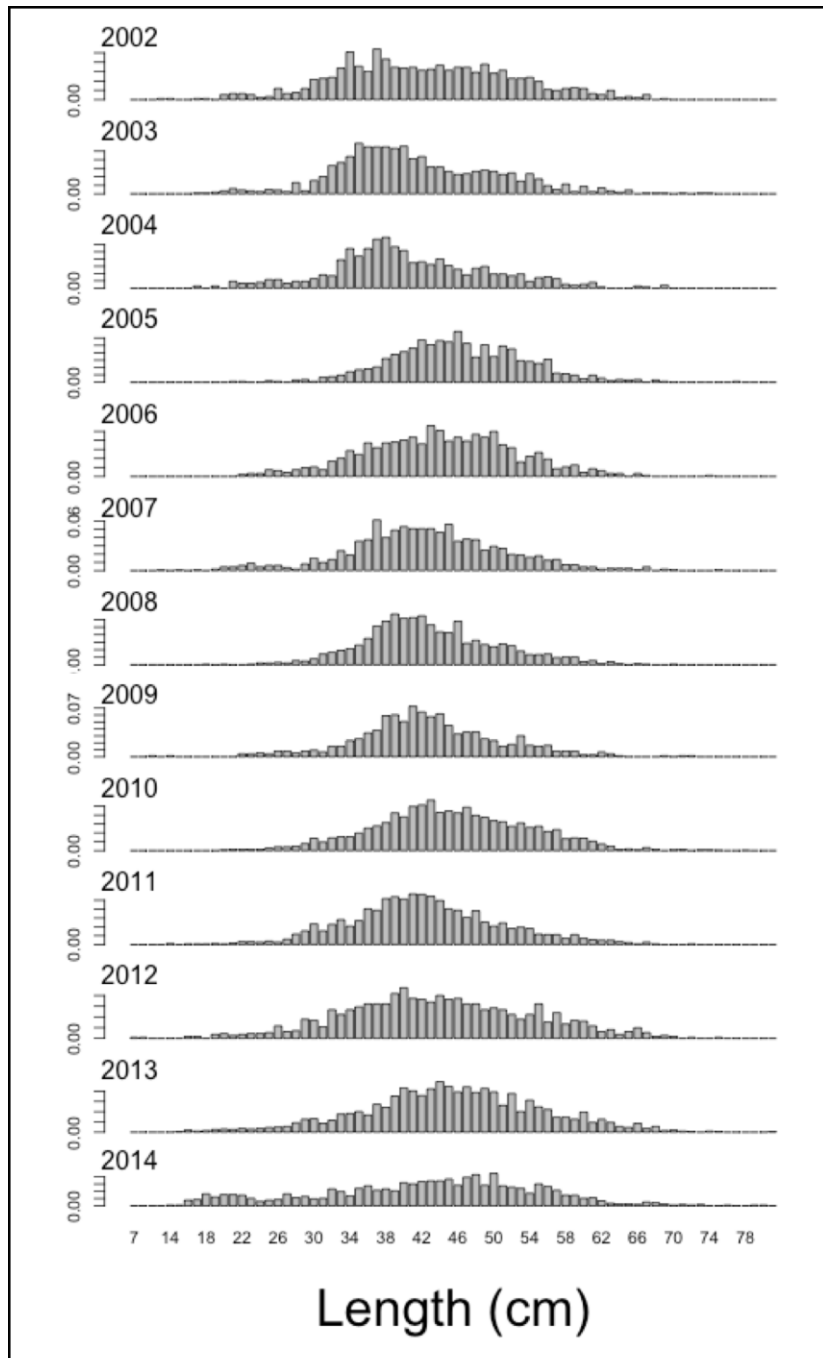
# Relative dusky rockfish catch 2004-2014



Dusky  
rockfish  
length  
frequencies  
(fishery  
observations)



# SST length frequency data (fisheries observations)



# Dusky Catch in Aleutian Islands

Gear	Target	541	542	543	Percentage of total
Bottom Trawl	Atka Mackerel	1804.38	387.78	60.48	0.84
Bottom Trawl	Flatfish	23.97			0.01
Longline	Flatfish		0.48		0.00
Longline	Halibut	0.03	0.31	0.01	0.00
Bottom Trawl	Kamchatka Flounder	7.83			0.00
Longline	Other		0.02	0.15	0.00
Bottom Trawl	Pacific Cod	31.47	5.59	2.96	0.01
Pot	Pacific Cod	0.03	0.41		0.00
Longline	Pacific Cod	46.80	37.16	16.99	0.04
Pelagic Trawl	Pollock	0.06			0.00
Bottom Trawl	Rockfish	165.68	59.65	23.32	0.09
Longline	Sablefish	0.08	0.07		0.00
<b>Sum</b>		<b>2,080.33</b>	<b>491.47</b>	<b>103.91</b>	<b>2,675.71</b>



# EBS shortspine thornyhead catch

Gear	Target	508	509	513	514	517	518	519	521	523	524	530	Percentage
Bottom Trawl	Atka					3.03		21.46					0.01
Bottom Trawl	Flatfish		0.04	2.72	0.06	468.97	6.05	150.13	33.21	0.74	1.18		0.36
	Kamchatka												
Bottom Trawl	Flounder					86.68	1.44	38.71			0.15		0.07
Bottom Trawl	Pacific Cod					32.58		6.26	0.01				0.02
Bottom Trawl	Pollock		0.05			4.67	0.13	5.88	0.60				0.01
Bottom Trawl	Rockfish					121.27	0.83	118.50	35.39	3.72			0.15
Bottom Trawl	Sablefish					2.57		5.71					0.00
Longline	Flatfish					20.88	4.53	1.03	237.13	84.22	3.86		0.19
Longline	Halibut			0.25		7.52	35.17	4.71	6.18	3.81	0.04		0.03
	Kamchatka												
Longline	Flounder									0.03			0.00
Longline	Other								0.52	0.11			0.00
Longline	Pacific Cod					5.88	0.37	1.43	22.46	1.55	0.15		0.02
Longline	Pollock												0.00
Longline	Rockfish					0.55	1.37	1.23	0.45	1.69			0.00
Longline	Sablefish	0.07			0.17	33.10	52.31	17.92	4.19	4.18		0.15	0.06
Pot	Flatfish												0.00
Pot	Sablefish					0.13	1.99	0.95					0.00
Pelagic Trawl	Pollock		0.40	0.19		74.87		35.67	0.20	0.01			0.06
Jig	Halibut												0.00
Trawl	Flatfish					0.23							0.00
Grand Total		0.07	0.48	3.16	0.23	862.95	104.20	409.58	340.35	100.07	5.37	0.15	1827

# EBS dusky catch

Gear	Target	508	509	513	514	516	517	518	519	521	523	524	Percentage
Atka Mackerel	Bottom Trawl								13.12				0.04
Atka Mackerel	Pelagic Trawl						0.01		0.03				0.00
Flatfish	Longline									1.87	0.05		0.01
Flatfish	Bottom Trawl		2.13	1.36		0.03	3.08	0.03	3.66	8.53		0.28	0.05
Halibut	Longline							0.10				0.04	0.00
Kamchatka Flounder	Bottom Trawl								0.04				0.00
Pacific Cod	Longline		0.15	3.32			12.75	0.02	4.28	135.33	0.21	0.01	0.44
Pacific Cod	Jig							0.07	0.04				0.00
Pacific Cod	Bottom Trawl		3.47				4.29		16.55	8.63	0.12	0.07	0.09
Pacific Cod	Pot		0.18				0.34		2.08				0.01
Pacific Cod	Pelagic Trawl						0.21						0.00
Pollock	Bottom Trawl		0.15				0.34		0.10	0.03			0.00
Pollock	Pelagic Trawl		6.94	0.53	0.06	0.03	43.53		15.49	9.75	0.90	0.27	0.22
Rockfish	Longline												0.00
Rockfish	Jig				0.58				0.09				0.00
Rockfish	Bottom Trawl	0.16					36.57	2.54	6.52	0.60	0.46		0.13
Sablefish	Longline							0.04					0.00
Sablefish	Bottom Trawl								0.08				0.00
Sum		0.16	13.02	5.21	0.63	0.06	101.12	2.80	62.07	164.75	1.74	0.66	352.22

# AI SST

Gear	Target	541	542	543	Percentage of total
Bottom Trawl	Atka	4.70	33.71	35.36	0.05
Bottom Trawl	Flatfish	6.22			0.00
Bottom Trawl	Kamchatka Flounder	2.33			0.00
Bottom Trawl	Pacific Cod	0.18		0.41	0.00
Bottom Trawl	Pollock	0.02			0.00
Bottom Trawl	Rockfish	10.79	91.93	313.07	0.27
Longline	Flatfish	10.90	113.37		0.08
Longline	Halibut	34.81	52.67	19.34	0.07
Longline	Other	0.31	1.82		0.00
Longline	Pacific Cod	27.26	12.28	14.70	0.03
Longline	Rockfish	0.60	4.03	7.90	0.01
Longline	Sablefish	335.80	268.80	145.06	0.48
Pot	Pacific Cod		0.01		0.00
Pot	Rockfish	0.02			0.00
Pot	Sablefish	2.08	0.08		0.00
Jig	Pacific Cod	0.02			0.00
Sum		436	579	536	1,551

# Summary

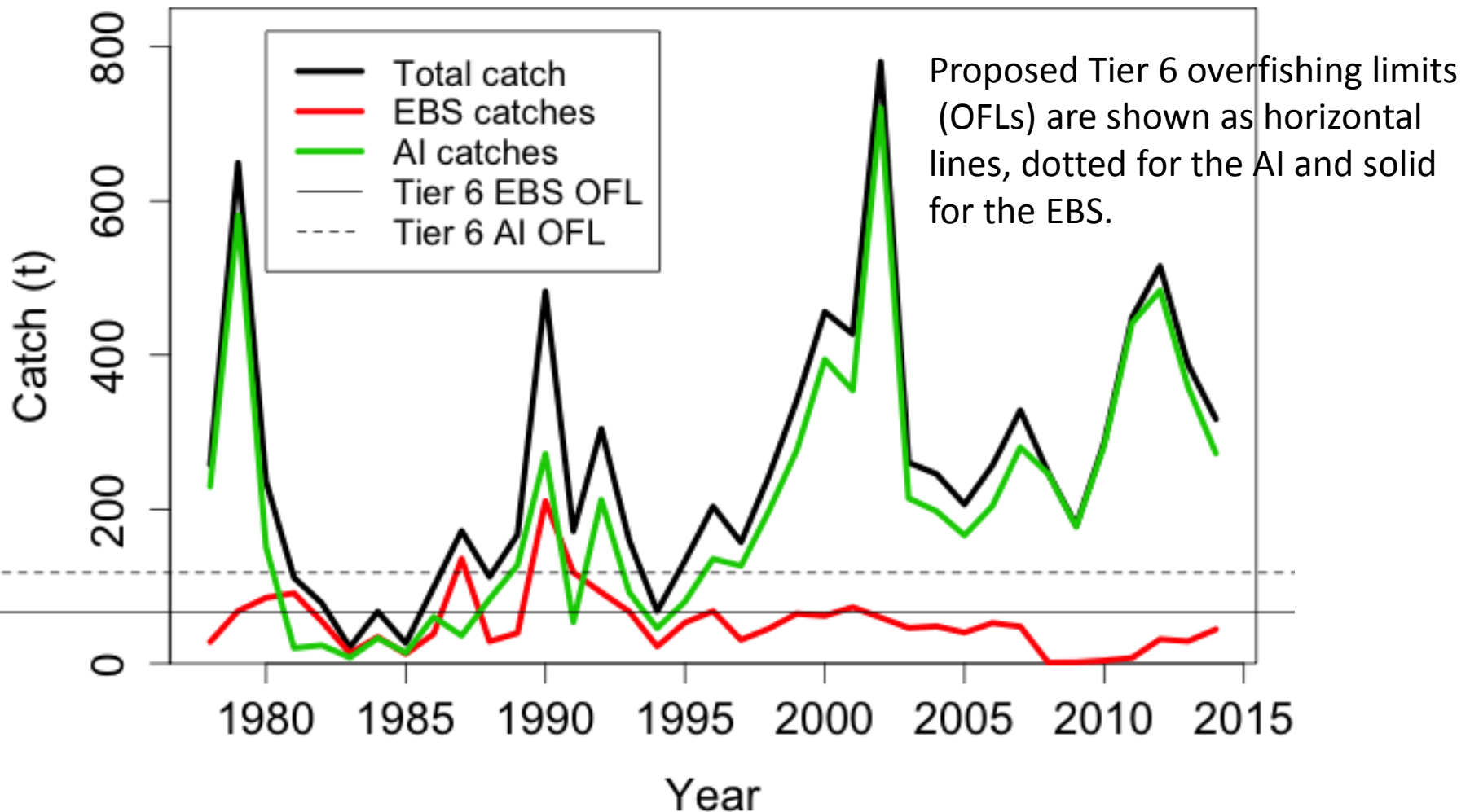
- The 2014 weighted average biomass estimate: 50,050 t,
  - 47,041 t for SST,
  - 3,165 t for non-SST.
- The random effect model estimates 49,630 t (42,528 - 56,731 t, 95% CI),
  - 46,647 t (39,849 - 53,444 t) for SST,
  - 2,983 t (927 - 5,039 t) for non-SST.
- Dusky catch primarily in the southern Bering Sea.

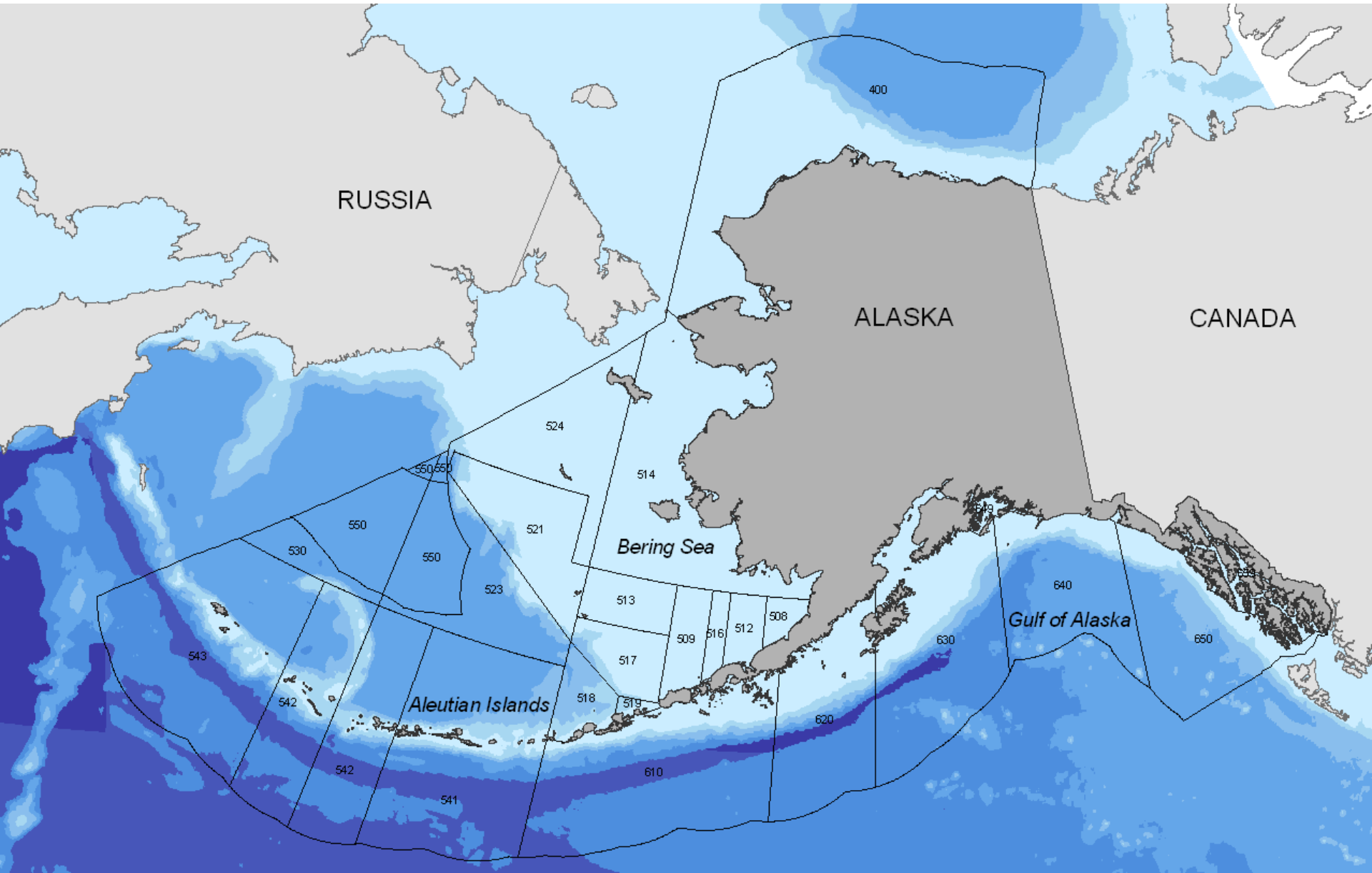
# Consider moving non-SST species to a Tier 6 assessment

- Tier 5: reliable point estimates of B and natural mortality rate M.
- Tier 6: Information available: reliable catch history from 1978-1995.
  - OFL = average catch from 1978-1995, unless an alternative value is suggested by the SSC based on best available scientific information.
  - $ABC \leq 0.75 \times OFL$ .
  - Tier 6 AI OFL: 118 t (ABC 88.5 t), Tier 6 EBS OFL: 66.3 t (49.7 t).

# Catches of non-SST Other rockfish from 1977- Aug. 23, 2014.

## Catch of the non-SST Other Rockfish Complex





# Summary

Area	Species	M	2014 Weighted Survey Average Biomass	2014 Random Effects biomass estimate (95% confidence interval)	ABC	OFL
BSAI	SST	0.03	47,041	46,647 (39,849, 53,444)		1,411
BSAI	Non-SST	0.09	3,165	2,983 (927, 5,039)		285
BSAI	Total Other Rockfish		50,050	49,630 (42,528, 56,731)		1,696
EBS	SST	0.03	30,333	30,321 (25,370, 35,271)	682	
EBS	Non-SST	0.09	289	300 (165, 436)	20	
EBS	Total Other Rockfish		30,466	30,621 (25,668, 35,574)	702	
AI	SST	0.03	16,708	16,326 (11,668, 20,984)	376	
AI	Non-SST	0.09	2,876	2,682 (631, 4,733)	194	
AI	Total Other Rockfish		19,584	19,008 (13,919, 24,098)	570	



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