14: ASSESSMENT OF THE DEMERSAL SHELF ROCKFISH STOCK COMPLEX IN THE SOUTHEAST OUTSIDE SUBDISTRICT OF THE GULF OF ALASKA

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Executive Summary

The results of a preliminary statistical age-structured assessment model (ASA) are not presented this year due to personnel changes. The ASA will be presented in full in 2018 or 2019; updates to the status quo methodology are presented here.

Summary of Changes in Assessment Inputs

The following updates have been made to last year's assessment:

Changes in the input data:
Catch information and the average weight of yelloweye rockfish caught in the commercial fishery were updated for 2017. The average weight of yelloweye rockfish from 2016 to 2017 decreased from 3.93 kg to 3.87 kg in East Yakutat (EYKT), increased from 3.52 kg to 3.57 kg in Central Southeast Outside (CSEO), decreased from 3.76 to 3.71 kg in Northern Southeast Outside (NSEO), and increased in Southern Southeast Outside (SSEO) from 3.31 kg to 4.59 kg.

Changes in the assessment methodology:
There were no changes in the assessment methodology due to personnel changes.

Summary of Results

The yelloweye rockfish biomass estimate increased from 10,347 t to 11,508 t from 2017 to 2018. The increase in abundance is largely driven by an increased density estimate for CSEO – an area closed to directed commercial fishing since 2014 – as well as an increase in mean fish weight in CSEO and SSEO.

Yelloweye rockfish comprise the largest component of the demersal shelf rockfish complex (DSR) and are managed using the Tier 4 harvest rule. The maximum allowable ABC for DSR in 2018 is 319 t (299 t yelloweye + 20 t non-yelloweye). The DSR is particularly vulnerable to overfishing given their longevity, late maturation, and habitat-specific residency. As in previous years, we recommend a harvest rate lower than the maximum allowed under Tier 4; $F=M$=0.02. This results in an author's recommended ABC of 250 t (230 t yelloweye + 20 t non- yelloweye DSR Tier 6) for 2018. The OFL is set using $F_{35\%}$=0.032; which is 394 t for 2018.

State of Alaska regulations at 5 AAC 28.160(c)(1)(A) dictate that subsistence DSR removals be deducted from the ABC prior to allocating the TAC to the commercial (84%) and recreational (16%) fisheries. In the current assessment, 7 t were deducted from the ABC for DSR caught in the subsistence fisheries for a TAC of 243 t; 204 t is allocated to commercial fisheries and 39 t is allocated to recreational fisheries for 2018.

Reference values for DSR are summarized in the following table, with the recommended ABC and OFL values in bold. The stock was not subjected to overfishing last year.

Quantity	As estimated or *specified last* year for: 2017	2018	As estimated or *recommended this* year for: 2018	2019
M (natural mortality rate)	0.02	0.02	0.02	0.02
Tier	4	4	4	4
Yelloweye Biomass (t)	10,347		11,508	
$F_{OFL} = F_{35\%}$	0.032	0.032	0.032	0.032
$maxF_{ABC}$	0.026	0.026	0.026	0.026
F_{ABC}	0.020	0.020	0.020	0.020
DSR OFL (t)	357	357	394	394
DSR max ABC (t)	289	289	319	319
ABC (t)	227	227	250	250
Status	As determined last year for:		As determined this year for:	
	2015	2016	2016	2017
Overfishing	No	n/a	No	n/a

The non-yelloweye DSR ABCs and OFL are calculated using Tier 6 methodology. Non-yelloweye Tier 6 ABCs and OFL are added to Tier 4 yelloweye ABCs and OFL for total DSR values.

Quantity (Tier 6 for other DSR only)	As estimated or *specified last* year and *recommended this* year for: **2017**	**2018**
OFL (t)	**26**	**26**
ABC (t)	**20**	**20**

Area Apportionment

The ABC and OFL for DSR are for the SEO Subdistrict. The State of Alaska manages DSR in the Eastern regulatory area with Council oversight and any further apportionment within the SEO Subdistrict is at the discretion of the State. Updated catch data (t) for DSR in the SEO Subdistrict as of October 24, 2017

(NMFS Alaska Regional Office Catch Accounting System via the Alaska Fisheries Information Network (AKFIN) database, http://www.akfin.org are summarized in the following table.

Summaries for Plan Team

Species	Year	Biomass	OFL	ABC	TAC[1]	Commercial Catch[2]	Recreational Harvest[3]	Total Catch[4]
DSR	2015	10,933	361	225	217	107	48	163
	2016	10,559	364	231	224	117	48	172
	2017	10,347	357	227	220	119	43	172
	2018	12,678	394	250	243			

[1]TAC is for the commercial and recreational fisheries and is calculated after the subsistence estimated harvest is deducted from the ABC.
[2]Assignment of ADF&G groundfish management areas for DSR bycatch landed in the commercial salmon troll fishery began in 2015. Commercial catch is updated through October 24, 2017.
[3]Updated recreational harvest (retained harvest plus estimated discard) for SEO as of October 17, 2017. Harvest in 2017 is a preliminary estimate.
[4]Total catch is from the commercial (incidental and direct), recreational, subsistence, and research fisheries.

Responses to SSC and Plan Team Comments Specific to this Assessment

November 2016 Plan Team

The Team recommends the authors bring forwards updated configurations for the corrected global (status quo) and fixed *M* models for September, 2017.

Due to personnel changes no updates to the ASA have been completed. A completed assessment is anticipated for 2018 or 2019.

The Team also recommends the authors coordinate with Auke Bay Lab to review model code and determine the appropriate application of Tier 3 FMP control rules.

Researchers at Auke Bay Lab have been contacted and have agreed to review ASA model code.

Table 14.1. Catch (t) of demersal shelf rockfish from research, directed commercial, incidental commercial, recreational and subsistence fisheries in the Southeast Outside Subdistrict (SEO), 1992–2017[a], ABC, OFL and TAC for commercial and recreational sectors combined after estimated subsistence harvest is decremented. Commercial catch includes discards at sea and at the dock and catch retained for personal use.

Year	Research	Directed	Incidental[d,f]	Recreational[b]	Subsistence[c]	Total[d]	ABC[e]	OFL	TAC
1992		351	119			478	550		550
1993	13	341	188			534	800		800
1994	4	383	219			604	960		960
1995	13	168	103			271	580		580
1996	11	350	85			436	945		945
1997	16	280	100			380	945		945
1998	2	241	120			361	560		560
1999	2	242	126			367	560		560
2000	8	187	107			295	340		340
2001	7	178	146			324	330		330
2002	2	136	149			285	350	480	350
2003	6	105	169			275	390	540	390
2004	2	173	155			329	450	560	450
2005	4	42	195			237	410	650	410
2006	2	0	203	75		280	410	650	410
2007	3	0	196	60		259	410	650	410
2008	1	42	152	68		263	382	611	382
2009	2	76	139	37		254	362	580	362
2010	7	30	131	52	8	228	295	472	287
2011	5	22	87	36	6	156	300	479	294
2012	4	105	76	46	7	238	293	467	286
2013	4	130	83	34	7	258	303	487	296
2014	5	33	63	40	7	148	274	438	267
2015	4	33	70	48	8	163	225	361	217
2016	4	34	79	48	7	172	231	364	224
2017	3	32	87	43	7	172	227	357	220
2018							250	394	243

[a]Landings from ADF&G Southeast Region fish ticket database and NMFS weekly catch reports through October 24, 2017.

[r]Recreational harvest (retained harvest plus estimated discard) from 2006 to 2008 include EYKT and IBS. These data are not available prior to 2006. Estimate for 2017 is preliminary.

[c]Projected subsistence catch for the fishery year, i.e. 2010 is for the 2010 fishery. These data were not available or deducted from the ABC prior to 2009.

[d]Data are from reported landings. Full retention of DSR went into effect in 2005, and unreported DSR discard associated with the halibut fishery prior to 2005 is not reported in these totals.

[e]No ABC prior to 1988, 1988–1993 ABC for CSEO, NSEO, and SSEO only (not EYKT).

[f]Assignment of ADF&G groundfish management areas for DSR bycatch landed in the commercial salmon troll fishery began in 2015.

Table 14.2. Submersible (1994–1995, 1997, 1999, 2003, 2005, 2007, 2009) and ROV (2012–2013, 2015–2017) yelloweye rockfish density estimates with 95% confidence intervals (CI) and coefficient of variation (CV) by year and management area. The number of transects, yelloweye rockfish (YE), and meters surveyed included in each model are shown, along with the encounter rate of yelloweye rockfish. Values in bold were used for this stock assessment.

Area	Year	# transects	# YE[b]	Meters surveyed	Encounter rate (YE/m)	Density (YE/km^2)	Lower CI (YE/km^2)	Upper CI (YE/km^2)	CV
EYKT[a]	1995	17	330	22,896	0.014	2,711	1,776	4,141	0.20
	1997	20	350	19,240	0.018	2,576	1,459	4,549	0.28
	1999	20	236	25,198	0.009	1,584	1,092	2,298	0.18
	2003	20	335	17,878	0.019	3,825	2,702	5,415	0.17
	2009	37	215	29,890	0.007	1,930	1,389	2,682	0.17
	2015	33	251	22,896	0.008	1,755	1,065	2,891	0.25
	2017	**35**	**134**	**33,960**	**0.004**	**1,072**	**703**	**1,635**	**0.21**
CSEO	1994[c]					1,683			0.10
	1995	24	235	39,368	0.006	2,929			0.19
	1997	32	260	29,273	0.009	1,631	1,224	2,173	0.14
	2003	101	726	91,285	0.008	1,853	1,516	2,264	0.10
	2007	60	301	55,640	0.005	1,050	830	1,327	0.12
	2012	46	118	38,590	0.003	752	586	966	0.13
	2016	**32**	**160**	**30,726**	**0.005**	**1,101**	**833**	**1,454**	**0.14**
NSEO	1994[c]	13	62	17,622	0.004	765	383	1,527	0.33
	2016	**36**	**125**	**34,435**	**0.004**	**701**	**476**	**1,033**	**0.20**
SSEO	1994[c]	13	99	18,991	0.005	1,173			0.29
	1999	41	360	41,333	0.009	2,376	1,615	3,494	0.20
	2005	32	276	28,931	0.010	2,357	1,634	3,401	0.18
	2013	**31**	**118**	**30,439**	**0.004**	**986**	**641**	**1,517**	**0.22**

[a] Estimates for EYKT management area include only the Fairweather grounds, which is composed of a west and an east bank. In 1997, only 2 of 20 transects and in 1999, no transects were performed on the east bank that were used in the model. In other years, transects performed on both the east and west bank were used in the model.

[b] Subadult and adult yelloweye rockfish were included in the analyses to estimate density. A few small subadult yelloweye rockfish were excluded from the 2012 and 2015 models based on size; length data were only available for the ROV surveys (not submersible surveys). Data were truncated at large distances for some models; as a consequence, the number of yelloweye rockfish included in the model does not necessarily equal the total number of yelloweye rockfish observed on the transects.

[c] Only a side-facing camera was used in 1994 and earlier years to video fish. The forward-facing camera was added after 1994, which ensures that fish are observed on the transect line.

Table 14.3. Commercial landings (t) of demersal shelf rockfish by species in Southeast Outside Subdistrict from 2010–2017. Discards (at sea and at dock) and personal use included.

Species	**2010**	**2011**	**2012**	**2013**	**2014**	**2015[a]**	**2016**	**2017[b]**
Canary rockfish	0.87	0.34	2.87	2.88	0.26	0.66	1.13	0.72
China rockfish	0.03	0.02	0.02	0.05	0.02	0.02	0.11	0.05
Copper rockfish	0.01	0.01	0.04	0.03	0.01	0.01	0.15	0.11
Quillback rockfish	4.08	1.68	3.79	3.72	1.83	2.47	3.07	2.7
Rosethorn rockfish	0.00	0.00	0.02	0.04	0.00	0.02	0.17	0.28
Tiger rockfish	0.28	0.11	0.41	0.31	0.26	0.23	0.32	0.21
Yelloweye rockfish	155.7	106.16	173.31	205.74	94.05	99.96	108.65	115.47
Total (t)	160.99	108.32	180.46	212.77	96.43	103.37	113.59	119.49
% yelloweye	96.7%	98.0%	96.0%	96.7%	97.5%	96.7%	95.7%	96.6%

[a]Assignment of ADF&G groundfish management areas for DSR bycatch landed in the commercial salmon troll fishery began in 2015.

[b]Represents preliminary commercial harvest data through October 24, 2017.

Table 14.4. Other FMP groundfish species landed (t) in DSR directed commercial fisheries in the Southeast Outside Subdistrict from 2010–2017. Discards (at sea and at dock) and personal use included.

Species	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Black rockfish	0.14	0.08	0.31	0.85	0.02	0.01	0.06	
Bocaccio rockfish	0.02	0.00	0.03	0.12	0.01		0.00	
Pacific cod	0.88	1.00	2.33	5.10	0.23	0.12	0.01	0.24
Redbanded rockfish	0.03	0.06	1.10	1.71	0.01		0.14	0.01
Dark rockfish								
Dusky rockfish	0.51	0.32	3.84	5.35	2.12	3.23	2.38	2.27
Rougheye rockfish		0.00					0.0	
Shortraker rockfish								
Silvergray rockfish	0.45	0.30	0.66	1.92	0.24	0.07	0.40	0.33
Skate, general			0.18					
Spiny dogfish shark			0.17					
Yellowtail rockfish	0.01	0.04	0.09	0.10	0.00	0.00		
Total	**2.04**	**1.80**	**8.71**	**15.15**	**2.63**	**3.43**	**2.99**	**2.85**

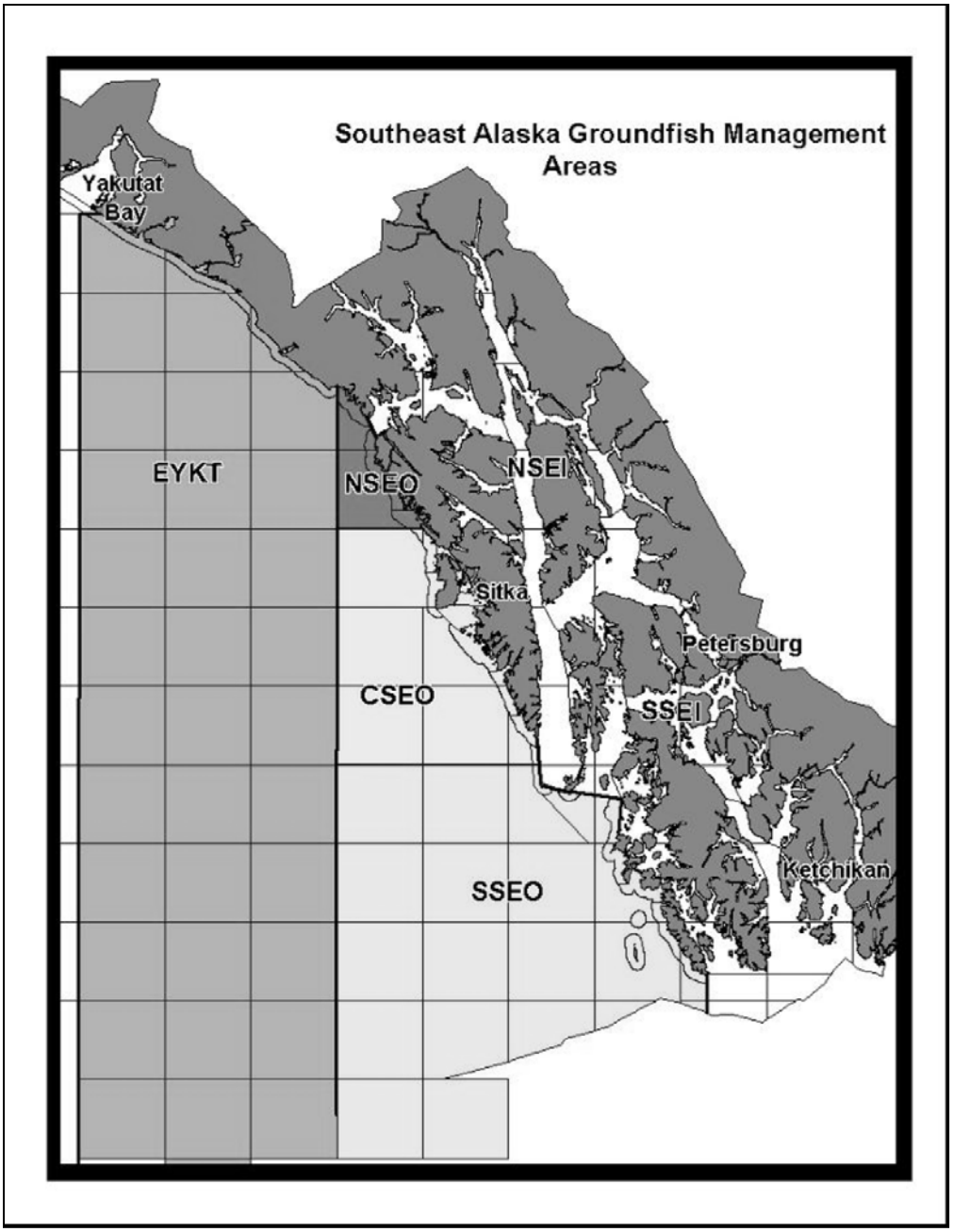

Figure 14.1. The Southeast Outside (SEO) Subdistrict with the Alaska Department of Fish and Game groundfish management areas used for managing the demersal shelf rockfish fishery: East Yakutat (EYKT), Central Southeast Outside (CSEO), Northern Southeast Outside (NSEO), and Southern Southeast Outside (SSEO).

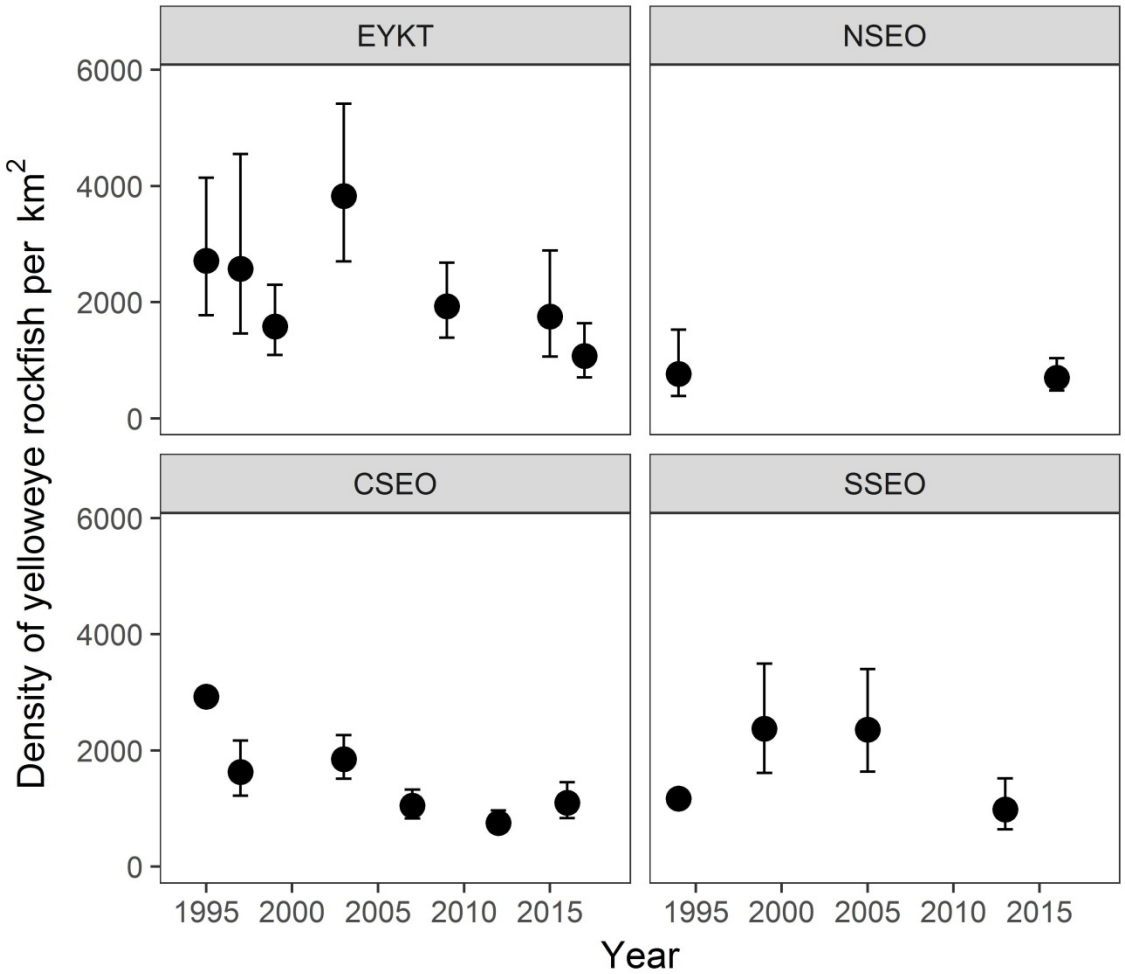

Figure 14.2. Density of yelloweye rockfish predicted by DISTANCE (circles) +/- two standard deviations in each management area (Central Southeast Outside (CSEO), East Yakutat (EYKT), Southern Southeast Outside (SSEO), and Northern Southeast Outside (NSEO)).

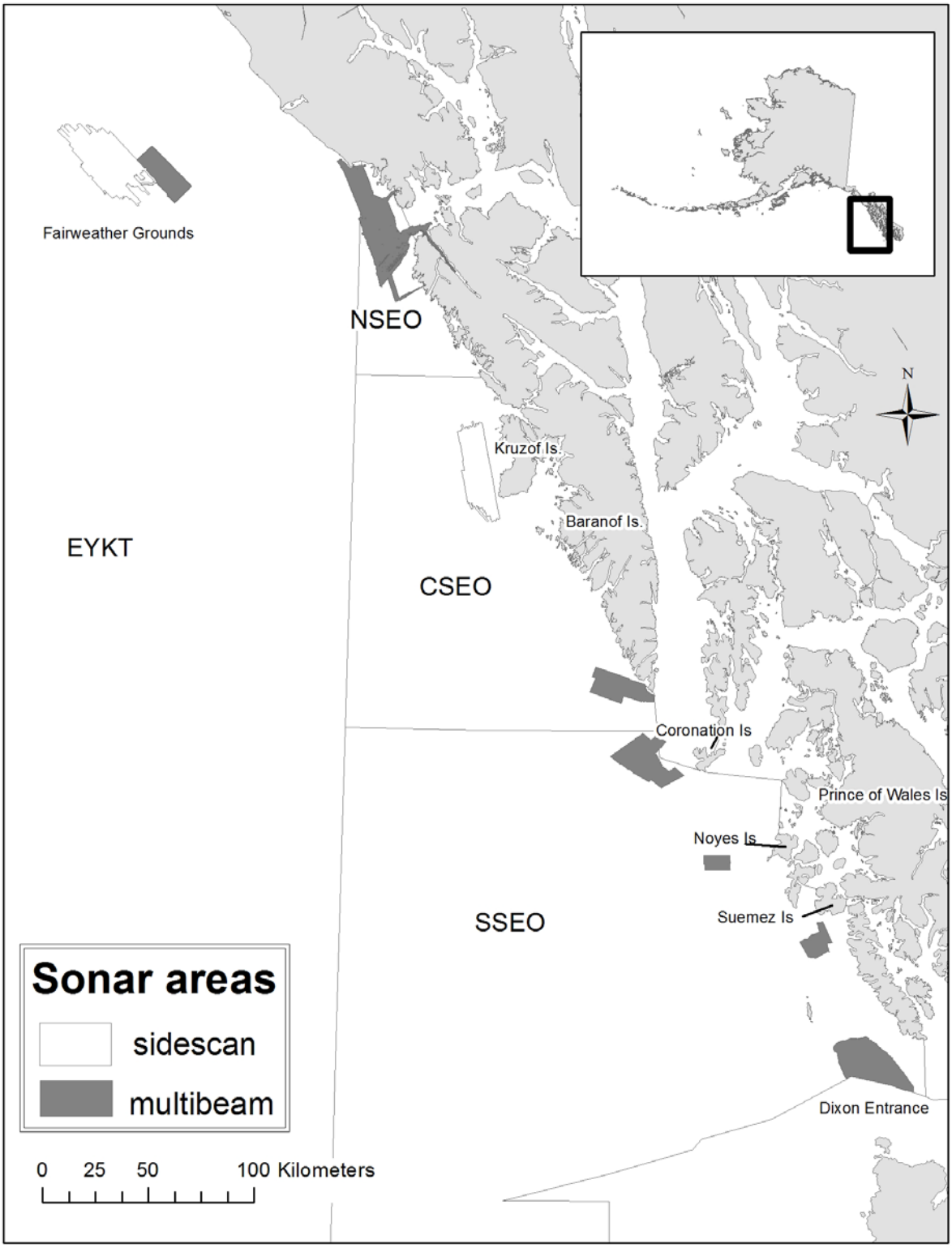

Figure 14.3. Sonar surveys performed in southeast Alaska used to delineate yelloweye rockfish habitat.

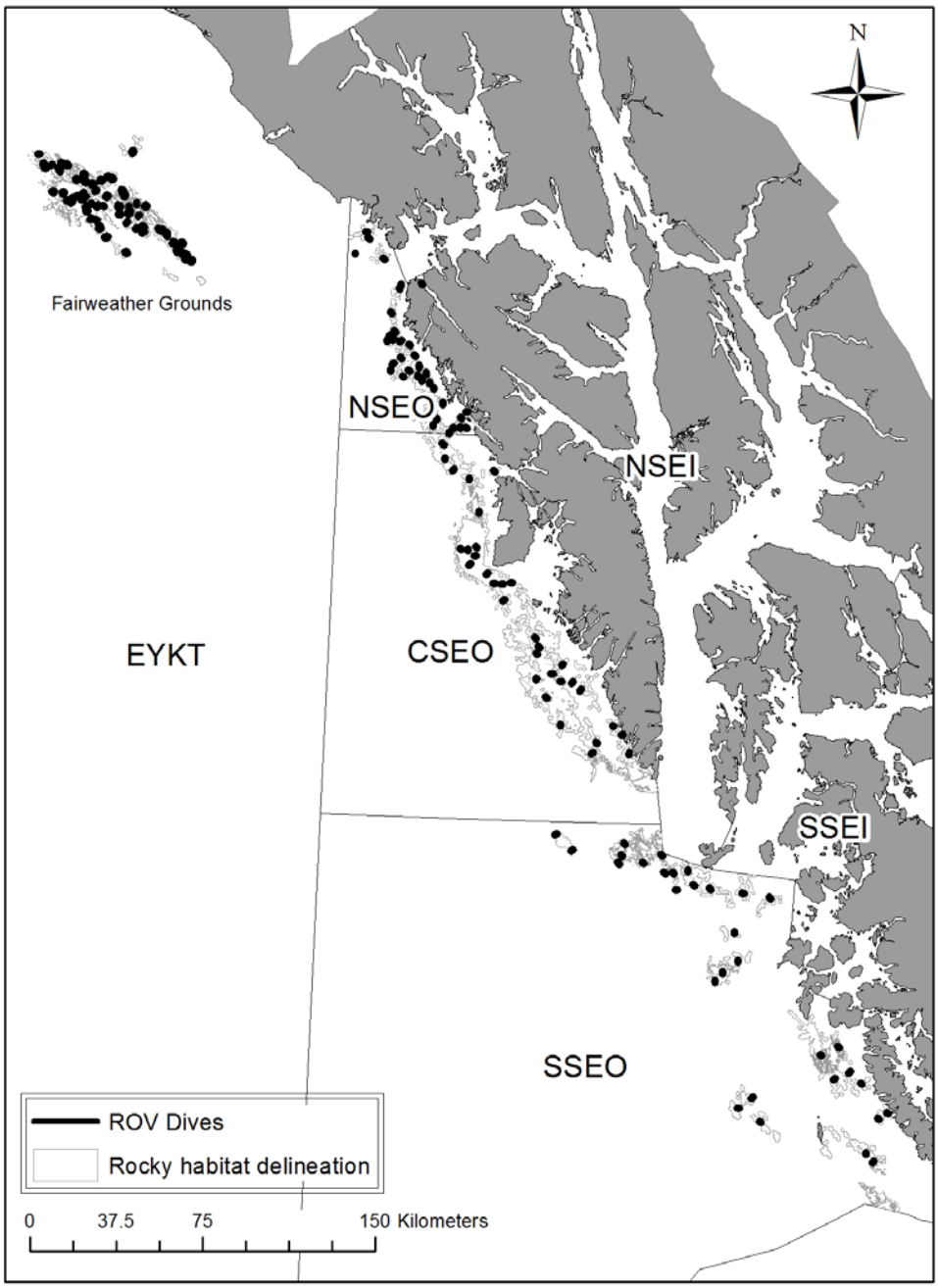

Figure 14.4. ROV transects conducted in Northern Southeast Outside (NSEO) and Central Southeast Outside (CSEO) in 2016, and East Yakutat (EYKT) in 2017. Southern Southeast Outside (SSEO) will be surveyed in 2018.

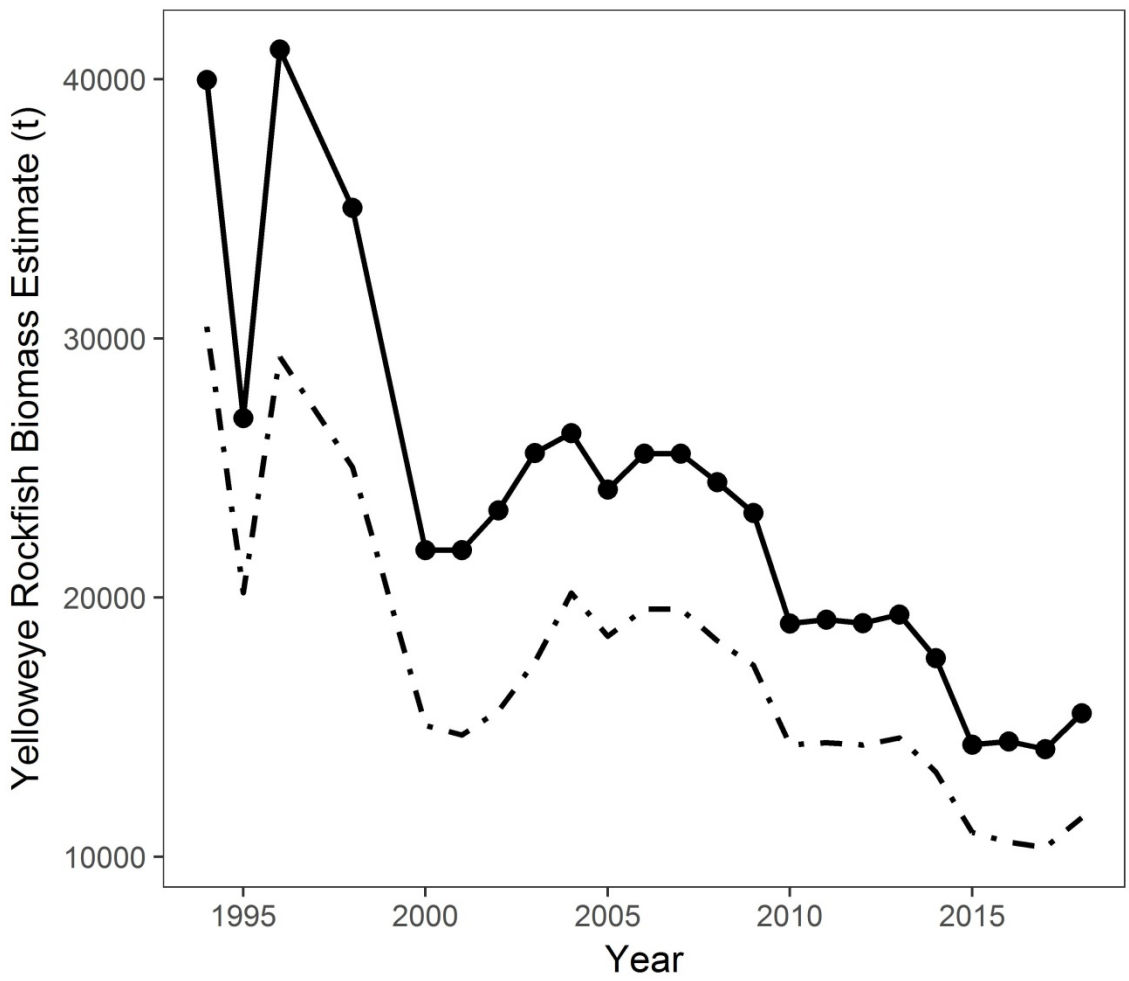

Figure 14.5. 1994–2017 yelloweye rockfish biomass estimate (t) (solid line) and 90% lower confidence interval (dashed line) for the Southeast Outside (SEO) Subdistrict.

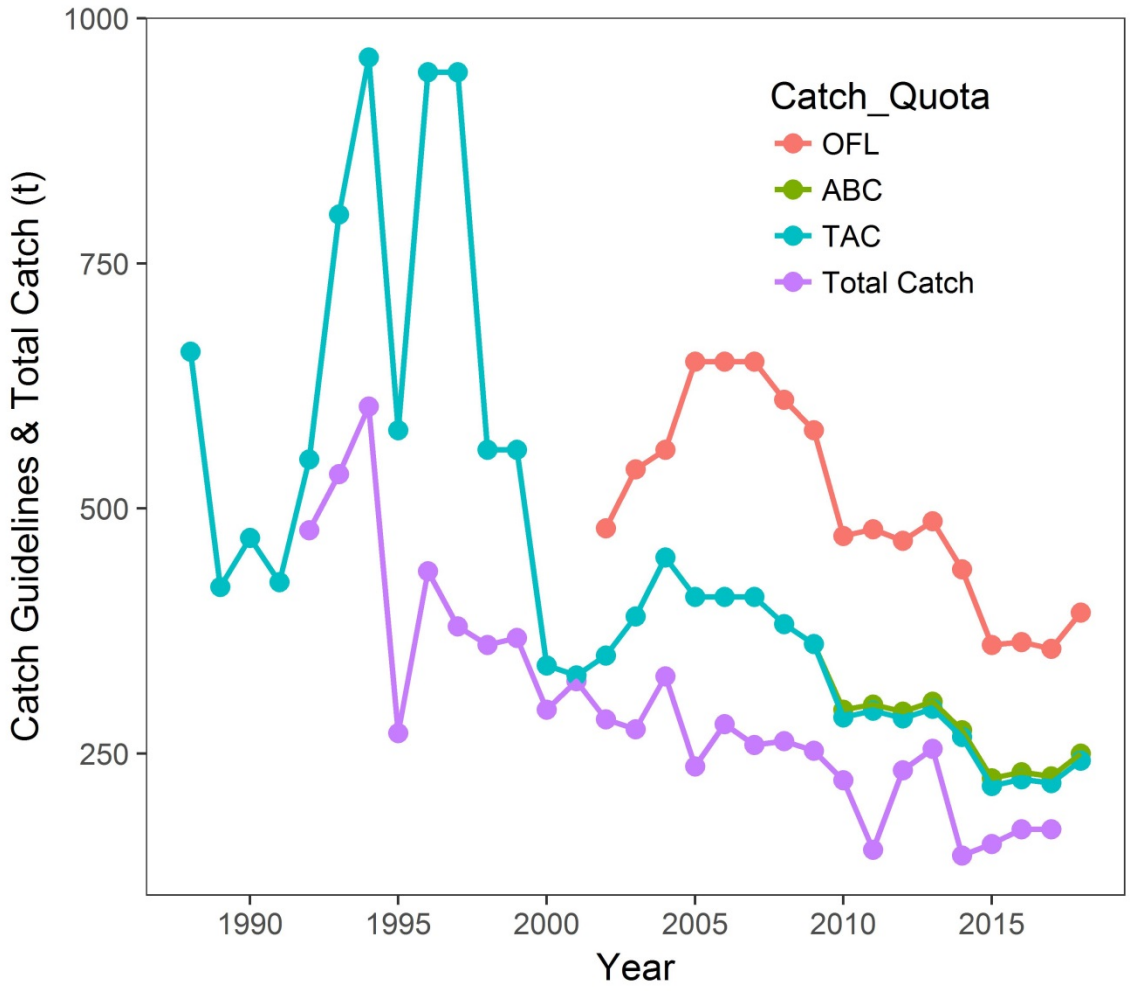

Figure 14.6. 1988–2017 DSR catch guidelines (OFL, ABC, and TAC) and total catch for the Southeast Outside (SEO) Subdistrict.

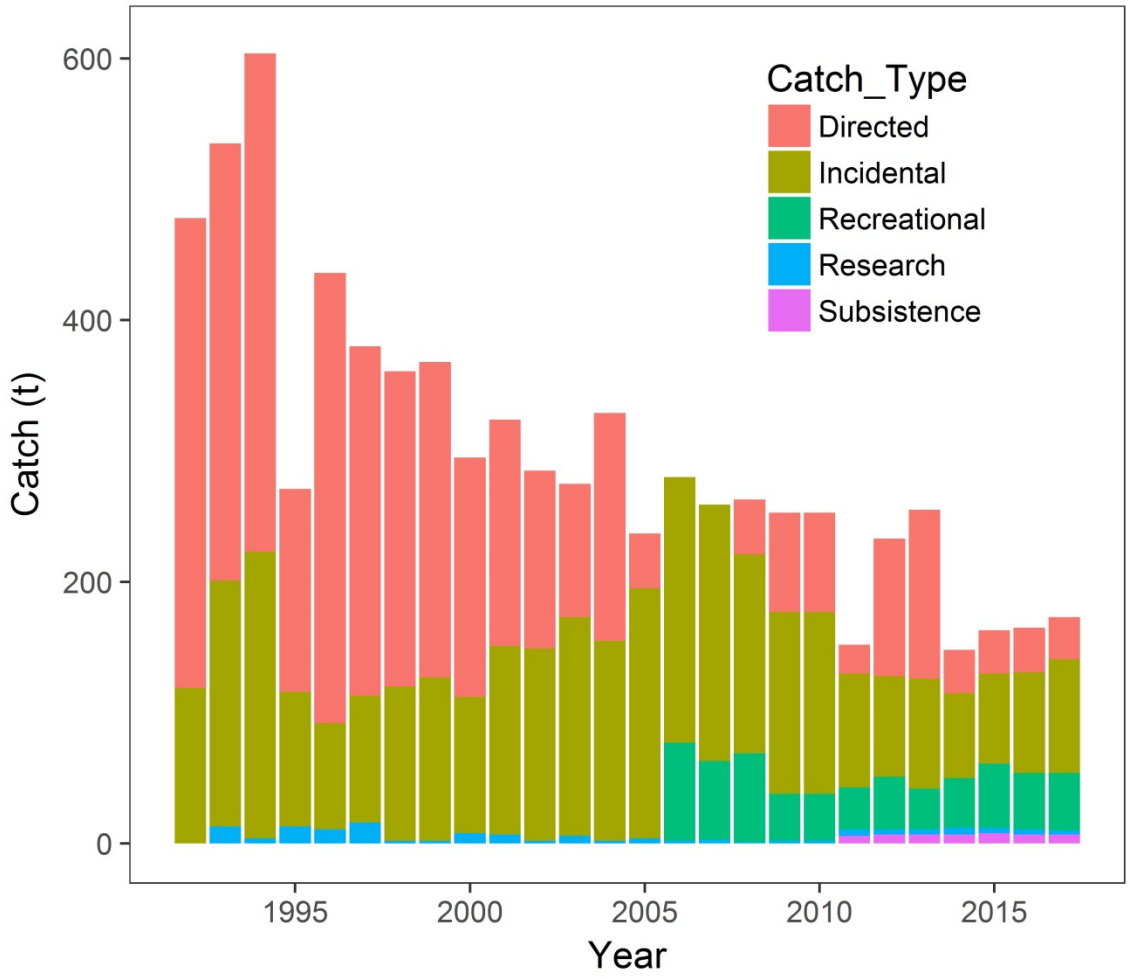

Figure 14.7. 1992–2017 DSR catch (t) by fishery type: commercial (direct and incidental), recreational, research (International Pacific Halibut Commission (IPHC) longline survey), and subsistence.

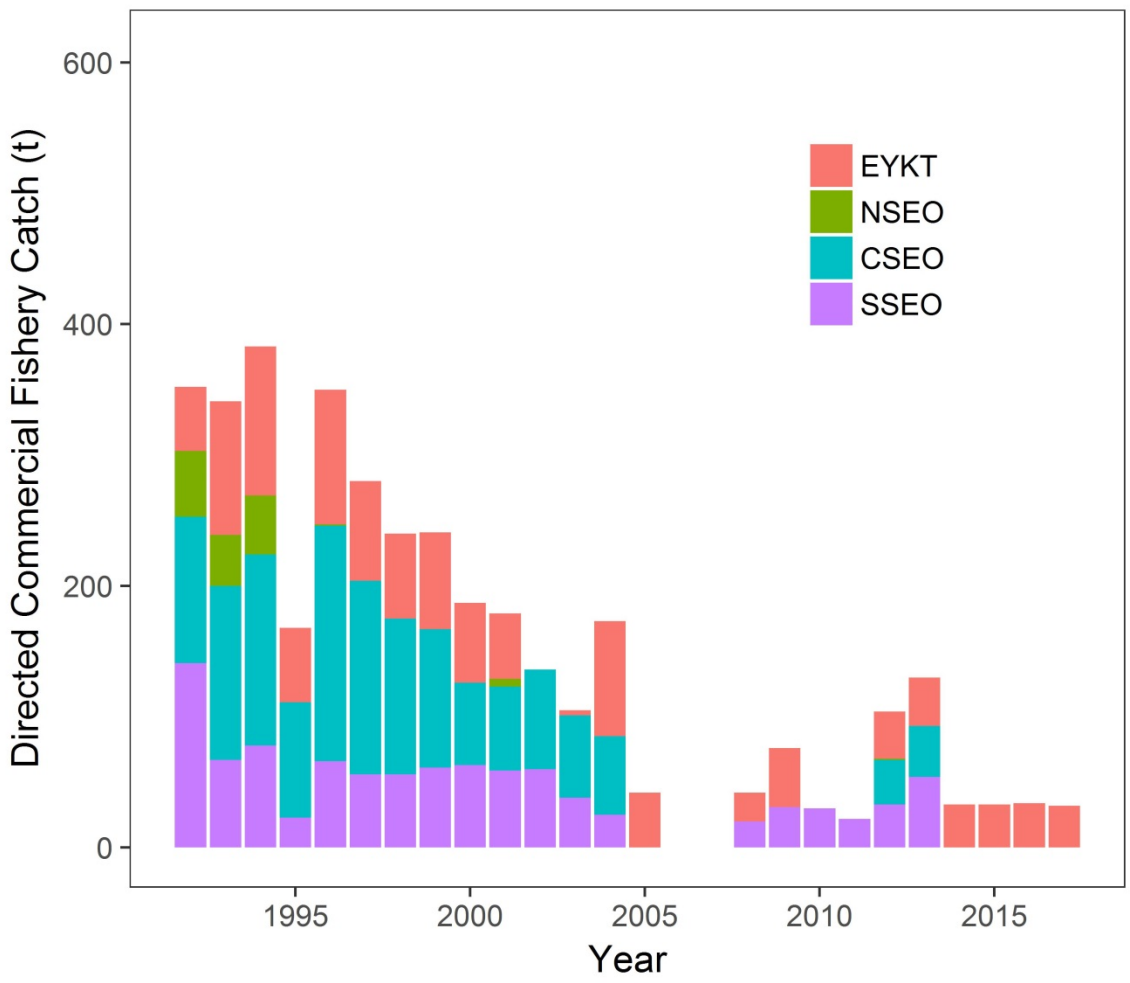

Figure 14.8. 1992–2017 directed commercial fishery catch (t) of DSR in the Southeast Outside (SEO) Subdistrict groundfish management areas: East Yakutat (EYKT), Northern Southeast Outside (NSEO), Central Southeast Outside (CSEO), and Southern Southeast Outside (SEO).

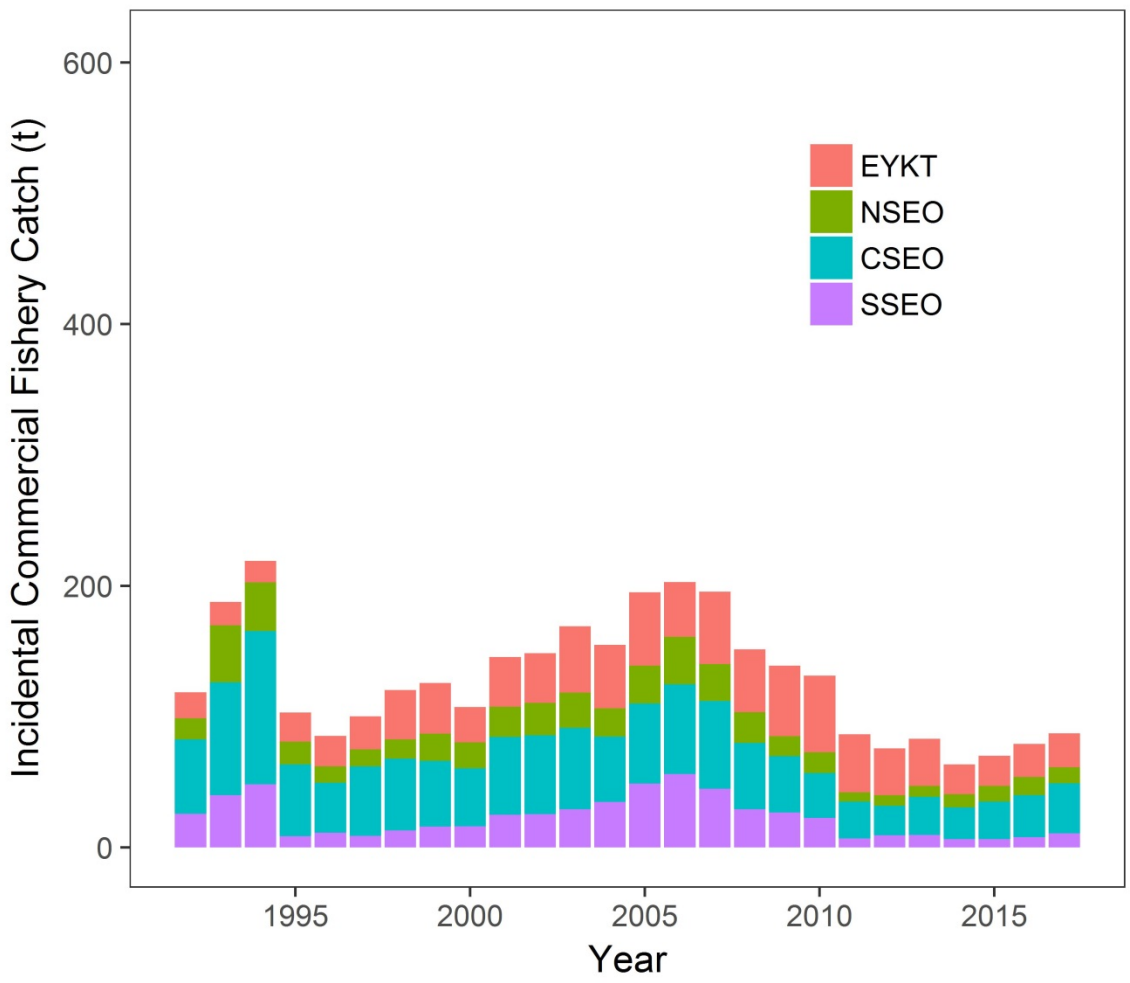

Figure 14.9. 1992–2017 incidental commercial fishery catch (t) of DSR in the for halibut, sablefish, lingcod, Pacific cod, and salmon fisheries for Southeast Outside (SEO) Subdistrict groundfish management areas: East Yakutat (EYKT), Northern Southeast Outside (NSEO), Central Southeast Outside (CSEO), and Southern Southeast Outside (SEO).