Chapter 16

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

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Executive Summary

Summary of Changes in Assessment Inputs

Changes in the input data

1) Catch and fishery lengths updated through October 12, 2012.
2) Biomass estimates from the 2012 AI trawl survey, the 2012 EBS slope survey, as well as CPUE and lengths from the 2012 AI trawl survey, are presented in the assessment.

Changes in the assessment methodology

1) There were no changes in the assessment methodology.

Summary of Results

The harvest recommendations for the Other Rockfish assessment are obtained by applying an exploitation rate to the estimated biomass. The exploitation rate is based on the estimated natural mortality, which differs between shortspine thornyhead (SST) and the remaining stocks in the Other Rockfish complex. For the 2013 fishery, we recommend the maximum allowable ABC of 1031 t for the Other Rockfish complex. Reference values for SST and the remaining stocks in the Other Rockfish complex are summarized in the following table, with the recommended ABC and OFL values in bold. The stock was not being subjected to overfishing last year.

Quantity/Status	As estimated or *specified last* year for: 2012	2013	As estimated or *recommended this* year for: 2013	2014
M (natural mortality)	0.03	0.03	0.03	0.03
Specified/recommended Tier	5	5	5	5
Biomass	44,939	44,939	45,820	45,820
F_{OFL} (F=M)	0.03	0.03	0.03	0.03
$maxF_{ABC}$ (maximum allowable = 0.75x F_{OFL})	0.0225	0.0225	0.0225	0.0225
F_{ABC}	0.0225	0.0225	0.0225	0.0225
OFL (t)	1,348	1,348	**1,375**	1,375
AI ABC (t)	402	402	**367**	367
EBS ABC (t)	609	609	**664**	664
Status	As determined *last* year for:		As determined *this* year for:	
	2010	2011	2011	2012
Overfishing	No	n/a	No	n/a
(for Tier 5 stocks, data are not available to determine whether the stock is in an overfished condition)				

The summary for the non-SST portion of the complex is as follows:

Quantity/Status	As estimated or *specified last* year for: 2012	2013	As estimated or *recommended this* year for: 2013	2014
M (natural mortality)	0.09	0.09	0.09	0.09
Specified/recommended Tier	5	5	5	5
Biomass	3,951	3,951	1,885	1,885
F_{OFL} (F=M)	0.09	0.09	0.09	0.09
$maxF_{ABC}$ (maximum allowable = 0.75x F_{OFL})	0.0675	0.0675	0.0675	0.0675
F_{ABC}	0.0675	0.0675	0.0675	0.0675
OFL (t)	356	356	**170**	170
AI ABC (t)	164	164	**106**	106
EBS ABC (t)	102	102	**22**	22
Status	As determined *last* year for:		As determined *this* year for:	
	2010	2011	2011	2012
Overfishing	No	n/a	No	n/a
(for Tier 5 stocks, data are not available to determine whether the stock is in an overfished condition)				

The total estimated biomass and recommended ABC and OFL for the Other Rockfish complex is as follows:

Quantity/Status	As estimated or *specified last* year for: 2012	2013	As estimated or *recommended this* year for: 2013	2014
M (natural mortality) Specified/recommended				
Tier	5	5	5	5
Biomass	48,890	48,890	47,705	47,705
F_{OFL} (F=M)				
$maxF_{ABC}$ (maximum allowable = 0.75x F_{OFL})				
F_{ABC}				
OFL (t)	1704	1704	**1545**	1545
AI ABC (t)	566	566	**473**	473
EBS ABC (t)	712	712	**686**	686
Status	As determined *last* year for:		As determined *this* year for:	
	2010	2011	2011	2012
Overfishing	No	n/a	No	n/a
(for Tier 5 stocks, data are not available to determine whether the stock is in an overfished condition)				

***Summaries for Plan Team**:*

The following table gives the recent biomass estimates, catch, and harvest specifications, and projected biomass, OFL and ABC for 2013-2014.

Species	Year	Biomass[1]	OFL	ABC	TAC	Catch[2]
Other rockfish	2010	39,215	1,380	1,040	1,040	670
	2011	48,890	1,700	1,280	1,070	903
	2012	47,705	1,545	1,159	1,070	729[1]
	2013	47,705	1,545	1,159		
	2014	47,705	1,545	1,159		

[1]Total biomass from trawl survey estimates.

[2] Current as of October 15, 2012. Source: NMFS Alaska Regional Office Catch Accounting System via the Alaska Fisheries Information Network (AKFIN) database (http://www.akfin.org).

Responses to the comments of the Scientific and Statistical Committee

At the 2010 SSC meeting, the author presented a revised area apportionment using a weighting of 4:6:9 of the last three surveys, similar to area apportionment for other BSAI rockfish species. The SSC agreed with the approach that was recommended by the Authors' and Plan Team. It was thought to be an appropriate compromise between smoothing variability and emphasizing the most recent information. There were no requests from the December 2010 or December 2011 SSC meetings pertaining to BSAI Other Rockfish.

Introduction

The Bering Sea/Aleutian Islands (BSAI) Other Rockfish complex includes all species of *Sebastes* and *Sebastolobus*, other than Pacific ocean perch (POP, *Sebastes alutus*), northern rockfish (*Sebatses. polyspinis)* rougheye rockfish (*S. aleutianus*), and shortraker rockfish (*S. borealis*). Current definitions of the complex do not specifically exclude blackspotted rockfish (S. *melanostictus)*, a recently recognized species (Orr and Hawkins 2008) that had historically been identified as rougheye rockfish in research surveys. However, blackspotted is currently not distinguished from rougheye rockfish in the fishery catches, and is thus currently managed under the BSAI blackspotted/rougheye complex.

Because the Other Rockfish complex is defined by what it excludes (i.e., POP, northern rockfish, rougheye rockfish, and shortraker rockfish) rather than by what it includes, an analysis was conducted in the 2001 Other Rockfish SAFE report to distinguish species expected to occur in the BSAI from rarely observed and potentially misidentified species (Reuter and Spencer 2001, http://www.afsc.noaa.gov/REFM/docs/2010/BSAIshortraker.pdf). The criteria used for the analysis was occurrence in at least one haul of the BSAI surveys and/or occurrence in at least 1% of observed fishery hauls. Using data from 1999-2001, 7 species (shortspine thornyhead; *Sebastolobus alascanus*, dusky rockfish; *Sebastes variabilis*, redbanded rockfish; *Sebastes babcocki*, redstriped rockfish; *Sebastes proriger*, yelloweye rockfish; *Sebastes ruberrimus*, harlequin rockfish; *Sebastes variegatus*, and sharpchin rockfish; *Sebastes zacentrus*) were identified as meeting these criteria (Table 1). Dark rockfish also met the criteria, but have since been removed from the Other Rockfish complex and is now managed by the State of Alaska.

The two most abundant species for Other Rockfish complex are dusky rockfish and shortspine thornyheads (SST). Shortspine thornyhead are a very long-lived fish with estimates of natural mortality ranging between 0.01 and 0.05. In the Aleutian Islands (AI) and eastern Bering Sea (EBS) slope, shortspine thornyheads occur between 200 m and 500 m (Reuter and Spencer 2001). In contrast, dusky rockfish are typically captured between 125-200 m in the AI, and are rarely encountered on the EBS slope in either survey or fishery catches.

In 2001, separate TACs were established for EBS and AI management areas, but the overfishing level pertained to the entire BSAI area. In 2005, the BSAI Other Rockfish complex was moved to a biennial assessment schedule to coincide with the frequency of trawl surveys in the AI and the EBS slope. These surveys occur in even years, and for these years a full assessment of the Other Rockfish complex in the BSAI area will be conducted. The other rockfish assessment is conducted with Tier 5 methods, and an exploitation rate is then applied to estimated current biomass to obtain the ABC and OFL.

Fishery

There is no directed fishery specifically for the seven species of “Other Rockfish;” however, between 1992 and 2012, approximately 12% of the “Other Rockfish” was caught in the directed rockfish fishery. The highest proportion (73%) has been caught in the Atka mackerel fishery Other less significant fisheries (under 6%) are, in order of significance: Pacific cod, sablefish, flatfish, and pollock. Since 1992 they have been primarily caught by trawl (92%) and hook and line (8%).

Foreign catch records did not identify the various Other Rockfish by species, but reported catches in categories such as "other species" (1977-1979), and "other rockfish" (1980-1990), with the definitions of these groups changing between years. In the domestic fishery, the NOAA Fisheries

Alaska Regional Office "Blend" catch database often reported the catches of Other Rockfish species in a single "other rockfish" category, although species-specific catch records have been available with the Catch Accounting System (CAS) database beginning in 2003. Reported ABCs, TACs, and catches of Other Rockfish from 1988-2012 are shown in Table 2. From 1991-2002, species catches were reconstructed by computing the harvest proportions within management groups from the North Pacific Foreign Observer Program database, and applying these proportions to the estimated total catch obtained from the NOAA Fisheries Alaska Regional Office "Blend" database. An identical procedure was used to reconstruct the estimates of catch by species from the 1977-1989 foreign and joint venture fisheries. Estimated domestic catches in 1990 were obtained from Guttormsen et al. 1992. Catches from the domestic fishery prior to the domestic observer program were obtained from PACFIN records. Catches of Other Rockfish since 1977 by area are shown in Table 3. Some relatively high catches occurred in the late 1970s – early 1980s; since 2001, catches have not exceeded 450 t in either the EBS or AI subareas. Both Tables 2 and 3 report only the catches of seven species identified above.

The catches of Other Rockfish are composed primarily of dusky rockfish and shortspine thornyhead; from 2004 -2012, these two species composed 82% of the catch identified to species in the AI and in the 93% in the EBS (Tables 4 and 5). In the AI, the catches of dusky rockfish and SST total 1,966 t and 1,237 t, respectively, from 2004-2012. However, the proportion of SST in the EBS Other Rockfish catch was higher, as the catches of SST and dusky rockfish totaled 1,540 t and 282 t, respectively.

The catch of dusky rockfish and SST in various target fisheries and gear types from 2004-2012 are shown in Tables 6-9. In the EBS, dusky rockfish are primarily caught in the Pacific cod longline fishery, and trawl fisheries for Pollock, Pacific cod, rockfish, Atka mackerel and flathead sole (Table 6). Shortspine thornyhead catches in the EBS are obtained in the longline sablefish, turbot, and Pacific halibut fisheries, and trawl fisheries for arrowtooth flounder, pollock, rockfish, Pacific cod, flathead sole, and "other flatfish" fisheries (Table 7). Both species are caught primarily in NMFS reporting areas 517, 519, and 521 along the EBS slope.

In the AI, dusky rockfish are caught primarily in the Atka mackerel trawl fishery, which accounted for 85% of the catch from 2004-2012 (Table 9). Catches of SST in the AI were obtained primarily in longline fisheries for sablefish, halibut, turbot, arrowtooth flounder, and Pacific cod, and trawl fisheries for rockfish and Atka mackerel (Table 9). Both species were caught primarily in the eastern and central AI, as the proportion of the AI catch in the western AI was 8% for dusky rockfish and 22% for SST.

A summary of the Other Rockfish catch retained and discarded from 2004-2012 are shown in Table 10. From 2004-2012 the percent of Other Rockfish discarded has ranged between 10% (2012) and 50% (2004) in the AI, and between 13% (2011) and 37% (2008) in the EBS. Low discard rates are observed for SST, particularly if they are caught using fixed-gear which yields a higher quality product than trawl gear (Hiatt et al. 2002).

Data

Fishery

In addition to the catch information discussed above, length samples have been collected for both SST and dusky rockfish since 2002. The fishery length frequencies for each species since 2002 show little change, with the bulk of the dusky rockfish being between approximately 28 and 48

cm (Figure 1), and the bulk of the SST lengths being between 30 and 60 cm (Figure 2). One exception, however, occurred in 2005 when the length frequencies for SST were slightly higher than in all other years.

Survey

Several bottom trawl surveys provide biomass estimates for the EBS and AI regions. The 1979-85 cooperative U.S.-Japan trawl surveys in the EBS were conducted both on the continental shelf and slope, and cooperative surveys were also conducted in the AI from 1980-1986. U.S domestic trawl surveys were conducted in 1988, 1991, 2002, 2004, and 2008 on the EBS slope, and in 1991, 1994, 1997, 2000, 2002, 2004, 2006, 2010 and 2012 in the AI (Table 8). The 2008 AI survey was canceled due to lack of funding. The 2002 EBS slope survey represents the initiation of a new survey time series distinct from the previous surveys in 1988 and 1991. The EBS slope survey samples depths from 200 to ~1200 m, whereas the AI survey samples depths to 500 m. Thus, survey biomass estimates of deep-water species such as shortspine thornyhead are likely underestimated in the AI survey. The cooperative U.S. – Japan AI trawl survey were conducted with different vessels, survey gear, and sampling design relative to the U.S. domestic trawls surveys that began in 1991.

From 1994-2006, the biomass estimates for Other Rockfish increased in both the AI and southern Bering Sea (SBS, the area from 165° W to 170° W) portions of the area covered by the AI trawl survey (Table 11). However, the 2010 and 2012 survey biomass estimate in the AI and SBS areas both decreased. The 2010 estimates decreased by 22% and 31%, respectively, from the 2006 estimates and the 2012 estimates decreased by 21% and 50% from those in 2010. Examination of species-specific survey biomass estimates reveals that the decrease between 2010 and 2012 is due to decreased estimates of shortspine thornyhead. Dusky rockfish estimates in the AI also decreased by 57% between 2010 and 2012 but actually increased in the S. Bering Sea. It should be noted that the CVs for both areas are fairly high, 0.32 and 0.57 respectively. Between 1997 and 2012, the dusky rockfish biomass estimate in the AI area has fluctuated between 236 t (2012) and 5,957 t (2006), although the large 2006 estimates was driven by a small number of very large tows, leading to a large coefficient of variation (CV) of 0.89 (Table 12). The biomass estimate of SST in the AI area increased from 6,153 t in 1991 to 18,075 t in 2010, but was estimated at 14,443 t in 2012 (Table 13). The estimates of SST for the SBS area between 1991 and 2012 have been lower and more variable, ranging between 187 t to 1,545 t with CVs between 0.41 and 0.73.

For dusky rockfish, the spatial distribution of biomass in the AI surveys show concentrations near Amchitka Island and the Delarof Islands (Figure 3). The spatial distribution of SST shows high densities primarily west of the Petral Bank (Figure 4).

The Other Rockfish species captured in the EBS slope survey from 2002-2012 were SST, dusky rockfish, and redbanded rockfish, although the estimated biomass for redbanded rockfish did not exceed 7 t for any year. The total for these three species increased from 16,975 t in 2002 to 29,619 t in 2012, and in each survey year SST contributed more than 99% of estimated survey biomass of Other Rockfish (Tables 11, 13).

The lengths of dusky rockfish obtained in the 1997-2012 AI surveys (dusky was not identified by species prior to 1997) were generally between 35 and 45 cm, corresponding closely to the length distribution in the BSAI fishery (Figure 1). The lengths of SST obtained in the 1991-2012 AI surveys were generally between 15 cm and 50 cm. Length frequencies were generally consistent between years, although there were a large proportion of 20-25 cm fish in 1994 and a large

proportion of 35-40 cm fish in 1991 (Figure 6). Relative to the fishery length composition, the AI survey length composition has a higher percentage of SST between 10 and 20 cm, and a lower percentage greater than 50 cm. Assuming that larger SST in the AI inhabit deeper water, this difference is likely related to the 500 m depth limit of the AI survey.

Very little age information exists for species in the Other Rockfish complex. The only available age data for dusky rockfish are from the 2002 AI survey (n = 108). Growth analysis of these data using a von Bertalanffy growth equation result in an L_{inf} of 41.6 cm, k=0.32 and a t_o=2.5 (Reuter and Spencer 2003). These results show that dusky rockfish in the AI grow to a smaller maximum length than dusky rockfish in the GOA (Clausen and Heifetz 2001). No age data exists for SST because an ageing technique has yet to be satisfactorily determined.

Analytical Approach

Parameter Estimates

Other rockfish are currently assessed with the Tier 5 method, which requires estimates of natural mortality (M) and population size. 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. The EBS estimated biomass was obtained from summing the weighted average from the EBS slope survey with the weighted average from the SBS portion of the AI survey, whereas the biomass from only the AI portions of the AI surveys were used for the AI biomass estimate.

Estimates of natural mortality of SST have been variable due to the difficulty of ageing this species. In the GOA shortspine thornyhead assessment, Gaichas and Ianelli (2003) presented natural mortality estimates from several studies. Studies have calculated natural mortality differently due to the age of their oldest sample. Miller (1985) estimated natural mortality to be 0.07 from a sample of SST in Southeast Alaska whose oldest age was 62 years old. A study using west coast SST estimated a natural mortality between 0.05-0.07 with the oldest age in the sample being 80 (Kline 1996). Pearson and Gunderson (2003) suggest that SST from Alaska have an M = 0.013, based on a study using the gonadosomatic index to estimate natural mortality. A natural mortality rate that low suggests that these fish reach maximum ages from 250-350 years, which would be very old even among rockfish species. One source of variability in these estimates is the variation in otolith age reading techniques. Miller (1985) used surface ageing and the break and burn technique, and found that precision and comparability was low. Kline (1996) used a thin section technique that had better inter-reader ageing agreement, and radiometric verification supported this technique. Subsequent radiometric work by Kastelle et al. (2000) corroborated Kline's results. Thus, Kline's methodology and results are presumed to be the most accurate given the uncertainty of ageing SST.

Work is currently being done at the Alaska Fisheries Science Center to determine the best ageing technique to use for SST (personal communication Betty Goetz, Age and Growth group, REFM, AFSC). Historically, the value of M of 0.07 has been used to assess the other rockfish stock, which represents an approximation based on knowledge of rockfish life histories from other areas. This value is based on the estimate for SST from Ianelli and Ito (1994), as this species comprises well over 90% of the other rockfish biomass (as calculated by survey data). In the 2003 GOA SST assessment a value of M of 0.038 was used, which was obtained as an alternate value given in Pearson and Gunderson (2003). Because this value has been reviewed by the Plan Team and SSC, we recommend that a value of 0.03 be used for the SST portion of the BSAI Other Rockfish biomass in order to maintain consistency with GOA SST.

The majority of the non-SST Other Rockfish biomass is composed of dusky rockfish. The parameter estimate for natural mortality for dusky rockfish in the GOA is 0.09, and thus is currently the best estimate of *M* (Clausen and Heifetz 2001) For the 2012 assessment, we recommend using *M* of 0.09 for the remaining group of Other rockfish.

Results

Harvest Recommendations

Other rockfish are currently managed under Tier 5, which requires a reliable estimate of stock biomass and natural mortality rate. For Tier 5 stocks, F_{ofl} and F_{abc} are defined as *M* and 0.75*M*, respectively. The acceptable biological catch (ABC) is obtained by multiplying F_{abc} by the estimated biomass. In recent years, BSAI other rockfish have been managed with a BSAI-wide OFL level and separate ABCs for the AI and EBS subareas. After calculating the average survey biomass as described above, the OFLs and area-specific ABCs are:

Area	Species	M	2013 Biomass	F_{abc}	ABC	F_{ofl}	OFL
BSAI	SST	0.03	45,820			0.03	1,375
BSAI	Non-SST	0.09	1,885			0.09	170
BSAI	Total Other Rockfish		47,705				1,545
EBS	SST	0.03	29,507	0.0225	664		
EBS	Non-SST	0.09	319	0.0675	22		
EBS	Total Other Rockfish		29,827		686		
AI	SST	0.03	16,313	0.0225	367		
AI	Non-SST	0.09	1,566	0.0675	106		
AI	Total Other Rockfish		17,879		473		

Ecosystem Considerations

Ecosystem Effects on Stock
Little to no information is available to determine the diet of Other Rockfish species, important predators, or their trends over time.

Fishery Effects on the Ecosystem
The Other Rockfish complex is not a targeted fishery, therefore reference on the effects of the fishery on the ecosystem will be described in the SAFE chapters of the fisheries in which Other Rockfish is taken as bycatch.

Data gaps and research priorities

Validating aging techniques of shortspine thornyheads, and obtaining ages from archived samples, remains research priorities and are required for age-structured population modeling. Little is known regarding most aspects of the biology of the species in the Other Rockfish complex, including the reproductive biology and distribution, duration, and habitat requirements of various life-history stages. Given the relatively unusual reproductive biology of rockfish and

its importance in establishing management reference points, data on reproductive capacity should be collected on a periodic basis.

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Table 1. The percentage catch of "other rockfish" in AFSC research bottom trawl surveys (where at least one fish was observed) and in observed fisheries hauls (where fish were observed in >1% of hauls) from 1991-2001. Cases were no fish were observed are denoted with "~".

		EBS		**AI**	
Common name	Scientific name	**Survey**	**Fishery**	**Survey**	**Fishery**
Redbanded rockfish	*Sebastes babcocki*	~	~	1%	<1%
Dusky rockfish	*Sebastes variabilis*	18%	39%	22%	45%
Redstriped rockfish	*Sebastes proriger*	~	1%	~	1%
Yelloweye rockfish	*Sebastes ruberrimus*	~	1%	<1%	1%
Harlequin rockfish	*Sebastes variegatus*	~	1%	9%	5%
Sharpchin rockfish	*Sebastes zacentrus*	~	<1%	<1%	<1%
Shortspine thornyhead	*Sebastolobus alascanus*	62%	43%	61%	34%

Table 2. Total allowable catch (TAC), acceptable biological catch (ABC), and catch of seven Other Rockfish species (SST, dusky, redbanded, redstriped, yelloweye, harlequin, and sharpchin rockfish) from 1988 to 2012 in the Aleutian Islands (AI) and Eastern Bering Sea (BS). Source: NMFS Alaska Regional Office Catch Accounting System.

Year	Area	ABC (t)	TAC (t)	Catch (t)
1988	BS	400	340	254
	AI	1,100	935	237
1989	BS	400	340	180
	AI	1,100	935	352
1990	BS	500	425	395
	AI	1,100	935	822
1991	BS	500	340	239
	AI	1,100	786	313
1992	BS	400	400	201
	AI	925	925	470
1993	BS	400	400	142
	AI	925	925	443
1994	BS	365	365	123
	AI	770	770	272
1995	BS	365	329	257
	AI	770	693	223
1996	BS	497	497	164
	AI	952	857	272
1997	BS	373	373	114
	AI	714	714	274
1998	BS	369	369	155
	AI	685	685	327
1999	BS	369	369	145
	AI	685	685	372
2000	BS	369	369	239
	AI	685	685	558
2001	BS	361	361	295
	AI	676	676	524
2002	BS	361	361	370
	AI	676	676	502
2003	BS	960	960	316
	AI	634	634	408
2004	BS	960	460	318
	AI	634	634	337
2005	BS	810	460	178
	AI	590	590	286
2006	BS	810	460	157
	AI	590	590	425
2007	BS	414	414	219
	AI	585	585	433
2008	BS	414	414	217
	AI	585	585	390
2009	BS	485	485	187
	AI	555	555	308
2010	BS	485	485	232
	AI	555	555	438
2011	BS	485	485	305
	AI	555	555	598
2012	BS	710	500	136
	AI	570	500	593

Table 3. Catch (t) of seven Other Rockfish species (SST, dusky, redbanded, redstriped, yelloweye, harlequin, and sharpchin rockfish) from 1977 to 2012 in foreign, joint venture (JV), and domestic fisheries.

	Eastern Bering Sea				Aleutian Islands				BSAI
Year	Foreign	JV	Domestic	Total	Foreign	JV	Domestic	Total	Total
1977	52	0		52	537	0		537	589
1978	304	0		304	795	0		795	1,099
1979	281	0		281	2,053	0		2,053	2,334
1980	566	1		567	484	0		484	1,051
1981	337	0		337	236	0		236	574
1982	365	0		365	2,057	0		2,057	2,422
1983	208	1		210	717	4		721	931
1984	112	7		119	57	25		81	200
1985	35	1		36	1	14		15	51
1986	4	14	81	99	0	10	147	157	256
1987	3	4	535	542	0	5	138	143	684
1988	0	3	252	254	0	68	168	237	491
1989	0	9	171	180	0	0	352	352	533
1990			395	395			822	822	1,217
1991			239	239			313	313	552
1992			201	201			470	470	671
1993			142	142			443	443	584
1994			123	123			272	272	395
1995			257	257			223	223	479
1996			164	164			272	272	437
1997			114	114			274	274	388
1998			155	155			327	327	482
1999			145	145			372	372	517
2000			239	239			558	558	797
2001			295	295			524	524	819
2002			370	370			502	502	872
2003			316	316			408	408	724
2004			314	314			333	333	647
2005			166	166			286	286	452
2006			157	157			424	424	581
2007			219	219			430	430	648
2008			207	207			384	384	591
2009			187	187			308	308	495
2010			232	232			438	438	670
2011			305	305			598	598	903
2012*			136	136			593	593	729

* Data prior to 1990 are on file at the Alaska Fisheries Science Center, 7600 Sand Point Way N.E., Seattle, WA 98115. Data from 1991 through October 24, 2012 is from the NMFS Alaska Regional Office Catch Accounting System.

Table 4. Catch (t) of Other Rockfish species in the Aleutian Islands from 2004-2012. Species total less than 1 ton of catch from 2004-2012 are not shown. Source: NMFS AKRO BLEND/Catch Accounting System, accessed October 24, 2012.

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012*	Sum
dusky rockfish	129.45	134.16	161.43	231.28	179.82	141.97	224.75	380.41	382.97	1966.24
SST	97.38	113.18	156.92	128.96	114.96	142.48	165.87	156.87	160.19	1236.80
other rockfish (unid.)	47.05	14.05	71.39	20.84	43.03	63.00	53.42	12.05	11.27	336.10
harlequin rockfish	36.87	14.35	25.22	39.93	34.33	22.76	42.60	59.26	45.67	320.99
sharpchin rockfish	14.05	0.01	2.00	0.00	0.01	0.00	0.08	0.21	0.00	16.35
yelloweye rockfish	0.90	5.57	0.38	0.57	4.48	0.22	0.54	0.26	0.15	13.06
redbanded rockfish	0.17	0.17	0.13	1.42	0.93	0.39	3.61	0.40	3.64	10.85
redstriped rockfish	3.15	0.00	1.72	0.53	0.65	0.05	0.93	0.30	0.11	7.43
black rockfish	1.35	0.00	0.15	0.09	3.18	1.24	0.37	0.12	0.25	6.74
silvergray rockfish	0.00	0.00	0.00	3.01	0.02	0.00	0.00	0.12	0.00	3.14
darkblotched rockfish	0.21	0.00	0.75	0.00	0.06	0.01	0.00	0.00	0.00	1.03
Total catch (t)	330.58	281.48	420.08	426.63	381.46	372.12	492.17	609.97	604.24	3918.74

*2012 catches through Oct 24, 2012

Table 5. Catch (t) of Other Rockfish species in the eastern Bering Sea from 2004-2012. Species total less than 1 ton of catch from 2004-2012 are not shown. Source: NMFS AKRO BLEND/Catch Accounting System.

Species	2004	2005	2006	2007	2008
SST	241.93	118.83	93.19	167.73	181.76
dusky rockfish	31.86	36.22	46.60	44.95	15.40
unidentified other rockfish	14.89	1.47	6.94	1.77	8.73
redbanded rockfish	10.44	0.31	0.40	0.05	0.04
black rockfish	0.86	7.20	0.18	0.29	2.23
yelloweye rockfish	1.42	0.74	1.41	1.72	1.04
harlequin rockfish	0.37	0.19	0.04	0.03	0.03
Grand Total	301.77	164.95	148.74	216.54	209.22

Species	2009	2010	2011	2012*	Sum
SST	175.50	196.52	253.95	110.70	1,540.10
dusky rockfish	10.27	32.31	43.71	20.06	281.38
unidentified other rockfish	2.52	23.43	10.80	17.60	88.13
redbanded rockfish	0.22	0.48	0.42	2.42	14.77
black rockfish	0.18	0.03	0.46	1.27	12.69
yelloweye rockfish	1.07	1.39	1.38	2.53	12.69
harlequin rockfish	0.07	1.22	5.17	0.01	7.12
Grand Total	189.83	255.37	315.87	154.59	1,956.88

*2012 catches through Oct 24, 2012.

Table 6. Total catch (t) of EBS dusky rockfish from 2004-2012 by target fishery and gear type. Areas 508-524 refer to NMFS areas within the BSAI. Source: NMFS AKRO BLEND/Catch Accounting System, accessed October 15, 2012.

Gear	Target	508	509	513	514	516	517	518	519	521	523	524	Grand Total
Bottom Trawl	Arrowtooth Flounder						1.12	0.32	2.84				4.28
Bottom Trawl	Atka Mackerel								13.30				13.30
Pelagic Trawl	Atka Mackerel						0.11		0.34				0.45
Bottom Trawl	Flathead Sole			0.29			0.67			8.17		0.28	9.41
Longline	Greenland Turbot									1.79	0.52		2.31
Bottom Trawl	Kamchatka Flounder								0.36				0.36
Longline	Pacific Cod		0.11	3.33			8.52	0.15	4.22	94.77	0.15		111.25
Jig	Pacific Cod							0.66	0.32				0.98
Bottom Trawl	Pacific Cod		3.17				4.97		16.55	8.63	0.12	0.70	34.14
Pot	Pacific Cod		0.17				0.40		0.30	0.10			0.97
Pelagic Trawl	Pacific Cod						0.21						0.21
Bottom Trawl	Other Flatfish						0.39		0.68				1.06
Bottom Trawl	Pollock		0.15				0.36			0.30			0.81
Pelagic Trawl	Pollock		5.94	0.40	0.10	0.90	31.14		14.80	8.71	0.87	0.26	63.12
Jig	Rockfish				0.58				0.86				1.44
Bottom Trawl	Rockfish	0.16					33.30	2.54	5.28	0.56	0.32		42.16
Longline	Sablefish							0.43					0.43
Bottom Trawl	Sablefish								0.79				0.79
Longline	Halibut							0.14				0.37	0.51
Bottom Trawl	Rock Sole		0.96	0.17		0.32	0.39						1.84
Bottom Trawl	Yellowfin Sole		0.42	0.78			0.21			0.33			1.73
Sum		0.16	10.93	4.96	0.68	1.22	81.79	4.24	60.64	123.36	1.97	1.61	291.56

Table 7. Total catch (t) of EBS shortspine thornyhead from 2004-2012 by target fishery and gear type. Areas 508-524 refer to NMFS areas within the BSAI. Source: NMFS AKRO BLEND/Catch Accounting System.

Gear	Target	508	509	513	514	517	518	519	521	523	524	530	Sum
Longline	Arrowtooth					1.46	0.62	0.23	0.26	5.36			7.93
Bottom Trawl	Arrowtooth					196.29	5.25	87.36	0.38	0.14	0.71		290.13
Bottom Trawl	Atka Mackerel					3.69		15.17					18.86
Bottom Trawl	Flathead Sole			3.38		66.23		0.14	0.32				70.07
Longline	Greenland Turbot					2.30	4.27	0.72	162.63	67.61	1.39		238.92
Bottom Trawl	Greenland Turbot					24.21	0.52	2.84					27.57
Pot	Greenland Turbot								0.2				0.2
Longline	Pacific Cod					2.49	0.44	0.35	12.29	0.15			15.72
Bottom Trawl	Pacific Cod					38.74		6.68	0.1				45.52
Longline	Other Flatfish					0.121							0.121
Bottom Trawl	Other Flatfish					39.00		1.56					40.56
Bottom Trawl	Pollock					0.828		6.18	0.11				7.118
Pelagic Trawl	Pollock		0.57	0.27		80.95		39.32	0.21	0.18			121.5
Longline	Rockfish					0.139	1.75	1.47	0.46	0.63			4.449
Bottom Trawl	Rockfish					72.65	0.24	48.44	17.56	3.71			142.6
Longline	Sablefish	0.81			0.2	22.15	32.47	9.11	3.69	1.77		0.15	70.35
Bottom Trawl	Sablefish					0.8		5.46					6.26
Pot	Sablefish					0.11	1.49	0.73					2.33
Longline	Halibut					4.17	22.84	3.59	2.47	1.23	0.31		34.61
Jig	Halibut						0.5						0.5
Bottom Trawl	Rock Sole				0.61	6.86		0.54					8.01
Bottom Trawl	Yellowfin Sole		0.7			0.27							0.97
Grand Total		0.81	1.27	3.65	0.81	563.45	70.38	229.88	200.67	80.78	2.41	0.15	1154.3

Table 8. Total catch (t) of AI dusky rockfish from 2004-2012 by target fishery and gear type. Areas 541, 542, and 543 refer to NMFS areas within the AI. Source: NMFS AKRO BLEND/Catch Accounting System, accessed October 15, 2012.

Gear	Target	541	542	543	Sum
Longline	Arrowtooth Flounder	0.00	0.17	0.00	0.17
Bottom Trawl	Arrowtooth Flounder	9.50	0.00	0.00	9.50
Bottom Trawl	Atka Mackerel	1204.52	354.20	60.48	1619.20
Longline	Greenland Turbot	0.00	0.31	0.00	0.31
Bottom Trawl	Kamchatka Flounder	7.16	0.00	0.00	7.16
Longline	Pacific Cod	46.72	29.60	16.99	93.30
Bottom Trawl	Pacific Cod	30.99	5.59	2.96	39.54
Pot	Pacific Cod	0.03	0.41	0.00	0.44
Pelagic Trawl	Pollock	0.06	0.00	0.00	0.06
Bottom Trawl	Rockfish	68.03	34.47	20.51	123.00
Longline	Sablefish	0.08	0.06	0.00	0.14
Longline	Halibut	0.03	0.32	0.00	0.34
Sum		1367.12	425.12	100.93	1893.17

Table 9. Total catches (t) of AI shortspine thornyhead from 2004-2012 by target fishery and gear type. Areas 541, 542, and 543 refer to NMFS areas within the AI. Source: NMFS AKRO BLEND/Catch Accounting System.

Gear	Target	541	542	543	Sum
Longline	Arrowtooth Flounder	7.41	51.01	0.00	58.42
Bottom Trawl	Arrowtooth Flounder	4.59	0.00	0.00	4.59
Bottom Trawl	Atka Mackerel	2.15	11.23	38.63	52.01
Longline	Greenland Turbot	2.25	79.36	0.00	81.60
Bottom Trawl	Greenland Turbot	1.33	0.00	0.00	1.33
Bottom Trawl	Kamchatka Flounder	1.78	0.00	0.00	1.78
Longline	Pacific Cod	27.67	6.02	13.28	46.97
Jig	Pacific Cod	0.02	0.00	0.00	0.02
Bottom Trawl	Pacific Cod	0.10	0.00	0.52	0.62
Pot	Pacific Cod	0.00	0.01	0.00	0.01
Bottom Trawl	Pollock - bottom	0.02	0.00	0.00	0.02
Longline	Rockfish	0.69	7.22	2.01	9.91
Bottom Trawl	Rockfish	4.28	59.97	215.94	280.18
Pot	Rockfish	0.02	0.00	0.00	0.02
Longline	Sablefish	298.23	218.75	51.30	568.28
Pot	Sablefish	2.25	0.10	0.00	2.34
Longline	Halibut	36.14	63.95	19.81	119.90
		388.91	497.61	341.49	1228.01

Table 10. Retained and discarded catch of seven Other Rockfish species (shortspine thornyhead, dusky rockfish, redbanded rockfish, redstriped rockfish, yelloweye rockfish, harlequin rockfish, and sharpchin rockfish) from 2004 to 2012 in the Aleutian Islands (AI) and Eastern Bering Sea (EBS). Accessed October 24, 2012 from the NMFS AKRO BLEND/Catch Accounting System.

Species Area	Catch (t) Year	Retained	Discard	Total	Percent Discarded
AI	2004	167	170	337	50.5%
	2005	186	100	286	35.0%
	2006	244	181	425	42.7%
	2007	209	224	433	51.6%
	2008	267	122	388	31.3%
	2009	253	55	308	17.9%
	2010	376	62	438	14.2%
	2011	471	127	598	21.2%
	2012	533	60	593	10.1%
EBS	2004	229	89	318	27.9%
	2005	144	34	178	19.0%
	2006	123	34	157	21.0%
	2007	143	76	219	34.7%
	2008	132	77	209	36.9%
	2009	167	32	199	16.1%
	2010	194	38	232	16.4%
	2011	266	39	305	12.8%
	2012	113	23	136	16.9%

*2012 catches through Oct 24, 2012.

Table 11. Survey biomass estimates (t) and CVs (in parentheses) for Other Rockfish (including shortspine thornyhead) from 1979 - 2012. Southern Bering Sea refers to NMFS reporting area 799.

	AI survey			EBS Slope survey
Year	AI	S. Bering Sea	Total	
1979				3,251
1980	930 (0.18)	36 (0.73)	966 (0.18)	
1981				4,975
1982				4,381
1983	3,971 (0.17)	802 (0.23)	4,774 (0.15)	
1984				
1985				5,127
1986	6,550 (0.19)	3,253 (0.86)	9,803 (0.31)	
1987				
1988				8,759
1989				
1990				
1991	6,643 (0.22)	248 (0.48)	6,891 (0.22)	4,529
1992				
1993				
1994	6,452 (0.16)	1,172 (0.48)	7,624 (0.15)	
1995				
1996				
1997	9,539 (0.17)	1,683 (0.63)	11,223 (0.18)	
1998				
1999				
2000	11,924 (0.17)	1,107 (0.45)	13,031 (0.16)	
2001				
2002	14,781 (0.20)	1,111 (37)	15,892 (0.18)	16,975 (0.12)
2003				
2004	18,566 (0.18)	6,473 (67)	25,039 (0.22)	18,807 (0.09)
2005				
2006	23,879 (0.24)	1,706 (0.52)	25,585 (0.23)	
2007				
2008				26,072 (0.12)
2009				
2010	18,663 (0.15)	1,172 (0.66)	19,835 (0.15)	29,453 (0.12)
2011				
2012	14,694 (0.15)	586 (0.61)	15,280 (0.15)	29,619 (0.11)

Table 12. Survey biomass estimates (t) and CVs (in parentheses) for Dusky rockfish from 1997 - 2012. Southern Bering Sea refers to NMFS reporting area 799.

	AI survey			EBS Slope survey
Year	AI	S. Bering Sea	Total	
1997	574 (0.76)	138 (0.46)	712 (0.62)	
1998				
1999				
2000	1,250 (0.34)	55 (0.36)	1,306 (0.33)	
2001				
2002	515 (0.32)	97 (0.36)	612 (0.27)	25 (0.57)
2003				
2004	730 (0.44)	1,359 (0.91)	2,089 (0.61)	13(0.57)
2005				
2006	5,956 (0.89)	731 (0.96)	6,687 (0.80)	
2007				
2008				10 (1.00)
2009				
2010	560 (0.34)	120 (0.44)	680 (0.29)	117 (0.87)
2011				
2012	236 (0.32)	135 (0.57)	371 (0.29)	41 (0.61)

Table 13. Survey biomass estimates (t) and CVs (in parentheses) for shortspine thornyhead from 1991- 2012. Southern Bering Sea refers to NMFS reporting area 799.

	AI survey			EBS Slope survey
Year	AI	S. Bering Sea	Total	
1991	6,153 (0.24)	187 (0.58)	6,341 (0.23)	
1992				
1993				
1994	6,240 (0.16)	1,071 (0.52)	7,311 (0.16)	
1995				
1996				
1997	8,896 (0.18)	1,545 (0.69)	10,441 (0.18)	
1998				
1999				
2000	10,649 (0.19)	1,051 (0.48)	11,700 (0.17)	
2001				
2002	14,243 (0.20)	1,012 (0.41)	15,255 (0.19)	16,950 (0.12)
2003				
2004	17,335 (0.19)	945 (0.56)	18,280 (0.18)	18,793 (0.09)
2005				
2006	17,876 (0.12)	968 (0.55)	18,844 (0.12)	
2007				
2008				26,055 (0.12)
2009				
2010	18,075 (0.16)	1,052 (0.73)	19,127 (0.16)	29,334 (0.12)
2011				
2012	14,443 (0.15)	452 (0.77)	14,895 (0.15)	29,574 (0.11)

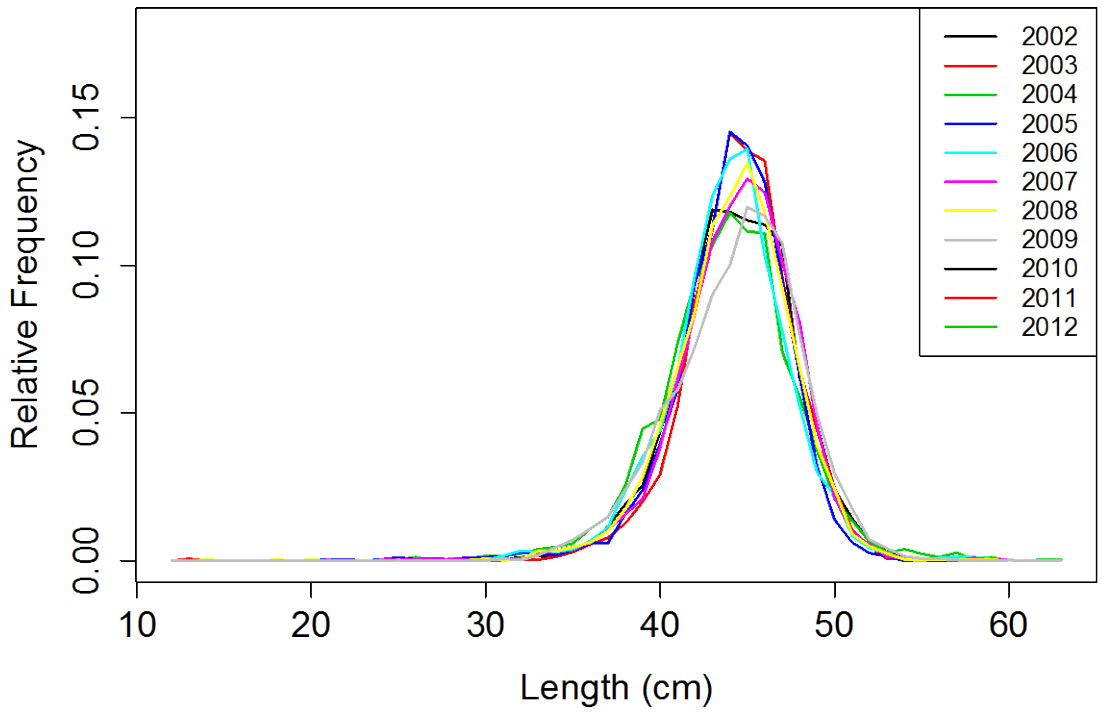

Figure 1. Dusky rockfish length frequencies from fishery observer sampling, 2002-2012.

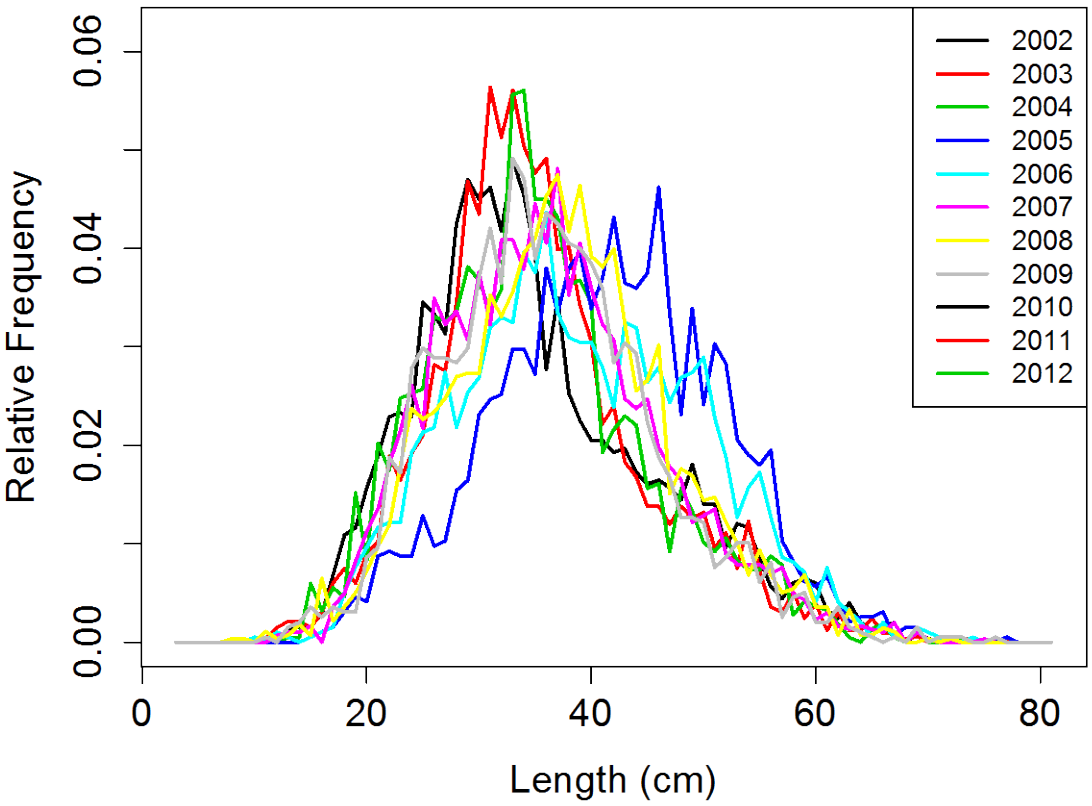

Figure 2. Shortspine thornyhead rockfish length frequencies from fishery observer sampling, 2002-2012.

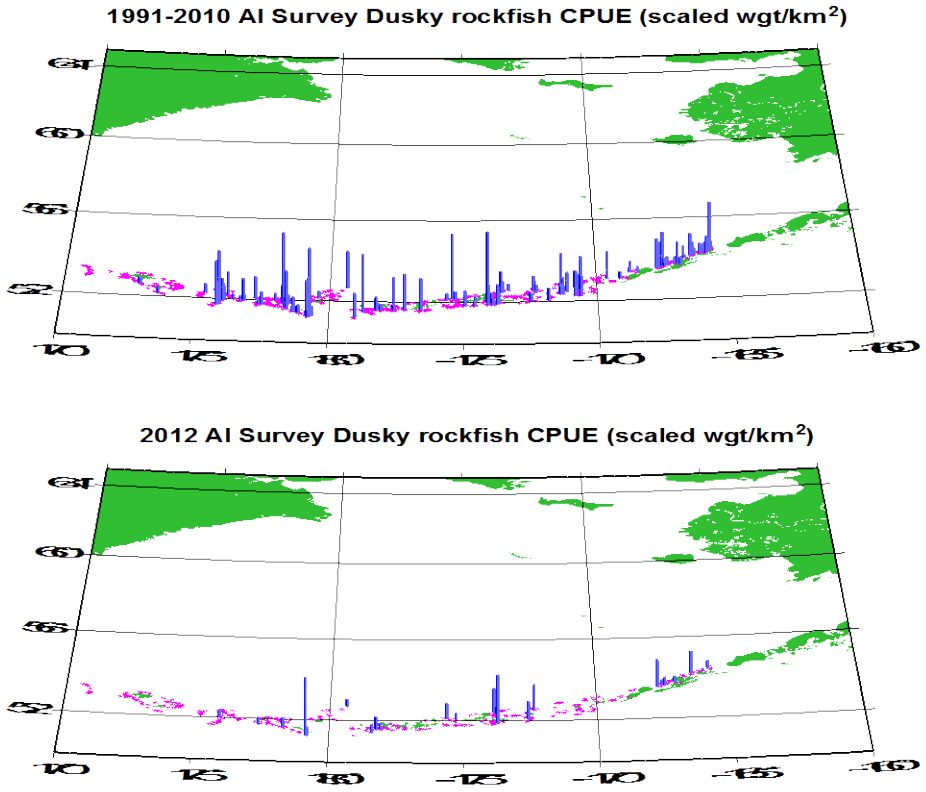

Figure 3. AI survey CPUE (scaled kg/km^2) of dusky rockfish from 1997 to 2012.

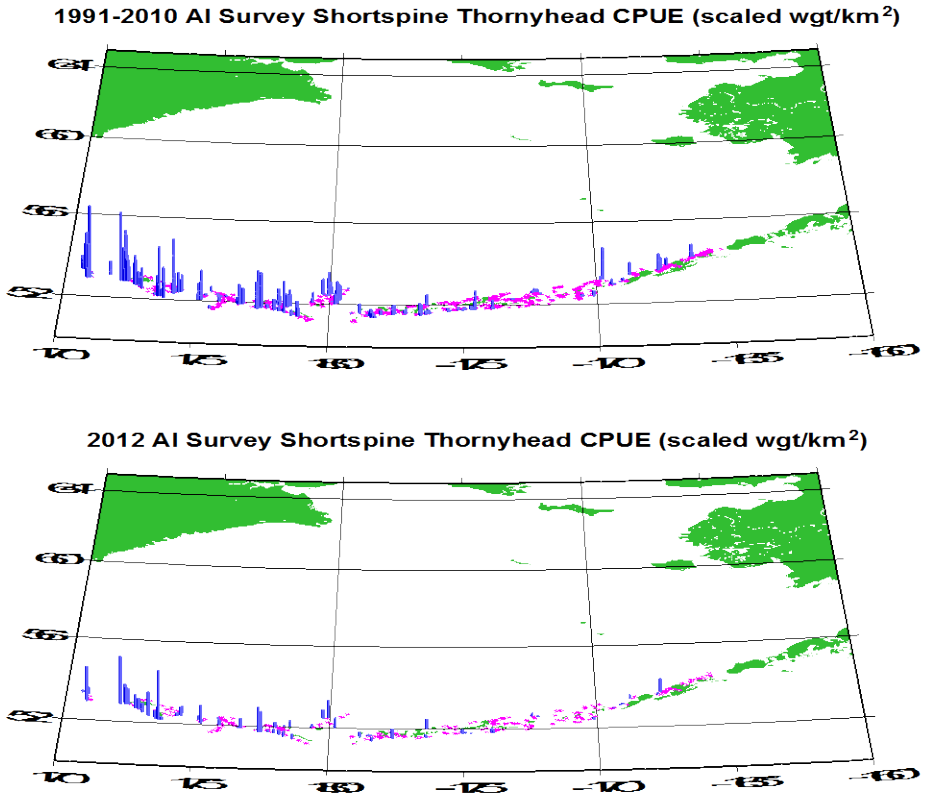

Figure 4. AI survey CPUE (scaled kg/km^2) of shortspine thornyhead from 1980 to 2012.

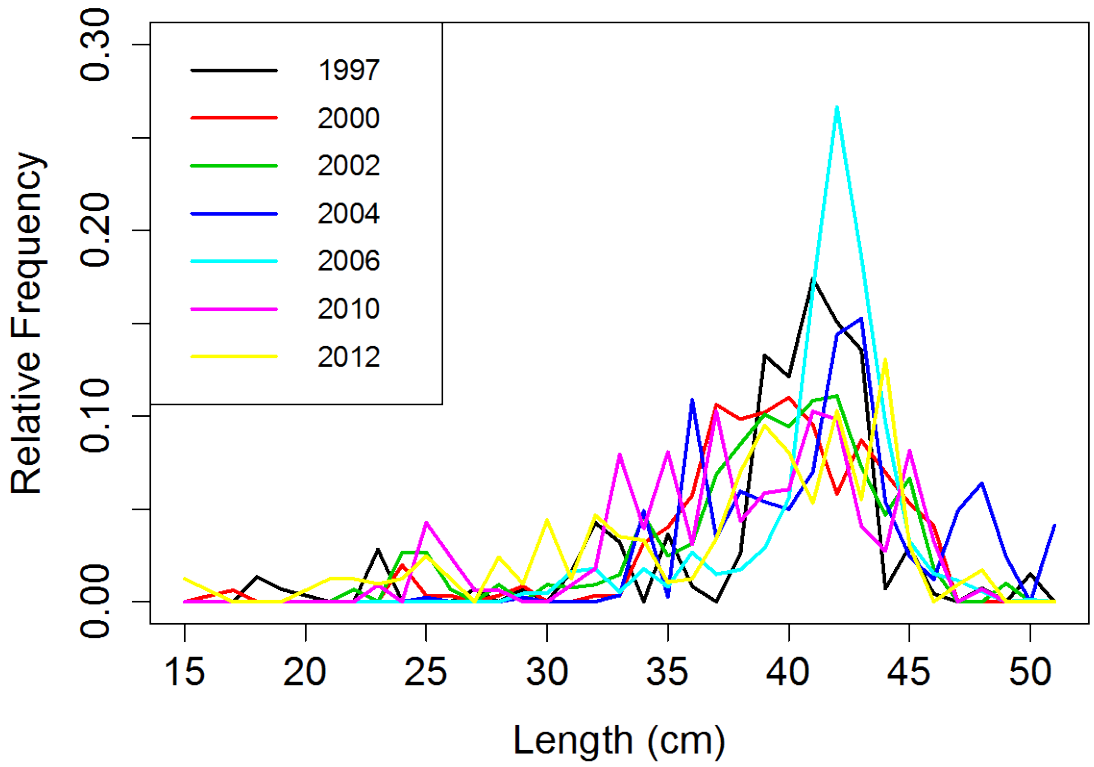

Figure 5. Dusky rockfish length frequencies from the Aleutian Island trawl survey, 1997-2012.

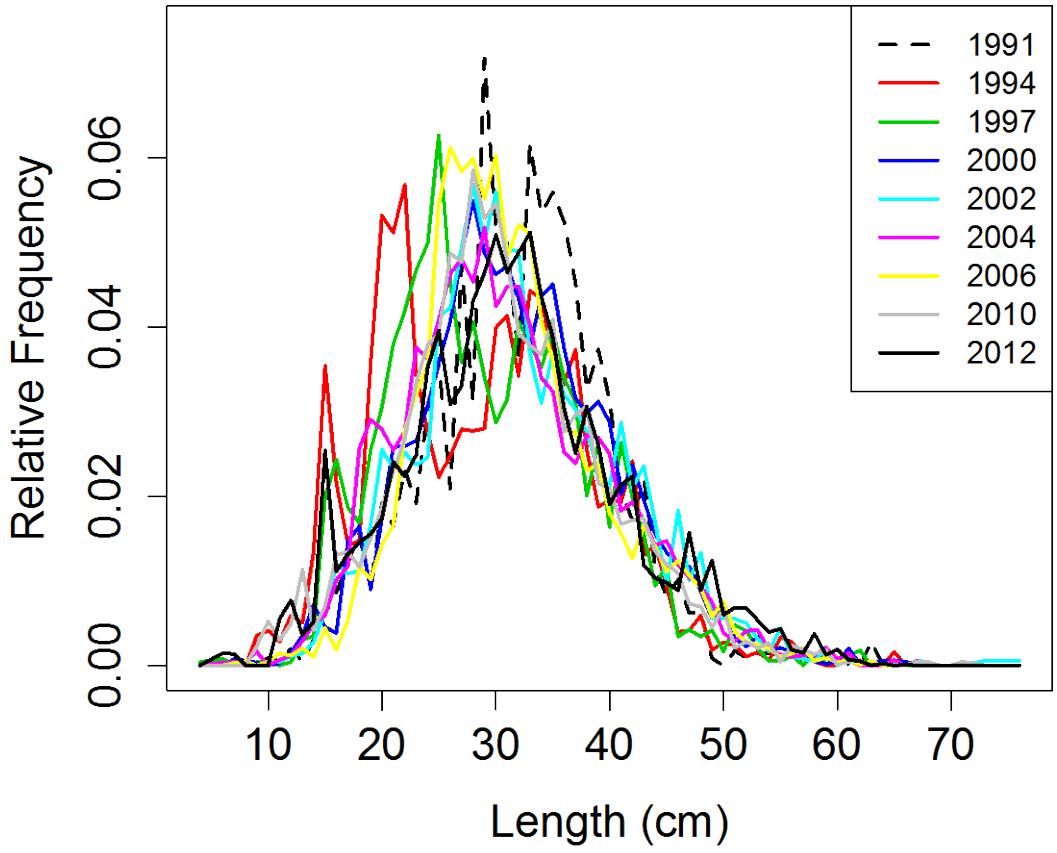

Figure 6. Shortspine thornyhead length frequencies from the Aleutian Island trawl survey, 1991-2012.

SST estimates from random effects model (t).

	Species	2012 Value	Last 3 survey years	Last 3 consecutive years	Projection (2013)
Estimated biomass	SST	45,820	43,932	45,033	44,970
OFL	SST	1375	1318	1351	1349
ABC (AI)	SST	384	377	371	362
ABC (EBS)	SST	647	612	641	650
Estimated biomass	non-SST	1,885	514	462	99
OFL	non-SST	170	15	14	18
ABC (AI)	non-SST	106	11	10	12
ABC (EBS)	non-SST	22	0.4	0.4	0.4