

Section 1 I

OTHER ROCKFISH

by

Daniel H. Ito and Paul D. Spencer

CHANGES FROM LAST YEAR'S ASSESSMENT

Relative to last year's final **BS/AI** SAFE Report, the following substantive changes have been made in the current **draft** of the Other **Rockfish** chapter:

- (1) The 1998 landings have been revised and the 1999 landings through September 25, 1999 have been included in the assessment.
- (2) A summary of the 2000 **ABC's** and **OFL's** relative to the 1999 recommendations is as follows:

		Eastern Bering Sea		Aleutian Islands	
		Last Year	This Year	Last Year	This Year
<i>Other Rockfish</i>	ABC	369 t	369 t	685 t	685 t
	OFL	492 t	492 t	913 t	913 t

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INTRODUCTION

Other rockfish, which includes all species of *Sebastes* and *Sebastolobus* spp. other than the Pacific ocean perch complex (Pacific ocean perch, *S. alutus*; northern rockfish, *S. polyspinis*; rougheyeye rockfish, *S. aleutianus*; shortraker rockfish, *S. borealis*; and sharpchin rockfish, *S. zacentrus*) have traditionally been managed as a unit and have been grouped together in reported commercial catch statistics. Since 1977, however, species of **rockfish** have been identified in catches by U.S. observers, which have provided a means of estimating annual harvests of individual species. Over 27 species of "other **rockfish**" have been confirmed or tentatively identified in catches from the eastern Bering Sea and Aleutian Islands region (Table 1). Shortspine thomyheads (*Sebastolobus alascanus*), however, account for the bulk of the other rockfish catch. In fact, based on recent trawl survey results from the Aleutian Islands region, over 90% of the other **rockfish** biomass is comprised of shortspine thornyheads.

For management purposes, the other **rockfish** resource is assumed to consist of **two** separate stocks and are therefore assessed and managed as two major groups -- the eastern Bering Sea (EBS) group and the Aleutian Islands group.

CATCH HISTORY

Historical catches of other **rockfish** since implementation of the **MFCMA** are shown in Table 2. Catches prior to 1990 are assumed to include discards; whereas, catches during the period 1990-99 explicitly account for discards based on NMFS Regional **Office** and observer information. The peak catch of other rockfish in the EBS occurred in 1978 with a removal of 2,600 t. In the Aleutian region, peak catch occurred in 1979 with a harvest of 4,500 t.

The catches of the top five species of other **rockfish** by area and year are shown in Table 3. These catches were computed by applying the distribution of catch biomass across species in the hauls sampled by the fishery observer program to the total catch in an area and year. It is notable that the proportion of light dusky **rockfish** catch ranges from 16% to 45% in the Aleutian Islands and 16% to 69% in the eastern Bering Sea. Further work will characterize the catch of light dusky **rockfish** in more detail with respect to gear type and depth.

ASSESSMENT METHODS

Relative Abundance

Commercial catch and effort data are of little use in examining trends in abundance for other rockfish. Standardizing and partitioning total groundfish effort into effort directed solely toward catching other **rockfish** is extremely difficult. This group is now, for the most part, relegated to an incidental fishery.

Absolute Abundance

A number of trawl surveys provide estimates of exploitable biomass for the EBS and Aleutians region. The 1979-88 cooperative U.S.-Japan trawl surveys in the EBS were conducted both on the continental shelf and slope, but almost all catches of other **rockfish** were taken by Japanese research trawlers working the difficult to fish slope regions at depths exceeding 200 m. For this reason, only data collected by Japanese research vessels were employed to calculate other **rockfish** abundance estimates for these years. In 1991 trawl surveys were conducted in both the EBS and Aleutian regions. These surveys, however, were conducted entirely by domestic trawlers and did not include participation by the deeper-water Japanese research trawlers. The most recent trawl surveys occurred in 1994 and 1997 in the Aleutian Islands region.

ABUNDANCE AND EXPLOITATION TRENDS

Reliable abundance trends are lacking for other **rockfish** in the eastern Bering Sea and Aleutian Islands regions due to poor estimation by the trawl surveys. These estimates are characterized by extremely high variances. **As** such, we thought it prudent to take an average of the survey point estimates to derive an estimates of recent biomass.

The biomass for the EBS group of other **rockfish** is comprised of 2 components--the EBS shelf-slope component and the Aleutian component of Bering Sea area 1 (Table 4). The 1979-91 mean of the first component is 5,170 t and the 1980-97 mean of the second component is 1,859 t. Therefore, the overall estimate of current biomass in the EBS region is 7,029 t.

For other rockfish in the Aleutian Islands region, the biomass estimates indicate a decrease **from** 19,100 t in 1980 to 16,000 t in 1983 (Table 4). Based on the 1986 survey, the biomass increased to 20,300 t. Then in 1991, the biomass apparently dropped precipitously to 6,389 t, the lowest biomass estimate recorded **to date**. The other rockfish biomass appears to have stabilized as the trawl **survey** conducted in 1994 is almost identical to that of the 1991 point estimate. More recently, the 1997 **survey** biomass estimate of other **rockfish** has shown a slight increase to **10,081** t. These estimates, however, are characterized by extremely wide variances, and the 95% confidence intervals overlapped extensively, indicating that the point estimates may not be significantly different. Nevertheless, the overall mean of these trawl survey estimates (**13,041** t) indicate a larger stock size than that found in the EBS.

As mentioned above, the survey estimates indicate that - 90% of the other **rockfish** biomass is composed of shortspine thomyhead (Table 5). The proportion of light dusky **rockfish** in the survey estimates is considerably lower than those in the catch estimates above, and this discrepancy may suggest that there is inadequate survey sampling of light dusky **rockfish**.

Based *upon* available information, the "best" estimate of exploitable biomass for other **rockfish** is 7,029 t in the EBS and 13,041 t in the Aleutian Islands (i.e., the mean of the survey estimates).

SPAWNER-RECRUIT RELATIONSHIP

Since this group of rockfishes is made up of many species for which detailed length frequency and age composition information is lacking, recruitment strengths for this resource are not known. Spawner-recruit relationships, therefore, cannot be determined at this time.

REFERENCE FISHING MORTALITY RATES AND YIELDS

Insufficient information is available to calculate meaningful reference fishing mortality rates and yields. Although an $F=M$ strategy is employed when determining ABC, note that the $M=0.07$ value used represents an approximation based on knowledge of **rockfish** life histories from other areas. The natural mortality (M) for shortspine thornyheads (0.07, Ianelli and Ito 1994) was used because this species evidently comprise well over 90% of the other **rockfish** biomass.

Under tier 5 of Amendment 44, a fishing mortality rate equal to 75% of the natural mortality rate is the maximum allowable F(ABC) value. Hence, ABC is estimated as $0.75 \times M \times \text{exploitable biomass}$. Therefore, the estimate of ABC for the eastern Bering Sea region is 369 t ($0.75 \times 0.07 \times 7,029$) and 685 t ($0.75 \times 0.07 \times 13,041$) for the Aleutian Islands region.

Based on the new overfishing definition, the overfishing level (OFL) is equivalent to $OFL = M \times \text{exploitable biomass}$. Thus, the overfishing level for the eastern Bering Sea region is 492 t and 913 t for the Aleutian Islands region.

SUMMARY

A summary of the estimates of current exploitable biomass and ABC for the other **rockfish** group in the EBS and Aleutian Islands region is provided in the following table:

Region	Exploitable biomass (t)	ABC (t)	OFL (t)
Eastern Bering Sea	7,029	369	492
Aleutian Islands Region	13,041	685	913

REFERENCES

- Ianelli, J. N., and D. H. Ito. 1994. Status of the thornyhead (*Sebastolobus sp.*) resource in 1994. *In* Stock assessment and fishery evaluation report of the Gulf of Alaska as projected for 1995 (November 1994), 26 pp. North Pacific Fishery Management Council, P.O. Box 103 136, Anchorage, AK 995 10.

Table 1. The common and scientific names of **rockfish** in the “other rockfish” reporting category identified by U.S. observers in the eastern Bering Sea and Aleutian Islands regions.

Aurora rockfish	<i>Sebastes aurora</i>
Black rockfish	<i>Sebastes melanops</i>
Blackgill rockfish	<i>Sebastes melanostomus</i>
Blue rockfish	<i>Sebastes mystinus</i>
Bocaccio	<i>Sebastes paucispinis</i>
Canary rockfish	<i>Sebastes pinniger</i>
Chilipepper rockfish	<i>Sebastes goodei</i>
Copper. rockfish	<i>Sebastes caurinus</i>
Dark blotched rockfish	<i>Sebastes crameri</i>
Dark dusky rockfish	<i>Sebastes ciliatus</i>
Greenstriped rockfish	<i>Sebastes elongatus</i>
Harlequin rockfish	<i>Sebastes variegatus</i>
Pygmy rockfish	<i>Sebastes wilsoni</i>
Red banded rockfish	<i>Sebastes babcocki</i>
Redstripe rockfish	<i>Sebastes proriger</i>
Rosethorn rockfish	<i>Sebastes helvomaculatus</i>
Silvergray rockfish	<i>Sebastes brevispinis</i>
Splitnose rockfish	<i>Sebastes diploproa</i>
Stripetail rockfish	<i>Sebastes saxicola</i>
Tiger rockfish	<i>Sebastes nigrocinctus</i>
Vermilion rockfish	<i>Sebastes miniatus</i>
Widow rockfish	<i>Sebastes entomelas</i>
Yelloweye rockfish (rasphead)	<i>Sebastes ruberrimus</i>
Yellowmouth rockfish	<i>Sebastes reedi</i>
Yellowtail rockfish	<i>Sebastes flavidus</i>
Longspine thomyhead rockfish	<i>Sebastolobus altivelis</i>
Shortspine thomyhead rockfish	<i>Sebastolobus alascanus</i>

Table 2.--Summary of catches (t) of other rockfish in the eastern Bering Sea and Aleutian Islands regions.

Year	Eastern Bering Sea				Aleutian Islands			
	Foreign	Domestic		Total	Foreign	Domestic		Total
		JVP	DAP			JVP	DAP	
1977	311	--	--	311	3,043	--	--	3,043
1978	2,614	--	--	2,614	921	--	--	921
1979	2,108	--	--	2,108	4,517	--	--	4,517
1980	456	3	--	459	420	--	--	420
1981	331	--	25	356	328	--	--	328
1982	262	11	3	276	2,114	--	--	2,114
1983	212	8	--	220	1,041	4	--	1,045
1984	121	8	47	176	42	14	--	56
1985	33	3	56	92	2	14	83	99
1986	4	12	86	102	Tr	15	154	169
1987	3	4	467	474	0	6	141	147
1988	0	8	333	341	0	68	210	278
1989	0	4	188	192	0	0	481	481
1990	0	0	418	418	0	0	858	858
1991	0	0	422	422	0	0	343	343
1992	0	0	600	600	0	0	664	664
1993	0	0	488	488	0	0	496	496
1994	0	0	132	132	0	0	292	292
1995	0	0	288	288	0	0	219	219
1996	0	0	170	170	0	0	281	281
1997	0	0	163	163	0	0	305	305
1998	0	0	199	199	0	0	380	380
1999(1)	0	0	131	131	0	0	693	693

(1) Estimated removals through September 25, 1999.

Table 3. Harvest(t) of top five species in other rockfish group in the Aleutian Islands and eastern Bering Sea from 1992-1998.

Aleutian Islands

Species	Year						
	1992	1993	1994	1995	1996	1997	1998
Sportspine Thornyhead	296	314	188	124	111	140	87
Light Dusky Rockfish	189	139	81	35	129	138	170
Dark Blotched Rockfish	90	7			6		
Harlequin Rockfish	39	14	8	43	8	16	31
Black Rockfish	13						
Rockfish Unidentified		10		6		6	58
Restripe Rockfish			8				
Redbanded Rockfish			3				
Thornyhead Rockfish Unident.				5	11		
Dark Rockfish Unident.						3	
<u>Small Red Rockfish Group</u>							17
Total	626	485	288	213	266	304	362

Eastern Bering Sea

Species	Year						
	1992	1993	1994	1995	1996	1997	1998
Sportspine Thornyhead	299	159	97	190	46	113	113
Light Dusky Rockfish	201	303	21	54	118	33	56
Harlequin Rockfish	36	7					
Dark Blotched Rockfish	12						
Rockfish Unidentified	11	7	2	4	1	4	4
Grey Rockfish		5					
Yelloweye Rockfish			5		1		
Widow Rockfish			3				
Yellowmouth Rockfish				17			
Bocaccio				15			
Thornyhead Rockfish Unident.					3	4	5
Restripe Rockfish						4	
Black Rockfish							10
Total	558	481	127	280	168	158	189

Table 4. Estimated biomass (t) of "other rockfish" from the NMFS bottom trawl surveys.

Eastern Bering Sea (EBS)			
	EBS shelf/slope	Aleutians portion of EBS Area 1	Aleutian Region
1979	3,251	--	--
1980	--	1,095	19,078
1981	4,975	--	--
1982	4,381	--	--
1983	--	1,696	15,995
1984	--	--	--
1985	5,127	--	--
1986	--	5,187	20,336
1987	--	--	--
1988	8,759	--	--
1989	--	--	--
1990	--	--	--
1991	4,529	530	6,389
1992	--	--	--
1993	--	--	--
1994	--	1,203	6,367
1995	--	--	--
1996	--	--	--
1997	--	1,443	10,081

Table 5. Biomass estimates of other rockfish group from the Aleutian Islands survey, by species and year.

Year	Species	Area	
		Aleutian Region	Southern Berins Sea
1991	Shortspine thornyhead	5853	469
	Dusky	507	57
	Harlequin	29	0
	Redbanded	0	1
	Total	6389	527
1994	Shortspine thornyhead	6194	1062
	Dusky	172	140
	Harlequin	1	1
	Total	6367	1203
1997	Shortspine thornyhead	9104	1491
	Dark dusky	376	
	Light dusky	513	196
	Redbanded	2	
	Harlequin	86	
	Total	10081	1687