

Status of the Darkblotched Rockfish (*Sebastes crameri*)
Resource in 2000

STAT Executive Summary

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EXECUTIVE SUMMARY

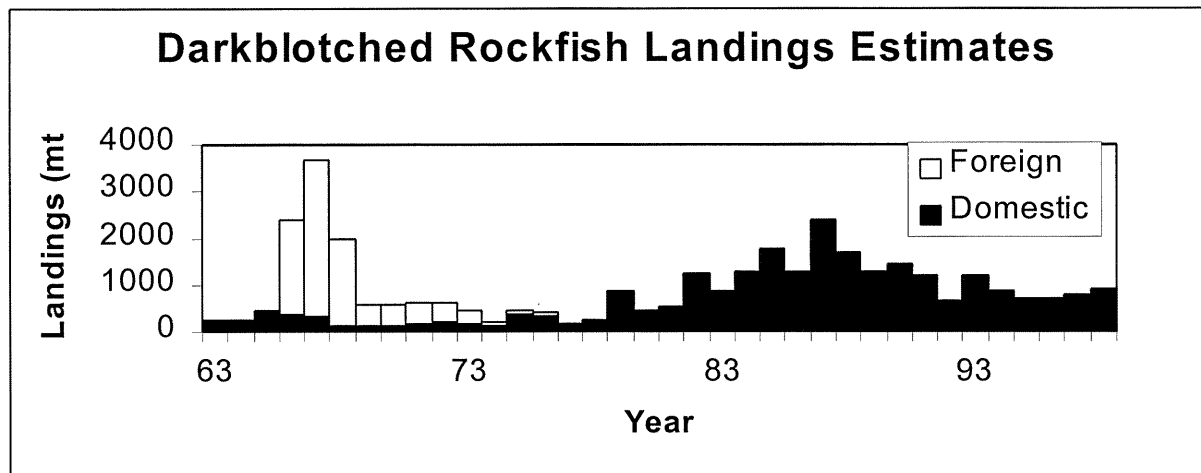
Stock

This assessment covers the population of darkblotched rockfish (*Sebastes crameri*) on the Pacific west coast of the United States between the Mexican and Canadian borders. The actual stock likely crosses the Canadian border, but an international assessment was not planned for this year.

Catch

Domestic landings of darkblotched rockfish generally increased until the mid 1980s and then declined. Foreign landings were estimated to be 10% of the landings attributed to Pacific ocean perch. Darkblotched rockfish is often caught with that species and the foreign landings are thought to include other red rockfish such as darkblotched.

year	88	89	90	91	92	93	94	95	96	97	98
Con	21	7	17	50	11	3	0	1	4	1	11
Monterey	142	140	358	121	97	140	126	98	75	281	179
Eureka	704	331	260	193	128	191	190	268	325	181	346
Columbia	730	747	753	754	411	847	532	326	280	311	333
US Van.	67	65	27	52	18	17	12	29	22	22	20
misc gear	30	5	12	18	15	2	1				
Total	1692	1295	1427	1189	680	1199	860	721	707	797	890



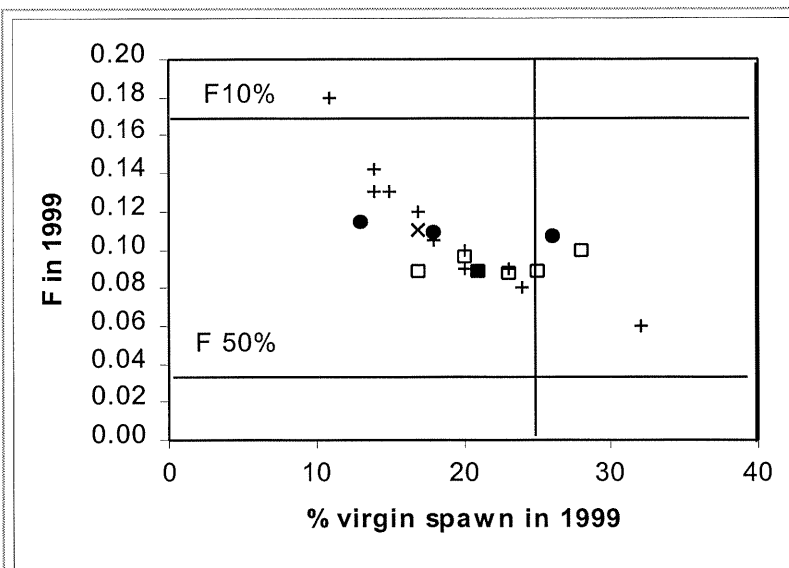
Data and Assessment

This assessment updates and expands the modeling in the 1996 assessment (Rogers et al. 1996). The last assessment and was based on a simple $F=M$ methodology verified by limited

modeling using length-based stock synthesis. The present assessment provides more extensive length-based stock synthesis modeling. The new length-based model explores three new indices of abundance in addition to the NMFS triennial survey and Pacific ocean perch bycatch indices used in the 1996 assessment. The new indices include a NMFS slope survey, a NMFS Pacific ocean perch survey, and a logbook index of catch-per-unit effort (Ralston 1999). This year's assessment model spans 1963-1999, while the 1996 model covered the period from 1980-1995. The two fisheries in the 1996 assessment are combined into one in the new model structure, and age compositions from 12 years of the fishery were added to the model. Discarding and changing fishery selectivity were explored in this year's model.

Unresolved problems and major uncertainties

Several uncertainties were explored in the modeling. One of the major uncertainties which affected the modeling outcome was the amount of foreign catch. Another uncertainty involved the ability of the data to accurately dictate the form and outcome of the modeling, such as the size of the 1994 year class. The amount of the 1999 landings is not yet known and could slightly affect our projections. When those landings are complete, the projections could be redone to ensure more accuracy. Comparing all the models tried indicates the range of the uncertainty in the results (see figure below). If the 1999 landings were overestimated, the F values would be lower and may instead be representative of 1998. Four models were selected by the STAR panel to express some of the uncertainty in the results. They included a comparison of two model configurations with foreign catch assumed to be 10% of the red rockfish total, and the second model with no foreign catch assumed or 20% assumed. The assumption of no foreign catch is probably not as likely as the alternatives, but expresses a lower bound. The selected models were: model 1 = solid square, model 2s = solid circles. The open squares were sensitivity analysis results on model 1, the crosses were all other models.



Reference points

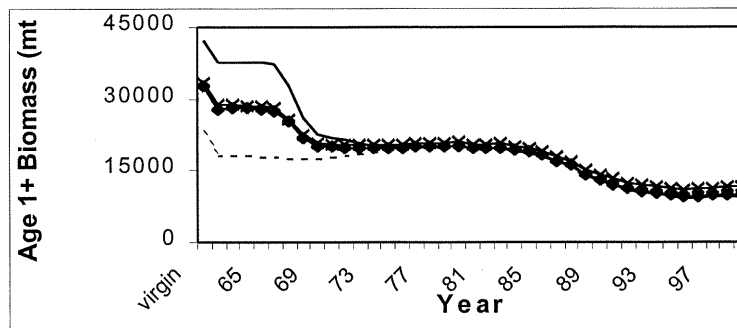
A panel convening in 2000 recommended that the proxy target fishing mortality rate for rockfish allowable biological catch should be F50%, the rate that would reduce the spawning potential to 50% of its unfished level (see horizontal line in figure above). In setting the harvest guideline, this rate could be reduced by a precautionary "40-10 default OY" if the stock biomass is believed less than B msy. B 40% (40% of the unfished spawning potential) is a proxy for Bmsy (see vertical line in figure above). The farther the stock is below B 40%, the greater the reduction in harvest rate, until at B10% all harvest is prohibited. If a stock falls below B 25% (vertical line in figure above), a formal rebuilding plan is needed.

Stock Biomass

Model 1 (x's in graph below) and model 2 (diamonds) had very similar biomass trends, with model 1 having slightly less of a decline in recent years. The primary difference between the three foreign catch assumptions with model 2 (solid line = 20% level, dashed line = no foreign catch) was the estimated level of virgin biomass. The greater the foreign catch, the higher the

Age 1+ Biomass (mt)	89	90	91	92	93	94	95	96	97	98	99
model 1	14005	13264	12402	11803	11744	11173	11041	11176	11397	11559	11607
model 2	12938	12123	11181	10495	10336	9674	9487	9593	9803	9961	10010
model 2b	13021	12211	11275	10596	10445	9792	9618	9741	9970	10148	10218
model 2c	12750	11924	10971	10273	10100	9423	9216	9295	9474	9600	9618

virgin level and the greater the decline.



Recruitment

Comparing the recruitment estimates from Model 1 to those from the three Model 2's indicates a difference due to the assumptions made about the stock-recruitment relationship. Model 2 assumed that there was no stock-recruitment relationship, so the fitted recruitments had no restraints. This resulted in greater variability in the earlier years where there was little information on recruitment size and slightly higher estimates for the 1995 recruits.

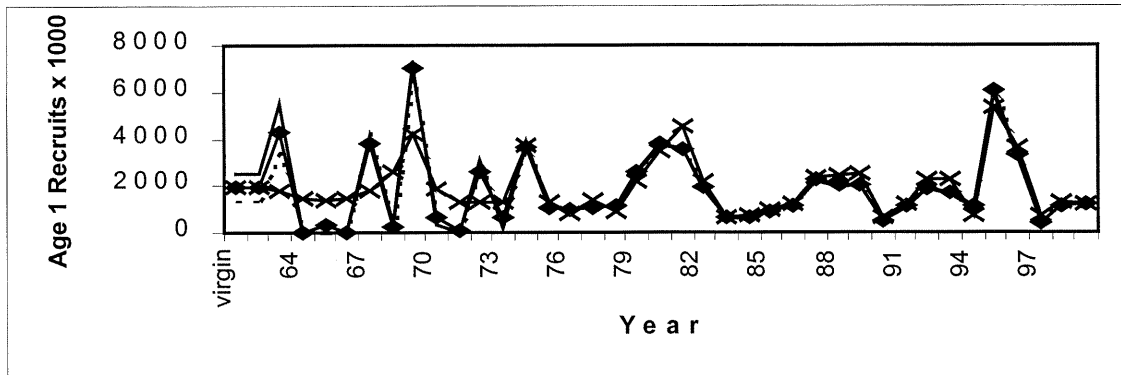
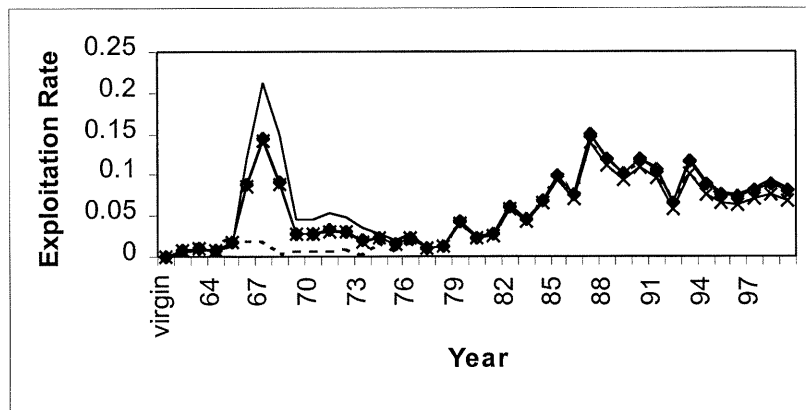


Table below is recruits (thousands of age 1 fish) in the last ten years. 1999 recruits are either fixed (model 2) or estimated from the stock-recruitment relationship (model 1).

	89	90	91	92	93	94	95	96	97	98	99
model 1	2511	621	1197	2224	2252	687	5325	3656	716	1326	1241
model 2	2044	492	1097	1889	1689	1117	6090	3343	377	1171	1246
model 2b	2075	500	1112	1922	1720	1142	6225	3412	390	1201	1246
model 2c	1996	480	1064	1826	1639	1078	5890	3209	366	1122	1246

Exploitation status

The exploitation rates (total catch divided by exploitable biomass) were similar across models in recent years. In the early years, the model with high foreign catch (solid line) had the highest rates and the model with no foreign catch (dashed line) the lowest rates.



Exploitation Rates in the last 10 years

	89	90	91	92	93	94	95	96	97	98	99
model 1	0.09	0.11	0.10	0.06	0.10	0.08	0.07	0.06	0.07	0.08	0.07
model 2	0.10	0.12	0.11	0.06	0.12	0.09	0.08	0.07	0.08	0.09	0.08
model 2b	0.10	0.12	0.11	0.06	0.11	0.09	0.07	0.07	0.08	0.09	0.08
model 2c	0.10	0.12	0.11	0.07	0.12	0.09	0.08	0.08	0.08	0.09	0.08

Management performance

Although darkblotched rockfish has had a species-specific allowable biological catch (ABC) since 1997, it has never had an individual species harvest guideline (OY). Catch substantially exceeded the ABC in 1997 and 1998, particularly in the southern area. The landings estimates for 1999 are likely incomplete, but still exceed the ABC in the southern area.

Forecasts and Decision Table

For each of the four models, the projected catch at the F50% target and the 10/40 policy was averaged for the three year period 2001-2003. This suite of catches was then assumed in each model and the resulting proportion of the 2003 spawn to the virgin spawn was estimated. The proportion ranged from 0.143 to 0.305. Only the model assuming no foreign catch or the model with variable likelihood weights and priors given 37 mt catch would not be considered overfished in 2003. In all cases the spawning biomass increased over the three year time period with the reduced catch and the estimated very large 1994 year class reaching maturity.

Model	Foreign	F	Projected	Spawn 2003/ Virgin Spawn			
	Catch			Catch	model 1	model 2	model 2b
	Assumption		2001-2003				
model 2C	20%	10/40 policy	37	0.251	0.209	0.305	0.154
model 2	10%	10/40 policy	86	0.249	0.206	0.302	0.152
model 1	10%	10/40 policy	145	0.246	0.204	0.298	0.15
model 2B	0%	10/40 policy	170	0.245	0.203	0.296	0.149
model 2C	20%	F50%	272	0.24	0.198	0.29	0.145
model 2	10%	F50%	284	0.24	0.197	0.289	0.145
model 1	10%	F50%	290	0.239	0.197	0.289	0.145
model 2B	0%	F50%	330	0.238	0.195	0.286	0.143

Recommendations

The following are potential research needs in order of priority:

- 1). Gather further information on the size of the 1994 year class to better predict the level of future catch needed to bring the stock level to the desired target.
- 2). Monitor the retained versus discarded catch of darkblotched rockfish through placing observers on vessels and/or recording those catches in fishermen's logbooks.
- 3). Obtain better knowledge of fishery landings by requiring fishermen and/or processors to sort darkblotched rockfish separately from other species.
- 4). Reach a common agreement on the allocation the foreign catch and unspecified domestic rockfish catch to individual species using the best available information.
- 5) Identify stock boundaries by comparing genetic samples from Alaska to the Mexican-U.S. border .
- 6) Employ submersibles or underwater videos to better understand the selectivity and catchability of the survey and fishery gears.

Sources of additional information:

Ralston, S. 1999. Trends in standardized catch rate of some rockfishes (*Sebastes* spp.) from the California trawl logbook database. NMFS SWFSC Administrative Report SC-99-01. 40 pp.

Rogers, J.B., M. Wilkins, D. Kamikawa, F. Wallace, T. Builder, M. Zimmerman, M. Kander, and B. Culver. 1996. Status of the remaining rockfish in the *Sebastes* complex in 1996 and recommendations for management in 1997. Appendix E in Status of the Pacific Coast Groundfish Fishery through 1996 and Recommended Acceptable Biological Catches for 1997, Stock Assessment and Fishery Evaluation. Pacific Fishery Management Council, 2000 SW First Ave., Portland, OR 97201.

Rogers, J.B., R.D. Methot, T.L. Builder, M. Wilkins, and K. Piner. 2000. Status of the darkblotched rockfish (*Sebastes crameri*) resource in 2000. Appendix to: Status of the Pacific Coast Groundfish Fishery through 2000 and Recommended Acceptable Biological Catches for 2001, Stock Assessment and Fishery Evaluation. Pacific Fishery Management Council, 2000 SW First Ave., Portland, OR 97201.

Stock Assessment Review (STAR). 2000. STAR panel meeting report on darkblotched rockfish (this document) Pacific Fishery Management Council, Portland, Oregon.

