

Appendix 5

STATUS OF BOTTOMFISH STOCKS 2003 APPLICATION OF CONTROL RULES

Revised April 15, 2005

Reference values for biomass and fishing mortality are needed for application of the control rules. Since estimates of biomass and fishing mortality are not available for any of the areas involved, proxies of CPUE and effort at msy, respectively, are used to establish reference values. The current values for CPUE and effort are compared to the reference values and their ratio determines the current status of the fishery relative to control rule thresholds. The best available reference value estimates are used for each region. It should be noted that refinement of reference value estimates and standardization of catch and effort data for all fleets are on-going activities and those applied here are apt to change as better data become available.

For the outer island areas of Guam, CNMI, and American Samoa estimates of MSY, shown in Table 1, are very crude and are based solely on the catchability estimate, q , obtained from a research depletion study conducted at Pathfinder Reef in the CNMI and the length of the 100 fathom contour in these island areas. These estimates refer to the deepslope resources only and do not include shallow complex resources, emperors and small snappers. Reference values for biomass and fishing mortality in terms of current regional commercial fishing activity, CPUE and effort, have not been established. In cases like this the control rules allow estimation of reference values based solely on a time series of CPUE and effort values obtained from the commercial fleet.

Table 2 lists similar CPUE and effort data as presented in the 2003 modules for American Samoa and the CNMI. CPUE at MSY is estimated using a 5-year running average as described above. Effort at MSY, however, cannot be estimated in the same manner because CPUE never drops below CPUE_{msy} and a simple long-term average would not be an appropriate limit in developing fishery situation as found in these areas. The estimate of effort at MSY presented in Table 1 for each of these areas is calculated from the crude deepslope MSY value listed and the CPUE_{msy} value obtained above for each area. These should be a conservative estimates since it is based solely on the deeper species complex.

For Hawaii a longer time series of more complete data have allowed the application of a simple dynamic surplus production model. A three parameter model was fit to the NWHI daily CPUE and the MHI per trip CPUE time series with parameters of intrinsic rate of increase, r ; Mau zone carrying capacity, k ; and MHI catchability, q . NWHI zone q values used in the model were based on standardized estimates obtained from a research depletion study carried out in the CNMI. A four-step pattern of MHI q was used to simulate changes in catchability expected from changes in technology and experience of MHI fishermen. Carrying capacity values for the Hoomalu zone and MHI were based on the Mau zone k adjusted by relative length of 100 fathom contour for the zones. The reference values obtained for each zone are presented in Table 3.

For the Guam bottomfish complex, the available catch and effort data have not yet been reviewed and processed to the extent necessary to compute time series of effort and CPUE for

the purpose of establishing the reference values or estimating current values.¹

The control rule uses the reference values to establish thresholds. The current status of the fishery is determined by the ratio of current values of CPUE and effort compared to the reference values. The maximum fishing mortality threshold (mfmt) is set at the effort at MSY, such that overfishing is occurring when the current effort ratio is greater than 1.00. The biomass threshold, MSST, is defined as 1.0 minus natural mortality. Natural mortality for species of the bottomfish complex is poorly estimated. Various sources report natural mortality estimates ranging from 0.30 to 0.90. We have selected the precautionary value of 0.30 for the purpose of establishing the MSST. The resulting MSST is 0.70. The current status of the stocks for the various island areas are presented in Table 3 and Figure 1. In 1998 the State of Hawaii established bottomfish restricted fishing areas encompassing 20% of the 100 fathom contour in the MHI. Commercial CPUE and effort data does not reflect any benefit in terms of increased biomass or decreased fishing mortality obtained from these closures. In Table 3 the MHI and Archipelago-wide biomass and fishing mortality ratios include potential benefits due to closure ranging from 0-20%, giving an upper and lower estimate of current condition. As can be seen in Table 3, American Samoan and CNMI fisheries are undeveloped with healthy stocks and minimal fishing effort (mortality). In Guam the necessary effort and CPUE estimates could not be made and therefore the status of the stock is unknown. In Hawaii stocks are below that necessary for MSY and only slightly above the msst of 70% CPUE_{msy} and effort continues to be above the mfmt threshold indicating overfishing. The MHI is the zone that contributes most of the problems in terms of both reduced biomass and overfishing. The Mau zone has recently shown a high level of fishing effort, as well.

Reference values for the Hancock Seamount armorhead fishery are obtained from a time series of Japanese trawl data covering the entire range of the northern Pacific stock. CPUE_{msy} is calculated from this time series as 50% of the highest 5 year running average of CPUE (in terms of mt per trawl hr). Effort is calculated as the mean of effort values prior to a drop in CPUE. MSY for the US EEZ is calculated as 9% of the total MSY for the stock, because about 9% of the fishing grounds and historical catch is from the US seamounts. There is a moratorium in effect since 1986 for trawling within the US EEZ. Trawl catches obtained at Colahan Seamount (just outside of the US EEZ) are used as a proxy for conditions at the unfished Hancock Seamounts. The latest estimates of CPUE for armorhead, the 2002 value, remain well below the 7.5 mt/hr level expected at MSST indicating that this stock remains overfished.

¹A previous version of this report, dated June 30, 2004, included time series of effort and CPUE for the Guam bottomfish complex, as well as reference and current values of effort and CPUE (Table 2 in that version). Since that version was made available, errors were found in the source data used to make the calculations, and the results and conclusions were consequently found to be unreliable. This report version replaces that version and corrects the errors by removing the unreliable effort and CPUE estimates for the Guam bottomfish complex, as well as the conclusions drawn from those estimates. It is anticipated that an assessment for the Guam bottomfish complex will be included in the 2004 annual report.

Table 1 MSY and Reference Values (CPUE and Effort at MSY) by Island Area

Island Area	MSY	CPUE at MSY	Effort at MSY
Guam	NA	NA	NA
American Samoa	74,970 lb	6.70 lb/hr	11,190 hr
CNMI	171,990 lb	65.3 lb/trip	2,634 trips
MHI	353,435 lb	407 lb/trip	868 trips
Mau zone	97,904 lb	470 lb/day	208 days
Hoomalu zone	339,728 lb	431 lb/day	789 days
Seamount (armorhead)	1,782 mt	10.71 mt/hr	166 hr

Table 2 CPUE and Effort Data for American Samoa and CNMI with 5-year running average for CPUE and MSY values

Year	Am. Samoa			CNMI		
	CPUE	5-yr ave	Effort	CPUE	5-yr ave	Effort
1982	8.5		7671			
1983	10.0		12695	43		536
1984	10.7		8796	70		489
1985	8.1		17682	117		279
1986	8.3	9.1	10983	104		229
1987	11.9	9.8	2632	169	100.6	236.0
1988	17.3	11.3	3661	181	128.2	209.0
1989	16.7	12.5	2844	73	128.8	267.0
1990	9.2	12.7	1548	81	121.6	128.0
1991	9.1	12.8	2042	47	110.2	122.0
1992	9.3	12.3	1426	59	88.2	143.0
1993	7.3	10.3	2393	84	68.8	176.0
1994	7.7	8.5	5857	74	69.0	276.0
1995	9.8	8.6	3497	93	71.4	310.0
1996	14.8	9.8	2608	119	85.8	448.0

1997	14.7	10.9	2712	137	101.4	375.0
1998	14.0	12.2	1132	148	114.2	318.0
1999	12.9	13.2	1519	156	130.6	288.0
2000	10.2	13.3	2769	56	123.2	647.0
2001	15.2	13.4	3210	68	113.0	833.0
2002	7.6	12.0	5489	101	105.8	370.0
2003	16.2	12.4	1620	89	94.0	374.0
	CPUEmsy	6.7			65.3	
		Effort ave	4763			335.9
MSY (lbs)	74970			171990		
		Effort msy	11190			2633.8

Table 3 Current Status of Bottomfish by Island Area

Island Area	Ratio of CPUE (current/msy)	Ratio of Effort (current/msy)
Guam	Unknown	Unknown
American Samoa	2.42	0.14
CNMI	1.36	0.14
Hawaii*	0.72-0.86	1.14-1.35
MHI*	0.44-0.75	1.86-2.33
Mau*	0.93	1.19
Hoomalu*	0.96	0.37
Seamount (armorhead) ⁺	NA	NA

* 2002 data used (2003 data incomplete)

⁺ Moratorium within US EEZ

Figure 1. Control Rule Application

