Southwest Fisheries Center Honolulu Laboratory
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ANALYSIS OF THE DEPLETION OF BOTTOM FISHES AT 2% BANK, AMERICAN SAMOA

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ORIGINAL

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NOT FOR PUBLICATION

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I was in American Samoa from May 22 to May 29, 1989, at the request of their Department of Marine and Wildlife Resources (DMWR). The purpose of the trip was to evaluate bottom fish catch data and attempt to document a depletion of bottom fish stocks. I spent my time working with Troy Buckley and associated staff at the DMWR office. First, I inspected a drawer of unsorted materials that might provide pertinent data. This drawer contained a historical summary of bottom fish fishing in American Samoa, several bottom fish fishing related reports written by DMWR and others, and copies of DMWR annual reports going back to 1973. Expected data concerning the suspected depletion of ehu, Etelis carbunculus, and onaga, E. coruscans, stocks at a small offshore pinnacle called 2% Bank, unfortunately, were not found in this drawer.

Here is a brief impression of the American Samoa fishery. The fleet is largely composed of vessels of less than 30 feet, numbering from 10 to about 50 vessels depending on the year in question. Many of these vessels concentrate on trolling activities and rarely if ever conduct bottom fish fishing operations. Most, if not all, of the fishermen do not rely on the sale of their catch as their sole source of income, and many use their boats solely for entertainment and supplemental income. Therefore, effort may not be as concentrated during a set fishing time as that of true commercial fishermen. Most fishing effort is directed at the shallow water snapper complex, including Lutjanus kasmira, L. gibbus, and Lethrinus rubioperculatis. Deepwater snappers, such as Etelis spp. and Pristipomoides spp., are not in high demand in the local market and most fishermen do not feel it worth their while to send these fish to the Honolulu fish auction, particularly with the uncertainty over what the selling price might be on a particular day.

As a first look at possible depletion of bottom fish stocks over time, I graphed the quarterly mean catch per bottom fishing trip values calculated from the annual reports, 1973-87 (Graph 1). As can be seen, the mean catch per trip fluctuates considerably over time, but no general decrease or increase can be determined. Catch rates are mostly between 100 and 150 pounds per trip in both 1973-74 and 1985-86. It should be noted that these catch values include all bottom fish species and do not take into consideration trip length, area fished, or vessel size. It is possible that certain areas, particularly those in shallow water and close to port, are depleted and that vessels must travel farther or fish less desirable species to maintain the constant poundage per trip.

To help answer this question, I looked at handwritten Dory Project trip results giving catch per trip and number of crew for trips between 1974 and 1978. These recorded the area fished as well as the catch. I chose results from the two most frequently fished areas, Aunuu and Taputapu, to compare with recent catches from the same areas. Graphs 2 and 3 show the results of these comparisons. Again, no significant decrease (or increase) can be seen between early and recent catch rates for these two areas. In fact, the 1988 values are higher than the 1974-76 values (though not significantly). The conclusion to be made so far is that depletion of stocks does not appear to be a problem in the American Samoa bottom fish fishery which targets the shallow water snappers and associated species.

On Friday, 26 May 1989, Buckley and I talked to Mike Crook, who had conducted bottom fish fishing operations at the 2% Bank in 1986. Crook gave us the dates of his trips to the area from his logbook. Unfortunately, locations of trips were not recorded, but sales to the United Fishing Agency were, and it was assumed that Crook's memory of the dates for fishing at 2% Bank was reliable. The auction sales reports were used to determine the catch per trip for Crook's trips and for the cumulative removals by adding the weights of all Samoan ehu and onaga sold during this time period, 23 February to 21 May 1986. Graph 4 shows the catch per unit of effort (CPUE) versus cumulative removals for these two species. After a period of slightly increasing catch rates, the catch rates decline rapidly. If the increasing catch rates of the early points are considered to be a learning period and only the decreasing portion (the last seven data points) is regressed to determine original biomass and catchability, the results indicate an original biomass at 2% Bank of 6,180 pounds of ehu and onaga, of which 4,846 pounds were removed during the 3-month fishing period. The r^2 value for this regression is 0.76, and the probability is 0.011, showing a good fit to the data. Catchability for the entire bank is the slope of the regression, or 0.089 $trip^{-1}$, indicating a 9% removal of biomass per trip from 2% Bank.

How reasonable is this estimate of 6,180 pounds of ehu and onaga for 2% Bank? To compare this result with those of other areas, the area of 2% Bank expressed as the length of the 100-fathom contour around the bank needs to be determined. Unfortunately, a chart of this bank cannot be found, and may not exist. Buckley asked Crook for his impression of the size and shape of the bank. The resulting sketch indicates a 100-fathom contour of about 2.5 nmi. This would result in a bottom fish density of 2,472 pounds/nmi. In the Marianas Archipelago, Polovina and Ralston (1986) estimated a density of bottom fish at the western seamounts to be about 1,978 pounds/nmi, a very similar amount lending credability to the result from 2% Bank.

In summary, although the traditional shallow water bottom fish fishery shows no signs of depletion with the current data, the deepwater snapper fishery at 2% Bank shows definite signs of drastic depletion. The high catchability value obtained at 2% Bank suggests a high susceptability to overfishing for ehu and onaga. The data from which these conclusions are made are not the best. They rely on several assumptions (e.g., all ehu and onaga caught at 2% Bank during the depletion period were sold at the United Fishing Agency auction, fishing dates used were matched correctly to the United Fishing Agency sales in calculating weights for catch per trip, all ehu and onaga sold during this period were actually caught at 2% Bank, and the area of 2% Bank is reasonably estimated). However, these data are the best we have, and they give reasonable results.

With the apparent depletion of deepwater snappers at 2% Bank and the lack of intervening fishing conducted at this remote bank, a unique opportunity to document the recovery of fish stocks at a depleted area presents itself. Excellent data could be gathered from this bank, with DMWR staff participating on research or charter trips. Quarterly, semiannual, or even annual trips to the area would be very valuable.

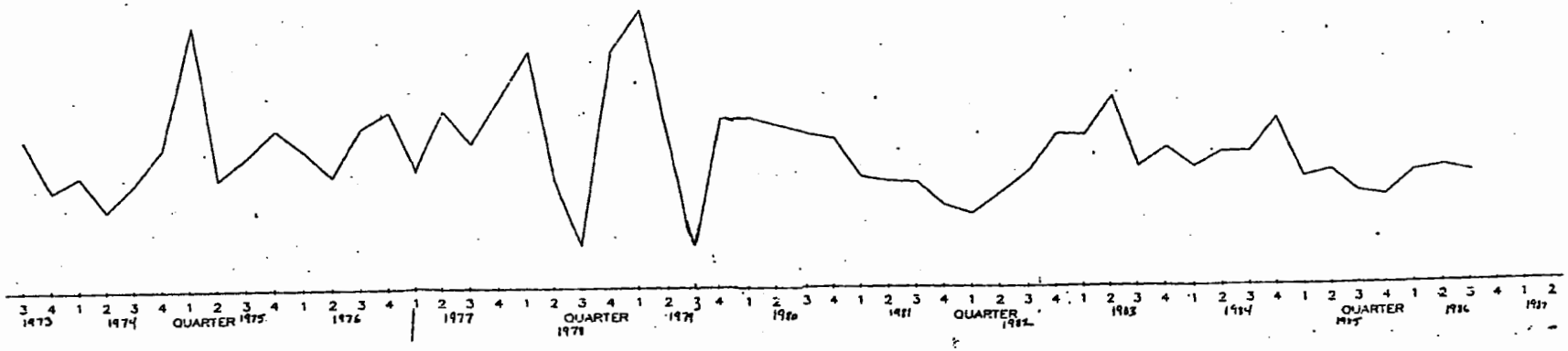
Important information to record would be fishing time and depth; number of lines fishing; and length, weight, and species of each fish caught. Catches may be small or nonexistent at first, but this is valuable information in itself and the sampling plan should still be followed through if initiated. Nowhere in the Pacific has the recovery of a depleted deepwater snapper population been documented. Thus, a sampling program at 2% Bank to first determine whether the population has been depleted would confirm estimates of maximum sustainable yield; secondly, if depletion has occurred, continued sampling would provide information on the growth and recovery rate. This information would be very valuable to the management of the deepwater snappers.

REFERENCE

Polovina, J. J., and S. Ralston.
1986. An approach to yield assessment for unexploited resources with application to the deep slope fishes of the Marianas. Fish. Bull. 84:759-770.

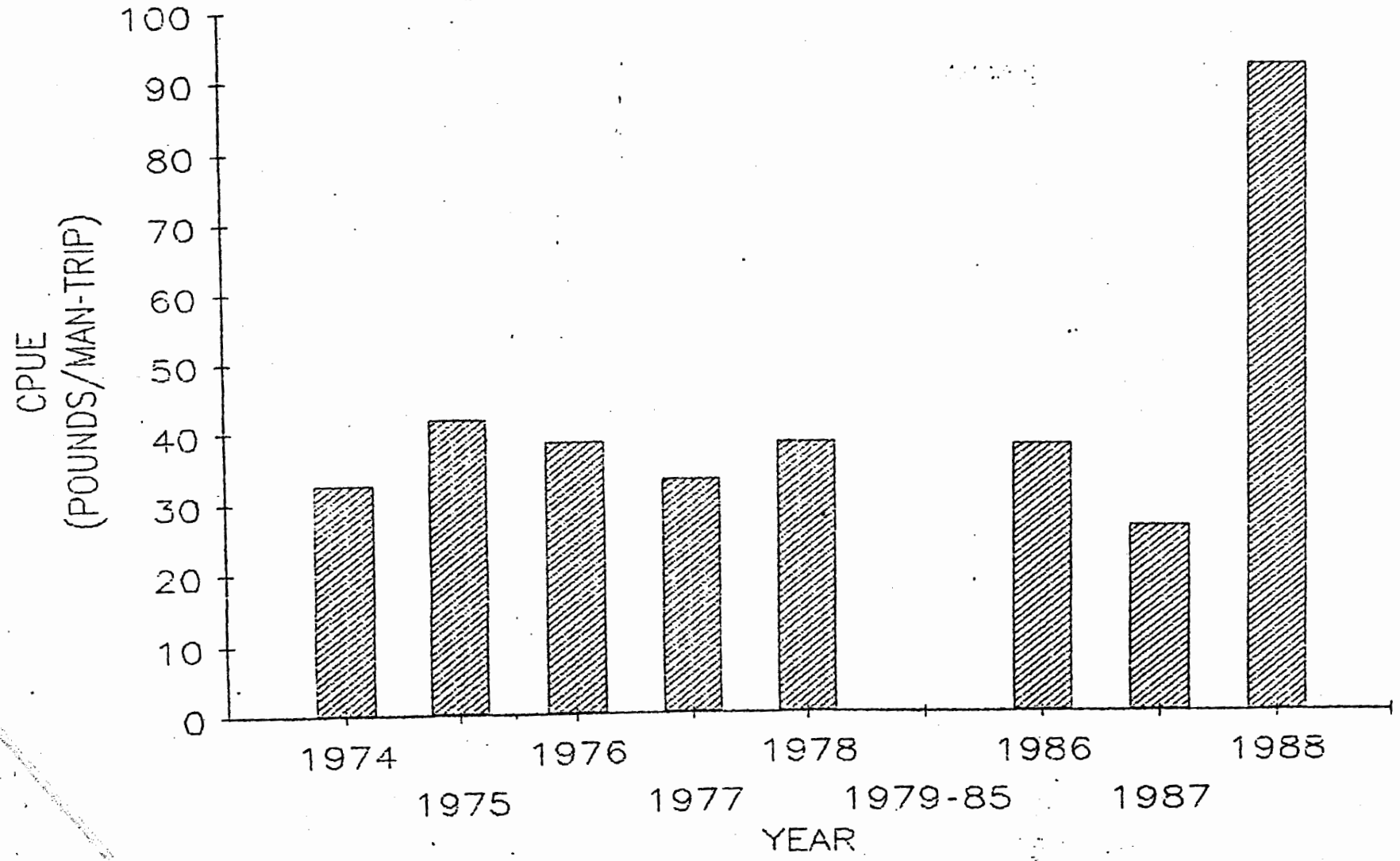
Graph 1

American Samoa Catch per Trip, 1973-87



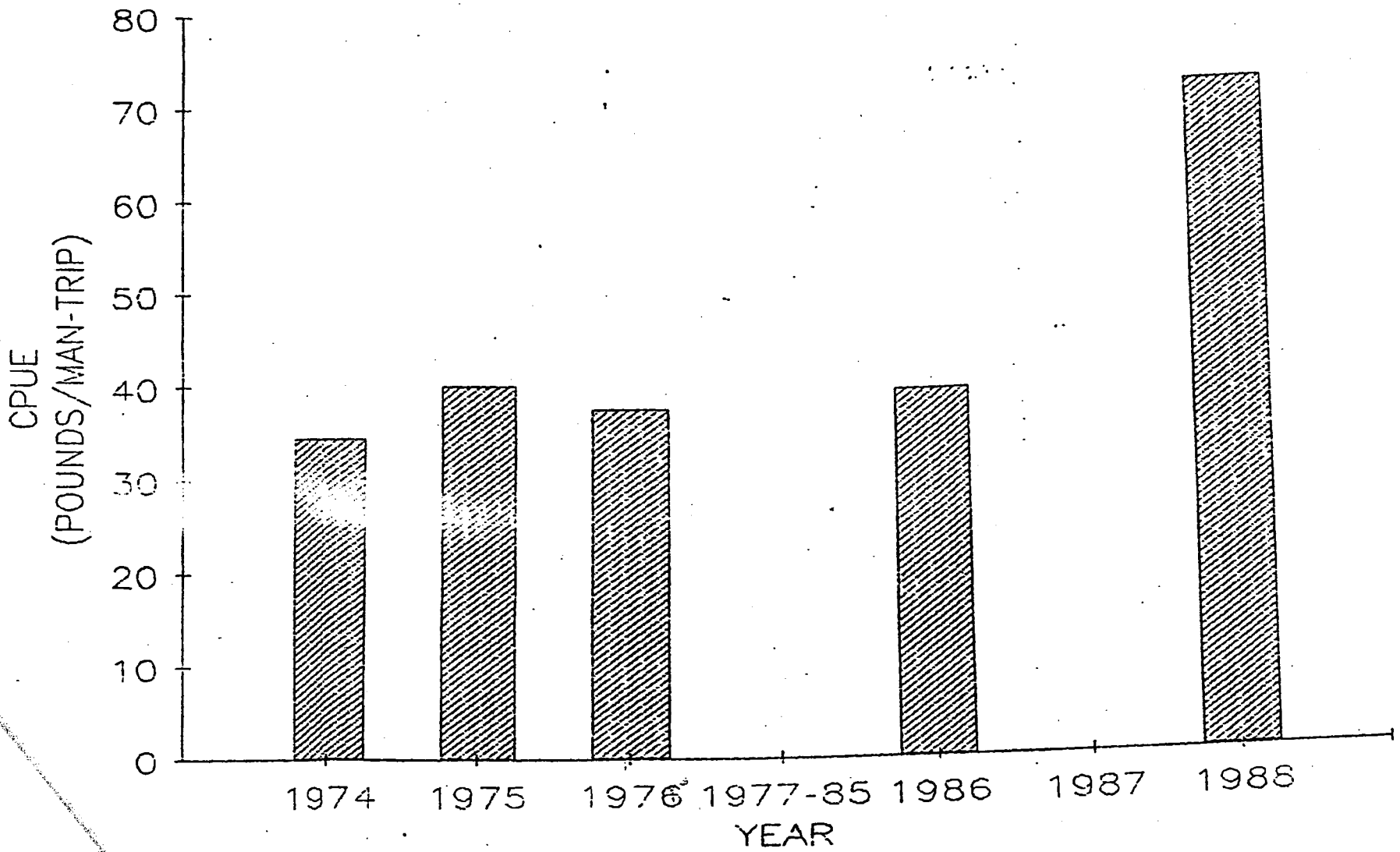
Graph 2

CATCH PER UNIT EFFORT FOR BOTTOMFISH AT AUNUU FISHING AREA 1974 - 1988



Graph 3

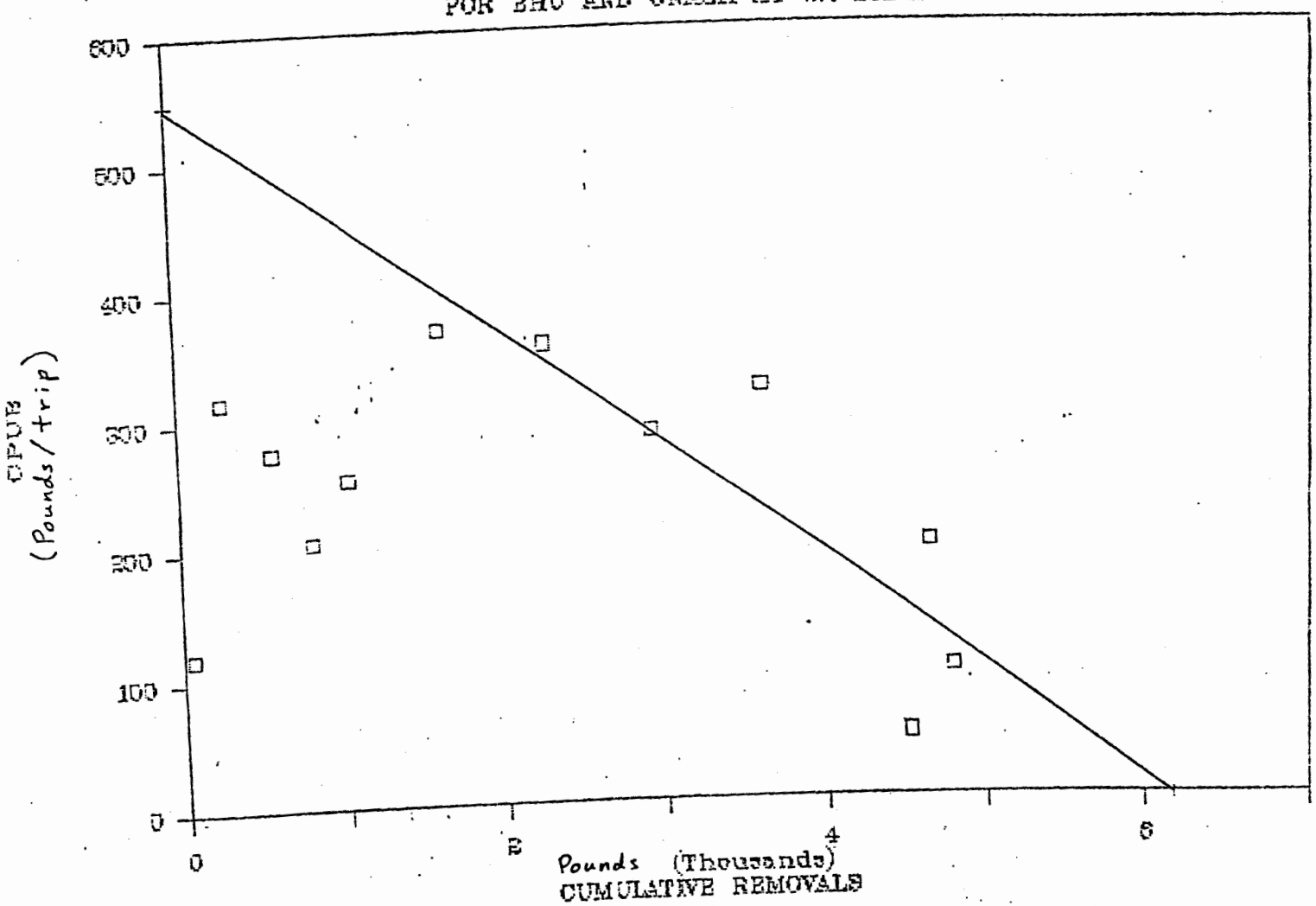
CATCH PER UNIT EFFORT FOR BOTTOMFISH AT TAPUTAPU FISHING AREA 1974 - 1988



Graph 4.

CPUE vs CUMULATIVE REMOVALS

FOR BHU AND ONAGA AT 2% BANK



COUNTRY / Area	Type	Principal Species	Nautical Miles of 200 meter isobaths	(Method) Number of Fish / nmi		Fish Mean Wgt (Kg.)	Unexploited Biomass / nmi (Tonnes)		Recruitment R/nmi/year	
MARIANAS		Pristipomoides zonatus		(Leslie)			(Leslie)			
Pathfinder Reef	SEA	P. auricilla	3.00	1354		1.5	2.0			
		P. flavipinnis								
		Etelis carbunculus								
TONGA		P. filamentosus		(Allen)			(Allen)		(Number of fish)	
		P. flavipinnis		M=.25	M=.50		M=.25	M=.50	M=.25	M=.50
801	SEA	Etelis coruscans	5.00	616	554	4.4	2.7	2.4	344	197
901	SEA	E. carbunculus	6.80	614	351	4.4	2.7	1.5	202	137
903	SEA		35.00	547	608	4.4	2.4	2.7	265	118
1004	SEA		1.20	1927	1233	4.4	8.5	5.4	762	493
FIJI SEAMOUNTS		Etelis coruscans		(Leslie)			(Leslie)			
Taveuni	SEA	E. carbunculus	3.10	333		7.5		2.5		
Napuka	SEA		4.20	507		7.5		3.8		
Kadavu	SEA		18.00	200		7.5		1.5		
Savusavu	SEA		7.90	189		6.5		1.2		
GRID 147	SEA		13.10	931		7.5		7.0		
FIJI SHELF										
Nasilai to Ovalau	ISLAND		50.00	94		7.5		0.7		
Ovalau to MoonReef	ISLAND		42.00	95		7.5		0.7		
MoonReef to Ellington	ISLAND		40.00	75		7.5		0.6		
GRID 482	ISLAND		40.00	73		7.5		0.5		
VANUATU									Recruitment	
		Etelis carbunculus		(Allen)			(Allen)		R/nmi/year - tonne	
		E. coruscans		M=.25	M=.50		M=.25	M=.50	M=.25	M=.50
Paama	ISLAND	E. radiosus	28.00	1277	1100	1.8	2.3	1.1	0.30	0.37
Ambae	ISLAND	Lutjanus malabarius	62.00	389	167	1.8	0.7	0.3	0.10	0.13
PAPUA NEW GUINEA		P. multidens		(Leslie)			(Leslie)			
Schoutten Islands	ISLAND	P. filamentosus	33.00	121		2		0.2		
Kavieng	SEA	E. carbunculus	0.25	416		2		3.3		
		Wattsia mosambitus								
		L. malabaricus								
		Paracaesia stonei								