


MEMORANDUM

TO: Council, SSC, and AP

FROM: Clarence G. Pautzke 
Executive Director

DATE: November 27, 1990

SUBJECT: Gulf of Alaska Groundfish

ACTION REQUIRED

- (a) Review final Stock Assessment and Fishery Evaluation (SAFE) report and set ABCs.
- (b) Set TACs, apportionments to DAP and JVP, and groundfish PSCs for 1991.

BACKGROUND

- (a) Review final SAFE and set ABCs

In September, a preliminary SAFE report was provided which indicated that, in the absence of the completion of the triennial trawl surveys, the best information available concerning status of stocks was contained in last year's SAFE document. The Council set preliminary 1991 ABCs the same as the final ABCs for 1990, pending further information. The Plan Team met in November to prepare the final SAFE reports which were mailed to you on November 23. The Plan Team incorporated the results of the 1990 triennial trawl survey in determining ABC recommendations for the 1991 fishing year. A summary of the Plan Team's recommendations for each species or species complex, taken from the SAFE report, is provided as item D-2(a-b)(1).

For pollock in the Gulf of Alaska, there is a considerable difference between the ABC recommended by the Plan Team this year and that recommended last year. The current assessment incorporates two changes to the stock synthesis (SS) model used to estimate pollock biomass: (1) the 1990 Gulf-wide bottom trawl survey estimates biomass to be 1,004,377 mt, and (2) the estimate of the natural mortality rate was revised from 0.4 to 0.3. When the SS model incorporates survey selectivity, the current biomass estimate for ages 3+ is 1,372,000 mt. Similarly, the current assessment now estimates the 1989 biomass to have been 1,564,000 mt for ages 3+ (as opposed to earlier estimates of 891,000 mt). According to the current assessment with a revised hindcast of historical biomasses, the population is at a higher level than previously believed, but has been declining since 1988. The Team's recommended ABC for pollock was derived by applying a 10% exploitation rate to the estimated 1991 exploitable biomass. Note that the exploitable biomass estimates from the hydroacoustic surveys differed significantly from the estimates by the bottom trawl survey. The Plan Team, consistent with last year's recommendation, placed greater confidence on the estimates derived from the bottom trawl survey. In regards to the Council's inquiry as to the setting of a Gulfwide ABC for pollock with the ability to shift TACs in-season between areas, the Plan Team does not support this proposal. The consensus was that this could lead to inequitable exploitation rates

between the regulatory areas in the event a large amount were to be reapportioned from one area to another.

A continued decline is observed in Pacific cod stocks, reflected in the Team's ABC recommendation of 77,900 mt, about a 12,000 mt decrease from last year's recommended ABC.

Team-recommended 1991 ABCs for deep and shallow water flatfish decreased from 1990 while the recommended ABC for arrowtooth flounder increased considerably. Increases in total flatfish biomass are almost entirely due to an increase in arrowtooth flounder. Part of the decrease in ABC for deep water flatfish is because the Plan Team established a separate ABC for flathead sole, with the concern that this species was inappropriately included in the deep water category. The Team was unwilling to include flathead sole in the shallow water category because the resultant increase in ABC for that category could produce unacceptably high exploitation rates for rock sole. The Team also recommends that Greenland turbot landings be reported in the deep water category. Team-recommended flatfish ABCs for 1991 are as follows: Deep - 50,500 mt; Shallow - 74,000 mt; Arrowtooth - 340,100 mt; Flathead sole - 50,400 mt.

In response to declining biomass estimates for sablefish, the Team recommends an ABC of 22,500 mt for 1991, a decrease from the previous year's ABC of 26,200 mt.

Given the lack of biomass estimates for demersal shelf rockfish, the Plan Team has no recommendation for an ABC for this species. However, it notes that a TAC of approximately 500 mt would be consistent with previous exploitation rates and would be adequate to provide for the increase in reported bycatch without impacting the directed fishery harvest objectives for 1991.

The other rockfish assemblages all show decreasing biomass estimates, especially so for thornyhead rockfish. The Team's recommended ABCs for these species groups are as follows: Slope rockfish - 15,400 mt; Pelagic shelf rockfish - 4,800 mt; Thornyhead rockfish - 980 mt. For pelagic shelf and thornyhead rockfish, these ABCs represent considerable decreases compared to the 1990 ABCs.

(b) Set TACs, apportionments to DAP and JVP, and groundfish PSCs

After setting final ABCs, the Council must set Total Allowable Catch (TAC) levels for each species or species complex and the apportionments of those TACs to DAP and JVP. The DAP requests from the NMFS survey will be distributed at the meeting. When you set preliminary ABCs, TACs and apportionments in September, no apportionments were given to JVP. For reference purposes, the 1989 and 1990 Council recommended ABCs, TACs, and apportionments are provided as item D-2(a-b)(2).

Item D-2(a-b)(3) is a worksheet for purposes of the TAC setting process. This worksheet has space for SSC recommendations of ABCs and for AP recommendations for TACs and apportionments. It also includes 1990 TACs and catch-to-date figures for the 1990 fishing year. The second page of this item consists of a blank worksheet for Council use. Staff will provide a computer worksheet as a screen projection to provide easy viewing of the numbers.

PART A: CURRENT STATUS OF STOCKS
AND ACCEPTABLE BIOLOGICAL CATCHES

Tables 1 and 2 provide a summary of the current status of the groundfish stocks, including estimated maximum sustainable yields, catch statistics, the 1989 and 1990 TACs, and final recommendations for ABCs for 1990 and 1991. Catch statistics, 1990 TACs, and ABCs are divided among the Gulf of Alaska regulatory areas. These areas are illustrated in Figure 1.

The abundances of Pacific cod, deep-water flatfish, shallow-water flatfish (except rock sole), flathead sole, arrowtooth flounder, and sablefish are high. The abundance of pollock is medium. The abundances of slope rockfish, demersal shelf rockfish, and thornyheads are low.

The sum of the 1991 ABCs is 769,880 mt, which is within the FMP-approved optimum yield (OY) of 116,000-800,000 mt for the Gulf of Alaska. The team notes that because of halibut bycatch mortality considerations in the high-biomass flatfish fisheries, an overall OY for 1991 will be considerably under this upper limit. For perspective, the sum of the TACs was 297,749 mt in 1990.

Table 1. Groundfish maximum sustainable yields (MSYs), 1990 and 1991 ABCs, 1989 and 1990 TACs, 1989 catches and 1990 catches through October 27, 1990.

Species	MSY	ABC (mt)		1989 Catch	1989 TAC	1990 Catch	1990 TAC	
		1990	1991					
Pollock	229,000	W/C	63,750	130,000	66,570	65,750	79,580	63,750
		Shelikof*	6,250	Part of W/C	6,124	6,250	7,587	6,250
		E	3,400	3,400	33	200	277	3,400
		Total	73,400	133,400	72,727	72,200	79,857	73,400
Pacific cod	39,100	W	29,500	25,700	13,830	13,500	30,022	29,500
		C	59,500	48,300	27,626	52,000	36,770	59,500
		E	1,000	3,900	221	5,700	329	1,000
		Total	90,000	77,900	41,676	71,200	67,122	90,000
Flatfish** (deep water) (includes flathead sole)	30,281 (includes flathead sole)	W	16,300	2,000	0	3,200	313	3,650
		C	77,700	38,900	2,597	31,800	6,661	15,300
		E	14,400	9,600	2	1,000	506	3,050
		Total	108,400	50,500	2,599	36,000	7,481	22,000
Flatfish*** (shallow water)	28,254	W	30,200	48,800	88		792	3,570
		C	52,200	22,200	1,603		4,725	6,180
		E	2,100	3,000	140		199	250
		Total	84,500	74,000	1,831		5,716	10,000
Flathead sole		W		12,600				
		C		32,700				
		E		5,000				
		Total		50,300				
Arrowtooth flounder	110,042	W	27,000	40,800	39		1,037	4,450
		C	141,000	272,100	642		15,047	23,170
		E	26,600	27,200	42		1,557	4,380
		Total	194,600	340,100	723		17,641	32,000

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Table 1 (cont.) Groundfish maximum sustainable yields (MSYs), 1990 and 1991 ABCs, 1989 and 1990 TACs, 1989 catches and 1990 catches through October 27, 1990.

Species	MSY (mt)		ABC (mt)		1989 Catch	1989 TAC	1990 Catch	1990 TAC
			1990	1991				
Sablefish	34,000 (GOA & BSAI combined)	W	3,800	2,925	4,200	3,770	1,939	3,770
		C	11,800	10,575	12,245	11,700	12,046	11,700
		WYK	4,600	4,050	5,515	4,550	5,181	4,550
		SE/EYK	6,000	4,950	6,110	5,980	6,403	5,980
		Total	26,200	22,500	28,070	26,000	25,570	26,000
Slope rockfish	15,000- 27,700	W	4,300	2,830	4,240	5,774	5,108	4,300
		C	7,700	7,020	7,580	8,452	9,739	7,700
		E	5,700	5,540	6,223	5,774	6,425	5,700
		Total	17,700	15,400	18,043	20,000	21,092	17,700
Pelagic shelf rockfish	Unknown	W	1,400	800	104	500	161	1,400
		C	5,800	3,100	860	2,400	946	5,800
		E	1,000	900	688	400	526	1,000
		Total	8,200	4,800	1,652	3,300	1,633	8,200
Demersal shelf rockfish (SE Outside District)	Unknown	Unknown	Unknown	412	420	307	470	
Thornyhead rockfish	3,750	GW	3,800	980	3,080	3,800	1,537	3,800
Other species	NA	GW	NA	NA	1,654	11,646	7,530	14,179
			762,575	769,880	178,102	235,485	235,486	297,749

* Shelikof Strait pollock is included within the W/C ABC range.

** "Deep water flatfish" means rex sole, Dover sole, and Greenland turbot.

*** "Shallow water flatfish" means rock sole, yellowfin sole, butter sole, starry flounder, and other flatfish not specifically defined.

GW means Gulfwide

Table 2. Exploitable biomasses, 1991 ABCs, and estimated trends and abundances of groundfish.

Species	Exploitable Biomass (mt)	1991 ABC	Abundance, trend
Pollock	1,303,000	W/C 130,000 Shelikof (Part of W/C) E 3,400 Total 133,400	Medium, decreasing
Pacific cod	424,100	W 25,700 C 48,300 E 3,900 Total 77,900	High, decreasing
Flatfish (deep water)	201,500	W 2,000 C 38,900 E 9,600 Total 50,500	High, stable
Flatfish (shallow water)	333,900	W 48,800 C 22,200 E 3,000 Total 74,000	High, stable
Flathead sole	251,800	W 12,600 C 32,700 E 5,000 Total 50,300	High, stable
Arrowtooth flounder	2,000,800	W 40,800 C 272,100 E 27,200 Total 340,100	High, stable
Sablefish	194,000	W 2,925 C 10,575 WYK 4,050 SE/EYK 4,950 Total 22,500	High, decreasing
Slope rockfish	550,000	W 2,830 C 7,020 E 5,540 Total 15,400	Low, decreasing
Pelagic shelf	96,300	W 800 C 3,100 E 900 Total 4,800	Relative rockfish abundance and trend unknown

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Table 2. (cont.) Exploitable biomasses, 1991 ABCs, and estimated trends and abundances of groundfish.

Species	Exploitable Biomass (mt)		1991 ABC	Abundance, trend
Demersal shelf rockfish (SE Outside district)	Unknown		Unknown	Depressed, stable
Thornyhead rockfish	25,700	Gulfwide	980	Depressed, decreasing
Other species	NA	Gulfwide	NA	TAC = 5% of the sum of TACs

$\Sigma = 5,381,100$

769,880

Pollock

	<u>ABC</u>	<u>EXPLOITABLE BIOMASS</u>	<u>CATCH</u>
1989	75,375	330,000- 593,000	78,879
1990	73,400	891,000	79,857
1991	130,000	1,303,000	

The exploitable biomass estimates for 1989 are from the 1988 hydroacoustic survey (330,000 mt), and 1987 bottom trawl survey (593,000 mt). For 1990, the stock synthesis model was utilized which estimated biomass at 891,000 mt. The estimated 1991 biomass is 1,303,000 mt which is based on a projection from the 1990 biomass estimated from stock synthesis (SS).

The current assessment incorporates two major changes into the SS model. First, the 1990 Gulf-wide bottom trawl survey estimated biomass at 1,004,377 mt. The second major change was in revising natural mortality from 0.4 to 0.3. A significant component of older fish (10+) were discovered in offshore waters outside of Shelikof Strait in 1989 and 1990, prompting a re-analysis of the natural mortality rate. When the SS model incorporates survey selectivity, 1990 biomass is estimated at 1,372,000 mt for ages 3+. Similarly, the current assessment now estimates the 1989 biomass to have been 1,564,000 mt for ages 3+. According to the current assessment with a revised hindcast of historical biomasses, the population is at a higher level than previously believed and has been declining since 1988. The decline is attributed to the weak 1982, 1983, 1986 and 1987 year classes.

The Team's recommended ABC was derived by applying a 10% rate to the estimated 1991 exploitable biomass. In 1988 when the trawl and hydroacoustic surveys first provided very different estimates of pollock biomass, the SSC developed an appropriate rate by examining past fishing in the Gulf prior to the development of the Shelikof Strait fishery. Catches were about 10% of the estimated biomass, and harvesting at this rate outside of Shelikof Strait was coincident with a substantial increase in the pollock population. Given the difficulty in determining an appropriate exploitation rate, the Team chose to apply a 10% rate to the 1991 biomass projected from a 1990 biomass estimated by SS tuned to bottom trawl survey data.

The recommended ABC differs from potential yields in the stock assessment which were derived by applying fishing mortality rates of 0.50 or 0.23 to projected 1991 biomass. These fishing mortality rates are the $F_{0.1}$ levels from a model which utilized parameters from 2 different runs of the SS model. (The SS model was tuned to either bottom trawl survey data or hydroacoustic survey data). The $F_{0.1}$ levels are tied to the assumed stock-recruitment relationship utilized in the model. The stock assessment notes the $F_{0.1}$ value of 0.50 is probably inflated due to an overly-optimistic stock-recruitment relationship, which shows that recruitment is not influenced by stock reduction until very low levels of spawning stock biomass.

Other concerns noted, were questions regarding the potential magnitude of the 1988 year class, and the differences in biomass estimates provided by the trawl and hydroacoustic surveys. The

Team concurred with the stock assessment that a fishing mortality rate of 0.5 may be too high given the uncertainty surrounding the current status of the stock. However, the Team did not utilize the $F_{0.1}$ value of 0.23 which assumes a 1990 biomass estimated from SS tuned to hydroacoustic data. The Team no longer supports the assumption that the hydroacoustic biomass estimates from Shelikof Strait represent the entire adult pollock stock in the Gulf of Alaska.

The recommended ABC for pollock is therefore 130,000 mt ($0.10 \times 1,303,000$ mt) for the Western/Central areas. The Team recommends that a portion of the TAC in the amount of 6,250 mt be allocated to the Shelikof Strait District to provide for a fishery for the collection of data. Lacking new information for the eastern Gulf population and noting that effort is low in this area, the Team again set ABC for the Eastern area at 3,400 mt. The ABC recommended for the Western/Central areas differs slightly from the 138,000 mt ABC recommended in the stock assessment. The ABC in the stock assessment was derived by averaging the yields determined by applying fishing mortality rates of 0.50 and 0.23.

There is sufficient concern with the stock-recruitment relationship, that the estimates of fishing mortality associated with sustainable yields may be over-inflated. Therefore, overfishing for pollock is the fishing mortality rate that results in the biomass-per-recruit ratio falling below 30% of the pristine level. This fishing mortality rate is 0.416. With a 10% rate (yield/biomass) in 1991, the fishing mortality rate will be approximately 0.09, well below the overfishing level.

The biomass estimates from the trawl and hydroacoustic surveys continue to provide very different estimates of the current status of Gulf pollock. The SS model shows the 1986 and 1987 year classes to have been weak when tuned to either trawl or hydroacoustic survey data. The SS model tuned to trawl survey data shows lower abundance of pollock prior to 1981 and higher abundance in recent years, compared to the model tuned to hydroacoustic survey data. The 1988 year class may potentially be strong, but it is still too early to judge the magnitude of this year class.

Pacific cod

	<u>ABC</u>	<u>EXPLOITABLE</u>	
		<u>BIOMASS</u>	<u>CATCH</u>
1989	71,200	558,700	41,547
1990	90,000	498,044	65,923
1991	77,900	424,100	

The 1990 bottom trawl survey of the Gulf of Alaska provided data for estimation of biomass of Pacific Cod by management area. Incorporating the bottom trawl results in the SRA model leads to an estimated exploitable biomass for 1991 of 424,100 t. This is a decline in biomass from previous years and the projection model estimates that the decline may continue.

The $F_{0.1}$ fishing mortality rate of .184 was used to calculate ABC for 1991. A 1990 fishing mortality rate of .187 corresponded to the 90,000 t ABC established by the Council for the 1990 fishing year.

The $F_{0.1}$ rate applied to the projected 1991 exploitable biomass of

424,100 t provides an estimate of ABC of 77,900 t. (Note that this is not a straight multiplication of $F \times \text{Biomass}$. Rather the F value is corrected to account for continuous growth and mortality.) This should be distributed by management area approximately as the biomass is distributed: 33% (25,700 t) in the western area; 62% (48,300 t) in the central area; and 5% (3900 t) in the eastern area.

The fishing mortality rate that would constitute overfishing would be .254. Hence, the recommended ABC does not violate the Council's overfishing policy.

Flatfish

	<u>ABC</u>	<u>EXPLOITABLE BIOMASS</u>	<u>CATCH</u>
1989	554,700	2,111,000	5,167
1990 Deep water	108,400	541,618	7,481
Shallow water	84,500	424,856	5,716
Arrowtooth flounder	194,600	1,144,242	17,641
TOTAL	387,500	2,110,717	30,838
1991 Deep	50,500	201,540	
Shallow	74,000	333,850	
Arrowtooth flounder	340,100	2,000,800	
Flathead sole	50,400	251,800	
TOTAL	515,000	2,787,990	

The 1991 exploitable biomass for each category is the same as the absolute abundance estimates from the 1990 triennial trawl survey. The increase in total biomass is almost entirely due to an increase in arrowtooth flounder. The decrease in shallow water flatfish is due mainly to decreasing abundance of rock sole. Flathead sole is a new category which in 1990 was included in the deep complex. Flathead sole biomass changed little in 1991. The decrease in the deep complex in 1991 is due almost entirely to recategorizing of flathead sole.

Fishing mortality rates for all flatfish groups was based on the $F_{0.1}$ value determined from yield-per-recruit analyses. All stocks are thought to be above the biomass that produces MSY; however, no estimate of F_{MSY} levels are available, due to the absence of stock-recruit relationships for flatfish species. In this case, the plan team opted to use $F_{0.1}$ fishing mortality rates.

The ABCs for the four flatfish categories were determined by applying the $F_{0.1}$ fishing mortality rates for each group to the exploitable biomass estimates. The plan team recommends that ABCs for each group be apportioned among the three regulatory areas in proportion to biomass distributions in the 1990 trawl survey. The resulting distributions are:

	WEST	CENTRAL	EAST	TOTAL
Deep water	2,000	38,900	9,600	50,500
Shallow water	48,800	22,200	3,000	74,000
Arrowtooth flounder	40,800	272,100	27,200	340,100
Flathead sole	12,600	32,700	5,000	50,300

All flatfish stocks are thought to be above the biomass that will produce MSY. In the absence of an F_{MSY} fishing mortality estimate, the team chose to use $F_{0.1}$ levels; therefore, the recommended ABCs do not violate the Council's overfishing policy.

The team recommendations for 1991 depart from 1990 by providing a separate ABC for flathead sole. The depth distribution of flathead sole in the 1990 triennial trawl survey clearly indicates that it is not a deep water species; therefore, its inclusion in the deep water complex is inappropriate. However, the plan team was unwilling to add flathead sole to the shallow water complex, as it would nearly double the shallow water biomass estimates. The plan team was concerned that the resultant increase in ABC for shallow water species could result in unacceptably high exploitation rates of rock sole, a species that experienced significant declines in biomass between 1987 and 1990.

The team also notes that Greenland turbot is included in the shallow water complex, while trawl survey results indicate it is more appropriately included in the deep water complex. Since the biomass estimate for this species is 0, moving it to the deep water complex involves no change in biomass estimates or ABCs. The team recommends that this change be implemented, and that Greenland turbot landings be reported in the deep water complex rather than in the shallow water complex.

Sablefish

	ABC	EXPLOITABLE	
		BIOMASS	CATCH
1989	30,900	249,000	27,763
1990	26,200	226,000	25,570
1991	22,500	194,000	

The method of calculating exploitable biomass from longline survey RPW indices in the Gulf of Alaska, Bering Sea, and the Aleutians was changed this year to a new scaling factor to provide consistency between regions. The cooperative longline survey and the domestic longline survey provided conflicting results as to whether the exploitable biomass of sablefish increased or decreased in the Gulf of Alaska in 1990. Utilizing the new scaling factor and assuming no change in the Gulf from 1989 to 1990, but zero recruitment for 1991, the exploitable biomass projected for 1991 is 194,000 mt.

The $F_{0.1}$ exploitation rate of .116 is used to calculate an ABC for 1991 of 22,500 mt. The exploitation rate used in the past has been equivalent to the $F_{0.1}$ level.

The 1988 to 1990 TACs were distributed in proportion to distribution of biomass in the 401-1000m slope and gully areas as estimated from the 1987 longline survey. The biomass distribution as obtained from the 1990 longline survey compares to the 1988-90 TAC apportionment as follows:

	<u>1990 RPW</u>	<u>1988-90 TAC</u>
Western	.13	.145
Central	.47	.45
W. Yakutat	.18	.175
Southeast Outside/ East Yakutat	.22	.23

The Team feels apportioning the 1991 ABC by either scheme or moderate variations of them would be satisfactory.

The $F_{0.1}$ fishing rate is below the estimated F_{msy} level of 0.27, as well as the fishing rate, $F=0.18$, that would drive biomass per recruit to 30% of its unexploited value. Therefore, the recommended ABC does not exceed that allowed by the overfishing definition.

It is also noted that sablefish abundance appears to be dropping in other areas of sablefish habitat, such as the Bering Sea, Aleutians, Southeast inside waters, and shallow gully areas of the Gulf. This suggests that the distribution of the North Pacific sablefish stock may be contracting from the marginal areas inhabited during the years of high abundance back to the preferred habitat areas. The survey which concentrates along the slope may not fully account for this phenomenon and therefore may not be particularly sensitive to initial decreases in overall abundance of this species.

Slope rockfish

	<u>ABC</u>	<u>EXPLOITABLE</u>	
		<u>BIOMASS</u>	<u>CATCH</u>
1989	20,000	702,000	18,973
1990	17,600	702,000	21,092
1991	15,400	550,000	

The 1990 trawl survey indicated a large decrease in exploitable biomass of slope rockfish from 1987 estimates (702,000 mt to 309,000 mt). SRA, using a range of recruitment scenarios, was fit to the data points of both surveys resulted in a range of biomass estimates projected for 1991. The appropriate recruitment scenario could not be determined, therefore the midpoint of this range is the value used for computing the 1991 ABC.

Because an appropriate recruitment scenario could not be determined, an exploitation rate equal to natural mortality rate ($M=0.05$), was used. The ABC is also adjusted downward by 44% to keep the shortraker and roughey rockfish exploitation rates from exceeding the desired rate. The 1990 exploitation rate was also equal to natural mortality and was applied to the 1987 biomass estimate of 702,000 mt. The adjustment to control the catch of shortraker and roughey rockfish in 1990 was 50%.

The resulting ABC for 1991 is 15,400 mt, and the recommended distribution, based on the biomass distribution averaged from the

1987 and 1990 trawl surveys, is: 2,830 mt for the Western area, 7,020 mt for the Central area, and 5,540 mt for the Eastern area.

The exploitation rate of .05 is below the fishing rate that would drive the biomass:recruit ratio to 30% of its unexploited state, which is computed to be $F=.108$. Therefore the recommended ABC does not exceed that allowed under the overfishing definition.

The magnitude of the decrease observed from the 1987 to the 1990 trawl survey casts some doubt as to the validity of at least one or both of the survey results, or the fishing mortality reported during the period between the surveys. The Team points out that, while the only available data indicates a dramatic decrease and the stock should be watched carefully, they are not comfortable with the capability of the present survey and its methods to accurately assess the abundance of rockfish. They recommend that innovative new techniques and approaches be attempted to better determine the distribution and abundance of slope rockfish. A survey approach that can utilize the capabilities of successful rockfish operations should be considered.

Pelagic shelf rockfish

	<u>ABC</u>	<u>EXPLOITABLE BIOMASS</u>	<u>CATCH</u>
1989	6,600	164,000	1,729
1990	8,200	164,000	1,633
1991	4,800	96,330	

The 1990 trawl survey estimate for pelagic shelf rockfish was 28,300 mt compared to the estimate 164,400 mt in 1987. Because the validity of the large difference in the surveys is questionable, the mean of the two estimates is used as exploitable biomass for computing ABC.

An exploitation rate equal to the natural mortality rate of .05 was used to compute an ABC of 4,800 mt. The distribution of the ABC, which is based on an average of the 1987 and 1990 biomass estimate distributions is: 800 mt in the Western area, 3100 mt in the Central area, and 900 mt in the Eastern area.

The exploitation rate of .05 is below the fishing rate that would drive the biomass:recruit ratio to 30% of its unexploited state, which is computed to be $F=.108$.

There is **doubt** as to the validity of trawl surveys' ability to assess **pelagic** species, especially considering the magnitude of the observed **contrasts** in the pelagic rockfish results.

Demersal Shelf Rockfish

Harvest of demersal shelf rockfish (DSR) through September, 1990 totalled approximately 285 mt, well below the 470 mt TAC. Both the directed harvest and bycatch of DSR were impacted by summer closures of the groundfish fisheries.

As the result of a review of commercial fisheries and survey data, the Alaska Department of Fish and Game (ADF&G) recommends that the DSR group be modified by removing bocaccio (*S. paucispinis*), silvergray (*S. brevispinis*) and redstripe (*S. proriger*) rockfishes

and adding redbanded rockfish (S. babcocki). Bocaccio, silvergray and redstripe would be placed in the slope assemblage.

The directed harvest is declining while the bycatch in fisheries for other species is increasing. The bycatch reported from other fisheries will exceed 100 mt by a substantial amount by the end of 1990. Much of the increase in reported bycatch is assumed, however, to be the result of more of the captured fish being landed and not the result of an increased fishing mortality.

There is no new information available to estimate ABC or MSY values for demersal shelf rockfish. No biological evidence exists to suggest that the total harvest of DSR should increase and there is no new information from the directed fishery to support a reduction in the directed fishing quotas.

In prior years, the TAC for this species group has been based upon a combination of the state's recommended directed fishing quotas and a bycatch allowance equal to the anticipated bycatch for the following year. If the same approach is used to set the TAC for 1991, the resulting TAC will have to be somewhat greater than the current 470 mt level. A TAC of approximately 500 mt should be adequate to provide for the increase in reported bycatch without impacting the directed fishery harvest objectives for 1991.

Thornyhead rockfish

	<u>ABC</u>	<u>EXPLOITABLE BIOMASS</u>	<u>CATCH</u>
1989	3800	98,670	3079
1990	3800	98,670	1537
1991	980	25,697	

Based on results of the 1990 trawl survey the best estimate of current exploitable biomass for 1991 is 25,697 t. The 1991 estimate has been adjusted upward to account for the lack of survey stations in 1990 at depths greater than 500 m. To adjust the 1990 estimate for the unsampled depths, the average proportion of the total biomass found deeper than 500 m in 1987 and 1984 (33 %) was assumed to be the same proportion of the total that would have been found in 1990.

Best estimates of current exploitable biomass derived from surveys in 1987 and 1990 indicate an apparent 74 % decline in thornyhead biomass over three years. The apparent decline has occurred despite the fact that thornyhead catches in 1989 and 1990 were 81 % and 61 % of the respective TACs. The Team did not adopt the Fmsy estimates because assumptions needed to arrive at the estimates did not seem to be supported by the subsequent yield estimates. Therefore, to determine an ABC, the Team chose an exploitation rate of 3.8 %, the same rate used for 1990. The recommended ABC for thornyheads for 1991 is 980 t (0.038 X 25,697). This may be sufficient only for bycatch needs.

No stock recruitment relationship has been defined for thornyheads. Therefore the maximum allowable fishing mortality rate for judging whether overfishing of thornyheads may occur was calculated as the value that results in the biomass-per-recruit ratio falling to 30 % of its pristine level. That value is $F = 0.07$, equivalent to an

exploitation rate of 6.5 %. Therefore, the recommended ABC does not exceed that allowed under the overfishing definition.

OTHER SPECIES - No recommendations were made by the Plan Team for this group. FMP procedures define the reasonable quota for this category to be set at 5 percent of the sum of the TACs established for the other species category.

GULF OF ALASKA GROUND FISH: Council recommendations for 1990 ABC, TAC, DAP, and JVP (in metric tons);

TABLE 1

Species	Area	1989				1990 Council Recommendations			
		ABC	TAC	DAP	JVP	ABC	TAC	DAP	JVP
Pollock 1/	W/C	72,000	65,750	65,750	0	63,750	63,750	63,750	
	Shelikof		6,250	6,250	0	6,250	6,250	6,250	
	E	3,375	200	200	0	3,400	3,400	3,400	
	Total	75,375	72,200	72,200	0	73,400	73,400	73,400	0
Pacific cod	W	13,500	13,500	13,500	0	29,500	29,500	29,500	
	C	52,000	52,000	52,000	0	59,500	59,500	59,500	
	E	5,700	5,700	5,700	0	1,000	1,000	1,000	
	Total	71,200	71,200	71,200	0	90,000	90,000	90,000	0
Flatfish/ deep 2/	W	111,500	3,200	3,200	0	16,300	3,650	3,650	
	C	384,300	31,800	21,800	10,000	77,700	15,300	15,300	
	E	58,900	1,000	1,000	0	14,400	3,050	3,050	
	Total	554,700	36,000	26,000	10,000	108,400	22,000	22,000	0
Flatfish/ shallow 3/	W					30,200	3,570	3,570	
	C		Not specified in 1989			52,200	6,180	6,180	
	E					2,100	250	250	
	Total					84,500	10,000	10,000	0
Arrowtooth flounder	W					27,000	4,450	4,450	
	C		Not specified in 1989			141,000	23,170	23,170	
	E					26,600	4,380	4,380	
	Total					194,600	32,000	32,000	0
Sablefish	W	4,900	3,770	3,770	0	3,800	3,770	3,770	
	C	13,900	11,700	11,700	0	11,800	11,700	11,700	
	W. Yakutat	5,300	4,550	4,550	0	4,600	4,550	4,550	
	E. Yak/SE Out	6,800	5,980	5,980	0	6,000	5,980	5,980	
	Total	30,900	26,000	26,000	0	26,200	26,000	26,000	0
Slope rockfish 4/	W	5,774	5,774	5,774	0	4,300	4,300	4,300	
	C	8,452	8,452	8,452	0	7,700	7,700	7,700	
	E	5,774	5,774	5,774	0	5,700	5,700	5,700	
	Total	20,000	20,000	20,000	0	17,700	17,700	17,700	0
Pel. shelf rcksh.	W	1,000	500	500	0	1,400	1,400	1,400	
	C	4,800	2,400	2,400	0	5,800	5,800	5,800	
	E	800	400	400	0	1,000	1,000	1,000	
	Total	6,600	3,300	3,300	0	8,200	8,200	8,200	0
Dem. shelf rcksh.	SE Outside	Unknown	420	420	0	unknown	470	470	0
Thornyheads	GW	3,800	3,800	3,800	0	3,800	3,800	3,800	0
Other species	GW	n/a	11,648	11,148	0	30,340	14,179	14,179	0
GULF OF ALASKA TOTAL		762,575	244,566	234,066	10,000	637,140	297,749	297,749	0

1/ Council's intent is quarterly apportionment of W/C pollock TAC, January-June 1990, with Shelikof TAC part of first quarter.

2/ Deep water flatfish are flathead, rex, and Dover sole.

3/ Shallow water flatfish include rock sole, yellowfin sole, butter sole, starry flounder, and other flatfish not specifically defined.

4/ Plan Team and SSC note that 1990 ABC would be 35,100 mt if apportioned as rougheye and shorttraker rockfish at 5,000 mt, POP at 15,700 mt, and other pelagic shelf rockfish at 14,400 mt, and only with observers.

Halibut Mortality Limit for 1990: 2,000 mt trawl, 750 mt pot and longline.

TABLE 2
GULF OF ALASKA GROUND FISH
1991 Plan Team, SSC, and AP recommendations and apportionments (metric tons)

26-Nov-90

Species	Area	1990			Plan Team	SSC	Advisory Panel	
		ABC	TAC	Catch *	ABC **	ABC	TAC	DAP
Pollock	W/C	63,750	63,750	80,017	123,750			
	Shelikof	6,250	6,250	n/a	6,250			
	E	3,400	3,400	277	3,400			
	Total	73,400	73,400	80,294	133,400			
Pacific Cod	W	29,500	29,500	30,117	25,700			
	C	59,500	59,500	38,046	48,300			
	E	1,000	1,000	330	3,900			
	Total	90,000	90,000	68,493	77,900			
Flatfish, Deep	W	16,300	3,650	337	2,000			
	C	77,700	15,300	6,822	38,900			
	E	14,400	3,050	506	9,600			
	Total	108,400	22,000	7,665	50,500			
Flatfish, Shallow	W	30,200	3,570	921	48,800			
	C	52,200	6,180	5,231	22,200			
	E	2,100	250	225	3,000			
	Total	84,500	10,000	6,377	74,000			
Arrowtooth	W	27,000	4,450	1,179	40,800			
	C	141,000	23,170	15,201	272,100			
	E	26,600	4,380	1,557	27,200			
	Total	194,600	32,000	17,937	340,100			
Sablefish	W	3,800	3,770	1,947	2,925			
	C	11,800	11,700	12,052	10,575			
	W. Yakutat	4,600	4,550	5,181	4,050			
	E. Yak/S.E. Out.	6,000	5,980	6,403	4,950			
Total	26,200	26,000	25,583	22,500				
Rockfish (Slope)	W	4,300	4,300	5,167	2,830			
	C	7,700	7,700	9,952	7,020			
	E	5,700	5,700	6,252	5,540			
	Total	17,700	17,700	21,371	15,390			
Rockfish (Pelagic Shelf)	W	1,400	1,400	165	800			
	C	5,800	5,800	947	3,100			
	E	1,000	1,000	526	900			
	Total	8,200	8,200	1,638	4,800			
Rockfish (Demersal Shelf)	S.E. Out.	0	470	315	0			
Thornyhead	G W	3,800	3,800	1,548	980			
Other Species	G W	30,340	14,179	7,678	0			
GULF OF ALASKA TOTAL		637,140	297,749	238,899	719,570			

* Catch through November 3, 1990. W/C Pollock catch includes Shelikof

** Flathead sole ABC of 50,300 mt is taken from deep water flatfish so that total ABC = 769,870

TABLE 3
GULF OF ALASKA GROUND FISH
1991 Council recommendations for ABCs and TACs (metric tons)

Species	Area	ABC	TAC	DAP	JVP
Pollock ¹	W/C Shellkof E Total				
Pacific Cod	W C E Total				
Flatfish, Deep	W C E Total				
Flatfish, Shallow	W C E Total				
Arrowtooth	W C E Total				
Sablefish	W C W. Yakutat E. Yak./S.E. Out. Total				
Rockfish (Slope)	W C E Total				
Rockfish (Pelagic Shelf)	W C E Total				
Rockfish (Demersal Shelf)	S.E. Out.				
Thornyhead	G W				
Other Species	G W				
GULF OF ALASKA TOTAL					

¹ The pollock TAC in the Western/Central Gulf will be divided into equal quarterly apportionments.



**UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE**

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Resource Assessment and Conservation
Engineering Division
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Auke Bay, Alaska 99821-0155

28 November 1990

**CPUEs Observed in the 1990 Gulf of Alaska
Triennial Bottom Trawl Survey**

The 1990 triennial bottom trawl survey of the western, central, and eastern Gulf of Alaska was completed by NMFS scientists from the Auke Bay Laboratory (ABL) and the RACE Division of the Alaska Fisheries Science Center (AFSC). The survey took place from 1 June 1990 through 12 September 1990. Three vessels contributed 710 successful tows to Gulf-wide abundance estimates. The R/V *Miller Freeman* contributed 166 tows from the eastern Gulf as well as completing a number of other tows in a special project. Working under charter, the F/V *Green Hope* and the F/V *Pat San Marie* contributed 544 tows for the central and western regions.

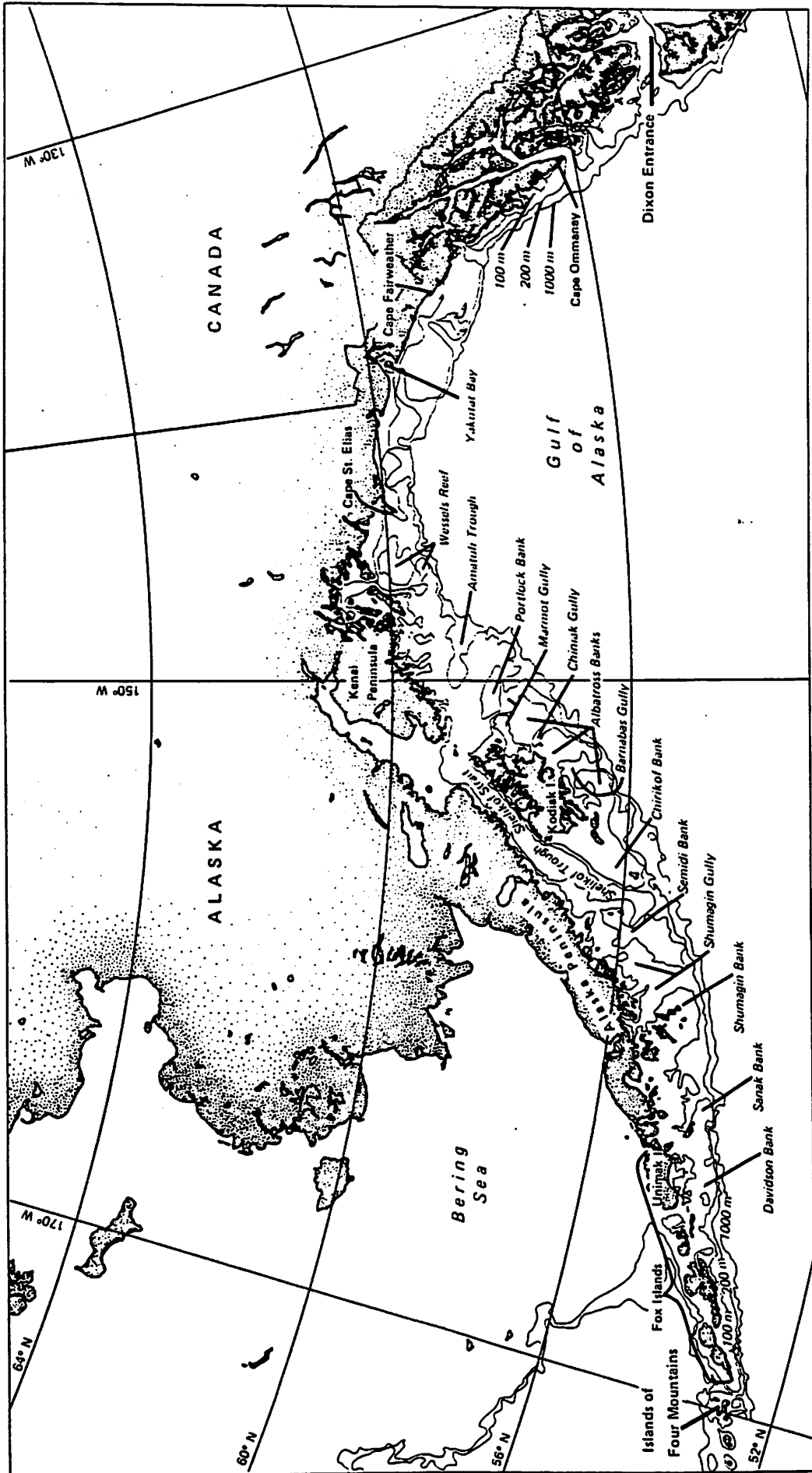
Presented here are a number of charts of the survey area, the survey station locations, and graphical representation of catch per unit effort data (CPUE) for eleven species for each tow. These data are preliminary in nature. Should additional data corrections be necessary, it is highly doubtful that the charts presented here will change in a way detectable to the human eye. This packet is intended to provide quick access to the information generated by the 1990 triennial survey. These charts may allow some understanding to be gained rapidly while waiting for detailed analyses. Final information regarding each tow will soon be available in fishing-log documents from the Auke Bay Lab for the eastern Gulf and from RACE Division for the central and western Gulf. Announcements of cruise results will also be produced forthwith. Documents pertaining to survey data for the eastern Gulf of Alaska may be obtained by contacting Dr. George Snyder, Director of the Auke Bay Laboratory. Documents pertaining to survey data for the central and western Gulf may be obtained by contacting Dr. Gary Stauffer, Director of the RACE Division.

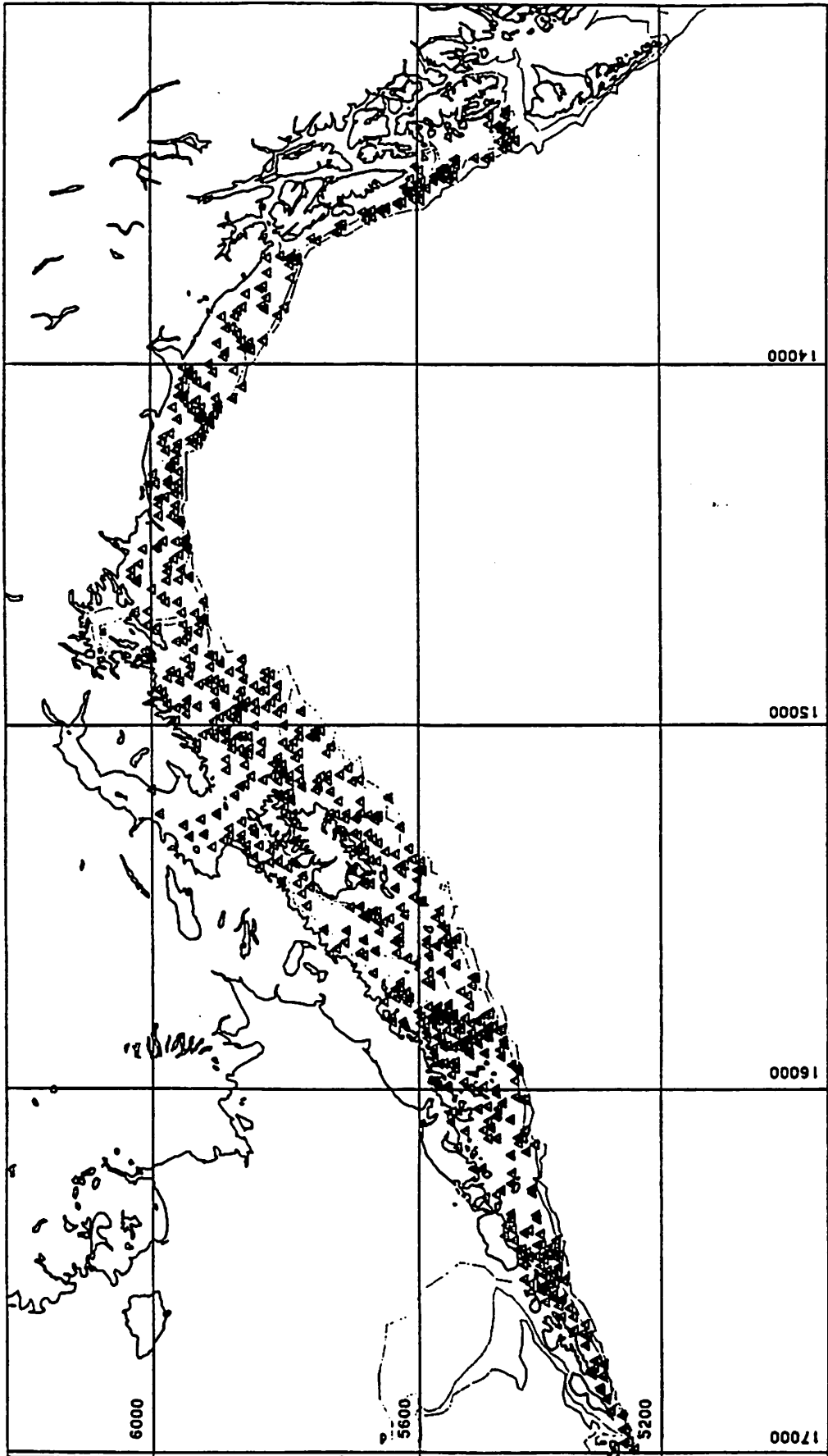


This packet consists of the following charts:

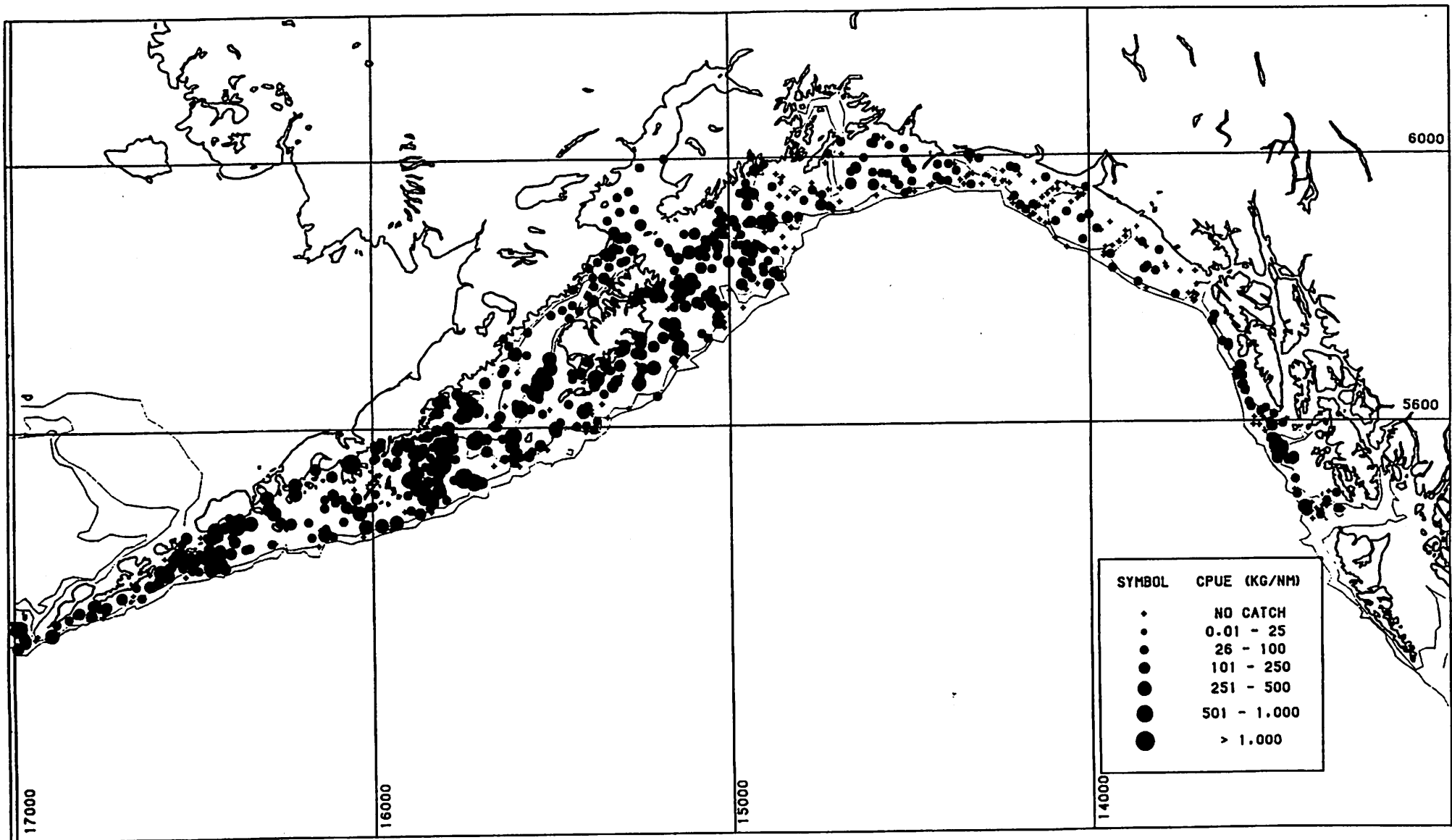
- 1) The region covered by the Gulf of Alaska 1990 Triennial Survey
- 2) Sites of successful tows in the 1990 Gulf Triennial
- 3) Tow by tow CPUE data, the units of measure being kilograms of catch per nautical mile towed by a net with a 15 meter opening. There is one chart for each of 11 species:

pacific cod
walleye pollock
pacific halibut
sablefish
pacific ocean perch
northern rockfish
flathead sole
dover sole
rock sole
rex sole
arrowtooth flounder

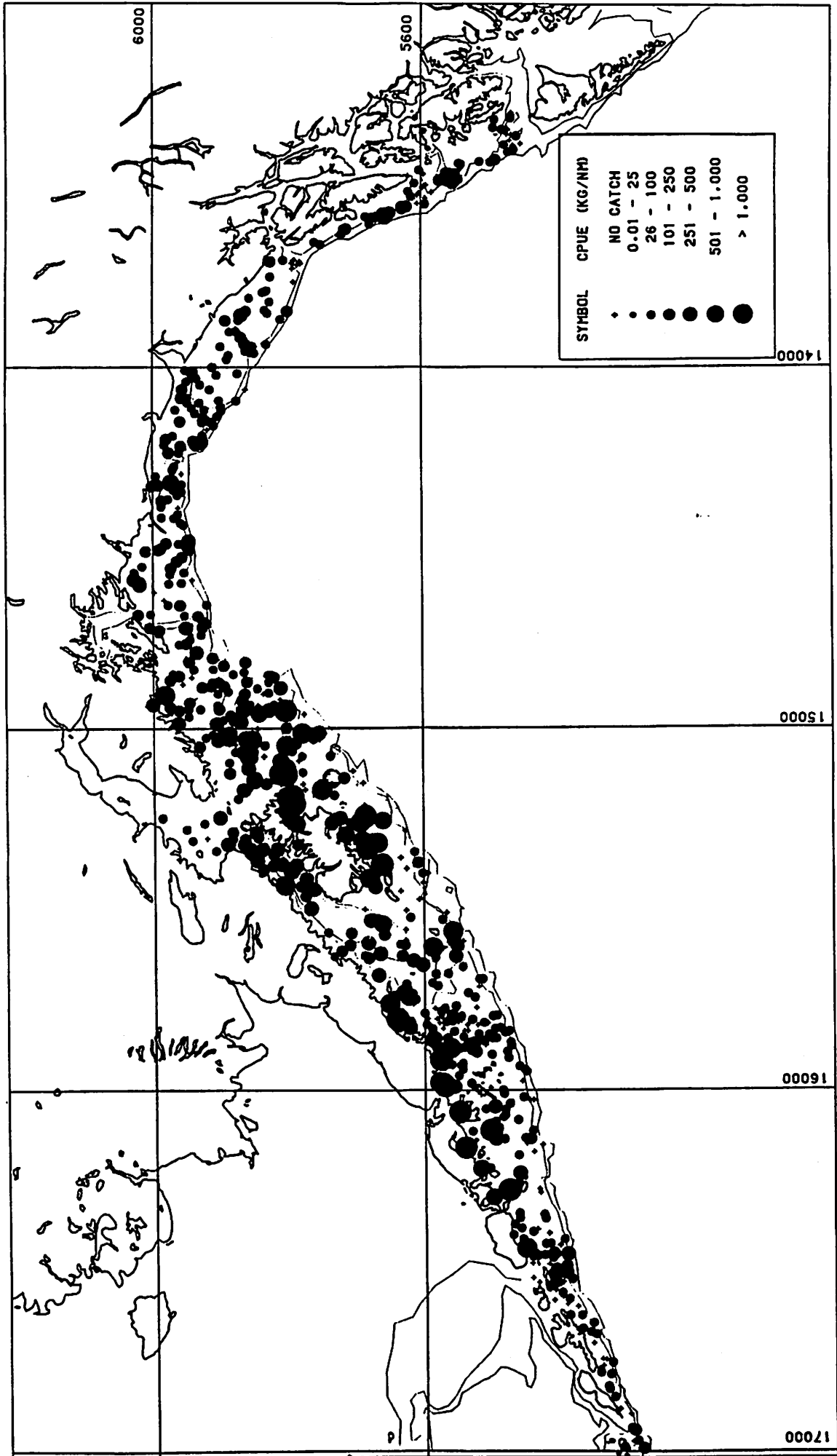




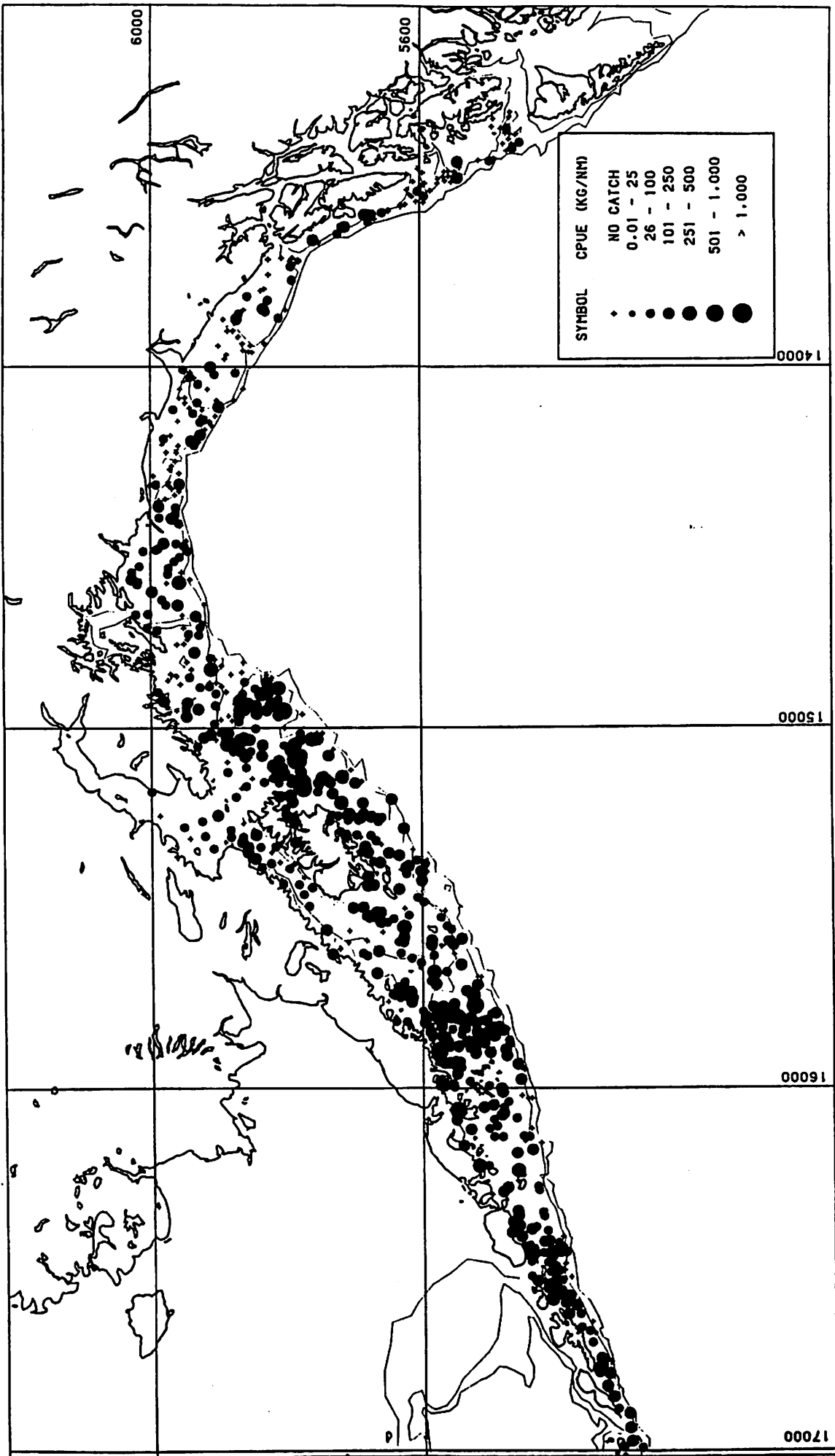
SUCCESSFUL STATIONS SAMPLED DURING THE 1990 GOA TRIENNIAL SVY.



PACIFIC COD CPUE (KG/NM) .DURING THE 1990 GOA TRIENNIAL SVY.

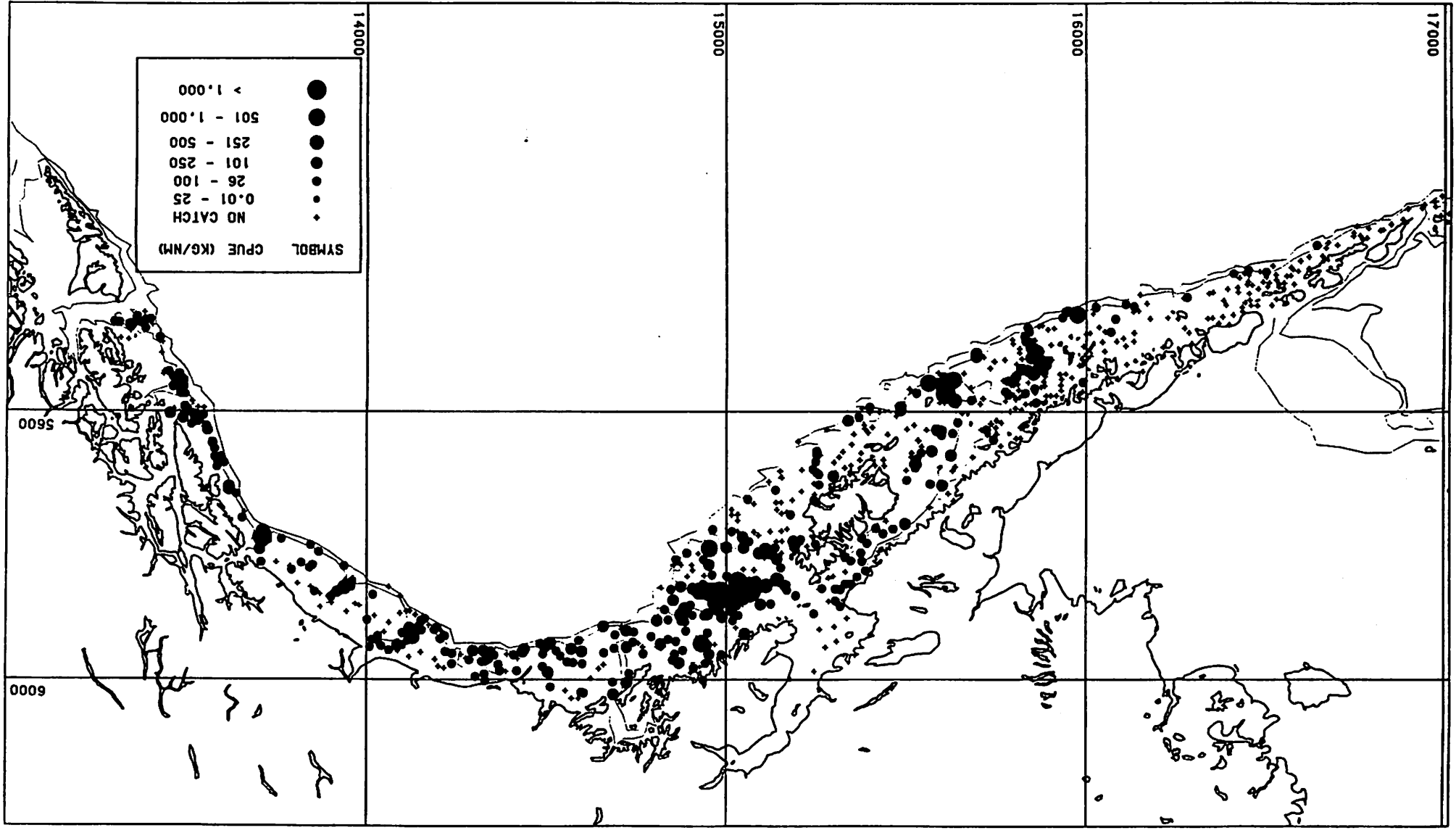


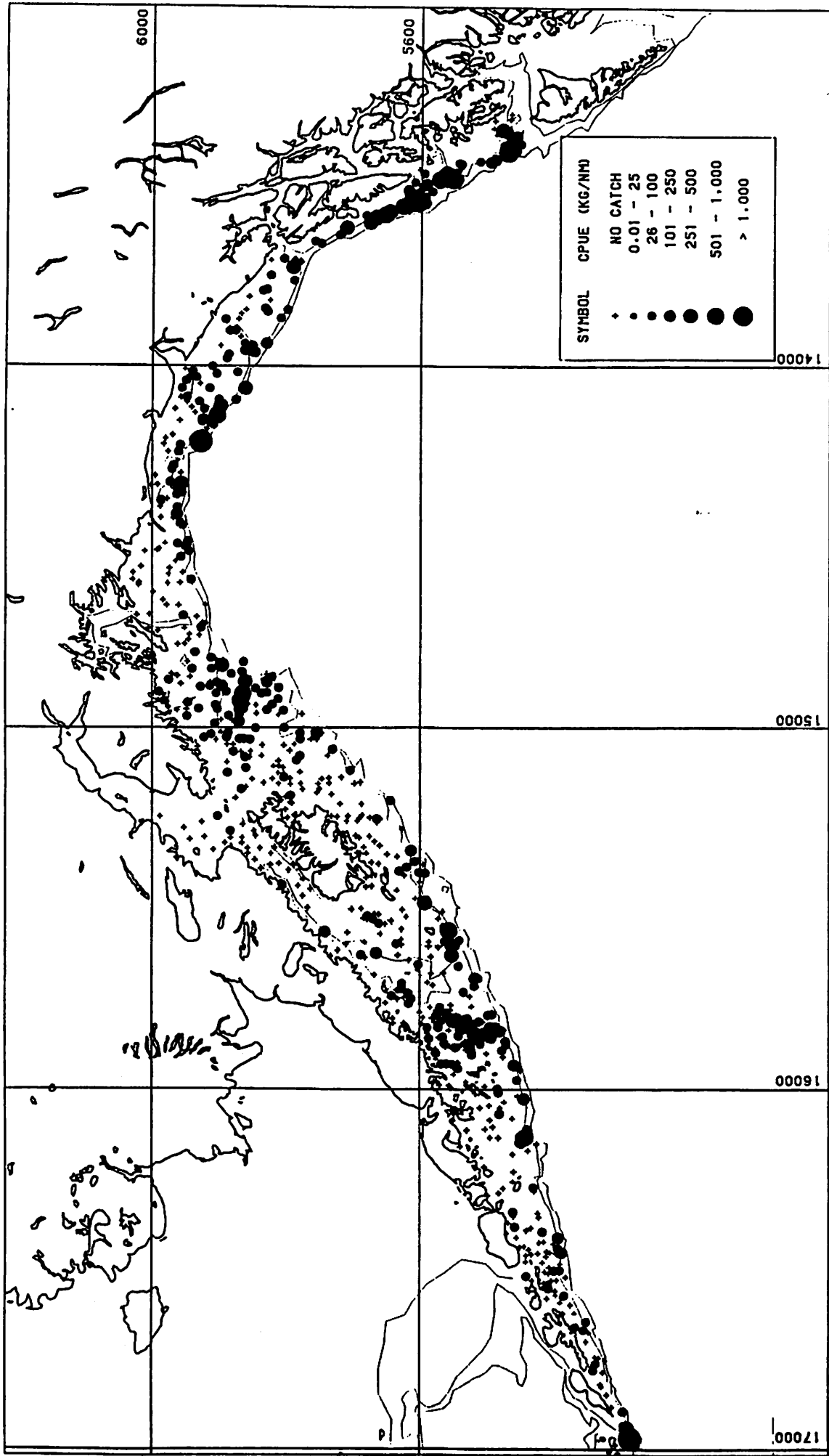
WALLEYE POLLOCK CPUE (KG/NM) DURING THE 1990 GOA TRIENNIAL SVY.



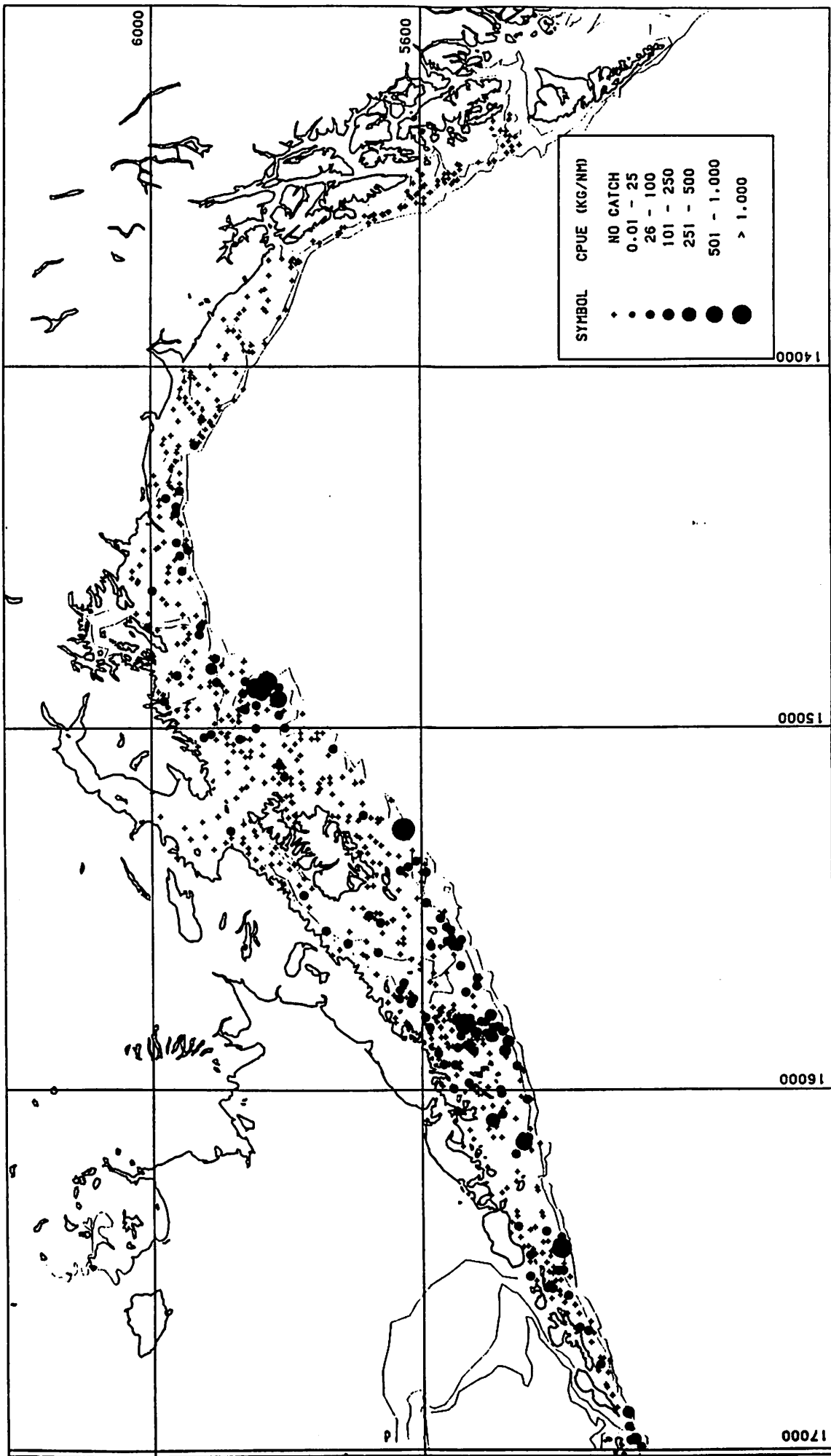
PACIFIC HALIBUT CPUE (KG/NM) . DURING THE 1990 GOA TRIENNIAL SVY.

SABLEFISH CPUE (KG/NM), DURING THE 1990 GOA TRIENNIAL SVY.



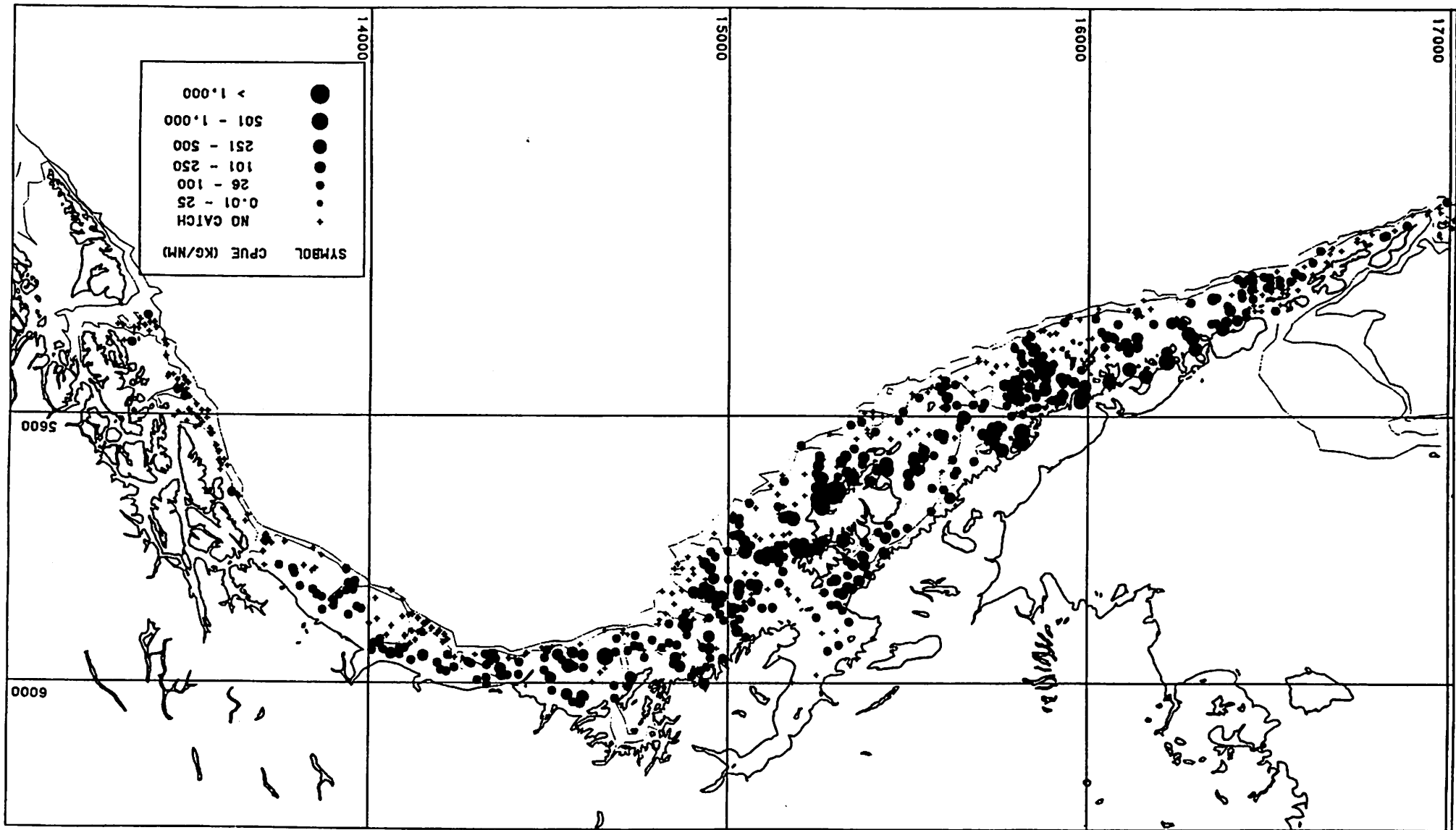


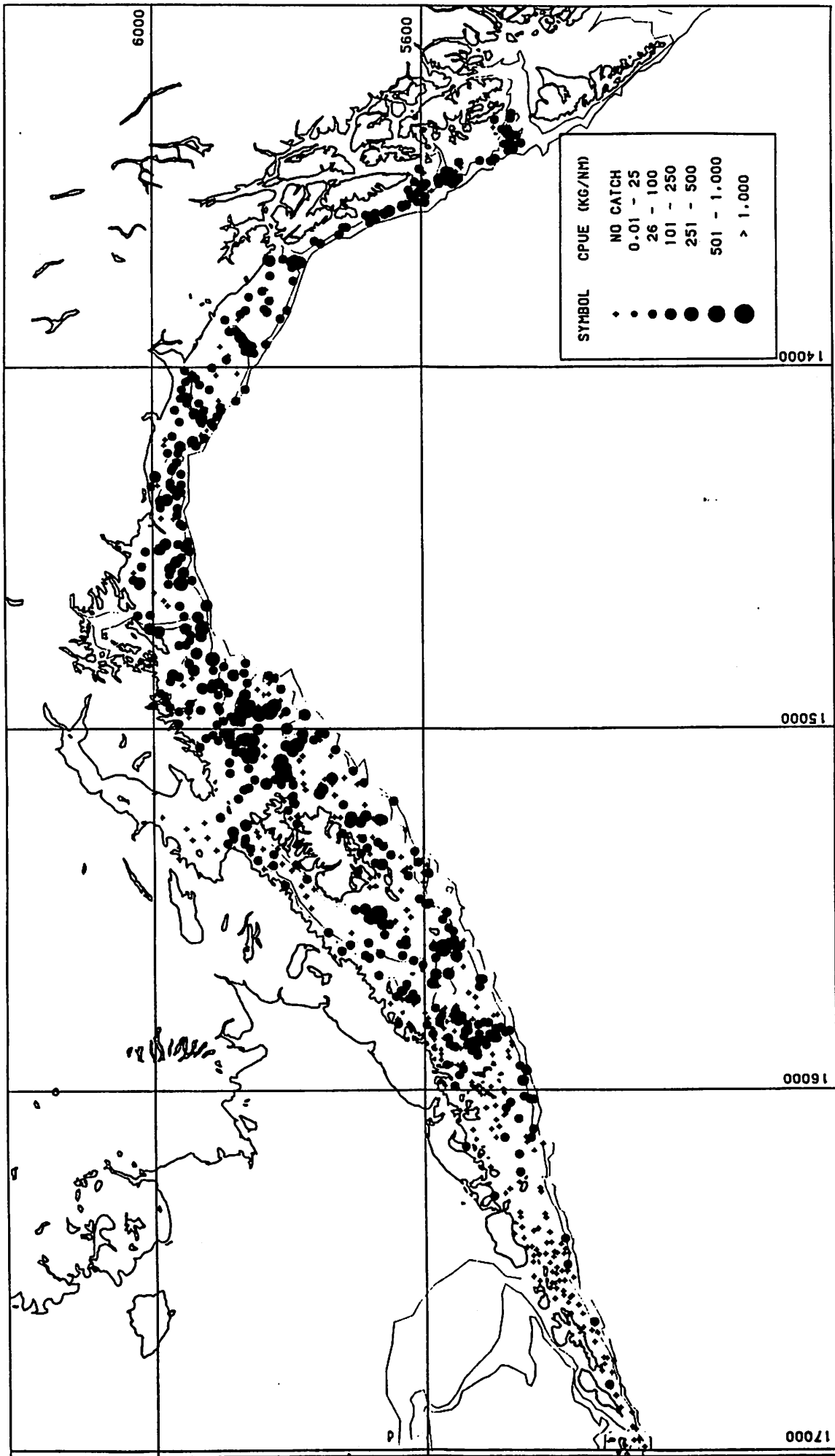
PAC. O. PERCH CPUE (KG/NM) DURING THE 1990 GOA TRIENNIAL SVY.



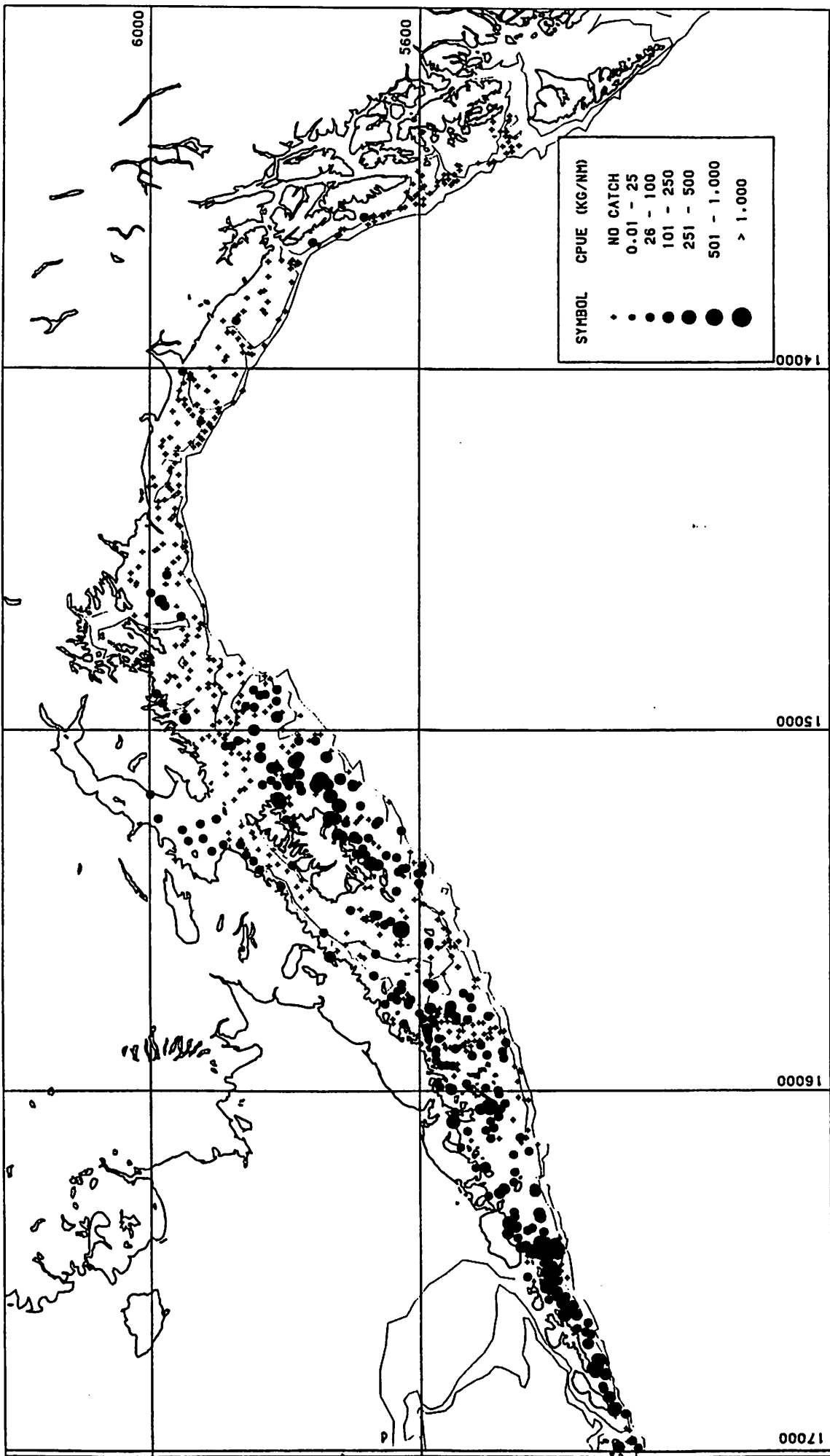
NORTHERN ROCKFISH CPUE (KG/NM) . DURING THE 1990 GOA TRIENNIAL SVY .

FLAHEAD SOLE CPUE (KG/NM), DURING THE 1990 GOA TRIENNIAL SVY.

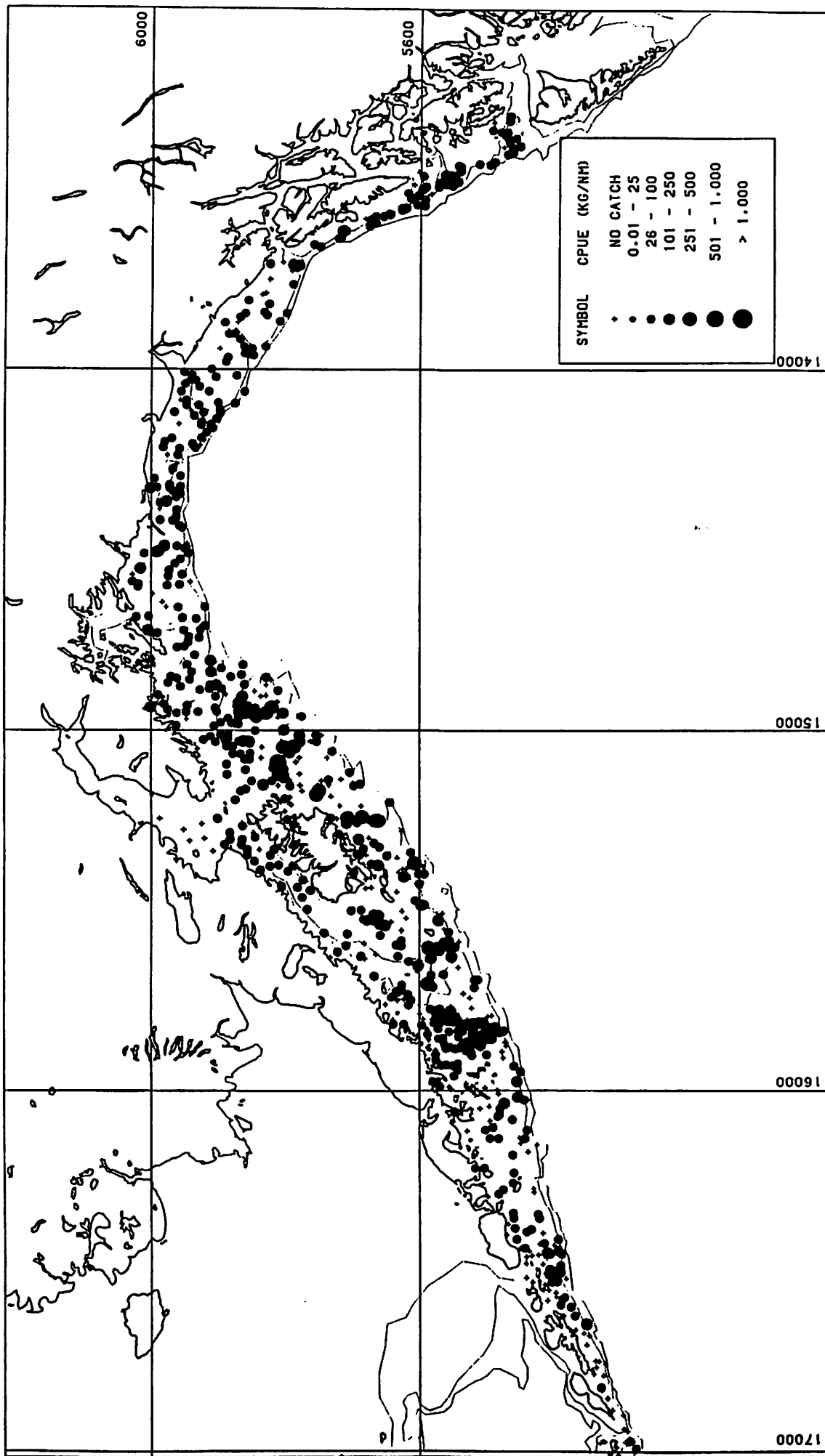




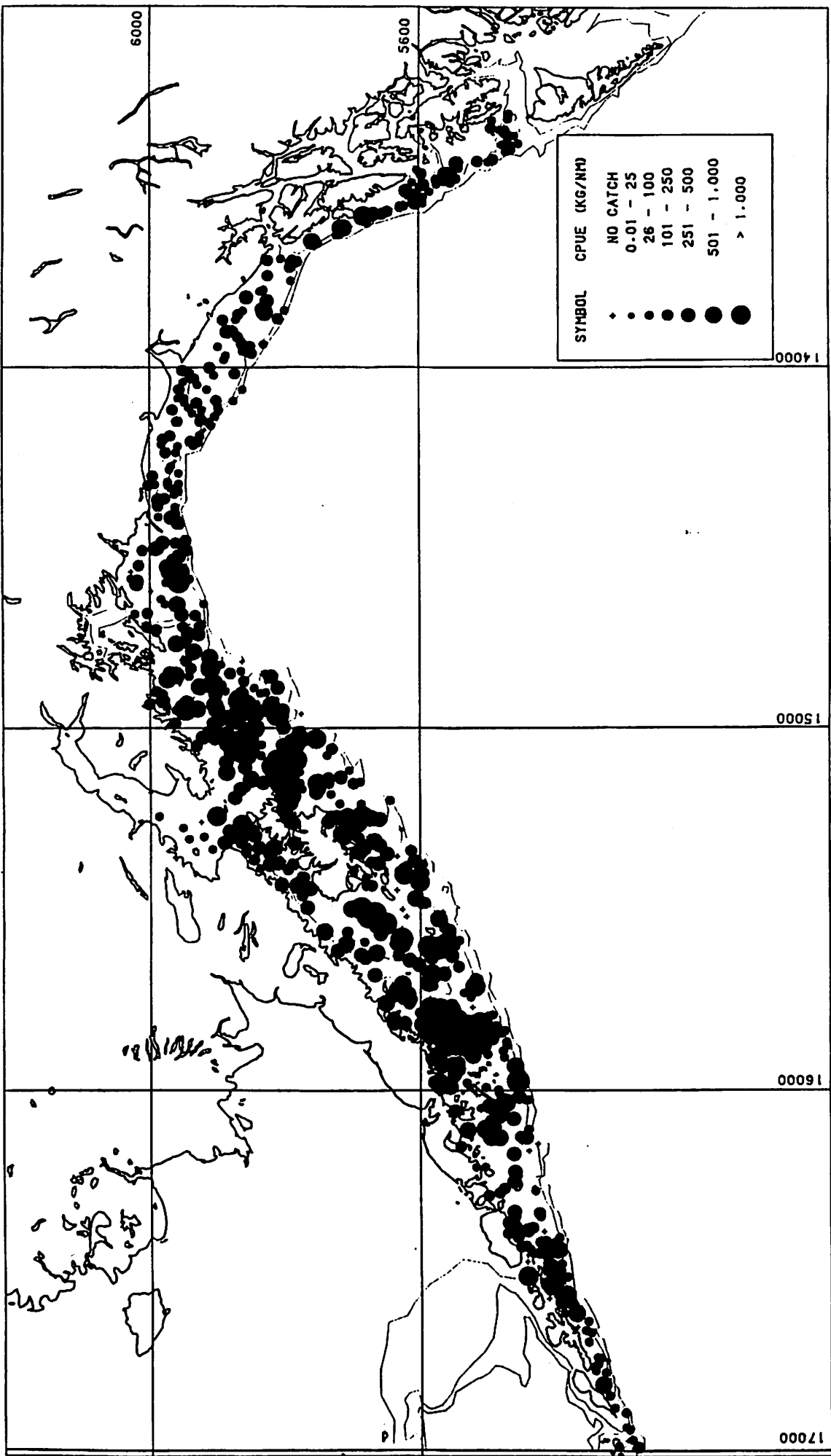
DOVER SOLE CPUE (KG/MM) .DURING THE 1990 GOA TRIENNIAL SVY.



ROCK SOLE CPUE (KG/NM) DURING THE 1990 GOA TRIENNIAL SVY.



REX SOLE CPUE (KG/NM) DURING THE 1990 GOA TRIENNIAL SVY.



ARROWTOOTH FL. CPUE (KG/NM) . DURING THE 1990 GOA TRIENNIAL SVY .