ALASKA LEGISLATURE COMMITTEE FILES 1987-1988 8672
4850 HLAB SJR 24

2/22

Two approximations to the circle are shown. The first is the entire area as depicted in Fig. 3.4--a rectangular block containing every 1° 2° by 1° square intersected by the circular zone. The second is a smaller block (depicted by a dash-dot-dash border) which eliminates all border squares from block 1. Closure of the smaller area will be considered as Alternative 2a while closure of the larger square will be considered as Alternative 2b.[2]

The other departure from the original proposal, a change from a specification of only DAP fishing in the zone to one of no foreign processing in the zone, is done for reasons of enforceability of the implementing regulations. The proposal suggests that only DAP fishing be allowed in the 100-mile zone. A regulation which allowed only DAP fishing would be difficult to enforce, as a U.S. trawler could be acting as a DAP vessel on one tow in delivering the cod end to a DAP at-sea processor or to a tender delivering shoreside and on the very next tow as a joint venture trawler in delivering the cod end to a foreign processor. Such a switch from DAP to JVP on two successive tows would render enforcement of the DAP-only restriction in the zone nearly impossible. NMFS enforcement suggests that the regulation be worded so as to prohibit the presence of foreign processing vessels in the zone. Such a change would make the implementing regulations enforceable but would not prevent foreign processors from waiting just outside the zone boundaries for deliveries.

3.2.3 Alternative 3: Close the 100 mile zones (described in Alternative 2) to joint venture fishing during the months of January - June

This alternative would institute a restricted fishing season for all joint venture operations in the 100-mile zones described above. Joint venture fishing would not be allowed between January 1 and June 30. There would be no similar restriction on DAP fisheries.

A variation on the seasonal closure of the 100-mile zones is a seasonal closure of the entire BSAI management area to joint venture fishing for the months of January - June. This is considered as Alternative 3b.

3.2.4 Alternative 4: Establish a fee structure for foreign processors who receive joint venture caught fish

This alternative would establish a fee system similar to that in existence for the directed foreign fishery whereby foreign processors that receive fish from domestic fishing vessels would be required to pay a unit fee ($/mt) in proportion to the ex-vessel value of the species received. The fee revenue would accrue to the U.S. government. A fee schedule is presented which attempts to equalize unit costs between foreign vessels processing at sea and U.S. shoreside processing facilities by considering

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2. It follows from footnote 1 that Alternative 2a considers a closed area approximately 210 miles square, while Alternative 2b closes an area approximately 150 miles square.

vessel operational costs and processing costs for domestic and foreign processors (Lynde, 1981; NRC, 198).

3.3 Biological and Physical Impacts

The likely impacts of adoption of each of the three alternatives to the status quo are examined in this section. Impacts are examined from, first, an environmental perspective, that is, how the measure might affect the non-human and human part of the ecosystem. Impacts are then examined from an economic perspective, viz., how the proposed change would affect the economics of fishing, and of processing; how the quantity and price to the consumer might be changed; and how management, information and enforcement costs might change. The approach taken is one of relative analysis, that is, the effect of each alternative is examined relative to the status quo.

The environmental impacts of each of the identified alternatives and sub-alternatives will therefore be presented in sequence with the economic impacts of each presented in a subsequent section. The concluding section, "cost-benefit" conclusion, will attempt to summarize the analysis.

3.3.1 Description and estimate of the number of small entities affected

The numbers of harvesting vessels operating in the Bering Sea/Aleutian Islands management area and in the Gulf of Alaska for DAP, JVP, and TALFF are discussed in Section 1.3. All alternatives could restrict JVP, and TALFF fishing operations and could enhance DAP fishing operations. Since the focus of this proposal is on domestic processors the regional distribution of shore-based processing plants, capacity, employment, investment, (Table 3.1) and the current capability of domestic at-sea processing vessels (Table 3.2) is also presented.

Table 3.1. Shore-based processing in the Unalaska/Akutan area: capacity, employment, investment[2]

Plant	Location	Capacity (mt/day)	Employees	Investment[4]
Greatland	Dutch Harbor	275	50 U.S.	312
Alyeska	Unalaska	300	70 U.S.	312
Trident	Akutan	250	63	314
		825	183	938

Table 3.2. Domestic at-sea processing, by area.

Sub-area	Numbers of Vessels	DAP Requested, mt
Bering Sea	18	101,000
Aleutian Islands	-	66,400
Total[5]	25	167,400

3.3.2 Environmental Impacts

Alternative 2: 100 mile closure

It has been suggested that a few boats (3-6) of the kind currently used by joint ventures could supply the annual needs of the three processing plants in the Unalaska/Akutan area. The issues to be examined are therefore: the shoreside processing capacity in the Unalaska area in relation to joint venture harvesting capacity; the current supply situation for the plants and what steps are being taken to remedy the shortage of product; the ability of the joint venture fleet to harvest fish in areas outside the closed zone, and the costs to the joint venture fleet in terms of catch foregone.

The closure of either of the areas shown in Figure 3.4 could lead to changes in the biomass levels of the affected species in the BSAI and GOA management areas if those closures result in significantly less overall

2. In terms of groundfish. Therefore if a plant processes other species only the groundfish component is included.

4. Initial value, in millions of $.

5. Total for BSAI area. Eighteen boats indicated fishing would take place in the Bering Sea sub-management area.

harvest than under the status quo. For the purposes of this analysis significant means a change in biomass which is: 1) measurable within the noise of the survey data and the precision of the population estimation procedure; and 2) of a long-term rather than transient nature.

To analyze the potential biological and socioeconomic impacts of closure of the 100 mile zone to joint venture and foreign fishing recent fishery performance data were examined. The data used were catches, by species, by month, by 1/2° by 1° square, for the years 1984 and 1985. These are the most recent available data, since detailed 1986 catch data will not be available until later this year. The data are the best available, but it is important to point out two limitations of the current analysis.

First, as is evident from the 1984 to 1985 trend, from overall 1986 fishing performance, and from what is being reported concerning the 1987 fishery, very rapid changes in the structure of the fishery are taking place. The most obvious trends are a rapid decline in the amount of directed foreign harvest and the concomitant increase in joint venture harvest. Also notable is a rapid increase in the amount of allocations to DAP. It follows, therefore, that trends shown in the 1984 and 1985 data have continued, or even accelerated, in 1986 and 1987. This means that the impacts considered using data from 1984 and 1985 may misrepresent the present fishery to a greater or lesser extent depending on the rate of change.

Second, the 1/2° by 1° square catch data are based on raw observer data. Since the observer coverage on fishing vessels is not 100% it is necessary to expand the raw catch data to predict actual total catch in a square. Data which would allow expansion on a square by square basis are not available, therefore, it is necessary to expand all squares by the uniform factor used to produce the "best blend" estimates. These estimates are made at the INPFC area level (Bering Sea I, Bering Sea II, etc.) hence the expanded square estimates assume a constant level of coverage across the INPFC area. To the extent that this assumption is invalid and to the extent that catches differ in composition from square to square the estimates presented herein will be in error.

Keeping these caveats in mind, the 1984 and 1985 joint venture and foreign fishery performance data are presented in Table 3.3. The Shumagin INPFC area, which is the same as the western Gulf sub-area in the Gulf of Alaska, is also included, as the 100 mile zone would extend southward of Unimak Pass. Aggregating the catches by 1/2° by 1° square for 1984 and 1985 for Block 1 (small closure), Block 2 (larger closure), and for the remainder of the Bering Sea and Shumagin areas allows comparison of the relative contribution of each area to total catch in the two years (Table 3.4).

To facilitate that comparison the relative proportion of catch in each zone versus the total catch in the relevant management area (BSAI - all areas; GOA - Shumagin area) is shown in Table 3.5. Some general conclusions can be drawn from examination of these data.

First, the Gulf of Alaska portion of the closed zones was of great significance to joint ventures operating in the Shumagin district in 1984 and 1985. Catches of all groundfish combined in the proposed closed areas

Table 3.3. 1984 and 1985 Joint Venture and foreign catches in the BSAI Management Area and Shumagin Sub-management Area, by INPFC area, in metric tons.1/

(Joint Venture)

INPFC Area		Pollock	P. Cod	Atka Mackerel	Flatfish	Rockfish	All Species
BS I	1984	185,863	24,136	1	49,741	136	261,128
	1985	359,324	35,551	3	178,403	35	574,786
BS II	1984	44,450	245	15	64	0	44,809
	1985	10,933	83	0	18	0	11,062
BS IV	1984	6,694	6,390	35,927	365	465	51,606
	1985	7,283	5,638	37,356	325	428	53,674
Shumagin	1984	8,018	305	573	566	1,658	11,471
	1985	12,246	310	1,842	324	239	15,247

(Foreign)

BS I	1984	256,870	20,163	23	152,894	169	435,773
	1985	245,141	14,071	1	127,598	50	391,299
BS II	1984	604,871	37,070	13	29,828	293	683,256
	1985	524,278	42,267	1	20,000	65	591,329
BS IV	1984	70,900	1,277	71	3,326	456	77,334
	1985	50,864	839	0	48	4	51,871
Shumagin	1984	42,477	10,843	478	603	311	55,798
	1985	23,821	7,338	2	11	115	31,382

1/ Sources: Berger, J., R. Nelson Jr., J. Wall. 1985. Summaries of Provisional Foreign and Joint Venture Groundfish Catches (Metric Tons) in the Northwest Pacific Ocean and Bering Sea, 1984, NWAFC.

Berger, J., S. Morai, R. Nelson Jr., J. Wall. 1986. Summaries of Provisional Foreign and Joint Venture Groundfish Catches (Metric Tons) in the Northwest Pacific Ocean and Bering Sea, 1985, NWAFC.

Table 3.4. 1984 and 1985 Joint Venture and Foreign Catches in the BSAI Management Area and Shumagin Sub-management Area in mt. /1,2/

Block/Area	Pollock	P. Cod	A. Mackerel	Flatfish	Rockfish	All Groundfish
(Joint Ventures)						
1984						
Block 1 - BSAI	44,035	11,192	10	1,458	181	57,925
1 - GOA	7,636	198	227	510	559	9,467
Subtotal	51,671	11,390	237	1,968	740	67,392
Block 2 - BSAI	124,412	13,699	51	1,751	186	141,294
2 - GOA	7,647	205	249	512	658	9,611
Subtotal	132,059	13,904	300	2,263	844	150,905
Outside - BSAI	11,424	17,451	35,164	48,615	399	224,476
- GOA	54	15	5	9	63	147
Subtotal	11,478	17,466	35,169	48,624	462	224,623
1985						
Block 1 - BSAI	57,405	12,065	1	1,614	174	72,389
1 - GOA	1,869	313	1,997	333	369	14,042
Subtotal	59,274	12,378	1,998	1,947	543	86,431
Block 2 - BSAI	155,635	13,676	1	2,196	176	173,020
2 - GOA	2,626	328	1,997	340	369	14,823
Subtotal	158,261	14,004	1,998	2,536	545	187,843
Outside - BSAI	214,176	29,259	37,660	175,956	393	484,786
- GOA	14	3	3	3	1	25
Subtotal	214,190	29,262	37,663	175,959	394	484,811
(Foreign)						
1984						
Block 1 - BSAI	102,031	2,130	219	1,676	46	106,272
1 - GOA	23,506	818	6	193	124	24,766
Subtotal	125,537	2,948	225	1,869	170	131,038
Block 2 - BSAI	119,265	2,556	299	1,973	60	124,353
2 - GOA	24,124	1,505	7	199	140	26,164
Subtotal	143,389	4,061	306	2,172	200	150,517
Outside - BSAI	818,630	54,612	165	159,588	2,158	1,036,473
- GOA	51,821	12,156	595	915	2,695	68,902
Subtotal	870,451	66,768	761	160,503	4,853	1,105,375
1985						
Block 1 - BSAI	109,919	897	0	1,463	11	112,307
1 - GOA	8,236	90	2	26	0	8,353
Subtotal	118,154	986	2	1,489	11	120,660
Block 2 - BSAI	114,174	1,291	0	1,632	15	117,133
2 - GOA	8,240	287	2	29	0	8,559
Subtotal	122,414	1,577	2	1,661	15	125,692
Outside - BSAI	726,684	55,975	2	131,417	293	914,516
- GOA	17,718	6,338	7	438	270	24,788
Subtotal	744,402	62,314	9	131,855	563	939,304

/1/. Blocks are as shown if Figure 3.3. Block 1 is the "small" 100 mile closure--the area between 164° W and 169° W; 55° 00" N and 52° 30" N. Block 2 is the "large" 100 mile closure--the area between 163° W and 170° W; 55° 30" N and 52° 00" N. "Outside" is the area not included in Block 2.
/2/. Source: Foreign observer database, NWAFC. Data used are catches by 1/2° x 1° square expanded to account for % observer coverage and aggregated over the relevant area; therefore, the sum of these catches may not exactly match those catches reported in Table 3.3.

Table 3 5. Percentage of 1984 and 1985 Joint Venture and Foreign Catches Foregone in the BSAI Management ... a and Shumagin Sub management Area, assuming none of the catch is made up outside the closed zone

Zone/Area (Joint Ventures)	Pollock	P. Cod	A. Mackerel	Flatfish	Rockfish	All Groundfish
1984						
Zone 1 - BSAI	32.4%	5.6%	0.0%	2.9%	30.9%	15.8%
1 - GOA	99.2%	90.0%	89.4%	97.9%	77.5%	97.0%
Subtotal	36.0%	6.5%	0.7%	3.9%	56.7%	17.9%
Zone 2 - BSAI	91.6%	17.5%	0.1%	3.5%	31.8%	18.0%
2 - GOA	99.1%	93.2%	98.0%	98.3%	91.3%	98.5%
Subtotal	92.0%	18.3%	0.8%	4.4%	61.6%	40.2%
1985						
Zone 1 - BSAI	15.5%	28.1%	0.0%	0.9%	30.6%	11.0%
1 - GOA	70.8%	94.6%	99.9%	97.1%	99.7%	94.6%
Subtotal	15.9%	28.6%	5.0%	1.1%	57.8%	12.8%
Zone 2 - BSAI	42.1%	31.9%	0.0%	1.2%	30.9%	26.3%
2 - GOA	99.5%	99.1%	99.9%	99.1%	99.7%	99.8%
Subtotal	42.5%	32.4%	5.0%	1.4%	58.0%	27.9%
(Foreign)						
1984						
Zone 1 - BSAI	10.9%	3.7%	47.2%	1.0%	2.1%	9.2%
1 - GOA	31.0%	6.0%	1.0%	17.3%	4.4%	26.1%
Subtotal	12.4%	4.2%	21.1%	1.1%	3.4%	10.4%
Zone 2 - BSAI	12.7%	4.5%	64.4%	1.2%	2.7%	10.7%
2 - GOA	31.8%	11.0%	1.2%	17.8%	4.9%	27.5%
Subtotal	14.1%	5.7%	28.7%	1.3%	4.0%	12.0%
1985						
Zone 1 - BSAI	13.1%	1.6%	0.0%	1.1%	3.6%	10.9%
1 - GOA	31.7%	1.4%	20.5%	5.6%	0.0%	25.0%
Subtotal	13.6%	1.5%	16.7%	1.1%	2.0%	11.3%
Zone 2 - BSAI	13.6%	2.3%	0.0%	1.2%	4.9%	11.1%
2 - GOA	31.7%	4.3%	20.5%	6.2%	0.0%	25.1%
Subtotal	14.1%	2.5%	16.7%	1.2%	2.6%	11.5%

range from 95% to 100% of the total Shumagin catch and, in 1985, the catch in the larger block was essentially the same as total joint venture catch in the sub-area. Second, the contribution of the GOA portion of the zones to total foreign catch in the Shumagin district is much less than that seen with the joint venture fleet with catches in Block 1 and 2 of all species combined in the range of 26-27% of the Shumagin total harvest. Third, the Gulf part of the closed areas is much less significant in terms of contribution to total Alaskan catch than the Bering Sea portion of the zones. Fourth, for the BSAI management area, the proposed closed areas are relatively more important to the joint venture fleet than the foreign fleet.

Lastly, and, perhaps most significantly, for the BSAI management area, the portion of each species catch in the proposed zone ranges from nearly 0 for Atka mackerel (joint ventures - 1984 and 1985; foreign - 1985) to in excess of 90% for pollock (joint venture - Block 2 - 1984). Overall, the catch that occurred in the smaller zone is in the order of 2-3% for the foreign fleet and 60% for the joint venture fleet. For the larger proposed closure, the appropriate proportions are 3-4% and 60-65%, respectively.

What is important for this analysis, however, is not what the catch was in 1984 or 1985 but what the distribution and total amount of harvest would be if the proposed blocks were in fact closed to joint venture and/or foreign fishing. This is difficult to assess since, as mentioned above, the current and, presumably, the future fisheries will be much different than what occurred two or three years ago. Second, assuming that all catch occurring in the zones would be unavailable to harvesters upon closure is a "worst case" scenario in which the catch foregone would not be made up by fishing in the remaining open area. The opposite "best case" scenario would be to assume that all catch foregone could be harvested elsewhere in the remaining open areas. Under this latter assumption there is no biological impact resulting from the closure of the zone to joint venture and foreign fishing.

Obviously, reality lies between these two extremes and, hence, the impact lies between nil and that implied by the numbers in Table 3.5. Note that even under the assumption that total catch is unaffected by closing the 100 mile zones, because of the fleet's potential to make up the lost catch, there would be a potential biological impact since the spatial distribution of the harvest will change. This is not deemed biologically significant under the definition given above.

The question of biological impact hinges, then, on the amount of catch that can be made up if either of the proposed closures are enacted. The answer depends on the distribution of the biomass of the various species both in space and time. Foreign catch data for pollock and cod in 1984 (Figure 3.5, Figure 3.6) indicate that there are fish of these species caught outside the closed areas (see also Table 3.3), although there is some indication that the proposed closures represent the most productive grounds for these species. The seasonality of the data is hidden by these annual totals, however. Also, fishery performance does not necessarily reflect biomass distributions.

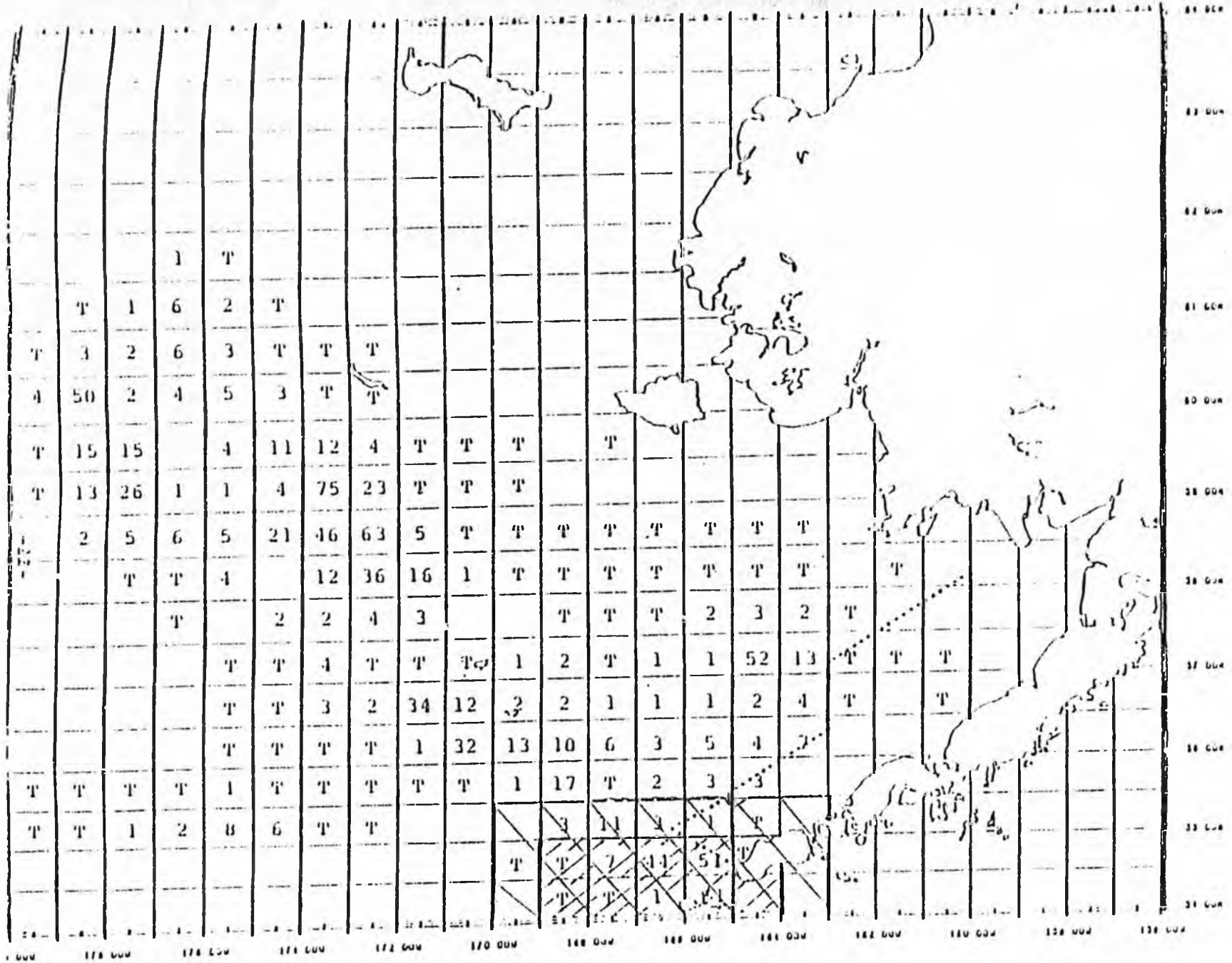

Figure 3.5.--Foreign-reported catch (thousands of metric tons) of walleye pollock in 1984.
T = less than 500 t.

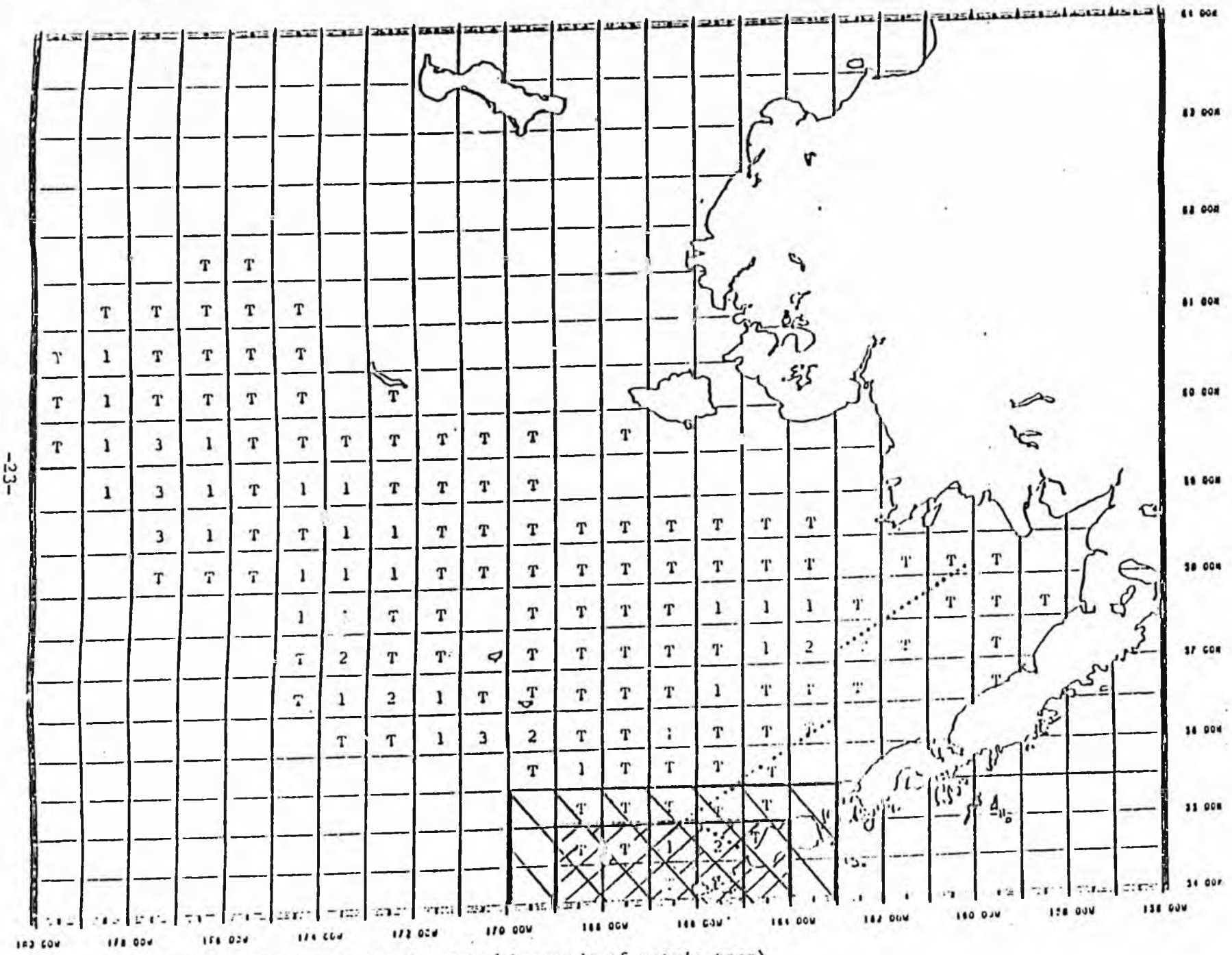

Figure 3.6.-Foreign-reported catch (thousands of metric tons) of Pacific cod in 1984.

Biological survey data may also be used to describe these distributions. CPUE data for pollock in 1984 and 1985 indicate a widespread distribution for this species (Figure 3.7, Figure 3.8), at least during the period of the survey.[6] From these data, then, it would seem that at least for pollock, and possibly cod, fish are available outside the proposed closures, and thus, from a biological perspective, significant changes in biomass levels are not expected.

Alternative 3: Seasonal closures

This alternative would close the areas proposed above only during the first half of the year. The biological impact of this alternative is therefore necessarily less than under Alternative 1. As a sub-alternative, however, it has been suggested that the entire Bering Sea/Aleutian Islands management area be closed to joint ventures during part of the year. The present analysis considers the specific closure of the entire BSAI area during the period January 1 - June 30 to all joint venture and foreign operations.

Catches by month for 1984 and 1985 for both joint venture and foreign vessels are shown in Table 3.6 and Table 3.7. Data for these years indicate that, in terms of total groundfish, for joint venture and foreign harvesters, the summer months, June, July and August are most important. The same general relation holds at the individual species level, also. Note that for the pollock fishery, however, the winter-spring roe fishery (Feb, Mar, Apr) is an important component of the total fishery. Informal reports from the 1987 fishery indicate the importance of the roe season to the total fishery is increasing.

The domestic cod fishery also has strong seasonal differences in its conduct. In the spring-early summer period bottom trawlers target on concentrations of cod in the Unimak Pass area. Later in the year, however, the trawlers are targeting on flatfish with significant amounts of cod as bycatch, that is, are operating in a general mixed species on-bottom fishery with catches of cod, pollock, and flounder. A seasonal closure of either of the zones would be expected to have an especially adverse impact on the fishery which targets on cod.

Thus, the seasonal catch distribution indicated by Tables 3.6 and 3.7 may not be representative of the current or near future fishery and may ignore species specific seasonal effects for pollock and cod. Table 3.8, however, which presents the percentage of catch in each zone in each season, does consider species specific impacts. Using these data it is possible to assess the proportion of catch that occurs between January 1 and June 30. This catch represents the "worst case" scenario--the maximum catch foregone assuming a January - June closure of Block 1, Block 2, or the entire BSAI management area. This scenario assumes that harvesters do not redistribute

6. The survey takes place during the summer months. It is likely that at other times of the year the population distributions for many species, notably cod and pollock, are very much different than these survey distributions.

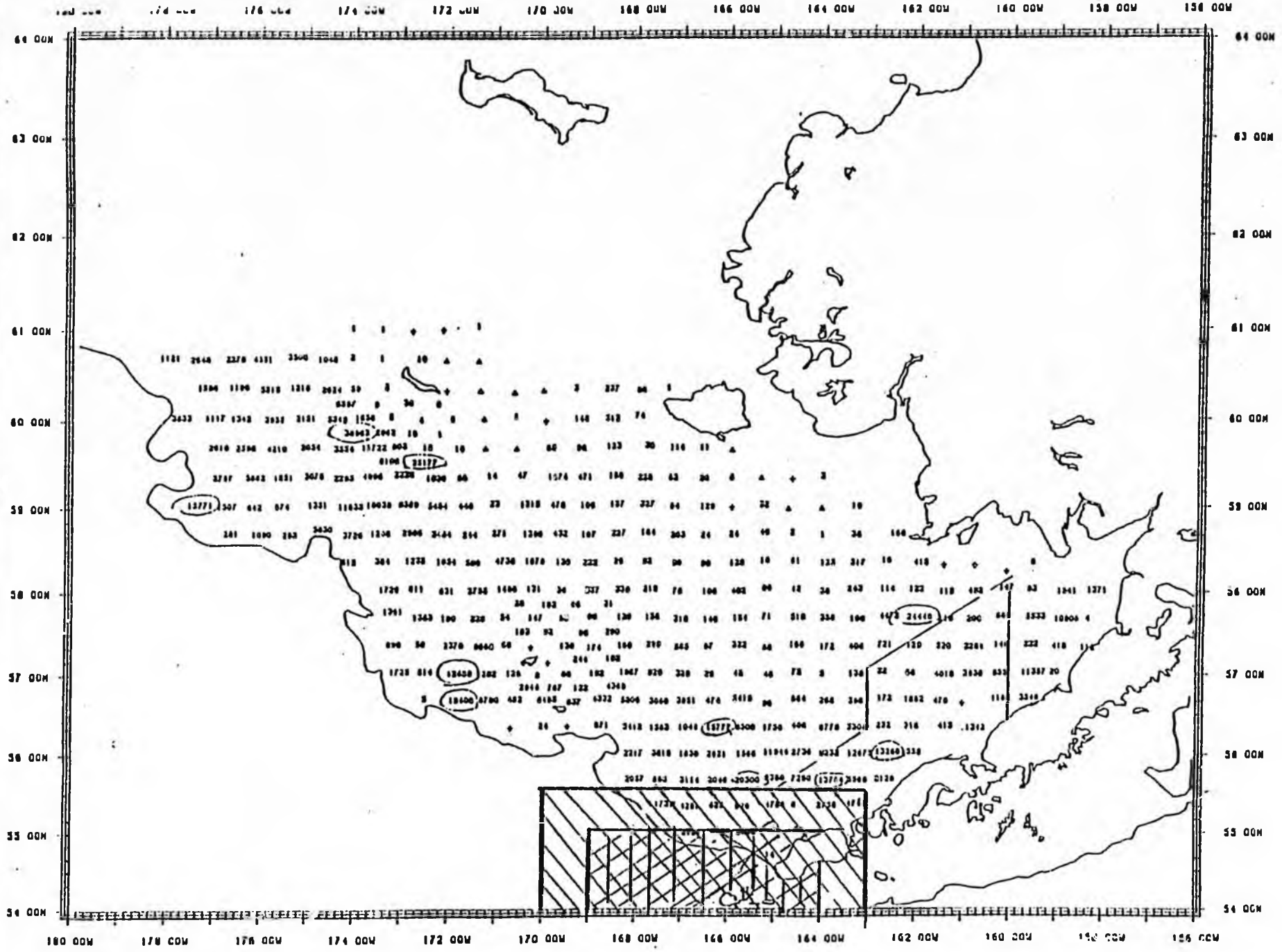

Figure 3.7 .--Catch per unit effort (lbs/hr trawled) of walleye pollock (Theragra chalcogramma) from 1984 research survey data.

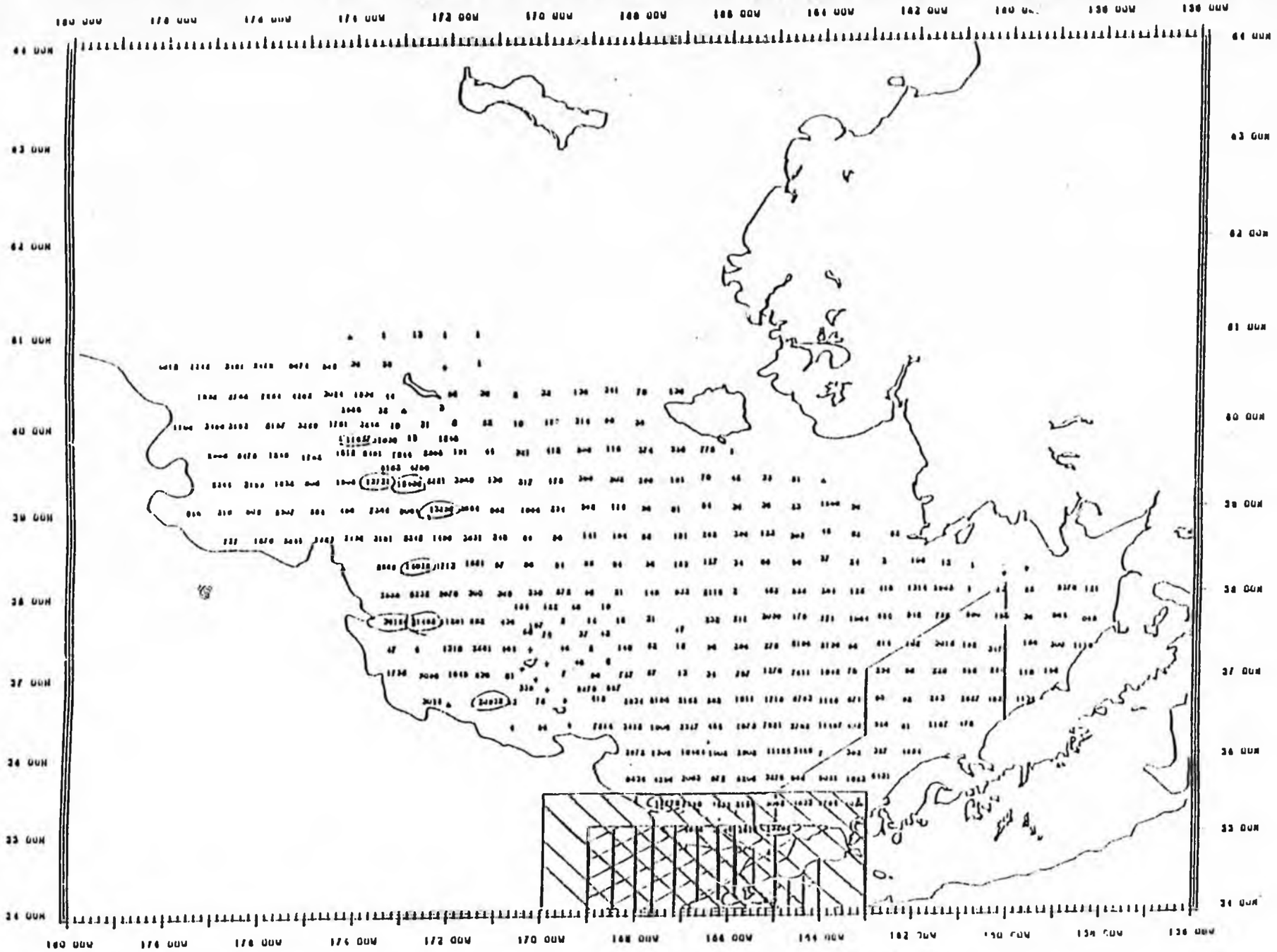

Figure 3.8.--Catch per unit effort (lbs/hr trawled) of walleye pollock (Theragra chalcogramma) from 1985 research survey data.

Table 3.6. 1984 joint venture and foreign catches in the BSAI Management Area and Shumagin Sub-management Area, by month, in metric tons.

Joint Venture

Month	Pollock	P. Cod	A. Mackerel	Flatfish	Rockfish	All Groundfish
Jan	38	212	0	25	0	280
Feb	607	3,739	0	411	0	5,068
Mar	28,757	6,937	0	809	0	37,196
Apr	43,111	3,679	1,842	4,653	108	55,059
May	1,974	2,688	7,656	7,574	281	21,044
Jun	31,340	3,971	10,018	11,300	115	58,051
Jul	68,855	3,963	9,655	5,797	407	89,922
Aug	50,553	3,550	6,159	9,938	157	73,667
Sep	11,196	2,417	0	9,636	65	26,550
Oct	6,937	216	140	750	172	8,559
Nov	131	0	0	1	1	133
TOTAL	243,499	31,372	35,470	50,894	1,306	375,529

Table 3.6. (Cont'd)
1984 joint venture and foreign catches in the BSAI Management Area and Shumagin Sub-management Area, by month, in metric tons.

Foreign

Month	Pollock	P. Cod	A. Mackerel	Flatfish	Rockfish	All Groundfish
Jan	14,868	2,377	1	1,066	5	18,304
Feb	63,859	3,934	0	1,846	7	74,719
Mar	14,329	4,015	12	5,016	14	23,692
Apr	6,587	2,989	0	10,907	1	20,685
May	21,681	576	0	4,557	11	26,878
Jun	84,490	5,674	67	5,696	1,316	97,812
Jul	150,587	3,629	202	16,180	1,426	172,063
Aug	164,228	4,850	81	24,035	1,011	194,346
Sep	179,878	5,044	21	19,365	396	204,824
Oct	127,243	8,878	318	25,308	603	162,740
Nov	108,667	11,902	302	25,291	191	146,335
Dec	77,152	11,962	62	23,273	45	112,963
TOTAL	1,013,839	70,830	1,066	162,675	5,054	1,255,892

Table 3.7. 1985 joint venture and foreign catches in the BSAI Management Area and Shumagin Sub-management Area, by month, in metric tons.

Joint Venture

Month	Pollock	P. Cod	A. Mackerel	Flatfish	Rockfish	All Groundfish
Jan	110	140	0	15	0	267
Feb	1,743	4,297	0	522	0	6,979
Mar	45,197	6,864	8	1,067	3	53,822
Apr	61,474	3,327	4,031	11,102	32	84,842
May	7,214	3,069	17,518	36,463	232	67,872
Jun	20,530	5,898	8,614	30,486	218	71,307
Jul	126,349	8,039	7,563	36,318	30	185,415
Aug	59,591	5,318	0	31,798	145	101,572
Sep	41,027	4,345	1,099	20,006	108	67,852
Oct	15,286	1,846	822	10,669	166	29,584
Nov	2,929	126	9	61	7	3,145
TOTAL	381,450	43,269	39,655	178,502	941	672,387

Table 3.7. (Cont'd)
1985 joint venture and foreign catches in the BSAI Management Area and Shumagin Sub-management Area, by month, in metric tons.

Foreign

Month	Pollock	P. Cod	A. Mackerel	Flatfish	Rockfish	All Groundfish
Jan	15,716	[illegible]742	0	9,134	1	25,593
Feb	17,187	12,401	0	2,218	0	32,009
Mar	18,604	5,553	0	9,724	0	33,881
Apr	1,603	1,851	0	6,366	1	10,822
May	4,125	1,580	0	2,863	4	8,580
Jun	46,375	903	0	8,419	15	55,722
Jul	127,011	1,737	0	10,527	311	139,588
Aug	156,664	4,048	0	19,780	44	180,540
Sep	145,055	3,946	0	19,418	73	168,504
Oct	150,985	9,870	2	19,221	111	180,212
Nov	104,719	10,693	0	15,616	13	131,075
Dec	78,774	9,047	9	10,232	7	98,151
TOTAL	866,818	63,891	11	133,518	580	1,064,996

Table 3.8. Percentage of 1984 and 1985 Joint Venture and Foreign Catches in the BSAI Management Area, January - June, by block

Block/Area	Pollock		P. Cod		A. Mackerel		Flatfish		Rockfish		All Groundfish	
(Joint Ventures)	*1984*	*1985*	*1984*	*1985*	*1984*	*1985*	*1984*	*1985*	*1984*	*1985*	*1984*	*1985*
Block 1	17.3%	3.0%	34.8%	27.3%	0.0%	0.0%	2.6%	0.8%	9.9%	0.4%	10.0%	3.8%
Block 2	59.1%	12.5%	42.2%	30.0%	0.0%	0.0%	3.1%	1.0%	9.9%	0.4%	26.3%	9.5%
All of BSAI	77.9%	36.6%	68.0%	54.9%	55.1%	79.9%	49.0%	44.7%	22.4%	64.1%	48.1%	43.2%
(Foreign)												
Block 1	0.1%	0.0%	0.4%	0.0%	0.0%	0.0%	0.1%	0.0%	0.3%	1.6%	0.1%	0.0%
Block 2	0.2%	0.0%	0.4%	0.1%	0.0%	0.0%	1.2%	0.8%	0.3%	1.6%	0.2%	0.0%
All of BSAI	21.9%	12.3%	25.1%	31.5%	2.8%	0.0%	17.9%	29.0%	43.3%	5.2%	21.5%	15.5%

effort to the latter part of the year. The data in Table 3.6 can be used to examine this eventuality. As might be expected, a six month closure of Block 1 would have a modest impact on the joint venture cod and pollock fishery and minor impact on the other fisheries. The foreign fleet would be little affected, at least in terms of catches similar to that shown by 1984 and 1985 fishery performance. The Block 2 closure is potentially much more significant to the joint ventures, particularly with regard to cod and pollock, but, again, insignificant to the foreign fleet.

Closure of the entire Bering Sea to joint ventures and foreign fishing vessels during January 1 - June 30 could have major impacts on the current patterns of catch in the joint venture fishery. This is particularly obvious with regard to cod and pollock where up to 70-80% of the catch could be foregone.

This "worst case" scenario is not very likely considering the fact that recent fishery performance indicates that the latter part of the year can provide very productive fishing for all species and also considering the considerable available fishing power and the large investment in the fleet. It is therefore, unlikely, in general terms, that such a seasonal closure, even if that closure were Bering Sea wide, would greatly reduce the total harvest in the management area, except, possibly, in the very short term. In terms of ecosystem performance, therefore, the seasonal closures would have little significant environmental impact.

This generality may not be true in the case of the pollock roe fishery, however, as a Bering Sea closure during the months of January 1 - June 30 would eliminate the JVP roe fishery. A strong spawner-recruit relationship would imply that reduced mortality on pollock stocks during their spawning period may positively influence the steady state biomass levels for the species. Unfortunately, spawner-recruit relationships for pollock are poorly understood.

Alternative 4: Foreign Processing Fees

If the imposition of fees on foreign processors, including those vessels receiving the catch of domestic harvesters, leads to a long term reduction in the harvest levels of the groundfish species of the Bering Sea, significant environmental impact might be expected. This is unlikely, however, since those fees would, at most, accelerate the replacement of foreign processors with domestic processors (both shoreside and at-sea), and thus, in the long run, not result in any reduction in total harvest in the Bering Sea management area.

3.4 Socioeconomic Impacts

3.4.1. Fishery Costs and Benefits (Harvesters and processors)

Alternative 2: 100 mile closure

The environmental impacts of potential reductions in catch were discussed in Section 3.3.2. Obviously, harvest reductions also have economic impacts. The most obvious perspective for examination of these impacts is one of reduced ex-vessel gross receipts in response to the reduction in harvest. Potential revenue losses arising from the proposed block closures are examined in Tables 3.9 and Table 3.10, which present total ex-vessel revenue in a zone, and percentage of total revenue in a zone, respectively. These are "worst case" scenarios of the likely revenue impact on the harvesting sector for the reasons argued above. The opposite "best case" scenario would assume no catch is foregone and that, therefore, ex-vessel receipts would not decline.

In contradistinction to the environmental analysis, however, the possibility of no reduction in receipts does not mean there is no economic impact on the fleet. This is because the displacement of the fleet from normally productive grounds to areas which may be less productive and involve greater running time from port will necessarily increase operational costs. This is not only due to increases in fuel costs because of increased running time, but also a consequence of increased "searching costs"--money and time spent locating productive grounds. Also, the distance to the new grounds or the timing of the new season may be such that some vessels will be unable to participate at all.

Representative costs for three sizes of joint venture trawlers are shown in Table 3.11. Costs per metric ton of groundfish range from $88 to $95 depending on vessel size. Fuel costs constitute between 12% and 18% of total operating costs, thus, if trip length were to double because of increased running time, fuel costs would be expected to double, everything else remaining equal. This means that fuel costs may increase by as much as $15.45 per mt of groundfish harvested, increasing total operational costs by approximately 17%.

One important question to be answered, however, is does everything else remain equal? In particular, will CPUE change to the extent that there is a change in gross revenue, an increase or decrease in operating costs, or both, should vessels relocate to less productive grounds? This is a relevant question if vessels which would have fished in areas of high CPUE were forced to fish elsewhere. This would certainly be the case in the closure of the two proposed zones in Unimak Pass because the total requirements of the shoreside plants, = 825 mt/day (Table 3.1), are much less than the total catching capacity of the joint venture fleet, 400-600 mt/day per vessel (Alaska Dragger's Association, pers. comm.), which in terms of a fleet of 120 vessels, is about 60,000 mt/day[7]. Thus, the daily catches of two or three vessels could satisfy the requirements of the shore based plants.

If there is a "CPUE effect" which increases cost to vessels fishing for joint ventures when they are forced to move to inferior grounds, there is a corresponding opposite positive effect to those vessels that remain in the area. This benefit would accrue primarily to domestic at-sea

7. This may be a high estimate. Reports from the joint venture roe pollock fishery indicate current maximum fishing rates are about 10,000 mt/day.

Table 3.9.1. 1984 and 1985 Joint Venture and Foreign Gross Ex-vessel Revenues in the BSAI Management Area and Shumagin Area ($1,000s), by Block

Block/Area (Joint Ventures)	Pollock	P. Cod	A. Mackerel	Flatfish	Rockfish	All Groundfish
1984						
Block 1 - BSAI	4,624	2,451	2	195	48	7,335
1 - GOA	794	43	34	58	148	1,117
Subtotal	5,418	2,494	36	253	196	7,952
Block 2 - BSAI	13,063	3,000	3	225	49	16,673
2 - GOA	795	45	38	58	174	1,134
Subtotal	13,859	3,045	45	292	224	17,807
Outside - BSAI	1,200	3,822	5,310	5,514	106	25,488
- GOA	6	3	1	1	17	17
Subtotal	1,194	3,308	5,311	5,495	122	25,506
1985						
Block 1 - BSAI	6,028	2,642	0	216	46	9,342
1 - GOA	194	68	302	38	98	1,857
Subtotal	6,222	2,710	302	254	144	10,199
Block 2 - BSAI	16,342	2,995	0	294	47	20,416
2 - GOA	273	72	302	38	98	1,749
Subtotal	16,615	3,067	302	333	144	22,165
Outside - BSAI	22,488	6,408	5,687	23,578	104	57,205
- GOA	1	1	0	0	0	3
Subtotal	22,490	6,408	5,687	23,578	104	57,208
(Foreign)						
1984						
Block 1 - BSAI	10,713	466	33	225	12	12,540
1 - GOA	2,445	178	1	22	33	2,922
Subtotal	13,153	645	34	246	45	15,462
Block 2 - BSAI	12,523	560	45	264	16	14,674
2 - GOA	2,509	328	1	22	37	3,087
Subtotal	15,032	888	46	287	53	17,761
Outside - BSAI	85,956	11,960	25	21,385	572	122,304
- GOA	5,389	2,650	90	103	714	8,130
Subtotal	91,346	14,610	115	21,488	1,286	130,434
1985						
Block 1 - BSAI	11,541	196	0	196	3	13,252
1 - GOA	857	20	0	3	0	986
Subtotal	12,398	216	0	199	3	14,238
Block 2 - BSAI	11,988	293	0	219	4	13,822
2 - GOA	857	52	0	3	0	1,010
Subtotal	12,845	345	0	222	4	14,832
Outside - BSAI	76,302	12,259	0	17,510	73	107,213
- GOA	1,843	1,382	1	50	72	3,325
Subtotal	78,144	13,640	1	17,559	149	110,538

Table 3.9.2. 1984 and 1985 Ex-vessel Revenue for Joint Venture and Foreign Fisheries in the BSAI Management Area, January - June, by b[illegible]k ($1,000s)

Block/Area	Pollock		P. Cod		A. Mackerel		Flatfish		Rockfish		All Groundfish	
(Joint Ventures)	*1984*	*1985*	*1984*	*1985*	*1984*	*1985*	*1984*	*1985*	*1984*	*1985*	*1984*	*1985*
Block 1	$2,463	$1,150	$2,371	$2,568	$0	$0	$173	$198	$15	$1	$4,31[illegible]	[illegible]
Block 2	$8,430	$4,873	$2,875	$2,822	$0	$0	$208	$243	$15	$1	$11,343	$7,359
All of BSAI	$11,108	$14,224	$4,640	$5,165	$2,929	$4,545	$3,309	$10,671	$35	$97	$20,771	$33,519
(Foreign)												
Block 1	$117	$8	$46	$0	$0	$0	$12	$2	$2	$1	$175	$12
Block 2	$173	$8	$49	$18	$0	$0	$263	$142	$2	$1	$247	$23
All of BSAI	$21,535	$10,875	$3,146	$3,948	$2	$0	$3,882	$5,170	$254	$4	$3,496	$18,905

Table 3.10 Percentage of 1984 and 1985 Joint Venture and Foreign Gross Ex-vessel Revenue in Block 1 and 2 of the BSAI Management Area and Shumagin Area

Block/Area	Pollock	P. Cod	A. Mackerel	Flatfish	Rockfish	All Groundfish
(Joint Ventures)						
1984						
Block 1 BSAI	32.4%	35.9%	0.0%	2.9%	30.9%	15.8%
1 GOA	99.1%	90.0%	89.4%	97.6%	77.5%	97.0%
Subtotal	36.0%	36.4%	0.7%	4.4%	56.7%	17.9%
Block 2 BSAI	91.6%	44.0%	0.1%	3.5%	31.8%	38.6%
2 GOA	99.3%	93.2%	98.0%	98.0%	91.3%	98.5%
Subtotal	92.1%	44.4%	0.8%	5.1%	64.6%	40.2%
1985						
Block 1 BSAI	15.5%	28.1%	0.0%	0.9%	30.6%	11.0%
1 GOA	70.8%	94.6%	99.9%	97.1%	99.7%	94.6%
Subtotal	15.9%	28.6%	5.0%	1.1%	57.8%	12.8%
Block 2 BSAI	42.1%	31.9%	0.0%	1.2%	30.9%	26.1%
2 GOA	99.5%	99.1%	99.9%	99.1%	99.7%	99.8%
Subtotal	42.5%	32.4%	5.0%	1.4%	58.0%	27.9%
(Foreign)						
1984						
Block 1 BSAI	10.9%	3.7%	47.2%	1.0%	2.1%	9.2%
1 GOA	31.0%	6.0%	1.0%	17.3%	4.4%	26.1%
Subtotal	12.4%	4.2%	21.1%	1.1%	3.4%	10.4%
Block 2 BSAI	12.7%	4.5%	61.4%	1.2%	2.7%	10.7%
2 GOA	31.8%	11.0%	1.2%	17.8%	4.9%	27.9%
Subtotal	14.1%	5.7%	28.7%	1.3%	4.0%	12.0%
1985						
Block 1 BSAI	13.1%	1.6%	0.0%	1.1%	1.6%	10.9%
1 GOA	31.7%	1.4%	20.5%	5.6%	0.0%	25.0%
Subtotal	13.6%	1.5%	16.7%	1.4%	2.0%	11.4%
Block 2 BSAI	13.6%	2.3%	0.0%	1.2%	4.9%	11.1%
2 GOA	31.7%	4.3%	20.5%	6.2%	0.0%	25.7%
Subtotal	14.1%	2.5%	16.7%	11.2%	2.6%	11.8%

Table 3.11. Cost Structure of Joint Venture Trawlers

	85 ft.		108-115 ft.		120 ft.	
	$/lb.	%	$/lb.	%	$/lb.	%
Variable Costs						
Labor	$0.015	37.5%	$0.014	33.3%	$0.013	30.2%
Fuel	0.007	17.5	0.005	11.9	0.005	11.6
Total Variable Costs	0.022	55.0	0.019	45.2	0.018	41.8
Fixed Costs						
Interest	0.002	5.0	0.003	7.1	0.004	9.3
ROI @ 30%	0.003	7.5	0.004	9.5	0.005	11.6
Insurance	0.004	10.0	0.004	9.5	0.004	9.3
Maintenance	0.006	15.0	0.007	16.7	0.007	16.3
Depreciation	0.003	7.5	0.005	11.9	0.005	11.6
Total Fixed Costs	0.018	45.0	0.023	54.7	0.025	58.1
TOTAL COSTS $/lb.	0.040	100.0	0.042	99.9	0.043	99.9
TOTAL COSTS $/mt	$88.20		$92.61		$94.80	
Other Information:						
Crew size	4.02		5.02		4.95	
Catch/Man/Day (lbs)	30,000		35,000		40,000	
Catch/Day	121,000		176,000		198,000	
Days/Fishing Year	150		190		200	
Total Catch/year (lbs)	18,150,000		33,440,000		39,600,000	
Total Catch/year (mt)	8,231		15,147		17,959	

Source: NRC, "A Strategy for the Americanization of the Groundfish Fisheries of the Northeast Pacific," V.2, p. 128 (1985).

catcher/processors or mothership/processo and to those domestic catchers who had previously fished for joint ventures who chose to remain in the zone. The numbers of vessels in the latter category will depend on the demand of domestic shorebased processors. Indications of shorebased capacity versus joint venture capture capacity indicate the number of vessels making the switch from joint venture to DAP fishing will be small, at least initially. Note that this positive effect accruing mostly to at-sea domestic processors is of a transitory nature. This is because as the fishery become more fully "Americanized" harvesting vessels and at-sea and shore processing capacity will enter the fishery to take advantage of increased catch opportunities in the zone. How quickly this might occur is unknown, but if the current rate of "Americanization" continues the entire catch will be domestically processed in a few years.

To answer the question posed above it is necessary to quantify the "CPUE effect". This is done by estimating the relation between catch and effort using detailed catch-effort data. Such estimation is difficult, and it has been impossible, in the time available for preparation of this analysis, to provide a detailed estimate of the catch vs. effort, or CPUE vs. effort relationship for the current fishery. However, analyses prepared by the Council Staff in consideration of Amendment 6 (1983) to the Bering Sea FMP may still be useful in examining the CPUE effect.

That work used catch-effort data for the period 1979-1981 in the Japanese trawl fishery to estimate a relationship between the two. The function estimated, using 1981 data, is

$$\ln (C - (72000 - C)) = -17.307 + 1.956 \ln (E) \quad [3] \qquad (1)$$

where C is catch in mt, and E is effort in trawl-hours.

The fishery today is very different from the fishery of 1981. In particular, the CPUE's reported in that period have increased in recent years. Nevertheless, if the general relationship still holds, one may use equation 1) to estimate how CPUE might increase given a reduction in effort. To do this solve for CPUE (C / E) and suppose that effort, E, is reduced from the initial level by some proportion, θ, ($0 < \theta \leq 1$). Then it is possible to compute a ratio of CPUE after the change to CPUE before the change. This ratio is the proportional increase in CPUE given by a proportional reduction of effort. Using 1) the relationship is given by

$$(CPUE^{NEW})/(CPUE^{OLD}) = \theta(1 - b\theta^2)/(1 + b\theta^2 E^2) \qquad (2)$$

where $b = e^{-17.307} = 3.05 \times 10^{-8}$.

If current effort levels in the proposed closed zone are 100 vessels fishing 100 days in a year, with each vessel fishing, on average, 10 hour days, E is 100,000 hours. If effort is cut in half due to the closure, (2) would estimate that the vessels remaining would benefit by an increase in

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3. Regulatory Impact Analysis, Amendment 6 to the Bering Sea/Aleutian Islands management plan, App. 1, p. 21.

CPUE of approximately 98%. If effort were instead reduced by 25% then CPUE would increase approximately 33%.

The profitability of this increase in CPUE can be examined by assuming that inputs (labor, time, etc.) are fixed. Then, an increase in CPUE would lead to an increase in catch (output) at the original level of inputs. From this perspective gross revenue has increased in the same proportion that CPUE has increased. If the returns to the vessel owner are 50% of net revenue (after the payment of all costs including crew shares) then the increase in profitability would be one half of increase in net revenue.

For example, calculations using the data of Table 3.11 for a fishing vessel of 108-115 'ft., indicate that total costs per day are about $93/mt and total annual catch is 15,000 mt. If daily catch had been 100 mt and CPUE increases such that catch is increased to 150 mt/day then gross revenue would increase by 50% and net revenue would increase from $700 per day to $2,850 per day.[9] If this gain were experienced by 30 vessels, the total increase in profitability would be $64,500.

The increase in profitability could therefore be substantial for those vessels able to fish in the DAP only zone, given the potential displacement of effort as indicated in Table 3.4. As mentioned above those benefits would accrue to the remaining vessels; perhaps 3 to 6 fishing vessels who had been operating as joint venture catcher vessels and up to 25 domestic catcher/processors or mothership/processors (Table 3.1, 3.2).

At the same time the opposite phenomenon would occur for the displaced vessels. CPUE could be expected to decrease for two reasons. The first is a consequence of the assumption that the closed areas represent the most productive fishing grounds. This is certainly true as far as past fishery performance is concerned although the survey data presented in Figure 3.7 and Figure 3.8 indicate that there may be potentially productive grounds for pollock in other areas of the Bering Sea. If these concentrations are available to the fishery it remains true that the increased running time and search time will increase costs. It is also possible that the spawning aggregations of pollock which are so attractive to roe and surimi processors do not occur in areas further north and west of the Unimak Pass area.

The second reason for an expected decline in CPUE is a consequence of the model presented above. A relation such as (1) or (2) would predict that as new effort is put into an area CPUE will decline, all else equal. The decline in CPUE experienced by the displaced joint venture vessels may be much less in percentage terms than that predicted as an increase for vessels allowed to fish in the zone since the percentage changes in effort are less. The actual decline will depend on the concentrations of target species on the new grounds and the percentage increase in total effort in the area. If both of these factors are modest the decline in CPUE will also be modest. However, the numbers of vessels involved (= 120) imply that the total loss in profits could be significant.

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9. Assuming an ex-vessel price of $100/mt.

Using the same data used for the example above, suppose that the decrease in CPUE due to moving to new grounds and due to increased effort is 10%. Then gross revenue per unit of effort can be expected to decline 10%. If operational costs increase 15% because of increased fuel costs due to increased running and search time the data indicate that the vessel can no longer make a profit. Although the owner may continue to fish to cover his variable costs it is improbable that the vessel would remain in the fishery over the long term.

Another question to be addressed is whether shorebased plants would continue to offer a higher price than offered by foreign processors should the management actions be effective in securing delivery of product shoreside. Generally, the answer will depend on whether or not competition for vessels remain, that is, whether the joint venture catcher vessels can make up the catch foregone outside the closed area. If they can, and if foreign processors do not reduce their demand for product, the shore plants will need to maintain the differential. If on the other hand, joint venture prices are reduced, demand for joint venture caught fish is reduced, or if there is excess fishing capacity (e.g., due to the fact that some vessels may be unable or unwilling to fish distant grounds, or that the cost effects outlined above are such that fishing for joint ventures is no longer profitable) then the plants will have little incentive to maintain the higher prices. Such a price reduction would reduce the profitability gains discussed above for those vessels delivering shoreside.

The potential losses to foreign processors has not yet been specifically addressed. This is because, relative to 1984 and 1985, the foreign presence is greatly reduced, and in all likelihood, will be even further reduced in 1988. Second, changes in foreign ex-vessel profit/loss are not directly relevant under the MFCMA, which under the National Standards, views fisheries management from the perspective of the U.S. economy. If those changes, however, lead in turn to changes in the import of product from or reexport of product to the United States economic impacts are expected. These effects with respect to the roe fishery for pollock are a topic of Chapter 9. Other import-export market effects are difficult to quantify and are beyond the scope of this document.[10]

Alternative 3: seasonal closures

The kinds of costs and benefits to fishing vessels, and to landbased and at-sea processors, are qualitatively identical to that arising from the area closures discussed in the preceding section: increased operational costs, and decreased CPUE and hence, net margin for displaced boats; and increased CPUE and increased profits for the remaining vessels. The segments of the industry effected are the same. This is because the qualitative effects of a closure are the same regardless of its extent in space and time.

The quantitative aspects differ, however, according to the amount of catch foregone (see Table 3.7, Table 3.8, Table 3.9.1 and Table 3.10). As argued

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10. Useful information on the world market for whitefish, in general, and cod, in particular, can be found in Queirolo (1986) and Crutchfield (1986).

in the environmental impact section, a seasonal closure of either of the suggested zones would be intermediate in impact between the no action alternative and the year round closure alternative (Alternative 2). Thus, the preceding discussion on costs and benefits to the fishing fleet overstates the impact of a six month closure of the Unimak Pass fishing grounds to joint venture and foreign fishing.

Likewise, Alternative 3b, which would impose a January 1 to June 30 closure on joint venture fishing Bering Sea wide, is predicted to have potentially a greater impact on the fishing vessels operating in the Bering Sea because of the large amount of catch likely to be foregone.

In sum, the economic impact of Alternative 2, Alternative 3a, and Alternative 3b are qualitatively the same. The magnitude of the impacts will stand in direct proportion to the amount the harvest is reduced in the closed zones, or in the entire Bering Sea. Short term benefits will accrue to those vessels delivering shoreside (to the extent that shoreside capacity exists to process fish) and to domestic vessels processing at-sea. Costs will be borne by the owners and crews of joint venture vessels who are not able to deliver shoreside, or who experience increases in costs, decreases in revenue, or both, and by joint venture service companies.

In the longer term, all the Alaskan harvest will be processed domestically, with or without establishing a zone for priority access, or a seasonal closure of all or a portion of the Bering Sea management area. The question to be answered is what is the best course for this Americanization--where best is taken to mean that course of action which results in the greatest stream of benefits to the U.S. economy. The answer depends on the investment climate, and the relative costs of various types of operation. This last issue--relative costs--is the topic of the following discussion concerning the imposition of fees or assessments on foreign processors receiving product from domestic catcher vessels.

Alternative 4: fees on foreign processors in the joint venture fishery

Much of the analysis of the preceding alternatives has been concerned with the changes in expected harvest, either in the physical sense for the environmental analysis, or in terms of ex-vessel revenue for the economic analysis. It is clear, however, from the debate surrounding this controversial issue and from the discussion above that one key factor is the relative cost advantage of foreign at-sea processing, versus domestic at-sea processing versus domestic shoreside processing.

Comparative cost information is limited but a recent study by Natural Resource Consultants (NRC, 1986) indicates that, for a pollock filleting operation, total processing costs shoreside and at-sea are roughly equivalent (Table 3.12). The cost comparison does not, however, include shoreside delivery cost.

A similar comparison of processing costs for surimi operations reveal a rough parity between domestic shorebased and at sea processors, with an estimated cost differential of between 4 and 11 cents per pound (Table 3.13). The Japanese catcher/processor of surimi faces costs similar to

Table 3.11. Costs Per Pound of Processing Pollock Fillets-
cents per pound)

Cost Element	American Factory Trawler	Alaska Shore-based Plant
Fish	---	37
Labor	29	19
Fuel and Lube/Energy	13	7
Packaging	8	8
Maintenance and Depreciation	10	6
Insurance	5	1
General and Administrative	2	4
Unloading/ Unloading Freight to Seattle	2	7
Return at 18%	19	10
TOTAL PER POUND	92	72
TOTAL PER POUND W/O 18% RETURN	63	62

1/ Skinless, boneless, shatterpack fillets

Source: NPC, "A Strategy for the Americanization of the Groundfish Fisheries of the Northeast Pacific" V.2, p. 148, (1985).

Table 3.13. Surimi Processing, Shore Based v. Sea Based
(cents/lb.)

Cost Element	Alaska Shoreside Plant[1/]	American Operated Mothership[1/]	American Catcher/ Processor[1/]	Korean Mothership	Japanese Catcher/ Processor
Fish	30-35	23-25	-	23-25	-
Other Materials					
Packaging	3	3	3	3	3
Labor	17	23	27	6	34
Fuel/Energy	1	1	4	1	4
Freight	10	10	10	.10	10
Insurance	.5	.5	1.5	.5	1
Depreciation	3	2	6	2	7
Maintenance	.5	1.5	3	.5	2
Other	2	2	2	2	2
Return on Capital (16%)	10	5	16	5	18
Total	77-82	71-73	73	53	81

Assumptions:[1/]

Annual Production Volume (millions of pounds)	23	63	24
Initial Capital cost (millions of dollars)	$13	$18	$22

Source: Natural Resources Consultants, Fletcher & Co. Analysis (Summer 1986 estimates).

those encountered by domestic shoreside plants while there is a substantially reduced cost for product processed by Korean motherships. The cost savings in the Korean operation are primarily a consequence of reduced labor costs, and, secondarily, a result of a lower opportunity cost of capital.

In addition to these cost differentials, Alaskan shorebased processors are assessed a landings tax on the gross value of receipts (Table 3.14). Given fish costs of 30-35 cents per pound the total cost of product to these plants may be 31-36 cents and the total processing costs 73-82 cents per pound. This is almost 30 cents more per pound than the processing costs of a Korean surimi mothership.

Table 3.14. The Alaska Renewable Resource Tax

Species	Shore Plants	Processed at-sea	Other
Groundfish	1%	3%	1.2 %[11]
Salmon	3%	-	
Crab	1%	5%	

Source: (Harold Jones, pers. comm.)

Suppose that this cost information is used to arrive at a per unit fee to those foreign processors who receive fish from U.S. catcher vessels under the rational that the economic system will work without intervention if all players are afforded a level playing field. The fee structure therefore recognizes that because of certain national subsidies for other nations and because U.S. regulations or law impose additional operational costs on shoreside processors an assessment may be imposed on those foreign processors to equalize total processing costs.

A fee on pollock alone may be sufficient, or it may be desirable to impose fees on cod and pollock. Using the above results (a 20-30 cent per lb differential) implies that, for pollock, an assessment of between $400 and $600 per mt would be necessary to equalize total operational costs of Korean mothership operations and Alaskan shoreside plants.[12] Of course, such a fee would penalize those foreign operations already experiencing higher costs (e.g. Japanese catcher/processor).

A fee system, therefore, might either consider differential costs of various nations and assess fees on a per nation basis or, instead, compute a weighted average cost differential to determine the fee (essentially the procedure now used for foreign fee assessment).

11. There is a 1% landings tax assessed by the borough of Dutch Harbor. In addition, the Alaska Seafood Marketing Institute (ASMI) levies a fee of 0.2% on all member processors.

12. A cost differential of 1 cent/lb is equivalent to $22.05/mt.

If, however, the rationale for imposition of the fee is to counteract the advantage accorded to foreign processors via the combination of national subsidies and the non-imposition of costs related to U.S. legal system (landings taxes, MFCMA assessments, OHSA requirements, etc.) it is more appropriate to consider only the relevant proportion of differential costs. A full analysis of the relative advantage of subsidies and the relative disadvantage of mandated costs is beyond the scope of this analysis, however, a rough approximation using information in Tables 3.13 and 3.14 is that U.S. processors are at least disadvantaged 2-3% due to the landings taxes. This translates to a differential of 6 to 9 cents per lb (for surimi processing, Table 3.13) which is equivalent to a per mt assessment of $130-200. If one wished to factor in transportation costs of fish shoreside (estimated earlier at 6-11 cents/lb) to level the playing field for Alaskan shorebased plants a total assessment of 12-20 cents/lb ($265-440/mt) would be appropriate.

Operationally, the assessment estimation, and collection procedures could be handled in the same way that the current fees on directed foreign fishing operations are administered. Note that the MFCMA permits the collection of fees

> at least in an amount sufficient to return to the United States an amount which bears to the total cost of carrying out the provisions of the [Magnuson] Act during ... fiscal year 1986 the same ratio as the aggregate quantity of fish harvested by foreign fishing vessels within the fishery conservation zone during 1985 bears to the aggregate quantity of fish harvested by both foreign and domestic fishing vessels within such zone and the territorial waters of the United States during [1985].[13]

This alternative does have price implications, however. That is, the new cost structure may affect the basic market pricing mechanisms, potentially raising prices at the secondary processing, wholesale and retail levels. Price responses will depend on the willingness and ability of the seller to pass on cost increases (i.e. the relative price elasticities of supply and demand).

3.4.2. Reporting Costs

The closed zone alternative(s) or the closed season approach may require imposition of new check in/check out procedures for all fishing vessels. If the reporting burden is placed on the foreign processing vessels existing regulations should suffice. Imposition of fees on foreign processors will not require any changes in the status quo reporting requirements..

3.4.3. Administrative, Enforcement, and Information Costs and Benefits

The administrative cost of the area closure relates to the cost of any reprogramming on the part of the observer program and PacFIN. These costs are not likely to be substantial. The administrative cost of the seasonal

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13. 16 U.S.C. 1824(b)(10)(B)

closure of the entire Bering Sea to joint venture and/or foreign fishing will be minimal, in fact, it may be possible to realize some cost savings. With regard to the fee alternative, the administrative costs of imposition will also be minimal if the procedures adopted are identical to that used currently for the directed foreign fisheries. If a separate program is established to determine, and collect assessments administrative costs could be substantial.

The enforcement costs of the proposed closures depend on the wording of the implementing regulations. If the regulations are written such that the closed areas are declared off limits to foreign processing vessels enforcement costs will not increase greatly. Note that the size and shape of the area has little effect on enforcement costs. Enforcement of the fee collection alternative should not increase status quo costs, assuming, as above, that the program is a supplement to the existing foreign fee program administered by NMFS.

3.4.4. Impact on Consumers

If the price paid by re-processors of blocks (especially pollock, but also cod) increases because of retractions in supply (due to the reduced catch from joint ventures) or because of increases in costs (CPUE declines, per ton assessments) then consumers will suffer a loss. The magnitude of this loss will depend on the price response of the consumer demand curve and the magnitude of the price shift. Changes in product level at the U.S. national retail level are expected to be modest in relation to the U.S. market for whitefish products. Significant changes in the supply of pollock for surimi or substantial price shifts for either raw product or primary surimi could have a major impact on the U.S. markets for analog products.

3.4.5. Redistribution of Costs and Benefits

All the alternatives described above may benefit the western Alaskan communities which participate in shorebased processing if those closures or fees result in more product being delivered shoreside. If more fishing, transport, and processing vessels visit those ports to purchase fuel, supplies, and for service and maintenance the local economies will further benefit. If less vessels use these ports for servicing local revenue may decrease. All alternatives benefit the domestic at-sea processing component, primarily because of potentially significant increases in CPUE and hence profitability. All alternatives harm joint venture operations to some extent. Losses in income to joint venture fishermen may be substantial. Additionally, if the restrictions are major and long term the viability of the joint venture service companies will be threatened. In the long run these losses to joint ventures will occur even under the status quo. The magnitude of these gains and losses will depend, of course, on the magnitude of the catch reduction and the CPUE effects.

3.4.6 Cost - Benefit Conclusion

First, it is not clear whether the supply problem in Unalaska/Akutan will be resolved without government intervention by business and marketing efforts currently underway. Second, it is obvious that the more extreme

alternatives (closure of the larger Block 2, a January - June closure of the entire Bering Sea to joint ventures and foreign fleets) will have significant positive impacts on the domestic at-sea processing component and significant negative economic impact on the joint venture fishery.

It is impossible to conclude, however, that the closures will result in more product delivered shoreside than would otherwise be the case. Certainly, all alternatives increase the likelihood of this happening by improving the competitive position of the shorebased plants. What actually happens is completely dependent on the ability of the displaced fleet to make up the foregone catch, and on the ability of the domestic at-sea processing component to preferentially capture the benefits. Cost reductions and increases also depend, in part, on the magnitude of the CPUE effect. If costs are reduced enough to allow vessels to lose fishing time by delivering shoreside or to operate (or charter) tendering vessels to complete the transfer of product while still enhancing profitability the supply problem for shorebased processors will cease over the near term. If the cost reduction on the grounds is not large enough to cover the transportation costs closures will not rectify the problem.

Whether the net benefit exceeds net costs in terms of the total U.S. economy will depend on the size of the closure (in space and time), the costs of displacement and the ability to make up catch potentially foregone because of the closures, and the quantitative relationship relating CPUE to profitability. All three items require estimation which has the usual attendant errors, however, our ability to predict the probable catch in new fishing areas is very limited, and it is this prediction of catch changes that is critical to the whole prediction process.

Worst and best case predictions are possible, however, using results presented earlier. The smaller block closure (Alternative 2a) would reduce joint venture gross ex-vessel revenue by $8-10 million if none of the catch foregone is made up (Table 3.9.1). Likewise, the worst case for the larger block closure indicates a revenue loss of $18-22 million (Table 3.9.1). Worst case scenarios for the foreign fisheries indicate potential losses in gross revenue of $14-18 million for the two alternative closures (Table 3.9.1). The corresponding best case scenarios would predict no ex-vessel revenue declines although profits would be expected to decline because of increased costs.

In the same manner, the worst case for the seasonal closure indicates a loss in ex-vessel gross revenue of $21-34 million for joint ventures, and $3-19 million for the foreign fisheries for a six month closure of the entire Bering Sea management area (Table 3.9.2). Corresponding worst case declines in ex-vessel revenue for seasonal closures of the blocks are, for the smaller closure, $3-4 million and $12-175 thousand for joint ventures and foreign fisheries, respectively; and, for the larger closure, $7-11 million and $23-250 thousand, respectively (Table 3.9.2). Again, the best case scenario would predict no revenue decline.

The best and worst case scenarios for DAP revenue would predict the maximum and minimum gains to DAP due to the closures (area or area/season). The worst case would be that DAP is unable to increase its share of the landings. Revenue increases would then be $0. This is very unlikely, as

is the best case scenario where gains would be characterized as equal to the revenue losses above, under the assumption that all catch foregone by joint ventures is taken by DAP vessels.

Although this bounds analysis may be useful in limiting the discussion of impacts, the latitude of predictions is extreme. Again, actual impacts will depend on the amount of catch foregone, the ability of DAP to harvest that catch, and, especially, the relationship between effort, CPUE, and costs.

Regardless of the outcome of this calculation procedure it is important to recognize that if it is the Council's desire to protect the local economies of western Alaskan communities, particularly with regard to the local seafood processing capabilities, adoption of one of the alternatives described above may prove attractive. To the extent that the U.S. regulatory system and foreign subsidies hinder free market competition in the international seafood markets per unit catch assessments on foreign processing vessels may be effective in increasing the rate of total U.S. domestication of the fishery.

The down side of any alternative which is effective in eliminating the foreign presence is the problem of idling U.S. fishing vessels while U.S. processing capacity increase and the possibility of price increases and supply reductions at the wholesale and retail level.

AGENDA D-2
JANUARY 1987
SUPPLEMENTAL

JUSTIFICATION FOR THE DOMESTIC FISHERY ZONE WITHIN 100-MILES OF UNALASKA

A Supplementary Report
to
James Campbell, Chairman
North Pacific Fishery Management Council

by

The City of Unalaska
Paul Fuhs, Mayor
(907) 581-1251

and

The City of Akutan
Erika Tritremmel, Administrator
(907) 279-9245

The proposed 100-mile zone
around Unalaska is intended for
all DAP fishermen of all gear types.

TABLE OF CONTENTS

INTRODUCTION

In Unalaska and Akutan, fish is our future. No fish, no future. During 1986, our processors had difficulty buying a steady supply of pollock and cod, even though they were paying 25% more than joint venture motherships offered.

To help us overcome this shortage, we request that the North Pacific Council set aside the grounds inside a 100-mile radius of Unalaska, not just for us, but for all DAP fishermen and processors.

The time-area closure concept of fishery management and allocation is the essence of our proposal.

When Congress was deciding how to stimulate the American fishing business ten years ago, it chose the time-area closure as its preferred instrument of change.

Congress drew the 200-mile boundary line and notified the world that access to the fish inside that line would be granted on a clearly-stated, priority basis: DAP fishermen and processors first, JVP fishermen second and TALFF last.

Our proposal is a legitimate descendant of the 200-mile limit line.

Congress anticipated that Americans like us would request such lines in the future as the domestic fishing business developed.

Our proposal seems to have given JVP fishermen boundary anxiety, though. They claim that drawing lines in the ocean is impractical and that it sets a dangerous precedent.

This is peculiar for two reasons. First, if Congress had not drawn a 200-mile line along the American coast in 1976, many of these people would not be in the groundfish business today. There would be no incentive for foreign fishing companies to participate in joint ventures. Directed foreign fishing would still dominate the Bering Sea and Gulf of Alaska. Second, many JVP fishermen who oppose the 100-mile line around Unalaska did not oppose, nor seek to repeal, the boundary lines that kept foreign fishermen out of the Shelikof Strait pollock fishery, where many JVP fishermen made their first, big money.

There's an obvious double standard here where there shouldn't be.

We all understood the rules under the Magnuson Act. Competition for the pollock and cod in the Bering Sea and Aleutian Islands should be conducted according to those rules. To suddenly deny the rules or to thwart them suggests an unwillingness to share the wealth from these fisheries.

Those who have already profited from priority access cannot reasonably deny DAP fishermen and processors the same advantage.

This paper will describe how much pollock and cod has been harvested from this area in 1983, 1984 and 1985, how that amount compares to the DAP processing capacity in the area, and if JVP fishermen could find pollock and cod in commercial abundance elsewhere.

CONGRESSIONAL MOTIVE

Why did Congress pass the 200-mile limit law in 1976?

On page 3 of the Magnuson Act, Congress describes exactly why it passed that law.

(1) To prevent overfishing;

(2) to rebuild overfished stocks;

(3) to insure conservation;

(4) to realize the FULL POTENTIAL of the nation's fishery resources; and

(5) to assure that our citizens benefit from the EMPLOYMENT, FOOD SUPPLY and REVENUE which could be generated by a national program for the development of fisheries.

Congress had a clear commercial motive. It intended to stimulate new jobs and new sales for American fishing companies, American fish processing companies, American shipyards, companies that supply hardware and services to the American fishing industry, American companies that transport processed fish to market, secondary fish processors throughout America and American fishing towns, too.

How much of the potential employment, food supply and revenue did Congress intend domestic fishermen and processors to capture?

". . . The full potential of the nation's fishery resources." One hundred percent.

Full potential is unambiguous. It means everything. No holdbacks.

That's the goal of our proposal. To capture the full potential of the BSAI pollock fishery for domestic fishermen, domestic processors and domestic businesses associated with the fishing industry.

We think there will be many benefactors of the 100-mile zone around Unalaska in addition to processors and fishermen. Our proposal will boost the volume of pollock and cod handled by DAP processors. That will generate new demand for the services of other Americans such as those listed below.

(1) Shipyard workers in Washington, Oregon, California, Louisiana, Alabama and Florida.

(2) Longshoremen and truck drivers in Alaska, Washington, Oregon and California.

(3) U. S. merchant seamen and ship owners transporting processed fish from Western Alaska to the Orient or the West Coast.

(4) Processing workers from Anchorage, the Pacific Northwest and California who will come to Unalaska, Akutan and King Cove for the new jobs.

(5) Airlines serving Seattle to Anchorage and Anchorage to Cold Bay and Unalaska.

(6) Surimi analog manufacturers around Puget Sound and in California.

(7) Cold storage owners and workers around Puget Sound.

HOW CONGRESS JUDGES THE VALUE OF THE FISHING INDUSTRY TO AMERICA'S ECONOMY

How important does Congress think a totally domestic fishing industry is to our nation?

Congress says just how important on page 2 of the Magnuson Act.

> "Commercial and recreational fishing constitutes a major source of employment and contributes significantly to the economy of the Nation."

Unalaska is one of the capitol cities of the domestic fishing industry. If commercial fishing "contributes significantly to the economy of the Nation", then Unalaska should contribute significantly, too.

To make that significant contribution to the American economy, Unalaska needs priority access for DAP fishermen and processors. That appears to be the most cost effective and reliable way to improve the odds of getting fish to our processors and our town.

We are not asking for any guarantees. All we need is a level playing field on which to compete with other DAP processors for the fish. For several reasons, stated

WHY DAP PROCESSORS NEED PRIORITY ACCESS.

DAP processors are at a distinct competitive disadvantage with joint venture processors in the Bering Sea and Aleutian Islands.

(1) The joint venture product enjoys virtually free access to some important Asian and European markets. DAP product faces public and hidden trade barriers abroad.

(2) Where the joint venture product is subject to import quotas and duties, DAP product commonly faces stiffer ones. In Japan, for example, we understand JVP surimi enjoys a 5¢ to 8¢ per pound lower import duty than DAP surimi does.

(3) The social costs of producing DAP product are much higher than they are for JVP product.

In the process of becoming one of the most civilized nations on earth, the United States has adopted some of the highest human rights standards, sanitation standards, environmental quality standards, occupational, safety and health standards and pure food standards in the world.

Meeting these standards is a direct cost to American manufacturers; in our case, DAP processors.

Most JVP processors enjoy a much lower cost of compliance with these standards. In many cases, the JVP processor is not required by its government to meet many of these standards.

This difference is obvious if you compare the DAP cost of production to the JVP's.

(4) DAP product faces unfair price competition on international markets from some JVP processors. The USSR, Poland and the PRC are command economies whose state enterprises are not required to sell their products at a price that would be break-even or profitable for DAP processors. Top priority for these countries may often be hard currency generation, not profit.

(5) JVP processors pay no user fees for the fish they acquire in the 200-mile zone. If those same processors were receiving deliveries under TALFF, they would be paying permit and user fees to the U. S. government.

DAP shore processors pay a raw fish tax to the State of Alaska, local resource taxes on landed fish and numerous conventional business and sales taxes in their communities.

(6) DAP processors must comply with certain federal laws that do not restrict JVP processors. American fishermen have the option of selling to domestic processors or JVP

processors. Domestic processors do not have the same flexibility. They can only receive direct deliveries from domestic fishermen. The Nicholson Act obstructs foreign deliveries to domestic processors.

The Jones Act effects the DAP processors in many ways. It does not seem to restrict the JVP processor at all.

U. S. federal anti-trust laws isolate DAP processors and promote auction-style pricing in the U. S. Many JVP processors are not subject to anti-trust laws in their homelands. In fact, most of the countries represented in the JVP processing fleet assume that the sale price of their products will not be determined by American-style competition, but by consultation and planning between producers.

(7) We have been told by businessmen in the American fishing industry that JVP processors may enjoy some national subsidies for their fuel, labor and marketing expenses, preferential interest rates on their business loans and distinct tax preferences and deferrals. The magnitude of these advantages to JVP processors is hard to determine.

We suspect that magnitude is greater for JVP processors than it is for DAP processors. If any evidence to the contrary is available, we'd like to see it.

PURSUING THE FULL-POTENTIAL OF THE BERING SEA-ALEUTIAN ISLANDS POLLOCK FISHERY

How close are domestic fishermen and processors to capturing the "full potential" of the Bering Sea-Aleutian Islands pollock fishery?

Let's concentrate on determining the "full potential" wholesale value, first.

To estimate the "full potential" wholesale value of the 1987 pollock fishery we must make several conservative assumptions.

(1) The recovery rate of surimi from raw pollock is at least 20% annually.

(2) The average wholesale price of surimi produced in Alaska by foreign motherships and domestic plants and factory trawlers is $1 per pound.

(3) American joint venture operating companies earn the equivalent of $10 per ton for their services.

(4) All of the DAP pollock is processed into surimi and consumed domestically. (This is assumable because pollock fillet recovery rates are similar to surimi recovery rates. Likewise, wholesale pollock fillet prices approximate surimi wholesale prices.)

(5) Approximately 150 million pounds of surimi will be consumed in the U. S. during 1987. Domestic processors will provide 30 million tons (if they can get the fish). Imports will provide 120 million pounds, or 54,000 tons.

The "full potential" wholesale value of this pollock fishery to the American economy in 1987 will be approximately $568 million.

DAH BS	1,200,000	MT
DAH AI	88,000	MT
TOTAL	1,288,000	MT
	X 20%	surimi recovery
	257,600	MT surimi
	X $2,205	MT wholesale value ($1 per pound)
TOTAL	$568,000,000	

How much of this will DAP fishermen and processors earn in 1987, if processors can acquire the fish?

DAP BS	190,000	MT
DAP AI	57,000	MT
TOTAL	247,000	MT
	X 20%	surimi recovery
	49,400	MT surimi
	X $2,205	wholesale value ($1 per pound)
TOTAL	$108,927,000	DAP wholesale value (includes ex-vessel price paid DAP fishermen)

To this amount, we must add the amount likely to be earned by JVP fishermen and JVP company operators from the 1987 JVP allocation.

BS	Final JVP	1,010,000	MT
AI	Final JVP	30,790	MT
TOTAL		1,040,790	MT

JVP fishermen will be paid approximately $125 per ton for their catch this year.

1,040,790	MT
X $125	per MT
$130,000,000	JVP fishermens' income

American JVP companies will earn approximately $10 per ton for their services. (If there is a better estimate, we welcome it.)

1,040,790	MT
X $10	per MT
$10,040,790	JV operators' income

The total domestic income from this pollock fishery in 1987 will be approximately $248 million.

$108,927,000	wholesale CAP value
130,000,000	JVP fishermens' income
10,041,000	JVP operators' income
$248,968,000	TOTAL

Is this $248 million the net wholesale value to the American economy in 1987?

No, because American importers are projected to pay $120 million for U. S. surimi imports in 1987.

By subtracting the cost of the imports from the value to DAP processors, JV fishermen and JV operators, we can estimate the net wholesale value of Bering Sea-Aleutian Islands pollock fishery to the American economy.

$249,000,000	domestic pollock income
-$120,000,000	cost of imports
$129,000,000	net wholesale value to U. S. economy

In the Findings Section of the Magnuson Act, Congress writes --

> (7) A national program for the conservation and management of the fishery resources of the U. S. is necessary . . . to realize the full potential of the Nation's fishery resources.

How close is the Nation to realizing the full potential of this pollock fishery in 1987?

Based on our assumptions, we can calculate that.

$568 million is the "full potential" wholesale value of the 1987 pollock fishery.

$129 million is the net wholesale value to the U. S. economy.

$$\frac{\$129 \text{ million}}{\$568 \text{ million}} = 23\%$$

That's how much of the "full potential" of this pollock fishery is being captured by the domestic economy in 1987.

This means the U. S. economy will receive less than one-quarter of the wholesale value generated by that pollock fishery in 1987.

How much motivation is there for the United States to fully utilize that pollock business as soon as possible?

$439 million worth of motivation in 1987 alone, and that's just wholesale value.

By establishing a priority access zone within 100-miles of Unalaska, the North Pacific Council will send a clear signal

to DAP processors and investors:

> "Gear up and compete for the $439 million wholesale value the U. S. economy hasn't yet captured from this pollock fishery. We recognize the DAP processor's competitive disadvantage against JVP processors. To counter-balance that, we've set aside productive fishing grounds where DAP fishermen and DAP processors can compete for the fish."

This policy will lead America to the full potential of the Bering Sea and Aleutians pollock fishery faster than any other.

POLLOCK MIGRATION AND THE 100-MILE ZONE AROUND UNALASKA

"Since pollock are ectotherms, with body temperatures in equilibrium with their surroundings, on- and off-shelf migrations appear to be an adaptive response to the extremely cold temperatures (0.0° to -1.7° C) of the shelf domain during winter. Along the shelf edge at depths of 200-300 m, water temperatures are relatively constant -- 3-5° C throughout the year, providing a warm winter refuge (i.e., freezing avoidance) layer. Dispersal from this layer out onto the continental shelf during summer presumably maximizes the exploitation of different food resources by different size and age classes."

NWAFC Processed Report 79-30
Fisheries Oceanography-
Eastern Bering Sea Shelf
Felix Favorite
October 1979

Pollock and codfish are born with tails. They move around the Bering Sea and Aleutian Islands all their lives. Attempts to corral them are futile. Their behavior is not exactly predictable. But fishermen have developed some ideas about where to find them during the spring, summer, fall and winter. See Appendix I - IV.

One of the best places fishermen find pollock and cod is along the 100-fathom curve near Cape Sarichef. The curve comes up from the Aleutians toward Sarichef, makes a sharp turn to the west and runs up towards the Pribilof Islands. This area

is known as the Horseshoe, because the 100-fathom curve is shaped like one there. Foreign and domestic fishermen have noticed that pollock and cod school up in this hot spot during several months of the year. Later they disperse and the majority of them apparently move to other grounds.

How valuable has this area been to pollock and cod fishermen lately?

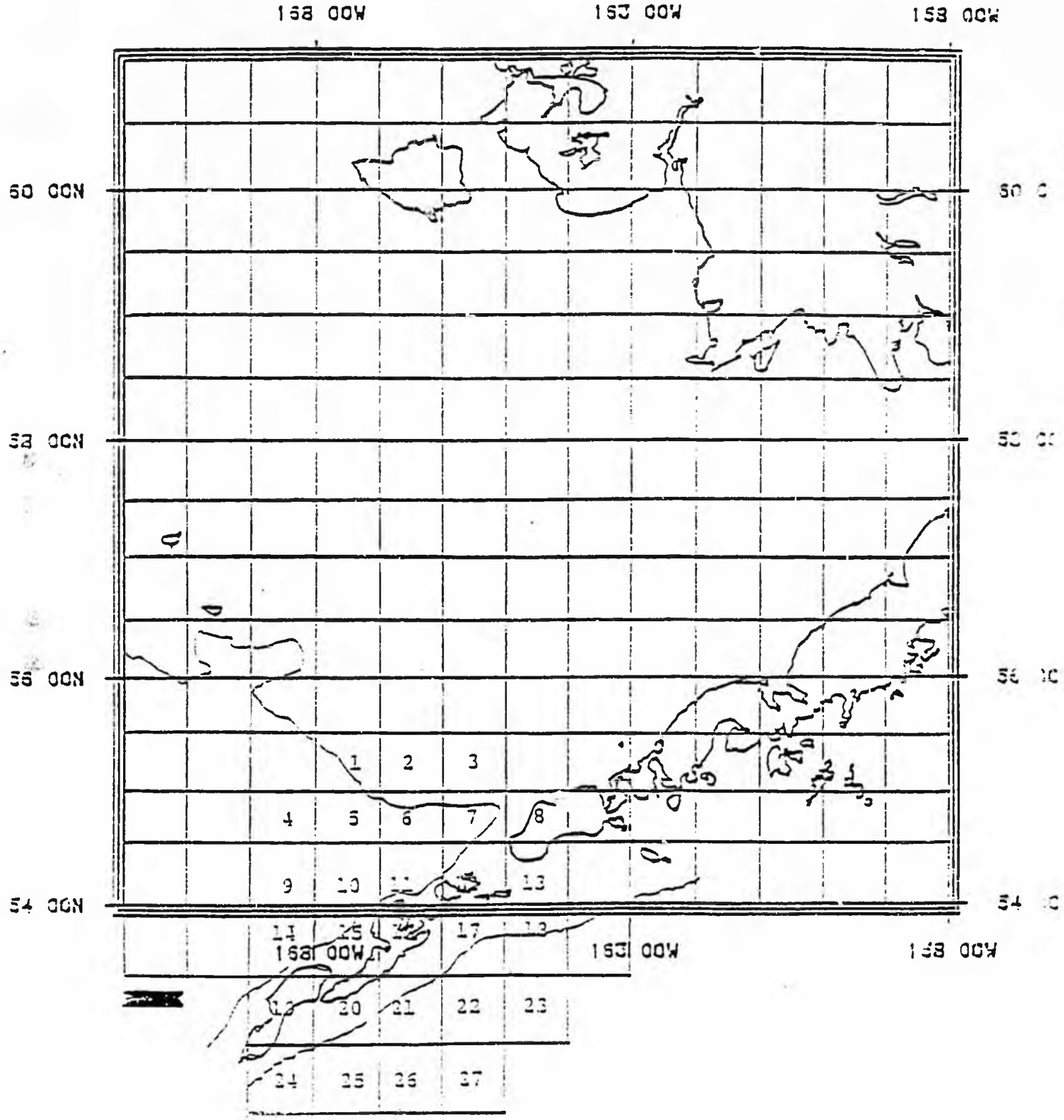
We calculated that by drawing a 100-mile radius around Unalaska, then comparing the monthly catch by foreign and JVP fishermen inside the zone to their total monthly catch of pollock and cod.

From NMFS Foreign Fishery Observer Office in Seattle, we received monthly catch data by one-degree longitude, half-degree latitude blocks in the Bering Sea and Aleutian Islands.

After drawing the 100-mile radius on a navigation chart, we determined which blocks were within the area.

Some blocks were not completely inside the radius. Those that appeared to be mostly-inside the area we added to the blocks that were entirely inside the radius.

The chart on page 21 shows which blocks we judged to be inside the radius and mostly-inside the radius.



BLOCKS INCLUDED IN THE 100-MILE RADIUS

Using NMFS data, we determined the monthly observed JVP catches in 1983, 1984 and 1985. Then we calculated what percent of JVP pollock and cod was caught inside the 100-mile radius. Table I shows those figures.

Table II combines the three annual JVP catches and shows that 36% of the observed JVP pollock catch and 31% of the observed JVP Pacific cod catch came from inside the 100-mile radius.

"Observed" is the key word here. Table III shows what percent of the annual JVP pollock and cod catch was actually observed by NMFS in 1983 - 1985.

Any conclusions drawn from Table I must be refined by data in Table III. For example, Table III shows that there was 100% observer coverage of the JVP pollock catch in 1984 and only 44% observer coverage in 1985. Any conclusions about the monthly pattern of JVP pollock and cod fishing in 1984 are probably more valid than those for 1985. Fuller observer coverage allows us to be more certain about exactly where the JVP catch came from.

Table IV shows the monthly observed foreign harvest of pollock and cod in the Bering Sea and Aleutian Islands. It also shows what percent was harvested within 100 miles of Unalaska.

Table V combines the three annual foreign catches and shows that overall 15% of the pollock and 6% of the Pacific cod was taken inside the 100-mile zone. This implies that JVP fishermen need not fish inside the 100-mile zone to catch their pollock and cod allocations. There are commercial abundances elsewhere that supported the foreign fleets. Since there's very little TALFF anymore, JVP fishermen will not have to compete against foreign fishermen outside of the 100-mile zone.

Table VI shows what percent of the foreign directed pollock and cod fishery was observed by NMFS in 1983-1985.

TABLE I

PERCENT OF THE MONTHLY
BSAI OBSERVED JVP HARVEST TAKEN
WITHIN A 100-MILE RADIUS OF UNALASKA

		WALLEYE POLLOCK		PACIFIC COD	
		Total Observed JV Catch MT	Percent Harvested Inside 100-mile Radius	Total Observed JV Catch MT	Percent Harvested Inside 100-mile Radius
Jan	1983	0	0	0	0
	1984	50	82	293	97
	1985	12	90	16	44
Feb	1983	74	96	455	94
	1984	478	95	2,957	97
	1985	601	12	1,331	96
Mar	1983	300	15	322	63
	1984	28,314	23	5,562	78
	1985	22,178	7	2,965	92
Apr	1983	4,207	89	571	10
	1984	39,653	45	2,896	48
	1985	20,373	21	1,544	39
May	1983	10,677	28	1,250	1
	1984	1,437	3	1,961	3
	1985	2,989	11	1,100	1
Jun	1983	20,247	18	1,251	2
	1984	30,123	34	3,745	1
	1985	9,682	3	2,083	0
Jul	1983	24,133	48	3,142	3
	1984	72,514	4	4,032	3
	1985	46,063	29	2,578	0
Aug	1983	19,995	55	2,019	2
	1984	41,578	5	2,631	8
	1985	31,912	49	2,208	4
Sept	1983	10,038	100	120	100
	1984	10,111	97	1,991	5
	1985	19,335	74	1,508	15
Oct	1983	116	100	34	100
	1984	5,457	94	192	84
	1985	7,895	85	722	17
Nov	1983	0	0	0	0
	1984	260	27	0	0
	1985	1,963	93	79	89
Dec	1983	0	0	0	0
	1984	0	0	0	0
	1985	0	0	0	0

TABLE 11

SUMMARY

	WALLEYE POLLOCK			PACIFIC COD		
	Observed JVP Harvest MT	Observed JVP Harvest Inside 100-Mile Radius MT	Percent of JVP Harvested Inside 100-Mile Radius	Observed JVP Harvest MT	Observed JVP Harvest Inside 100-Mile Radius MT	Percent of JVP Harvested Inside 100-Mile Radius
3-year Total	482,765	174,876	36	51,558	15,874	31

Source: NMFS Foreign Fishery Observer Program
(206) 526-4194

TABLE III

OBSERVED BERING SEA-ALEUTIAN ISLAND
JVP HARVEST AS A PERCENTAGE
OF ACTUAL JVP HARVEST

	WALLEYE POLLOCK			PACIFIC COD		
	Observed MT	Actual MT	% of JVP Observer Coverage	Observed MT	Actual MT	% of JVP Observer Coverage
1983	89,787	146,000	61	9,110	9,662	94
1984	230,025	230,314	100	26,260	24,382	107
1985	162,991	370,000	44	16,134	35,634	45
Average			68			82

** Since not all of the JVP harvest during these three years was observed by NMFS, it is useful to determine how much coverage NMFS did get. This will help the Council assess the validity of the monthly numbers in Table I and Table II.

Source: Resource Assessment Document for Bering Sea-Aleutian Groundfish, 1986
Pages 20 & 29

TABLE III

TABLE IV

PERCENT OF THE MONTHLY
BSAI FOREIGN DIRECTED HARVEST TAKEN
WITHIN A 100-MILE RADIUS OF UNALASKA

		WALLEYE POLLOCK		PACIFIC COD	
		Total Foreign Directed Catch MT	Percent Inside 100-Miles	Total Foreign Directed Catch MT	Percent Inside 100-Miles
Jan	1983	12,330	0	1,375	0
	1984	14,553	0	617	31
	1985	11,219	0	741	0
Feb	1983	49,061	0	2,514	0
	1984	63,345	0	2,671	0
	1985	11,377	0	3,646	0
Mar	1983	36,113	0	3,307	0
	1984	14,323	0	1,514	0
	1985	11,683	0	1,333	1
Apr	1983	36,810	0	3,030	0
	1984	6,568	0	2,381	1
	1985	1,352	0	2,265	0
May	1983	34,670	0	2,700	0
	1984	21,681	0	511	8
	1985	4,053	0	1,504	0
Jun	1983	113,391	7	2,363	0
	1984	80,125	2	5,265	0
	1985	46,209	0	377	0
Jul	1983	147,794	13	3,302	6
	1984	144,687	1	3,437	0
	1985	126,887	0	1,732	0
Aug	1983	154,005	16	3,602	15
	1984	142,637	4	4,649	1
	1985	156,396	0	4,026	0
Sept	1983	139,233	31	2,690	23
	1984	156,224	14	4,654	4
	1985	135,110	0	3,749	0
Oct	1983	87,167	60	3,300	42
	1984	97,058	35	6,633	3
	1985	137,171	36	9,027	6
Nov	1983	42,162	49	4,223	42
	1984	93,507	51	11,113	7
	1985	93,354	68	3,525	4
Dec	1983	20,153	0	5,123	17
	1984	67,341	0	11,839	5
	1985	74,651	0	3,345	1

TABLE V

SUMMARY

	WALLEYE POLLOCK			PACIFIC COD		
	Observed Foreign Harvest MT	Observed TALFF Harvest Inside 100-Mile Radius MT	Percent Harvested Inside 100-Mile Radius	Observed Foreign Harvest MT	Observed TALFF Harvest Inside 100-Mile Radius MT	Percent Harvested Inside 100-Mile Radius
3-year Total	2,575,809	389,231	15	145,722	9,028	6

Source: NMFS Foreign Fishery Observer Program
(206) 526-4194

TABLE V

TABLE VI

OBSERVED BERING SEA-ALEUTIAN ISLAND
FOREIGN HARVEST AS A PERCENTAGE
OF ACTUAL FOREIGN HARVEST

	WALLEYE POLLOCK			PACIFIC COD		
	Observed MT	Actual MT	% of Foreign Observer Coverage	Observed MT	Actual MT	% of Foreign Oberver Coverage
1983	862,889	982,363	88	37,984	93,167	41
1984	903,059	1,093,783	83	52,279	133,161	39
1985	809,861	1,179,787	69	52,459	145,426	36
Average			80			39

Source: Resource Assessment Document for Bering Sea-Aleutian Groundfish, 1986
Pages 20 & 29

OBSERVATIONS ON THE DATA

(1) In all three years, the observed JVP pollock and cod catch was low during the months of November, December, January and February. We think that's because JVP trawlers were in the shipyard in November and December and in Shelikof Strait in January and February. Since Shelikof is closed to JVP fishing this year, we expect much more JVP effort in the Bering Sea and Aleutians.

(2) That increased JVP pollock and cod fishing need not come from within 100-miles of Unalaska, though. In 1983-85, only 15% of the total observed foreign pollock harvest was taken inside the 100-mile radius. See Table V. The areas where TALFF was taken in the past are wide open now that the Council has nearly eliminated foreign fishing. JVP fishermen can catch their pollock allocation outside of the 100-mile zone and JVP processors can cruise with them to those alternative hot spots. Our shore plants cannot. They are much more dependent on the catch from the 100-mile zone around Unalaska.

(3) DAP processing capacity in Unalaska and Akutan is approximately 930 MT per day or 26,040 MT per 28-day operating month. We estimate that DAP floating capacity is approximately 700 MT per day. If the Council has a better estimate, we welcome it.

Estimated 1987 total DAP processing capacity in our area is 1,630 MT per day or 45,640 MT per 28-day operating month.

Table I shows that from January through August, the total observed monthly JVP catch exceeded the current DAP capacity only once in 1983-1985.

We recognize that JVP catch capacity has risen since then. But we think that DAP processors would use many tons of pollock and cod from the 100-mile zone if they could get priority access to it.

Is that just wishful thinking?

Not after what happened in Unalaska last December.

POLLOCK FOR CHRISTMAS

By December 1986, all joint venture fishing was over for the year. Two large American trawlers, the Aldebaron and the Arcturus from Anacortes, Washington, agreed to deliver pollock and cod to Great Land Seafoods in Unalaska. During the previous 11 months, Great Land was unable to buy enough fish for surimi production because most American trawlers preferred delivering to joint venture motherships.

From December 9 to December 16, Great Land processed 2.7 million pounds of pollock delivered by these two trawlers. That's 153 tons per day processed by approximately thirty people. One of the managers at Great Land told us that if they could count on pollock deliveries like that all year, they'd put in another filet line and boost daily production substantially. (They already have the plant space for it.) That would put an additional fifteen to twenty people to work processing surimi.

Great Land did receive more deliveries from these trawlers during the two weeks right after Christmas. The problem is that the Great Land managers were notified that the two trawlers will return to joint-venture fishing later in January.

The shortage of pollock in Unalaska is inhibiting new investment in the plant and the creation of new jobs there, too.

We're looking for a practical way to get pollock and cod to Unalaska in the same magnitude it arrived just before Christmas. Our whole town was excited about those first eight days of prosperity. With the North Pacific Council's help we'll have many more days like them, soon.

It's not pleasant being low man on the fishery allocation totem pole -- especially when the Magnuson Act says DAP processor needs should be provided for first, not last.

CONCLUSION

There's been a serious shortage of pollock and cod in Unalaska and Akutan during 1986. Most American trawlers have delivered all of their catch to joint venture processing ships at sea. Even though one Unalaska processor offered a 25% higher price for pollock, he wasn't able to attract many deliveries last year. Consequently, DAP shoreplants will be deploying several tenders in 1987; hoping to buy pollock and cod on the grounds from U. S. fishermen. Even if they can acquire some fish this way, creation of a 100-mile domestic fishery zone around Unalaska will still be vital to them. It will give all DAP fishermen and processors several important competitive advantages over their JVP counterparts (as the Magnuson Act intended.)

(1) The DAP fishermen's CPUE within the zone will be maximized in the absence of simultaneous JVP fishing nearby. DAP fishermen will be able to load up faster, thereby maximizing their catch per month.

(2) The fuel cost and running time for DAP fishermen will be minimized since most of the hot spots within the 100-mile zone are only 10 hours from Unalaska and Akutan. Minimizing run time helps maximize deliveries and income per month.

(3) Pacific cod bycatch in DAP pollock deliveries will be maximized by the absence of the JVP fleet. Cod filet sales really improve the DAP processor's monthly income statement. They make him more competitive with JVP processors.

For these reasons, we ask the North Pacific Council to accept our proposal as Amendment 11 to the Bering Sea - Aleutian Islands Groundfish Management Plan for 1988, send it out for public review and adopt it at the May meeting.

The Council may receive other proposals to solve the pollock shortage in Unalaska and Akutan.

We only request that they not be substituted for ours in the amendment cycle.

APPENDIX I

CATCH PER UNIT EFFORT
IN THE SUMMER SURVEY

These following three CPUE charts show the relative abundance of pollock during the NMFS summer surveys.

In 1983 and 1984, all ten best CPUE's were outside the 100-mile radius of Unalaska.

In 1985, only two of the ten best CPUE's were inside the 100-mile radius of Unalaska.

Most of the best summer pollock fishing appears to be outside the 100-mile radius of Unalaska.

In 1983 and 1984, several of the ten best CPUE's were just beyond the 100-mile radius of Unalaska.

CPUE's change from month to month. Like many fishermen, we believe some of the best January to May and September to December CPUE's for pollock and cod are probably found inside the 100-mile radius or just beyond it.

Those CPUE's can be maximized by allowing DAP fishermen only inside the zone. Simultaneous fishing by JVP fishermen in the same area will probably reduce the CPUE for the DAP fleet.

During the spring months, Pacific cod school up inside the 100-mile radius. Cod is very valuable to DAP processors in our area. Receiving pollock deliveries with a high

percentage of Pacific cod bycatch is a bonus to them. Large-scale JVP trawling inside the 100-mile zone will probably diminish the Pacific cod tonnage delivered to DAP processors.

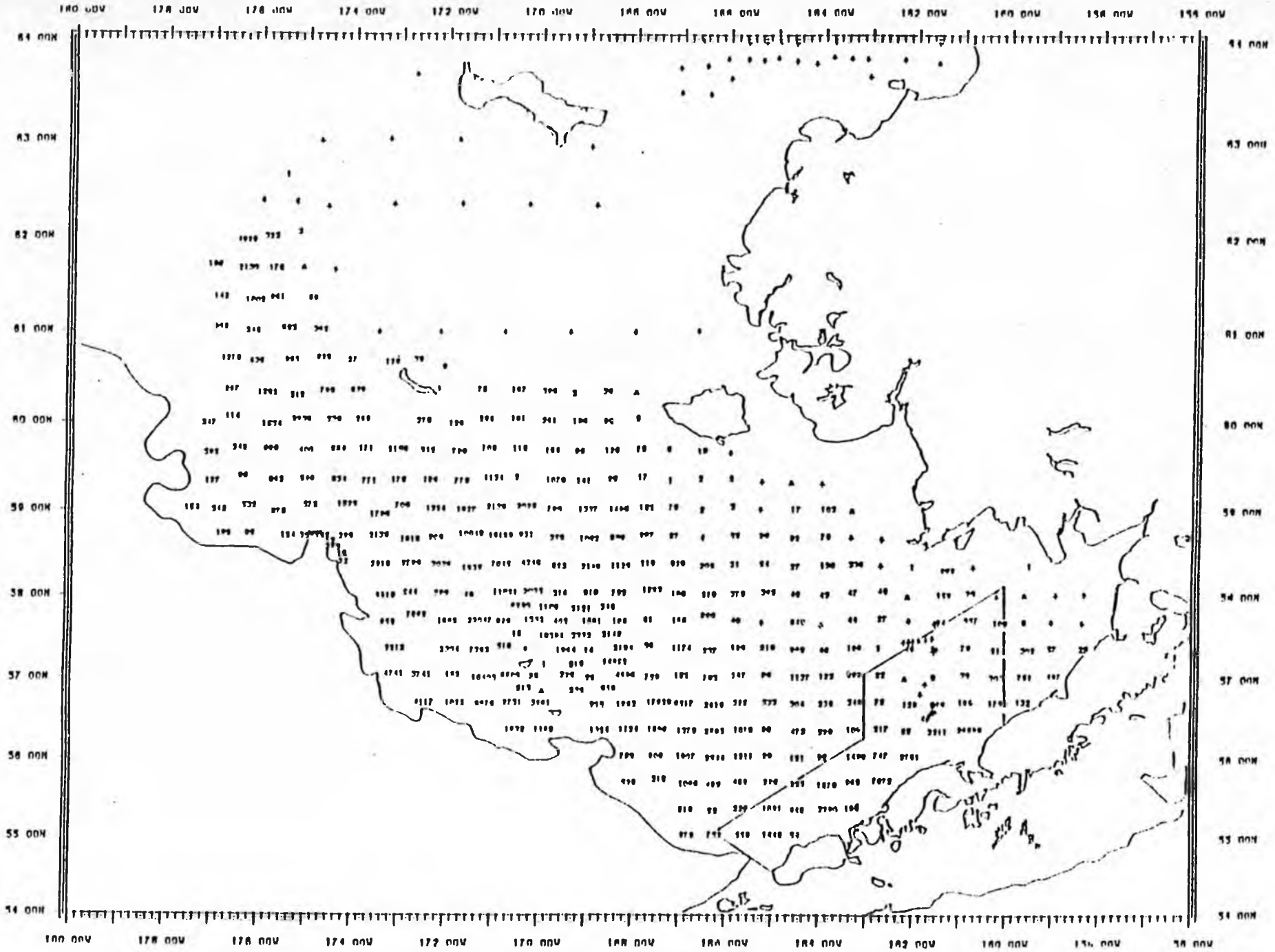
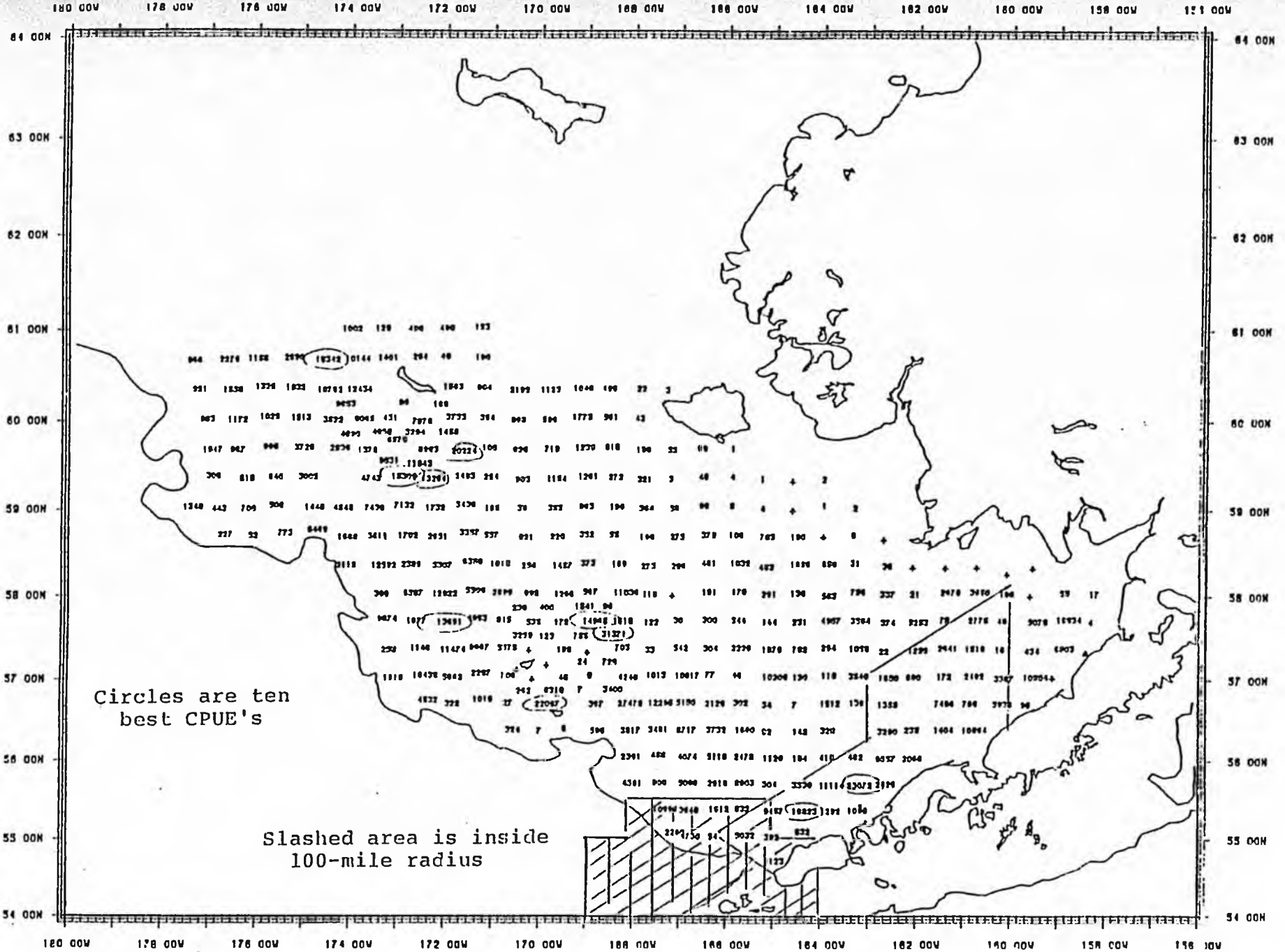
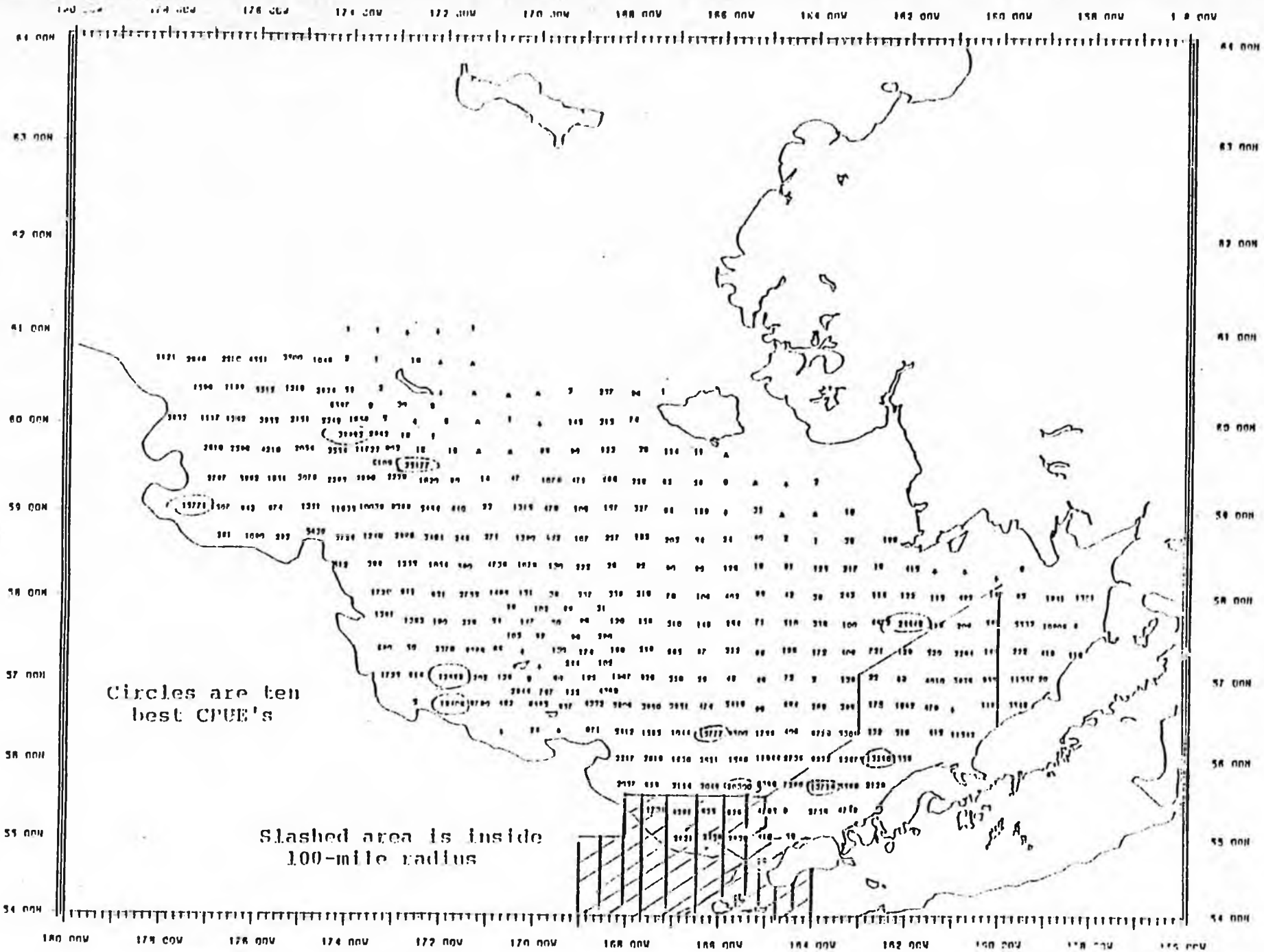


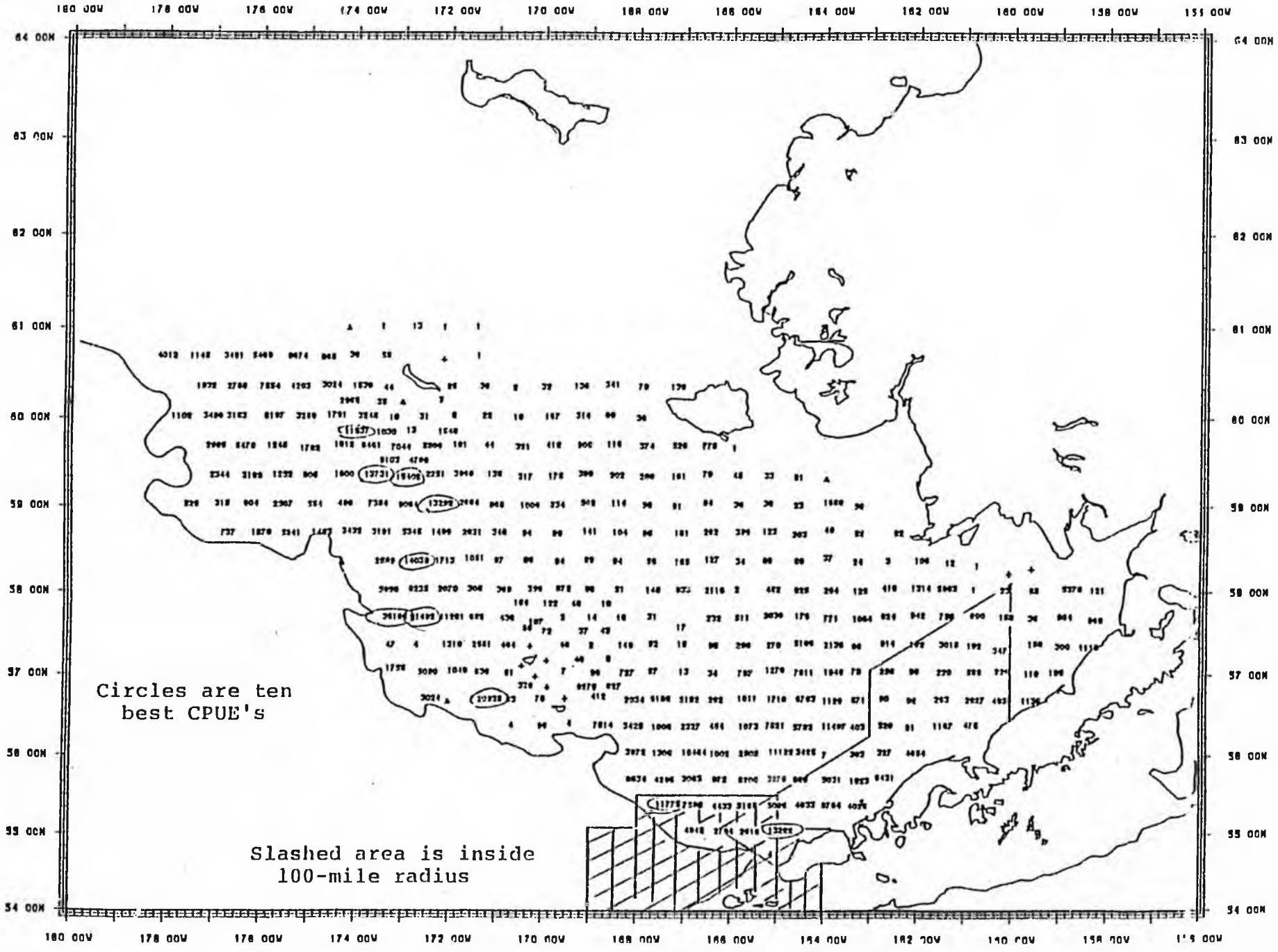
Figure 31.--Catch per unit effort (lbs/hr trawled) of walleye pollock (Theragra chalcogramma) from 1982 research survey data.



---Catch per unit effort (lbs/hr trawled) of walleye pollock (Theragra chalcogramma) from 1983 research survey data.



.--Catch per unit effort (lbs/hr trawled) of walleye pollock (Theragra chalcogramma) from 1984 research survey data.



.--Catch per unit effort (lbs/hr trawled) of walleye pollock (Theragra chalcogramma) from 1985 research survey data.

APPENDIX II

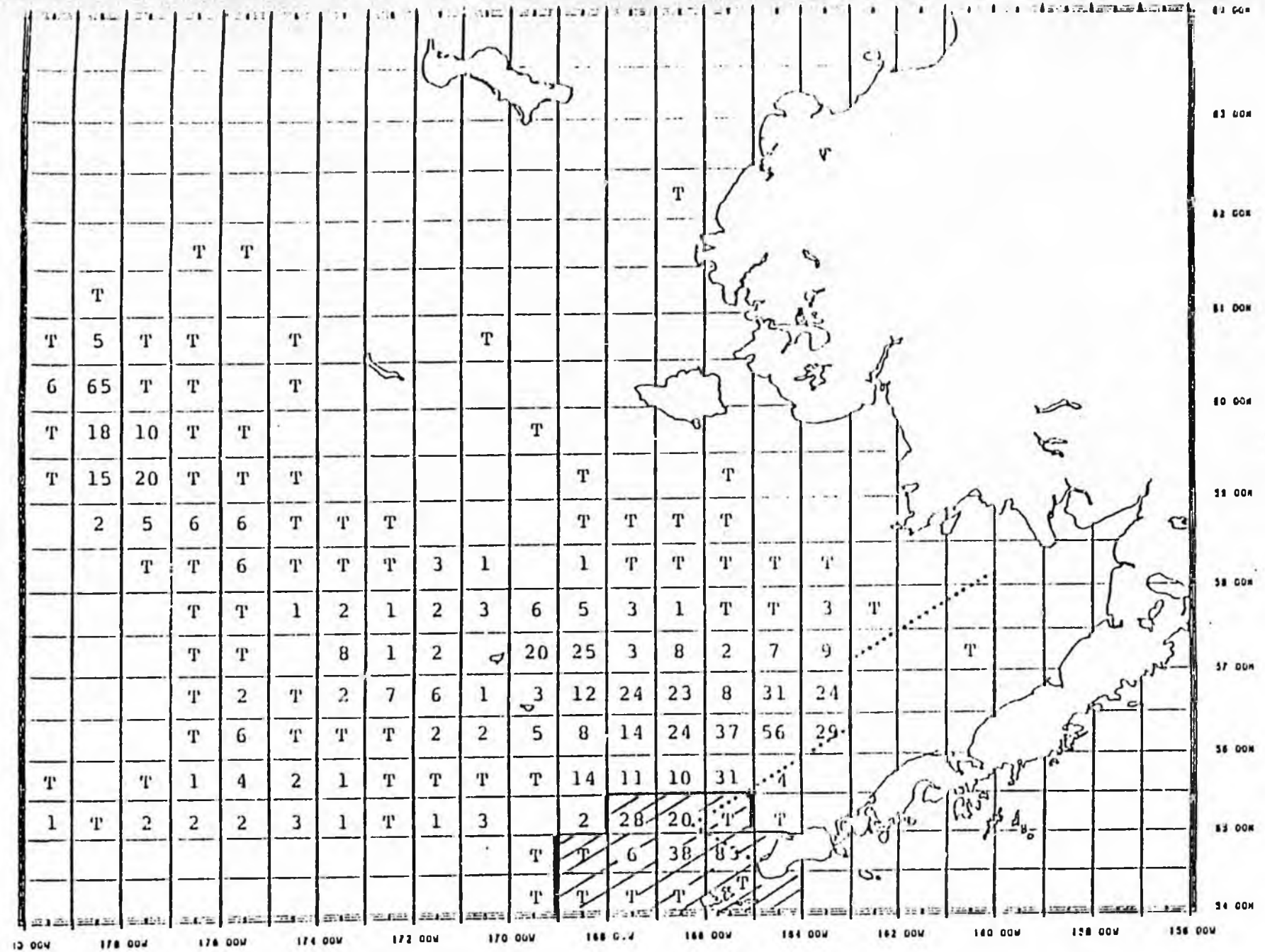


Figure 8.--Foreign-reported catch (thousands of metric tons) of walleye pollock in 1982.
T = less than 500 t.

SLASHED AREA INSIDE 100-MILE ZONE

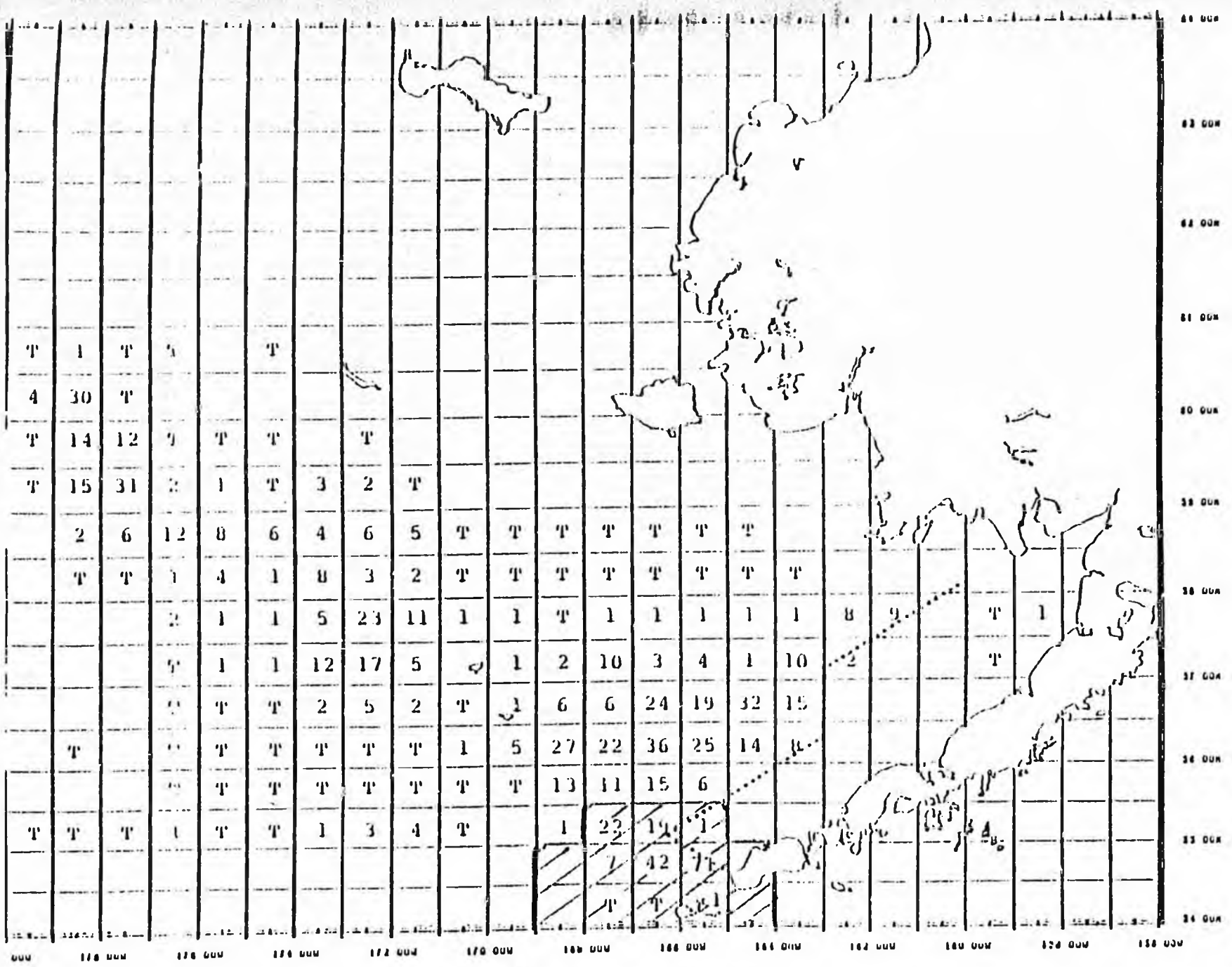


Figure 9.--Foreign-reported catch (thousands of metric tons) of walleye pollock in 1983.
T = less than 500 t.

ASHED AREA IS INSIDE 100-MILE ZONE

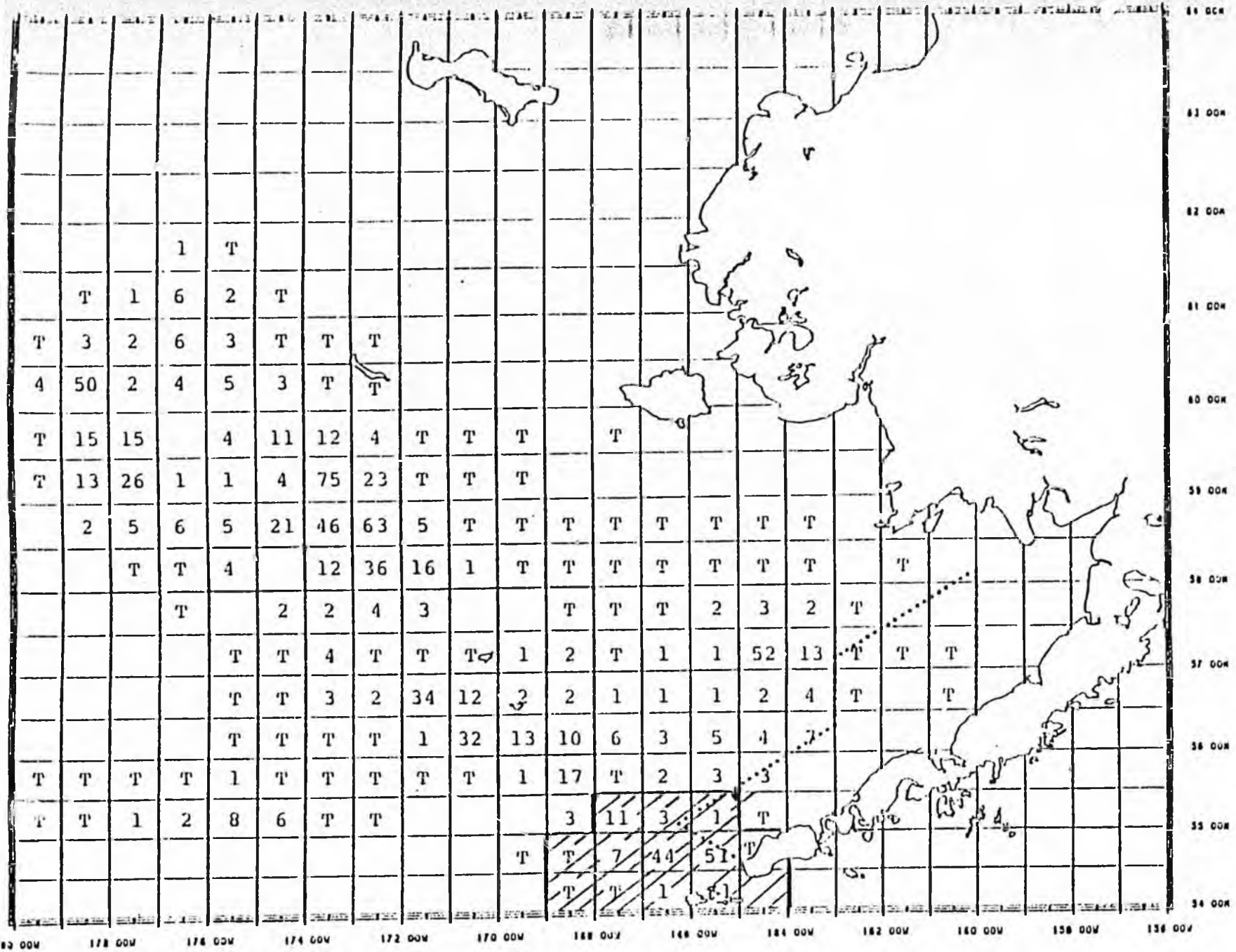
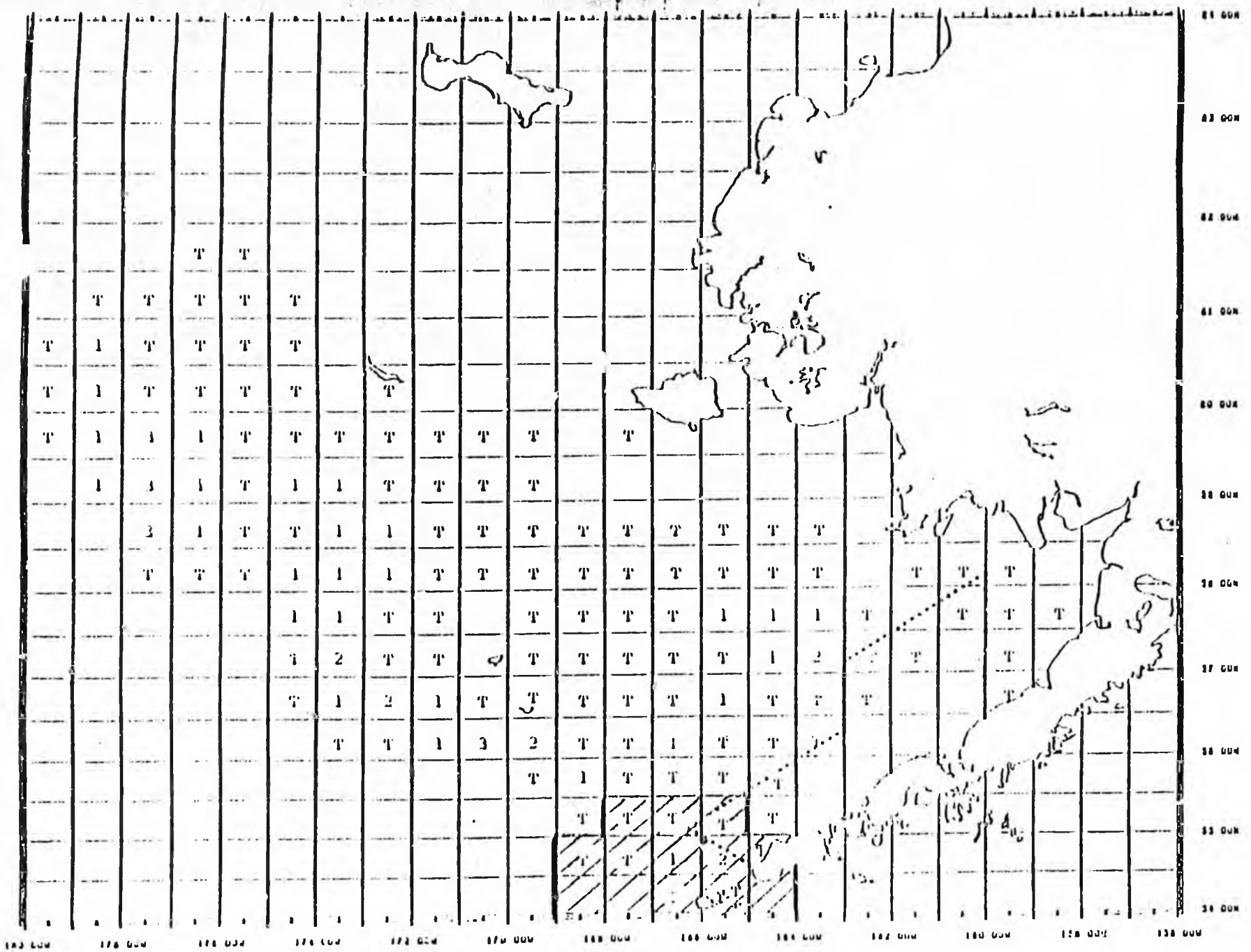


Figure 10.--Foreign-reported catch (thousands of metric tons) of walleye pollock in 1984.
T = less than 500 t.

SLASHED AREA INSIDE 100-MILE ZONE



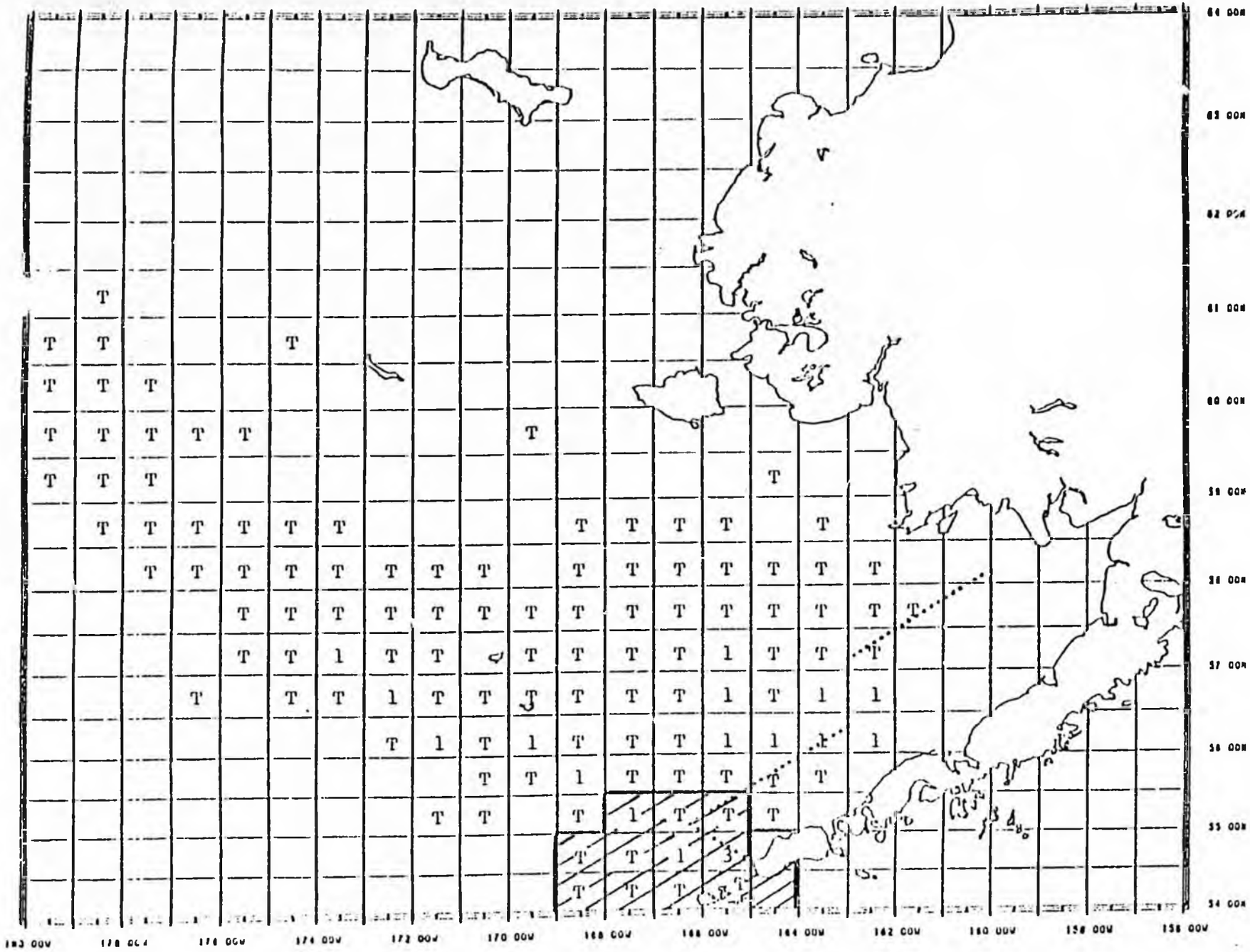


Figure 13.-Foreign-reported catch (thousands of metric tons) of Pacific cod in 1982.