

# Multiple Area Participation Patterns in Alaska Roe Herring Fisheries: Implications for Alaska Salmon?

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Roe herring permit areas in Alaska stretch from Southeastern Alaska to the Bering Sea, much like the Alaska salmon fisheries. Among nonexclusive roe herring fisheries, fishing operations are able to participate in an unlimited number of permit areas. Analysis of the activity of vessels with commercial landings in multiple roe herring permit areas over the 1994 through 2000 period reveals that vessels in the gillnet fisheries have fished as many as three permit areas in one year and vessels in the seine fisheries have fished as many as five permit areas in one year. As much as 40% of the gillnet fleet and 27% of the seine fleet have made landings in more than one permit area in a year. This study may provide some insight to the level of fleet reduction that would occur if the currently enforced exclusive salmon net area registration requirements were eliminated.

## *Introduction*

This report analyzes the nonexclusive roe herring fisheries over a seven-year period, 1994-2000. Seasonal peaks and levels of participation are examined for each fishery. The number of vessels fishing multiple permit areas within the seine and gillnet roe herring fisheries, the combination of areas that roe herring operations fish, and some characteristics of those fishing operations with landings in one permit area versus multiple permit areas are presented and discussed.

The situation in the nonexclusive roe herring areas contrasts sharply with the situation in the salmon net areas. Currently, exclusive salmon net area registrations exist for vessels and Commercial Fisheries Entry Commission (CFEC) permit holders.<sup>1</sup> Some have suggested that removing the exclusive salmon net area registrations might provide a means to reduce the number of fishing operations through private market transactions. If the regulations are in fact inhibiting fleet consolidation, removing these regulations would encourage fleet consolidation.

With the decline of ex-vessel salmon prices and concomitant falls in limited entry permit values, there is a growing discussion in the industry about the need to find ways to encourage fleet consolidation and reductions to reduce harvesting costs and consequently improve profitability in the salmon fisheries.

If a vessel and permit holder could fish in more than one salmon net area during the season, some persons might find it profitable to purchase permits for multiple areas and take their fishing operation to the different permit areas as runs peak across the state. The number of permits in each area would remain constant but the total number of fishing operations would be reduced. Holding other factors constant, this voluntary consolidation would increase the average gross earnings per salmon fishing operation and increase the total economic rents from each fishery to the extent that total harvesting costs are reduced.

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<sup>1</sup> See 20 AAC 05.1940, 20 AAC 05.1950, and 5 AAC 39.120.

How large of a consolidation could be expected if the regulations for exclusive salmon net areas were eliminated is not known. The question is difficult to answer since the exclusive salmon net area regulations have been in place since 1956<sup>2</sup>, and there are no available data on how many operations fished in multiple areas prior to the regulation. Nonexclusive roe herring permit areas may, however, provide some insight.

Several roe herring permit areas are nonexclusive, allowing for a fishing operation to fish in multiple areas. Like salmon fisheries, the Alaska roe herring fisheries are dispersed throughout the state. The purpose of this paper is to look at the nonexclusive roe herring fisheries to examine the extent to which fishing operations fish in multiple areas during the season. The analysis, in combination with a more rigorous comparison of the salmon and roe herring fishery characteristics, may provide some insights into the magnitude of fleet reduction that might occur if the exclusive salmon net area restrictions were removed.

***Superexclusive Use Versus Nonexclusive Roe Herring Permit Areas***

A person who participates in the commercial taking of roe herring as a CFEC permit holder or crew member in a superexclusive use area at any time from February 1 through June 30 (a span including all sac roe seasons) may not participate or have participated in the commercial taking of herring either as a CFEC permit holder or as a crew member aboard a vessel used to take herring, in another superexclusive or nonexclusive use area at any time from February 1 through June 30 of that same year. The same is true for a vessel that is used to take herring in a superexclusive area (5 AAC 27.899(b-d), 5 AAC 27.987(b-d)).

This report examines the activity of fishing operations that participate in only one fishery versus the activity of those that fish multiple fisheries. Since participants in superexclusive fisheries do not have the choice to fish multiple fisheries, they are excluded from this report.

**NONEXCLUSIVE  
ROE HERRING PURSE SEINE FISHERIES  
INCLUDED IN REPORT**

***Fisheries Limited to Entry***

- Southeast (A)
- Prince William Sound (E)
- Cook Inlet (H)
- Kodiak (K)

***Open Access Fisheries***

- Chignik (L)
- Alaska Peninsula-Aleutian Islands (M)
- Bristol Bay (T)
- Kotzebue (including Port Clarence) (X)\*

**NONEXCLUSIVE  
ROE HERRING GILLNET FISHERIES  
INCLUDED IN REPORT**

***Fisheries Limited to Entry***

- Southeast (A)
- Prince William Sound (E)
- Kodiak (K)

***Open Access Fisheries***

- Cook Inlet (H)
- Security Cove (S)
- Bristol Bay (T)
- Kotzebue (including Port Clarence) (X)
- Alaska Peninsula-Aleutian Islands (M)\*\*

<sup>2</sup> Exclusive salmon net area registration pre-dates the creation of the Alaska Board of Fish and Alaska Department of Fish and Game. Source: Morehouse, T.A., J. Hession. 1972. "Politics and management: the problem with limited entry", *Alaska fisheries policy, economics, resources and management*. Institute of Social, Economic and Government Research, University of Alaska, Fairbanks. ISEGR Report No. 33, p 298.

**SUPEREXCLUSIVE USE BEACH SEINE FISHERY  
NOT INCLUDED IN REPORT**

***Fisheries Limited to Entry***

Norton Sound (Z) 5 AAC 27.987(a)

**SUPEREXCLUSIVE USE GILLNET FISHERIES  
NOT INCLUDED IN REPORT**

***Fisheries Limited to Entry***

Nunivak Island (U) and Nelson Island (N) are combined superexclusive use areas 5 AAC 27.899(a)

Goodnews Bay (W) 5 AAC 27.899(a)

Cape Romanzof (Y) 5 AAC 27.987(a)

Norton Sound (Z) 5 AAC 27.987(a)

***Open Access Fisheries***

Cape Avinof (V) 5 AAC 27.899(a)

\* Purse seine or beach seine 5 AAC 27.930(a)(3)

\*\* Though gillnet gear is legal in Area M, there have not been any landings on gillnet permits during the years included in this report

Note: In addition to the seine and gillnet fisheries identified above, CFEC has issued two gillnet and purse seine (combined) limited entry permits for Kodiak roe herring.

***Season and Fishing Periods in Alaska Roe Herring Fisheries***

Commercial roe herring fisheries may only occur (for a specific district within a registration area) if biomass estimates are above an established minimum spawning biomass threshold. For each district with stock level estimates sufficiently above the threshold, guideline harvest levels are set on district or section levels within each registration area. In most areas, when the spawning biomass estimates exceed the threshold, the allowable roe herring harvest ranges from 10 to 20 percent of the spawning biomass. The actual percentage is a function of the projected spawning biomass. As guideline harvest levels are achieved, fisheries are closed by emergency order.

In any registration area or portion of registration area, the Alaska Department of Fish and Game (the department or ADF&G) commissioner may delay an opening beyond the earliest date specified in the regulations if the commissioner finds that it would affect the orderly conduct of the fishery or conservation of the fishery resources (5 AAC 27.045). The commissioner may also close a registration area or portion of a registration area by emergency order when the commissioner finds that continued herring fishing would jeopardize the health of herring stock (5AAC 27.035(b and d)).

Generally, herring may be taken in each registration area only during fishing periods established by emergency order within a roe herring season that is defined by Board of Fisheries regulations<sup>3</sup>. There is some flexibility in the management guidelines for commercial roe herring fisheries allowing the department to enhance the value of the landed product through establishing fishing periods in areas that 1) the herring roe content of the catch is likely to be highest and/or 2) the catch is composed of the maximum average size of herring available for the stock (5 AAC 27.059(a)(1-2)).

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<sup>3</sup> In Southeastern Alaska (registration area A), sac roe seasons are defined by emergency order; eliminating the need for fishing periods (5 AAC 27.110(b)).

### *Seasonal Peaks in Roe Herring Fisheries*

Figures 1 and 2, at the end of this section, show the range of seasonal harvest peaks in select nonexclusive roe herring fisheries. Both figures include all commercial landings of herring on roe herring permits<sup>4</sup> in the selected fisheries over a seven-year period, 1994-2000. As in the rest of this report, superexclusive areas are not included. In addition, those nonexclusive use areas with relatively low harvest totals for each gear group are not shown because the period of harvest is not evident graphically in relation to the other fisheries.

The figures illustrate the timing of seasonal peaks in selected commercial roe herring fisheries by averaging the total pounds of herring landed on roe herring permits during each statistical week over all years that the fishery occurred, 1994-2000. Since not all fisheries were open every year and years of zero harvest are excluded from the average, the graphs should be used only to examine the range in timing of each fishery relative to the others. The figures are not a representation of typical harvest levels within each fishery (see Tables 1 and 2 for year-end total pounds harvested in each permit area).

Statistical weeks can be converted to calendar weeks for any year by identifying the first full week, Sunday to Saturday, of the year. If January 1<sup>st</sup> falls on a Sunday, then statistical week one is equal to the first seven days of the year, statistical week two is equal to the second week of the year, etc. The last statistical week ends on December 31<sup>st</sup> regardless of what day of the week it falls on; therefore, the last week may not be a full seven days. If January 1<sup>st</sup> is not a Sunday, the first full week of the year becomes statistical week two, and any days in January preceding the first Sunday become statistical week one. Because statistical weeks are not assigned to the same calendar dates each year, a single statistical week may represent a range of up to 13 days over multiple years.

The following translation of statistical weeks to calendar dates may be used to interpret Figure 1 and Figure 2:

Statistical Week	Calendar Dates
12	Mid March
14	Late March to Early April
18	Late April to Early May
22	Late May to Early June
26	Mid to Late June

Pacific herring spawn during the spring. Generally in Alaska, spawning occurs first in Southeast, followed by the central and western portions of the Gulf of Alaska, and lastly in the Bering Sea. As evident in both the seine and the gillnet fishery figures below, the roe herring fisheries follow the same pattern as they target Pacific herring just before spawning.

The roe herring seine fisheries typically peak first in Southeast Alaska, followed by Prince William Sound and Kodiak, Cook Inlet, and Bristol Bay (Figure 1). The seasonal peaks between each fishery are separated by roughly one to two weeks, with the exception of Prince William Sound and Kodiak. During the seven-year period included in this report, the Prince William

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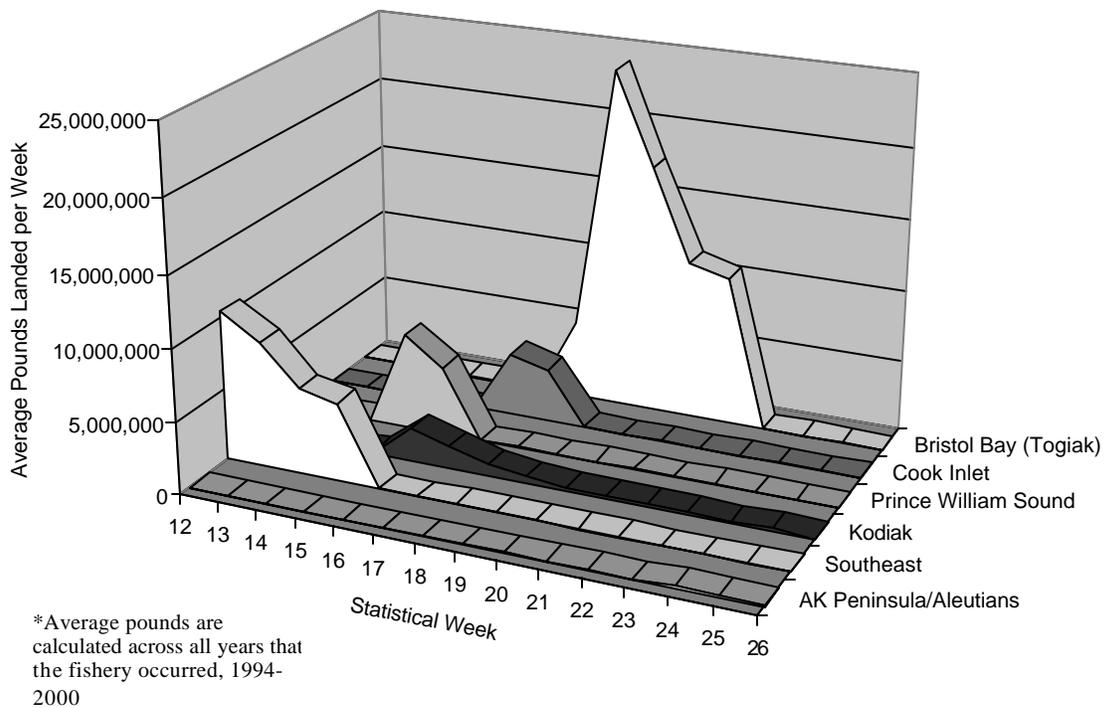
<sup>4</sup> Total pounds landed throughout this report include herring landed as bait on roe herring permits. If herring caught during the roe season do not have high enough roe content, they are often sold as bait herring at a bait ex-vessel price.

Sound seine fishery occurred only in 1997 and 1998. In those years, the majority of the Prince William Sound harvest was taken during the statistical week preceding and the week of the peak in the Kodiak harvest.

Due to relatively low total harvest levels over the seven year period, two fisheries are not shown on the seine figure: Chignik and Kotzebue/Port Clarence. Annually, those years with a Chignik fishery show the fishery peaking a week after Bristol Bay. Due to an extremely low level of effort in the Kotzebue/Port Clarence fishery, it will not be discussed in this report.

The seasonal peaks in sac roe seine fisheries are opportunely distributed for vessel owners and permit holders who would like to fish multiple herring sac roe areas. Looking at the seine figure, it becomes clear that a vessel could first fish the Southeast Alaska Sitka Sound fishery in the early spring, have approximately two weeks to travel to and prepare for the Kodiak, Prince William Sound, or Cook Inlet fisheries, and continue on to the Bristol Bay fishery in May. Chignik and the Alaska Peninsula/Aleutian Island fisheries have followed the peak in Bristol Bay in the years that they have been fished.

**Figure 1. Seasonal Peaks in Selected Roe Herring Seine Fisheries, 1994-2000\***

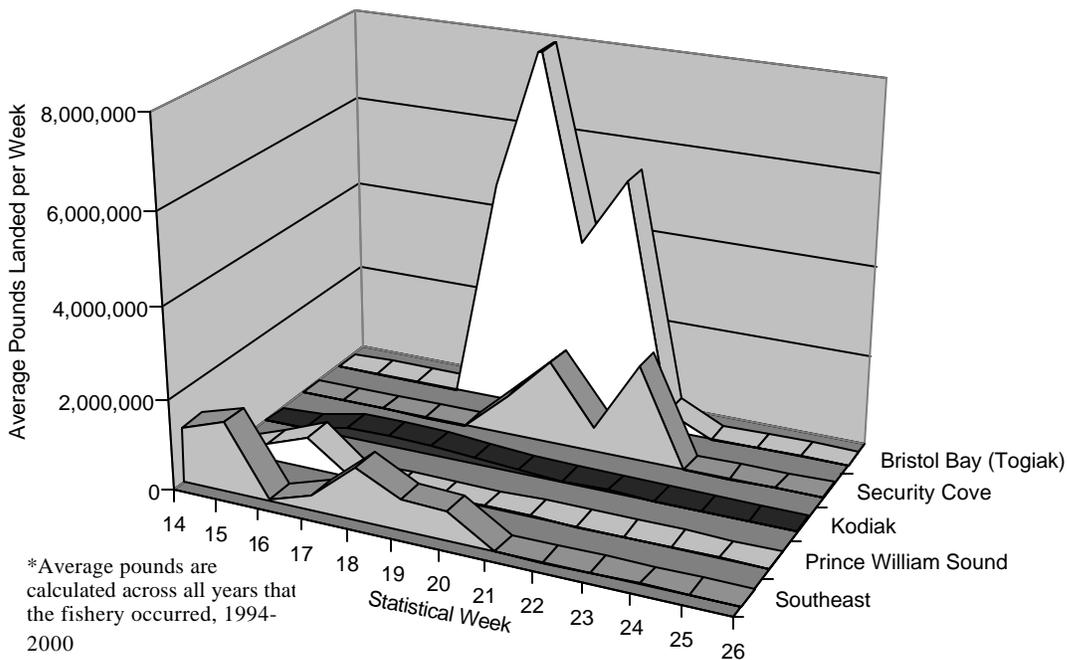


Similarly, Figure 2 shows the average harvest for roe herring gillnet fisheries over the years that each occurred, 1994-2000. Again, some permit areas, or portions of permit areas may have been closed in one or more seasons. Thus, this figure should only be used to estimate the range of typical seasonal peaks for each fishery. The Southeast fishery begins in late March to early April, followed by Prince William Sound, Kodiak, Cook Inlet, Bristol Bay, and Security Cove ending late May to early June. Cook Inlet is not shown in Figure 2 because of undetectable harvest levels on the scale used in the figure.

Unlike the seine fisheries, a clear seasonal peak does not emerge while looking at the seven years of gillnet fishery harvests. Three of the five fisheries show two peaks in harvest, and the Kodiak fishery shows harvests over a period of eight statistical weeks without a clearly defined peak. The first of two peaks in the Southeast gillnet fishery is the Revilla Channel harvest, generally occurring mid-March to early-April. Further north, Southeast gillnet fishery openings are typically later, ending with Seymour Canal in early May (represented by the second peak in the Southeast fishery). The Kodiak roe herring fisheries are characterized as handling a relatively small amount of herring over a long time period. Kodiak Management Area has several distinct schools of herring in most management sections, spawning from April to early June.<sup>5</sup> Though there is not a clear seasonal peak in the Kodiak gillnet fishery, the majority of the harvest occurs early in the season. Multiple peaks in both the Bristol Bay and Security Cove fisheries are due to annual variation in the fisheries across the seven years reported.

As with the seine fisheries, several opportunities to fish multiple gillnet fisheries are apparent. The most common combination of gillnet fisheries is Bristol Bay and Security Cove due to the proximity of the two fisheries, temporally and spatially.

**Figure 2. Seasonal Peaks in Selected Roe Herring Gillnet Fisheries, 1994-2000\***



<sup>5</sup> Source: Gretsch, D. 1998. *Kodiak management area herring report to the Alaska Board of Fisheries, January 1999*. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K98-54, Kodiak, pp 5-7.

### *Considerations for Choosing Fisheries*

There are several factors that affect the combination of fisheries a permit holder or vessel owner chooses to fish. One of the most significant is that seven of the fifteen roe herring fisheries included in this report are limited to entry, which requires the additional investment of purchasing a limited entry permit for any individual who was not an initial recipient of a permit following limitation. For those permit holders in limited fisheries who were initial issuees or who have purchased limited entry permits, the opportunity cost of holding the permit must be considered. The table below shows the current estimated values of roe herring limited entry permits reported by the Commercial Fisheries Entry Commission.

#### **Permit Value Estimates for Roe Herring Limited Entry Permits, Year-end 1996 and Year-end 2000**

Roe Herring Limited Entry Permit <sup>6</sup>	Permit Value Estimated by CFEC <sup>7</sup>	
	1996	2000
<b>Seine</b>		
Southeast (G 01A)	\$287,300	\$241,300
Prince William Sound (G 01E)	\$76,700	\$34,000
Kodiak (G 01K)	\$103,000	\$57,000
Cook Inlet (G 01H)	\$106,900	\$23,000
<b>Gillnet</b>		
Southeast (G 34A)	\$35,900	\$17,700
Prince William Sound (G 34E)	\$64,300	\$69,400
Kodiak (G 34K)	\$28,100	\$21,100

Several of the roe herring fisheries, both limited and open access, have been closed due to poor stock conditions or have not had any effort due to a deteriorating market in recent years. See Tables 1 and 2 for the number of permits issued and fished each year, the total pounds landed, and the total estimated gross earnings in each permit area, 1994-2000. The Prince William Sound seine fishery was last open in 1998, following three consecutive years of closures. Cook Inlet has also been closed since the 1998 season.

Often, it is not possible for ADF&G to make the decision to cancel a fishery in advance of the season. The fleets may be put on as little as a 12 hour advance notice for a fishery,<sup>8</sup> giving only those catcher vessels and tenders in area ports enough time to reach fishing grounds for what may

<sup>6</sup> Though Nelson Island and Norton Sound herring sac roe gillnet fisheries are also limited and have an associated permit value estimate, they are not included in this report because of their superexclusive status.

<sup>7</sup> The permit value estimates shown were calculated for the December 1996 and the December 2000 *CFEC Estimated Monthly Permit Value Reports*. CFEC permit value estimates are averages of permit transactions over the most recent three months, where sufficient information exists. For any permit with fewer than four transactions in the most recent three-month period, the average spans the number of months necessary to include a minimum of four observations.

<sup>8</sup> Sharp, D., T. Joyce, J. Johnson, S. Moffitt, M. Willette. 2000. *Prince William Sound management area 1999 annual finfish management report*. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report 2A00-32, Anchorage, pp 28-33.

be a single short fishing period. For fisheries which will only be open for a short period, permit holders and vessels owner must decide which fisheries to commit resources to without always knowing whether a particular fishery will be open.

In addition, once open, there is risk of having an unsuccessful set or catch with low roe content and not recovering the costs of participating in the fishery. The anticipated ex-vessel price will influence the amount of risk a permit holder or vessel owner is willing to accept to participate in each of the fisheries.

Ex-vessel roe herring prices across the state were at a high in 1995 and 1996 followed by a dramatic reduction in 1997. See Tables 1 and 2 for average roe herring price per pound for each permit area. In the seine fisheries, the number of vessels with landings was between 335 and 381 from 1994 to 1997. Participation dropped in 1998, the year following significant reductions in ex-vessel price. In the gillnet fisheries, the number of vessels peaked in 1996, dropped by 20% in 1997, and by more than 50% (from the 1996 high) in 1998. In both gear types, the highest number of vessels with landings and the greatest percentage of vessels with landings in more than one fishery occurred during one of the two years of high prices. See Tables 3 and 4 for the total number of vessels with landings in each fishery and the percentage of vessels that fished multiple areas.

**Table 1. Number of Permits, Total Gross Earnings, and Total Pounds Landed in Roe Herring Seine Fisheries (nonexclusive areas only), 1994-2000**

Permit Area		1994	1995	1996	1997	1998	1999	2000**
A, Southeast	Permits Fished	50	38	51	50	49	51	49
	Permits Issued	51	51	51	51	51	51	51
	Gross Earnings	\$3,625,530	\$3,932,868	\$14,349,558	\$4,726,487	\$1,646,221	\$4,906,058	\$2,286,033
	Total Pounds	9,515,826	5,808,440	16,159,412	22,294,749	13,275,977	18,036,979	9,144,133
	Estimated Price/lb	\$0.381	\$0.677	\$0.888	\$0.212	\$0.124	\$0.272	\$0.250
E, Prince William Sound	Permits Fished	0	0	0	61	46	0	0
	Permits Issued	107	106	105	106	106	106	104
	Gross Earnings	0	\$0	\$0	\$756,322	\$787,102	\$0	\$0
	Total Pounds	0	0	0	9,440,853	6,785,358	0	0
	Estimated Price/lb				\$0.080	\$0.116		
H, Cook Inlet	Permits Fished	60	59	62	44	19	0	0
	Permits Issued	76	77	76	76	76	75	74
	Gross Earnings	\$1,605,147	\$4,149,384	\$5,925,889	\$341,656	\$64,909	\$0	\$0
	Total Pounds	4,105,235	6,703,366	5,967,663	3,382,731	595,497	0	0
	Estimated Price/lb	\$0.391	\$0.619	\$0.993	\$0.101	\$0.109		
K, Kodiak	Permits Fished	64	72	53	61	35	25	20
	Permits Issued	84	80	84	82	74	75	75
	Gross Earnings	\$4,190,620	\$5,021,494	\$4,535,083	\$921,553	\$823,010	\$975,834	\$706,896
	Total Pounds	9,745,627	7,645,918	4,319,127	5,091,453	3,900,522	3,178,613	2,579,913
	Estimated Price/lb	\$0.430	\$0.657	\$1.050	\$0.181	\$0.211	\$0.307	\$0.274
L, Chignik	Permits Fished	0	5	1	0	0	0	0
	Permits Issued	15	19	25	19	13	9	7
	Gross Earnings	\$0	\$66,517	*	\$0	\$0	\$0	\$0
	Total Pounds	0	153,591	*	0	0	0	0
	Estimated Price/lb		\$0.433					
M, Alaska Peninsula	Permits Fished	6	13	4	0	2	0	0
	Permits Issued	104	89	109	67	39	30	23
	Gross Earnings	\$28,653	\$164,779	\$195,216	\$0	*	\$0	\$0
	Total Pounds	196,174	799,900	426,236	0	*	0	0
	Estimated Price/lb	\$0.146	\$0.206	\$0.458				
T, Bristol Bay	Permits Fished	267	267	330	274	136	112	119
	Permits Issued	402	368	477	419	237	199	196
	Gross Earnings	\$6,529,188	\$16,175,112	\$12,017,532	\$4,007,559	\$4,998,116	\$4,799,184	\$2,897,737
	Total Pounds	44,771,385	39,017,428	34,279,212	36,104,132	32,245,909	27,902,234	28,977,370
	Estimated Price/lb	\$0.146	\$0.415	\$0.351	\$0.111	\$0.155	\$0.172	\$0.100
X, Kotzebue/Port Clarence***	Permits Fished	0	1	1	0	0	0	0
	Permits Issued	2	1	3	2	0	0	0
	Gross Earnings	\$0	*	*	\$0	\$0	\$0	\$0
	Total Pounds	0	*	*	0	0	0	0
	Estimated Price/lb							

\* Confidential data

\*\* 2000 data are preliminary and may be incomplete.

\*\*\* Beach seine and purse seine permit totals are combined for area X.

**Table 2. Number of Permits, Total Gross Earnings, and Total Pounds Landed in Roe Herring Gillnet Fisheries (nonexclusive areas only), 1994-2000**

Permit Area		1994	1995	1996	1997	1998	1999	2000**
A, Southeast	Permits Fished	118	113	121	116	87	89	44
	Permits Issued	121	121	121	120	115	116	115
	Gross Earnings	\$1,767,883	\$1,863,868	\$1,664,653	\$984,762	\$613,016	\$569,508	\$196,240
	Total Pounds	2,196,640	1,857,196	1,202,784	3,187,007	3,104,965	2,425,723	788,882
	Estimated Price/lb	\$0.805	\$1.004	\$1.384	\$0.309	\$0.197	\$0.235	\$0.249
E, Prince William Sound	Permits Fished	0	0	0	22	19	0	0
	Permits Issued	24	24	24	24	24	24	24
	Gross Earnings	\$0	\$0	\$0	\$15,814	\$78,604	\$0	\$0
	Total Pounds	0	0	0	351,418	714,581	0	0
	Estimated Price/lb				\$0.045	\$0.110		
H, Cook Inlet	Permits Fished	0	0	0	0	15	10	13
	Permits Issued	45	35	24	21	64	55	42
	Gross Earnings	\$0	\$0	\$0	\$0	\$4,480	\$3,714	\$8,174
	Total Pounds	0	0	0	0	35,843	20,788	32,567
	Estimated Price/lb					\$0.125	\$0.179	\$0.251
K, Kodiak	Permits Fished	55	69	74	59	6	5	8
	Permits Issued	111	105	106	103	99	97	95
	Gross Earnings	\$790,739	\$1,039,278	\$2,270,812	\$209,494	\$36,733	\$36,111	\$40,870
	Total Pounds	1,838,929	1,419,695	2,140,834	1,210,947	202,945	121,179	160,906
	Estimated Price/lb	\$0.430	\$0.732	\$1.061	\$0.173	\$0.181	\$0.298	\$0.254
S, Security Cove	Permits Fished	0	106	326	220	77	86	3
	Permits Issued	129	206	546	485	271	277	247
	Gross Earnings	\$0	\$1,204,277	\$1,458,197	\$276,815	\$223,731	\$442,507	*
	Total Pounds	0	2,514,147	3,701,814	1,751,992	1,945,482	2,137,508	*
	Estimated Price/lb		\$0.479	\$0.394	\$0.158	\$0.115	\$0.207	
T, Bristol Bay	Permits Fished	183	301	625	435	239	254	256
	Permits Issued	424	525	883	747	473	458	435
	Gross Earnings	\$2,559,966	\$6,082,484	\$5,447,060	\$1,419,982	\$1,892,766	\$2,176,571	\$1,089,137
	Total Pounds	14,813,185	13,991,433	13,613,498	10,357,406	11,904,180	9,760,536	10,891,367
	Estimated Price/lb	\$0.173	\$0.435	\$0.400	\$0.137	\$0.159	\$0.223	\$0.100
X, Kotzebue/Port Clarence	Permits Fished	6	7	3	0	0	0	0
	Permits Issued	58	12	10	7	2	2	0
	Gross Earnings	\$1,796	\$9,019	*	\$0	\$0	\$0	\$0
	Total Pounds	4,157	14,810	*	0	0	0	0
	Estimated Price/lb	\$0.432	\$0.609					

\* Confidential data

\*\* 2000 data are preliminary and may be incomplete.

### *Combinations of Permit Areas Fished*

Tables 3 and 4 show the permit area or combination of permit areas in which vessels in the roe herring fisheries made landings each year. The vessels are grouped by the number of areas fished. In the seine fleet, between 73 and 90 percent of the vessels fished only one permit area each year. The gillnet fleet has a wider range from year to year. In 1994, the first reported year, 98 percent of the gillnet fleet fished just one permit area. In 1996, however, less than 60 percent of the fleet fished a single permit area. Of all seine and gillnet permit areas and permit area combinations, Bristol Bay is fished by the largest number of vessels. Note in both tables, there are fisheries without any effort in some years due to low stock levels or no market.

The most common combinations of permit areas fished by seine vessels are either Cook Inlet or Kodiak combined with Bristol Bay. In addition, there are several three and four area combinations that occur in more than one year. All but one of the three and four area combinations involve Bristol Bay, and several include Southeast. Depending on which fisheries are open, one or two of the Central and Western Gulf of Alaska fisheries (Cook Inlet, Prince William Sound, and Kodiak) are most regularly combined with Bristol Bay or with Southeast and Bristol Bay.

Those vessels in the gillnet fleet that fished multiple areas overwhelmingly fished the combination of Bristol Bay and Security Cove. The subsequent two most common combinations in the gillnet fisheries are the two area combination of Southeast and Bristol Bay and the three area combination of Southeast, Bristol Bay, and Security Cove.

**Table 3. Areas and Combination of Areas Fished by Vessels in Roe Herring Seine Fisheries, 1994-2000\***

Area or Combination of Areas Fished	1994	1995	1996	1997	1998	1999	2000
Southeast (A)	38	25	32	28	34	40	40
Prince William Sound (E)				22	18		
Cook Inlet (H)	17	8	7	3	5		
Kodiak (K)	39	25	14	17	15	8	9
Chignik (L)		4					
Alaska Peninsula/Aleutian Islands (M)	1	2	1				
Bristol Bay (T)	198	180	241	189	97	89	102
Kotzebue/Port Clarence (X)		1	1				
<b>Vessels with Landings in One Area</b>	<b>293</b>	<b>245</b>	<b>296</b>	<b>259</b>	<b>169</b>	<b>137</b>	<b>151</b>
Percentage of Total Vessels	80.3%	73.1%	77.7%	73.2%	78.6%	85.1%	89.9%
AE				4			
AH	5	3	3				
AK	2					1	
AT		2	3	5	3	6	6
EH				3	2		
EK				1			
ET				11	9		
HK		4	2	1			
HM			1				
HT	30	25	29	8	2		
KT	21	25	24	26	8	11	5
MT	2	7			2		
<b>Vessels with Landings in Two Areas</b>	<b>60</b>	<b>66</b>	<b>62</b>	<b>59</b>	<b>26</b>	<b>18</b>	<b>11</b>
Percentage of Total Vessels	16.4%	19.7%	16.3%	16.7%	12.1%	11.2%	6.5%
AEH				1	1		
AET				2	4		
AHT	5	5	6	1	1		
AKT		1	3	3		6	6
EHT				11	1		
EKT				1	2		
HKT	3	11	8	9	1		
HMT	1		1				
KMT	1	3					
<b>Vessels with Landings in Three Areas</b>	<b>10</b>	<b>20</b>	<b>18</b>	<b>28</b>	<b>10</b>	<b>6</b>	<b>6</b>
Percentage of Total Vessels	2.7%	6.0%	4.7%	7.9%	4.7%	3.7%	3.6%
AEHT				1	1		
AEKT				1	4		
AHKT	1	3	3	4	1		
AHLT			1				
EHKT				1	3		
HKMT	1	1	1				
<b>Vessels with Landings in Four Areas</b>	<b>2</b>	<b>4</b>	<b>5</b>	<b>7</b>	<b>9</b>		
Percentage of Total Vessels	0.5%	1.2%	1.3%	2.0%	4.2%		
AEHKT				1	1		
<b>Vessels with Landings in Five Areas</b>				<b>1</b>	<b>1</b>		
Percentage of Total Vessels				0.3%	0.5%		
<b>Total Number of Vessels</b>	<b>365</b>	<b>335</b>	<b>381</b>	<b>354</b>	<b>215</b>	<b>161</b>	<b>168</b>

\* The data include landings made on 2 Kodiak herring gillnet and purse seine (combined) permits using seine gear.

The table does not include superexclusive use areas.

Areas A, E, H, and K are sac roe herring seine fisheries which have been limited to entry.

\*\* 2000 data are preliminary and may be incomplete.

**Table 4. Areas and Combination of Areas Fished by Vessels in Roe Herring Gillnet Fisheries, 1994-2000\***

Area or Combination of Areas Fished	1994	1995	1996	1997	1998	1999	2000
Southeast (A)	113	112	90	105	93	95	48
Prince William Sound (E)				18	17		
Cook Inlet (H)					10	9	8
Kodiak (K)	57	70	71	58	7	5	8
Security Cove (S)		7	12	16	3	5	
Bristol Bay (T)	167	195	272	204	163	167	183
Kotzebue/Port Clarence (X)	6	6	3				
Vessels with Landings in One Area	343	390	448	401	293	281	247
Percentage of Total Vessels	97.7%	79.1%	58.5%	65.0%	78.1%	77.4%	76.0%
AE					1		
AK		1	2				
AS				2			
AT	8	1	9	6	7		
EK				1			
ET				1			
KT		3	1				
ST		90	281	196	74	82	78
Vessels with Landings in Two Areas	8	95	293	206	82	82	78
Percentage of Total Vessels	2.3%	19.3%	38.3%	33.4%	21.9%	22.6%	24.0%
AET				2			
AST		6	22	8			
KST		2	3				
Vessels with Landings in Three Areas		8	25	10			
Percentage of Total Vessels		1.6%	3.3%	1.6%			
Total Number of Vessels	351	493	766	617	375	363	325

\* The data include landings made on 2 Kodiak herring gillnet and purse seine (combined) permits using gillnet gear.

The table does not include superexclusive use areas.

Areas A, E, and K are sac roe herring gillnet fisheries which have been limited to entry.

\*\* 2000 data are preliminary and may be incomplete.

### *Vessels Fishing Multiple Areas*

Vessels that made landings in more than one roe herring permit area, 1994 through 1998, had substantially higher average pounds landed and average gross earnings than those vessels that made landings in only one permit area. In the seine fisheries, average pounds landed and average gross earnings per vessel with landings in two permit areas were more than three times higher than the averages per vessel with landings in only one permit area in three years of the seven-year period, 1994-2000. See Table 5 for details. Vessels with landings in three or more areas had an average per vessel gross earnings estimate more than six times greater than vessels in a single area for four of the seven years.

In the gillnet fisheries, vessels that made landings in two areas had an average gross earnings estimate more than double that for vessels in one area in four years of the seven year period (Table 6). Unlike the seine fleet, however, there are two years with a per vessel average gross earnings estimate for vessels in two areas that is only slightly higher than vessels in one area (roughly 10 and 20 percent higher). Some vessels in the gillnet fisheries made landings in three areas in 1995, 1996, and 1997. In all three years, those vessels had either an average per vessel pounds landed or average per vessel gross earnings estimate of more than three times that for vessels with landings in one area.

**Table 5. Average Pounds Landed and Estimated Gross Earnings  
for Vessels in Roe Herring Seine Fisheries, 1994-2000\***  
Grouped by Number of Areas Fished by Each Vessel

		<i>Number of Areas Fished by Vessels</i>			All Vessels
		One	Two	Three or More	
1994	Number of Vessels	293	60	12	365
	Average Pounds Landed per Vessel	131,009	346,628	780,506	187,806
	Average Gross Earnings per Vessel	\$30,168	\$79,107	\$207,162	\$44,032
1995	Number of Vessels	245	66	24	335
	Average Pounds Landed per Vessel	100,184	312,829	619,538	179,050
	Average Gross Earnings per Vessel	\$47,760	\$157,438	\$307,968	\$87,890
1996	Number of Vessels	296	62	23	381
	Average Pounds Landed per Vessel	108,603	239,535	616,085	160,545
	Average Gross Earnings per Vessel	\$60,784	\$150,804	\$421,306	\$97,197
1997	Number of Vessels	259	59	36	354
	Average Pounds Landed per Vessel	142,549	303,730	599,643	215,896
	Average Gross Earnings per Vessel	\$21,201	\$38,967	\$82,886	\$30,435
1998	Number of Vessels	169	26	20	215
	Average Pounds Landed per Vessel	159,623	530,443	808,575	264,834
	Average Gross Earnings per Vessel	\$23,438	\$80,475	\$114,328	\$38,790
1999	Number of Vessels	137	18	6	161
	Average Pounds Landed per Vessel	224,620	597,080	1,266,228	305,080
	Average Gross Earnings per Vessel	\$47,864	\$127,748	\$304,049	\$66,342
2000**	Number of Vessels	151	11	6	168
	Average Pounds Landed per Vessel	191,985	696,661	674,738	242,270
	Average Gross Earnings per Vessel	\$26,674	\$102,027	\$123,436	\$35,063

\* The data include landings made on 2 Kodiak herring gillnet and seine (combination) permits using seine gear.

The table does not include superexclusive use areas.

Vessels that fished 4 or 5 areas are grouped with those that fished 3 areas to maintain confidentiality

\*\* 2000 data are preliminary and may be incomplete

**Table 6. Average Pounds Landed and Estimated Gross Earnings  
for Vessels in Roe Herring Gillnet Fisheries, 1994-2000\***  
Grouped by Number of Areas Fished by Each Vessel

	<i>Number of Areas Fished by Vessels</i>			All Vessels
	One	Two	Three	
1994	Number of Vessels	343	8	351
	Average Pounds Landed per Vessel	51,044	164,315	53,619
	Average Gross Earnings per Vessel	\$14,003	\$39,046	\$14,572
1995	Number of Vessels	390	95	8
	Average Pounds Landed per Vessel	30,355	76,802	97,284
	Average Gross Earnings per Vessel	\$16,898	\$34,716	\$49,498
1996	Number of Vessels	448	293	25
	Average Pounds Landed per Vessel	18,738	36,832	57,814
	Average Gross Earnings per Vessel	\$12,468	\$15,020	\$32,654
1997	Number of Vessels	401	206	10
	Average Pounds Landed per Vessel	21,356	37,190	63,395
	Average Gross Earnings per Vessel	\$4,139	\$5,439	\$12,679
1998	Number of Vessels	293	82	
	Average Pounds Landed per Vessel	36,599	87,207	
	Average Gross Earnings per Vessel	\$6,093	\$12,910	
1999	Number of Vessels	281	82	
	Average Pounds Landed per Vessel	31,306	68,750	
	Average Gross Earnings per Vessel	\$7,105	\$14,936	
2000**	Number of Vessels	247	78	
	Average Pounds Landed per Vessel	34,076	52,024	
	Average Gross Earnings per Vessel	\$4,001	\$4,436	

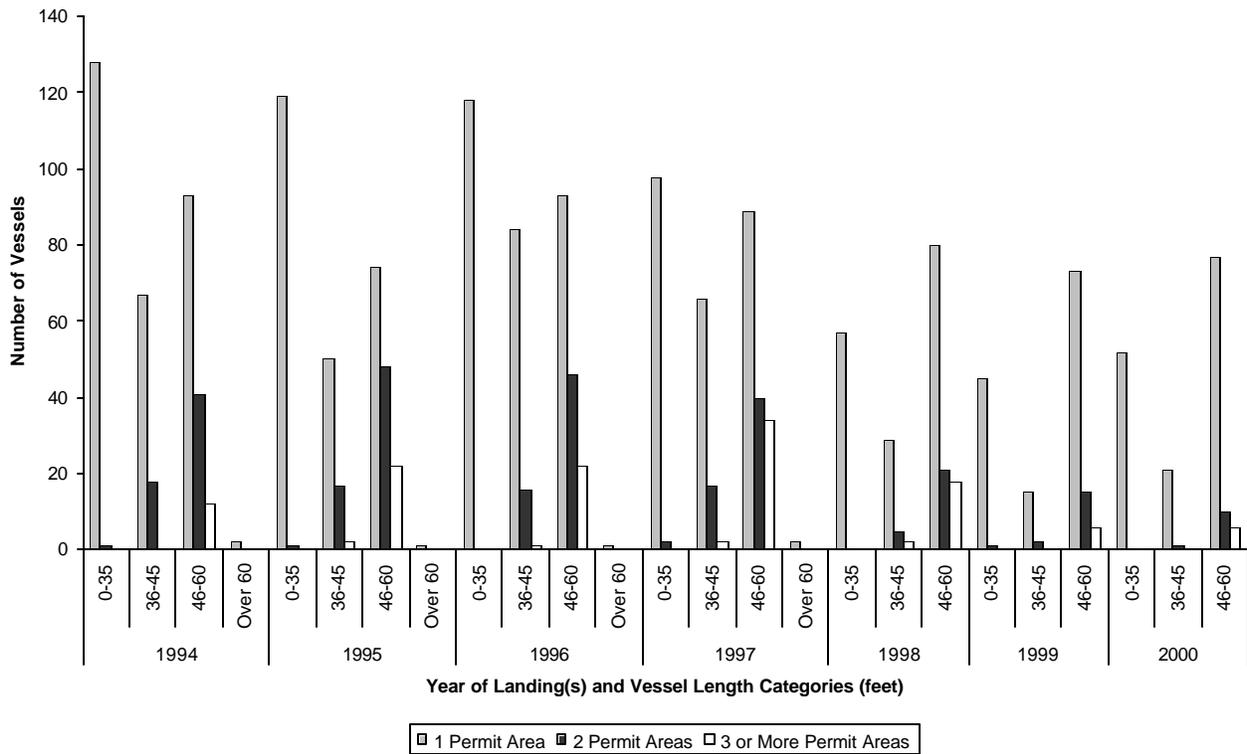
\* The data include landings made on 2 Kodiak herring gillnet and seine (combination) permits using gillnet gear.

The table does not include superexclusive use areas.

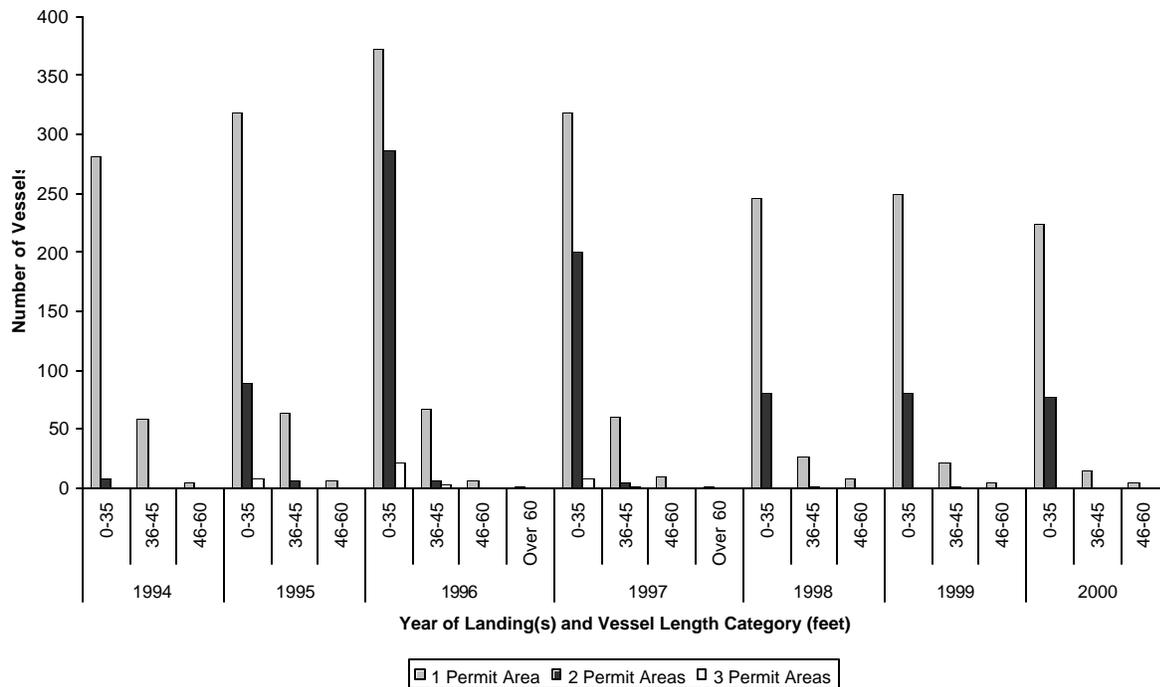
\*\* 2000 data are preliminary and may be incomplete

Some characteristics of vessels fishing single permit areas versus vessels fishing multiple areas are easily summarized. As expected, vessels of all length categories have made landings in only a single permit area per year. Those with landings in multiple permit areas in the seine fisheries are generally between 36 and 60 feet in length, with only a few 35 feet or less. In the gillnet fisheries, vessels with landings in multiple areas are almost all 35 feet or less. See the Figure 3 and Figure 4 on the following page for the number of vessels in each length category by year and by the number of permit areas in which the vessel made landings.

**Figure 3. Length of Vessels with Landings in One Versus Multiple Sac Roe Herring Seine Permit Areas**



**Figure 4. Length of Vessels with Landings in One Versus Multiple Sac Roe Herring Gillnet Permit Areas**



Complete information on the age and value of vessels involved in the roe herring fisheries is not available, but available data suggest that vessels of all ages and values make landings in single permit areas in both seine and gillnet fisheries. Vessels with landings in multiple gillnet fisheries also span a wide range of ages and values, but those with landings in multiple seine fisheries tend to be built more recently and have higher value relative to the fleet fishing a single seine permit area. Vessels with landings in two seine permit areas tend to be built after 1970, and those participating in three or more permit areas in the seine fisheries are generally built in the 1980s and 1990s and most have high values relative to the fleet fishing in only one or two permit areas.

### **Summary**

This paper has examined the extent to which roe herring vessels participate in multiple nonexclusive use areas in the same year. The analysis shows that across all seven years explored, more than 10 percent and as much as 27 percent of the seine fleet made landings in multiple roe herring permit areas. In all except the first year, at least 20 percent of the gillnet fleet made landings in multiple permit areas. In one year, more than 40 percent of the gillnet fleet made landings in multiple areas.

In the seine fisheries, the average gross earnings and average pounds landed among those vessels participating in multiple permit areas are much higher than for those with landings in only one permit area. To a lesser degree, the same occurs in the gillnet fisheries.

The higher gross earnings associated with vessels fishing multiple permit areas are coupled with lower fixed costs per permit area. An individual fishing multiple fisheries with the same vessel and gear can spread some of the fixed costs of their vessel and gear across multiple fisheries, reducing their cost per fishery.

The timing of different runs and the associated opportunity cost of leaving one area to fish in another may be important factors in determining the profitability of fishing multiple areas. The most profitable and lowest risk opportunity for fishing multiple areas occurs if fisheries in the different areas do not overlap in time. As shown by the seasonal peak charts and table of average pounds landed and average gross earnings, there are several combinations of roe herring seine and gillnet fisheries with this attribute.

Before suggesting that fishing operations in salmon fisheries would make similar decisions as those in the roe herring fisheries have if salmon net registration areas were eliminated, care must be taken to examine similarities and difference between circumstances in the nonexclusive roe herring fisheries and the situation in the salmon fisheries. If a comparison between the two groups of fisheries reveals similarities with respect to the amount of time between peaks and the distance between consecutively timed fisheries, this study reveals potential for a substantial reduction in fleet size and accompanying increase in profitability across all salmon fisheries.

The number of unfished permits could also impact the net benefits of removing exclusive salmon net area regulations. In recent years, there has been an increase in unfished permits in many salmon fisheries. If removal of the regulations resulted largely in the purchase of unfished permits, then it is possible that participants in any single fishery could increase, thereby decreasing the average gross earnings per permit holder. Thus this issue would also need to be considered in any analysis of exclusive salmon net area regulations.