

Economic Aspects of the Development of the Herring Roe Gillnet Fishery, Southeastern Alaska, 1976

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ABSTRACT—In December 1975 the State of Alaska established regulations permitting the gillnetting of herring (*Clupea harengus*). Quotas were set for nine locations, totaling 975 tons. The opening at Kah Shakes Bay on 30 March continuing to the closure on 4 April 1976 was observed. Two types of gillnet operations were used. One method utilized a purse seiner as a motherboat while the other operated with a single standard salmon gillnetter. Interviews with operators provided investment and operating costs. High gross returns of the purse-seine-based operation were offset by high operating costs. The net returns to the operator were higher for the gillnet-vessel-based operation. The net returns to both groups of operators were higher than the Canadian gillnetters fishing off British Columbia. Gillnetter-based operations fished more of the nine openings than did the purse-seine-based operations. This lack of participation in additional gillnet openings by the seiners was due to coinciding dates of purse seine openings. Gillnetters consistently reported a catch more frequently than purse seiners, though the average catch size per vessel was greater for seiners. Japan receives an estimated 90 percent of the world sales of herring roe. Alaska supplied about 10 percent of the Japanese herring roe market in 1976.

This economic description of the herring (*Clupea harengus*) gillnet fishery in southeastern Alaska fulfills, in part, an agreement between the Alaska Department of Fish and Game and the National Marine Fisheries Service to investigate the economic worth and potential of this newly established fishery. It includes: 1) A description of the fishery, 2) descriptions of cost-earnings estimates of two gillnet methods and comparisons with earnings received by Canadian gillnet and purse seine fishermen, and 3) the marketing implications of the herring roe fishery.

In December 1975, the Alaska Board of Fisheries permitted gillnet fishing for herring in nine widely dispersed areas within southeastern Alaska. A total of 975 tons of roe herring was allocated to the gillnet fleet in the following areas:

Kah Shakes Bay, 300 tons; Helm Bay, 25 tons; Annette Island, 300 tons; Shrine Island or Berners Bay, 150 tons;

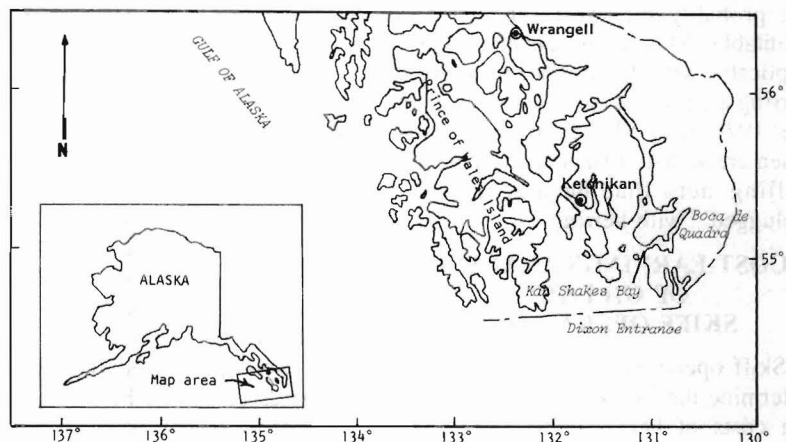
Pybus Bay, 25 tons; Mud Bay, 25 tons; Gambier Bay, 25 tons; Distant Point, 25 tons; Kasaan, 100 tons.

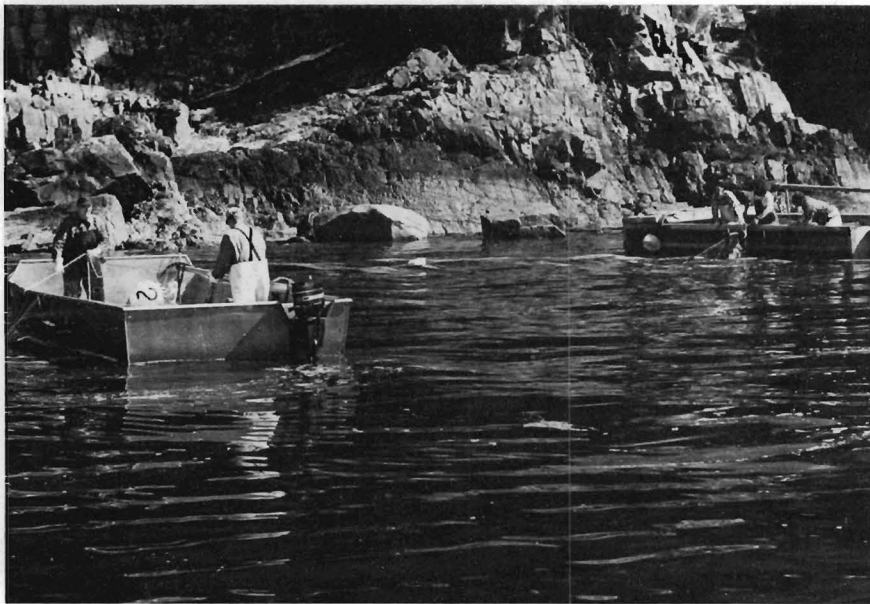
The author observed the gillnet fishery at Kah Shakes Bay during the period 30 March to 4 April 1976 (Ness, 1977).

EFFICIENCY OF INDIVIDUAL SKIFF OPERATIONS

Two basic types of gillnet operations were present: 1) One with operations based on a purse seine vessel, which uses one or more skiffs with several complements of gear and employs three

Kah Shakes Bay, near Ketchikan, Alaska.





Canadian built aluminum skiff and plywood constructed gillnet skiff built in Ketchikan, fishing side by side.

or more fishermen; and 2) the other was based on a gillnet vessel and supported one skiff and usually two fishermen.

The highest production for a single purse-seine-based skiff at Kah Shakes Bay was slightly more than 20 tons, which yielded gross sales of more than \$6,000. The operation included the skipper and four crew members, all of whom would be involved in purse seining for herring and salmon later in the season. Individual crew shares were 10 percent of the gross receipts.

It should be noted that power net puller operations, capable of fishing more gear than (all) manual operations, are probably the most efficient and profitable. This would be particularly applicable when large concentrations of herring are present, such as occurred at the 1976 Kah Shakes Bay opening when crews had difficulty in manually pulling nets that became quickly "plugged" with herring.

COST EARNINGS ANALYSIS OF GILLNET SKIFF OPERATIONS

Skiff operators were interviewed to determine the investments and operating costs of herring gillnetting. Not

enough interviews were conducted to obtain a statistically valid sample of the cost-earnings of gillnetting herring. It is believed that enough information was collected during the interviews and author's observations to derive hypothetical cost-earnings statements of the two basic types of operations. The cost-earnings information derived from interviews with individual fishermen has been modified somewhat to avoid individual identity.

Table 1 presents a cost-earnings estimate for a gillnet operation that involved a typical new gillnet vessel utilized as a base of operation and transportation. This vessel towed a skiff to three southeastern Alaskan gillnet openings and grossed slightly over \$7,000. This operator reported an estimated net earning of \$3,440.

Table 2 compares the initial capital expenditures of the two methods of gillnet operations. The major variation is the cost of the motherboat. The purse seiner costs twice the amount of the gillnetter. Differences in the cost of the outboards reflect the size and condition of the motor purchased. The cost of the outboards presented here are for used equipment. If new motors had been

Table 1.—Total annual cost and return estimate for a herring roe gillnet operation at Kah Shakes Bay, 1976.

Item	Amt.
Costs	
Operating	
Groceries	\$ 280
Fuel	400
Crew share	1,400
Total	\$2,080
Depreciation	
Gillnet vessel (15 years)	\$ 455
Skiff (10 years)	250
Outboard net (5 years)	200
Total	\$ 905
Interest on investment	\$ 350
Miscellaneous cost	\$ 255
Total	\$3,560
Gross revenue	\$7,000
Net return to operator	\$3,440

Table 2.—Comparative capital expenditures for two basic types of gillnet operations at Kah Shakes Bay, 1976.

Investments	Purse seine motherboat	Gillnet motherboat
Motherboat	\$150,000	\$75,000
Skiff	2,500	2,500
Outboard	700	500
Gear (net, anchor, etc.)	800	500

purchased, the cost would be increased. The use of more than one complement of gear by the purse-seine-based operation resulted in greater expenditures for netting, anchors, etc.

The cost-earnings data presented in Table 3 compares the profitability of two basic types of operations for one gillnet opening. The gillnet-based operation depicted in Table 3 is the same gillnet-vessel-based operation described above and summarized in Table 1.

The cost-earnings presented in Table 3 are for operation of a purse seine "motherboat" that utilized four crewmen and a limit purse seiner¹ for the operation base and tendering. The gross revenue for this operation was approximately \$6,500, including \$50 per ton

¹Salmon purse seiner limited in length to 50 feet (U.S. Coast Guard registered length or 58 feet overall) by Alaska statute 16.05.835.

Table 3.—Comparative cost and return estimates for two methods of gillnet operations at Kah Shakes Bay, 1976 (purse seine motherboat and a gillnet motherboat).

Item	Purse seine motherboat	Gillnet motherboat
Costs		
Operating		
Groceries		
\$ 10/day/person	\$ 400	\$ 160
Fuel	250	300
Crew share	¹ 2,600	² 944
Total	\$3,250	\$1,404
Depreciation		
Motherboat (15 years)	\$ 520	\$ 260
Skiff (10 years)	143	143
Outboard (5 years)	80	57
Gear (5 years)	91	57
Total	\$ 834	\$ 517
Interest³		
Loan on motherboat	\$ 56	\$ 28
Total costs	\$4,140	\$1,949
Gross revenue from herring fishing		
	\$6,500	\$4,720
Net return to operator/owner		
	\$2,360	\$2,771

¹The four crewmen on the purse seiner were paid 10 percent of the gross revenue. This share is standard payment on salmon purse seiners in southeast Alaska.

²The one crewman on the gillnetter was paid 20 percent of the gross revenue. This share is standard payment on gillnetters in southeast Alaska.

³Variation in cost between operation methods is due to differing capital outlay.

for tendering. The purse seiner's net return was less than the gillnet operator's return, \$2,360 compared with \$2,771. The ratio of return to capital investment of the purse seine "motherboat" operation would be considerably less than the ratio of return to capital investment for the gillnetter because the cost of a new purse seine vessel can be more than double that of a gillnetter. The additional cost of the gillnet skiff and gear is almost the same for both operations. Most skiff purchases were made in aggregate (more than one fisherman in a community purchases a skiff from a single seller). At least six skiffs in the fleet were constructed by the owner-operators. Therefore, there is not a wide variation in skiff investment.

It is evident from Table 3 that the most important profit determining factor between the two operations is the cost of labor. If the four crewmen on the purse seine operation were paid 20 percent of the gross as the single crewman on the gillnetter, it is obvious that this operator would show a loss.

HOURLY WAGE FROM HERRING FISHING

The example gillnet "motherboat" operator at Kah Shakes Bay earned \$28.86 per hour for his efforts. The single crewman earned almost \$10 per hour for labor. The hourly wages for the entire season for all openings compute to \$20.48 for the operator and \$8.30 for the crewman.

The purse-seine-based operator earned an estimated \$24 per hour and the crewmen earned \$6.78 per hour each at Kah Shakes Bay.

Canadian gillnet operators earned an estimated \$4.25 per hour per crewman based upon 18 sixteen-hour days in 1975. The Alaska gillnetters earned more than the Canadian fishermen (at least at the Kah Shakes opening), especially considering that the Canadian calculation does not include traveling or time spent waiting on the grounds for an opening announcement.

GILLNET "MOTHERBOAT" VS PURSE SEINE "MOTHERBOAT"

Out of 42 skiff operations that fished Kah Shakes Bay, 22 also fished one or more of the other nine herring gillnet openings in southeastern Alaska in 1976². Fourteen Kah Shakes Bay operators fished two additional openings. All but two of these operators fished at Helm Bay in the Ketchikan area.

Those gillnet-based operators that participated in more than one herring fishery were more successful for the gillnet season than the eight purse seine "motherboat" operators who were present at the Kah Shakes opening. At least three of these operators also participated in the Shrine Island gillnet opening. That fishery, however, was

²There were actually 42 skiffs counted at Kah Shakes Bay. Fish ticket information later indicated there were landings made on 60 individual Alaska Department of Fish and Game (ADFH) vessel numbers; this is attributable to the fact that many fishermen wish to establish a "grandfather right" in this new fishery and therefore accompanied the gillnet operations to establish a presence in the fishery. Then they indicated the ADFG number of the skiff that made the landing.

almost a total failure due to the spawned-out condition of the herring stocks.

Six purse seine "motherboat" operations, supporting at least 10 skiffs and 25 percent of the skiff effort, accounted for 15 percent of the 420-ton reported catch at Kah Shakes Bay. These same operators accounted for 13 percent of the total southeastern Alaska gillnet roe herring catch of 531 tons. The purse seiner's support operators apparently did not direct their effort toward more gillnet openings because of the coinciding herring purse seine openings in southeastern Alaska.

Mobility

Eight purse seiners fished purse seine openings in addition to supporting gillnet operations and at least 16 skiffs at Kah Shakes Bay. This is a definite advantage of the purse seining because gillnetters are restricted in their method of operation. At least 38 percent of the total gillnetting effort at Kah Shakes Bay was directed at purse seine fisheries later in the season.

Another advantage of a purse seine vessel support operation is that these "limit seiners" have the hold capacity to tender the daily catch of at least two gillnet skiffs back to the processing plant. Herring were thus worth \$50 more per ton to the operators.

Advantage of Gillnetting

An advantage of gillnetting is that, assuming readily available stocks, the fishery is more reliable for the participants than purse seining. For example, at the 1976 Auke Bay purse seine fishery only 16 seiners reported landings out of 41 that fished, and the individual catch varied from just over 1 ton to 95 tons. The average was 27 tons for all the vessels that made landings and only 9 tons per vessel for the entire fleet. Seven vessels reported landings less than 27 tons. The Sitka purse seine opening was much more successful with 32 vessels reporting landings out of 41, and the vessel average was just over 24 tons for vessels that reported landings. Nonetheless, almost 25 percent of the fleet in this fishery did not make successful sets, and seven of the

vessels that did report landings caught less than 15 tons.

At the Kah Shakes opening, all the participants of the gillnet fishery reported landings; the high skiff reported almost 20 tons and the low skiff just over 2 tons. The average landing per skiff was 10.3 tons for 42 skiffs.

Additionally, the monitoring and termination of the season when the quota has been reached is much more easily managed by the Alaska Department of Fish and Game with a gillnet fishery.

Average Gross Revenue

The average gross revenue for the 41 seiners which participated in the three purse seine openings, where a total of 425 tons of herring were landed, was \$9,520. This does not compare favorably with the Canadian fishermen gross returns from herring roe fisheries. Canadian purse seiners off British Columbia averaged between \$33,600 and \$41,600 in the 1975 roe season for 37,500 tons of herring.

The average gross return from gillnetting in the Alaskan 1976 season was

approximately \$2,411, exclusive of the Annette Island opening. This was computed for an estimated 62 skiffs that took a total of 561 tons having an average value of \$280/ton³.

An interesting comparison comes to light when this average return is compared with the 1975 British Columbia Canadian gillnetters' "potential"⁴ return of \$3,900 to \$5,250 per operation for approximately 1,200 units. Considering that the Alaskan gillnet herring fishery is new and that inefficiencies exist, the Alaskan gillnet fleet actually did quite well during the first season when compared with the Canadian gillnetters, who have been able to develop their fishing techniques over a 5-year period.

FUTURE OF THE FISHERY

The most successful participants in the 1976 gillnet fishery were six gillnet

³The Auke Bay fishery landed 31 tons valued at \$40/ton.

⁴Estimated by the Canadian government quota described by number of fishing units that actually fished.

"motherboat" operators who utilized their 25- to 33-foot gillnetters for transportation and support during the season. These vessels, accompanied by a 39-foot salmon troller, fished three or more openings and caught 313,116 pounds or 28 percent of the total catch of 1,122,392 pounds. The average gross return for each operator was just over \$6,300. It would appear that these were the more successful and efficient operations and the 1977 herring roe season may witness more operations of this type.

The gillnet herring roe fishery offers an extended opportunity to earn additional income from fishing during spring when there is very little opportunity for fishing diversification. Although there is some salmon trolling and snow crab fishing activity at this time, gillnetting roe herring offers an additional fishery opportunity while requiring only a small additional investment in gear.

MARKETING IMPLICATIONS

Herring roe, kazunoko, is a favored seafood delicacy in Japan and the salt-cured product is sold by the gram to restaurants and housewives. It is served as an hors d'oeuvre, usually during festive occasions. Herring roe remaining attached to the eviscerated cured fish is consumed in Korea and in some areas of northern Europe and the United States. The Japanese, however, account for an estimated 90 percent of the herring roe sales in the world market.

The Japanese first purchased North American roe herring in British Columbia in 1971, and approximately 5,033 metric tons of fresh, chilled, or frozen roe herring were exported to Japan that year (Table 4). British Columbia production was increased to 40,000 metric tons in 1972, 50,000 metric tons in 1973, and almost 45,000 metric tons in 1974. That same year, Japan imported 12,573 metric tons of processed herring roe; 48 percent of this came from The People's Republic of China (6,058 metric tons). Canada's production totaled 38 percent, or 4,314 metric tons of extracted roe. The United

Table 4.—Japanese herring and herring roe imports in kilograms, by country of origin, 1971-76.¹

Product	Country of origin	1971	1972	1973	1974	1975	1976
Herring (Fresh, chilled, frozen)	China (PRC)	39,879	2,155,445	651,680	345,960	—	—
	Canada	4,478,491	2,827,866	6,398,602	2,838,307	6,428,702	4,499,883
	United States	514,177	983,424	2,438,318	1,710,922	2,427,720	996,148
	Rep. of Korea	—	1,654,498	581,924	—	—	414,250
	Sweden	—	—	97,045	—	—	—
	Denmark	—	—	540	—	—	—
	Total (incl. other countries)		5,032,538	7,621,233	10,168,109	5,688,000	8,856,422
Herring roe (Salted, dried, or smoked)	Rep. of Korea	79,780	584,788	1,459,408	—	975,149	1,360,039
	People's Rep. of Korea	19,992	163,418	112,101	—	6,375	14,474
	China (PRC)	111,448	3,891,568	4,781,740	6,057,505	1,115,623	1,446,620
	Iceland	1,800	—	—	—	—	—
	Norway	3,695	4,620	7,371	—	—	—
	United Kingdom	7,729	319	—	—	—	2,472
	Netherlands	980	4,000	965	—	2,856	2,440
	U.S.S.R.	16,811	—	—	—	45,377	1,552
	Canada	356,274	2,387,963	3,879,699	4,314,403	4,359,835	7,661,329
	United States	189,668	304,754	657,336	628,379	1,105,663	1,201,893
	Hong Kong	—	37,018	168,201	—	—	—
	Taiwan	—	—	7,799	—	—	—
	Poland	—	—	1,047	—	—	—
	Denmark	—	—	—	—	—	1,034
Total (incl. other countries)		789,177	7,378,448	11,075,667	12,573,000	7,610,838	11,697,923

¹Compiled and translated by Sune C. Sonu, Foreign Reporting Division, National Marine Fisheries Service, NOAA, Terminal Island, Calif.

Source: Japan exports and imports, commodity by country, 1971-76. Compiled by Ministry of Finance, Japanese Tariff Association, 1977.

States only produced 5 percent of this total, or 628 metric tons. In 1975, Canadian roe fisheries yielded 60.3 thousand short tons and in 1976, the Canadians produced almost 90 thousand short tons of roe herring and supplied the Japanese market with 90 percent of its herring roe.

The Chinese, during successful fishing years, control exports of herring roe to influence the price in Japan for herring. Chinese exports of roe herring were cut back to less than 2,000 metric tons in 1976. Apparently herring production failed to materialize in the Yangtze Delta, the major Chinese herring producing area, because of the disastrous earthquake that caused mass evacuations of fishing communities along the Delta. Yangtze Delta production occurs concurrently with Canada's.

China tends to be very secretive about its herring productions. The Chinese fall and spring herring fishery board meetings are no longer held in an effort to control the flow of production information from that country. The current Chinese export policy encourages exporting to foreign nations all nonessential food items; therefore, Chinese roe herring production can be expected to be exported to Japan. Chinese consumption of roe herring is not an important market factor.

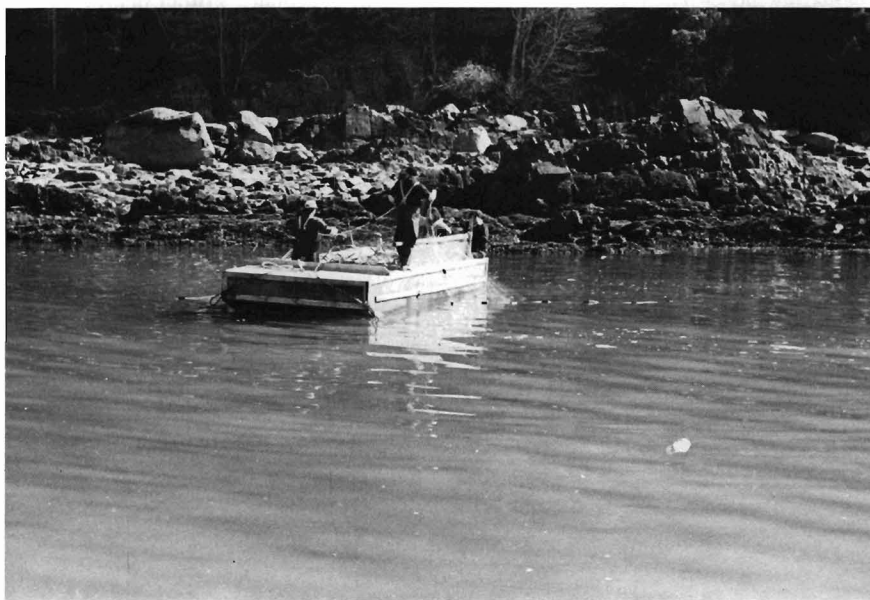
Japanese traders try to obtain as much market intelligence as they can about the amount of roe herring in cold storage in January and February and about the production prospects in North America. It is reported that false marketing information is sometimes released about the Chinese production by Japanese buyers seeking to influence roe prices in the northeast Pacific.

The California herring roe production, in January-February, although very small, is the first season to occur in North America. This is followed by the Canadian production in February-March. Alaskan roe fishery begins in southeast Alaska toward the end of March and lasts through April. It is followed by fisheries in Prince William Sound and, lastly, by Cook Inlet in April and May.

Alaska has very little marketing



Canadian built aluminum gill net skiff, Amalga Harbor fishery, April 1977.



Plywood skiff built in Ketchikan, April 1977.

influence on Japan's roe herring prices. Only about 10 percent of the roe sold to Japan (around 1,100 metric tons) comes from that State. Also, a decision was made in the December 1976 Commercial Fishery Board Meeting to restrict southeastern Alaska herring fish-

ery quota increases to include only the winter bait fishery. Increased harvests will not be allowed in the spring roe fishery.

The addition of 500 tons of herring that can be harvested in the Bering Sea by Alaskan fishermen in 1977 will have

little immediate effect on world markets. Alaska production is further disadvantaged by being last on the buying chain. If the Chinese produce and market 40-50,000 metric tons of roe herring and Canada produces 60,000 metric tons of roe herring, the herring roe market could be satisfied at around 10,000 metric tons of roe, depending upon current storage inventories in Japan. This could mean a severely depressed herring roe market in Alaska and have grave implications for that industry⁵. If this does occur, some herring roe seiners and gillnetters may wish to participate in the fall/winter fishery for bait herring after the close of the salmon seasons. A flexible management policy would be required to allow the diversification into the bait fishery, particularly if quota allocations are placed on

⁵During low production years in China and Canada, the Alaskan herring roe industry does have an advantage because if roe production is in short supply in Japan, Alaskan processors can command a higher price for their product.

the winter bait fishery and on roe fisheries operating on the same stocks. Japanese roe herring import quotas were enforced prior to 1972. This was initiated by the Japanese government to protect herring marketing interests of fishermen on the Japanese Island of Hokkaido. The quotas applied only to round herring and the Japanese roe industry circumvented this restriction by importing cured roe skeins, most of which were extracted in Korea. If this quota were actually enforced, it would be to the advantage of the Alaskan herring roe industry and the U.S. economy because extracted roe has more value and the increased economic activity connected with the roe extraction labor would increase economic multiplier benefits to coastal fishery communities.

SUMMARY

Although purse-seine-based "purse seine motherboat" gillnet operators indicated the most fishing power and potential for high gross earnings, the most financially successful operations were

apparently the "gillnet motherboat operators" who fished more than two openings in southeastern Alaska in 1976.

The gillnet roe herring fishery apparently has the potential to return significant gross earnings to the operator with less risk of production variability than purse seining in southeastern Alaska.

The average hourly wage to the crewmen from gillnetting roe herring was higher in southeastern Alaska in 1976 than the reported hourly wage from gillnetting roe herring in Canada in 1975.

If the People's Republic of China and Canada concurrently have peak roe herring production in any given season, the Alaskan roe market could be severely depressed because the Japanese roe markets could become totally glutted before Alaska production begins.

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