THE DEVELOPMENT OF THE NORTON SOUND COMMERCIAL HERRING FISHERY, 1979-1988

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ABSTRACT

The Norton Sound herring fishery is the northernmost commercial herring fishery in the state that has reached full development. Sea ice, population levels of herring and incidental catches of other species in more northerly areas will restrict expansion of commercial exploitation to the North. The early history of the commercial fishery is briefly covered. The rapid expansion since 1979 is discussed in detail. The current ranking as fifth largest by harvest and largest fishery of its type (gillnet) in the state is supported by catch statistics. The section titled management concerns discusses communication within the fishery, biomass estimation and age structure evaluation. Finally, the possible expansion of the Bering Sea fishery is discussed.

INTRODUCTION

The Norton Sound and Port Clarence herring fisheries are the northernmost commercial herring fisheries in the Bering Sea. It is unlikely that additional commercial herring fisheries will develop to the north. Spring ice conditions north of the Bering Strait severely complicate any attempts at sac roe fisheries. At this time insufficient populations of herring have been found to support bait or food fisheries.

The Norton Sound sac roe fishery, over the past eight years has had a mean annual harvest of 4300 short tons (st) (Table 1). During the 1988 season the ex-vessel value of the fishery climbed to 3.9 million dollars, more than twice the recent five year average. Currently a moratorium on new entrants has been declared in preparation to limiting the number of fishermen in the fishery. The Commercial Fisheries Entry Commission plans to limit ithe number of fishermen to 305 within a few years. However, in 1987, 564 fishermen made at least one delivery.

In comparison to other fisheries, Norton Sound is the sixth largest in the state, and by gear type (gillnet), it is the largest.

HISTORY

Records of commercial harvest of Norton Sound herring by domestic fishermen can be found as far back as 1916 when a fall food fishery began in Golovin Bay. The Golovin Bay fishery took only 3200 st total over a 15 year period (Table 2). The product was salt cured, and marketed to compete with a northern European product. After World War II, demand fell off and only very small harvests of roe herring were recorded from 1964 until 1978. The Japanese also harvested herring within Norton Sound from 1968 to 1977 (Table 3). The Japanese were excluded from Norton Sound by the Magnuson Act, which came into effect during 1977.

Shortly after the institution of the 200 mile limit and the consequent curtailment of foreign near-shore fishing, a full scale domestic sac roe fishery began to develop. In 1979, 1,292 st were harvested by 63 fishermen, of which 13 were purse seiners. The purse seine fleet took the majority of the harvest. Local fishermen found it difficult to compete with the large boats and sought separate areas to fish. As result of the low harvest by local fishermen, the Alaska Board of Fisheries changed the regulations to exclude purse seines as a legal gear type north of the Togiak fishery. The Board recognized that in many cases the local fishermen could not afford the same investment that a seine fishermen had made, and would be effectively

excluded from the harvest of a local resource. The Alaska Board of Fisheries has a policy which states developing fisheries are to primarily benefit local users. The Board chose not to disallow beach seines as a gear type at that time since some local people owned beach seines for subsistence salmon fishing and occasionally used them to harvest herring commercially.

Following the 1982 season, the Board of Fishseries implemented super exclusive registration, a regulation restricting the Norton Sound herring fishermen's participation in other herring fisheries in the state. The intent was to make fishermen commit to the Norton Sound fishery or fish else where. Local fishermen saw this as a way to reduce the number of herring fishermen who travel up the Pacific Coast participating in several herring fisheries. These fishermen are specialists who typically utilize state of the art equipment and have some of the largest catches. By reducing the number of the highly technical fishermen the Board sought to allow local fishermen in developing fisheries to develop their boats and gear under less economic presure. Prior to the 1985 season, this super exclusive registration was expanded to include vessels since many fishermen were leasing or operating boats as crew members. This regulation is difficult to enforce.

By the 1981 season, the herring fishery in Norton Sound was harvesting roughly 20% of the observed biomass and over 300 fishermen were participating in the fishery. However, fishing techniques and equipment were still developing. In 1981, 10 days were required to complete the harvest. By 1984, only 6 days were required to complete a similar harvest.

As the gillnet fishery developed, the herring roe-on-kelp fishery was undergoing a paralled development. During the 1981 season, 47 st were harvested in a few relatively small areas (Table 4). Department staff became concerned that uncontrolled development of this fishery would harm the Fucus (sp) beds that were favored spawning areas in southern Norton Sound. Consequently, the Board of Fisheries initiated closures to shift effort to less utilized beds in order for the previously exploited areas to recover. The idea was to periodically rotate kelp harvest in order to preserve adequate spawning substrate.

During the 1984 season a fisherman who had pounded kelp in Prince William Sound imported Macrocistas kelp and placed an open pound near Elim. He was successful in harvesting a marketable product. There had been developing a local controversy over harvesting roe-on-kelp and simultaneously harvesting spawning fish. The idea of expanding the harvest of spawned eggs "tipped the balance" and the local advisory committees petitioned the Board of Fisheries to close all spawn-on-kelp fisheries in Norton Sound following the 1984 season.

Beginning in 1986, some non-local fishermen began beach seining in a more efficient manner than had previously been attempted. Most of the new fishermen developed shallow draft vessels that could be easily grounded and were rigged with power blocks or hydraulic winches to facilitate net retrieval. The technique was similar to purse seining except purse lines were not allowed. In 1981, the Board had decided to retain this gear type. At the next meeting they were confronted by representatives of the gill net fleet wanting beach seines banished, and representatives of the beach seine fishermen became concerned about losing their investment. The Board, in an attempt to compromise, decided to discourage further development of beach seining by limiting the beach seine harvest to not more than 10% of the preseason estimated harvest. This regulation still stands today.

During the 1987 season, 564 fishermen harvested over 4,000 st in 11 hours of fishing time. This level of efficiency caused concern that the herring fleet was over capitalized and could easily over exploite the herring population with a relatively small error in management. Department staff initiated several regulation proposals to restrict the amount of gear that could be used by each fisherman during the winter 1987 Board meeting. The Board approved regulations reducing beach seine length from 150 to 75 fathoms and gill net aggregate length from 150 fathoms to 100 fathoms, with the manager given authority to further restrict gill net length to 50 fathoms per fishermen. These proposals were generally supported by local fishermen because their boats were less well equipped and these regulations tended to have more effect on efficient non-local boats.

The Commercial Fisheries Entry Commission was also petitioned in 1987 to limit entry into the Norton Sound herring fishery as well as several other smaller fisheries in the Bering Sea. The Commission decided to limit entry into these fisheries and will begin issuing permits to fishermen based on longevity in the fishery, investment into the fishery and their alternative opportunities for employment. As stated, the goal is to limit the gill net fleet to 301 permits and the beach seine fleet to 4 permits.

MANAGEMENT CONCERNS

The Norton Sound District is similar to the Togiak District in size. Commercial fishing is generally restricted to eastern Norton Sound, an area roughly 60 by 130 miles. The fishery is managed from the village of Unalakleet located at a central point in relation to the fishery. Unalakleet, a town of 1800 people, serves as a logistics center since it has bulk fuel storage, a small boat harbor, a jet airport, and two stores.

Adequate means of communication is essential to the orderly management of aa commercial fishery. Communication with the

fishing fleet is complicated by the distances involved. The two AM radio stations at Nome have fishery broadcasts twice daily that allow management staff to update the fleet, and make fisheries announcements. Single sideband or FM radios are used to communicate with larger boats, but only a few fishermen can afford these radios. Often messages are relayed using telephone, local VHF, and CB radios.

Prior to the fishing season the staff attempts to hold a village meeting in every village within the fishing area. This is important since in many cases this is the only employment opportunity available to these fishermen. Frequently a translator is required to help explain the manager's ideas. There are 3 distinct Eskimo languages used in the Norton Sound fishing district. The department staff spends a great deal of their time issuing licence and acting as a "go between" with the licencing offices in the state capitol, 1,000 miles away.

The field office at Unalakleet also has a steady stream of traffic to the public information desk. Both local and nonlocal fishermen use this service to keep up-to-date and to post messages.

Population assessment, and judging spawn timing is primarily accomplished by aerial surveys. A contract giving department staff priority and frequent use of a Cessna 180 equipped with bubble windows is established each year with a local air taxi. Just prior to the season opening, daily surveys are flown of the Eastern Sound. As the biomass builds, portions of the Sound may be flown twice each day. A survey may take up to 5 hours with another 2 hours to tabulate sightings. Aerial surveys are used as an actual estimate of population since no other method has been found that can be used in as timely a manner. Sea ice frequently poses a problem during the fishing season. Moving pack ice can cover large portions of southern Norton Sound, eliminating any possibility of aerial observation. During most years the staff has less than a week to assess the size of the herring population. Moving sea ice often restricts boat traffic even during the fishery.

Aerial surveys have been calibrated by using methods practiced in the Togiak District where aerial sightings of herring school surface area have been compared to volume pumped from purse seine sets. Only two such point estimates have been made in Norton Sound. Those catches compared well with the estimation technique developed in the Southern Bering Sea. Briefly, the technique is to estimate the surface area of a school and apply a conversion factor based on past experience in similar water depth to derive the school's tonnage.

The ripeness of the population or roe quality of fishery also

judged from the air. Aerial surveyors familiar with the area can judge time from peak spawning based on the herring's location and migration patterns. Once the fish are thought to be two days before peak spawning, "beach parties" are held. "Beach Parties" are also a technique borrowed from Togiak. Samples from as many locations as possible are gathered and brought to a previously announced location for public inspection. Roe quality is judged by industry roe technicians and a straw poll is conducted of all fishermen and representatives of processors present to determine if an opening should be called. Department staff has not always followed these recommendations, because it was felt that critical samples were missing, or weather and ice conditions were going to preclude or disrupt a later opening.

It should be mentioned that the Department usually has two field camps in addition to the field office. The duty of camp personnel is to sample herring in both northern and southern Norton Sound, primarily for population age structure. This information is used to judge run strength, migration timing and to predict the next year's return. Since each year's preseason forecast is based on the previous years return, the recruiting year classes are consistently underestimated. This frustrates the beach seiners whose quota is based on this forecast. Gillnetters and the buyers use the age class projections to select their gill net mesh size for the up coming season.

FUTURE FISHERIES EXPANSION

The Port Clarence herring fishery is situated directly north of Norton Sound and adjacent to the Bering Strait. This is a small fishery, 165 st harvest quota, that is an extension of the pelagic Bering Sea population. The commercial fishery depends on fish that winter south of St. Matthew's Island. There is a smaller less numerous stock that apparently overwinters in a large brackish water estuary called Imruck Basin. This stock mixes with cod and cisco's during the time the commercial fishery takes place, and the high percentage of these incidental species discourages commercial harvest at that time.

It is the staff's opinion that the Port Clarence fishery cannot support much more fishing effort than has been present during the last two years. Fisheries north of the Bering Strait seem unlikely because only small local stocks have been found.

St. Lawrence Island's south coast has over 100 miles of beach line and probably offers the last potential hope of an unexploited herring stock in the Bering Sea. The southern portion of the Island clears during May and June. The documented overwintering area of the pelagic Bering Sea herring is only 300 miles away. Norton Sound is roughly 500 miles from that area. Local residents report the presence of a spawning population. Spawn apparently occurs on rocky headlands and areas

of submarine vegetation. The area staff has set a goal of flying some aerial surveys prior to the development of a fishery to assess the resource and gather timing information.

SUMMARY

In summation, the Norton Sound herring fishery has developed from a new fishery in 1979 to a fully capitalized fishery in 1987. Fleet efficiency increases annually with increased utilization of larger fishing vessels, hydraulic reels and shakers and increased experience of the fishermen. Currently the population is being managed on a sustained yield basis with a fairly stable age class composition. Management will now concentrate on maximizing the ex-vessel value of the fishery given the allocative decisions handed down by the Alaska Board of Fisheries.

It appears unlikely that commercial herring fisheries will develop to the north. Only St. Lawrence Island to the west has the possibility of developing into a commercial fishery.

Figure 1. Map of the eastern Bering Sea region.

Table 1. Herring biomass estimates and commercial fisheries data for the Norton Sound District, 1979-1988.

Year	Biomass 1/ (st)	Harvest 2/ (st)	% Exploitation 3/	Roe %	Dollar Value (millions)	Number Fishermen
1979	7,700	1292	16.8	7.0	.6	67
1980 4/	8,400	2452	29.2	8.1	.5	294
1981	25,100	4371	17.3	8.8	1.5	332
1982 4/	17,400	3933	22.6	8.8	1.0	237
1983	28,100	4582	16.3	8.6	1.4	272
1984	23,100	3662 5/	15.8	10.3	.9	194
1985	20,000	3548	17.7	9.9	1.4	277
1986	28,062	5194	18.5	9.6	2.9	323
1987	32,370	4082	12.6 6/	8.6	2.6	564
1988	33,924	4672	13.8	9.0	3.9	349

1/ Methods of calculating biomass have varied over the years. Biomass estimates listed follow methods used during that year.

2/ Includes both bait and sac roe harvests.

3/ Represents total District exploitation. During many years southern subdistricts are closed because exploitation of the local biomass reaches 20%, while northern subdistricts have remained open because little or no harvest has occurred.

4/ Minimal biomass estimates due to poor survey conditions.

5/ Includes an estimated 90 st of wastage.

6/ Peak estimate made after the commercial fishery; the fishery was not re-opened due to the high probability of spawnouts present after two consecutive days of heavy spawning.

Table 2. Norton Sound herring and spawn-on-kelp harvests (in st) by U.S. commercial fishermen, 1909-1988.

Year	Sac Roe Herring	Food or Bait Herring	Total	Spawn-on-kelp
1909-1916		1/	1/	-
1916-1928	-	1881	1881	-
1929	-	166	166	-
1930	-	441	441	-
1931	-	86	86	-
1932	-	529	529	-
1933	-	31	31	-
1934	-	4	4	-
1935	-	15	15	-
1936	-	-	-	-
1937	-	6	6	-
1938	-	10	10	-
1939	-	6	6	-
1940	-	14	14	-
1941	-	3	3	-
1942-1963	-	-	-	-
1964	20	-	20	-
1965	-	-	-	-
1966	12	-	12	-
1967	-	-	-	-
1968	-	-	-	-
1969	2	-	2	-
1970	8	-	8	-
1971	20	-	20	-
1972	17	-	17	-
1973	35	-	35	-
1974	2	-	2	-
1975	-	-	-	-
1976	9	-	9	-
1977	11	-	11	trace
1978	15	-	15	4
1979	1292	-	1292	13
1980	2451	1	2452	24
1981	4371	-	4371	47 2/
1982	3864	69	3933	38
1983	4181	401	4582	29 3/
1984	3298	274	3662	19 4/
1985	3420	128	3548	- 5/
1986	4926	268	5194	-
1987	3779	303	4082	-
1988	4256	416	4672	-

1/ Fishery occurred some years, but harvest unavailable. Fishery from 1909-1941 occurred near Golovin; 1964 to present has occurred in southeast Norton Sound.
2/ Does not include approximately 6 st of wastage.
3/ Does not include approximately 2 st of wastage.
4/ Includes 3 st of spawn on Macrocystus kelp.
5/ All spawn-on-kelp fisheries closed by regulation prior to the 1985 season.

Table 3. Japanese gillnet herring catches in Norton Sound, 1968-1977. (North of 63 N. Latitude and East of 167 W. Longitude)

Year	Gillnet Catch (st)	Remarks
1968	131	First foreign effort on herring in Norton Sound
1969	1400	Peak catch with large effort (about 40 ships). Two vessels apprehended.
1970	69	
1971	703	
1972	15	
1973	38	
1974	764	
1975	0	
1976	-	Data unavailable.
1977	-	Herring fishery closed to foreign nations.
Total	3120	Excludes 1976 catches.

Table 4. Norton Sound commercial spawn-on-kelp (Fucus) harvest, 1978-1984. 1/

Year	st	Fishermen
1978	4	9
1979	13	19
1980	24	20
1981	47	22
1982	38	44
1983	29	35
1984	19	32

1/ Norton Sound commercial spawn-on-kelp harvest closed by regulation prior to the 1985 season.