

EASTERN ALEUTIAN ISLANDS "DUTCH HARBOR"
FOOD AND BAIT HERRING FISHERY, 1991

REPORT TO THE BOARD OF FISHERIES

By

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and

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ABSTRACT

During the spring of 1991 the Alaska Board of Fisheries changed the opening of the Dutch Harbor food and bait herring fishery from August 15 to July 16. Nine hundred thirty-one tons of herring was allocated to this fishery in 1991. Short openings were scheduled to manage the fishery conservatively. Eight seiners and eleven tenders registered. Weather precluded fishing during the first opening on July 16. The fishery reopened on July 17 at 12:01 AM and was closed at 6:38 AM with a catch of 1,325 tons. Five processors purchased herring for \$300 per ton. The ex-vessel value of the fishery was about \$397,500. Twenty-four percent of the catch was processed for food and 76 percent for bait.

Key words: Aleutian Islands, herring, catch, food, bait

INTRODUCTION

The Eastern Aleutian Islands herring food and bait fishery occurs near Unalaska and Akutan Islands, primarily in the vicinity of Unalaska and Akutan Bays (Figure 1). By regulation, the Bering Sea Herring Fishery Management Plan (5 AAC 27.060) applies to the Unimak, Akutan, and Unalaska Districts, and the Umnak District east of Samalga Pass (ADF&G 1991). This management plan has been in effect since 1983. Historically, the Dutch Harbor Food and Bait fishery occurred from 1929 through 1938 and 1945 (Table 1).

Historically, the fishery was a mixture of gill net and seine gear, holding pounds, and numerous small, shore-based hand packing operations. A large portion of the catch was brined for either food or bait purposes; some product was frozen. Seine gear provided the bulk of the herring harvest. Currently, fishing gear consists of purse seine vessels, which use large seines, up to 250 fathoms long and 25 to 35 fathoms deep. The entire 1981-86 and 1990 harvest was caught with purse seine gear. One gill net permit holder participated in the 1987 and 1988 seasons, and two gill net permit holders fished in 1989. Gill net vessels used in the fishery are typically 32 feet long, and there is no restriction on gear length. Purse seine vessels used in the fishery average about 50 feet in keel length and the majority also participate in the area M salmon fishery. Fish finding electronics (sonar) aboard these vessels are critical to the fishing operation, much as the airplane is critical to the sac roe fishery. Generally, during the season, the permit holders freely exchange information.

When herring concentrations leave traditional fishing areas, fishermen will increase their efficiency by conducting organized "sonar searches" over fairly large areas until concentrations of herring are located. When catcher vessels leave the immediate area of shore-based processing facilities, the industry follows with floating processors and tenders. Processing efficiency and product quality may decline when this occurs. Harvest locations have extended over approximately 90 miles, from Tigalda Island to Makushin Bay (Figure 1). The majority of the harvest, however, has occurred within a five mile radius of shore-based processing facilities in Unalaska and Akutan Bays.

One similarity between the current and historical fisheries is the quality problem associated with feeding herring. Feed problems were overcome in the historical fishery by the use of holding pounds, where seine caught herring were held until their stomachs became empty. Gill net caught herring required special handling to prevent spoilage. In the current fishery, the use of shaved ice and super-chilled seawater in conjunction with rapid processing alleviates most of the feed related problems. When feeding conditions are severe, the processors have suspended buying.

One difference between the current and historical (1929-38 and 1945) fisheries are the availability of herring. Historically, herring were categorized into an early summer run (late June to late July) and a late summer run (late August to early September). This pattern does not seem to apply in the current (post 1980) fishery. Herring now appear in the Dutch Harbor area about July 1 and are available throughout the summer through mid-September.

Shore-based processors purchase the majority of the herring harvested. Floating processors have been used each year; however, they are limited by daily handling

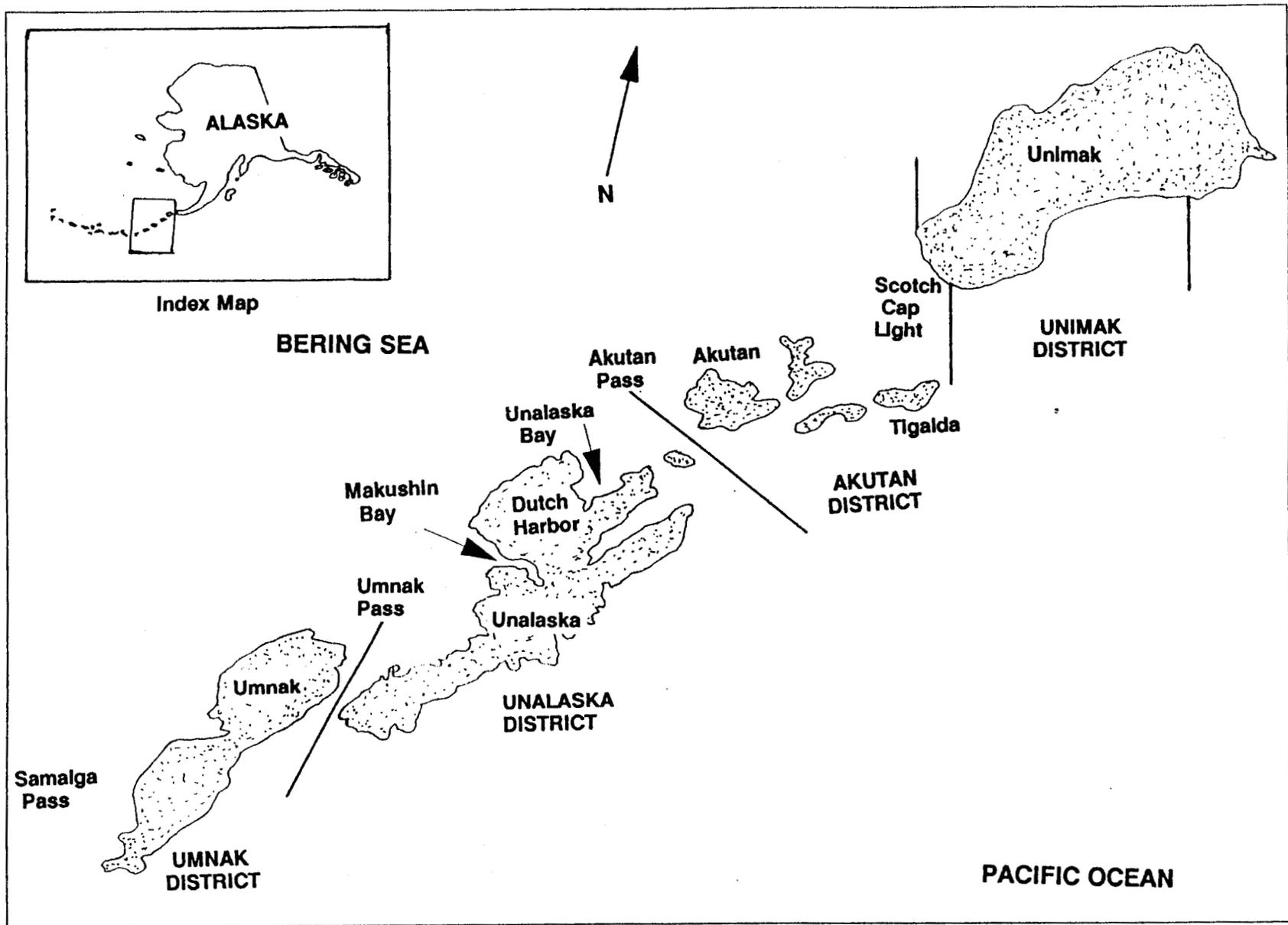


Figure 1. Map of the Eastern Aleutian Islands, the study area includes the Unimak, Akutan, and Unalaska Districts and that portion of the Umnak District east of Samalga Pass.

Table 1. Eastern Aleutian Islands "Dutch Harbor" area herring food and bait fisheries historical industry summary, 1929-91.

Year	Harvest In Short Tons	No. Processors	No. Permits	No. Landings	Tons Per Boat	Tons Per Landing	\$ Per Ton	\$ Value (Millions)	\$ Per Vessel (Millions)
1929	1,259	*	*	*	*	*	*	*	*
1930	1,916	*	*	*	*	*	*	*	*
1931	1,056	12	26	*	*	*	*	*	*
1932	2,510	12	30	*	*	*	*	*	*
1933	1,585	12	38	*	*	*	*	*	*
1934	1,533	9	*	*	*	*	*	*	*
1935	2,412	10	*	*	*	*	*	*	*
1936	1,379	8	*	*	*	*	*	*	*
1937	579	*	*	*	*	*	*	*	*
1938	513	*	*	*	*	*	*	*	*
1939-44					NO FISHERY				
1945	75	*	*	*	*	*	*	*	*
1946-80					NO FISHERY				
1981	704	^a	^a	16	352	44	300	0.211	0.11
1982	3,565	6	7	95	509	38	300	1.020	0.15
1983	3,567	5	8	96	446	37	232	0.828	0.10
1984	3,578	5	9	61	398	59	210	0.751	0.08
1985	3,480	3	6	78	560	45	162	0.564	0.09
1986	2,394	4	7	53	342	45	254	0.600	0.09
1987	2,503	4	8 ^b	45	373	56	300	0.751	0.09
1988	2,004	6	8 ^b	59	251	34	252	0.505	0.06
1989	3,081	5	9 ^b	69	342	45	283	0.873	0.10
1990	820	5	7	8	117	103	350	0.287	0.04
1991	1,325	5	8	18	166	74	300	0.398	0.05
1929-38									
Average	1,474	11	31	*	*	*	*	*	*
1982-91									
Average	2,632	5	8	58	350	54	264	0.658	0.09

-Continued-

Table 1. (page 2 of 2)

^cData not available.

^aThe number of processors, fishing vessels, and catch by gear type can not be released due to state confidentiality requirements.

^bThe catch by gear type can not be released due to state confidentiality requirements.

capacities, which are considerably less than that of the shore-based plants. All of the processors associated with the herring fishery have floating processors and are diversified into groundfish, salmon, halibut, black cod, scallops, and the Bering Sea and Alaska Peninsula crab fisheries. In 1988 and 1990, some herring were tendered to the King Cove shore plant, in 1989 and 1990 to the Sand Point shore plant, and in 1988-90 to the Akutan shore plant.

Generally, the ex-vessel value for bait herring has exceeded that for food herring (Table 1). Industry information indicates that foreign food markets currently have multiple sources of herring from European and Canadian stocks which have been cycling high in recent years. While Eastern Aleutian food herring are a suitable and desirable product, an ample and more reliable supply of food herring from other countries currently dominates the market. The bait product from this fishery has a more stable market which is used locally and in other Alaskan fishing ports for the longline and crab fisheries. Bait demands have been increasing in recent years and a premium price is placed on quality bait which is fresh and has high oil content. Overall, the ex-vessel value of bait herring has remained more stable than that for food.

The harvest strategy of the Dutch Harbor food and bait herring fishery has evolved since it was re-established in 1981 (Table 2). During the 1981 and 1982 seasons, there were no harvest restrictions. From 1983 to 1985 the Board of Fisheries implemented a harvest ceiling of 3,527 tons per year due to biological concern over multiple exploitation on Eastern Bering Sea spawning stocks, specifically the Bristol Bay, Nelson Island, and Port Moller stocks. Scale pattern analysis studies identified these stocks as comprising the Eastern Aleutian herring biomass (Rogers and Schnepf 1985). The extensive sac roe fisheries occurring on these stocks coupled with the Dutch Harbor food and bait fishery which may harvest some of these stocks, may create biological concern and possible exploitation above the board's 20% guideline policy. In 1986, a modification of the harvest ceiling was implemented by the Alaska Department of Fish and Game (ADF&G) in response to the Board of Fisheries concern for the possible diminishing nature (lack of recruitment in the spawning stocks) of the contributing stocks (primarily Togiak, to which the bulk of the Eastern Aleutian catch is estimated to be comprised). The 1986 harvest allocation in the Eastern Aleutians was reduced by 30% (2,453 ton limit). This reduction was commensurate with the percent reduction of the observed Togiak spawning biomass between the springs of 1985 and 1986. The 1987 harvest allocation was 2,332 tons, which was in line with the 1985 to 1987 reduction of observed Togiak spawning biomass.

In 1988, the Alaska Board of Fisheries implemented the Bering Sea Herring Fisheries Management Plan, which established criteria for calculating the Dutch Harbor food and bait quota. To ensure the conservation of herring stocks, the board adopted a requirement that the overall exploitation of a herring stock should not exceed 20% of the spawning biomass. In the case of the Togiak spawning stock, an allocation between the sac roe fishery, spawn on kelp fishery, and the Dutch Harbor food and bait fishery was established so that the catch did not exceed 20% of the observed spawning biomass. The number of fishermen involved and the value of the fishery were factors considered by the Board when it made the allocations.

The Bering Sea Herring Fishery Management Plan in effect during the 1991 season defines under what conditions and to what extent there will be a Dutch Harbor food and bait fishery.

Table 2. Dutch Harbor commercial herring food and bait catch, in short tons, 1981-91.

Year	Landing Date		Days Fished	Preseason Togiak Spawning Biomass	Harvest Quota	Food and Bait Harvest	% Togiak Spawning Biomass Harvested	Number Permit Holders Fishing
	First	Last						
1981	8/03	8/23	21	159,000	NONE	704	0.4	- ^a
1982	8/05	9/12	39	98,000	NONE	3,565	3.6	6
1983	7/23	9/06	46	142,000	3,525 ^b	3,567	2.5	5
1984	7/17	7/27	11	115,000	3,525 ^b	3,578	3.1	5
1985	7/17	8/11	26	132,000	3,525 ^b	3,480	2.6	3
1986	7\16	7/28	13	96,000	2,453 ^c	2,394	2.5	4
1987	7/16	7/23	4 ^d	88,000	2,332 ^c	2,503	2.8	9
1988	7/16	9/18	21	132,000	3,100 ^e	2,004	1.6	8
1989	7/16	8/05	19 ^f	100,108	3,100 ^e	3,081	3.2	9
1990	8/15	8/15	<1	72,000	903 ^e	820	1.1	7
1991	7/17 ^g	7/17	<1	83,229	931 ^e	1,325	1.6	8
Average			18	110,667	2,614	2,456	2.2	6

^aNumber can not be released due to state confidentiality requirements.

^bHarvest ceiling of 3,525 established by Board of Fisheries.

^cHarvest quota set by ADF&G. Reduced proportionate with the drop from the 1985 Togiak spawning biomass level.

^dClosed 7/19, reopened for 14 hours on 7/23.

^eHarvest quota set under provisions of the Bering Sea Herring Fisheries Management Plan.

^fClosed 7/26, reopened 7/27 through 8/5.

^gFishery opened for six hours on 7/16; weather prevented any fishing effort.

The elements governing the food and bait fishery are listed below:

1. The Dutch Harbor food and bait fishery quota is determined through the following calculations:
 - A. An exploitation rate of 20% is applied to the estimated Togiak herring spawning biomass. This figure represents the total combined allowable harvest to be extracted by the Togiak sac roe fishery, spawn on kelp fishery, and the Dutch Harbor food and bait fishery.
 - B. The spawn on kelp fishery is allocated 1,500 tons of herring.
 - C. The Dutch Harbor fishery is allocated 7% of the remaining allowable harvest (after the 1,500 ton spawn on kelp allocation has been subtracted from the total allowable harvest).
 - D. The Togiak herring sac roe harvest allocation is the remainder of the total allowable harvest after the spawn on kelp and Dutch Harbor allocation have been subtracted.
2. When any Bering Sea herring stock from Port Clarence to Port Moller is below its threshold the Dutch Harbor food and bait fishery will be closed for that season. The threshold levels in short tons are as follows:

Port Moller	1,000
Togiak	35,000
Security Cove	1,200
Goodnews Bay	1,200
Cape Avinof	500
Nelson Island	2,000
Nunivak Island	1,500
Cape Romanzof	1,500
Norton Sound	7,000

This formula results in an allocation of herring to the Dutch Harbor food and bait fishery equivalent to approximately one percent (1.1-1.3%) of the estimated Togiak herring spawning biomass.

Alaska Board of Fisheries action in March, 1991 changed the Dutch Harbor food and bait herring fishery opening date from August 15 to July 16. This change was implemented to lessen the chance of catching other than Togiak and Port Moller herring stocks in the Dutch Harbor fishery.

Interest by the Peninsula Marketing Association in the possibility of a local herring spawning stock harvested in the Dutch Harbor food and bait fishery resulted in an agreement between ADF&G and the Association. ADF&G agreed to sample herring caught in the fishery for age, weight, length, and maturity. The Association agreed to pay \$7,000 to ADF&G for this sampling.

This report documents historical catches and the number, age, sex, and size composition of the 1991 herring food and bait harvest in the Dutch Harbor fishery. This data will provide a base for management considerations.

METHODS

Commercial catch data were compiled by the Division of Commercial Fisheries of the Alaska Department of Fish and Game (ADF&G). These data were based on computer tabulations originating from individual sale receipts (fish tickets) given to fishermen at the time of delivery. Fish tickets and the computer generated summaries were edited by ADF&G Alaska Peninsula staff for errors and omissions. Because extensive fish ticket editing is usually required to finalize the data for any given year, later reports may contain minor differences in the catch information listed in this report.

Catches were sampled during the one day fishery at Akutan and Dutch Harbor. The sampling plan specified 600 herring to be sampled per fishing period with at least 100 herring to be sampled from each tender. For single sampling events, a 600-fish sample was chosen to provide 95% simultaneous confidence levels for age composition within $\pm 5\%$ of the true age composition (Thompson 1987). Herring were randomly sampled, usually collected from the holds of tender vessels to minimize scale loss. The harvest area of each tender sampled was determined through vessel operator interviews and fish ticket information.

Age compositions were computed for the catch. Age was determined by examining scales (Warner and Shafford 1970). Scales were taken from the preferred area, which was located on the left side of the herring three rows below the lateral line and three scales posterior to the center of the operculum plate (Anonymous 1986). One scale was taken from each herring. Ages were recorded in actual fish age in years. The accuracy of age determination was not tested.

Standard length measurements were taken from the anterior most portion of the fish, including the lower jaw with the mouth closed, to the end of the vertebra (hypural plate) using a meter stick with 1 mm gradations and reading the measuring device to within 1 mm. While not tested, accuracy of a length measurement was probably ± 5 mm. Mean lengths were calculated from an unweighted composite of the data collected from each area sampled.

Individual fish weight measurements were recorded to the nearest 2 g using a digital scale with 2 g gradations. While not tested, accuracy of a weight measurement was probably within ± 2 g. Mean weights were calculated from an unweighted composite of the data collected from each area sampled.

Sex compositions and sexual maturity were determined for each sample. Sex and sexual maturity was determined by internal observation of the gonads. Sexual maturity of herring were classified as: (1) virgin herring, (2) virgin herring with small sexual organs, (3) gonads occupying about half the ventral cavity, (4) gonads almost as long as body cavity, (5) gonads fill body cavity, (6) ripe gonads, (7) spent herring, and (8) recovering spent herring.

1991 FISHERY

A 931 ton quota was allocated for the Dutch Harbor food and bait harvest using the Bering Sea Herring Management Plan allocation formula, as follows:

1991 Togiak Spawning Biomass	74,000 Tons
@ 20% Maximum Exploitation	

Total Allowable Catch	14,800 Tons

Togiak Spawn on Kelp Allocation	- 1,500 Tons

Remainder of Allowable Catch	13,300 Tons
Dutch Harbor Allocation	7%

Dutch Harbor Quota	931 Tons

Eight seiners and 11 tenders with a combined capacity of 1,600 tons registered for the fishery. During the week prior to the opening, large schools of herring were seen in shallow bays causing concern over the potential for overharvest. Short openings were scheduled to keep the fishery under control (McCullough 1991). Codes were given to all tenders with instructions to report landings immediately. Seiners were instructed to monitor their radios.

The fishery opened on July 16 at 2:00 AM and closed at 8:00 AM. No fishing occurred due to bad weather. The next opening was July 17 at 12:01 AM. One permit holder, using a spotter plane, found a large school of herring in Summer Bay (Figure 2). The rest of the permit holders began fishing the area between Eider Point and Broad Bay. Initially small sets were made, then six permit holders moved to Summer Bay, while one permit holder remained at Eider Point. Large sets were quickly made in the shallow waters (4-8 fathoms) of Summer Bay.

Initial radio reports were slow coming in and inaccurate. At 6:38 AM the closure was announced with a reported catch of 870 tons on board and one set still in the water.

The entire catch of 1,325 tons was taken with purse seine gear. Three hundred eighteen tons (24%) were processed for food and 1,007 tons (76%) were processed for bait. Five processing companies from Dutch Harbor, Akutan, and King Cove purchased herring for \$300 per ton. In 1991, 58% of the herring were processed in Dutch Harbor. The ex-vessel value of the fishery was \$397,500. The 1991 retail price for bait herring was \$900 per ton. Table 2 presents the harvest dates by year.

The 1991 Togiak herring spawning biomass was revised to an estimated 83,229 tons. This revision was done by ADF&G Staff in Anchorage after the Dutch Harbor fishery closed. This revision is a post-season assessment determined through analysis of fish tickets, survey data, and age composition data from the various Togiak herring fisheries and spawning population.

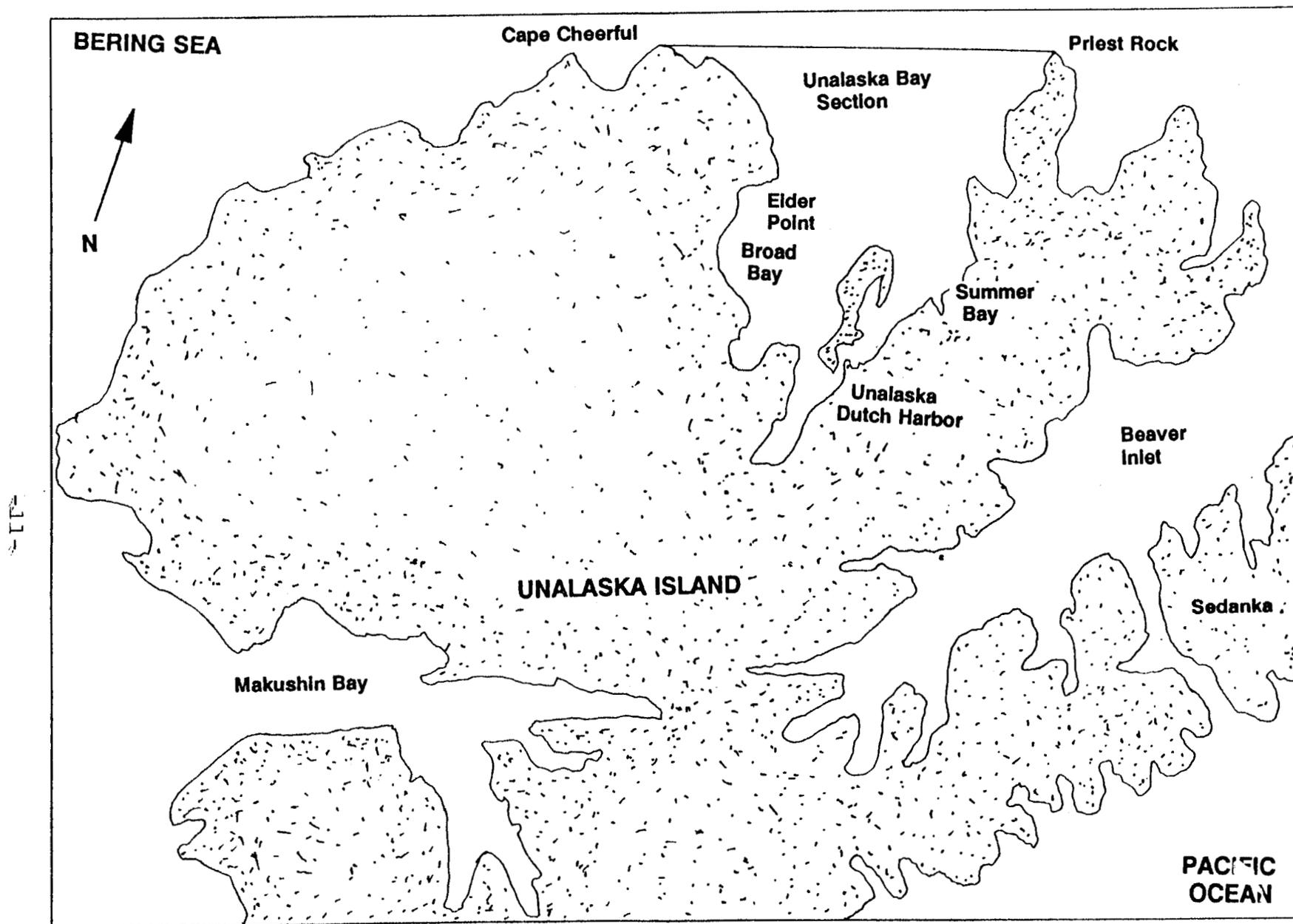


Figure 2. Map of Northern Unalaska Island with Unalaska Bay shown.

SAMPLE RESULTS

Five hundred and sixty-two herring were collected on July 17, 1991 and sent to Kodiak for analysis. The results are presented in Table 3. Seventy-four percent of the herring sampled were 10 years old or older and no strong year classes appear to be recruiting into the population. Table 4 compares the Bering Sea herring spawning stocks by age with herring caught in the Dutch Harbor food and bait fishery. No conclusive stock composition results are apparent based on age data from the Dutch Harbor fishery in comparison to the age composition of other Bering Sea herring spawning stocks. Samples used for aging in sac roe and food and bait fisheries are usually obtained from the commercial catch or from test fishing. The Dutch Harbor samples are assumed to be representative of the catch but may not be representative of the population. Samples from some Bering Sea spawning stocks where ADF&G had extensive sampling projects are assumed to be representative of the population.

The average size of the herring caught in the Dutch Harbor food and bait fishery was 471 grams (1 pound). This is substantially larger than the largest herring spawning stock sampled in the Bering Sea in 1991 which averaged 364 grams. Comparing the weight at age data of herring harvested in the Dutch Harbor fishery with sac roe stocks also does not result in any conclusive stock composition comparisons.

One controversy concerning the Dutch Harbor food and bait herring fishery was the possibility that some herring may spawn later in the summer after the fishery in Aleutian Islands waters. Table 3 lists the gonad maturity of the samples by age. All herring sampled had spawned earlier in the year, were recovering from spawning, and would not spawn again until the following year (i.e. 1992).

Several stock separation studies have indicated that the origins of the herring caught in this fishery are predominantly from the Togiak stock, averaging 78% Togiak over all studies (Funk 1991). The composition of the non-Togiak component of the harvest was not identifiable as to origin. Possible contributing stocks include: Norton Sound, Cape Romanzof, Nunivak Island, Nelson Island, Cape Avinof, Goodnews Bay, Security Cove, and Port Moller.

Based on migration timing, the mid-July opening date at Dutch Harbor should avoid Nelson Island herring and should restrict the fishery to Port Moller and Togiak stocks.

Table 3. Estimated age, sex, weight, length, and maturity of herring harvested in the Dutch Harbor commercial herring food and bait fishery, July 17, 1991.

Age Years	Sample			Catch			Weight			Length			Maturity	
	N	Male	Female	(%) Male	(%) Female	(%) of Total	N	Mean (g)	STD (g)	N	Mean (mm)	STD (mm)	Number Spent	Number Ripe
1														
2														
3														
4	1	0	1	0.0	100.0	0.2	1	211	0.0	1	239	0.0	1	0
5	1	0	1	0.0	100.0	0.2	0			1	262	0.0	1	0
6	1	0	1	0.0	100.0	0.2	1	371	0.0	1	298	0.0	1	0
7	44	21	23	47.7	52.3	8.7	29	352	35.4	44	277	7.6	44	0
8	56	26	30	46.4	53.6	11.0	36	384	42.1	56	286	9.1	56	0
9	29	9	20	31.0	69.0	5.7	20	436	44.9	29	295	9.7	29	0
10	68	26	42	38.2	61.8	13.4	39	466	46.4	68	302	7.7	68	0
11	57	24	33	42.1	57.9	11.2	44	490	56.9	57	305	10.0	57	0
12	112	44	68	39.3	60.7	22.1	76	502	43.4	112	310	8.9	112	0
13	87	37	50	42.5	57.5	17.2	57	526	47.5	87	311	8.1	87	0
14	45	14	31	31.1	68.9	8.9	20	529	53.0	45	315	10.0	45	0
15	5	1	4	20.0	80.0	1.0	4	544	24.6	5	323	7.3	5	0
16	0	0	0	0.0	0.0	0.0	0			0			0	0
17	1	0	1	0.0	100.0	0.2	1	469	0.0	1	319	0.0	1	0
Total	507	202	305			100.0	328	471		507	303		507	0
Sex Composition of Aged Herring														
		39.8	60.2											

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Table 4. Age comparison of Dutch Harbor commercial herring food and bait samples and other Bering Sea herring spawning stocks, in percent by age class, 1991.

Sampling Sites	Sample Size	Ages										
		3	4	5	6	7	8	9	10	11	12	13
Norton Sound	4,572	1.2	1.6	11.9	3.0	10.5	15.2	28.9	13.3	6.7	4.8	2.1 ^a
Cape Romanzof	1,889	0.1	2.6	3.5	2.8	29.3	14.3	15.1	13.1	7.5	6.6	4.9 ^a
Nunivak Island	714	0.0	9.5	1.6	1.0	6.8	12.8	8.6	14.8	11.9	19.0	13.9 ^a
Nelson Island	1,512	1.9	13.5	4.1	3.1	20.6	16.0	5.4	9.5	7.6	10.1	8.2 ^a
Cape Avinof	1,613	2.3	15.7	10.7	4.9	19.3	14.5	10.0	6.6	6.6	5.8	3.6 ^a
Goodnews Bay	1,875	1.3	22.2	3.9	3.5	20.1	13.2	5.1	8.7	7.6	9.1	5.0 ^a
Security Cove	1,245	0.3	31.7	3.4	2.5	15.8	16.6	5.2	9.2	6.7	5.8	2.8 ^a
Togiak	5,029	0.0	16.2	1.5	1.6	18.4	18.2	5.0	10.2	4.7	9.0	15.2 ^a
Inner Port Moller	87	1.1	58.6	12.6	2.3	16.1	1.1	4.6	2.3	1.1 ^b		
Outer Port Moller	680	2.9 ^c	74.3	6.0	1.2	10.9	2.4	1.3	0.6	0.4 ^b		
Herendeen Bay	550	2.0	71.5	5.3	1.6	11.1	3.8	0.4	1.8	2.5 ^b		
Bear Island	173	1.7	85.5	8.1	0.0	3.5	0.6	0.0	0.0	0.6 ^b		
Deer Island	284	0.7	64.8	7.4	2.5	17.6	4.9	0.0	1.4	0.7 ^b		
Cape Kutuzof	68	0.0	36.8	10.3	0.0	39.7	8.8	1.5	1.5	1.5 ^b		
Dutch Harbor	507	0.0	0.2	0.2	0.2	8.7	11.2	5.7	13.4	11.2	22.0	27.2 ^a

-Continued-

Table 4. (page 2 of 2)

^aPercent of sample 13 years or older.

^bPercent of sample 11 years or older.

^cSample also contained 0.1% of age 2 herring.

HARVEST PROJECTION FOR THE 1992 FISHERY

The estimator's quota for the 1992 Dutch Harbor food and bait herring fishery is 738 tons (K.A. Rowell, Alaska Department of Fish and Game, Anchorage, personal communication). This number is derived using the Bering Sea Herring Management Plan (5 AAC 27.060) and the projected 1992 Togiak herring spawning biomass of 60,214 tons (Skrade and Brookover 1991). The actual quota will be established when the 1992 Togiak herring spawning biomass is determined.

RECOMMENDATIONS

The fast pace of the 1991 Dutch Harbor food and bait herring fishery in conjunction with the small projected 1992 quota (738 tons) and the likelihood of available tenders with a total capacity of more than double the quota, makes it obvious that the fishery needs to be slowed down. In consideration of this, the following management strategies will be implemented in 1992.

1. Fishing restricted to daylight hours.
2. Fishing periods of two hours or less.

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