

OVERVIEW OF THE
TOGIAK HERRING SAC ROE AND SPAWN-ON KELP FISHERIES
BRISTOL BAY, ALASKA

REPORT TO THE ALASKA
BOARD OF FISHERIES



By

James B Browning
Katherine A. Rowell
and
Timothy M. Sands

Regional Information Report' No. 2A00-39

Alaska Department of Fish and Game
Division of Commercial Fisheries, Central Region
333 Raspberry Road
Anchorage, Alaska 99518

December 2000

The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the authors or the Division of Commercial Fisheries.

AUTHORS

James B Browning is the Area Management Biologist for the Department of Fish and Game, Division of Commercial Fisheries, P.O. Box 230, Dillingham, Alaska 99576. He is responsible for overall management of the Togiak herring fisheries.

Katherine A. Rowell is a herring research biologist for the Department of Fish and Game, Division of Commercial Fisheries, 333 Raspberry Road, Anchorage, Alaska 99518. She oversees all research and sampling programs in the Togiak fishery, and is responsible for the annual completion of stock assessment and forecast.

Timothy M. Sands is the Assistant Area Management Biologist for the Department of Fish and Game, Division of Commercial Fisheries, P.O. Box 230, Dillingham, Alaska 99576. He is responsible for the management of the Togiak herring spawn-on-kelp fishery and for conducting aerial surveys of herring biomass and spawn.

TABLE OF CONTENTS

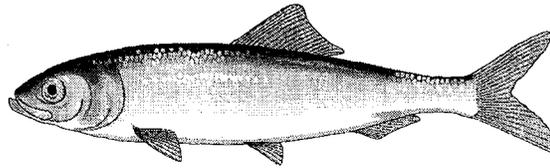
	<u>Page</u>
LIST OF TABLES.....	ii
LIST OF FIGURES.....	iii
INTRODUCTION	1
STOCK ASSESSMENT.....	2
<i>Method</i>	2
<i>Spawning Population</i>	2
SAC ROE HERRING FISHERY	3
<i>Fishing and Industry Participation</i>	3
<i>Harvest and Management Performance</i>	4
SPAWN-ON-KELP FISHERY	8
2001 FORECAST	9
LITERATURE CITED	11
TABLES	12
FIGURES.....	20

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Exvessel value of the commercial herring and spawn-on-kelp harvest, in thousands of dollars, Togiak District, Bristol Bay, 1978-2000	12
2. Aerial survey estimates of herring biomass and spawn deposition, Togiak District, Bristol Bay, 1978-2000	13
3. Sac roe herring industry participation, fishing effort and harvest, Togiak District, Bristol Bay, 1978-2000	14
4. Exploitation of Togiak herring, Togiak District, Bristol Bay, 1978-2000	15
5. Guideline and actual harvests of sac roe herring, Togiak District, Bristol Bay, 1988-2000	16
6. Herring spawn on kelp industry participation, fishing effort, area and harvest, Togiak District, Bristol Bay, 1978-2000	17
7. Guideline and actual harvests of herring spawn on kelp, Togiak District, Bristol Bay, 1984-2000	18
8. Harvest allocation of the 2001 forecasted Pacific herring run biomass, Togiak District, Bristol Bay	19

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Togiak District, Bristol Bay	20
2. Spawn-on-kelp management areas (K-1 through K-11), Togiak District, Bristol Bay	21



INTRODUCTION

The Bristol Bay area includes all waters south of a line extending west from Cape Newenham, east of the International Date Line in the Bering Sea and north of a line extending west from Cape Menshikof. The Bristol Bay area is divided into three herring fishing districts: Bay District; including all waters east of the longitude of Cape Newenham, Togiak District; including all waters between the longitude of Cape Newenham and the longitude of Cape Constantine, and General District; including all waters west of the longitude of Cape Newenham. Togiak District spans approximately 192 km (Figure 1). Togiak village lies at the center of the district, 108 km west of Dillingham.

Pacific herring (*Clupea pallasii*) have been documented throughout Bristol Bay, but the major spawning concentration returns to the Togiak area each spring as the focus of herring sac roe and spawn-on-kelp fisheries. In the Togiak District, herring are commercially harvested for sac roe using gillnets and purse seines. Herring generally spawn on rockweed kelp (*Fucus spp.*) substrate; this kelp is commercially harvested by hand and/or rake.

The herring sac roe fishery began in Togiak District in 1967, followed by the first fishery for spawn on kelp in 1968. Effort and harvest levels remained low for the first 10 years of the fishery. Increased interest, favorable market conditions and additional incentives provided by the Fishery Conservation and Management Act of 1976 (the 200-mile limit) resulted in a rapid expansion of the Togiak herring fishery in 1977.

The Togiak herring fishery is the largest in Alaska. Sac roe harvests since 1978 averaged over 19,400 tons, worth \$7.8 million annually. Spawn-on-kelp harvests since 1978 averaged 365,000 lbs., worth about \$273,000 to permit holders. In 2000, poor market conditions led to low prices on the grounds; sac roe harvests brought only \$4 million to permit holders, which represents the lowest annual value since 1981 (Table 1).

This report summarizes the Togiak herring stock assessment program, reviews the Togiak District herring fisheries from 1978 through 2000 and presents projections for the 2001 herring season.

STOCK ASSESSMENT

Methods

Since 1978, the Alaska Department of Fish and Game has conducted aerial surveys throughout the herring spawning season to estimate abundance, timing and distribution of Pacific herring in the Togiak District. Surveys are conducted regularly from approximately April 15 until June 1 each year. Once herring are observed, surveys are conducted daily, weather permitting, until biomass declines and spawning activity subsides.

Aerial survey techniques used in Togiak have remained largely unchanged since 1978 and are described in Lebida and Whitmore (1985). Herring school surface area is estimated through a handheld tube with a measured grid and a known focal length from a known altitude. Standard conversion factors of 1.52 tons (water depths of 16 ft or less), 2.58 tons (water depths between 16 and 26 ft) and 2.83 tons (water depths greater than 26 ft) per 538 ft² of surface area are applied to herring school surface areas to estimate the total biomass observed during each flight.

Volunteer test fisheries, which were originally implemented by the department to estimate roe quality, also provide samples for age, size and sex composition analysis. Samples are also collected from commercial harvest for age composition and size analysis. After the season, results are used to revise biomass estimates.

Spawning Population

Since 1978, herring have generally been observed in the district in early May, but have been seen entering near shore areas as early as April 22 and as late as May 20. Biomass has increased rapidly and peaked within one to seven days of the first observation in all but three years. In recent years, biomass declined rapidly following the peak observation, but herring continued to enter and exit the district for several weeks. In all but three years, spawn was first observed within three days of the first herring observation. Similar to trends observed for biomass, spawning activity, with the exception of two years, accelerated rapidly, peaked from one to four days after the first occurrence of spawn then rapidly subsided. Small "spot" spawns have been observed as late as June 7.

Annual estimates of the Togiak herring biomass range from 49,000 tons observed in 1980 to 239,000 tons documented in 1979 (Table 2). Abundance appeared to be high in the late 1970's, declined in the mid 1980's and remained relatively low and stable through 1991. Observed biomass levels increased to a peak of 164,000 tons in 1993 (Table 2).

In January of 2000, climatic conditions and Bering Sea ice pack were indicating another late arrival for herring in the Togiak District. Conditions were so unusual that the Bering Sea crab fishery was postponed from its normal start of January 15 to at least April 1 due to ice cover.

However, a warming trend and numerous successive days of sunshine and warm winds in March and early April removed the shorefast ice and warmed inshore water temperatures, resulting in relatively normal timing of the herring migration.

Herring were first observed April 24 between Tongue Point and Togiak Bay, but with inshore water temperatures of 0° - 1° C., the observed biomass was minimal for several days. The run began to build slowly on April 29. By May 3, over 25,000 tons were documented on grounds, this increased to a peak observed biomass on May 8 of 82,000 tons. Spawn was first observed on May 6 with approximately 8 linear miles mapped that day. Nearly 16 miles of spawn were documented May 7, the peak day of spawning. By May 12, less than one half mile of spawn was observed. However, spawn was observed in the Togiak District as late as June 14.

The 2000 herring run was forecasted to be 131,000 tons. Herring ages-3 to -20 were present in the 2000 return. Older (age-9 and above) herring comprised 56% of the biomass. The 1987 and 1988 year classes (age-9 and -10) represented 37 % of the biomass, and were followed in magnitude by the 1990 and 1991 (age-6 and -7) year classes. At this time, the condition of the Togiak herring stock is considered to be in a nominal decline.

SAC ROE HERRING FISHERY

Fishing and Industry Participation

Unlike most herring fisheries in Alaska, the Togiak sac roe fishery is not a limited entry fishery. Gillnets, purse seines and hand purse seines are legal gear.

Since fishing effort is not limited, effort levels can vary substantially each year. Herring market conditions are one of the leading factors influencing effort in a given year, but other factors also influence fleet size. Since the majority of herring permit holders in Togiak participate in other fisheries like Bristol Bay salmon, salmon and other markets indirectly affect effort in the herring fishery. Prior year herring prices and run timing also affect effort.

Fishing effort in the sac roe fishery increased through the late 1980's, decreased in the early 1990's, then increased again to a peak in 1996 and has declined since 1997 (Table 3). Gillnet effort increased to over 300 vessels in 1989, declined to a low of 75 vessels in 1993, and then peaked in 1996 with 461 vessels and has since decreased to between 150 and 225 vessels. Purse seine effort increased steadily from 1978 through 1989, when 310 vessels were observed. From 1990 to 1997, the purse seine fleet has fluctuated between 200 and 300 vessels, and has declined to less than 100 vessels since 1998. The 2000 fishing effort was below average for both gear types, most notably for purse seine vessels.

The Alaska Board of Fisheries has reduced gear to limit harvesting capacity and control problems with waste. Prior to 1989, gillnet length was restricted to 150 fathoms. Permit holders were restricted to the use of one legal limit of gear, but up to 300 fathoms could be operated from

a fishing vessel. Under these gear allowances, lost and abandoned nets accounted for substantial amounts of waste during some years. In 1989, the Board reduced the legal compliment of gillnet gear to the current maximum of 100 fathoms in length per permit holder, restricted the operation of gear from a single vessel to 100 fathoms, and granted the department the authority to reduce length to 50 fathoms inseason. Gillnet depth remains unrestricted. In October of 1989, the Board reduced purse seines to 100 fathoms in length and 16 fathoms in depth. In 1995, the Board further restricted purse seine depth to 625 meshes, of which 600 could be no larger than one and one-half inches. The 1995 depth restriction was enacted to control harvesting capacity.

The department first restricted herring gillnet length to 50 fathoms in 1992 to maintain an orderly fishery, help ensure roe quality and minimize potential waste. From 1994 through 1997, gear length was restricted to 50 fathoms during all gillnet openings. These restrictions appeared to control waste and preserve orderliness in the fishery without a substantial reduction in harvesting capacity.

Industry participation in the fishery peaked between 1979 and 1982, when 33 processors participated in the herring fishery. From 1987 through 1997, 16 to 22 companies have purchased herring or spawn-on-kelp product in Togiak. Fifteen companies registered in 1998; in 1999 and 2000, 12 companies registered to buy product. Daily processing capacity on grounds increased from approximately 3,000 tons in 1990 to a peak of 4,850 tons in 1996, and has more recently declined to a low in 2000 of 2,100 tons. This capacity equated to approximately 11% to 25 % of actual sac roe harvests.

The early 1997 run surprised fishermen and industry. Much of the processing, tender and purse seine fleet expected to participate in the Togiak fisheries remained in Cook Inlet for the Kamishak herring fisheries through April 28. Only four processing vessels, four purse seiners and one tender were observed during the April 27 survey, when the first herring were observed. From April 29 through May 2, eighteen companies registered to buy gillnet and purse seine sac roe herring. The 1997 processing capacity (4,200 tons per day) was similar to 1992 to 1996 levels.

Harvests and Management Performance

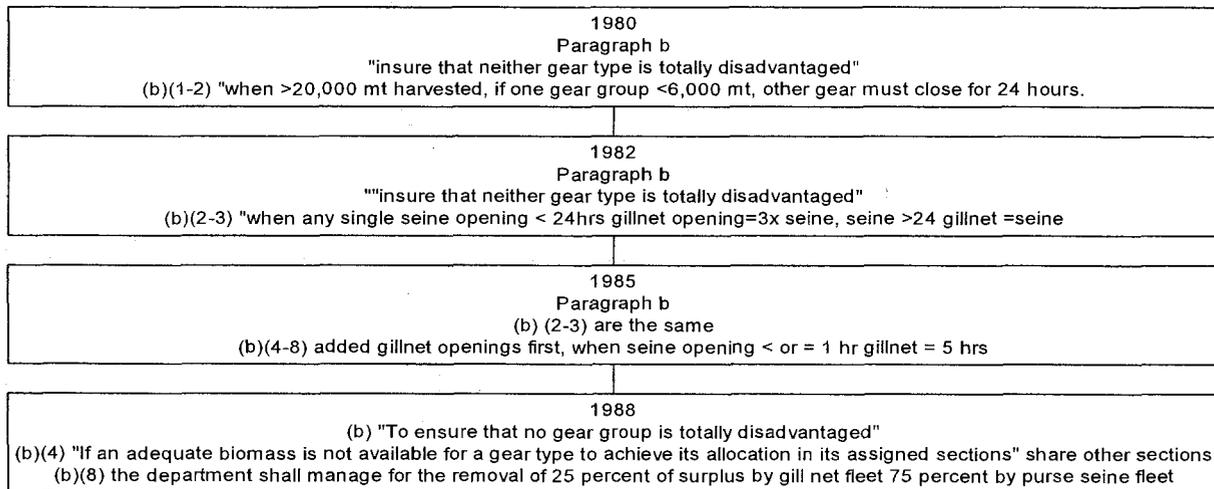
Exploitation

The commercial sac roe and spawn-on-kelp harvests in the Togiak District have been regulated by emergency order since 1981. From 1981 through 1987, informal policies directed the department to ensure that minimum threshold biomass levels were observed before opening the herring fishery, and to manage the fishery so that exploitation did not exceed 20%. In 1988, the Board incorporated the threshold and exploitation rate policies into the Bering Sea Herring Fishery Management Plan (5 AAC 27.060) for Togiak and other Bering Sea fisheries. Herring biomass in Togiak has been estimated at levels well above threshold requirements since 1981.

Including the 1978 season, exploitation rates have exceeded 20% in 14 of 23 years, and have fallen below the 20% maximum for all other years (Table 4). Annual exploitation averaged 21% between 1978 and 1999. Although the spawn-on-kelp and Dutch Harbor food and bait fisheries conduct harvests on Togiak herring, only sac roe harvests were used in calculating exploitation from 1981 to 1983. Estimates for herring equivalent to spawn-on-kelp harvests and harvests in the Dutch Harbor fishery were not included in the exploitation until respective years, 1984 and 1988.

Sac Roe Allocation

Herring sac roe purse seine and gillnet harvests are managed for allocation guidelines set forth in the Bristol Bay Herring Management Plan (BBHMP) (5 AAC 27.865) originally adopted by the Alaska Board of Fisheries in late 1980.



This graphic shows the allocative language adopted in previous versions of the BBHMP. In 1980, paragraph b contained some "intent" language: "It is desirable to try to insure that neither gear group is totally disadvantaged." This was followed by the allocative mechanism: "When total reported harvest reaches 20,000 metric tons, if one gear type has less than 6,000 tons, the other gear type shall close for 24 hours." This language directs the Department to adjust fishing time inseason by closing the gear type that was ahead in harvest (This is approximately a 3:1 ratio, and at the time was trying to preserve a portion of harvest for the gillnets). In 1982, while the intent language remained unchanged, the allocative mechanism became based on fishing time instead of tonnage. (b)(2) "When any single seine opening is less than 24 hours long, the opening for gillnets shall be three times that allowed for seines." And (b)(3) "When any single seine

opening is 24 hours or more, the opening for gillnets shall be equal to the opening for seines.” (Again, an inseason 3:1 ratio, since seine openings were generally less than 24 hours.) In 1985, along with the intent language, (b)(2) and (b)(3) were retained; and (b)(7) was added: “When a purse seine fishing period is one hour or less, the gillnet fishing period must be for at least five hours.” This additional language used a 5:1 ratio for gillnet fishing time as the inseason allocative mechanism. The plan was further modified in 1988 to the current language. This plan currently states that, before opening the sac roe fishery, 1,500 short tons must be set aside for the spawn-on-kelp fishery, and 7% of the remaining available harvest is allocated to the Dutch Harbor food and bait fishery. After the spawn-on-kelp and the Dutch Harbor harvests are subtracted, the remaining harvestable surplus is allocated to the Togiak sac roe fishery. The Department shall manage for a removal of 25% of that surplus by the gillnet fleet, and 75% by the purse seine fleet. While the current language does not specify an inseason ratio per se; it does direct the Department to “manage for the removal of 25% of that surplus by the gillnet fleet and 75% by the purse seine fleet.” The Department has applied the current language, based on past management practices and continuity from manager to manager, as an inseason ratio. With the recent changes in herring markets, both the reduction in overall market resulting in less processing capacity, and the increased marketability of larger size and generally higher roe percentage of the gillnet product, there is increasing pressure and confusion surrounding the current language and the Department’s application of that language.

To achieve the gillnet and purse seine allocations, the department calculated guideline harvest levels (tons) each year based on preseason forecasts by apportioning 25 % and 75 % of the sac roe allocation to each gear, respectively. The department then regulated fishing time and area to achieve these guideline harvests, while maintaining the 75/25 ratio. From 1988 to 2000, gillnet harvests exceeded guideline harvest levels 6 of 13 years (Table 5). Actual harvests exceeded guideline harvests by as much as 19% and fell short by as much as 46 %. For the same period, purse seine harvests exceeded guideline harvests in 7 of 13 years. Differences between actual and guideline purse seine harvests ranged from 38% below the guideline to 25% above . Since the BBHMP established allocations by gear in 1988, 24% of all sac roe harvest was taken by gillnets and 76% by purse seines.

Product Quality and Value

The Board of Fisheries and the industry have directed the department to give product quality and fishery value an equal priority with exploitation objectives. Management Guidelines for Commercial Herring Sac Roe Fisheries (5 AAC 27.059) state the department may manage sac roe fisheries to enhance product value by opening areas in which sampling has demonstrated high herring roe content and large herring size, and to minimize harvest of recruit size herring. The BBHMP also states that the primary objective in the sac roe fishery is to prosecute an orderly, manageable fishery while striving for the highest level of product quality and a minimum of waste. Given these regulations and comments from industry, the department considers maximizing quality and value a primary objective in the Togiak fishery.

The Department used volunteer test fishing as a means to maximize harvest roe quality since 1982. Test fishing procedures developed and became more intensive from 1982 through 1989. By 1990, the Department had established standard test fishing areas and sample sizes,

coordinated test fishing start times between areas, coordinated and assisted in transporting samples to roe technicians and established criteria required to open fishing areas. Since then, the Department has opened to commercial fishing only areas that have documented high quality roe.

Development of test fishing procedures sped the availability of results, reduced time required between test fishing and opening an area to commercial fishing and helped ensure high mature roe percents in harvests. From 1988 through 2000, combined sac roe harvests averaged approximately 9.9% mature roe. Mature roe percent of purse seine harvests for this period averaged 9.7% mature roe. This percentage did not vary by more than 1 % above or below the average and showed no distinct trend through time (Table 3). As an indirect result of recent test fishing procedures, gillnet harvest area was gradually reduced in the late 1980's and early 1990's due to lack of successful test fishing or poor quality results in some areas of the district. From 1994 through 1997, gillnet fishing was opened almost exclusively in the area between Right Hand Point and Kulukak Bay. This reduction in area heightened competition among the gillnet fleet, especially during 1996 and 1997, when fishing effort was high. Since 1997, attempts have been made by management staff to spread gillnet harvest out to include areas west of Right Hand Point. It has proven difficult to dislodge the gillnet fleet from the protected anchorage of Metervik Bay not only to participate in test fisheries but even to fish in a commercial gillnet period.

Unlike purse seine harvest quality, mature roe percent in gillnet harvests has increased substantially since 1993. Gillnet harvests from 1988 through 1993 averaged 8.8% mature roe, while roe percentage from harvests between 1994 to 2000 averaged 11.6%. Although some of this difference may be attributed to management efforts, most is due to an apparent shift to larger gillnet mesh sizes. Prior to 1993, gillnets with mesh sizes smaller than three inches (stretched) were common. Gillnets with 3-inch mesh and larger have since become standard gear. This shift to large-mesh gillnets also has increased the percentage of female herring caught in the gillnet fishery from 44% (1982-1992) to 58% (1993-1997), and 59% (1998-2000).

In 1992, over 20,000 tons of herring were harvested by purse seines in one 20-minute period. This magnitude of harvest from this single opening, combined with a limited processing capacity, resulted in holding times up to seven days, and large-scale deterioration of flesh and roe quality. Increasing market demands for high quality product, combined with the poor quality product from the 1992 harvest, compelled the department to recognize quality problems associated with holding times. Limiting individual harvests not to exceed processing capabilities became a management objective after 1992.

Although impact to product quality is difficult to measure, industry commented that limiting individual harvests to an amount that will not exceed three days of production strongly contributed to higher product quality and value. Since 1993, the department limited time and area in the purse seine fishery to reduce holding times to three days or less. To provide harvest opportunity yet control purse seine harvest rates, required intensive management by the department to evaluate rapid changes in biomass distribution and other factors that affect harvest capacity. Since 1995, the Department has limited the area considered for an opening using test fish results. Aerial surveys have been conducted over the limited area where high quality roe

samples have been documented. Depending on the biomass, movement of that biomass, and distribution of effort that is observed in the area, boundaries are set around the area to be opened usually not more than 1 hour prior to scheduled opening times. Aerial observation of the area, biomass and effort continues right up to opening time. Duration of the opening is announced last, usually no more than 30 minutes prior to the opening. As an example, at 10:00 a.m. on May 7, the purse seine fleet was advised that the Department was considering an opening in Nunavachuk Bay, but the open area boundaries would be announced at 12:00 noon for a 1:00 p.m. opening. Management staff had worked out 3 options regarding open area; Plan A was for the entire bay, Plan B was for the eastern ½ of the bay, and Plan C was for the eastern 1/3 of the bay. With staff in the air over Nunavachuk Bay at 12:00 noon, the decision was made for Plan C; at 12:30, with management staff still in the air watching the movement of herring into the area to be opened, the duration of the 1:00 p.m. purse seine opening was announced as 10 minutes.

Limiting individual harvests has resulted in a larger number of openings over a longer time period. Purse seine fishing time from 1985 to 1992 averaged less than 5 hours per season. For the same number of years since 1993, (1993 to 2000), fishing time has averaged over 12 hours per year. Effects of limiting area also included a much higher level of competition within the purse seine fleet. The Board addressed this issue in 1995 by reducing the allowable depth of purse seine gear. The department has continued this strategy through 2000.

SPAWN-ON-KELP FISHERY

Like the sac roe fishery, the spawn-on-kelp harvest in the Togiak District has been regulated by emergency order since 1981. Beginning in 1984, the spawn-on-kelp fishery was managed under the direction of the Togiak District Herring Spawn on Kelp Management Plan (5 AAC 27.834)¹. The plan essentially provides for an allocation of 350,000 lbs. of product, equivalent to 1,500 tons of herring, to this fishery. The plan also directs the department to 1) rotate harvest areas on a two- to three-year basis (Figure 2), 2) ensure product quality and 3) include the herring equivalent to the spawn-on-kelp harvest when calculating exploitation.

Fishing effort in the spawn-on-kelp fishery increased steadily since its inception, and peaked at 532 participants in 1991 (Table 6). The fishery became limited to interim use and permanent permit holders in 1990. Following the 1991 season, the Board limited the role of non-permit holders in the spawn-on-kelp fishery to assisting with transporting kelp only after the close of the commercial period. Most permits became permanent by 1993, and in 1997, 295 people held permanent permits.

¹ The Board did not adopt this plan as regulation until 1988. From 1984 to 1987, the plan existed as an informal directive from the Board to the Department

The fishery has opened for all years, since 1984, except 1985, 1997, 1998 and 2000. Harvests exceeded the 350,000-lb. guideline by more than 10% in six years and fell short in three (Table 7). For the four other years in which a fishery occurred, harvests were within 10% of the guideline. The two- to three-year area rotation schedule was adhered to in all years except 1987. In 1987, area K-9 was opened after harvest in area K-10 fell short of the harvest guideline. The western half of area K-9 had been opened in 1986. To ensure product quality the department and industry representatives usually collect spawn-on-kelp samples to display at a public meeting, once herring spawning activity begins to subside.

Management decisions are based on comments from industry and users regarding sample quality. In 2000, the processing company that was interested in buying spawn-on-kelp product collected kelp samples in areas K-4, K-5 and K-6 (Nunavachuk Bay to Right Hand Point) and K-8 and K-9 (Middle Bay to Rocky Point). Even though samples were collected from areas where spawning occurred over several days, spawn coverage was very light. After a second sampling trip to locate quality kelp samples, the buyers found that wind had caused siltation and samples contained grit which made the kelp unmarketable. An announcement was made on May 15, that there would be no kelp fishery for the 2000 season.

2001 FORECAST

The forecasted 2001 Togiak herring biomass is 119,818 tons (Table 8). Based on the maximum 20% exploitation rate specified in the BBHMP, the recommended allowable harvest is 23,964 tons. Less allocations to the Togiak spawn-on-kelp fishery (1,500 tons) and the Dutch Harbor food and bait harvest (1,572 tons), the Togiak sac roe harvest is projected to be 20,892 tons. The purse seine guideline harvest based on 75 % of the projection will be 15,669 tons and the gill net harvest, 5,223 tons. Herring age-9 and older are expected to comprise 40% of this biomass. The 1987, 1988 and 1993 year classes represent the most recent though small recruitment events to the population. The 1987 and 1988 year classes combined as age- 13 and -12 herring are expected to contribute 8% of the forecasted biomass. The 1993 year class that will be returning as age -8 herring is predicted to comprise 28% of the biomass. The forecasted average weight is 324g.

GENERAL COMMENTS ON PROPOSALS BEFORE THE BOARD

All but one of the twenty-two proposals submitted to the Board pertaining to the Togiak herring fishery are allocative in some manner, the exception being the proposal regarding marking requirements of herring gillnets. The Department is neutral on the allocative aspects of all these proposals, however, there is an issue contained in Proposal 14 & 15 which we would like addressed by the Alaska Board of Fisheries. The allocation language contained in 5 AAC 27.865. BRISTOL BAY HERRING MANAGEMENT PLAN. Paragraph (b)(8) needs to be re-examined in the context of recent changes in the Togiak herring fishery. Changes in processing capacity and marketability of gillnet vs. purse seine product have focused attention on the

Department's application of this paragraph. There is confusion on the part of the gear groups and pressure from industry as to the interpretation of this paragraph. The Department would like the Board's intent and the language clarified so that industry, permit holders from both gear groups, and the Department are all clear on how the allocative mechanism is to be applied.

LITERATURE CITED

Lebida, R.C. and D.C. Whitmore. 1985. Bering Sea Herring Aerial Survey Manual. Alaska Department of Fish and Game, CFMD, Bristol Bay Data Report 85-2, Anchorage.

Table 1. Exvessel value of the commercial herring and spawn-on-kelp harvest, in thousands of dollars, Togiak District, Bristol Bay, 1978-2000.^a

Year	Herring		Spawn-on-Kelp	Total
	Sac Roe	Food/Bait		
1978	2,635	0	120	2,755
1979	6,561	180	249	6,990
1980	3,055	150	95	3,300
1981	3,988	1	250	4,239
1982	6,070	105	176	6,351
1983	10,450	67	284	10,801
1984	7,178	33	203	7,414
1985	13,696	41	^b	13,737
1986	8,648	12	187	8,847
1987	8,614	49	166	8,829
1988	14,103	3	346	14,452
1989	4,983	19	448	5,450
1990	6,494	9	360	6,863
1991	6,173	21	383	6,577
1992	8,818	26	254	9,098
1993	5,218	3	268	5,489
1994	9,090	0	212	9,302
1995	16,713	0	362	17,075
1996	14,395	5	510	14,910
1997	4,306	0	^b	4,306
1998	4,000	0	^b	4,000
1999	6,185	0	315	6,500
1978-1999 Average	7,790	33	273	8,058
1990-1999 Average	8,139	6	333	8,412
2000	4,000	0	^b	4,000

^a Exvessel value (value paid to the fisherman) is derived by multiplying price/ton by the commercial harvest. These estimates do not include any postseason adjustments to fishermen from processors and should therefore be treated as minimum estimates.

^b Fishery not conducted.

Table 2. Aerial survey estimates of herring biomass (tons) and spawn deposition, Togiak District, Bristol Bay, 1978-2000.

Year	Preseason Forecast ^a	Peak Aerial Survey Estimate	Spawn Estimates	
			Observations	Miles
1978		191,450	70	41.2
1979		239,022	52	21.9
1980		48,886	64	24.3
1981		70,132	106	40.1
1982		73,192	103	38.6
1983		114,210	189	59.7
1984	106,422	83,658	171	61.4
1985	81,899	114,604	141	43.4
1986	86,310	67,384	182	66.5
1987	61,100	64,462	160	75.8
1988	54,500	128,959	107	61.1
1989	80,100	66,290	69	52.5
1990	56,000	71,879	94	65.7
1991	55,000	51,498	90	69.5
1992	60,214	129,256	160	96.9
1993	148,786	164,130	76	53.4
1994	142,497	148,716	80	71.9
1995	149,093	105,695	70	58.7
1996	135,585	88,766	99	72.9
1997	125,000	117,000	79	59.1
1998	121,000	4,412	42	32.8
1999	90,000	156,183	33	55.7
1978-1999 Average	97,094 ^b	104,536	102	56
1990-1999 Average	108,318	103,754	82	64
2000	130,904	81,995	66	45.7

^a 1993-2000 forecasts based on Age Structured Analysis. Previous years based on age composition, abundance, average growth and mortality rates. Forecasts for Togiak herring not provided prior to 1984.

^b Average of 1984 to 1999

Table 3. Sac roe herring industry participation, fishing effort and harvest, Togiak District, Bristol Bay, 1978-2000.

Year	Companies	Daily Processing Capacity ^a	Fishery Dates	Gillnet					Purse Seine					Total Harvest
				Effort ^b	Duration	Harvest ^c	C.P.U.E.	Roe% ^d	Effort ^b	Duration	Harvest ^c	C.P.U.E.	Roe% ^d	
1978	16		5/11-6/1	40	528.0	683	0.03	8.2	25	528	7,069	0.5	8.2	7,752
1979	33		5/1-6/1	350	768.0	4,459	0.02	8.6	175	696	6,667	0.1	8.6	11,126
1980	27		4/25-5/16	363	384.0	4,150	0.03	8.0-11.0	140	384	20,366	0.4	8.0-11.0	24,516
1981 ^e	28		5/2-5/16	106	101.0	2,338	0.22	6.7	83	101	10,151	1.2	10.1	12,489
1982	33		5/14-5/24	200	60.0	7,105	0.59	7.4	135	36	14,716	3.0	9.5	21,821
1983	23		5/3-5/11	250	42.0	5,344	0.51	6.9	150	14	21,442	10.2	9.3	26,786
1984	25		5/18-5/21	300	35.0	4,934	0.47	8.4	196	11	14,485	6.7	10.2	19,419
1985	23		5/23-5/25	302	11.0	4,482	1.35	7.4	155	3	21,330	45.9	10.0	25,812
1986	23		5/14-5/15	209	10.0	3,448	1.65	8.8	209	1	12,828	61.4	9.9	16,276
1987	18		4/27-5/6	148	36.0	2,685	0.50	8.6	111	5.5	12,845	21.0	8.9	15,530
1988	22		5/17	300	4.0	3,695	3.08	8.3	239	0.5	10,472	87.6	10.9	14,167
1989	19		5/9-5/14	320	5.0	2,844	1.78	7.8	310	3	9,415	10.1	8.5	12,259
1990	16	3,100	5/8-5/20	277	66.0	3,072	0.17	9.0	221	3	9,158	13.8	9.7	12,230
1991	16	3,350	5/10-5/17	170	14.0	3,182	1.34	8.5	200	3	11,788	19.6	10.0	14,970
1992	18	3,700	5/20-5/27	274	25.5	5,030	0.72	8.8	301	0.3	20,778	230.1	9.2	25,808
1993	12	2,500	4/27-5/9	75	144.5	3,564	0.33	10.1	140	33.8	14,392	3.0	9.6	17,956
1994	16	3,300	5/11-5/20	146	76.0	7,462	0.67	12.0	240	4.6	22,853	20.7	9.4	30,315
1995	22	4,350	5/7-5/15	250	33.5	6,995	0.84	12.0	254	12.2	19,737	6.4	10.1	26,732
1996	19	4,850	5/3-5/8	461	18.0	6,863	0.83	11.1	266	2.42	18,008	27.8	9.0	24,871
1997	18	4,200	5/2-5/6	336	24.0	5,164	0.64	11.8	231	6.4	18,649	12.6	9.4	23,813
1998	15	2,475	4/29-5/12	152	46	5,952	0.85	12.5	123	16.5	16,824	8.29	9.6	22,776
1999	12	2,400	5/18-5/26	171	28	4,858	1.01	11.5	96	4.67	15,020	33.50	9.1	19,878
1978-1999	21	3,423		236	111.8	4,469	0.80	9.3	182	85.0	14,954	28.4	9.5	19,423
1990-1999	16	3,423		231	47.6	5,214	0.74	10.7	207	8.7	16,721	37.6	9.5	21,935
2000	12	2,100	5/6-5/14	227	67	5,442	0.36	10.56	90	15.75	14,632	10.32	10.13	20,074

^a Number of tons per day based on companies registered.

^b Number of vessels from peak aerial survey.

^c Sources: 1988-97: A.D.F. & G. 1997 Bristol Bay Annual Management Report, in press. 1980-87: A.D.F. & G. RIR #2A88-15, Sandone and Brannian. 1978-79: ADF&G, 1978 and 1979 Bristol Bay Annual Management Reports.

^d Source: A.D.F. & G. 1997 Bristol Bay Annual Management Report, in press.

^e Fishery managed by emergency order from 1981 to present.

Table 4. Exploitation of Togiak herring, Bristol Bay, 1978-2000.

Year	Biomass ^a Estimate	S-O-K Herring Equivalent	Dutch Harbor Food/Bait	Sac Roe			Total Harvest	Exploitation Rate
				Gillnet	Purse Seine	Total		
1978	191,450			683	7,069	7,752	7,752	4.0%
1979	239,022			4,459	6,667	11,126	11,126	4.7%
1980	48,886			4,150	20,366	24,516	24,516	50.1%
1981	70,132			2,338	10,151	12,489	12,489	17.8%
1982	73,192			7,105	14,716	21,821	21,821	29.8%
1983	114,210			5,344	21,442	26,786	26,786	23.5%
1984	106,422	1,552		4,934	14,485	19,419	20,971	19.7%
1985	114,604	0		4,482	21,330	25,812	25,812	22.5%
1986	86,310	1,446		3,448	12,828	16,276	17,722	20.5%
1987	64,462	1,309		2,685	12,845	15,530	16,839	26.1%
1988	128,959	1,782	2,004	3,695	10,472	14,167	17,953	13.9%
1989	80,100	2,499	3,081	2,844	9,415	12,259	17,839	22.3%
1990	71,879	1,617	820	3,072	9,158	12,230	14,667	20.4%
1991	55,000	1,310	1,325	3,182	11,788	14,970	17,605	32.0%
1992	129,256	1,482	1,949	5,030	20,778	25,808	29,239	22.6%
1993	164,130	1,481	2,790	3,564	14,392	17,956	22,227	13.5%
1994	148,716	1,134	3,349	7,462	22,853	30,315	34,798	23.4%
1995	149,093	996	1,748	6,995	19,737	26,732	29,476	19.8%
1996	135,585	1,899	2,239	6,863	18,008	24,871	29,009	21.4%
1997	125,000	0	1,950	5,164	18,649	23,813	25,763	20.6%
1998	121,000	0	1,994	5,952	16,824	22,776	24,770	20.5%
1999	156,200	1,605	2,398	4,858	15,020	19,878	23,881	15.3%
1978-1999 Average	116,982	1,257	2,137	4,469	14,954	19,423	21,503	21.1%
1990-1999 Average	125,586	1,152	2,056	5,214	16,721	21,935	25,144	21.0%
2000	130,904	0	2,014	5,442	14,632	20,074	22,088	16.9%

^a The biomass estimate is the greater of the peak inseason aerial survey or the preseason forecast. This number is used in the BBHMP to calculate harvest guidelines for the respective fisheries. Revised biomass estimates are calculated postseason for use in forecasting.

Table 5. Guideline and actual harvests of sac roe herring, Togiak District, Bristol Bay, 1988-2000.

Year	Gillnet Harvest			Purse Seine Harvest		
	Guideline ^a	Actual	Difference ^b	Guideline ^a	Actual	Difference ^b
1988	5,647	3,695	-34.6%	16,943	10,472	-38.2%
1989	3,376	2,844	-15.8%	10,128	9,415	-7.0%
1990	2,993	3,072	2.6%	8,980	9,158	2.0%
1991	3,143	3,182	1.2%	9,429	11,788	25.0%
1992	5,662	5,030	-11.2%	16,985	20,778	22.3%
1993	6,570	3,564	-45.8%	19,709	14,392	-27.0%
1994	6,277	7,462	18.9%	18,832	22,853	21.4%
1995	6,582	6,995	6.3%	19,747	19,737	-0.1%
1996	5,956	6,863	15.2%	17,868	18,008	0.8%
1997	5,464	5,164	-5.5%	16,391	18,649	13.8%
1998	5,280	5,952	12.7%	15,840	16,824	6.2%
1999	6,914	4,858	-29.7%	20,741	15,020	-27.6%
1988-1999 Average	5,322	4,890	-7.1%	15,966	15,591	-0.7%
1990-1999 Average	5,484	5,214	-3.5%	16,452	16,721	3.7%
2000	5,738	5,442	-5.2%	17,215	14,632	-15.0%

^a Harvest guideline derived from inseason biomass estimate when available, or preseason forecast when weather precluded an inseason estimate.

^b Actual minus guideline divided by guideline.

Table 6. Herring spawn-on-kelp industry participation, fishing effort, area and harvest, Togiak District, Bristol Bay, 1978-2000.

Year	Companies	Fishery Dates	Hours	Effort ^a	Area	Total Harvest	Herring Equivalent
1978	11	5/13-6/3		160	Togiak District	329,858	
1979	16	5/4-5/23		100	Togiak District	414,727	
1980 ^b	21	5/2-5/13		78	K 3 - K10	189,662	
1981	7	5/5-5/13		108	K 3 - K 9	378,207	
1982	8	5/21-5/23	39.0	214	K 3 - K 9	234,924	
1983	4	5/5-5/7	52.0	125	K 3 - K 9	270,866	
1984 ^c	6	5/21-5/24	16.0	330	K 4, K 9	406,586	1,552
1985		no fishery					
1986	6	5/18-5/21	21.0	204	K 7, K 8, K 9	374,142	1,446
1987	5	4/29-5/4	26.0	187	K 9, K 10	307,307	1,309
1988	10	5/20	6.0	259	K 4, K 8	489,320	1,782
1989	11	5/14	4.0	487	K 9	559,780	2,499
1990	7	5/11	3.0	481	K 8	413,844	1,617
1991	7	5/13	2.5	532	K 4	348,357	1,310
1992	5	5/23	3.3	386	K 9	363,600	1,482
1993	2	5/1-5/2	7.0	173	K 8	383,000	1,481
1994	3	5/13-5/14	7.5	204	K 5	308,400	1,134
1995	5	5/11-5/14	14.5	188	K 2, K 3	281,600	996
1996	3	5/9-5/10	12.0	200	K 8, K 9	455,800	1,899
1997		no fishery					
1998		no fishery					
1999	1	5/23	8.0	152.0	K 9	419,563	1,605
1978-1999 A	7		15	240		364,713	1,547
1990-1999 A	4		7	290		371,771	1,441
2000		no fishery					

^a Based on fish tickets, unless specified otherwise. 1990 and 1991 effort from aerial survey of participants.

^b Management plan adopted by Board of Fisheries in December, 1979 designating 10 kelp areas, and requiring emergency order closure when 10% of the standing biomass of kelp was harvested.

^c Management plan adopted by Board of Fisheries setting 350,000 lb. harvest guideline, specifying 2 to 3 year rotation, and including spawn-on-kelp herring equivalent in exploitation rate.

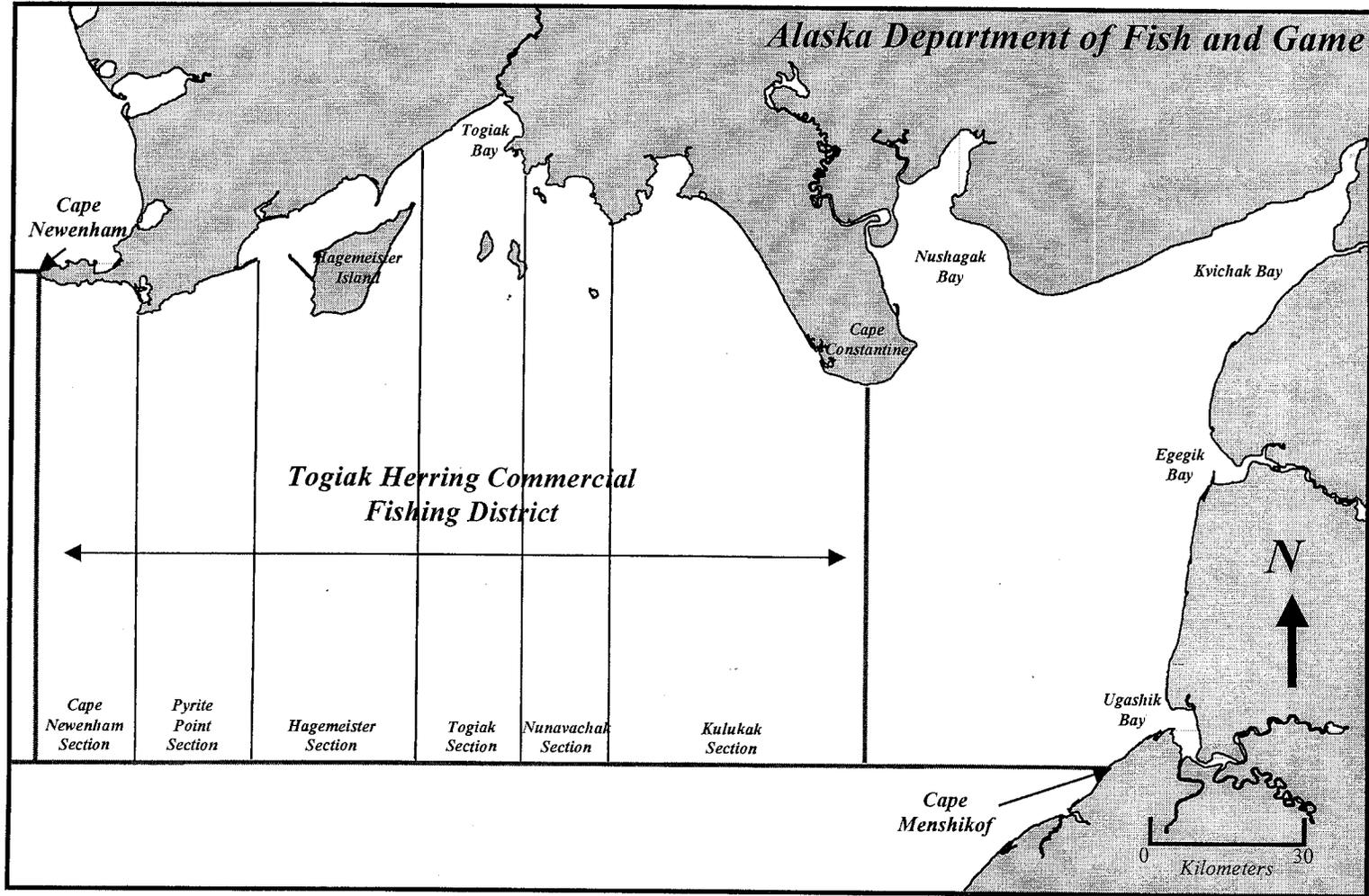
Table 7. Guideline and actual harvests (lbs.) of herring spawn on Kelp, Togiak District, on kelp, Togiak District, Bristol Bay, 1984-2000.

Year	Guideline	Actual	Difference ^a
1984	350,000	406,586	16.2%
1985	350,000	0	
1986	350,000	374,142	6.9%
1987	350,000	307,307	-12.2%
1988	350,000	489,320	39.8%
1989	350,000	559,780	59.9%
1990	350,000	413,844	18.2%
1991	350,000	348,357	-0.5%
1992	350,000	363,600	3.9%
1993	350,000	383,000	9.4%
1994	350,000	308,400	-11.9%
1995	350,000	281,600	-19.5%
1996	350,000	455,800	30.2%
1997	350,000	0	
1998	350,000	0	
1999	350,000	419,563	19.9%
1984-1999 Average		319,456	12.3%
1990-1999 Average		297,416	6.2%
2000	350,000	0	

^a Actual minus guideline divided by guideline.

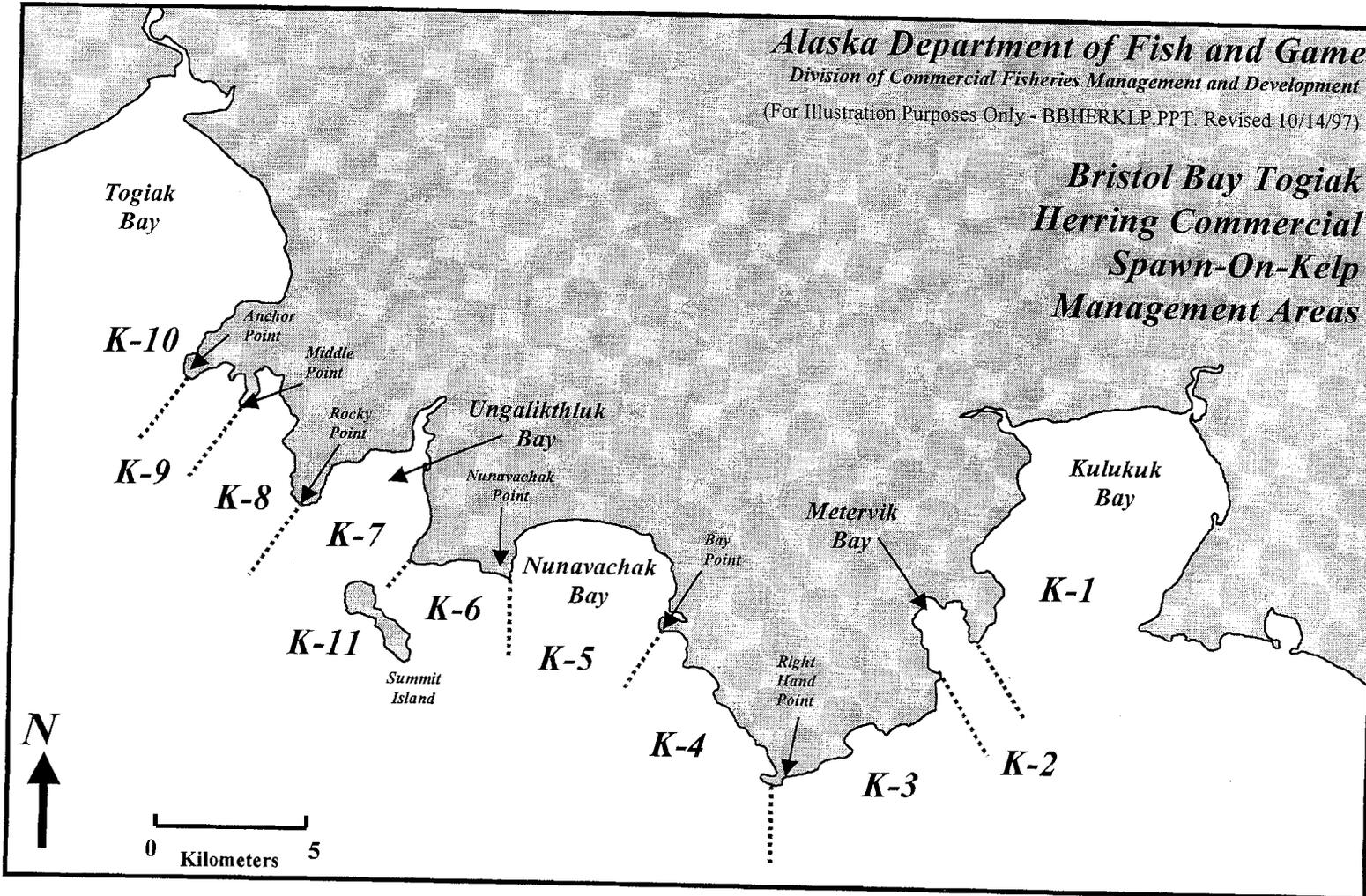
Table 8. Harvest allocation of the 2001 forecasted Pacific herring run biomass, Togiak District, Bristol Bay.

	Biomass (Tons)	Harvest (Tons)
2001 Forecasted Biomass	119,818	
Exploitation @ maximum 20% for Total Allowable Harvest		23,964
Togiak Spawn-on-Kelp Fishery (Fixed Allocation)		1,500
Remaining Allowable Harvest		22,464
Dutch Harbor Food/Bait Allocation (7.0% of the remaining allocation)		1,572
Remaining Allowable Harvest for Togiak District Sac Roe Fishery:		20,892
Purse Seine Allocation 75.0%		15,669
Gill Net Allocation 25.0%		5,223



Alaska Department of Fish and Game
Division of Commercial Fisheries Management and Development
(For Illustration Purposes Only - BBHERKLP.PPT. Revised 10/14/97)

***Bristol Bay Togiak
Herring Commercial
Spawn-On-Kelp
Management Areas***



The Alaska Department of Fish and Game administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information please write to ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; U.S. Fish and Wildlife Service, 4040 N. Fairfax Drive, Suite 300 Webb, Arlington, VA 22203 or O.E.O., U.S. Department of the Interior, Washington DC 20240.

For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-6077, (TDD) 907-465-3646, or (FAX) 907-465-6078.