

Operational Plan for Assessment of Herring in the  
Kodiak Management Area, 2001

by

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## PROJECT DESCRIPTION

### *Identification of Issue*

The Alaska Department of Fish and Game (ADF&G), Division of Commercial Fisheries (CF) is charged with the management of the Pacific herring *Clupea harengus* stocks of the Kodiak Management Area (KMA). KMA herring fisheries are divided into two groups, a sac roe fishery and a food and bait fishery. The sac roe fishery occurs in the spring, from mid-April to late June, and the food and bait fishery occurs in the fall and early winter, from October to February. The KMA sac roe herring fishery has been an economically important, small boat fishery. Exvessel values averaged \$ 2.9 million from 1990-1999. The food and bait fishery is smaller, with very little participation, and has produced an average exvessel value of less than \$ 300 thousand. Management plans for each fishery have been put into regulations by the Alaska Board of Fisheries (5 AAC 27.535). Concerns over possible over-exploitation have forced the closure of many areas to sac roe fishing, and the closure of the entire KMA to food/bait fishing.

The KMA sac roe herring fishery is currently managed within 13 districts and 82 sections (Gretsch 1998). Historically harvests have occurred within 63 sections. Strong age classes from the 1987 and 1988 brood years resulted in a major increase in the herring stocks of the West Afognak, Uganik, Eastside, and Alitak Districts. Unfortunately, for unknown reasons, the herring biomass found in the remaining districts experienced declines. In some cases the declines were so sharp that entire districts were closed to commercial fishing.

The department relies on a variety of information to evaluate stock status trends, which are then used to establish guideline harvest levels (GHLs) for the commercial sac roe and food and bait herring fisheries. This information includes evaluating:

- 1) Fishery performance during the preceding season or seasons (harvest timing, fishery harvest duration, average school size);
- 2) Trends in age composition (eg. level of recruitment age fish (age-3) in catch samples, the proportion of the spawning population age-5 and younger, the proportion of age-2 fish in the spawning biomass as an indicator of future recruit strength);
- 3) Observations of spawn and juvenile herring;
- 4) Industry and ADF&G aerial surveys;
- 5) Industry and ADF&G hydroacoustic surveys;
- 6) ADF&G test fishing to obtain additional age composition samples;
- 7) Aged-structured analysis (ASA).

With section closures to fishing, much of the information used in evaluating herring stock status such as age compositions and fishery performance is no longer available. Department funding is very limited, and stock assessment work (aerial and hydroacoustic surveys) generally occurs in sections opened to fishing during fishery management programs, as personnel and vessel time are available between or immediately after commercial fishery openings. Hydroacoustic assessment

involves the use of two State vessels, the R/V K-Hi-C and R/V Resolution, equipped with commercial grade sonar, and is limited to a two week period from April 15-May 1 (during the peak of the commercial sac roe fishery). Age composition samples can be collected from a trawl on the R/V Resolution if conditions are ideal. ADF&G also conducts a small number of aerial surveys to monitor stock status during and after the sac roe fishery.

The public and the BOF have voiced concern about herring stock abundance and the department's harvest forecasts (GHLs), within various areas of the KMA. At the most recent BOF held in Kodiak (1999), this was a recurring theme of public testimony. The BOF indicated that they wished to see more effort put forth by the department in order to gain greater knowledge of the size and health of herring stocks located within the KMA.

State of Alaska general fund money for KMA herring management is very limited, and has been cut dramatically in recent years. There are no general fund projects for KMA herring research. With the stock assessment program limited by lack of funds, and the loss of age composition data and hydroacoustic assessments from closed sections, the department received approval to conduct a herring cost recovery test fishery (a revenue gathering program) to supplement current funding. In April of 2001, a successful cost recovery fishery resulted in the harvest of approximately 72 tons of herring, which was sold in the name of the State. Funds are dedicated to assessment of KMA herring stocks.

The ultimate goal of any assessment project is to come up with a good estimate of the total size of the population in question. However, this may be complicated by many factors, including the availability of funds, trained personnel, and equipment, and the availability of the population to assessment techniques. The CF in Kodiak does not currently have the equipment or trained personnel to conduct scientific hydroacoustic surveys, where precise sonar signals are recorded and later analyzed (echo-integrated) to determine population size. Past experience has demonstrated that the herring populations of Kodiak are not available to more standard aerial survey techniques. Herring are only visible from the air for very short periods of time, if at all, due to the water depth and clarity of KMA bays. Also, herring migrate in and out of KMA bays seasonally. Populations aggregate into large schools to over-winter (the wintering area of many KMA stocks are unknown). These schools break up in late winter and move out of the bays to offshore areas. In the spring, as nearshore water temperatures rise, herring reform into schools of various size and migrate in to nearshore waters as they ripen and prepare to spawn. KMA herring exhibit a very protracted spawning period. Initial spawning may begin as early as mid March, with schools continuing to enter bays to spawn through July. After spawning, the herring migrate to offshore waters to feed (very little is known about the summer feeding locations of KMA herring). This seasonal movement and uncertain aggregation timing confounds efforts to measure population sizes.

## **GOALS AND OBJECTIVES**

The goal of this project is to gather biological information on selected KMA herring populations, including assessment of population sizes, and age, weight, and length of individuals. A secondary goal is to increase knowledge and understanding about the distribution and timing of spawning

herring in select KMA bays, and the methods and techniques of hydroacoustic assessment. It is unrealistic to presume an absolute abundance could be estimated with reasonable confidence with the present resources available, however a monitoring program might be developed to assess relative abundance between years or qualitatively assess the trends in stock abundance.

There are three objectives to this project:

- 1) To ascertain the relative abundance of herring within the Uyak, South Afognak, and Inner Marmot Districts, which have been closed to commercial fishing in recent years.
- 2) To ascertain the relative abundance of herring within the West Afognak, South Afognak, and Uganik Districts that are present after the commercial fishery has occurred.
- 3) To collect herring from these areas to obtain age composition data.

This sampling and subsequent data analysis may also prove useful in identifying and differentiating separate herring stocks.

## **METHODS**

### *Surveys*

#### **Hydroacoustic**

Hydroacoustic surveys will be conducted by two chartered purse seine vessels, operating commercial grade sonar equipment. Each vessel must have an operating forward looking “searchlight” sonar and a downward looking “down sounder” sonar. Minimum vessel size and necessary fishing and safety equipment, as well as minimum qualifications of the vessel captain, are also specified in Appendix A.

The first charter will occur from approximately May 7 to May 13. This charter will survey the following areas, which have been closed to commercial fishing in recent years: Kitoi Bay, Izhut Bay, and McDonalds Lagoon, in the South Afognak District, and Kizhuyak Bay in the Inner Marmot District. This survey will also look at post-fishery herring abundance within Paramanof Bay, Foul Bay, Malina Bay, and Raspberry Straits in the West Afognak District, and in Danger Bay in the South Afognak District.

The second chartered vessel survey will occur from approximately May 14 to May 20. This charter will survey the following areas, which have been closed to commercial fishing in recent years: Inner Uyak Bay, Browns Lagoon, Spiridon Bay, Zachar Bay, and Larsen Bay in the Uyak District. This survey will also look for post-fishery herring abundance within in the Village Islands and South Arm of Uganik Bay, in the Uganik District.

Hydroacoustic surveys will consist of running transects in the outer portions of each bay using scanning and down sounder sonar equipment to locate schools of herring. The majority of the survey time will concentrate on known historic harvest and spawn areas, generally located in the

inner portions of the bays. Pre specified transects will not be used; transects will be determined by staff while in the field based on the current location of the herring stocks. The approximate search locations will be plotted on marine charts and the locations (latitude and longitude) of herring schools will be recorded. Comments detailing the size of each school (depth, length, width, and estimated tonnage) and depth of the water, will also be recorded on standard forms (Appendix B).

If possible, a laptop computer equipped with navigation software and hooked to a portable GPS unit will be used to record the location of transects and herring schools within bays. If time permits this will be attempted during both charters, but may not occur until the second charter.

### **AWL Sampling**

Purse seine sets will be made when herring schools are encountered, as time, weather, and herring availability permits. Herring schools that are found at or near known spawning locations will be targeted. A minimum sample of 500 herring will be drawn from each bay, with samples taken from all successful seine sets. Samples will be frozen, if possible, or iced. Captured herring samples will be returned to the Kodiak ADF&G office, where the fish will be sampled to obtain age-weight-length (AWL) data.

### **Aerial Surveys**

Aerial surveys will be made throughout the project period and will continue as weather, personnel time, and funds allow. Surveys will be conducted from chartered aircraft, using pilots with experience spotting herring. A record of location and estimated size of herring schools encountered, along with the estimated biomass will be kept on standard forms (Appendix C).

The aerial surveys will also be used to direct the chartered purse seine vessels to herring concentrations for hydroacoustic surveying and age composition sampling.

## *Data Analysis*

### **Surveys**

As previously stated, it is unrealistic to presume an absolute abundance can be estimated with reasonable confidence with the present resources available, however this monitoring program should allow the development of relative abundance estimates.

A qualitative analysis of hydroacoustic and aerial surveys will be made, comparing both methods for identifying herring distribution and abundance. Tonnage estimates made by vessel captains, experienced herring spotter pilots, and ADF&G biologist will be compared. These data will be used in determining the guideline harvest levels for 2002 sac roe fisheries.

## **AWL Samples**

The AWL samples will be used to determine the age composition of surveyed herring concentrations. ADF&G Kodiak management and research staff will develop the stock structure of KMA herring in surveyed bays. This analysis will focus on comparing various population parameters estimated from the purse seine catch. Specific parameters of interest will be age, size (length and/or weight), sex ratio, and fecundity.

The age composition data may also be used in an age structure analysis (ASA). The ASA may be conducted by ADF&G research staff in Kodiak, if funds and personnel time permits. This data could be compared to previous ASA work on Kodiak herring by Kodiak and Juneau staff.

## LITERATURE CITED

Gretsch, D. 1998. Kodiak management area annual herring management report, 1998. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K99-53.

## **APPENDICES**

## Appendix A. Bid specifications for hydroacoustic charters.

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The Alaska Department of Fish and Game (ADF&G) is seeking one fully equipped purse seine vessel to charter for herring test fishing and hydroacoustic surveys in the bays of xxxxxxxxxx; if time allows additional surveys will be conducted in xxxxxxxx bays).

The charter is expected to consist of one, 5 to 7 day trip. The charter will begin on approximately May xxxx through May xxxx. The charter will originate from xxxxxxx. The duration of the charter may be reduced if full funding is not available.

The chartered vessel will be expected to conduct hydroacoustic surveys on selected transects to locate herring concentrations. The chartered vessel may also be directed by aircraft to herring concentrations. The chartered vessel will be expected to make seine sets on herring schools to collect samples (500-600 fish) for age, weight, length, and sexual maturity analysis. It is anticipated that the majority of the survey and sampling activity will occur in the evening, night, or early morning hours.

Vessels must have a herring purse seine (minimum of 100 fathoms in length and 3 strips in depth), an operational scanning sonar for locating herring schools, down-sounding sonar, and an operational VHF and SSB radio with 3.230 MHz frequency. The vessel must have a skipper and at least two crewmembers. The vessel must have berthing accommodations for an ADF&G observer for the duration of the charter. Further, the vessel is required to have survival suits for the entire crew (ADF&G will provide a survival suit for the observer), first aid kit, fire fighting equipment, and a Coast Guard approved life raft with capacity for the entire crew (including the ADF&G observer) aboard at all times while under contract.

The skipper of the vessel must have at least five seasons of experience purse seining herring in the Kodiak Management Area. The skipper must be competent in operating scanning sonar equipment and locating herring schools. The skipper will be responsible for the operation of the vessel and direct fishing activity.

Protection and Indemnity insurance, including crew exposure, in the amount of \$300,000 is required. The chartered vessel will provide all gear necessary for purse seine test fishing including fuel, lubricants, and meals.

Qualified skippers must submit a written bid to the ADF&G, (Use attached bid sheet) Kodiak office no later than xxxxx April xxx, 2001. The bid should be made on a daily rate basis, not exceeding \$2,500/day. The bids will be awarded on xxxxx, xxxxx, 2001 to the lowest bidder meeting the above qualifications. Delays or interruptions in the charter due to equipment failure will be the responsibility of the skipper and lost time will be deducted from the charter costs or can be made up by extending the charter duration.

The following time table will be adhered to; Notice for soliciting bids was be announced/faxed on xxxxxx, 2001. Bid is due at xxxx, xxxxxx, 2001. Contact bidders and award tentative bid on xxxxxxx, 2001. Vessel will begin charter work approximately xxxxxxx, 2001.

Full funding for this project will be contingent on the level of funding derived from the Herring Test Fishery.

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Appendix B. Hydroacoustic assessments of herring schools, Kodiak Management Area, Spring 2001.

Location	Date	Time	Estimated Size of Herring School			Tonnage Estimate	Additional comments
			<i>Estimate tonnage and size of school, including length, width, depth, and estimated density</i>				
			Small	Medium	Large		

Appendix C. Aerial survey reporting form.

KODIAK MANAGEMENT AREA - SACROE HERRING AERIAL SURVEY FORM								
Date:		Observer: _____			Aircraft/Pilot:		Start Time:	
							Return Time:	
Management Unit	Number of Schools			Total Tons	Spawn Observed (Distance)	Visibility	Comments:	
	Small	Medium	Large				Altitude	Tide
Small School=1-10 tons Medium School=11-50 tons Large School=50+ tons								