A PROGRAM FOR IMPROVING MANAGEMENT AND RESEARCH OF FISHERIES IN THE SOUTHEAST REGION

SOUTHEAST/YAKUTAT HERRING FISHERIES

Project Bluebook – 2005

Alaska Department of Fish and Game
Division of Commercial Fisheries
Southeast Region

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INTRODUCTION

Overview of Southeast Alaska Commercial Fisheries

The Southeast/Yakutat Region, stretching south from Cape Suckling to the Canadian border at Dixon Entrance, is divided into two registration areas. Registration Area A, the Southeast Alaska area, extends from Dixon Entrance to Cape Fairweather. Area D, the Yakutat area, extends from Cape Fairweather to Cape Suckling. Pacific herring stocks are found throughout the region. The stocks vary greatly in size and productivity. Herring are harvested in the region in commercial bait, sac roe, spawn-on-kelp and bait pound fisheries. In the Yakutat area the only commercial herring fishery allowed by regulation is a winter bait fishery. Subsistence and personal use harvesting of herring and herring spawn-on-kelp and spawn-on-branches occurs in both areas.

Prior to 1967 most of the region's harvest was taken in a commercial reduction fishery with a historic peak harvest of 79,700 tons in 1929; this fishery typically harvested mixed stocks of feeding herring during the summer months for reduction to meal and oil. A commercial winter bait fishery has occurred annually since the turn of the century and has historically supplied most of the bait for Alaskan commercial longline and pot fisheries. Harvests in this fishery are taken by purse seine gear during the fall and winter months, when bait quality is best, on discrete wintering schools in major bays and inlets. Since statehood, annual winter bait harvests have ranged from 460 tons to 6,400 tons.

Sac roe fisheries began to dominate the Southeast industry beginning in 1971. Sac roe fisheries are held in the spring immediately prior to spawning when egg maturity is highest. Southeast Alaska commercial sac roe fisheries are limited entry fisheries, with two exclusive purse seine areas (Sitka Sound and Lynn Canal), two exclusive set gillnet areas (Kah Shakes/Cat Island and Seymour Canal), and the Hobart Bay/Port Houghton fishery area where a herring gillnet sac roe fishery is allowed if the winter bait fishery does not harvest the entire guideline harvest level (GHL). The Sitka Sound purse seine sac roe fishery is the largest herring fishery in the region, with annual harvests during the 1980–2004 seasons ranging from 1,800 tons to 12,000 tons, and exvessel values for the 51 permit holders as high as $14.3 million. During the January 2003 meeting, the Board of Fisheries adopted regulations allowing a sac roe fishery in West Beam Canal, near Ketchikan. This fishery is unique to Southeast herring fisheries because allowable gear types will alternate between purse seine and set gillnet each year. The first year of the fishery was scheduled to occur in 2004 using gillnets, however due to a very poor return of spawning biomass the fishery was not conducted. The Lynn Canal purse seine fishery has been closed since 1982 due to low stock abundance. Since 1980, sac roe harvests in the combined gillnet areas have ranged from 300 tons to 3,300 tons, and exvessel values for the approximately 120 permit holders as high as $3.2 million. Two herring spawn-on-kelp pound fisheries developed in the early 1990s in the Hoonah Sound and Craig/Klawock areas. The spawn-on-kelp fisheries became limited entry fisheries in 1995. In January 2003, the Board of Fisheries adopted regulations creating spawn-on-kelp fisheries in Tenakee Inlet and Ernest Sound. During the spring of 2005 a spawn-on-kelp fishery was conducted in Tenakee Inlet, however the Ernest Sound area did not achieve threshold and no fishery was opened. Herring mortality in spawn-on-kelp fisheries is probably lower than other fisheries, as herring are released after spawning and

the value of the fishery is derived from eggs deposited on suspended kelp blades. Annual exvessel value for the Hoonah Sound fishery has ranged from $0.2 million to $2.0 million annually and for the Craig fishery from $48,000 to $1.5 million. The ex-vessel value of the 2005 Tenakee Inlet spawn-on-kelp fisheries was approximately $800,000. Fresh bait and tray pack bait pounds are allowed under a permit system in Southeast, but very little harvest has occurred in these fisheries during the last two decades (0 to 80 tons annually). Growing interest in bait pound fishing opportunities lead the Board of Fisheries to modify regulations during the January 2003 meeting, by combining fresh bait and tray pack seasons, quotas and use descriptions to allow greater flexibility to participate in these fisheries.

Management of Southeast Alaska Herring Fisheries

Southeast Alaska commercial herring fisheries are managed according to the Herring Management Plan for Statistical Area A, passed by the Board of Fisheries in 1994. This plan directs the department to manage herring stocks on a spawning area basis, to establish minimum spawning biomass thresholds below which fishing is not allowed, to assess abundance of mature herring for each stock before allowing fishing to occur, to allow herring harvests at exploitation rates between 10% and 20% of the estimated spawning biomass when the biomass exceeds the minimum threshold level, to identify and consider other sources of mortality in setting harvest guidelines, and to modify fishing periods to minimize incidental mortalities during commercial fisheries.

Threshold levels are the minimum herring biomass needed to ensure sustained yield and maintain biological productivity, and have been established for each winter bait, sac roe, and spawn-on-kelp pound spawning stock. For stocks exceeding their threshold level, annual harvest limits (GHLs) are based on a graduated scale that allows for higher harvest rates as the herring population increases, reaching a maximum of 20% when the population is six-times the threshold level.

Herring populations are assessed annually to estimate herring spawning biomass. The department estimates spawning biomass by combining the miles of shoreline receiving spawn, as documented using aerial and skiff surveys, with diver estimates of herring egg deposition on the spawning grounds. The department then converts estimates of egg abundance to spawning biomass by applying average fecundity estimates. For most major stocks, forecasts of the following year's spawning biomass are developed using an age-structured analysis (ASA). This method applies estimates of recruitment, growth, maturation, and natural mortality to an estimate of spawning escapement from one year to forecast herring biomass for the next year.

Management of sac roe fisheries is very demanding due to short intense fishing periods during which the GHL can be taken in less than one hour. Harvests are timed to coincide with the brief period when roe quality and value is the highest. For this reason management is very intensive, and relies on frequent aerial and sonar surveys of schooling fish, test fishing, as well as close contact with industry to assess product quality prior to fishing. In years when demand for bait exceeds the GHLs, intensive on-the-grounds management can also be necessary in winter bait fisheries. Bait fisheries occur at night and close contact with industry is maintained via radio to

assess harvest rates. Management of spawn-on-kelp pound fisheries also requires significant staff time and effort to monitor all aspects of the fishery. Due to the intensive nature of the fisheries and the need for extended periods of on-the-grounds management, costs of managing herring fisheries are frequently substantial.

EFFECTS OF GENERAL FUND REDUCTIONS

General fund support for herring fisheries management and stock assessment in Southeast Alaska, including such basic tools as aerial surveys and management vessel expenses, has decreased substantially in recent years. Additionally, during the January 2003 Board of Fisheries meeting, the Board approved several new herring fisheries, including an annually alternating purse seine-gillnet sac roe fishery in West Behm Canal, and spawn-on-kelp fisheries in Tenakee Inlet and Ernest Sound. The department has not received an increased allocation to support these fisheries. In response to declining budgets and new fisheries, and after consulting with industry, the department has implemented new or expanded herring test fisheries in the region to support some of the most critical functions of the program. Test fishing is not the department's preferred method of funding important research and management programs because of the need to harvest fish and because of logistical and administrative difficulties associated with oversight of test fish contracts and conducting test fishing operations. Funding essential herring management and assessment programs through more secure funding sources that do not require resource extraction is desired.

PROPOSED PROJECTS

This document contains a list of projects proposed for increased funding. The projects described are either not conducted due to a lack of funding or are currently operated at levels insufficient to meet management objectives. Projects are grouped into two categories (Table 1). The first category (A) covers replacing five test fisheries currently operated in the region with a more stable funding source. This is a high priority for the department. The second category (B) covers improvements needed in the region's herring stock assessment program. Within the stock assessment category projects are listed in order of priority.

Table 1. Summary of proposed projects and estimated costs (thousands of dollars).

Project	Estimated First-Year Cost	Estimated Annual Continuing Cost	Duration
A. Fishery Management			
A.1. Herring Fishery Management	$115.0	$117.0	Long Term
B. Stock Assessment Projects			
B.1. Herring Biometrics Support	$35.0	$35.0	Long Term
B.2. Herring Tagging in Districts 1 and 10	$200.0	$200.0	4 Years
B.3. Herring Diver Calibration Studies	$28.2	$28.2	3 Years
B.4. Herring Spawn Deposition GIS Mapping	$20.0	$0.0	1 Year
B.5. Expanded Herring Spawn Deposition Studies	$15.0	$15.0	Long Term
B.6. Fecundity Estimates	$8.0	$8.0	Long Term
B.7. SOK Pound Capacity Estimate	$4.0	$4.0	2 Years
C. Subsistence Harvest Estimates			
C.1. Sitka Sound Subsistence Herring Roe Fishery Harvest Assessment	$23.0	$23.0	3 Years

A. Fishery Management Projects

Herring test fisheries provide funding for many of the region's essential herring management and stock assessment activities. Test fisheries are conducted in the Ketchikan, Petersburg, Sitka, and Juneau management areas, with revenues used to support management and assessment activities in each of the respective areas. Revenues from several of these test fisheries are substantial when compared to the value of associated commercial fisheries. Test fishing is not the department's preferred method of funding important research and management programs because of the need to harvest fish and because of logistical and administrative difficulties associated with oversight of test fish contracts and conducting test fishing operations.

Project A.1. Herring Fishery Management

Location: Southeast Alaska.

Primary Objective: To provide biological samples and revenue to support herring management and assessment programs in Southeast Alaska.

Description: Gillnet sac roe test fisheries are currently conducted in West Behm Canal in the Ketchikan management area, Hobart Bay/Port Houghton in the Petersburg management area, and Seymour Canal in the Juneau management area. A purse seine test fishery is conducted in the Sitka management area. Spawn-on-kelp test fisheries were conducted in Section 3-B, Hoonah Sound, and Tenakee Inlet during 2005. Biological samples gathered from the fisheries provide age, sex, and size data, weight-at-age, and fecundity data that are used in generating biomass forecasts used to set following year's GHLs. Revenues from the fisheries are used to conduct aerial surveys, charter vessels, and help cover costs of managing fisheries in these management areas.

Duration: A long-term stable funding source is desired.

Estimated Annual Cost: $115.0.

B. Stock Assessment Projects

Management of the region's herring stocks relies heavily on monitoring and analysis of spawning biomass. The first project in this category is increased biometric support for the herring research program, which is badly needed to deal with a backlog of stock assessment, modeling, and analysis needs to address trends of biomass and age composition. Funding of the next three ranked projects in this section would, at minimal cost, significantly improve our abilities to estimate current-year spawning biomass and forecast biomass. These projects include conducting herring diver calibration studies to improve estimates of egg deposition, creating a geographic information system of herring spawn maps, and expanding spawn deposition surveys to cover additional stocks. The final project in this category is a herring tagging project for the Ketchikan and lower Stephens Passage areas, which would provide valuable insight into the dynamics of herring populations in those areas, facilitate more effective management of those stocks, and improve understanding of herring movement in other areas.

Project B.1. Herring Biometrics Support

Location: Southeast Alaska.

Primary Objective: To improve the region's herring stock assessment program through increased biometric support.

Description: Additional biometric support is needed for the herring program in Southeast Alaska. Currently one Biometrician position is funded to provide support for all herring and groundfish fisheries in the Southeast and Yakutat areas. A backlog of stock assessment modeling, analyses, and reporting is accumulating. We are requesting funds to hire a Biometrician II in order to improve management and assessment of herring and groundfish fisheries. Because the new position would dedicate approximately half of its time to herring issues, this specific request is

for six mm of funding for the position. The remaining six mm of funding for this position is requested in the 2004 Groundfish Project Bluebook.

There are numerous biometric improvements that need to be made to improve the region's herring stock assessment program. Refinement and sensitivity analyses of ASA models used to forecast and evaluate herring biomass are needed. External estimates of age-specific survival would improve the model and provide more accurate forecasts of spawning biomass. Although it is understood that survival rate varies considerably throughout the herring life cycle a constant (average) survival rate is currently used in the modeling process for all age classes because empirical estimates have not been made for Southeast Alaska stocks. Age specific estimates could be obtained using currently-available age data, additional empirical studies, and modeling. Additional improvements to the ASA model include incorporating bootstrapping to estimate confidence intervals for ASA model parameter estimates such as biomass.

Duration: A long-term stable funding source is desired.

Estimated Annual Cost: $35.0.

Project B.2. Herring Tagging in Districts 1 and 10

Location: District 1, Ketchikan area, and District 10, Lower Stephen's Passage, Southeast Alaska.

Primary Objective: To determine the role of movement in the population dynamics of herring and facilitate more effective management of herring in the Ketchikan, Juneau and Petersburg areas.

Description: Controversy about the state managed fishery at Cat Island/Kah Shakes and the fishery at Annette Island managed by the Annette Island Indian Reservation led to a series of unsuccessful legal actions in the early 1990s to try to halt the state-managed fishery. Although legal actions were not successful in halting the fishery in the early 1990s, there has not been a commercial herring fishery in the Cat Island/Kah Shakes gillnet area since 1998. This has been due to reduced herring abundance in the fishery area. This decline may be due to actual population declines, but may more likely be due to a shift in spawning locations of herring from Cat Island and Kah Shakes to other areas such as Annette Island. While there has not been a state-managed fishery in the last four years, herring spawning activity, and subsequent commercial harvest, at Annette Island has increased markedly over historic levels. Similarly, West Behm Canal, north of Ketchikan, experienced a dramatic increase in herring spawning activity beginning in the mid-1990s. While these increases in spawning activity may be due to increases in actual population abundance of somewhat discrete spawning populations, they may also be due, at least partially, to movement of herring among various historical spawning areas. A long-term herring tagging program would provide data needed to determine the role of movement in population dynamics of herring in the Ketchikan area and facilitate more effective management of herring. Due partly to questions about the role of movement in herring population dynamics south of Ketchikan in the Prince Rupert area, the Canadian Department of

Fisheries and Oceans (DFO) has been conducting tagging operations (PIT tags) for the last few years. There is limited historical data indicating movement of herring between Canada and Alaska, presumably across Dixon Entrance.

More recently, biomass trends have been observed in Seymour Canal and Hobart Bay/Port Houghton herring stocks that are generally consistent with expectations of migration between these two spawning areas. Since spawner biomass fluctuations may be influenced by several elements, including environmental effects and impact of harvest, it is difficult to determine if migration plays a role without direct observations. For this reason, development of a tagging program similar to that currently being conducted by DFO could complement DFO studies and help resolve questions about the regularity, frequency, timing, and extent of herring movements both within the waters of Alaska and between Alaska and Canada.

Major components of the project include purchase and deployment of PIT tagging equipment for tagging fish and detecting recaptures during fisheries and fish sampling, vessel charter to capture herring for tagging, biologist and biometric staff time.

Duration: Four years.

Estimated Annual Cost: $200.0.

Project B.3. Herring Diver Calibration Studies

Location: Entire Southeast Alaska Area.

Primary Objective: To improve accuracy of divers' estimates of herring egg deposition.

Description: Calibration factors are used to compensate for estimator error while visually assessing herring eggs during spawn deposition surveys. Divers estimate the number of eggs on kelp within a fixed area and then collect those eggs and kelp for later laboratory counts. Correction factors are then developed for each diver by kelp type, and directly applied to their visual estimates made during surveys. For several years calibration factors have been relatively low (close to one) and consistent among divers and years. Individual calibration factors can have a potentially large impact on spawn deposition estimates of biomass because typically 5–6 divers' estimates comprise most of the data. In recent years the ratios have become variable and inconsistent. Recent variable and very high calibration factors have raised concerns about using the data because the reason for the change is unknown. During this time several changes in the assessment program have occurred. For example, there have been fewer samples collected each year, a different laboratory is used for processing, a different egg preservative is used to store eggs, and estimator experience level has changed with new personnel.

A directed study of the several steps involved in producing calibration factors may help determine the underlying cause of recent changes in the ratios. Specifically, there is a need to investigate: appropriate sample size, estimator feedback from laboratory, differences among areas, differences among years, field sample collection procedure, preservative type, laboratory

sample processing, and data analysis. This study would require vessel time and staff time (estimators, lab, and biometrician), and some travel and equipment.

Duration: Three years.

Estimated Annual Cost: $28.2.

Project B.4. Herring Spawn Deposition GIS Mapping

Location: All herring spawn areas of Southeast Alaska.

Primary Objective: To create a geographic information system (GIS) mapping of spawn deposition for Southeast Alaska.

Description: Location of spawn deposition varies year to year in all locations where herring traditionally spawn. Records of these locations have been kept on hand-drawn maps for decades, and only recently some of the spawn locations have been digitized. This project would have all historical mapped spawn deposition records entered into GIS. This would produce numerous benefits, including quantitative analysis of miles of spawn, more precise estimation of biomass (based on miles of spawn), improved comparisons of spawn distribution between years, and rapid and precise determination of locations of spawn deposition surveys.

Development of the GIS would entail approximately six months of staff time, followed by training for the area management staff and herring research staff in the maintenance and use of the GIS.

Duration: One year.

Estimated Annual Cost: $20.0.

Project B.5. Expanded Herring Spawn Deposition Studies

Location: Lynn Canal, Lisianski Inlet, and other areas of Southeast Alaska.

Primary Objective: To expand spawn deposition surveys to cover additional spawning stocks.

Description: Starting in the mid-1970s major herring stocks in Southeast Alaska have been assessed using a combination of aerial surveys of spawn and subsequent spawn deposition dive surveys. Direct estimate of herring egg density, which is obtained from the dive surveys, has been a useful tool for determining herring spawning biomass and forecasting returns. Continuation of this method for all currently exploited stocks is desirable and expansion to other recovering or low-level stocks in anticipation of future exploitation would improve the modeling process used to determine forecasts. Where spawn deposition data exists for an adequate time series, Age Structured Analysis (ASA) is the preferred model and it has been used to forecast

herring returns for Sitka Sound, Craig, Tenakee Inlet, Kah-Shakes/Cat Island, and Seymour Canal stocks. For acceptable model goodness of fit a ten-year continuous minimum is required for spawn deposition records. A more general model is applied to data from other major stocks that have fewer than ten years of spawn deposition data. For those stocks where no spawn deposition data exists, spawning biomass is estimated as the product of shoreline miles of spawn (from aerial surveys) and an average biomass-per-mile conversion factor.

Several herring stocks that once supported (or currently support) fisheries are at low levels, including Lynn Canal, Lisianski, Ernest Sound, Kah-Shakes/Cat Island and Hobart Bay/Port Houghton. During years when relatively little spawning occurred the practice has been to forego a spawn deposition estimate with the assumption that the biomass estimate will fall below the threshold to conduct a fishery. Mainly, this has been a means to preserve funds for herring surveys in more promising areas. Although this assumption may be true, it extinguishes the possibility of maintaining continuous data time series for these stocks. For some stocks (e.g. Lynn Canal and Lisianski), initiation of spawn deposition surveys would begin a data time series that would anticipate use of the ASA model, even if fisheries were not conducted for several years. The alternative is waiting until the stock size has returned to threshold levels before conducting surveys and possibly exploiting for years before having the necessary data to take advantage of the preferred forecast model. For stocks where harvest has been intermittent over recent years (e.g. Ernest Sound and Kah-Shakes), conducting continuous annual surveys, regardless of threshold size, would maintain ASA requirements and may improve the Department's understanding of those stocks.

Duration: A long-term funding source is desired.

Estimated Annual Cost: $15.0.

Project B.6. Fecundity Estimates

Location: Various herring spawning areas in Southeast Alaska.

Primary Objective: To provide estimates of fecundity by size.

Description: Accurate and regular estimates of fecundity are important for ground truthing assumptions used for spawner-recruitment relationships that are incorporated into estimates and forecasts of herring biomass. In addition, fecundity estimates are used to convert estimates of herring egg deposition into biomass of the mature component of the population. This project would estimate fecundity to establish a relationship between egg number and weight of fish. Sample collection would rotate among several stocks so that estimates of fecundity would be updated every few years, particularly for stocks with existing long survey data time series.

Duration: Long-term

Estimated Annual Cost: $8.0k

Project B.7. SOK Pound Capacity Estimate

Location: Hoonah Sound, Craig (Southeast Alaska)

Primary Objective: To provide estimates of average herring catch used in spawn-on-kelp pounds.

Description: The spawn-on-kelp (SOK) fishery relies on the ability to capture herring and transfer them into holding pounds with minimal mortality or injury. After herring spawn on kelp blades that are hung in the pounds, they are released alive. Consequently, it is difficult to measure the amount of fish that are captured over the course of a fishery. Estimates have been based on observations by biologists on the fishing grounds in conjunction with prior semi-successful attempts to quantify the amount of herring in pounds. Currently, an estimate of 10 tons per pound is used as a "best guess", however little data exists to support this number. The amount of herring captured and transferred into a pound can vary substantially depending on the allocation of kelp (size of quota), number of participants using the pound, depth of retaining nets, and fishermen's experience in the fishery. It is important to have accurate estimates of the amount of herring used in pounds to better understand the magnitude of fishing mortality in this fishery. It is assumed that only 25% of pounded herring survive after release from the pounds. Therefore a large source of mortality probably exists which has not been accurately accounted for in the past. This project would directly measure the amount of herring in several pounds in each of two years to better estimate total removals from all SOK fisheries in Southeast Alaska.

Duration: 2 Years

Estimated Annual Cost: $4.0k

C. Subsistence Harvest Estimates

Project C.1. Sitka Sound Subsistence Herring Roe Fishery Harvest Assessment

Location: Sitka Sound, Sitka (Southeast Alaska)

Primary Objective: The primary objective of this research project is to produce estimates of subsistence herring eggs-on-hemlock-branches harvests by harvesters fishing in Sitka Sound using a face-to-face interview methodology.

Description: Current regulations allow the subsistence harvest of herring and herring spawn in Districts 13(A) and 13(B) north of Latitude of Aspid Cape (5AAC 01.716(7)) and limits on customary trade in herring roe on kelp (5AAC 01.717). There are no regulations regarding subsistence reporting requirements, or specific allocations for subsistence. At the Alaska Board of Fisheries meeting in January 2002 the board made a finding for the amount reasonably necessary for subsistence herring roe in Sitka Sound, Section 13-B: 105,000 to 158,000 lbs. The Sitka Tribe of Alaska and ADF&G agreed that the Tribe will provide ADF&G with harvest data each year and this raw data will be analyzed by ADF&G, Subsistence Division using standard statistical techniques. ADF&G may publish the results in their Statewide Subsistence Harvest Database. The Tribe and ADF&G will collaborate to improve the survey and interview reporting system and survey methodology, with ADF&G providing technical consultative work and, when possible, field survey/interview project support.

Duration: Three years.

Estimated Annual Cost: $23.0k