MATURITY ANALYSIS OF SALMON CAUGHT IN THE SOUTH PENINSULA POST-JUNE IMMATURE TEST FISHERY

By

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Regional Information Report[1] No. 4K00-75

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

December 2000

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ACKNOWLEDGMENTS

The authors gratefully acknowledge Daniel Connolly, Briana Lawson, and Abraham Shryock who collected and measured the salmon samples from the Post-June immature test fishery. Thanks are also extended to Denby Lloyd for providing the impetus for this study. Lucinda Neel provided technical support and Jim McCullough, Ivan Vining, and Rod Campbell provided critical review of this paper.

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ABSTRACT

The Alaska Department of Fish and Game (ADF&G) operates a seine test fishing program in the Shumagin Islands Section of the South Alaska Peninsula prior to opening the Post-June fishery to assess the abundance of immature salmon that inadvertently get gilled in seine web during normal fishing operations. Due to a lack of maturity information on the gilled salmon, a study was implemented during the 2000 Post-June test fishery to develop methods of determining maturity as well as to identify the proportion of immature salmon among the gilled fish. Gilled salmon from the test fishing vessel, as well as salmon of comparably small size separated from the catch at the processing facility, were sampled for maturity characteristics. A gonadosomatic index (GSI) was developed for the samples to aid in determining maturity. A relatively small number of gilled fish encountered in the 2000 test fishery, and subsequently small sample sizes, limited analysis of maturity at size. Nonetheless, an estimation procedure to determine the number of immature salmon under specific lengths by species was developed and may be used in future test fisheries. Past practices of using the number of salmon gilled in the seine as an index of relative immature salmon abundance is still considered a viable procedure and may be the only way to maintain historically consistent criteria required to open the fishery, but will require a change in regulatory language. Utilization of other estimation techniques will result in more stringent management thresholds for the Post-June fishery.

INTRODUCTION

The South Alaska Peninsula of the Alaska Peninsula Management Area consists of coastal waters west of Kupreanof Point to Scotch Cap on Unimak Island (Figure 1). The Alaska Peninsula Management Area is made up of four fishing districts in the South Peninsula (Figure 2) where five salmon species (chinook *Oncorhynchus tshawytscha*, sockeye *O. nerka*, coho *O. kisutch*, pink *O. gorbuscha*, and chum *O. keta* salmon) are commercially harvested (Witteveen et al. 2000). During normal fishing operations in early to mid July, immature salmon of three species (chinook, sockeye, and chum salmon) are inadvertently gilled in purse seine gear (McCullough and Shaul 1992). The presence of immature salmon in South Peninsula waters has resulted in commercial purse seine fishing restrictions in some years, specifically in the Shumagin Islands Section where immature salmon have been most prevalent.

The Post-June immature test fishery program was established in 1990 by the Alaska Department of Fish and Game (ADF&G), in order to assess the presence and abundance of immature salmon in South Peninsula waters prior to commercial fishing periods in July. Test vessels were selected randomly from a list of vessel owners interested in participating in the test fishery. A minimum of three test fish sites were fished with purse seine gear making 20-minute sets (Figure 3). ADF&G biologists counted and identified the number of immature salmon in each set. Immature salmon were defined as any salmon gilled in the seine webbing and weighing less than three pounds (McCullough and Shaul 1992). Following each set, immature salmon were discarded and mature (i.e., "not gilled") salmon were sold to pay vessel charter costs. During offloading, the catch was separated by species and weighed. Small fish (determined by the processing facility weight criteria) were separated during offloading and the number of "marketable" fish per species was estimated using average weights by species.

In 1998, the Post-June Salmon Management Plan for the South Alaska Peninsula (ADF&G 1998) was amended to include the following:

5 AAC 09.366. (i) The department shall conduct a seine test fishery in the Shumagin Islands Section to assess the presence of immature salmon. If 100 or more immature salmon, per set, are present, the commissioner shall close, by emergency order, the seine fishery in an area to be determined by the department. If the seine fishery is closed in an area under this subsection, the set gillnet fishery shall remain open in that area.

In order to comply with specific wording in this regulation, a reliable inseason estimate of the presence of immature salmon is necessary. Specifically, the number of biologically immature fish present per set must be determined rather than simply the number of gilled fish in the seine webbing. Assessment of size at maturity requires knowledge of the stage of gonad development in individual fish. Methods to determine gonad development range from histology (the most detailed but most time consuming and expensive) to visual inspection. Because gonad size in fishes increases with stage of development and fish size, a gonadosomatic index (GSI) can be developed by dividing gonad weight by fish weight and then plotting it versus fish length. This index offers a validation of visual maturity determination, without the time and expense of detailed histological investigations, based on the energy expenditure per fish weight applied toward gonad development (West 1990, Foster *in prep*).

For management purposes during the 2000 season and concurrent to this study, the number of immature salmon present was estimated by determining the number of salmon that were of gillable size, since little salmon maturity information for this area was available. All gilled salmon were measured from the mid eye to tail fork (MEF) on-board the test vessel and the approximate maximum sizes of each species that were gilled (440 mm for sockeye salmon and 450 mm for chum and chinook salmon) were determined. During the unloading process at the dock, all salmon that fell into the gillable size categories were counted as immatures. They were then combined with the number of gilled salmon and the resultant "inseason estimate" of the number of immature salmon was used to determine whether the fishery would open.

Goal

The purpose of this study is to assess the characteristics of immature salmon present in the South Peninsula Post-June immature test fishery. Moreover, a "threshold" size of maturation will be developed, if possible, that can be used in subsequent test fisheries to aid in the management of the Post-June Shumagin Islands Section commercial salmon fishery as described in 5 AAC 09.366.

Objectives

1. Establish a sockeye and chum salmon gonadosomatic index (GSI) to quantitatively verify visual maturity determination.

2. Estimate the proportion of sockeye and chum salmon that are sexually mature at length.

3. Evaluate, post season, the number of immature salmon present in the Post-June test fishery.

4. Develop a procedure to estimate the abundance of immature salmon in the Post-June test fishery in a timely manner.

METHODS

Collection

Test fishery vessels were selected randomly from a list of vessel owners interested in participating in the test fishery. During the 2000 test fish period (2-4 July), three sites, consistent with past test fishing practices (Popof Head, Middle Set, and Red Bluff; Figure 3), were sampled each of the three days. Following each set, fish that were gilled in the seine were set aside for the ADF&G personnel to be counted by species and measured (MEF). A subsample goal of 50 gilled fish per species (sockeye and chum salmon) at varying length intervals (Table 1) from all sets combined during the day were placed in a tote for subsequent maturity sampling, however there were generally not enough fish gilled to meet the goals.

During unloading at the processing facility, the "not purchased" population was sampled from all sets combined during the day. The cannery crew sorted the fish by species as they were unloaded

from the boat and those fish under 2 ½ pounds were separated into a tote. Just as the gilled fish were sampled on the boat, the fish in the "not purchased" tote were counted by species and measured (MEF). A portion of these fish (n=50/species) at varying length intervals were placed in a tote for subsequent maturity sampling (Table 1).

Finally, the "purchased" population (fish not gilled, and that were subsequently purchased by the processing facility) were sampled. Fish that were purchased by the processor that appeared relatively small were measured and if the lengths fell into the length interval categories previously outlined (Table 1), the samples were retained for maturity sampling. The "purchased" population was sampled to increase the sample size, and to represent upper length intervals, in the maturity analysis. Samples were selectively taken from the "purchased" population and are not representative of that entire population since only relatively small-sized fish were sampled.

All subsamples were separated, labeled, and frozen in the processor's freezer until they were analyzed for maturity characteristics.

Measurement

All fish samples were thawed overnight prior to measurement. The samples were measured (MEF) to the nearest millimeter (mm) and the weight was recorded to the nearest gram. The fishes' body cavities were opened carefully so the gonads remained intact. Sex and maturity were determined by visual inspection. The gonads were classified into one of four visual categories of maturity including #1: very small threadlike bloodshot gonads; #2: gonads beginning to form; #3: developing gonads; #4: fully mature gonads filling much of body cavity. These classifications comprise the "maturity index" as listed in Table 2. The gonads were extracted and all blood and excess tissue were removed. The gonads were weighed to the nearest tenth of a gram.

Two scales were collected from each fish to ensure that a readable scale was obtained. The "preferred scale" (INPFC 1963) was removed from the fish by grasping its exposed posterior edge with forceps and pulling it free. All slime, grit, and skin were removed from the scale to allow for clear pressed images. If no scales were present in the "preferred area" on the left side of the fish, a scale within the preferred area on the other side of the fish or a scale sample as close to the preferred area as possible was taken (Nelson et al. 2000).

Scale impressions were then made by pressing the scales into cellulose acetate cards (Clutter and Whitesel 1956). The ages were then determined by examining the scale impressions under 60X magnification with a microfiche reader (Mosher 1968).

Analysis

A GSI (West 1990) was developed for the sampled sockeye and chum salmon by dividing the gonad weight by the body weight and then plotting it versus length. This index offers a validation of the visual maturity index based on the energy expenditure per fish weight applied toward development of the gonads by sex. The maturity classifications validated with the GSI

(GSI maturity) were used to estimate the number of immature salmon present in the Post-June test fishery.

Incorporating the validated maturity classifications of either zero (0) for immature or one (1) for mature, length at maturity for the sampled sockeye and chum salmon was estimated by fitting the data to the common logistic maturity function (Quinn and Deriso 1999):

$$p_l = \frac{m_\infty}{1 + e^{-\kappa(l-\gamma)}}$$

where:

p_l is the proportion mature at length l;
m_∞ is the asymptotic maturity (the maximum achievable maturity proportion);
κ is the instantaneous rate of fish maturation (characterizes the curve of the logistic function);
γ is the length of the fish at which the inflection point of the curve occurs.

Because the sample size was fairly large (n>100), the normal approximation of the multinomial distribution was used and a nonlinear least squares optimizing scheme was created in Excel™ to estimate the four parameters. Variance of the parameter estimates was calculated using Hessian methodolgy.

In addition to the estimate of immature salmon present (from the GSI maturity classification), an estimator of the number of immature salmon based upon the length frequencies of the smaller sockeye, chum, and chinook salmon was constructed. A combination of maturity information was utilized, consisting of the female sockeye length-at-maturity logistic model and the maturity proportions of the sampled chum, chinook, and male sockeye salmon. This information was used to construct a length-based function that was tested against data from the 2000 Post-June immature test fishery catches. For the 2001 test fishery, this model could be incorporated to expeditiously estimate the number of immature salmon present per set. The assumptions of this length frequency estimator will be evaluated by sampling a portion of the test fishery catch to ensure the 2000 population characteristics are representative of subsequent years.

For the purposes of discussion, the definitions associated with study's maturity terminology are listed below:

Gilled fish: Fish "gilled" by the seine mesh; historically used as an index of the abundance of immature salmon present in the catch.

Inseason estimate: Estimated number of immature salmon consisting of the sum of sockeye under 440 mm in length (MEF) and chum and chinook salmon under 450 mm in the test fishery catch.

Visual maturity index: Visual maturity classification (1-4) determined during sampling efforts.

GSI maturity: Quantitative maturity classification (0 or 1) based upon analysis of gonadosomatic index (GSI) plots.

Length frequency estimator: Informal length-based function which estimates the number of immature salmon present in the test fishery based on the number and lengths of sockeye, chum, and chinook salmon under a threshold size (e. g., 460 mm).

RESULTS

The GSI fundamentally agreed with the visual maturity index for the sockeye salmon sampled. The GSI plot revealed two relatively distinct clusters of mature and immature fish (Figure 4). The plot allowed the construction of a boundary GSI which the mature fish were above and the immature were below. For the female sockeye, it appeared that a GSI value of above 0.02 would indicate mature gonads, and for male sockeye a GSI value of above 0.005 indicated maturity. Macroscopic field maturity determination (visual maturity index) agreed with this quantitative rationale on all but 17 of the 138 sockeye sampled (Table 2). Fourteen of the 17 differences were classified as #3 (developing gonads) using the visual maturity index, and were officially classified as mature using GSI maturity. The ovary weight for immature female sockeye salmon ranged from 0.2 to 8.9 grams, and 28.2 to 208.3 grams for mature individuals. The testes weight of immature male sockeye salmon ranged from 0.2 to 2.6 grams, and 4.7 to 93.8 grams for mature individuals. (Table 2).

Only seven of the 167 sampled chum salmon (Table 2) sampled were classified as mature using GSI maturity. The lack of mature individuals caused the GSI to be a weak tool in assessing maturity (Figure 5). For the female chum salmon, it appears that a GSI value of above 0.015 would indicate mature gonads, and for male chum salmon a GSI value of above was 0.003 indicates maturity. The visual maturity index agreed with this quantitative rationale on all but five of the 167 chum salmon sampled (Table 2). Three of the five differences were classified as #3 (developing gonads) using the visual maturity index, and were officially classified as mature using GSI maturity. The ovary weight for immature female chum salmon ranged from 0.1 to 14.7 grams, and 28.4 to 140.0 grams for mature individuals. The testes weight of immature male chum salmon ranged from 0.1 to 2.8 grams, and 5.0 to 113.0 grams for mature individuals. (Table 2). There was not an adequate number of mature chum salmon in the sample to model maturity using the logistic function.

Length, maturity, sex, and age characteristics by species and sub-population sampled in the test fishery are represented in Table 3. The average length of gilled sockeye was 382 mm, and for gilled chum the average length was 389 mm. The proportion of gilled sockeye salmon that were mature was 45% while 0% of the gilled chum salmon were mature.

All immature salmon, as established using GSI maturity, were summed to estimate the total number of immature salmon present in the Post-June test fishery by sample date (Table 4). Also included in Table 4 are the number of gilled fish (historical immature salmon estimate), inseason estimate (based on length threshold by species), and length frequency estimator results.

The logistic model was fitted to both the male and female length-at-maturity data for sockeye salmon. The logistic curve adequately modeled the female sockeye salmon. Male sockeye salmon length at maturity could not be modeled successfully for two reasons. The first reason is that despite achieving the overall sample size, there were no male sockeye sampled over 489 mm to properly model the upper end of the maturity curve. A second reason is the abundance of small, age .1, mature "jacks" present in the sample in association with larger, but immature, age .2 sockeye salmon. The logistic curve is not adequate for describing this type of maturation process.

Sockeye salmon in the sample demonstrated an increase in maturity with increasing length. The asymptotic maturity parameter m_∞ was constrained to be ≤ 1.0, which ensures the proportion mature does not exceed 100%. With m_∞ equaling 1.0, the inflection point parameter γ equals $L_{50\%}$, which is the length at which 50% of the fish are mature. The $L_{50\%}$ for female sockeye salmon was estimated to be 433 mm with a standard error equal to 5.7 (Table 5; Figure 6). Male sockeye salmon as a group were not modeled successfully, therefore males and females were pooled to estimate overall length at maturity. This required the removal of the 16 "jacks" so the parameters in the logistic model would converge. The resultant $L_{50\%}$ estimate was 399 mm with a standard error equal to 22.9 (Table 5; Figure 6). The addition of the male maturity data shows the $L_{50\%}$ to decrease, but with a larger standard error. The elimination of the "jacks" makes the $L_{50\%}$ estimate a conservative measure of the parameter.

A length-based method of estimating the number of immature salmon per set using the length frequencies of sockeye, chum and chinook salmon $\leq$460 mm (MEF) within the catch was successfully developed. From the length frequencies, the estimator essentially considered the probability of a fish of a certain length being mature or immature (from the logistic maturity model) and operates under an assumption of a 50/50 ratio of males to females. Since only female sockeye salmon length at maturity was successfully modeled, certain generalizations were adopted into the model for male sockeye salmon, and all chum and chinook salmon due to the fact that sample size restricted the modeling of length at maturity. Generalizations made were: 1) All male sockeye salmon $\leq$460 mm (MEF) have an 85% chance of being mature (of the 64 males under $\leq$460 mm, 85% were mature); 2) All chum and chinook salmon $\leq$460 mm (MEF) are assumed to be immature (Nearly 100% of all chum and chinook salmon in this size range were found to be immature in this study).

The length frequency estimator was calculated in four steps: 1) the number of sockeye salmon in the catch $\leq$460 mm was estimated, multiplied by 0.15, and divided by two to estimate the number of immature males; 2) to estimate the number of immature females sockeye, the number of sockeye salmon in the catch $\leq$460 mm and above 433 mm (female sockeye salmon $L_{50\%}$) were enumerated and divided by two; 3) the number of chum and chinook in the catch $\leq$460 mm was estimated and all were assumed immature; 4) the individual estimates (male sockeye, female sockeye, chum, and chinook salmon) were summed to estimate the total number of immature salmon in the catch. Since the only length-at-maturity logistic model used was the female sockeye salmon, this estimator is incomplete, and additional maturity information about male sockeye, chum, and chinook salmon is required to enhance accuracy.

DISCUSSION

Maturity Analysis

The GSI was a valuable tool in classification of maturity status in sockeye salmon. Two clusters of fish are evident (Figure 4); however, with limited sample sizes, the boundary between the two clusters may be indistinct. To ultimately classify the maturity status of the few individual fish that lie somewhere between the mature and immature clusters, existing literature on sockeye and chum salmon maturity was reviewed. The GSI boundaries developed for the male and female sockeye are in agreement with Takagi (1961) who reported that a sockeye or chum salmon that has reached a testes weight of 3.0 grams or ovary weight of 20 grams by early July would completely mature that season. In addition, Ishida et al. (1961) reported that sockeye and chum salmon that have attained a testes weight of 2-3 grams or ovary weight of 15-20 grams or more by June will achieve complete maturation that season. The maturity index assigned to the salmon upon visual inspection in the field was in close agreement with the GSI maturity classification. The only major differences were in the fish that were indexed by visual maturity classification as #3 (developing gonads). Visual maturity classification, if used in the future, will be more accurate due to the GSI and gonad boundary weights that were determined during this study.

Estimating the length at maturity of female sockeye salmon using the logistic curve was successful. The female sockeye salmon appear to abruptly transition into maturity between 420 and 460 mm and there are relatively low variances associated with the logistic model parameter estimates. The addition of the male sockeye salmon data greatly increases the associated variances of the model, even with the removal of the mature age .1 "jacks". Male and female sockeye salmon (as well as other salmonids) mature at different rates and it may not be reasonable to attempt to model different sexes as one group. A problem with the male maturity data was that very few fish sampled were over 450 mm. In the future, a greater number of male sockeye salmon over 450 mm in length need to be sampled to adequately model maturity.

Maturity analysis indicated that all of the gilled chum salmon sampled in the test fishery were immature. Subsequent sampling at the dock of similar-sized fish showed similar results, with a high proportion of immature chum salmon. Unfortunately, the larger-sized chum salmon were not sufficiently sampled to determine size at maturity. Therefore, a direct assessment of the number of immature chum salmon present during the test fishery for the 2000 season was not possible.

Determining the number of immature salmon using the length frequency estimator, while incomplete in construction, appeared to perform well against the inseason estimate and GSI estimate (Table 4). Additional length-at-maturity information from chum, chinook, and male sockeye salmon is necessary for the appropriate completion of this function instead of the generalizations (under the length threshold) established for the data deficient areas. If the individual lengths of all of the salmon under a threshold size level (i.e., 460 mm) cannot be acquired for the estimator, an approximation of the lengths can be generated by estimating the number of salmon under the threshold and subsampling these fish to acquire an average and standard deviation. The calculations required to estimate the number of immature salmon in the catch can be quickly attained, using a laptop personal computer and a spreadsheet template.

Management Implications

In past ADF&G Post-June test fisheries, the department defined immature salmon (for the purposes of the test fishery) as "salmon gilled in seine webbing and weighing less than three pounds per fish" (McCullough and Shaul 1992). The number of "gilled" salmon was considered to be a rough index and was intended to track relative vulnerability of immature salmon to the fishery from day to day and between years. While the past established practice of ADF&G was to keep the Post-June fishery in the Shumagin Islands Section closed if an average of 100 "gilled" salmon were captured per set, there is no known relationship between this index and actual abundance of immature salmon.

During the January 1998 BOF meeting, the portion of the Post-June Salmon Management Plan that addressed immature salmon was put into regulation (5 AAC 09.366 (i)) as follows: "...If 100 or more immature salmon, per set, are present, the commissioner shall close..." (ADF&G 1998). This language has restricted the department from continuing to use the number of fish gilled in the seine as an index. However, since a paucity of maturity information was available, the number of salmon that were gilled in the seine, and those salmon of gillable size found while unloading the catch at the processor, were used as the inseason estimate of mature fish.

The threshold number, to restrict the fishery, of 100 immature salmon per set, was initiated using the number of gilled salmon per set, the established practice at the time. The regulatory language stated the "number present" (likely higher than the number gilled) was to be determined while the threshold remained at 100 fish. The total number of fish "of gillable size" in a seine set will almost always be greater than that subset which actually becomes "gilled" in the web. Thus the change in monitoring practice by ADF&G, to accommodate the regulatory language of "immature salmon present", from the previous practice of counting those salmon actually "gilled" has resulted in a likely more restrictive criterion required to open the fishery. In fact, results from the 2000 test fishery indicate that the number of fish actually gilled can range roughly from equal-to to as little as one-third the number of "gillable" fish or those considered immature by GSI and length frequency estimates, depending upon species composition (Table 4).

Since the GSI maturity classifications indicate that a significant proportion of the sockeye salmon of gillable size are mature, the inseason estimation method (that assumes all sockeye salmon of gillable size are all immature) is likely high (Table 4). In contrast, the inseason estimation for chum salmon was low compared to the GSI results. This indicates that the current size threshold for mature chum salmon (450 mm) is too low. The accuracy of the inseason estimation procedure (all sockeye salmon under 440 mm and all chum salmon under 450 mm) is dependent upon species composition. If sockeye salmon were relatively more abundant in a given year, the current inseason strategy, relying on counts of fish of "gillable size", would overestimate the number of immatures present. Alternately, if chum salmon were more prevalent, the inseason strategy would underestimate the total number of immatures.

Past indices of immature salmon vulnerable to the Post-June fishery, monitoring the number of salmon actually gilled in the seine web, was never intended to be an estimate of actual abundance of immature salmon in the area. It may not be possible to translate such a rough index of fishing performance into a population estimate. On the other hand, the number of "gilled salmon per set" was useful as a relative, if somewhat arbitrary, indicator of when a commercial

fishery might harvest "too many" immature salmon. Thus, the department had established an easily monitored threshold of "100 gilled salmon per set" to guide the daily closure of the Post-June fishery.

Literal interpretation of regulatory language, passed by the BOF in 1998, however, establishes a more stringent threshold of "100 immature salmon present per set". The difference from past practice rests in the determination of "immature" versus "gilled" and also "present" versus "gilled". Determination of the actual maturity of individual salmon requires substantial sampling and the development of usable estimators (such as the GSI and length frequency estimators); the determination of the total number "present" per set requires sampling entire loads. These sampling and estimation procedures are substantially more time-consuming and expensive than past practice of counting the number of "gilled" salmon in the web. The resulting measure, for any particular seine set, will usually be a higher number of fish considered "immature and present" than the number of fish "gilled". Thus, the threshold of "100 fish" will more often be attained under interpretation of the new regulatory language than under previously established practice of the department, and the Post-June fishery would more often be closed.

The department is uncertain whether such an action was intended by the BOF. At the meeting in January 1998, dialogue between members of the board and department staff on this issue emphasized following longstanding, established practice of the department in conducting the Post-June test fishery and instituting closures of the Post-June commercial seine fishery. Strict interpretation of the resulting regulatory language, however, does not allow for continuing those established practices. The new regulatory language imposes substantially increased sampling and estimation responsibilities on the department and institutes a more stringent threshold for opening of the Post-June commercial salmon fishery.

Future Test Fisheries

While not necessarily an accurate representation of the abundance of immature salmon present, using the number of salmon that are gilled in the seine during the test fishery is still the most efficient and easily executed option for management of the fishery. However, using the number of gilled salmon as an index will require a change in regulatory language.

If the BOF determines that current regulatory language should remain the same, thus using gilled salmon as an index is not an option, the length frequency estimator developed in this study may be a viable tool to estimate the number of immature salmon present in the Post-June test fishery. While this method will require additional staff and will not be as timely to implement, results should be made available in a time frame that is sufficient to make appropriate management decisions inseason. The length frequency estimator however, will become less accurate with high proportions of chum, chinook, or male sockeye salmon. Additional maturity information for these salmon, however, may increase the accuracy of the length frequency estimator.

If future immature test fisheries utilize the length frequency estimator, changes will have to made to the test fishing operation. Two observers will need to participate in the vessel charter. This will allow on-board measurement, speciation, and sex determination of a subsample of gilled salmon. Upon unloading the catch at the dock, several department personnel will be required to count all salmon of each species that are below a threshold length (e.g., 460 mm). The estimation

procedure would then be applied to each species estimate of the number of individuals below the threshold length to summarize the final estimation of immature salmon present in the test fishery. The number of immature salmon present per set could then be determined and management decisions regarding the Post-June fishery could be made.

Conclusions

Takagi (1961) documented the size differences between mature and immature sockeye salmon. Immature salmon tend to be smaller in size than mature salmon. Results of this study also indicated that a consistently small average size of salmon was gilled in seine web. It follows that the number of gilled salmon in the immature test fishery should be an appropriate index of the number of immatures present.

In order to maintain the historical standards of criteria required to open the Post-June fishing season, the number of gilled salmon per set should remain the basis of estimating the number of immature salmon present in the Post-June test fishery. This will require a modification of current regulatory language. Using current regulatory language, and estimates of the presence of immature salmon, will likely result in higher standards required to open the fishery. At this time, the department does not have any information to indicate that the threshold number of immature salmon should be higher. Further, it is unknown whether a high level of accuracy in measuring immature numbers is appropriate in measuring a relatively arbitrary threshold level.

RECOMMENDATIONS

1. The department should consult and clarify with the BOF, the intent of regulations (5 AAC 09.366 (i)) promulgated at the January 1998 meeting. A clear distinction should be made between longstanding department practice of counting "gilled" salmon against a threshold of 100 per set versus interpretation of new regulatory language requiring characterization of maturity and estimating the total number of immature salmon "present" per set.

2. If the intent of the BOF is to remain with past practice of the department, then an amendment to regulatory language in 5 AAC 09.366 should be considered. Suggested language could be: "for the purposes of this section, the phrase 'immature salmon per set, are present' shall refer to the number of salmon observed to be gilled in the seine web".

3. If the intent of the BOF is to abide by a strict interpretation of regulatory language passed in 1998, then the department should consult with the BOF about the sampling and estimation procedures required and the more stringent standards for opening the commercial fishery that would result.

4. If current regulatory language remains intact, the department should expand the sampling of male sockeye salmon and all chum salmon, in order to enhance the utility of the length frequency estimator of maturity.

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Table 1. Sockeye and chum salmon maturity subsample goal by length interval.

	Length Intervals (mm)								
	<321	321-340	341-360	361-380	381-400	401-420	421-440	>440	Total
Number of Sockeye	2	5	9	9	9	9	5	2	50

	Length Intervals (mm)								
	<371	371-390	391-410	411-430	431-450	451-470	471-490	>490	Total
Number of Chum	2	5	9	9	9	9	5	2	50

Table 2. Data compilation of salmon samples collected during the South Peninsula Post-June immature test fishery, July 2-4, 2000.

Date	Species	status	Fw age	Sw age	Length (mm)	Sex	Weight (g)	Visual Mat. Index	Gonad wt (g)	GSI maturity	GSI
7/2/00	sockeye	Gilled	2	2	402	F	818	2	7.2	0	0.009
7/2/00	sockeye	Gilled	1	2	387	F	734	2	3.8	0	0.005
7/2/00	sockeye	Gilled	1	2	428	F	1086	1	0.3	0	0.000
7/2/00	sockeye	Gilled	2	2	460	F	1492	4	71.3	1	0.048
7/2/00	sockeye	Gilled	2	1	340	M	668	4	12.1	1	0.018
7/2/00	sockeye	Gilled	2	1	338	M	631	4	10.8	1	0.017
7/2/00	sockeye	Gilled	1	2	408	F	867	2	6.5	0	0.007
7/2/00	sockeye	Gilled	2	1	370	M	852	4	15.8	1	0.019
7/2/00	sockeye	Gilled	1	1	334	M	584	4	13.2	1	0.023
7/3/00	sockeye	Gilled	1	2	408	F	905	2	6.9	0	0.008
7/3/00	sockeye	Gilled	1	1	332	M	577	4	35.0	1	0.061
7/3/00	sockeye	Gilled	1	2	394	F	919	4	32.8	1	0.036
7/3/00	sockeye	Gilled	2	2	435	F	1060	2	6.1	0	0.006
7/3/00	sockeye	Gilled	2	2	434	F	1144	1	0.6	0	0.001
7/3/00	sockeye	Gilled	2	2	461	F	1540	4	56.9	1	0.037
7/3/00	sockeye	Gilled	1	2	381	F	735	3	28.2	1	0.038
7/3/00	sockeye	Gilled	3	1	355	M	732	4	45.8	1	0.063
7/3/00	sockeye	Gilled	1	2	415	F	839	2	4.7	0	0.006
7/3/00	sockeye	Gilled	2	1	340	F	526	1	0.2	0	0.000
7/3/00	sockeye	Gilled	2	1	320	M	570	4	17.6	1	0.031
7/4/00	sockeye	Gilled	3	1	375	M	840	4	37.8	1	0.045
7/4/00	sockeye	Gilled	1	2	387	F	910	2	4.5	0	0.005
7/4/00	sockeye	Gilled	1	2	403	F	843	1	0.3	0	0.000
7/4/00	sockeye	Gilled	1	2	402	F	943	1	0.3	0	0.000
7/4/00	sockeye	Gilled	1	2	390	F	932	2	4.9	0	0.005
7/4/00	sockeye	Gilled	2	2	401	M	970	1	0.4	0	0.000
7/4/00	sockeye	Gilled	2	1	351	M	706	4	22.1	1	0.031
7/4/00	sockeye	Gilled	2	1	349	M	773	4	27.4	1	0.035
7/4/00	sockeye	Gilled	2	1	312	M	516	3	9.6	1	0.019
7/4/00	sockeye	Gilled	1	2	411	F	999	1	0.3	0	0.000
7/4/00	sockeye	Gilled	1	2	388	M	723	1	0.2	0	0.000
7/4/00	sockeye	Gilled		2	393	F	910	2	3.1	0	0.003
7/4/00	sockeye	Gilled	2	2	396	F	981	2	6.6	0	0.007
7/4/00	sockeye	Gilled	2	2	344	M	726	4	18.4	1	0.025
7/4/00	sockeye	Gilled	1	2	425	F	1267	4	53.3	1	0.042
7/4/00	sockeye	Gilled	1	2	395	F	893	2	3.8	0	0.004
7/4/00	sockeye	Gilled	1	2	399	M	947	1	0.3	0	0.000
7/4/00	sockeye	Gilled	2	1	337	M	699	2	4.7	1	0.007
7/4/00	sockeye	Gilled	2	2	390	M	811	1	0.2	0	0.000
7/4/00	sockeye	Gilled	1	2	368	M	887	4	34.3	1	0.039
7/4/00	sockeye	Gilled	2	1	333	F	530	1	0.4	0	0.001
7/4/00	sockeye	Gilled	1	2	425	F	1055	2	6.6	0	0.006
7/4/00	sockeye	Gilled	1	2	419	F	1035	2	5.3	0	0.005
7/4/00	sockeye	Gilled	2	1	291	M	535	3	16.5	1	0.031
7/2/00	sockeye	Purchased	2	2	447	F	1386	3	28.4	1	0.020
7/2/00	sockeye	Purchased	1	3	530	F	2100	4	121.5	1	0.058

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Table 2. (page 2 of 7)

Date	Species	status	Fw age	Sw age	Length (mm)	Sex	Weight (g)	Visual Mat. Index	Gonad wt (g)	GSI maturity	GSI
7/2/00	sockeye	Purchased	2	2	465	F	1569	4	58.7	1	0.037
7/2/00	sockeye	Purchased	2	2	505	F	1955	4	102.7	1	0.053
7/2/00	sockeye	Purchased	1	2	440	F	1393	4	75.2	1	0.054
7/2/00	sockeye	Purchased	2	2	496	F	2100	3	73.1	1	0.035
7/2/00	sockeye	Purchased	1	2	441	M	1190	3	12.8	1	0.0108
7/2/00	sockeye	Purchased	2	2	402	M	1043	2	4.8	1	0.005
7/2/00	sockeye	Purchased	1	2	389	M	1052	4	30.9	1	0.029
7/2/00	sockeye	Purchased	1	2	427	M	1230	4	34.3	1	0.028
7/2/00	sockeye	Purchased	2	3	460	F	1409	4	58.3	1	0.041
7/2/00	sockeye	Purchased	1	2	458	M	1354	1	0.4	0	0.000
7/2/00	sockeye	Purchased	1	3	501	F	1924	4	208.3	1	0.108
7/3/00	sockeye	Purchased	2	2	448	F	1371	4	69.3	1	0.051
7/3/00	sockeye	Purchased	1	2	460	F	1400	4	97.2	1	0.069
7/3/00	sockeye	Purchased	2	2	426	M	1356	4	38.9	1	0.029
7/3/00	sockeye	Purchased	2	2	472	F	1688	4	79.2	1	0.047
7/3/00	sockeye	Purchased	0	2	398	M	1207	4	56.7	1	0.047
7/3/00	sockeye	Purchased	1	2	451	F	1503	4	91.1	1	0.061
7/3/00	sockeye	Purchased		2	466	M	1411	1	2.6	0	0.002
7/3/00	sockeye	Purchased	1	2	419	M	1267	4	71.3	1	0.056
7/3/00	sockeye	Purchased	2	2	434	F	1269	4	92.3	1	0.073
7/3/00	sockeye	Purchased	1	2	392	F	945	2	7.1	0	0.008
7/3/00	sockeye	Purchased	2	2	444	M	1437	4	61.5	1	0.043
7/3/00	sockeye	Purchased	1	2	444	F	1527	4	87.5	1	0.057
7/3/00	sockeye	Purchased	1	2	425	M	1141	1	0.2	0	0.000
7/3/00	sockeye	Purchased	1	2	434	M	1393	4	42.7	1	0.031
7/3/00	sockeye	Purchased	1	2	467	F	1760	4	64.3	1	0.037
7/3/00	sockeye	Purchased	1	2	442	M	1506	4	54.2	1	0.036
7/3/00	sockeye	Purchased	1	2	489	M	2100	3	26.2	1	0.012
7/3/00	sockeye	Purchased	1	2	459	F	1586	4	49.7	1	0.031
7/3/00	sockeye	Purchased	1	2	429	M	1363	4	44.5	1	0.033
7/3/00	sockeye	Purchased	1	2	447	F	1486	4	95.5	1	0.064
7/3/00	sockeye	Purchased	1	2	482	F	1409	1	0.5	0	0.000
7/3/00	sockeye	Purchased	1	2	429	F	1233	2	8.8	0	0.007
7/3/00	sockeye	Purchased	2	2	461	F	1534	4	94.5	1	0.062
7/3/00	sockeye	Purchased	1	2	460	M	1563	4	76.4	1	0.049
7/3/00	sockeye	Purchased	2	2	444	F	1410	3	38.1	1	0.027
7/4/00	sockeye	Purchased	2	3	473	F	1739	4	111.1	1	0.064
7/4/00	sockeye	Purchased	1	2	446	M	1579	4	69.5	1	0.044
7/4/00	sockeye	Purchased	1	2	457	M	1870	4	71.6	1	0.038
7/4/00	sockeye	Purchased	1	2	410	F	1150	4	71.2	1	0.062
7/4/00	sockeye	Purchased	1	2	447	F	1150	1	0.4	0	0.000
7/4/00	sockeye	Purchased	1	2	448	F	1190	2	8.1	0	0.007
7/4/00	sockeye	Purchased	1	2	477	F	1735	4	143.1	1	0.082
7/4/00	sockeye	Purchased	1	2	446	F	1545	4	8.9	0	0.006
7/4/00	sockeye	Purchased	1	2	468	F	1740	4	145.2	1	0.083
7/4/00	sockeye	Purchased	1	2	432	F	1157	1	0.3	0	0.000
7/4/00	sockeye	Purchased	2	2	482	F	1827	4	73.4	1	0.040

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Table 2. (page 3 of 7)

Date	Species	status	Fw age	Sw age	Length (mm)	Sex	Weight (g)	Visual Mat. Index	Gonad wt (g)	GSI maturity	GSI
7/4/00	sockeye	Purchased	1	2	429	M	1413	3	25.8	1	0.018
7/4/00	sockeye	Purchased	1	2	413	M	1193	4	59.3	1	0.050
7/4/00	sockeye	Purchased	1	2	469	F	1599	4	124.9	1	0.078
7/4/00	sockeye	Purchased	1	2	441	M	1564	4	57.8	1	0.037
7/4/00	sockeye	Purchased	2	2	432	M	1480	3	22.7	1	0.015
7/4/00	sockeye	Purchased	1	2	466	F	1849	4	100.2	1	0.054
7/4/00	sockeye	Purchased	1	2	443	F	1567	4	63.4	1	0.040
7/4/00	sockeye	Purchased	1	2	450	M	1332	4	42.8	1	0.032
7/4/00	sockeye	Purchased	1	2	437	M	1499	4	65.3	1	0.044
7/4/00	sockeye	Purchased	1	2	436	F	1406	4	84.7	1	0.060
7/4/00	sockeye	Purchased	2	2	493	F	2100	3	60.9	1	0.029
7/4/00	sockeye	Purchased	1	2	429	F	1333	4	53.7	1	0.040
7/4/00	sockeye	Purchased	2	2	426	F	1396	4	61.8	1	0.044
7/4/00	sockeye	Purchased	2	2	445	M	1612	3	40.3	1	0.025
7/4/00	sockeye	Purchased	2	2	461	F	1498	4	48.8	1	0.033
7/4/00	sockeye	Purchased	1	2	440	M	1575	4	43.7	1	0.028
7/4/00	sockeye	Purchased	2	2	432	M	1442	4	32.8	1	0.023
7/4/00	sockeye	Purchased	2	3	488	F	1750	4	161.6	1	0.092
7/4/00	sockeye	Purchased	1	2	418	M	1017	1	0.5	0	0.000
7/4/00	sockeye	Purchased	1	2	438	M	1464	4	60.4	1	0.041
7/2/00	sockeye	Not purchased	1	2	408	M	1130	4	32.0	1	0.028
7/3/00	sockeye	Not purchased	1	2	405	M	1264	4	37.6	1	0.030
7/3/00	sockeye	Not purchased	1	2	444	M	1095	1	0.3	0	0.000
7/3/00	sockeye	Not purchased	1	2	410	M	1183	4	44.1	1	0.037
7/3/00	sockeye	Not purchased	1	2	423	F	988	2	5.7	0	0.006
7/3/00	sockeye	Not purchased	1	2	396	M	1002	4	36.2	1	0.036
7/3/00	sockeye	Not purchased	1	2	426	F	1049	1	0.4	0	0.000
7/3/00	sockeye	Not purchased	2	2	420	M	1173	4	72.4	1	0.062
7/3/00	sockeye	Not purchased	1	2	416	M	997	1	0.2	0	0.000
7/3/00	sockeye	Not purchased	2	1	366	M	689	4	28.9	1	0.042
7/3/00	sockeye	Not purchased	2	2	421	F	1196	4	70.5	1	0.059
7/3/00	sockeye	Not purchased	1	2	378	M	826	3	24.3	1	0.029
7/3/00	sockeye	Not purchased	2	1	353	F	630	1	0.2	0	0.000
7/4/00	sockeye	Not purchased	1	2	393	F	849	2	5.7	0	0.007
7/4/00	sockeye	Not purchased	1	2	393	M	1025	4	45.2	1	0.044
7/4/00	sockeye	Not purchased	2	1	371	M	822	4	47.0	1	0.057
7/4/00	sockeye	Not purchased	1	2	400	M	1024	4	50.4	1	0.049
7/4/00	sockeye	Not purchased	1	2	425	F	1126	1	0.4	0	0.000
7/4/00	sockeye	Not purchased	2	1	401	M	1170	4	28.1	1	0.024
7/4/00	sockeye	Not purchased	1	2	394	M	893	4	23.6	1	0.026
7/4/00	sockeye	Not purchased	1	2	406	M	1066	4	93.8	1	0.088
7/4/00	sockeye	Not purchased	1	2	402	M	1103	3	32.3	1	0.029
7/4/00	sockeye	Not purchased	1	2	408	F	914	2	7.2	0	0.008
7/4/00	sockeye	Not purchased	1	2	412	M	1126	4	53.5	1	0.048
7/4/00	sockeye	Not purchased	1	2	403	M	1147	4	48.7	1	0.042
7/2/00	Chum	Gilled	0	2	364	M	628	1	0.1	0	0.000
7/2/00	Chum	Gilled	0	2	393	F	769	2	3.9	0	0.005

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Table 2. (page 4 of 7)

Date	Species	status	Fw age	Sw age	Length (mm)	Sex	Weight (g)	Visual Mat. Index	Gonad wt (g)	GSI maturity	GSI
7/2/00	Chum	Gilled	0	2	375	F	711	1	0.2	0	0.000
7/2/00	Chum	Gilled	0	2	446	F	1080	1	0.6	0	0.001
7/2/00	Chum	Gilled	0	2	390	M	743	1	0.1	0	0.000
7/2/00	Chum	Gilled	0	2	404	F	750	2	6.4	0	0.009
7/3/00	Chum	Gilled	0	2	399	M	847	1	0.6	0	0.001
7/3/00	Chum	Gilled	0	2	393	M	789	1	0.6	0	0.001
7/3/00	Chum	Gilled	0	2	388	F	748	2	4.2	0	0.006
7/3/00	Chum	Gilled	0	2	378	F	654	2	3.2	0	0.005
7/3/00	Chum	Gilled	0	2	397	F	825	2	4.1	0	0.005
7/3/00	Chum	Gilled	0	2	401	M	979	1	0.5	0	0.001
7/3/00	Chum	Gilled	0	2	384	F	751	2	4.7	0	0.006
7/3/00	Chum	Gilled	0	2	426	F	1046	1	0.4	0	0.000
7/3/00	Chum	Gilled	0	2	372	M	779	1	0.4	0	0.001
7/3/00	Chum	Gilled	0	2	442	F	1142	2	7.4	0	0.006
7/3/00	Chum	Gilled	0	2	456	F	1459	2	8.3	0	0.006
7/3/00	Chum	Gilled	0	2	383	M	766	1	0.4	0	0.001
7/3/00	Chum	Gilled	0	2	350	F	621	1	0.1	0	0.000
7/4/00	Chum	Gilled	0	2	381	M	744	1	0.3	0	0.000
7/4/00	Chum	Gilled	0	2	367	F	671	2	4.2	0	0.006
7/4/00	Chum	Gilled	0	2	383	F?	864	1	0.3	0	0.000
7/4/00	Chum	Gilled	0	2	352	F	749	1	0.2	0	0.000
7/4/00	Chum	Gilled	0	2	397	F	917	2	6.7	0	0.007
7/4/00	Chum	Gilled	0	2	388	M	746	1	0.2	0	0.000
7/4/00	Chum	Gilled	0	2	382	M	886	1	0.4	0	0.000
7/4/00	Chum	Gilled	0	2	399	F	955	2	5.9	0	0.006
7/4/00	Chum	Gilled	0	2	344	F	583	2	5.0	0	0.009
7/4/00	Chum	Gilled	0	2	414	F	938	2	7.2	0	0.008
7/4/00	Chum	Gilled	0	2	351	F	645	2	2.5	0	0.004
7/4/00	Chum	Gilled	0	2	365	F	734	2	3.2	0	0.004
7/4/00	Chum	Gilled	0	2	391	M	768	1	0.3	0	0.000
7/4/00	Chum	Gilled	0	2	383	M	880	1	0.5	0	0.001
7/4/00	Chum	Gilled	0	2	359	M	684	1	0.4	0	0.001
7/4/00	Chum	Gilled	0	2	356	F	641	2	5.2	0	0.008
7/4/00	Chum	Gilled	0	2	407	F	924	2	7.4	0	0.008
7/4/00	Chum	Gilled	0	2	366	F	707	1	0.2	0	0.000
7/4/00	Chum	Gilled	0	2	411	M	887	1	0.3	0	0.000
7/4/00	Chum	Gilled	0	2	382	F	877	2	5.8	0	0.007
7/4/00	Chum	Gilled	0	2	408	M	945	1	0.5	0	0.001
7/4/00	Chum	Gilled	0	2	382	M	822	1	0.4	0	0.000
7/4/00	Chum	Gilled	0	2	406	M	911	1	0.2	0	0.000
7/4/00	Chum	Gilled	0	2	407	F	776	2	5.2	0	0.007
7/4/00	Chum	Gilled	0	2	419	F	957	2	8.2	0	0.009
7/4/00	Chum	Gilled	0	2	388	F	729	2	4.6	0	0.006
7/4/00	Chum	Gilled	0	2	366	M	662	1	0.1	0	0.000
7/2/00	Chum	Purchased	0	3	479	M	1623	1	0.7	0	0.000
7/2/00	Chum	Purchased	0	3	453	F	1339	2	11.9	0	0.009
7/3/00	Chum	Purchased	0	3	496	M	1994	1	2.2	0	0.001

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Table 2. (page 5 of 7)

Date	Species	status	Fw age	Sw age	Length (mm)	Sex	Weight (g)	Visual Mat. Index	Gonad wt (g)	GSI maturity	GSI
7/3/00	Chum	Purchased	0	3	485	M	1673	1	0.6	0	0.000
7/3/00	Chum	Purchased	0	2	431	F	1172	1	0.3	0	0.000
7/3/00	Chum	Purchased	0	3	478	F	1401	2	14.7	0	0.010
7/3/00	Chum	Purchased	0	3	459	F	1530	1	1.2	0	0.001
7/3/00	Chum	Purchased	0	2	438	F	1206	2	8.5	0	0.007
7/3/00	Chum	Purchased	0	3	495	M	1716	1	0.8	0	0.000
7/3/00	Chum	Purchased	0	3	476	F	1530	2	11.8	0	0.008
7/3/00	Chum	Purchased	0	3	490	F	1647	2	14.1	0	0.009
7/3/00	Chum	Purchased	0	3	460	F	1377	2	10.6	0	0.008
7/3/00	Chum	Purchased			477	F	1750	1	1.0	0	0.001
7/3/00	Chum	Purchased	0	3	456	M	1229	1	0.9	0	0.001
7/3/00	Chum	Purchased	0	3	464	F	1587	1	1.2	0	0.001
7/3/00	Chum	Purchased			458	F	1214	2	10.7	0	0.009
7/3/00	Chum	Purchased	0	3	493	F	1602	3	28.4	1	0.018
7/3/00	Chum	Purchased	0	3	488	M	1605	1	0.5	0	0.000
7/3/00	Chum	Purchased	0	3	455	F	1192	2	8.0	0	0.007
7/4/00	Chum	Purchased	0	3	469	F	1527	3	23.5	1	0.015
7/4/00	Chum	Purchased	0	3	468	F	1211	2	13.2	0	0.011
7/4/00	Chum	Purchased	0	2	460	M?	1371	1	0.5	0	0.000
7/4/00	Chum	Purchased	0	2	459	M	1446	1	1.0	0	0.001
7/4/00	Chum	Purchased	0	2	444	F	1275	2	7.3	0	0.006
7/4/00	Chum	Purchased	0	3	484	F	2100	4	140.0	1	0.067
7/4/00	Chum	Purchased	0	2	420	M	996	1	0.4	0	0.000
7/4/00	Chum	Purchased	0	2	454	M	1422	1	0.6	0	0.000
7/4/00	Chum	Purchased	0	3	483	F	1427	2	12.5	0	0.009
7/4/00	Chum	Purchased	0	3	455	F	1423	1	0.8	0	0.001
7/4/00	Chum	Purchased	0	3	478	F	1487	2	12.5	0	0.008
7/4/00	Chum	Purchased	0	3	453	F	1179	2	13.1	0	0.011
7/4/00	Chum	Purchased	0	2	378	F	816	2	4.7	0	0.006
7/4/00	Chum	Purchased	0	3	503	M	2100	1	0.9	0	0.000
7/4/00	Chum	Purchased	0	3	482	M	1996	4	113.0	1	0.057
7/4/00	Chum	Purchased	0	2	428	M	1103	1	0.2	0	0.000
7/4/00	Chum	Purchased	0	3	468	F	1643	2	10.3	0	0.006
7/4/00	Chum	Purchased	0	3	520	M	1988	1	0.6	0	0.000
7/4/00	Chum	Purchased	0	2	440	F	1278	1	0.6	0	0.000
7/4/00	Chum	Purchased	0	3	485	F	1790	2	11.8	0	0.007
7/4/00	Chum	Purchased	0	3	503	M	2100	3	20.4	1	0.010
7/4/00	Chum	Purchased	0	3	504	M	1846	2	6.4	1	0.003
7/4/00	Chum	Purchased	0	2	448	M	1179	1	0.6	0	0.001
7/4/00	Chum	Purchased	0	2	470	M	1722	2	5.0	1	0.003
7/4/00	Chum	Purchased	0	3	455	F	1507	2	12.0	0	0.008
7/4/00	Chum	Purchased	0	3	505	M	1841	1	2.8	0	0.002
7/2/00	Chum	Not purchased	0	2	421	F	996	1	0.7	0	0.001
7/2/00	Chum	Not purchased	0	2	432	F	1071	2	6.8	0	0.006
7/3/00	Chum	Not purchased	0	2	407	M	894	1	0.2	0	0.000
7/3/00	Chum	Not purchased	0	2	377	M	577	1	0.4	0	0.001
7/3/00	Chum	Not purchased	0	2	390	F	776	2	3.8	0	0.005

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Table 2. (page 6 of 7)

Date	Species	status	fw age	sw age	Length (mm)	Sex	Weight (g)	Maturity Index	Gonad wt (g)	Maturity class.	GSI
7/3/00	Chum	Not purchased	0	2	393	F	822	2	5.1	0	0.006
7/3/00	Chum	Not purchased	0	2	408	F	839	2	7.8	0	0.009
7/3/00	Chum	Not purchased	0	2	392	F	795	2	4.5	0	0.006
7/3/00	Chum	Not purchased	0	2	423	F	866	2	6.0	0	0.007
7/3/00	Chum	Not purchased	0	2	389	F	747	2	5.4	0	0.007
7/3/00	Chum	Not purchased	0	2	436	F	910	2	6.2	0	0.007
7/3/00	Chum	Not purchased	0	2	418	M	916	1	0.2	0	0.000
7/3/00	Chum	Not purchased	0	2	411	M	885	1	0.6	0	0.001
7/3/00	Chum	Not purchased	0	2	396	F	837	2	5.7	0	0.007
7/3/00	Chum	Not purchased	0	2	408	M	1032	1	0.5	0	0.000
7/3/00	Chum	Not purchased	0	2	436	F	896	2	7.1	0	0.008
7/3/00	Chum	Not purchased	0	2	410	M	860	1	0.2	0	0.000
7/3/00	Chum	Not purchased	0	2	419	M	1048	1	0.2	0	0.000
7/3/00	Chum	Not purchased	0	2	378	M	649	1	0.4	0	0.001
7/3/00	Chum	Not purchased	0	2	400	F	801	2	3.4	0	0.004
7/3/00	Chum	Not purchased	0	2	407	M	899	1	0.4	0	0.000
7/3/00	Chum	Not purchased	0	2	387	F	661	2	5.5	0	0.008
7/3/00	Chum	Not purchased	0	2	412	F	928	2	6.7	0	0.007
7/3/00	Chum	Not purchased	0	2	409	F	774	1	0.3	0	0.000
7/3/00	Chum	Not purchased	0	2	423	F	900	2	6.6	0	0.007
7/3/00	Chum	Not purchased	0	2	427	F	996	1	0.7	0	0.001
7/3/00	Chum	Not purchased	0	2	415	F	905	2	8.5	0	0.009
7/3/00	Chum	Not purchased	0	2	373	M	704	1	0.2	0	0.000
7/3/00	Chum	Not purchased	0	2	400	F	804	2	5.8	0	0.007
7/3/00	Chum	Not purchased	0	2	443	F	969	2	6.9	0	0.007
7/3/00	Chum	Not purchased	0	2	411	F	879	2	7.7	0	0.009
7/3/00	Chum	Not purchased	0	3	496	?	1363	1	0.3	0	0.000
7/4/00	Chum	Not purchased	0	2	418	F	926	1	0.4	0	0.000
7/4/00	Chum	Not purchased	0	2	430	M	1037	1	0.5	0	0.000
7/4/00	Chum	Not purchased	0	2	409	F	985	1	0.4	0	0.000
7/4/00	Chum	Not purchased	0	3	455	F	1186	2	12.7	0	0.011
7/4/00	Chum	Not purchased	0	2	434	M	1040	1	0.4	0	0.000
7/4/00	Chum	Not purchased	0	2	366	F	634	2	3.6	0	0.006
7/4/00	Chum	Not purchased	0	2	438	M	1240	1	0.3	0	0.000
7/4/00	Chum	Not purchased	0	2	426	F	944	1	0.4	0	0.000
7/4/00	Chum	Not purchased	0	2	413	M	895	1	0.1	0	0.000
7/4/00	Chum	Not purchased	0	2	459	M	1436	1	0.7	0	0.000
7/4/00	Chum	Not purchased	0	2	411	F	843	2	5.3	0	0.006
7/4/00	Chum	Not purchased	0	2	402	F	877	1	0.3	0	0.000
7/4/00	Chum	Not purchased	0	2	400	F	833	2	6.7	0	0.008
7/4/00	Chum	Not purchased	0	2	403	F	875	2	5.5	0	0.006
7/4/00	Chum	Not purchased	0	3	466	F	1268	2	9.1	0	0.007
7/4/00	Chum	Not purchased	0	2	414	F	937	2	3.9	0	0.004
7/4/00	Chum	Not purchased	0	2	424	F	1061	1	0.6	0	0.001
7/4/00	Chum	Not purchased	0	2	421	F	842	2	5.8	0	0.007
7/4/00	Chum	Not purchased	0	2	417	F	943	2	5.4	0	0.006
7/4/00	Chum	Not purchased	0	2	404	F	863	1	0.2	0	0.000

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Table 2. (page 7 of 7)

Date	Species	status	Fw age	Sw age	Length (mm)	Sex	Weight (g)	Visual Mat. Index	Gonad wt (g)	GSI maturity	GSI
7/4/00	Chum	Not purchased	0	2	397	F	827	2	5.8	0	0.007
7/4/00	Chum	Not purchased	0	2	432	F	1001	2	7.9	0	0.008
7/4/00	Chum	Not purchased	0	2	396	M	869	1	0.3	0	0.000
7/4/00	Chum	Not purchased	0	2	382	F	689	1	0.2	0	0.000
7/4/00	Chum	Not purchased	0	2	413	F	973	2	7.1	0	0.007
7/4/00	Chum	Not purchased	0	3	458	F	1094	2	7.7	0	0.007
7/4/00	Chum	Not purchased	0	2	396	M	770	1	0.1	0	0.000
7/4/00	Chum	Not purchased	0	2	383	F	736	2	4.9	0	0.007
7/4/00	Chum	Not purchased	0	3	463	F	1323	2	11.5	0	0.009
7/4/00	Chum	Not purchased	0	2	408	F	885	2	4.6	0	0.005
7/4/00	Chum	Not purchased	0	2	420	M	920	1	0.2	0	0.000
7/4/00	Chum	Not purchased	0	3	437	M	1191	1	0.6	0	0.001
7/4/00	Chum	Not purchased	0	2	420	M	1063	1	0.4	0	0.000
7/4/00	Chum	Not purchased	0	2	411	F	910	2	6.5	0	0.007
7/4/00	Chum	Not purchased	0	2	427	F	940	2	7.2	0	0.008
7/4/00	Chum	Not purchased	0	2	439	F	972	2	7.5	0	0.008
7/4/00	Chum	Not purchased	0	3	432	F	1067	2	10.0	0	0.009
7/4/00	Chum	Not purchased	0	2	426	M	888	1	0.2	0	0.000
7/4/00	Chum	Not purchased	0	2	377	F	700	2	3.1	0	0.004
7/4/00	Chum	Not purchased	0	2	442	M	967	1	0.4	0	0.000
7/4/00	Chum	Not purchased	0	2	428	F	926	2	7.3	0	0.008
7/4/00	Chum	Not purchased	0	2	430	F	939	2	6.1	0	0.006
7/4/00	Chum	Not purchased	0	2	455	F	1021	2	8.5	0	0.008
7/4/00	Chum	Not purchased	0	2	396	F	762	2	4.8	0	0.006
7/2/00	Chinook	Gilled			293	M	487	4	15.7		0.032
7/2/00	Chinook	Gilled			364	?	751	1	0.1		0.000
7/2/00	Chinook	Gilled			360	?	705	1	0.1		0.000
7/3/00	Chinook	Gilled			410	F	991	2	2.8		0.003
7/3/00	Chinook	Gilled			368	F	876	1	0.8		0.001
7/3/00	Chinook	Gilled			348	M	666	1	0.1		0.000
7/4/00	Chinook	Gilled			313	M	547	1	0.2		0.000
7/4/00	Chinook	Gilled			359	F	895	1	1.0		0.001
7/4/00	Chinook	Gilled			350	M	734	1	0.2		0.000
7/4/00	Chinook	Gilled			326	?	564	1	0.1		0.000
7/4/00	Chinook	Gilled			351	F	?	1	0.2		
7/3/00	Chinook	Not purchased			380	?	917	1	0.6		0.001
7/4/00	Chinook	Not purchased			384	F	1020	1	1.8		0.002
7/4/00	Coho	Purchased	2	1	444	M	1520	4	52.9		0.035

Table 3. Length and age-at-maturity proportions from the South Peninsula Post-June immature test fishery sockeye and chum salmon maturity samples, July 2-4, 2000 (determined using GSI).

	#	% Mature	% Female	Average Length (mm)	% Males Mature	% Females Mature
Sockeye Salmon						
Gilled	44	45	57	382	79	20
Not Purchased	25	68	28	403	89	14
Purchased [a]	69	84	58	449	86	83
Total	138	69	52	419	85	54
Age .1	19	84	16	346	100	0
Age .2	114	65	56	428	80	53
Age .3	5	100	100	491	n/a	100
Chum Salmon						
Gilled	46	0	61	389	0	0
Not Purchased	75	0	71	416	0	0
Purchased [a]	45	16	58	468	21	12
Total	166	4	64	423	7	3
Age .2	127	1	64	406	2	0
Age .3	37	16	65	475	23	13

[a] Samples were selected from the smaller-sized fish in the "Purchased" population and are therefore not representative of the purchased population as a whole.

Table 4. Methods used to assess number of immature salmon present in the 2000 Post-June immature test fishery.

Date	Number of Sets	Number of Immature Salmon			
		Number Gilled	Inseason Estimate	GSI Estimate	Length Frequency Estimate
2-Jul					
Sockeye		8	11	5	7
Chum		6	8	10	9
Chinook		3	3	3	3
Total	3	17	22	18	19
3-Jul					
Sockeye		12	26	15	16
Chum		12	48	59	49
Chinook		3	4	4	4
Total	5	27	78	78	69
4-Jul					
Sockeye		24	40	23	27
Chum		29	70	91	81
Chinook		5	6	6	6
Total	5	58	116	120	114
Species Total					
Sockeye		44	77	43	50
Chum		47	126	160	139
Chinook		11	13	13	13
Grand Total	13	102	216	216	202

Note:
Number gilled: number of salmon actually "gilled" in the seine web.

Inseason Estimate: estimated number of immature salmon consisting of the sum of sockeye under 440 mm in length (MEF) and chum and chinook salmon under 450 mm.

GSI estimate: number of sampled salmon in the catch that were classified as mature based upon analysis of the GSI.

Length frequency estimate: estimated number of immature salmon consisting of an informal length-based function based on the number and lengths of sockeye, chum, and chinook salmon under 460 mm.

Table 5. Summary of parameter estimates and associated standard error for the sockeye salmon length-at-maturity logistic models.

	Female Sockeye Salmon		All sockeye (w/o "jacks")	
Parameters	Estimate	Standard Error	Estimate	Standard Error
m_∞	1.000	0.116	1.000	0.191
κ	0.0738	0.0303	0.0213	0.0093
γ	432.8	5.7	398.8	22.9

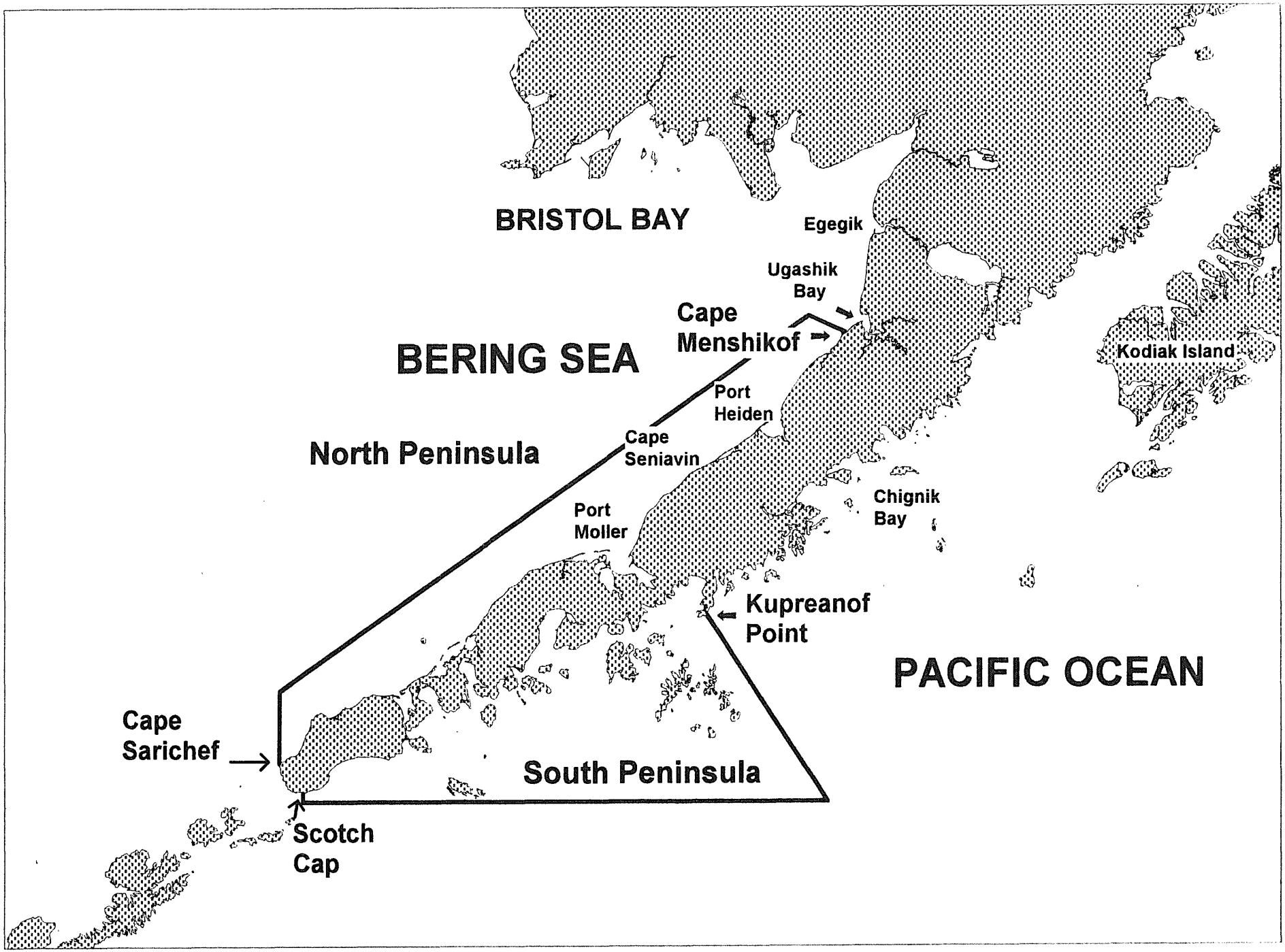


Figure ap of the Alaska Peninsula Management Area, with the North a South Peninsula defined.

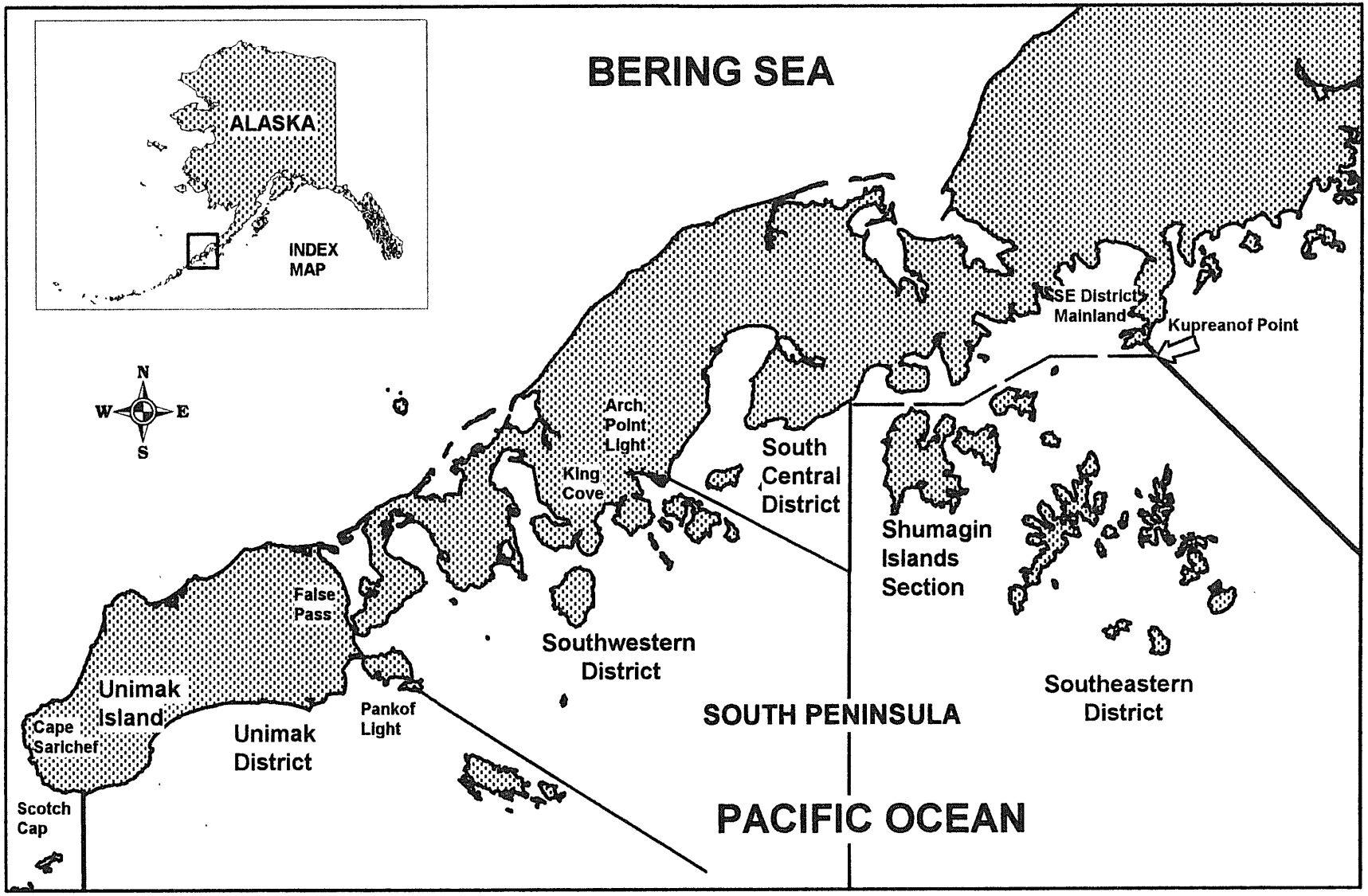
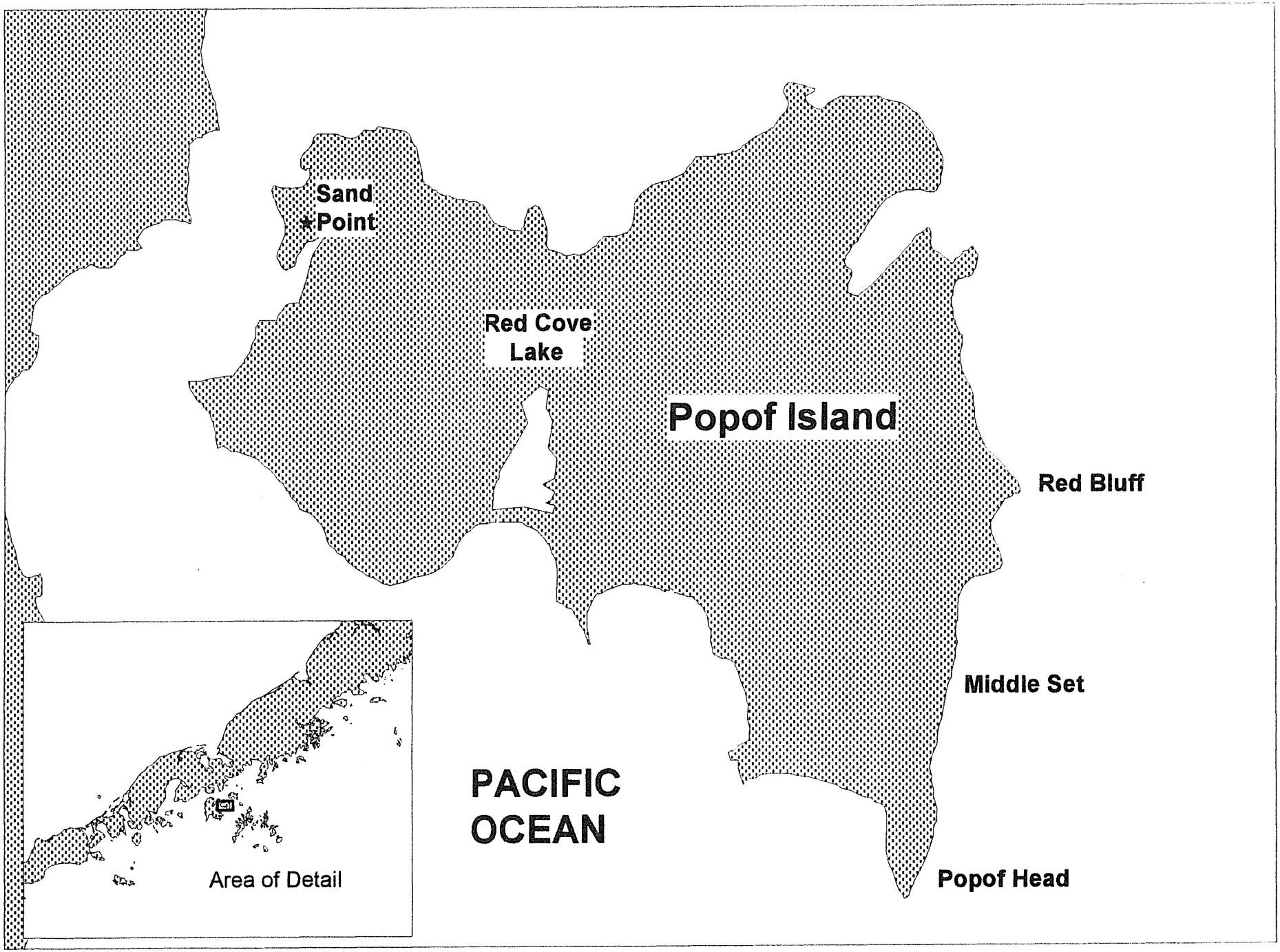


Figure 2. Map of the South Alaska Peninsula Management Area with the commercial salmon fishing districts defined.



Figur('ap of Popof Island with the test fishing sites at Popof Head, M` `` Set and Red Bluff defined.

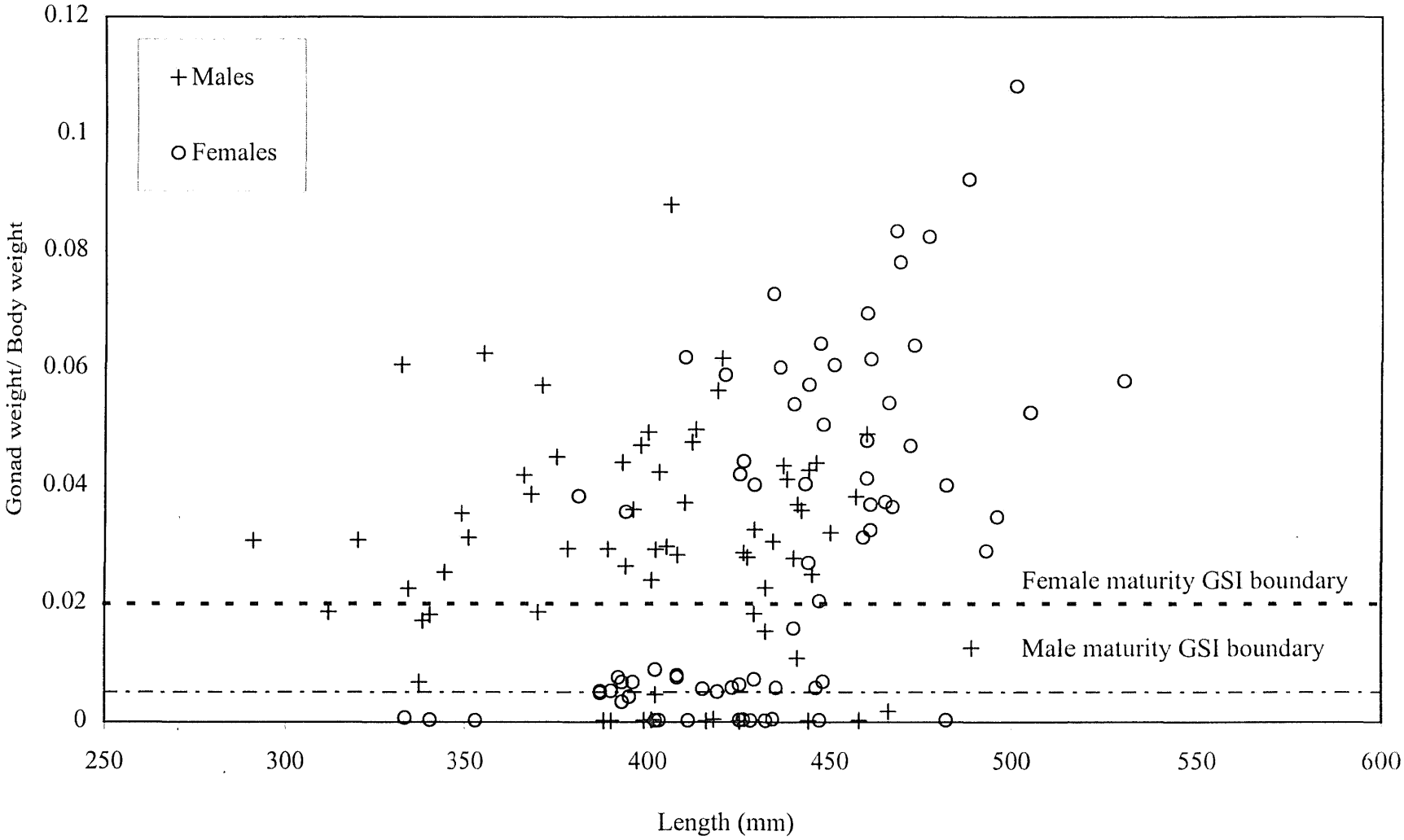


Figure 4. Sockeye salmon gonadosomatic index (GSI), July 2000.

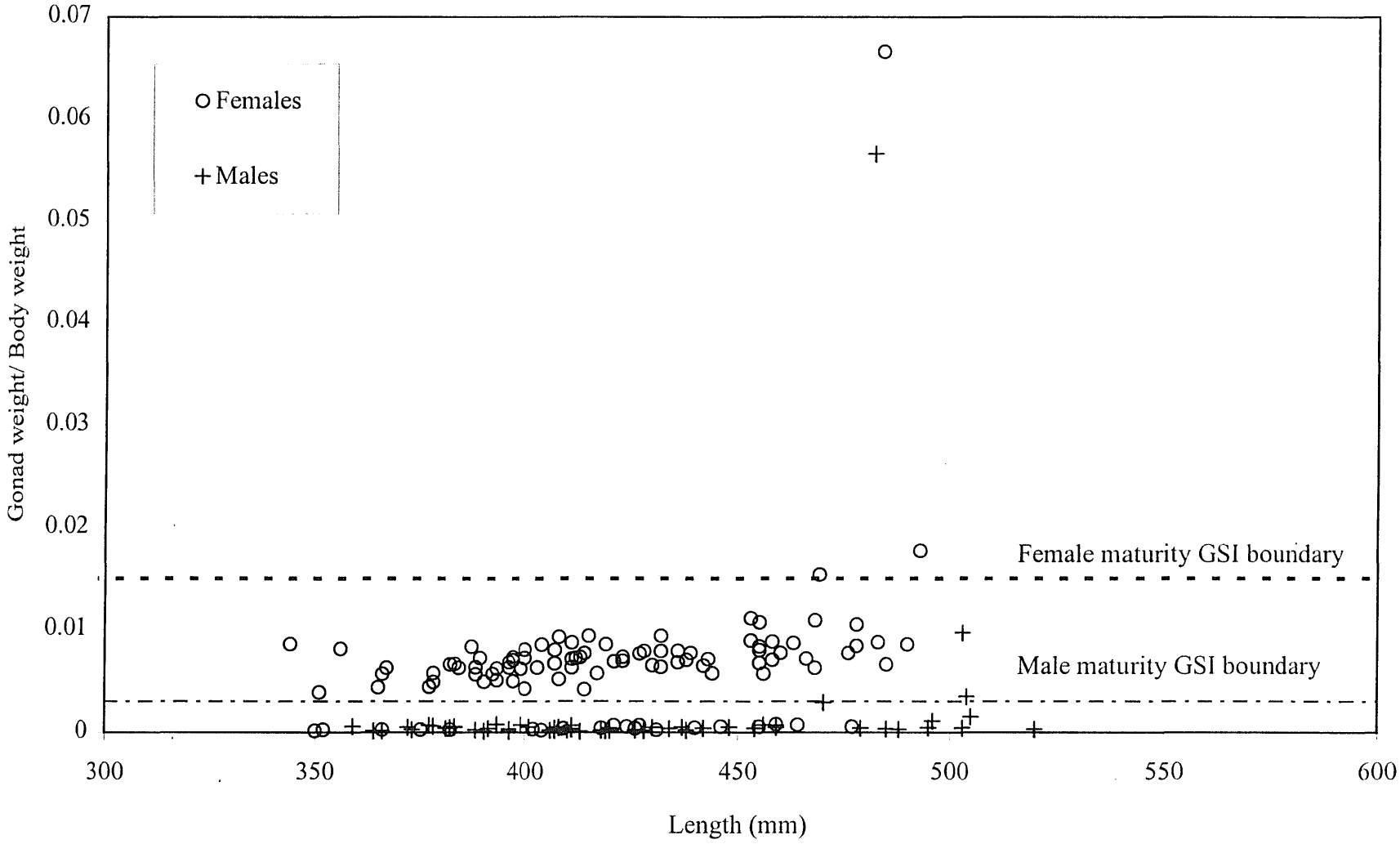


Figure 5. Chum salmon gonadosomatic index (GSI), July 2000.

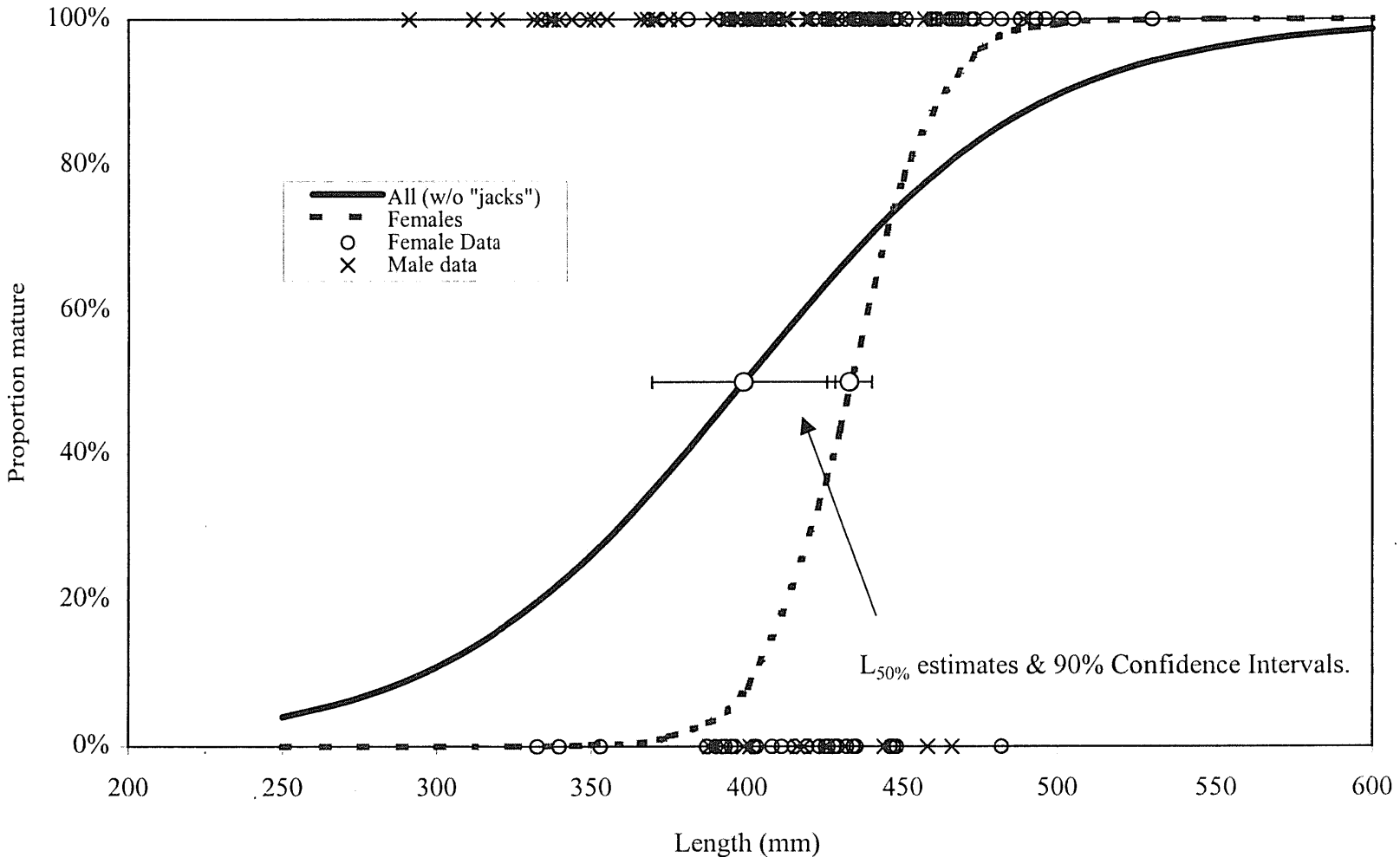


Figure 6. Sockeye salmon length at maturity.