

M E M O R A N D U M

TO: Council, SSC, and AP Members
FROM: Jim H. Branson
Executive Director
DATE: September 15, 1982
SUBJECT: Status of Contracts and Proposed Projects

ACTION REQUIRED

Approve continued funding for the Incidental Salmon Catch Study (81-5) and funding for a Halibut Limited Entry Sociocultural Study. There will be a progress report on the joint venture analysis.

BACKGROUND

Current Council contracts are listed below with contract information on the contractor, funding amount, percent expended to date, duration, objective, and status. Those contracts requiring Council action at this meeting are indicated with an asterisk.

Current Council Contracts

*81-5: Incidental Salmon Catch Study
(FRI/UW, \$56,840, 52%, October 1, 1981 to September 30, 1982)

Objective: To determine the feasibility of using scale analysis to identify the stream or area of origin of chinook salmon caught incidentally in the foreign trawl fisheries off Alaska.

Status: An annual progress report was received on September 9 and distributed to the SSC for review. The contractor has recommended continuation of funding for the second year from October 1, 1982 through September 30, 1983. The first and second years were projected to cost \$56,840 and \$52,090, respectively. The total of \$108,930 originally agreed to exceeds the \$100,000 provided by NMFS. Council approval is needed to continue this contract into its second year and reprogram where necessary to provide the extra \$8,930 to complete the study. Copies of the contract and the annual report are included here as E-1(a) and (b).

82-2: Crab Observer Program
(ADF&G, \$69,489, 0%, April 1, 1982 to March 15, 1983)

Objective: To gather in-season catch data on species and sex composition, size frequency, fecundity, and discards.

Status: Field work began on September 1, 1982 and a status report should be available at this meeting.

82-3: An Economic Profile of the Southeast Alaska Salmon Industry
(UA, \$10,000, 1%, April 1 to September 30, 1982)

Objective: To provide current data on effort, costs and earnings in the Southeast Alaska salmon fisheries.

Status: The first progress report for work through June 30, 1982 was received on July 7 and distributed to the SSC for review. A draft final report is due in December 1982.

82-4: Halibut Limited Entry Study
(NW Res. Analysis, \$73,000, 40%, June 1, 1982 to February 28, 1983)

Objective: To fully evaluate a share-type halibut limited entry system for Alaska; from design of the system to analysis of its impact on income, prices, geographic distribution and product quality in the harvesting, processing, and marketing sectors; and to generally evaluate other types of limited entry systems.

Status: A contractor's report and workgroup recommendations were presented at the July Council meeting. The steering group should now have received a progress report from the contractor. Final report should be available at the December Council meeting.

Marine Mammal Workshop

In July, the Council and SSC tentatively committed up to \$10,000 for a workshop on marine mammal-fisheries interactions and modeling. The Marine Mammal Commission has committed \$5,000 and other agencies will be requested to chip in once we have the costs estimated. A small planning group will meet informally in Sitka to determine participation in the workshop and its total costs. The SSC already has received the workshop's draft scope of work for review [see agenda item E-1(c)]. The workshop is tentatively set for late February or early March 1983 in Anchorage.

*Halibut Limited Entry Sociocultural Study

Since July, the Council has supported a sociocultural study examining fishermen's perceptions of the proposed share-type limited entry system for the halibut fisheries off Alaska. We now need to develop information responding to MFCMA requirements that we consider the cultural and social framework relevant to a fishery for which limited entry is proposed. NMFS has approved \$25,000 for this study and Council approval is needed to proceed with it as described in agenda item E-1(d).

*Joint Venture Analysis

Work will be commencing soon on this analysis with funding support from the Northwest and Alaska Fisheries Center. A report should be available in December. Dr. Rich Marasco will give a progress report at this meeting.

FRI-UW-8215
September, 1982

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DETERMINATION OF STOCK ORIGINS OF CHINOOK SALMON
INCIDENTALLY CAUGHT IN FOREIGN TRAWLS IN THE ALASKA FCZ

by

Katherine W. Myers and Donald E. Rogers

ANNUAL REPORT
Contract No. 81-5
October 1, 1981 to September 30, 1982
North Pacific Fishery Management Council



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Submitted September 3, 1982

R. L. Burgner
Director
by *SSmith*

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DETERMINATION OF STOCK ORIGINS OF CHINOOK SALMON
INCIDENTALLY CAUGHT IN FOREIGN TRAWLS IN THE ALASKA FCZ

Annual Report for October 1, 1981 to September 30, 1982

INTRODUCTION

This is a report on the first year of a two-year project to determine stock origins of incidental catches of chinook salmon (Oncorhynchus tshawytscha) in foreign groundfish fisheries of the U.S. Fishery Conservation Zone (FCZ) of Alaska. Our purpose during this first year was to determine the feasibility of using scale pattern recognition techniques to determine region or stream origins of chinook in samples collected by U. S. observers in 1978, 1979, and 1981.

Chinook salmon is the least abundant species of Pacific salmon in Alaska (Major et al. 1978). However, since the enactment of the Magnuson Fishery Conservation and Management Act of 1976, observers placed aboard foreign groundfish vessels operating in the Alaska FCZ have found that chinook often account for over 90% of the incidental salmon catch in the Bering Sea/Aleutian Islands and Gulf of Alaska regions (Table 1). Estimated incidental catches of over 100,000 salmon in foreign groundfish fisheries in the Bering Sea/Aleutian Islands region in 1979 and 1980 (Table 2) amounted to more than 1/3 the average annual commercial harvest of 261,000 chinook salmon in Western Alaska since 1963 (Meacham 1980). Incidental catches of this magnitude are likely to have a significant impact on commercial, subsistence, and sport chinook fisheries (Fig. 1), as well as on escapement of mature adults to the spawning grounds (Table 3).

Tagging, scale, maturity, and distribution studies summarized by Major et al. (1978) indicate that the probable area of origin of chinook salmon stocks in the eastern Bering Sea is Western Alaska. Meacham (1980) reported that over 90% of the chinook salmon produced in Western Alaska probably originate in the Nushagak, Kuskokwim, and Yukon rivers.

Much less is known about the origins of chinook salmon in the Gulf of Alaska, but they are thought to represent a mixture of stocks originating along the North American coast from California to Central Alaska (Major et al. 1978). The relative contributions of individual streams or areas within this large geographical area to chinook populations in the Gulf of Alaska have not been well defined.

Scale pattern analysis has been used for many years to identify stocks of Pacific salmon (Major et al. 1972). However, early attempts at separating stocks of chinook salmon using univariate statistical techniques were, largely, unsuccessful (Rowland 1969; Bohn and Jensen 1971). More recently, discriminant function analyses of scale characters have resulted in reasonably high classification accuracies for determining origins of chinook in mixed stock fisheries (Major et al. 1978; McBride 1981).

Our objectives were 1) to determine if freshwater age patterns and freshwater-marine growth patterns on the scales of selected major coastal chinook stocks allow area or stream-of-origin separation, and 2) to determine if chinook scale samples collected by U. S. observers on foreign groundfish vessels in the Alaska FCZ in 1978, 1979, and 1981 are

adequate for stock separation analyses. If stock separation by scale pattern analysis proves feasible, chinook unknowns in the 1978, 1979, and 1981 foreign trawl catches in the Alaska FCZ will be classified to region or stream-of-origin.

METHODS

Inshore Scale Samples

Information on chinook stocks, particularly those in the Gulf of Alaska, is limited (Major et al. 1978). Therefore, initial analyses should include all major hatchery and wild chinook stocks from California to the Yukon River and Asia. Because our funding does not provide for such an extensive amount of scale collecting, collection of inshore chinook scale samples is being conducted, primarily, by personnel on a Fisheries Research Institute (FRI) project funded by the Alaska Department of Fish and Game (ADF&G) to determine origins of chinook salmon caught by the Japanese mothership fishery (1975-1981). Samples collected to date are listed in Rogers et al. (1982), and include 1975-1981 scales of North American stocks from the Sacramento River in California to the Yukon River in Western Alaska, and 1975-1980 scales of Asian stocks from the Bolshaya and Kamchatka rivers. However, the inshore sample collection is not yet complete and several notable gaps occur. In particular, very few samples for Central and Southeast Alaskan stocks have been collected.

For our feasibility study we decided to select inshore samples from one year during the period of interest (1978-1981) that had the best regional coverage. Although none of the yearly inshore samples for this period are complete, we decided to use the 1980 sample. This sample included a recently received collection of Kamchatka River and Bolshaya River chinook scales provided by the U.S.S.R.'s Pacific Scientific Institute of Fisheries and Oceanography (TINRO). In addition, 1980 was the only year for which we had obtained scale samples from the Columbia River, the major producer of chinook salmon in the Oregon-Washington region.

Trawl Scale Samples

The trawl scale samples were collected by U.S. observers aboard foreign groundfish vessels in the Alaska FCZ in 1978, 1979, and 1981. The scales, data forms, and sample and biological data stored on magnetic tape were provided by the National Marine Fisheries Services (NMFS, Northwest and Alaska Fisheries Center).

The scale samples consisted of a scraping of scales taken from each fish and smeared on the inside of a small Manila envelope. The outside of the envelope was marked with some identification, usually a scale number, haul/set number, date, species, and scale zone.

The scale zone refers to the area of the fish where the scale sample was taken. Observers are provided by NMFS with a diagram showing the location of preferred scale sampling (Fig. 2). When observers did not collect scales from Zones A or B (Fig. 2), they usually wrote on the scale

envelope the area of the fish from which scales were collected. This information is of particular importance to our study. Because the inshore scale samples that we will use to classify the trawl unknowns are taken from the preferred area of the fish (Fig. 2), a valid scale pattern analysis will require the use of only those trawl scale samples taken from or near this area.

Preparation, Aging, and Measurement

Laboratory preparation and visual aging of chinook salmon scales was done using techniques similar to those described by Koo (1962) and Clutter and Whitesel (1956). Because chinook salmon are known to have a large number of regenerated scales, non-regenerated scales, identified by their small, regularly shaped nucleus, were selected under a binocular microscope for trawl and unprocessed inshore scale samples. One scale was selected per fish, and if all of the scales in a sample were regenerated, a scale showing the least amount of regeneration was selected.

Aging and measurement of 1980 inshore samples and 1978, 1979, and 1981 trawl samples was done by one experienced fish scale technician to maintain consistency in interpretation throughout the analysis. Inshore scale samples provided by resource agencies were re-aged using a standard set of criteria established by aging chinook of unknown origin in the trawl samples. Briefly, annuli were identified by a decrease in circuli spacing and thickness, and by breakage and inter-braiding of circuli. Thickness and spacing of freshwater circuli was less than thickness and spacing of ocean circuli.

Measurements and counts of freshwater and marine scale characters were made on 1980 inshore scale samples using a micro-computer based digitizing system developed by FRI in 1979 for INPFC-related research (Harris et al. 1980). Acetate impressions of the scales were re-projected onto the digitizing surface at 100 power, and counts and measurements were made along a radius approximately 17.5 degrees dorsad or ventrad from the anterior-posterior axis of the scale. The distance to the outer edge of every circulus in the freshwater and first ocean zone was measured and recorded on floppy disc. A subset of up to 100 scales for each major age class was measured for each stock in the 1980 samples.

Character Selection

Thirty-six scale characters were generated from the raw scale data (Table 4). From these a subset of six characters were chosen using the method of Cook and Lord (1978). Briefly, a Kruskal-Wallis H-statistic (Kruskal and Wallis 1952) and the difference between the average sum of ranks for each pairwise class combination were calculated. Characters having the largest H-statistic, the greatest pairwise differences, and the least dependence on each other were chosen.

Construction and Classification of Training Samples

The major chinook producers in Western Alaska are the Yukon, Kuskokwim, and Nushagak rivers (Meacham 1980), and the major producers in Asia are thought to be the Kamchatka and Bolshaya rivers on the Kamchatka Peninsula. Because chinook of Asian and Western Alaskan

origin are likely to be the major stocks present in the Bering Sea trawl samples (Major et al. 1978), we conducted an analysis in which four major stocks from Asia and Western Alaska in 1980 were classified: 1) the Kamchatka River; 2) the Bolshaya River; 3) the Yukon River; and 4) the Nushagak River. There were too few scales to construct a training sample for 1980 Kuskokwim River chinook.

Much less is known about the origin and composition of chinook stocks in the Gulf of Alaska. Therefore, Gulf of Alaska stocks will probably only be separable on the basis of large geographic areas. A second analysis was performed in which stocks were grouped according to four major geographical regions: 1) Asia; 2) Western Alaska; 3) British Columbia; and 4) Oregon-Washington. The 1980 inshore samples did not contain enough scales of Central or Southeast Alaskan chinook to construct standards for these regions. However, the British Columbia sample includes stocks returning to the major chinook producing streams in Southeastern Alaska.

Training samples or standards of selected scale characters for each region or stream to be classified were constructed from the digitized scale samples. Because there is no information on population sizes of Asian and most Western Alaskan stocks, sample sizes of stocks within the training samples were not proportionalized to reflect abundance. Initially, enough scales (up to 100) of each major age class and stock were digitized to insure an adequate sample size when training sample construction was determined. This sample size is large enough to keep the variance of mixing proportion estimates low (Cook, unpublished manu-

script), yet small enough to maintain reasonable computer costs. When digitized samples were greater than 200 scales, a random sample of up to 200 scales for each region or stock was selected. Within each region or stock samples were pooled over ocean age class. Only freshwater age 1. chinook were used in these analyses, as this is known to be the predominant age class in Asian and Western Alaskan stocks (Vronskiy 1972; McBride and Wilcock, unpublished manuscript).

Training samples were classified using a direct density, leaving-one-out approach (Cook 1982) to establish the level of accuracy that would be obtained in classifying chinook in the trawl samples.

Adequacy of Trawl Samples

The adequacy of the trawl scale samples collected in 1978, 1979, and 1981 was examined in terms of quality and quantity. In terms of quality, scale samples were examined to determine if they were regenerated, and regeneration rates were calculated. In addition, the body zone of each scale sample was coded and tallied. In terms of quantity, we determined if sample sizes were "area-significant," i.e., if enough fish had been sampled from each area to make a classification to region or stock meaningful. The number of non-regenerated scales taken from in or near the preferred area was tallied by month within NMFS statistical areas (Fig. 3) for predominant age classes in the trawl samples. Sample sizes greater than or equal to 25 fish were considered to be area-significant. These will be the largest time-area strata and smallest sample sizes used to make point estimations of mixing proportions of chinook salmon stocks in the Alaska FCZ.

RESULTS

Age Composition of 1980 Inshore Samples

The age composition of the inshore scale samples by stock and region is shown in Table 5. Age 1. was the predominant freshwater age class in both the Asian and Western Alaskan samples. ~~Only a small per-~~centage of freshwater age 0. fish were present in western Alaskan and Asian samples. Freshwater age 0. chinook were more prevalent to the south, and comprise a large percentage of the 1980 Fraser River sample.

The age composition of the 1980 Columbia River sample (Table 5) does not accurately reflect the true proportions of freshwater age 0. and 1. chinook in this river. This sample was collected in spring chinook test fisheries during April, and consists primarily of age 1. hatchery chinook. The 1980 Columbia River spring chinook test fishery samples were specifically requested from the Oregon Department of Fisheries and Wildlife when it became apparent that our analyses would involve only freshwater age 1. chinook.

The predominant ocean age classes in the 1980 samples were .2's, .3's, and .4's (Table 5). Age .4 chinook were predominant in the Kamchatka, Bolshaya, and Yukon rivers, and age .3's were predominant in the remaining Western Alaska, British Columbia, and Oregon-Washington samples. The percentage of age .2 chinook was highest in the Washington-Oregon region; however, the proportions of age .2 chinook, particularly in the Western Alaskan samples, are affected by the proportions of the

catch made with chinook (about 8 1/2" mesh) and sockeye (about 5 3/8" mesh) gillnet gear.

Regeneration rates for the 1980 inshore scale samples are also shown in Table 5. Regeneration rates were very high (51.4%) for Western Alaska samples where only one scale per fish was mounted, and lowest for the Asian samples (8.8%) which were selected under a binocular microscope. As we re-aged the Western Alaskan samples, we found that many of the regenerated scales had been assigned a freshwater age of 1. by ADF&G scale readers.

Stock Separation Analyses

The total number of 1980 chinook salmon scales digitized and the sample sizes used in the four-way region and river stock separation analyses are shown by region, stock, and age in Table 6. The number of stocks available in our 1980 British Columbia scale collection was quite large, and because of time limitations we chose to use scales only from the Fraser River, the major producer of chinook salmon in British Columbia, and from the Taku, Stikine, and Alsek rivers, as these are the major chinook producers in Southeastern Alaska. The number of stocks available in our 1980 Washington scale collection was also quite large, but the percentage of age 1. chinook in these samples was very low. Therefore, we chose to use only the scale samples from the Columbia River, the major producer of age 1. chinook in the Oregon-Washington region.

The difference between the average ranks of categories and the Kruskal-Wallis H-statistic for each scale character for pooled age 1.2, 1.3, and 1.4 chinook used in the four-region and four-river analyses are shown in Tables 7 and 8, respectively. The numbered scale characters listed in Tables 7 and 8 are described in Table 4. The six scale characters chosen for each analysis are marked with asterisks (Tables 7 and 8). The means, standard deviations, and frequency distributions of the scale characters chosen for the four-region and four-river analyses, respectively, are shown in Appendix Figures 1 and 2. For the regional analysis, the best characters for separating Oregon-Washington from the other three regions were in the freshwater zone, and the best characters for separating Asia, Western Alaska, and British Columbia were in the first ocean zone. In general, means of circuli counts and measurements in the first ocean zone were considerably lower for Asian than for North American chinook. However, mean values of characters in the freshwater zones of Kamchatka and Yukon chinook were similar, and could lead to misclassification errors.

The results of classifying the four regional standards are shown in Table 9. The percentages of fish correctly classified as Asia, Western Alaska, British Columbia, and Oregon-Washington were 80.0, 84.0, 75.0, and 89.9%, respectively. The overall accuracy was 82.2%. Misclassification errors were greatest between British Columbia and Asia.

The results of classifying the four river standards are shown in Table 10. The percentages of fish correctly classified as Kamchatka River, Bolshaya River, Yukon River, and Nushagak River were 66.4, 82.7,

63.0, and 71.5%, respectively. The overall accuracy was 70.9%. Misclassification errors were greatest between rivers within the same regions.

Adequacy of Trawl Scale Samples

A summary of NMFS data on the numbers of chinook sampled for scales by U.S. observers on foreign trawlers in the Alaska FCZ by area and month, 1977-1981, is shown in Table 11. The 1977 and 1980 samples were collected, primarily, for species identification, and will not be used for stock separation analyses. These original sample sizes include the scales of chum salmon (O. keta) mistakenly identified as chinook salmon by U.S. observers in 1978 (n=16), 1979 (n=8), and 1981 (n=29), and scale samples from two cruises in 1978 (n=57), one cruise in 1979 (n=23), and one cruise in 1981 (n=14) that were lost at the NMFS lab (Northwest and Alaska Fisheries Center).

Regeneration rates calculated for the 1978, 1979, and 1981 samples by NMFS statistical areas and ocean age classes are shown in Table 12. Compared to regeneration rates in some of the regional standards (Table 5), regeneration rates in the observer samples were low. Within a particular year, regeneration rates appear to be similar for all ocean age classes. Total regeneration rates decrease over the period from 1978 through 1981; and this is probably related to increased skill of scale technicians or observers in selection of non-regenerated scales.

The body zone composition of the 1978, 1979, 1981 trawl scale samples is shown in Table 13. Zones A and B are shown in Fig. 2, and

Zone C represents a scale that could have been taken from any area of the body, except Zones A or B. By convention, scale samples collected from both Zone A and B were coded as Zone B scales. When observers were more specific than coding Zone C, these areas (usually near body fins) were tallied if more than one sample was collected from a particular body area. The category "other" in Table 13 represents ~~samples taken~~ from unique body areas or samples in which scales were taken from more than one body area. In general, Table 13 shows that scale samples collected by U.S. observers were taken from many different areas of the fish. In 1978 over 40% of the samples had no zone indicated on the scale packets, this percentage decreased to less than 0.5% in the 1981 samples, indicating an improvement in observer sampling techniques. With the exception of the 1978 Bering Sea samples, percentages of scales taken from the preferred (Zone A) or adjacent (Zone B) areas was usually high (> 75%).

Sample sizes of 1978, 1979, and 1981 trawl chinook samples usable in stock separation analyses by month, age class, and NMFS statistical areas are shown in Table 14. Only readable, non-regenerated scales taken from the preferred area of the fish (Zone A) or areas directly adjacent to the preferred area (Zone B) were included in these sample sizes. Observer samples for which a zone was not indicated were not included in the sample sizes since we have no established criteria for identifying preferred area scales. The largest area-time strata considered to be acceptable for a stock separation analysis were NMFS statistical areas by month. Samples were considered to be "area-significant" if they contained 25 or more fish. No samples for Bering

4, Yakutat, and Southeast (Fig. 3) were area-significant. Only four samples of freshwater age 0. fish pooled over ocean age classes were area-significant. All four of these samples were in Gulf of Alaska statistical areas (Shumagin, Nov. 1978; Kodiak, May 1979; and Chirikof, Oct. and Nov. 1980), and none were area-significant without pooling over ocean age classes. Twenty-nine samples of freshwater age 1 chinook pooled over ocean age classes were area-significant. Within these samples there were 4 area-significant samples for 1.1's, 20 for 1.2's, 10 for 1.3's, and 2 for 1.4's. The majority of the area-significant samples are in NMFS statistical areas: Bering 1 and Bering 2 (Fig. 3) during winter months (November-April). Several samples, particularly Bering 2 in February 1979 (n=1122), are large enough to divide into smaller area-time strata for a finer-grained analysis.

DISCUSSION

Use of Freshwater Age Patterns for Stock Separation

Chinook in the 1978, 1979, and 1981 trawl samples spent from zero to two winters in freshwater (Table 14). Age 2. fish accounted for less than 2% of readable scales in the trawl samples. Age 0. fish were more prevalent, but only accounted for about 11% of the total sample size. Approximately 75% of the age 0. chinook were collected in Gulf of Alaska statistical areas (Table 14). The predominant freshwater age class was 1., comprising approximately 87% of the total sample of readable scales. The greatest number of readable scales in the trawl samples were collected in the eastern Bering Sea statistical areas (Table 14); and the

probable area of origin of eastern Bering Sea chinook stocks is Western Alaska (Major et al. 1978). The majority of chinook in our 1980 inshore samples from Western Alaska were also freshwater age 1. (Table 5), and, therefore, freshwater age appears to be of little use in determining detailed stock origins of chinook in the trawl samples.

One possible use of freshwater age patterns would be for a regional (Alaskan vs non-Alaskan) stock separation based on the assumption that all age 0. chinook are of non-Alaskan origin. Stock separations based on this assumption have been conducted on chinook caught in mixed stock fisheries in Southeastern Alaska (Kissner 1975). Although age composition of chinook stocks from the Yukon River to the Columbia River and from the Bolshaya and Kamchatka rivers in Asia were determined for only one year, the 1980 Western Alaska and British Columbia samples (Table 5) exhibit the well known geographical trend of increasing percentages of age 0. chinook in stocks from more southern regions. A recent compilation of age statistics on Alaskan chinook salmon (1961-1980) by the Alaska Department of Fish and Game (McBride and Wilcock, unpublished manuscript) finds that "virtually all Alaskan chinook stocks are of the 'spring' type exhibiting one winter's growth in the freshwater zone." However, our re-aged chinook scale data from 1980 western Alaskan stocks show a small percentage of age 0. fish, as well as other (primarily age 2.) age classes in Western Alaskan stocks (Table 5). We have already noted the tendency we found in our 1980 samples of Western Alaska stocks for agency scale readers to assign a freshwater age of 1., regardless of the appearance of the scale. The age 0. scales in our 1980 Nushagak

samples may be age 1. fish in which the annulus did not form in fresh-water or was masked by rapid estuarine growth. Chinook scales of this type have been reported by Tutty and Yole (1978). However, the presence of age 0. chinook in 1980 British Columbia samples (Table 5) suggests that age 0. chinook may also be present in southeastern Alaska sections of streams originating in British Columbia, especially since chinook originating in spawning groups near the ocean have a greater tendency to migrate to the ocean during their first year than fish originating farther upstream (Major et al. 1978). Therefore, until we have examined more inshore (particularly Southeastern Alaska) scale samples, we are reluctant to assume that all age 0. chinook are of non-Alaskan origin.

Use of Freshwater-Marine Scale Growth Patterns for Stock Separation

Overall classification accuracies of 82.2% were obtained for a four region analysis (Table 9) and overall accuracies of 70.9% were obtained for a four river analysis (Table 10) of 1980 chinook stocks. These accuracies are well above the lowest acceptable overall accuracy (60.0%) for a four-way classification using the techniques of Cook (1982), and demonstrate the feasibility of using scale pattern recognition techniques to determine region- or stream-of-origin of mixed stocks of chinook.

A major premise of previous high seas salmon stock separations using scale pattern recognition techniques has been that the most accurate classification is based on training samples constructed from scale characters of maturing fish of the same cohort (Harris et al. 1981). However, because the age of maturity of chinook caught incidentally in

the foreign groundfish fisheries is not known, a different strategy for training sample construction will have to be developed. We think the best classification results will be obtained by classifying chinook in the unknowns with chinook of the same freshwater age and brood year in the inshore samples. These fish will have resided in freshwater and entered the ocean at the same approximate time, and therefore, should have similar scale growth patterns in the freshwater and first ocean zone.

Because most of the inshore scale samples were collected well into 1982, we only had time to age and measure inshore samples from one year. For our analysis, we pooled all freshwater age 1. fish over ocean age class (Table 6). This same technique was used by Major et al. (1970) to construct training samples for classifying chinook caught in the mother-ship fishery. These classifications represent a "worst-case" analysis in that fish were pooled over brood year. We expect that even higher accuracies, particularly in stream-of-origin analyses, may be obtained with training samples constructed from fish of the same freshwater age and brood year.

Adequacy of Trawl Scale Samples

The scales of chinook salmon are highly deciduous, and this results in high regeneration rates in chinook scale samples. By selecting scales from the trawl samples under a binocular microscope we were able to obtain a regeneration rate of 8.6% for the entire sample (Table 12). This is relatively low when compared to regeneration rates as high as

51.4% in some of the 1980 inshore samples (Table 5). This rate is similar to that obtained for 1980 scales from the Kamchatka and Bolshaya rivers (8.8%; Table 5) that were processed using the same techniques, and is probably about the best rate that can be obtained from scrape samples of chinook scales taken from only one side of the body.

Chinook caught in the cod end of a trawl net with a large catch of groundfish may arrive on board completely scaled or with scales attached only to body areas protected by fins. In these cases, observers have sampled scales from any part of the body where scales are still present. With the exception of the Bering Sea samples in 1978 (Table 13), observers usually noted the area of the body from which scales were sampled. The majority of the trawl scale samples were taken either from Zone A or Zone B (Fig. 2; Table 13).

Several studies have shown that counts and measurements of circuli on the scales of salmon vary with sample location on the body (Clutter and Whitesel 1956; Hayashi and Kitahara 1959; Kondo and Kitahara 1962; Lalanne 1963; Anas 1963, 1964; and Scarnecchia 1979). Therefore, one of the requirements for a valid scale pattern analysis is that all of the scales should be taken from approximately the same area on the fish. In a statistical comparison of scale characters, Scarnecchia (1979) found that counts and measurements on the scales of coho salmon taken from the preferred area (Zone A; Fig. 2) and areas adjacent to the preferred area (Zone B; Fig. 2) were not significantly different; scales taken from other areas of the body (Zone C) were significantly different than preferred scales. Therefore, we think that a valid scale pattern analysis

of the trawl samples requires that we use only those scales taken from Zones A and B on the fish.

The largest area-time strata considered to be acceptable for a stock separation analysis were NMFS statistical areas (Fig. 3) by month; and samples were considered to be "area-significant" if they contained 25 or more fish. Using these criteria, a tally of non-regenerated scales taken from body Zones A and B found 33 area-significant samples for chinook of the same freshwater age pooled over ocean age in the 1978, 1979, and 1981 samples (Table 14). Most of these were age 1. fish caught in NMFS statistical areas in the eastern Bering Sea during winter months. Within these samples there were 36 area-significant samples for individual ocean age classes of freshwater age 1. fish; and several of these are large enough to divide into smaller area-time strata for a finer grained analysis. We think that this quantity of samples is adequate for a provisional classification of chinook stocks caught in foreign groundfish fisheries in the Alaska FCZ.

Recommendations to NMFS

In order to improve the quality and quantity of salmon scale samples collected by U. S. observers for future stock separation analyses, we have provided the NMFS with the following recommendations:

1. Always write the body area or zone from which the scale sample was collected on the scale envelope. If the scale sample was not collected from Zone A or B, the specific area, e.g., "underneath the pectoral fin," should be written on the scale envelope. Many observers,

particularly in 1978, did not write the scale zone on the envelope (Table 13).

2. Collect scales only from the preferred area (Zone A) whenever possible. We realize that in many cases there are no scales present in Zone A due to scaling in the net. ~~However, some observers were se-~~ consistent in collecting all of their scales from Zone B or another particular body area, we suspect they may not be aware that Zone A is the preferred area on salmon.

3. Collect a sample from both sides of the fish in Zone A to reduce the probability of samples in which all of the scales are regenerated. There were many samples in which most or all of the scales were regenerated in the freshwater portion of the scale. Grossly regenerated scales in which most of the circuli pattern is regenerated can be detected by holding them up to the light, and should be rejected before placing them into the sample envelopes.

4. Collect scale samples from only one zone on the body of the fish. Many of the observers have collected scales from two or more different body zones on the same fish. This may be because they think they have to collect a large sample of scales from each fish.

5. No more than 20 scales should be collected from each fish. For example, a sample of 20 scales, 10 from each side of the body in Zone A would be more than adequate. Many of the scale packets contained very large samples (up to 150 scales per fish). These samples may be so large because they are being collected as scrape samples with a knife.

6. Collect only scales that are still attached to the fish. Many of the scale packets contained the scales of non-salmonid species, indicating contamination from previously collected samples or from other fish whose scales were rubbed off onto the fish being sampled.

7. Clean the scales before placing them in the scale envelopes. Scales can easily be cleaned by rubbing them between the thumb and forefinger or on a cloth before placing them in the scale envelopes. Many of the scales in the '78 and '79 samples were so covered by slime and dirt that they had partially decomposed in the packets.

8. Use forceps instead of a knife to collect scale samples. This would enable the collection of a smaller sample of scales from a more precise area on the body, and would also aid in avoiding contamination from previously collected samples or unattached scales. In addition, individual scales collected with forceps could be cleaned and examined more easily than a scrape sample.

9. Collect scale samples from all fish that are weighed or measured for length. If the fish is already being handled to take a length measurement, it should only take a few more seconds to collect a scale sample. The collection of a scale sample from all of the fish for which length measurements were taken in 1978 and 1979 would have greatly improved our sample sizes, particularly, for Bering I and Bering II in 1979, Shumagin and Kodiak in 1978 and 1979, and Chirikof in 1978 (Table 15).

10. Improve the instruction sheet for observers showing the location of the preferred scale sampling zones. The preferred area on the body of the salmon is the area between the insertion of the dorsal fin and origin of the anal fin, but not more than four scale rows above or below the lateral line. Although the drawing of the salmon shows four scale rows in Zone B beneath the origin of the dorsal fin (Fig. 2), this is not adequately explained in the caption under the drawing. The sizes of the boxes enclosing A and B give the impression of including an area much larger than four scale rows above and below the lateral line, i.e., they reach over half-way to the dorsal fin (chinook salmon usually have about 27 scale rows between the base of the dorsal fin and the lateral line). Because the scales in many samples taken from individual fish and coded as Zone A or B contained a wide variety of shapes and sizes, and because the scale samples were often large (50-150 scales per fish), we suspect that some samples collected by observers and coded as Zone A or B were actually taken from a much larger vertical area. In addition, several observers coded scales as Zone "D". Although there is not a Zone "D" on the salmon drawing, there is one on the drawing of the herring at the bottom of the page (Fig. 2). Observers may be confusing the drawing of the herring with a salmon.

SUMMARY

A study was conducted from October 1, 1981 through September 30, 1982 to determine the feasibility of using scale pattern recognition techniques to determine region or stream origins of chinook in samples collected by U.S. observers on foreign groundfish vessels in the Alaska

FCZ in 1978, 1979, and 1981. Because the predominant freshwater age class in both the trawl samples and the 1980 inshore samples from Asia and Western Alaska was 1., freshwater age patterns will be of little use in determining detailed stock origins of chinook in the Alaska FCZ. High classification accuracies obtained for a four-region (82.2%) and four-river (70.9%) scale pattern analysis of ~~selected major coastal chinook stocks in 1980 demonstrate the feasibility of using freshwater~~ marine scale growth patterns to separate Asian and North American chinook stocks, as well as major Western Alaskan or Asian stocks, from each other. Out of 6,917 scales collected by U.S. observers in 1978, 1979, and 1981, a total of 4,895 or approximately 71.0% were non-regenerated scales taken from the preferred area or areas adjacent to the preferred area. Of these, 3,921 or approximately 80.0% were from "area-significant" ($n \geq 25$ fish when samples were stratified by month and NMFS statistical areas) samples. Although quality and quantity of U.S. observer samples could be improved, samples collected in 1978, 1979, and 1981 appear to be adequate for a provisional classification of chinook stocks caught by foreign groundfish fisheries in the Alaska FCZ.

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Table 1. The species composition (%) of Pacific salmon (*Oncorhynchus* spp.) in the Alaska FCZ foreign groundfish fishery, 1977-1980.

Area	Year	Chinook	Chum	Sockeye	Pink	Coho	Source
Bering Sea/ Aleutians	1977	91.0	9.0	0.0	0.0	0.0	(Nelson et al. 1981a)
	1978	87.8	10.8	NA	NA	NA	(Nelson et al. 1981a)
	1979	93.2	5.7	NA	NA	NA	(Nelson et al. 1980)
	1980	94.2	5.6	NA	NA	NA	(Nelson et al. 1981b)
Gulf of Alaska	1977	91.0	9.0	0.0	0.0	0.0	(Wall et al. 1981a)
	1978	93.1	2.1	2.2	1.0	1.6	(Wall et al. 1981a)
	1979	82.7	14.1	0.2	0.3	2.7	(Wall et al. 1980)
	1980	87.9	11.6	0.0	0.1	0.4	(Wall et al. 1981b)

Table 2. The estimated incidental catch (numbers and metric tons) of Pacific salmon (*Uncorhynchus* spp.) in the Alaska FCZ foreign groundfish fishery, 1977-1981.

Area	Year	No.	Metric Tons	Source
Bering Sea/ Aleutian	1977	47,840	197.9	(Nelson et al. 1981a)
	1978	44,548	137.0	(Nelson et al. 1981a)
	1979	107,706	340.1	(Nelson et al. 1980)
	1980	120,104	381.0	(Nelson et al. 1981b)
	1981	43,126	140.0	(NMFS, Northwest and Alaska Fisheries Center)
Gulf of Alaska	1977	5,272	19.3	(Wall et al. 1981a)
	1978	45,603	131.3	(Wall et al. 1981a)
	1979	20,410	68.7	(Wall et al. 1980)
	1980	35,901	106.9	(Wall et al. 1981b)
	1981	34,304	105.0	(NMFS, Northwest and Alaska Fisheries Center)

Table 3. Estimates¹ of chinook salmon escapements (wild and hatchery), 1976-1980 (fish in thousands.)

Year	California	Oregon- Washington	British Columbia	Southeast Alaska	Total
1976	258*	593	164	18	1,033
1977	258*	660	224	30	1,172
1978	290	702	196	20	1,208
1979	269	581	177	25	1,052
1980	216	643	190*	39	1,088
Average 1976-80	258	636	190	26	1,111
Average catch (all gear)	671	1,361	1,719**	339	4,090

*Estimate from average of other years.

**1976-1978 average only.

¹Data sources: Fredin (1980), INPFC (1979), Major et al. (1978), INPFC Statistical Yearbooks, PFMC proposed management plan for 1981, and personal communication with fisheries agencies (1978-1980 data).

Table 4. Scale characters examined for use in the discriminant function analyses of 1980 Age 1. chinook salmon (Onco-rhynchus tshawytscha) scale samples.

Character No.	Description ^a
1	Size zone 1
2	Size zone 2
3	Size zone 3
4	Size zone 1 + size zone 2
5	Size zone 2 + size zone 3
6	Size zone 1 + size zone 2 + size zone 3
7	No. circuli zone 1 + no. circuli zone 2 + no. circuli zone 3
8	Size zone 2/(size zone 1 + size zone 2 + size zone 3)
9	Ocean age
10	(Size zone 1 + size zone 2)/(size zone 1 + size zone 2 + size zone 3)
11	(Size zone 2 + size zone 3)/(size zone 1 + size zone 2 + size zone 3)
12	No. circuli zone 1
13	No. circuli zone 2
14	No. circuli zone 3
15	No. circuli zone 1 + no. circuli zone 2
16	No. circuli zone 2 + no. circuli zone 3
17	Size zone 1/no. circuli zone 1
18	Size zone 2/no. circuli zone 2
19	Size zone 3/no. circuli zone 3
20	(Size zone 1 + size zone 2)/(no. circuli zone 1 + no. circuli zone 2)
21	(Size zone 2 + size zone 3)/(no. circuli zone 2 + no. circuli zone 3)
22	Distance C1 to C3 in zone 3/size zone 3
23	Distance C4 to C6 in zone 3/size zone 3
24	Distance C7 to C9 in zone 3/size zone 3
25	Distance C10 to C12 in zone 3/size zone 3
26	Distance C13 to C15 in zone 3/size zone 3
27	Distance C16 to C18 in zone 3/size zone 3
28	Distance C19 to C21 in zone 3/size zone 3
29	Distance C22 to C24 in zone 3/size zone 3
30	Distance C25 to C27 in zone 3/size zone 3
31	Distance C28 to C30 in zone 3/size zone 3
32	Distance C31 to C33 in zone 3/size zone 3
33	Distance C34 to C36 in zone 3/size zone 3
34	Distance C1 to C9 in zone 3
35	Distance C10 to C18 in zone 3
36	Distance C19 to C27 in zone 3

^aZone 1: The area of the scale from the center of the focus to the outer edge of the last circulus in the freshwater annulus.

Zone 2: The area of the scale from the outer edge of the last circulus in the freshwater annulus to the outer edge of the last freshwater circulus.

Zone 3: The area of the scale from the outer edge of the last freshwater circulus to the outer edge of the last circulus in the first ocean annulus.

C = circulus

Table 5. Age composition of 1980 chinook salmon (Oncorhynchus tshawytscha) scale samples by stock and region.

Region	Stock	Age							Regene- rated ¹	Total
		1.2	1.3	1.4	0.2	0.3	0.4	Other		
Asia	Kamchatka R.	33	60	72	0	3	2	15	13	198
	Bolshaya R.	17	25	122	1	0	5	8	22	200
Total		50	85	194	1	3	7	23	35	398
% Total		12.6	21.4	48.7	0.2	0.7	1.8	5.8	8.8	100.0
Western Alaska	Yukon R.	47	392	320	0	0	0	32	776	1567
	Kuskokwim R.	7	43	13	0	0	0	5	72	140
	Nushagak R.	6	231	75	1	3	5	34	435	790
	Togiak R.	4	10	5	0	0	0	2	23	44
Total		64	676	413	1	3	5	73	1306	2541
% Total		2.5	26.6	16.2	0.1	0.1	0.2	2.9	51.4	100.0
British Columbia	Fraser R.	36	164	10	24	74	32	6	76	422
	Klukshu R. (Alsek R.)	4	16	32	0	0	1	0	32	85
	Stikine R.	27	55	49	0	3	1	8	44	187
	Taku R.	9	14	6	0	0	0	2	7	38
Total		76	249	97	24	77	34	16	159	732
% Total		10.4	34.0	13.3	3.3	10.5	4.6	2.2	21.7	
Oregon- Washington	Columbia R.	62	106	0	2	6	6	0	131	313
	% Total	19.8	33.9	0.0	0.6	1.9	1.9	0	41.9	100.0

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¹This column includes scales that are regenerated, damaged, missing or otherwise unreadable.

Table 6. Total number of 1980 chinook salmon scales digitized by region, stock, and age; and sample sizes used in the four-way region and river stock separation analyses by region, stock, and age.

Region	Stock	Age class									Total		
		1.2			1.3			1.4			Total digitized	Sample size	
		Total digitized	Region	River	Total digitized	Region	River	Total digitized	Region	River		Region	River
Asia	Bolshaya R.	17	10	17	22	16	22	100	69	100	139	95	139
	Kamchatka R.	30	23	30	59	35	59	69	47	69	158	105	158
	Region Total	47	33		81	51		169	116		297	200	
Western Alaska	Yukon R.	46	16	38	100	44	79	100	39	83	246	99	200
	Nushagak R.	6	1	6	100	44	100	66	24	66	172	69	172
	Togiak R.	4	1		10	2		4	4		18	7	
	Kuskokwim R.	8	4		38	16		13	5		59	25	
	Region Total	64	22		248	106		183	72		495	200	
British Columbia	Fraser R.	31	18		100	63		9	6		140	87	
	Stikine R.	25	12		53	33		44	29		122	74	
	Taku R.	10	6		13	8		6	1		29	15	
	Klukshu R. (Alsek R.)	3	3		11	5		28	16		42	24	
	Region Total	69	39		177	109		87	52		333	200	
Washington-Oregon	Columbia R.	55	55		93	93		0	0				

Table 7. The differences between the average rank of categories and the Kruskal-Wallis H-statistic for each scale character for pooled 1980 age 1.2, 1.3, and 1.4 chinook salmon (*Oncorhynchus tshawytscha*) scales used in the four region analysis. Asterisks indicate scale characters selected for use in the discriminant analysis. (Numbered scale characters are described in Table 4)

Category Combination ¹	Scale Character No.											
	1*	2	3	4	5	6	7	8	9	10	11*	12
WA,UR-ASIA	433.4	68.3	316.6	333.4	344.6	426.7	507.4	-35.2	-226.2	97.3	-209.3	424.1
WA,UR-AK	291.5	126.9	-68.1	285.7	-28.9	91.2	272.6	95.9	-174.3	312.4	-382.5	334.8
WA,UR-BC	319.9	269.8	93.7	385.5	178.6	265.7	246.9	212.3	-122.7	316.6	-250.7	301.4
BC-AK	-25.4	-142.8	-161.8	-99.8	-207.6	-174.5	25.7	-116.4	-51.5	-4.2	-131.8	33.4
BC-ASIA	116.4	-201.4	222.9	-52.1	166.0	161.1	260.5	-247.5	-103.5	-219.3	41.4	122.7
AK-ASIA	141.8	-58.6	384.7	47.6	373.6	335.5	234.8	-131.1	-51.9	-215.1	173.2	89.2
H-Statistic	355.7	153.5	352.8	306.5	369.1	414.7	475.2	152.8	118.2	283.8	270.6	355.6

Category Combination ¹	Scale Character No.											
	13	14*	15*	16	17	18	19*	20	21	22	23	24
WA,UR-ASIA	90.8	346.9	344.1	430.4	-131.8	-54.7	-26.5	-137.7	-32.9	-194.6	-188.7	-289.0
WA,UR-AK	144.3	69.7	334.4	156.8	-228.5	-33.6	-217.6	-222.8	-262.8	105.5	120.5	38.2
WA,UR-BC	275.7	-8.5	378.2	145.2	-94.7	93.2	153.0	-93.3	81.2	64.2	85.9	-8.7
BC-AK	-131.4	78.2	-43.8	11.6	-133.8	-126.8	-370.6	-129.5	-344.1	41.3	34.6	46.9
BC-ASIA	-184.9	355.4	-34.1	285.2	-37.1	-147.8	-179.6	-44.4	-114.2	-258.8	-274.6	-280.3
AK-ASIA	-53.5	277.2	9.7	273.6	96.8	-21.1	191.0	85.1	229.9	-300.1	-309.2	-327.2
H-Statistic	153.7	346.8	321.4	376.0	99.4	54.9	296.6	95.3	276.2	226.8	246.0	287.2

Category Combination ¹	Scale Character No.											
	25	26	27	28	29	30	31	32	33	34	35	36*
WA,UR-ASIA	-296.9	-320.8	-242.1	-24.9	145.4	258.5	205.8	128.5	50.7	26.3	26.8	287.1
WA,UR-AK	27.2	-67.1	-147.2	-175.9	-179.2	-50.4	8.7	34.6	33.4	62.8	-168.8	-124.9
WA,UR-BC	-5.3	-59.4	-58.7	-41.1	-41.6	26.9	-12.1	-3.2	-6.7	180.9	65.5	61.8
BC-AK	32.5	-7.6	-88.5	-134.8	-137.6	-77.3	20.8	37.8	40.0	118.2	-234.2	-186.7
BC-ASIA	-291.7	-261.3	-183.3	16.2	187.0	231.7	217.9	131.7	57.4	-154.7	-38.7	225.3
AK-ASIA	-324.2	-253.7	-94.8	151.0	324.6	308.9	197.1	93.9	17.4	-36.5	195.5	411.9
H-Statistic	294.5	246.0	128.7	75.6	232.2	249.3	163.4	82.3	38.7	76.6	136.8	379.5

¹WA,UR = Washington and Oregon; AK = Alaska; BC = British Columbia.

Table 8. The difference between the average ranks of categories and the Kruskal-Wallis H-statistic for each scale character for pooled 1980 age 1.2, 1.3, and 1.4 chinook salmon (*Oncorhynchus tshawytscha*) scales used in the four river analysis. Asterisks indicate scale characters selected for use in the discriminant analysis. (Numbered scale characters are described in Table 4)

Category Combination ¹	Scale Character No.											
	1	2	3	4	5	6*	7	8	9	10	11	12
NUS-KAM	103.8	-209.1	311.5	-124.5	284.2	275.8	251.7	-243.0	11.9	-310.8	199.4	21.8
NUS-BUL	216.4	-62.4	391.6	79.3	393.4	385.3	386.2	-136.4	-81.7	-250.9	247.7	148.7
NUS-YUK	-29.8	-147.2	78.8	-151.4	52.4	42.6	66.5	-127.8	18.2	-143.2	65.7	-60.7
YUK-BUL	246.2	84.8	312.8	230.8	340.9	342.7	319.7	-8.6	-99.9	-107.8	182.0	209.4
YUK-KAM	133.6	-61.9	232.6	26.9	231.8	233.2	185.2	-115.2	-6.3	-167.6	133.7	82.4
BUL-KAM	-112.6	-146.7	-80.1	-203.8	-109.2	-109.5	-134.5	-106.6	93.6	-59.9	-48.3	-126.9
H-Statistic	158.9	112.9	443.7	151.1	447.4	437.3	391.6	131.5	31.1	245.1	169.4	100.6

Category Combination ¹	Scale Character No.											
	13	14	15*	16*	17	18	19	20	21	22	23	24
NUS-KAM	-217.3	336.5	-197.2	282.9	123.3	-39.0	52.1	141.0	153.7	-297.1	-321.5	-339.2
NUS-BUL	-41.0	366.2	49.8	399.6	99.0	-62.9	213.3	53.6	240.0	-387.1	-372.2	-377.1
NUS-YUK	-126.8	130.3	-154.1	95.9	47.2	-109.6	-90.2	18.1	-50.9	-156.6	-165.0	-160.1
YUK-BUL	85.8	235.9	203.9	303.7	51.8	46.7	303.6	35.6	290.9	-230.5	-207.1	-217.1
YUK-KAM	-90.5	206.2	-43.2	187.1	76.1	70.6	142.3	122.9	204.6	-140.5	-156.4	-179.1
BUL-KAM	-176.3	-29.7	-247.1	-116.6	24.3	23.9	-161.2	87.4	-86.4	89.9	50.7	37.9
H-Statistic	122.9	392.2	181.4	412.7	39.8	31.2	208.7	52.1	238.0	364.3	363.3	390.7

Category Combination ¹	Scale Character No.											
	25*	26	27	28	29	30	31*	32	33	34*	35	36
NUS-KAM	-362.6	-332.6	-171.5	93.6	239.8	288.8	245.4	165.0	60.2	-190.1	-13.4	341.2
NUS-BUL	-365.8	-285.4	-145.7	104.8	277.1	309.3	256.6	169.1	62.4	-136.0	153.2	374.3
NUS-YUK	-157.2	-129.2	-103.9	-17.9	51.6	137.7	160.4	137.1	59.1	-246.0	-149.3	112.6
YUK-BUL	-208.6	-156.2	-41.8	122.8	225.4	171.6	96.3	31.9	3.2	110.0	302.4	261.7
YUK-KAM	-205.3	-203.4	-67.6	111.6	188.2	151.2	85.1	27.9	1.1	55.9	135.9	228.6
BUL-KAM	3.2	-47.2	-25.8	-11.2	-37.3	-20.4	-11.2	-4.1	-2.2	-54.1	-166.6	-33.1
H-Statistic	406.7	302.6	75.5	53.5	254.4	319.3	279.9	200.9	83.9	160.3	202.8	424.9

¹NUS = Nushagak River; KAM = Kamchatka River; BOL = Bolshaya River; YUK = Yukon River.

Table 9. Decision array for four-way regional classification of pooled mature age 1.2, 1.3, and 1.4 chinook salmon (*Oncorhynchus tshawytscha*) of Asia vs. Western Alaska vs. British Columbia vs. Oregon-Washington origin in 1980. The overall classificatory accuracy was calculated as the unweighted mean of the accuracies on the diagonal of the classification array.

Calculated decision	Correct decision (%)				Overall accuracy 82.2%
	Asia	Western Alaska	British Columbia	Oregon-Washington	
Asia	160(80.0)	19(9.5)	19(9.5)	1(0.7)	
Western Alaska	16(8.0)	168(84.0)	15(7.5)	0(0.0)	
British Columbia	21(10.5)	13(6.5)	150(75.0)	14(9.4)	
Washington-Oregon	3(1.5)	0(0.0)	16(8.0)	133(89.9)	
Total	200	200	200	148	

Table 10. Decision array for four-way river classification of pooled mature age 1.2, 1.3, and 1.4 chinook salmon (Onchorynchus tshawytscha) of Kamchatka R. vs. Bolshaya R. vs. Yukon R. vs. Nushagak R. origin in 1980. The overall classificatory accuracy was calculated as the unweighted mean of the accuracies on the diagonal of the classification array.

Calculated decision	Correct decision (%)				Overall accuracy 70.9%
	Kamchatka R.	Bolshaya R.	Yukon R.	Nushagak R.	
Kamchatka R.	105(66.4)	21(15.1)	25(12.5)	8(4.6)	
Bolshaya R.	27(17.1)	115(82.7)	0(0.0)	1(0.6)	
Yukon R.	20(12.7)	3(2.2)	126(63.0)	40(23.3)	
Nushagak R.	6(3.8)	0(0.0)	49(24.5)	123(71.5)	
Total	158	139	200	172	

Table 11. Summary of National Marine Fisheries Service data on the number of chinook salmon (*Oncorhynchus tshawytscha*) sampled for scales by U.S. observers on foreign trawlers in the Alaska FCZ by area and month, 1977-1981.

Area	Year	Month												Total
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Bering 1	1977	0	0	0	0	0	0	0	0	3	42	127	18	190
	1978	0	0	0	1	2	18	4	12	9	21	15	1	83
	1979	0	2	1	0	5	16	20	44	71	166	5	21	351
	1980	1	9	6	9	8	0	0	7	10	21	119	17	207
	1981	30	68	101	66	34	10	7	6	14	85	319	15	755
Bering 2	1977	0	26	9	2	0	0	1	2	2	58	7	13	120
	1978	239	20	22	13	9	0	0	0	2	11	96	10	422
	1979	228	1706	257	220	87	2	0	0	0	20	139	114	2773
	1980	27	40	6	22	2	0	0	0	0	0	76	44	217
	1981	240	133	178	459	64	0	0	0	11	12	6	109	1212
Bering 4	1977	0	0	0	0	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	1	0	0	1	0	0	2
	1979	0	0	0	0	1	0	0	0	0	0	0	1	2
	1980	0	1	0	0	0	0	0	0	0	0	0	0	1
	1981	0	0	2	15	0	0	0	0	0	6	5	1	29
Shumagin	1977	0	0	0	1	0	3	0	0	0	0	0	0	4
	1978	0	0	0	0	29	0	5	0	5	59	75	0	173
	1979	0	0	0	0	0	15	4	10	66	19	21	44	179
	1980	5	0	0	0	4	2	3	0	3	16	2	0	35
	1981	8	41	0	0	0	3	4	10	10	90	43	0	209
Chirikof	1977	0	0	0	0	0	0	0	2	2	0	1	0	5
	1978	0	0	0	12	46	1	1	0	0	0	5	0	65
	1979	0	0	0	0	0	8	4	2	0	0	0	0	14
	1980	0	0	0	5	0	0	0	0	0	1	13	0	19
	1981	21	0	0	0	0	3	36	37	5	126	232	18	478

Table 11. Summary of National Marine Fisheries Service data on the number of chinook salmon (*Oncorhynchus tshawytscha*) sampled for scales by U.S. observers on foreign trawlers in the Alaska FCZ by area and month, 1977-1981 - continued.

Area	Year	Month												Total
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Kodiak	1977	0	0	0	0	0	3	45	25	6	6	7	0	92
	1978	0	0	0	0	0	23	2	1	5	5	34	0	70
	1979	0	0	0	0	49	34	13	19	5	32	16	0	168
	1980	0	0	0	0	0	13	1	2	4	50	2	0	72
	1981	0	0	0	0	0	0	2	0	1	6	15	0	24
Yakutat	1977	0	23	0	0	0	2	0	0	0	0	1	0	26
	1978	0	0	0	1	2	0	0	0	0	0	0	0	3
	1979	0	0	0	0	4	0	1	0	1	2	1	0	9
	1980	0	0	0	0	0	1	0	0	2	3	0	0	6
	1981	0	0	0	0	0	0	0	0	0	26	0	0	26
Southeast	1977	0	7	0	0	2	0	0	0	0	0	0	0	9
	1978	0	0	0	0	4	0	0	0	0	0	0	0	4
	1979	0	0	0	0	0	2	0	0	0	8	0	0	10
	1980	0	0	0	0	0	0	0	0	0	0	0	0	0
	1981	0	0	0	0	0	0	0	0	0	1	0	0	1

Table 12. Regeneration rates calculated for chinook salmon scales sampled by U.S. observers on foreign trawlers in the Alaska FCZ in 1978, 1979, and 1981, by National Marine Fisheries Service statistical areas and ocean age class.

Year	Stat. Area	Ocean age ^d												Total reg	Total sample size	
		X.0	T.0	X.1	T.1	X.2	T.2	X.3	T.3	X.4	T.4	X.5	T.5			X.X
1978	Bering 1	0	0	0	4	6	33	3	26	1	4	0	0	4	14	71
	Bering 2	0	0	3	43	9	168	9	129	5	58	0	2	12	38	412
	Bering 4	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
	Shumagin	0	0	2	24	4	75	0	16	0	1	0	0	9	15	125
	Chirikof	0	0	0	0	6	42	2	19	0	1	0	0	3	11	65
	Kodiak	0	0	3	21	1	32	1	9	0	2	0	0	5	10	69
	Yakutat	0	0	0	0	0	0	0	1	0	1	0	0	1	1	3
	Southeast	0	0	0	1	1	1	0	2	0	0	0	0	0	1	4
Total 1978		0	0	8	93	27	353	15	202	6	67	0	2	34	90	751
% Total 1978 ^b		0.0		8.6		7.6		7.4		9.0		0.0		4.5	12.0	
1979	Bering 1	0	3	2	30	23	250	1	54	0	7	0	0	5	31	349
	Bering 2	1	24	13	120	168	1920	41	542	9	89	0	12	36	268	2743 ^c
	Bering 4	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2
	Shumagin	0	0	2	38	13	122	1	14	0	3	0	0	1	17	178
	Chirikof	0	0	0	0	0	8	1	3	0	2	0	0	1	2	14
	Kodiak	0	0	3	26	12	110	0	27	0	3	0	0	1	16	168
	Yakutat	0	0	0	1	0	3	0	2	0	3	0	0	0	0	9
	Southeast	0	0	0	0	0	3	1	5	0	2	0	0	0	1	10
Total 1979		1	27	20	215	216	2417	45	648	9	109	0	12	44	335	3473
% Total 1979 ^b		3.7		9.3		8.9		6.9		8.3		0.0		1.3	9.6	

Table 12. Regeneration rates calculated for chinook salmon scales sampled by U.S. observers on foreign trawlers in the Alaska FCZ in 1978, 1979, and 1981, by National Marine Fisheries Service statistical areas and ocean age class - continued.

Year	Stat. Area	Ocean age ^d													Total reg.	Total sample size
		X.0	T.0	X.1	T.1	X.2	T.2	X.3	T.3	X.4	T.4	X.5	T.5	X.X		
1981	Bering 1	0	1	3	106	11	425	8	153	2	26	0	1	21	45	733
	Bering 2	0	9	1	29	36	683	16	306	6	141	0	5	36	95	1209
	Bering 4	0	0	0	2	0	18	0	9	0	0	0	0	0	0	29
	Shumagin	0	0	2	76	1	65	3	47	0	12	0	4	3	9	207
	Chirikof	0	0	5	172	5	214	1	62	1	9	0	0	7	19	464
	Kodiak	0	0	0	6	0	8	1	6	0	0	0	0	2	3	22
	Yakutat	0	0	0	0	0	11	0	12	0	3	0	0	0	0	26
	Southeast	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Total 1981		0	10	11	391	53	1424	29	596	9	191	0	10	69	171	2691
% Total 1981 ^b		0.0		2.8		3.7		4.9		4.7		0.0		2.6		6.4
Grand Total 1978,1979,1981		1	37	39	699	296	4194	89	1446	24	367	0	25	147	596	6915
% Grand Total 1978,1979,1981		2.7		5.6		7.1		6.2		6.5		0		2.1		8.6

^aAn "X" before the decimal point represents scales that are regenerated or otherwise unreadable in the freshwater zone. An "X" after the decimal point represents scales that regenerated or otherwise unreadable in the ocean zone. A "T" represents the total count of fish of a particular ocean age.

^bTotal (%) regenerated scales for each ocean age class, the percentage of the total sample regenerated in both the freshwater and ocean zones (x.x), and the percentage of the total sample that was regenerated.

^cOne age 1.6 scale was not included in the total.

Table 13. Body zone composition of chinook salmon (*Oncorhynchus tshawytscha*) scale samples collected by U.S. observers on foreign trawlers in the Bering Sea and Gulf of Alaska in 1978, 1979, and 1981.

Body zone	Area and year											
	1978				1979				1981			
	Bering (%)	Sample size	Gulf (%)	Sample size	Bering (%)	Sample size	Gulf (%)	Sample size	Bering (%)	Sample size	Gulf (%)	Sample size
ZONE A*	21.6	105	57.5	153	50.8	1573	46.1	175	56.8	1119	46.3	333
ZONE B*	13.6	66	22.9	61	27.2	842	41.1	156	25.5	502	38.1	274
ZONE C*	0.0	0	0.0	0	1.6	50	2.1	8	4.7	93	1.4	10
Pectoral fin	3.1	15	0.4	1	7.6	236	3.4	13	7.2	142	7.2	52
Behind head	0.0	0	0.0	0	0.0	0	0.0	0	0.5	10	0.1	1
Dorsal fin	1.9	9	0.0	0	2.1	65	2.4	9	2.5	50	1.5	11
Lateral line	0.0	0	1.9	5	0.0	1	0.3	1	0	0	0	0
Operculum	2.3	11	0.0	0	1.8	56	0.3	1	0.1	2	0.1	1
Pelvic fin	0.0	0	0.0	0	0.9	27	0.0	0				
Anal fin	0.0	0	0.0	0	2.9	90	0.0	0				
Other	0.6	3	0.0	0	1.4	42	1.1	4	1.5	30	3.6	26
No zone indicated	56.7	275	15.0	40	3.2	100	3.2	12	0.7	14	1.3	9
No scale in packet	0.2	1	2.3	6	0.5	14	0.0	0	0.5	9	0.4	3
Total	100.0	485	100.0	266	100.0	3096	100.0	379	100.0	1971	100.0	720

*Zones A, B, and C are International North Pacific Fisheries Commission body zone.

Table 14. Sample sizes of 1978, 1979, and 1981 foreign trawl chinook salmon (*Oncorhynchus tshawytscha*) scale samples usable in stock separation analyses by month, age class, and National Marine Fisheries Service statistical areas. Only readable, non-regenerated scales taken from the preferred area of the fish or areas directly adjacent to the preferred area are included in these sample sizes.

Year	Stat. Area	Month	Age class ¹														Total		
			0.0	0.1	0.2	0.3	0.4	0.5	0.7	1.0	1.1	1.2	1.3	1.4	1.5	1.T		2.T	
1978	Bering 1	Apr											1				1	1	
		May				1			1				1				1	2	
		Jun			5	2			7			3	4				7	14	
		Aug				1	1		2			3	4				7	9	
		Sep										2	1				3	3	
		Oct			1	2			3		1	6	1		1		9	12	
	Nov				2			2			6	2		1		9	11		
	Bering 2	Apr			1				1		1	5	1				7	8	
		May											4		2		6	6	
		Sep											2				2	2	
		Oct				1			1			4	1				5	6	
		Nov										17	42	6	1		66	1	67
		Dec										5	2				7		7
	Bering 4	Jul										1					1	1	
		Oct										1					1	1	
	Shumagin	May			12	3	1		16			5	4				9	25	
		Jul				3			3			1					1	4	
		Sep				2			2		1						1	3	
		Oct			1	7			8			6	2				8	16	
Nov				4	18	6		28		10	15					25	53		

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Table 14. Sample sizes of 1978, 1979, and 1981 foreign trawl chinook salmon (*Oncorhynchus tshawytscha*) scale samples usable in stock separation analyses by month, age class, and National Marine Fisheries Service statistical areas. Only readable, non-regenerated scales taken from the preferred area of the fish or areas directly adjacent to the preferred area are included in these sample sizes - continued.

Year	Stat. Area	Month	Age class ¹															Total	
			0.0	0.1	0.2	0.3	0.4	0.5	0.7	1.0	1.1	1.2	1.3	1.4	1.5	1.T	2.T		
1978	Chirikof	Apr			2	2			4									4	
		May			5	6	1		12			2	1				3	15	
		Jun			1				1										1
		Jul			1				1										1
		Nov			2	1			3			1					1		4
	Kodiak	Jun			12	4			16			3	1					4	20
		Jul			2				2										2
		Sep		1					1		1	1		1			3		4
		Oct		2	2				4										4
		Nov		7	10	1			18		6		2					8	1
	Yakutat	Apr													1			1	1
		May				1			1										1
	Southeast	May				2			2		1						1		3
	Total 1978			15	87	34	3		139		43	109	38	7			197	2	338
1979	Bering 1	Feb											2				2	2	
		Mar									1						1	1	
		May											3				4	4	
		Jun				1			1			4	2	3			9		10
		Jul				2			2			11	6				17		19
		Aug			2	6			8		1	23	2				26		35
		Sep			7	5			12		2	42	7				51		63

Table 14. Sample sizes of 1978, 1979, and 1981 foreign trawl chinook salmon (*Oncorhynchus tshawytscha*) scale samples usable in stock separation analyses by month, age class, and National Marine Fisheries Service statistical areas. Only readable, non-regenerated scales taken from the preferred area of the fish or areas directly adjacent to the preferred area are included in these sample sizes - continued.

Year	Stat. Area	Month	Age class ¹															Total	
			0.0	0.1	0.2	0.3	0.4	0.5	0.T	1.0	1.1	1.2	1.3	1.4	1.5	1.T	2.T		
1979 (cont'd.)	Bering 1	Oct			6	2				8		16	111	12	1		140	1	149
		Nov										1	2				3		3
		Dec									2	5	10				17		17
	Bering 2	Jan				1				1			97	51	6	1	155	1	157
		Feb				3	1		4		17	808	254	38	5	1122	15	1141	
		Mar				1			1		2	83	47	8	2	142	1	144	
		Apr			3	4			7		2	126	55	14	3	200		207	
		May				2			2		4	45	8	3	1	61		63	
		Jun										1				1		1	
		Oct				1			1			14	2			16		17	
Nov				1				1		3	23	64	4		94		95		
Dec									2	17	43	4		66	2	68			
Bering 4	Dec										1				1		1		
Shumagin	Jun			7	2	3			12			2				2		14	
	Jul			1					1									1	
	Aug				1				1		5	2			7		8		
	Sep			13	4				17		2	29	3		34		51		
	Oct			1					1		16				16		17		
	Nov				2				2		3	13			16		18		
	Dec			7	5				12		23	5			28		40		
Chirikof	Jun					1			1		5	1			6		7		
	Jul					1			1		2				2	1	3		
	Aug											1			1		1		

Table 14. Sample sizes of 1978, 1979, and 1981 foreign trawl chinook salmon (*Oncorhynchus tshawytscha*) scale samples usable in stock separation analyses by month, age class, and National Marine Fisheries Service statistical areas. Only readable, non-regenerated scales taken from the preferred area of the fish or areas directly adjacent to the preferred area are included in these sample sizes - continued.

Year	Stat. Area	Month	Age class ¹														Total		
			0.0	0.1	0.2	0.3	0.4	0.5	0.7	1.0	1.1	1.2	1.3	1.4	1.5	1.7		2.7	
1979	Kodiak	May			23	6			29			11		1		12		41	
		Jun			16	5		1	22			4	1			5		27	
		Jul				1			1			3	3			6		7	
		Aug		2	2		1		5		3	3				6		11	
		Sep			2				2		1					1		3	
		Oct		3	6	4			13		8	5	2				15		28
		Nov		1	1				2		3	2	1				6		8
Yakutat		May			1		1		2		1					1		3	
		Jul												1		1		1	
		Sep										1				1		1	
Southeast		Jun				2			2									2	
		Oct				1	2		3		2					2		5	
Total 1979				13	99	54	10	1	177	7	133	1594	474	76	12	2296	21	2494	
1981	Bering 1	Jan			1	1			2			21	5			26		28	
		Feb				1	1		2			23	26	8		57	1	60	
		Mar				1	1		2		2	27	30	8		68	1	71	
		Apr				1			1		1	21	7	2		31		32	
		May			3	2			5		2	3	12	2		19		24	
		Jun			2				2			3	2	1		6	1	9	
		Jul				2			2			1	3			4		6	
		Aug			1	2			3				1			1		4	
		Sep		1	2	1			4		3	7	1			11		15	
		Oct		1	2	1			4		7	43	6			56		60	

Table 14. Sample sizes of 1978, 1979, and 1981 foreign trawl chinook salmon (Oncorhynchus tshawytscha) scale samples usable in stock separation analyses by month, age class, and National Marine Fisheries Service statistical areas. Only readable, non-regenerated scales taken from the preferred area of the fish or areas directly adjacent to the preferred area are included in these sample sizes - continued.

Year	Stat. Area	Month	Age class ¹														Total	
			0.0	0.1	0.2	0.3	0.4	0.5	0.7	1.0	1.1	1.2	1.3	1.4	1.5	1.7		2.7
1981 (cont'd.)	Bering 1	Nov	1	8	8	6			23		45	151	19			215	7	245
		Dec									3	9				12	1	13
	Bering 2	Jan			2	5			7		88	67	31		186	1	194	
		Feb			3	2			5		1	48	38	18	105	2	112	
		Mar			1				1		4	66	30	13	2	115	3	119
		Apr				2	2		4		1	220	66	23	2	312	9	325
		May										10	15	20		45	2	47
		Sep				1				1		8	1			9		10
		Oct										8	1	1		10	1	11
		Nov										5				5		5
		Dec		4		1				5	4	16	54	9	2	85	2	92
	Bering 4	Mar											2		2		2	
		Apr				1			1		1	7	1		9	1	11	
		Oct										2	3		5		5	
		Nov										3	1		4		4	
		Dec									1				1		1	
	Shumagin	Jan					1	1	1		1	1	1	1	4	3	8	
		Feb			1	9	6	1	17			11	10	2	23	1	41	
		Jun			1	1			2			1			1		3	
		Jul										3			3		3	
		Aug									1	6	2		9		9	
		Sep				1			1		1	4	2		7		8	
		Oct		11	3	6			20		27	18	6		51		71	
		Nov		1	5	3		1	10		14	7	1		22		32	

Table 14. Sample sizes of 1978, 1979, and 1981 foreign trawl chinook salmon (*Oncorhynchus tshawytscha*) scale samples usable in stock separation analyses by month, age class, and National Marine Fisheries Service statistical areas. Only readable, non-regenerated scales taken from the preferred area of the fish or areas directly adjacent to the preferred area are included in these sample sizes - continued.

Year	Stat. Area	Month	Age class ¹														Total	
			0.0	0.1	0.2	0.3	0.4	0.5	0.7	1.0	1.1	1.2	1.3	1.4	1.5	1.T		2.T
1981	Chirikof	Jan			12	1	1		14					1			1	15
		Jul				3	1		4					4			4	8
		Aug												2			2	2
		Sep												1			1	1
		Oct		4	24	5	1		34		41	33		1			75	109
		Nov		6	17	15	3		41		76	63		13			152	193
		Dec		2			3			5		4	7		2		13	18
	Kodiak	Jul														1	1	
Oct				1	1			2		2			1			3	5	
Nov			1	4	2			7		3	3					6	13	
	Yakutat	Oct			3	3	3		9			5	3			8	17	
		Southeast	Oct				1			1								1
Total 1981			5	35	100	82	18	2	242	4	256	990	397	32	6	1785	36	2063

¹Age is designated by the European formula where the number preceding the decimal point is the number of winters the fish spent in freshwater, and the number following the decimal point is the number of winters the fish spent in the ocean. A "T" after the decimal point represents the total count of fish of a particular freshwater age.

Table 15. Comparison of the number of chinook sampled for scales to the number of chinook whose lengths were measured by U.S. observers on foreign trawlers in the Alaska FCZ, 1978-1979.

Area	Year	No. chinook scale samples	No. chinook length measurements
Bering I	1978	83	101
	1979	351	2,124
Bering II	1978	422	551
	1979	2,773	5,736
Bering IV	1978	2	2
	1979	2	7
Shumagin	1978	173	434
	1979	179	396
Chirikof	1978	65	204
	1979	14	18
Kodiak	1978	70	161
	1979	168	281
Yakutat	1978	3	8
	1979	9	6
Southeastern	1978	4	4
	1979	10	9

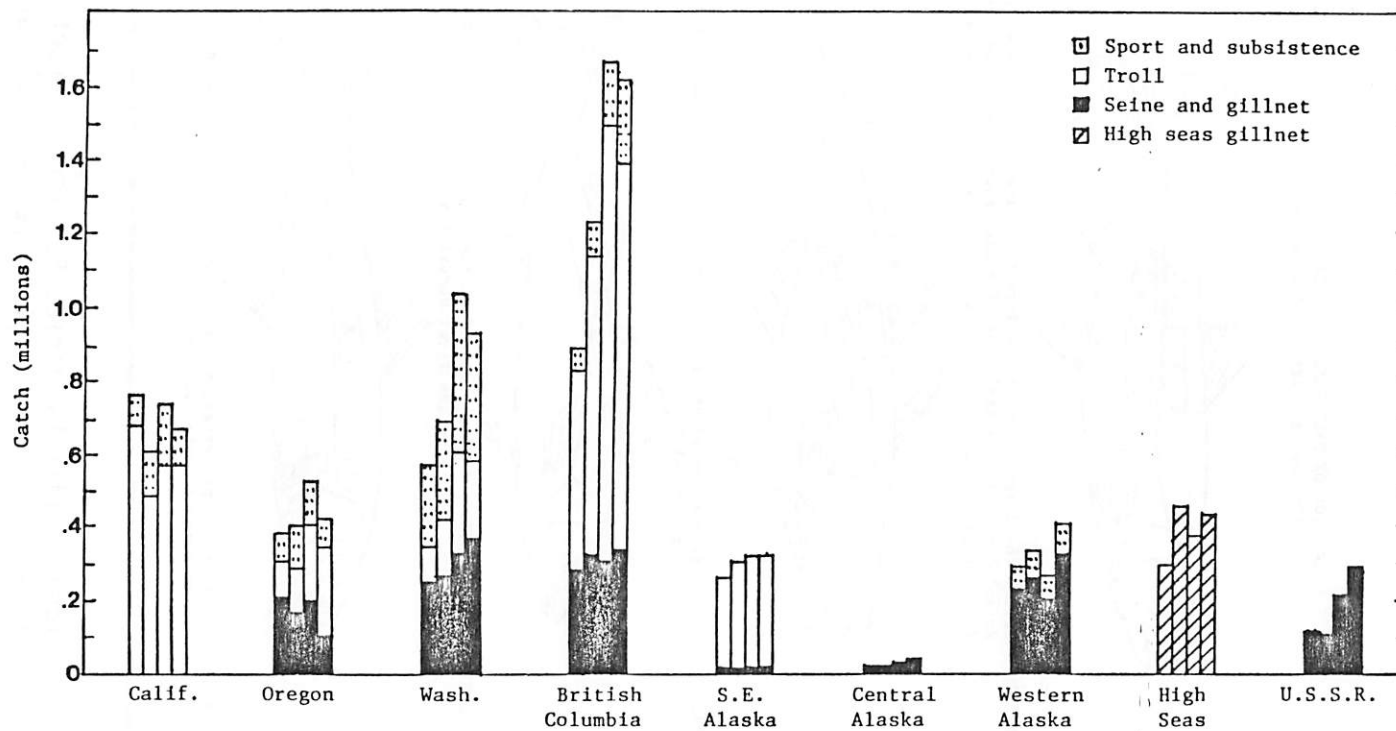


Fig. 1. Catches of chinook salmon by 5-year periods beginning 1961-1965 and ending 1976-1980. (U.S.S.R. fishery is seine and trap.)

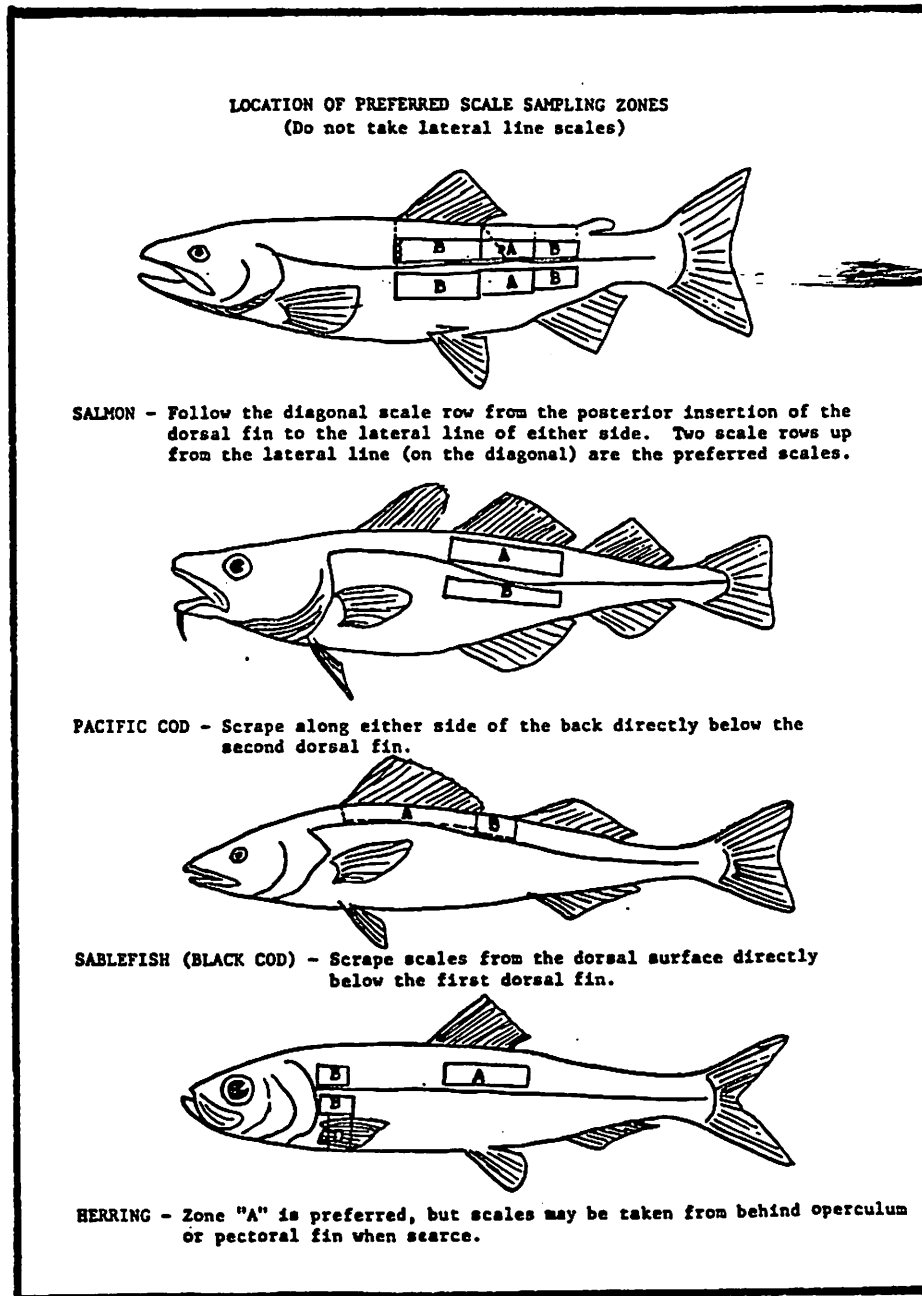


Fig. 2. National Marine Fisheries Service instructions to U.S. observers on location of preferred scale sampling zones.

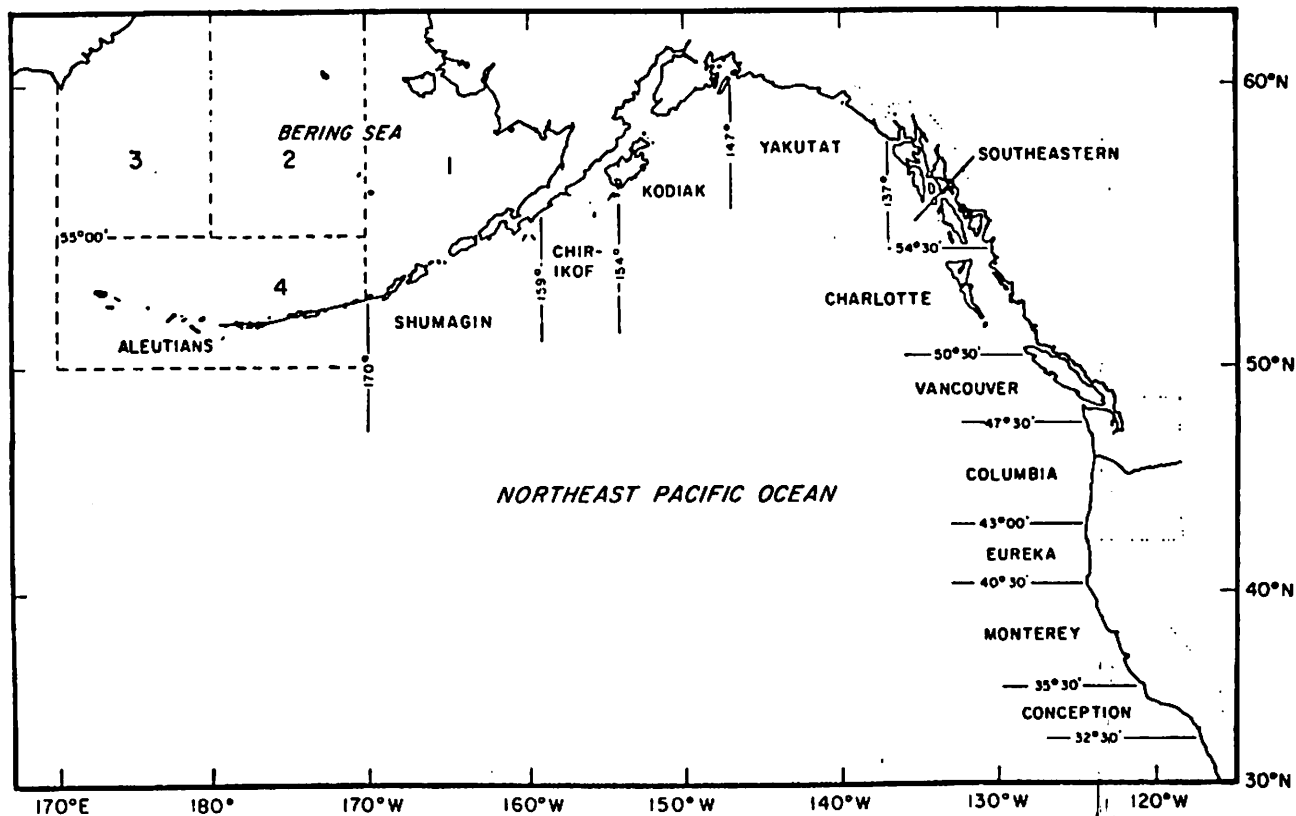
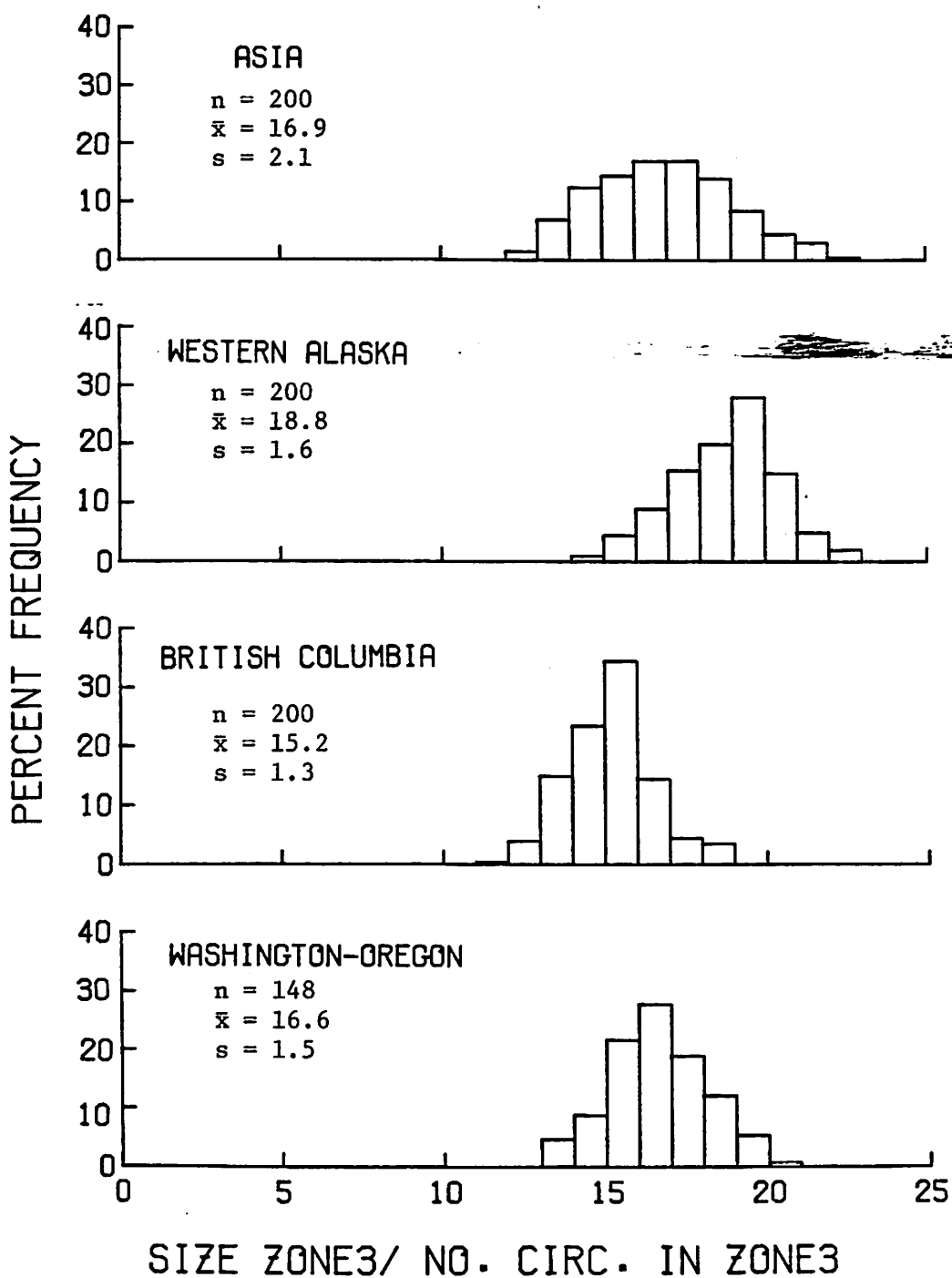


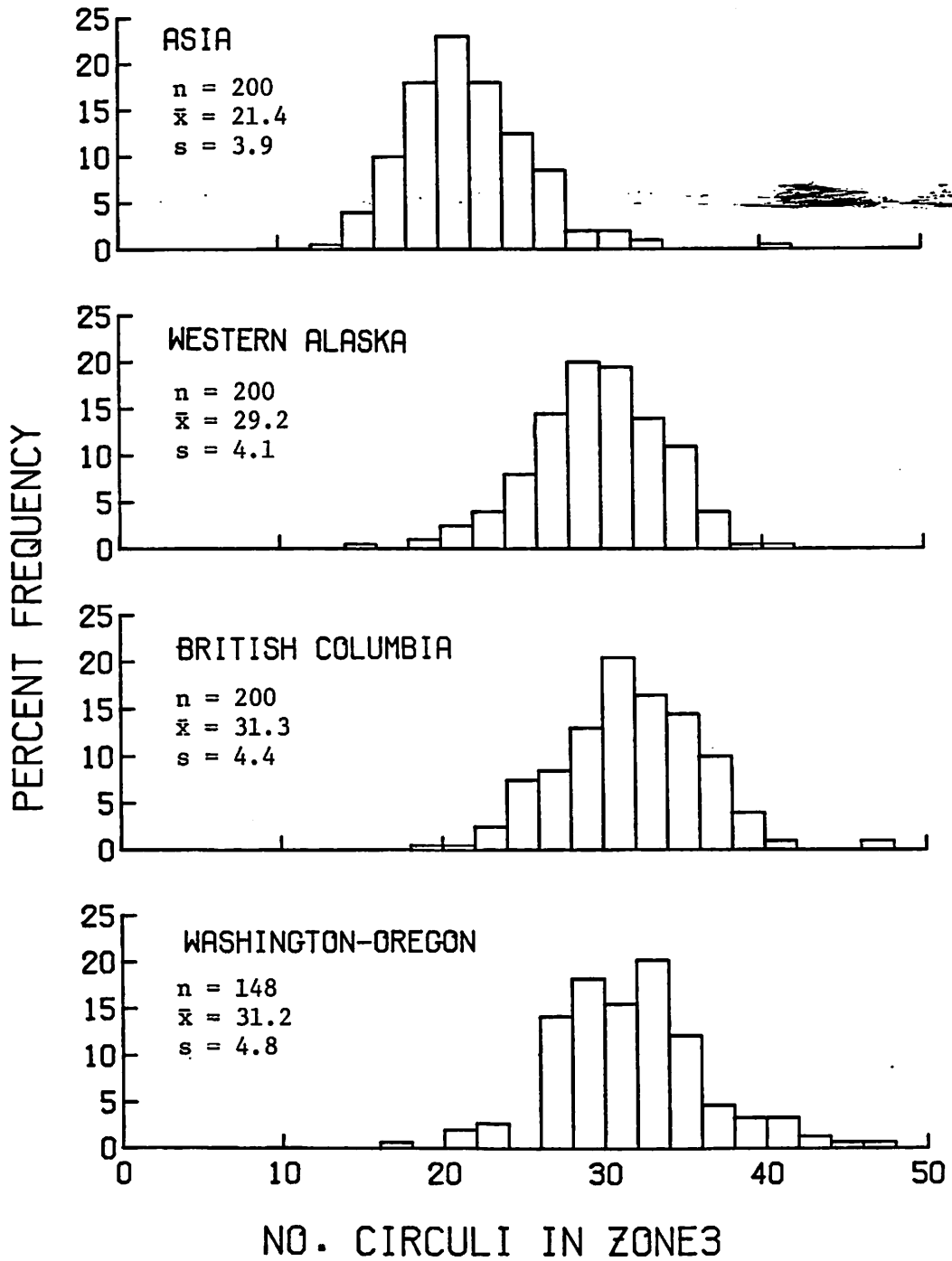
Fig. 3. Map showing National Marine Fisheries Service statistical areas.

APPENDIX



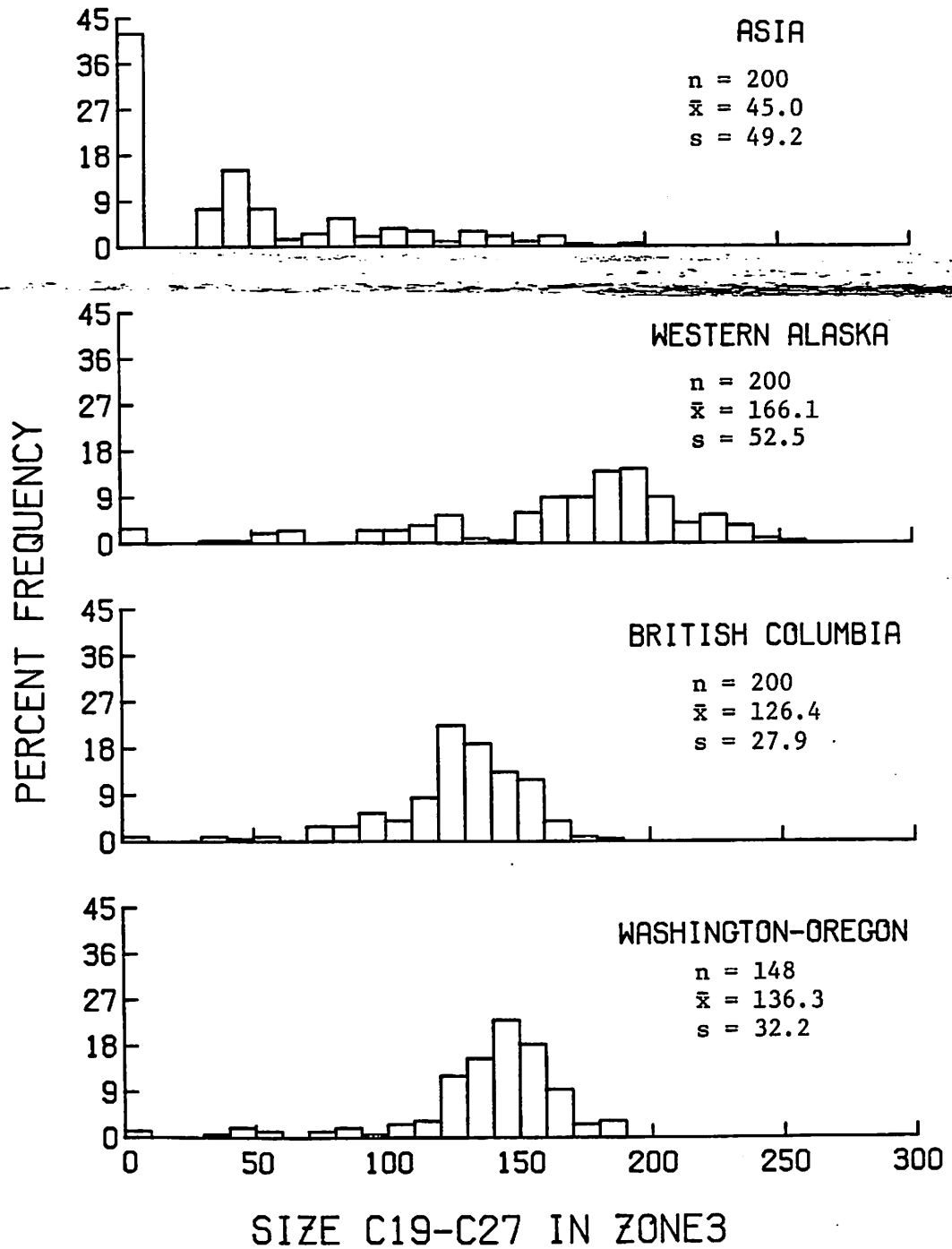
Appendix Fig. 1. The means (\bar{x}), standard deviations (s), and frequency distributions of the six scale characters used in a four region stock separation analysis of 1980 inshore chinook salmon (*Oncorhynchus tshawytscha*) stocks from Asia, Western Alaska, British Columbia, and Oregon-Washington. All measurements are .01 inches at 100 power. n = sample size.

A. The mean spacing of circuli in the first ocean year (zone 3).



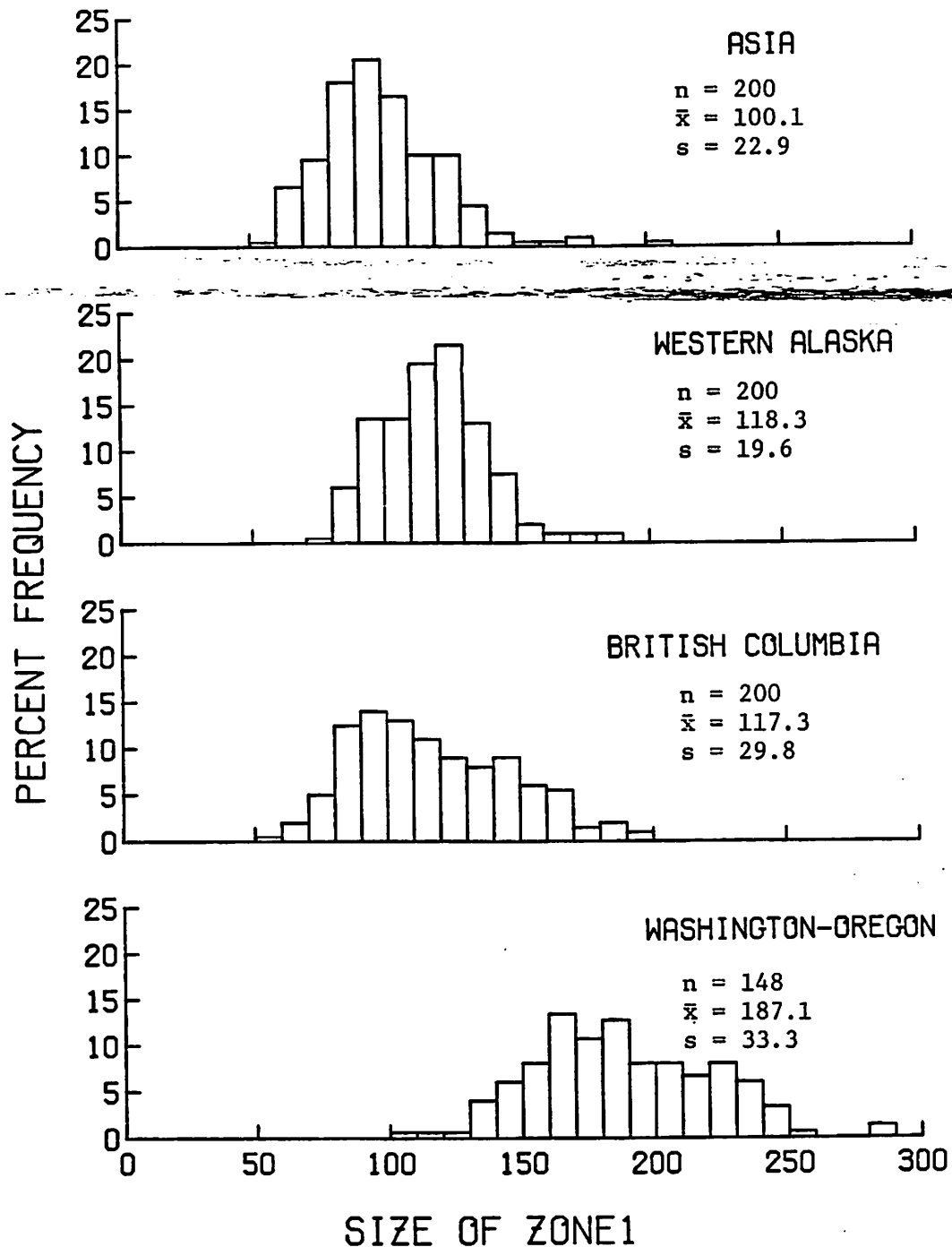
Appendix Fig. 1 - continued.

B. The number of circuli in the first ocean year (zone 3).



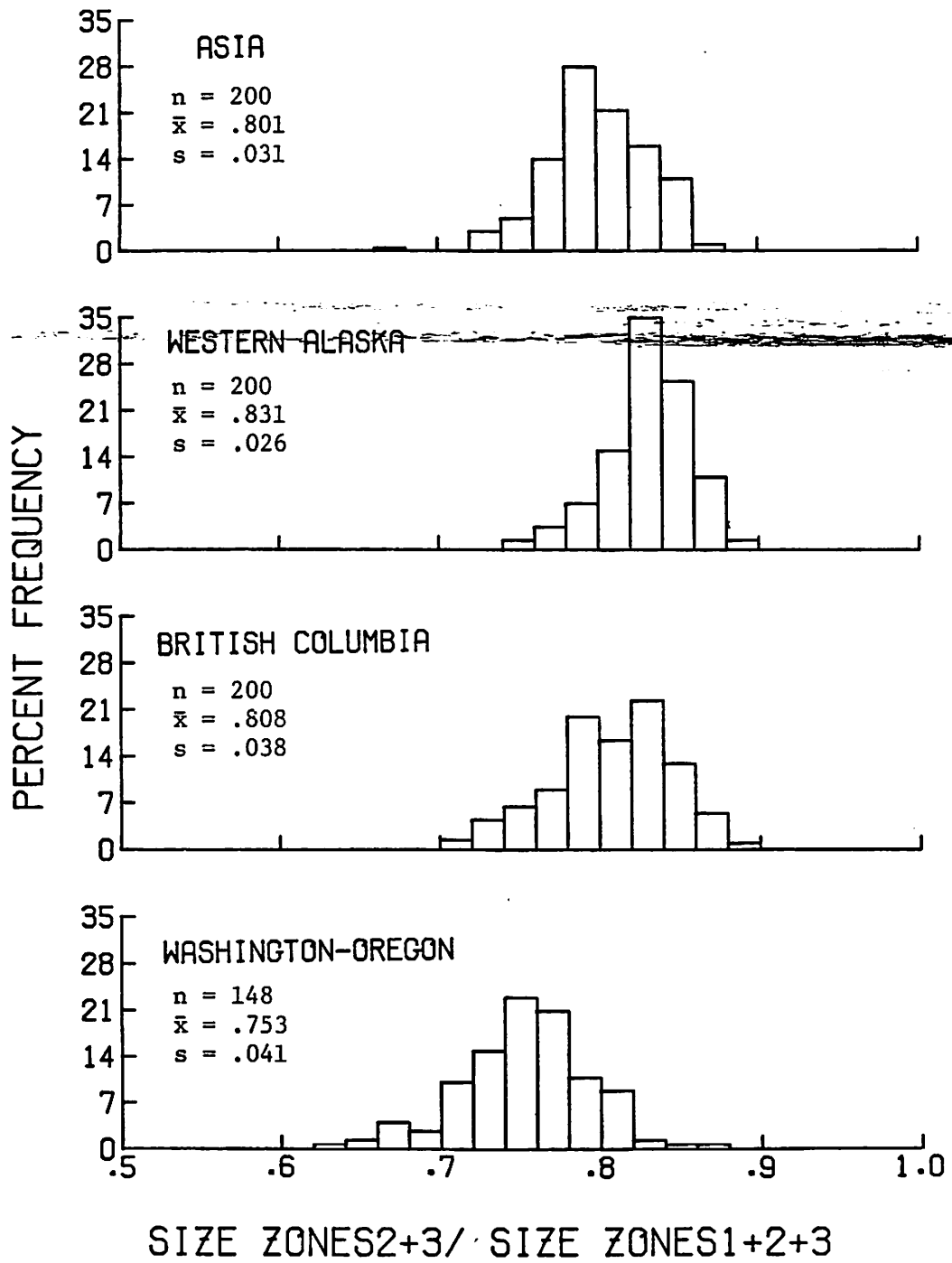
Appendix Fig. 1 - continued.

C. The distance between the nineteenth (C19) and twenty-seventh (C27) circhulus in the first ocean year (zone 3).



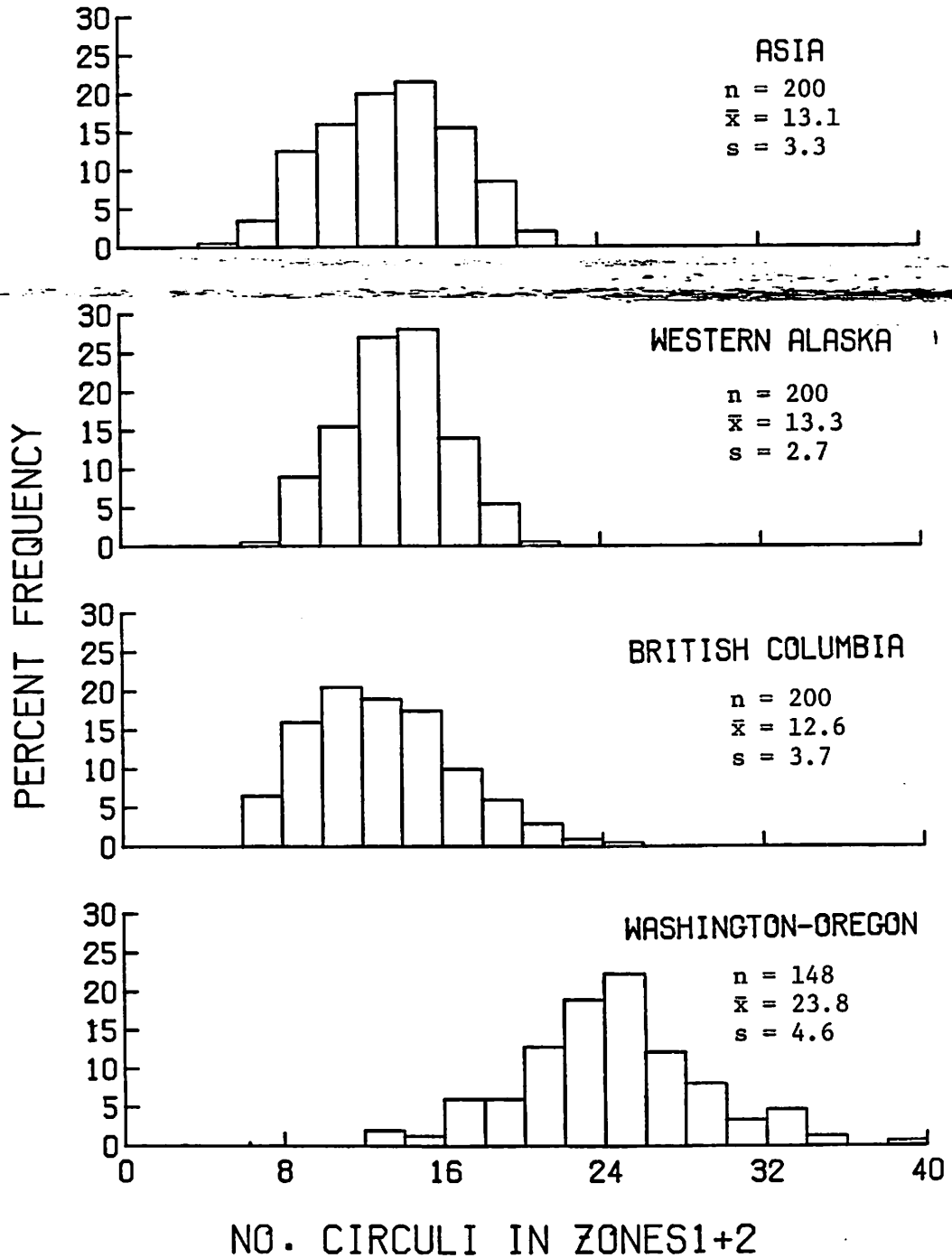
Appendix Fig. 1 - continued.

- D. The size of the freshwater zone from the center of the focus to the outer edge of the last circulus in the freshwater annulus (zone 1).



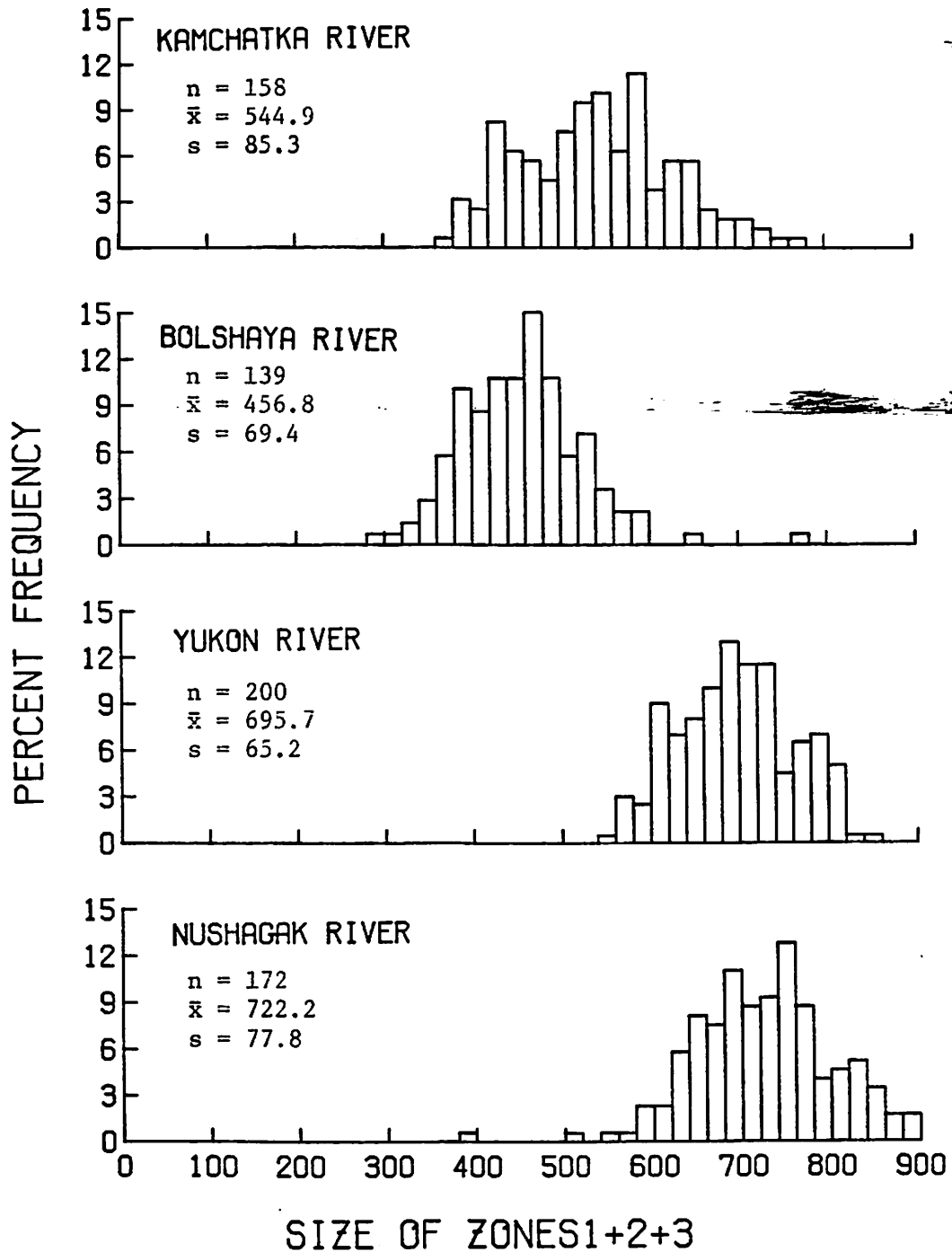
Appendix Fig. 1 - continued.

E. The size of the second year of growth (zone 2 and zone 3) divided by the size of the scale from the center of the focus to the outer edge of the last circulus in the first ocean year (zone 1 + zone 2 + zone 3).



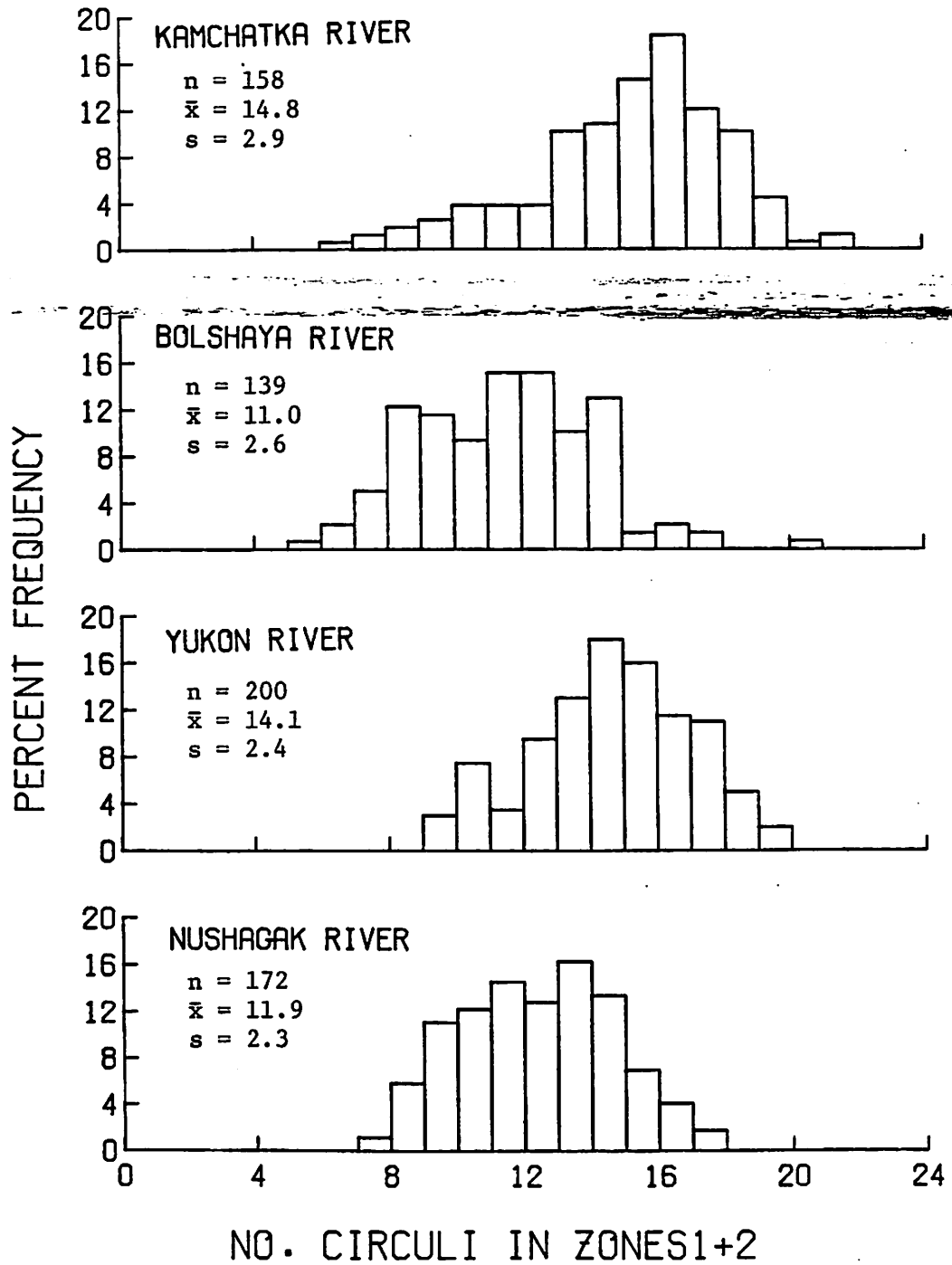
Appendix Fig. 1 - continued.

F. The number of circuli in the freshwater zone (zone 1 and zone 2).



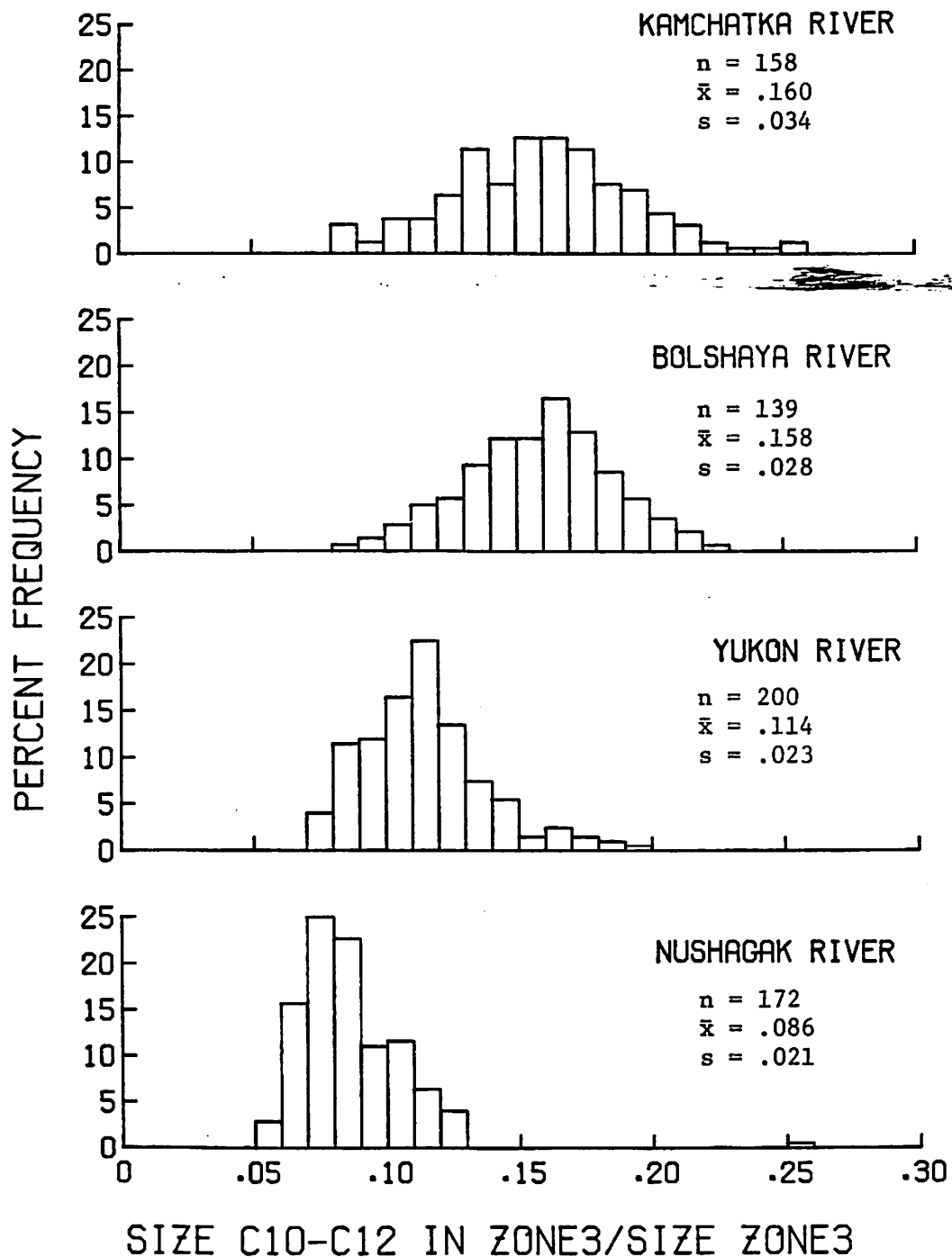
Appendix Fig. 2. The means (\bar{x}), standard deviations (s), and frequency distributions of the six scale characters used in a four river stock separation analysis of 1980 inshore chinook salmon (*Oncorhynchus tshawytscha*) stocks from the Kamchatka River, the Bolshaya River, the Yukon River and the Nushagak River. All measurements are .01 inches at 100 power. n = sample size.

- A. The size of the scale from the center of the focus to the outer edge of the last circulus in the first ocean year (zone 1 + zone 2 + zone 3).



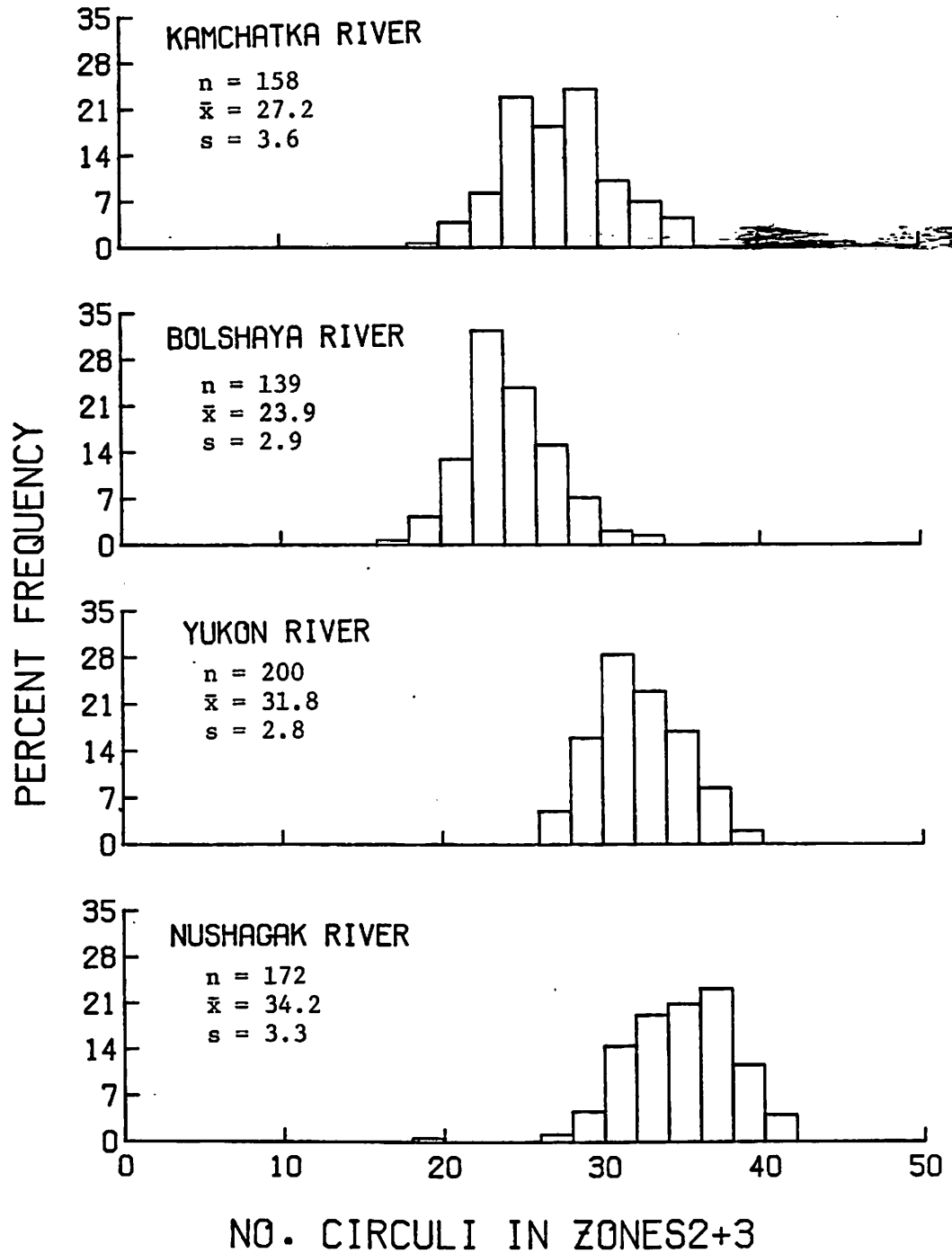
Appendix Fig. 2 - continued.

B. The number of circuli in the freshwater zone (zone 2 and zone 3).



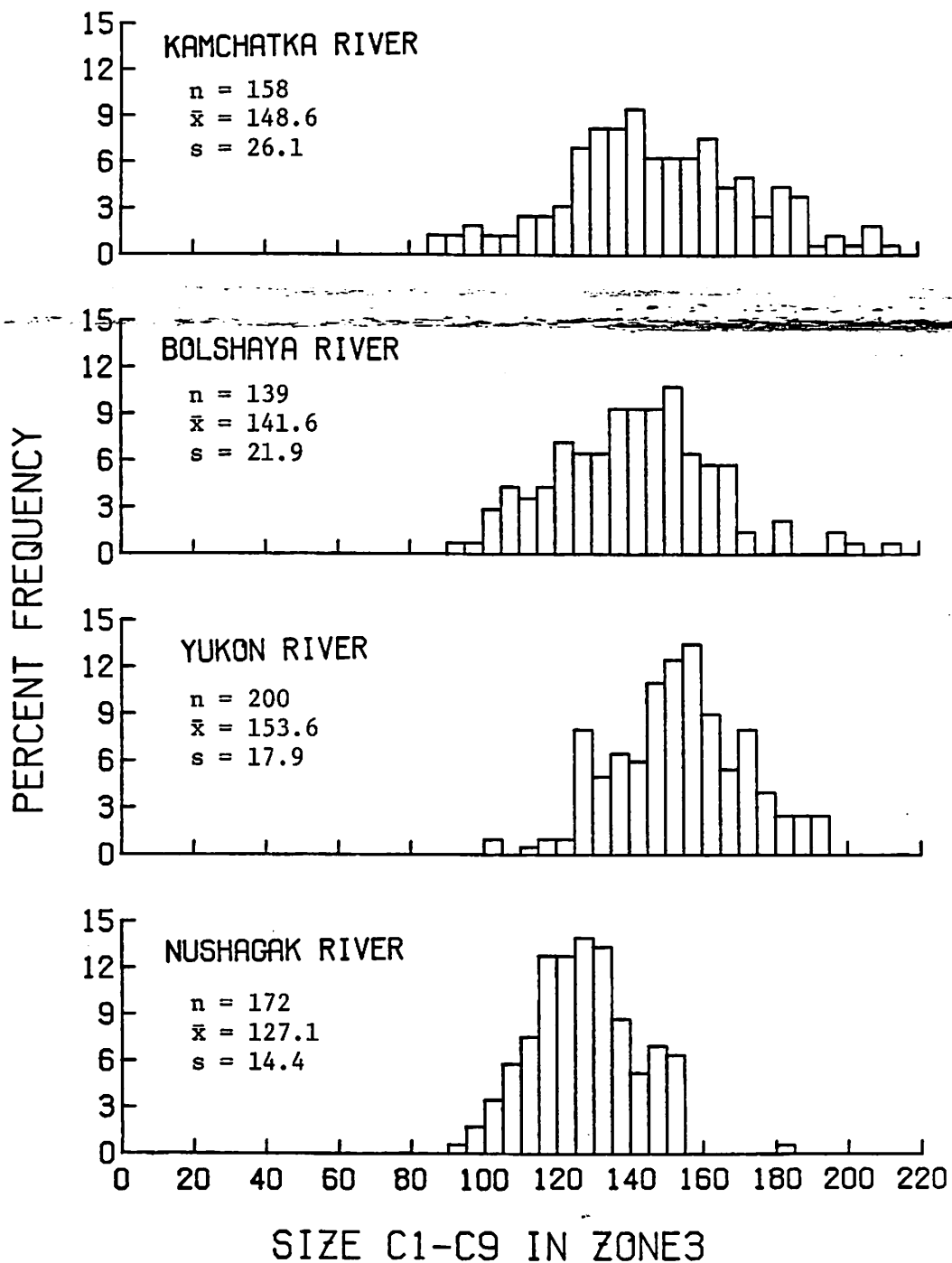
Appendix Fig. 2 - continued.

- C. The distance between the tenth (C10) and twelfth (C12) circuli in the first ocean year (zone 3) divided by the size of the first ocean year.



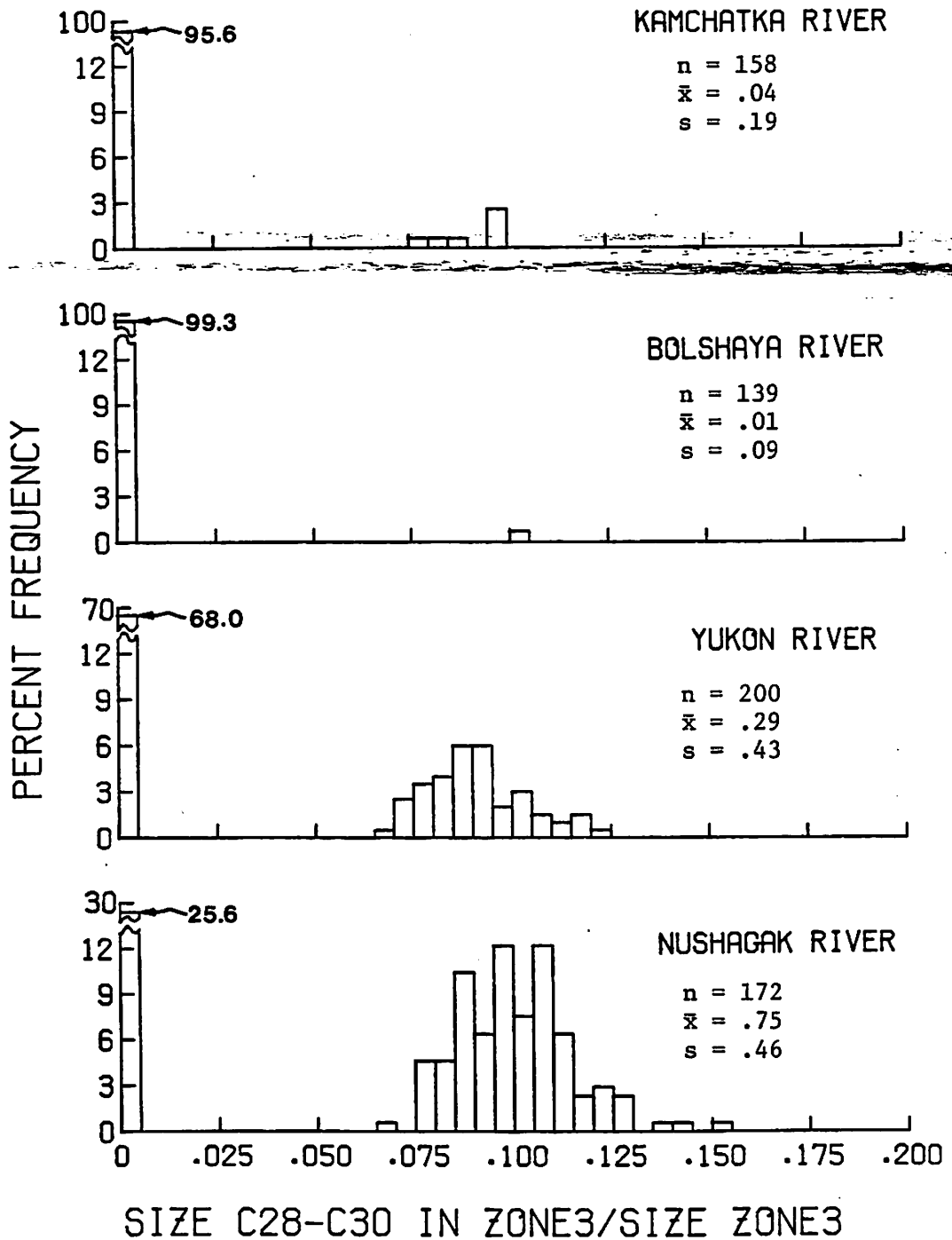
Appendix Fig. 2 - continued.

D. The number of circuli in the second year of growth (zone 2 and zone 3).



Appendix Fig. 2 - continued.

E. The distance between the first (C1) and the ninth (C9) circuli in the first ocean year (zone 3).



Appendix Fig. 2 - continued.

F. The distance between the twenty-eighth (C28) and thirtieth (C30) circuli in the first ocean zone (zone 3) divided by the size of zone 3.

North Pacific Fishery Management Council

Clement V. Tillion, Chairman
Jim H. Branson, Executive Director

Mailing Address: P.O. Box 3136DT
Anchorage, Alaska 99510

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Post Office Mall Building



Telephone: (907) 274-4563
FTS 271-4064

Contract 81-5

DETERMINATION OF STOCK ORIGINS OF CHINOOK SALMON INCIDENTALLY CAUGHT IN FOREIGN TRAWLS IN THE ALASKA FCZ

This contract is entered into between the North Pacific Fishery Management Council, herein called the "Council" and represented by the Executive Director executing this contract, and

University of Washington
Seattle, Washington 98195

hereinafter called the "Contractor," who agree as follows:

INTRODUCTION

Chinook salmon (Oncorhynchus tshawytscha) are the least abundant species of Pacific salmon in Alaska. However, since the passage of the Magnuson Fishery Conservation and Management Act, observers placed aboard foreign groundfish vessels operating in the U.S. Fishery Conservation Zone (FCZ) off Alaska have found that chinook often account for over 90% of the incidental catch of salmon in the Bering Sea/Aleutian Islands region and the Gulf of Alaska. Although incidental catches of chinook salmon in the FCZ off Alaska are usually considered to be low, the estimated incidental catch of chinook salmon in foreign groundfish fisheries in the Bering Sea/Aleutian Islands region in 1979 was approximately 100,000 fish, or more than 1/3 the average annual commercial harvest of 261,000 chinook salmon in Western Alaska since 1963. These high incidental catches may significantly impact commercial, subsistence, and sport chinook fisheries, as well as escapement of mature adults to the spawning grounds.

Tagging, scale, maturity, and distribution studies indicate that chinook salmon stocks in the eastern Bering Sea probably originate in Western Alaska. Over 90% of the chinook salmon produced in Western Alaska probably originate in the Nushagak, Kuskokwim, and Yukon rivers. Much less is known about the origins of chinook salmon in the Gulf of Alaska, but they are thought to represent a mixture of stocks originating along the North American coast from California to Central Alaska. The relative contributions of individual streams or areas within this large geographical area to chinook populations in the Gulf of Alaska have not been well defined.

The most promising way to determine the origin of chinook salmon is analysis of scales to detect regional or river-of-origin differences in age composition and freshwater-marine growth patterns. This contract first will determine the feasibility of using scale analyses to identify the stream or area of origin of chinook salmon caught incidentally in the foreign trawl fisheries of the U.S. Fisheries Conservation Zone of Alaska. Secondly, if feasible, scale analysis will be used to determine the origin of these chinook salmon.

ARTICLE I - OBJECTIVES AND STATEMENT OF WORK

Objectives

1. Determine if freshwater age patterns and freshwater-marine growth patterns of selected major coastal stocks allow area or stream-of-origin separation.
2. Determine if scale samples collected from incidentally caught salmon by U.S. observers on foreign trawlers are adequate for stock separation analyses.
3. Provide information where gaps in stock data exist.
4. Classify trawl-caught chinook salmon by probable area or river of origin.
5. Provide recommendations as to whether this type of study could be applied to chinook salmon caught in the S.E. Alaskan troll fishery.

Statement of Work

1. Categorize freshwater age patterns (e.g. spring, fall chinook) and freshwater-marine growth patterns from samples available from selected major natural and hatchery coastal stocks from California to the Yukon River to determine the degree of stock or area separation feasible. Because the projected year of maturity of immature chinook in trawl catches cannot be determined, standard samples will need to be pooled over years and ocean age groups. Scale samples provided by public resource agencies will be re-aged to minimize reader error.
2. Determine from chinook scales collected by U.S. observers on foreign trawlers in 1978, 1979, and 1981, whether scale samples from incidentally caught chinook are adequate in quality and quantity for stock separation analyses.
3. Arrange for agency collection of additional samples where important data gaps exist.
4. If stock separation by scale pattern analysis proves feasible, and if scale samples collected by U.S. observers are adequate, classify chinook unknowns in the 1978, 1979, and 1981 foreign trawl catches in the Alaska FCZ.
5. If stock separation by scale pattern analysis proves feasible, plan sampling program for 1982-83 trawl fishery and evaluate origin of trawl-caught chinook.
6. If coastwide separation by scale pattern analysis proves generally feasible, make recommendations on its application to chinook salmon caught in the S.E. Alaskan troll fishery.

ARTICLE II - PROJECT SCHEDULE AND DELIVERABLES

Schedule

<u>Date</u>	<u>Event</u>
October - December 1981	a. Compile chinook salmon abundance and age statistics. b. Sort, mount and age 1978-79 trawl samples. c. Quarterly report, December 31.
January 1981 - March 1982	a. Sort, mount and age 1981 trawl samples. b. Collect scales from inshore fisheries from agencies. c. Quarterly report, March 31.
April - June 1982	a. Digitize scales from inshore fisheries. b. Statistical analysis of 1978-79 data. c. Quarterly report, June 30.
July - September 1982	a. Digitize scales from inshore fisheries. b. Annual report, September 30. *c. Recommendation to Council on feasibility of using scale analysis to separate stocks by area or stream of origin, and whether contract should be continued.
October - December 1982	a. Digitize trawl samples. b. Plan sampling program and analysis for the 1982-83 trawl fishery. c. Quarterly report, December 31.
January - March 1983	a. Collect and digitize scales from 1982 inshore fisheries. b. Evaluate 1978-82 data, i.e., origin of trawl-caught chinook. c. Quarterly report, March 31
April - June 1983	a. Determine applicability of this study to the Southeast Alaska troll fishery. b. Quarterly report, June 30.
July - September 1983	a. Project evaluation and final report preparation. b. Final report draft in August and final report in September.

*Note: This will be a two-year project with the second year being contingent on the feasibility of using scale analysis to separate trawl-caught chinook salmon. Should stock separation prove unfeasible, the project will be terminated after the first year.

Deliverables

All products shall be delivered to Executive Director, North Pacific Fishery Management Council and must be of professional quality and reproducible. Style and format should conform to CBE Style Manual, 3rd edition, unless the Executive Director, NPFMC, specifies otherwise.

Progress reports shall be due on the dates indicated above and shall review the technical accomplishments, inventory and include all data collected during the period, indicate the extent of data synthesis and analysis accomplished, and present any preliminary conclusions.

An explanatory management letter of no more than two pages must accompany each voucher. The letter must indicate the allocation of all charges by task and explain all the charges on the voucher. In addition, the letter shall contain statements about the adequacy of funds remaining to complete each task. Three copies are to be delivered to the Executive Director.

The final report shall be camera-ready copy, single spaced, typed on one side of the page in IBM Prestige Elite typestyle and on good quality white paper measuring 8½ X 11 inches. Specific detailed information or changes may be requested and/or provided by the Executive Director. Ten copies plus the original Final Report shall be provided.

The following format will be used in preparing the final report:

- Title Page
- Preface
- Executive Summary
- Table of Contents
- List of Figures
- List of Tables
- List of Abbreviations and Symbols
- Acknowledgements
- Introduction
- Materials and Methods
- Results
- Discussion
- Conclusions
- Recommendations
- Abstract
- Key Words
- References (annotated bibliography)

The Executive Director shall be responsible for distribution. The Contractor shall refer all requests to the Executive Director.

ARTICLE III - COST IN TERMS OF THE CONTRACT

This project will be administered through a contract with University of Washington. The Council agrees to pay and the Contractor, the University of Washington, agrees to accept as full payment for all services agreed to for the period ending September 30, 1982, an amount not to exceed \$56,840, and for

the period October 1, 1982 to September 30, 1983, an amount not to exceed \$52,090, should the contract be extended for the second year. Determination to proceed for the second period will be made by the Council.

ARTICLE IV - PERIOD OF CONTRACT

Work on the first half of this contract shall commence on October 1, 1981 and shall be completed by September 30, 1982 at which time an evaluation will be made by the Council on whether the second year's tasking should be undertaken. Given a favorable recommendation to proceed, work on the second half of this contract shall commence on October 1, 1982 and shall be completed by September 30, 1983, unless extended by written mutual agreement.

ARTICLE V - CONTRACT MONITOR

Dr. Clarence Pautzke is designated Contract Monitor. The Contract Monitor is responsible for the administration of this contract for the Council. Dr. Pautzke is located at the Council's headquarters office, 333 West Fourth Avenue, Suite 32, P. O. Box 3136DT, Anchorage, AK 99510, telephone (907) 274-4563.

ARTICLE VI - PAYMENTS

Provisional payments for services under this contract will be made on the basis of quarterly billings in arrears upon submission of a detailed invoice to the Contract Monitor at the address specified in Article V above. The total may not exceed \$56,840 for the period ending September 30, 1982, and \$52,090 for the period October 1, 1982 to September 30, 1983 should the contract be extended for the second year.

ARTICLE VII - BUDGET SUMMARY

	<u>Oct. 1, 1981 - Sept. 30, 1982</u>	<u>Oct. 1, 1982 - Sept. 30, 1983</u>
<u>Salaries</u>		
D.E. Rogers (Principal investigator)		
4 mos @ 100% each year	\$ 10,120	\$ 10,630
K. Myers (Biol. II)		
12 mos @ 50% each year	9,000	9,300
B. Rogers (Biol. II)		
3 1/2 mos @ 100%	5,111	-0-
Research Assistant		
6 mos @ 50% first year	3,600	9,150
Student Helper		
6 mos @ 50%	<u>2,400</u>	<u>-0-</u>
TOTAL DIRECT SALARIES	\$ 30,231	\$ 29,080
<u>Benefits</u>		
Faculty (18%), staff (23%), student (7%)	5,487	4,693

<u>Supplies and Services</u>	500	400
<u>Computer</u>	2,000	1,200
<u>Travel and Per diem</u>	1,000	500
<u>Cost Center</u>		
Secretarial, data processing, report preparation, and in-house administration	<u>3,200</u>	<u>3,000</u>
TOTAL DIRECT COSTS	\$ 42,418	\$ 38,873
Indirect Costs (34%)	<u>14,422</u>	<u>13,217</u>
TOTAL BUDGET	<u>\$ 56,840</u>	<u>\$ 52,090</u>
GRAND TOTAL		<u>\$ 108,930</u>

ARTICLE VIII - GENERAL PROVISIONS

1. TERMINATION

- a) The performance of work under this contract may be terminated by the Council whenever the Executive Director determines that such termination is in the best interest of the Council.
- b) Any such termination shall be effected by delivering to the Contractor a Notice of Termination specifying the extent to which performance of work under the contract is terminated, and the date upon which such termination becomes effective.

2. NONDISCRIMINATION CLAUSE

The Contractor shall comply with federal Executive Order 11246, entitled "Equal Employment Opportunity," as amended by Executive Order 11375, and as supplemented in Department of Labor regulations (41 CFR, Part 60).

3. FEDERAL ACCESS TO RECORDS

The Contractor will provide the Council, the National Marine Fisheries Service, the Comptroller General of the United States, or any of their duly authorized representatives, access to any books, documents, papers, and records of the Contractor involving transactions relating to this contract for a period of three years after final payment.

4. PROTESTS, CONTRACT DISPUTES, AND APPEALS

- a) Authority of the Executive Director. The Executive Director is authorized to settle, compromise, pay or otherwise adjust any claim by or against, or any controversy with, a contractor or bidder relating to a contract entered into by the Council, including a claim or controversy initiated after award of a contract, based on

breach of contract, mistake, misrepresentation or other cause for contract modification or rescission. In the event a settlement or compromise involves or could involve adjustments and/or payments aggregating \$10,000 or more, then the Executive Director shall prepare written justification and obtain approval in advance, from the full Council and its legal advisor. When a claim cannot be resolved by mutual agreement, the Executive Director shall promptly issue a decision in writing. A copy of that decision shall be mailed or otherwise furnished to the contractor and shall state the reasons for the action taken on the claim, and shall inform the contractor of his right to administrative relief as provided in this section. The decision of the Executive Director is final and shall be conclusive unless fraudulent, or the contractor appeals to the Council. If the Executive Director does not issue a written decision within one hundred and twenty (120) days after receipt of a claim, or within such longer period as might be established by the parties to the contract in writing, then the contractor may proceed as if an adverse decision has been received.

b) Appeal to the Council. The Council has jurisdiction over each controversy arising under, or in connection with, the interpretation, performance, or payment of a contract of the Council provided that:

- 1) the contractor has not instituted action over such controversy in court, and
- 2) the contractor has mailed notice to the Council of his election to appeal within 90 days of his receipt of the decision from the Executive Director, or at the contractor's election, within a reasonable time after the Executive Director fails or refuses to issue a decision.

5. CONTRACT MODIFICATIONS

A contract modification is considered to be any written alteration of contract provisions, i.e., work statement, specification, period of performance, time and rate of delivery, quantity, price, cost, fee, or other provisions of an existing contract whether accomplished in accordance with a contract provision or by mutual actions of the parties to the contract.

- a) Approval Authority. Only the Executive Director has the authority to approve a contract modification.
- b) Processing Contract Modifications. The Contract Monitor is responsible for monitoring the contract and recommending changes in existing contracts. In such capacity, he will generally be responsible for initiating the necessary documents involving technical changes. In preparing the documents, he shall review the statement of work and the applicable specifications and then delineate the proposed changes thereto. The Contract Monitor should also evaluate whether these proposed changes are within the general scope of the contract or are considered new procurement and set forth the

rationale supporting his position. If the Contract Monitor believes the changes to be in the general scope, the proposed changes, recommendations, and rationale are forwarded to the Executive Director for concurrence.

6. SUBCONTRACTING

Except as provided in the Schedule or in the Contractor's proposal incorporated in this contract, the Contractor shall not subcontract any part of the work under this contract without specific written approval of the Contract Monitor. This clause does not apply to the purchase of supplies, materials, equipment, or incidental support services.

7. RIGHTS IN DATA

- a) The term "Subject Data" as used herein includes writings, sound recordings, pictorial reproductions, drawings, or other graphical representations, and works of any similar nature (whether or not copyrighted) which are furnished by the Contractor under this contract. The term does not include information incidental to contract administration.
- b) All "Subject Data" first produced in the performance of this contract shall be the sole property of the Council. The Contractor shall not publish or reproduce such data in whole or in part, or in any manner or form, nor authorize others to do so without the written consent of the Contract Monitor.
- c) The Contractor agrees to grant and does hereby grant to the Council and to its officers, agents, and employees acting within the scope of their official duties, a royalty-free, nonexclusive, and irrevocable license throughout the world (1) to publish, translate, reproduce, deliver, perform, use, and dispose of, in any manner, any and all subject data not first produced or composed in the performance of this contract, but which is incorporated in the work furnished under this contract; and (2) to authorize others so to do.
- d) The Contractor shall indemnify and save and hold harmless the Council, its officers, agents, and employees acting within the scope of their official duties against any liability, including costs and expenses, (1) for violation of proprietary rights, copyrights or right of privacy, arising out of the publication, translation, reproduction, delivery, performance, use, or disposition of any subject data furnished under this contract, or (2) based upon any libelous or other unlawful matter contained in such data.
- e) Paragraphs (c) and (d) above are not applicable to material furnished to the Contractor by the Council and incorporated in the subject data furnished under the contract; however, such incorporated material shall be identified by the Contractor at the time of furnishing such data.
- f) The Contractor shall not affix any restrictive markings upon any subject data.

8. KEY PERSONNEL

- a) It has been determined that the individual(s) named in the schedule of this contract are necessary for the successful performance of this contract. No diversion or replacement of these individual(s) shall be made by the Contractor without the written consent of the Contract Monitor: Provided, that the Contract Monitor may ratify in writing such diversion or replacement and such ratification shall constitute the consent of the Contract Monitor required by this clause.
- b) Whenever for any reason, one or more of these individual(s) are unavailable for performance under this contract, the Contractor agrees to replace such individual(s) with an individual(s) of substantially equal abilities and qualifications. The Contractor shall submit to the Contract Monitor, in duplicate, a resume giving the full name, title, date, and place of birth, qualifications, experience, and salary history, for all successor or new personnel prior to assignment of such personnel to perform work under the contract, so that the Contract Monitor may decide whether or not such successor meets the qualifications of the personnel to be diverted or replaced, or in the case of new personnel, whether or not they are qualified to perform work assigned, and advise the Contractor accordingly.

9. RIGHTS TO INVENTION

Rights to inventions generated under this contract are subject to the regulations issued by the Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

10. CONFLICT OF INTEREST

It shall be improper for any Council employee or Council member to participate directly or indirectly and realize financial gain in any matter pertaining to this contract.

11. DISCLOSURE OF BENEFITS RECEIVED FROM CONTRACTS

Any Council employee or Council member who has or obtains any benefit from this contract, shall report such benefit to the full Council.

12. GRATUITIES AND KICKBACKS ILLEGAL

- a) Gratuities. It is improper for any person to offer, give or agree to give to any employee or Council member or for any employee or Council member to solicit, demand, accept or agree to accept from another person, anything of pecuniary value for or because of:
 - 1) an official action taken or to be taken, or which could be taken; or
 - 2) a legal duty violated or to be violated, or which could be violated by such employee or former employee.

- b) Kickbacks. It is improper for payment, gratuity, or benefit to be made by or on behalf of a subcontractor under a contract to the prime contractor or higher tier subcontractor or any person associated therewith as an inducement for the award of a subcontract or order.

13. COVENANT RELATING TO CONTINGENT FEES

- a) Representation of Contractor. Every person, before being awarded a contract with this Council, shall represent that he has not retained a person to solicit or secure the contract with this Council upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, excepting for bona fide employees or bona fide established commercial, selling agencies maintained by the person so representing for the purpose of securing business or an attorney rendering professional legal services, employed, consistent with applicable canons of ethics.
- b) Intentional Violation Unlawful. The intentional violation of the representation specified in Subsection (1) above is cause for termination of a contract.

14. RESTRICTION ON EMPLOYMENT OF PRESENT COUNCIL EMPLOYEES

No present Council employee may be employed by the Contractor while the work under this contract is being performed.

The parties hereto executed this contract as of the day and year of the last signature date indicated below:

UNIVERSITY OF WASHINGTON

By: _____

Title: _____

Date: _____

NORTH PACIFIC FISHERY MANAGEMENT COUNCIL

By: _____

Title: Executive Director

Date: _____

Draft Scope of Work for a workshop dealing with biological interactions among marine mammals and commercial fisheries in the Bering Sea.

Agenda item no. 1. Review of possible approaches for addressing management questions relating to marine mammal-fishery interactions. Suggested categories of approaches to be discussed:

- a) conceptual
- b) quantitative, i.e., amounts of fishes/shellfishes consumed
- c) correlative
- d) predictive

Discussion should deal with the present status of theory and data bases, utility of assessments for making management decisions, and the probability of future improvement in assessments.

Agenda item no. 2. Review of density dependent responses in marine mammals.

Discussion should include a review of density dependence in large mammals in general, a discussion of specific information relating to marine mammals, and an analysis of the prospects for gathering additional data for the Bering Sea ecosystem in particular. Some questions to be addressed are: a) can it be shown that any Bering Sea marine mammal population is presently limited by food; b) if so, what is the cause of the food limitation and what would be the effect of changing food availability; and c) if not, what types of data must be gathered to address question a) and can the data be obtained.

Agenda item no. 3. Review of available and desirable models useful for simulating interactions between marine mammals and fish populations in the Bering Sea. Discussion should emphasize a) the need to predict the causes and magnitudes of fish stock fluctuations and the effects of fisheries and mammal predation on such fluctuations and b) prediction of the probable effects of fish stock fluctuations on marine mammal populations. The best modeling approach(es) for investigating the above questions should be determined and past, present, and future data gathering efforts should be discussed in relation to data inputs required by the model(s).

Agenda item no. 4. Review of desirable and obtainable data for high priority marine mammal species (northern fur seal, Steller sea lion, harbor seal, belukha whale, harbor porpoise, spotted seal, Dall's porpoise, and ribbon seal). Discussion should be based on data needs identified in agenda items 1-3.

Draft List of Participants for a workshop dealing with biological interactions among marine mammals and commercial fisheries in the Bering Sea.

Clarence Pautzke - NPFMC
Don Rosenberg - NPFMC/UA
Gordie Swartzman - UW
Doug Chapman - UW
Guy Oliver - NOAA/OMPA
Chuck Fowler - NOAA/NMFS/NMML
Cliff Fiscus - NOAA/NMFS/NMML
Bob DeLong - NOAA/NMFS/NMML
Bruce McAlister - NOAA/NMFS/NMML
Mike Perez - NOAA/NMFS/NMML
Taivo Laevestu - NOAA/NMFS
Bert Larkins - NOAA/NMFS
Bruce Mate - OSU
Doug DeMaster - NOAA/NMFS/SWFC
Jim Estes - USFWS
Ancel Johnson - USFWS
Bob Hofman - MMC
Bob Weeden - MMC/UA
Mike Bigg - Dept. Fisheries and Oceans, Nanaimo, B.C.
Paul Brodie - Dept. Fisheries and Oceans, Dartmouth, N.S.
Don Siniff - Univ. of Minnesota
Bob Elsner - UA/IMS
Bud Fay - UA/IMS
Vera Alexander - UA/IMS
John Burns - ADF&G
Steve Pennoyer - ADF&G
Don Calkins - ADF&G
Kathy Frost - ADF&G
Lloyd Lowry - ADF&G

THE CULTURAL AND SOCIAL FRAMEWORK RELEVANT
TO THE PACIFIC HALIBUT FISHERY

PHASE I: FISHERMEN'S PERCEPTIONS OF HALIBUT LIMITED ENTRY

Report to the North Pacific Fishery Management Council

Prepared By:

Marc L. Miller, Steve Langdon and Penelope Cordes

September 1982

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1.0 INTRODUCTION

This report on Phase I of the study deals with attitudes of commercial fishermen toward limited entry in the Pacific halibut fishery. ^{1/} The principal study objective is to describe the range and nature of industry reactions in 1982 to attempts to introduce an "individual quota-share" system to the fishery -- a method of fishery management alternately promoted and opposed by the various fisherman factions and interest groups in the harvesting sector. Thus, the report articulates the logic and tradeoffs fishermen see as pertinent to the discussion of limited entry.

A secondary study objective is to begin to detail the human component of the Pacific halibut fishery system as per the mandate of the Fishery Conservation and Management Act Section 303(b)(6) and the Northern Pacific Halibut Act of 1982 (Pub. L. No. 97-176). Whereas the halibut fishery has been the subject of extensive biological, significant economic, and limited historical research, virtually no attention has been directed to understanding the contemporary sociocultural context of halibut fishing. The report addresses this omission in a preliminary fashion by presenting the major social and cultural dimensions of the work and the values and beliefs associated with the fishery.

1/ In using the term "fisherman" generically to suggest people of either sex who fish, we follow the established custom of the fishing community.

This study has relied primarily on secondary source materials (e.g., letters by fishermen and fishermen's groups, transcripts of public testimony, press coverage of policy events) for information about attitudes prevalent in the fishing community. These data were modestly supplemented by personal opinions and statements elicited via informal interviewing of fishermen and interest-group representatives. Discussion of the actions and perceptions of fishermen and aspects of the cultural organization of the halibut fishery is the interpretative product of the study.

2.0 REGIONAL DESCRIPTIONS OF THE HALIBUT FISHERY

Pacific halibut are distributed along the continental shelf off Alaska as far north as Nome. Usually ranging in depths from 15 to 150 fathoms, halibut migrate to shallower banks and coastal waters in the summer and return to deep water along the edge of the continental shelf in winter. Figure 1 shows the distribution of Pacific halibut and the major fishing grounds.

For descriptive purposes, the Alaskan halibut fishery is here divided into six regions roughly corresponding to Alaska Department of Fish and Game Management Regions (see Figure 2). For each region, population distribution, fishing patterns, and management regimes are briefly described. Data on the halibut fishery is drawn from the Tetra Tech document "The Applicability of Limited Entry to the Alaskan Halibut Fishery" (1981).

2.1 Southeast Alaska (Area A)

Southeast Alaska (including Yakutat) has two major predominantly non-Native population centers: Juneau (19,528) and Ketchikan (11,318). Sitka is a medium sized community of 7,800 people while Petersburg, Wrangell, and Haines are small towns with fewer than 3,000 residents. There are nine predominantly Alaskan Native villages and about ten non-Native communities, each with less than 1,000 people.

Salmon fisheries, including purse seine, drift gillnet, set gillnet (Yakutat only), power troll and hand troll, are the major fisheries in this region,

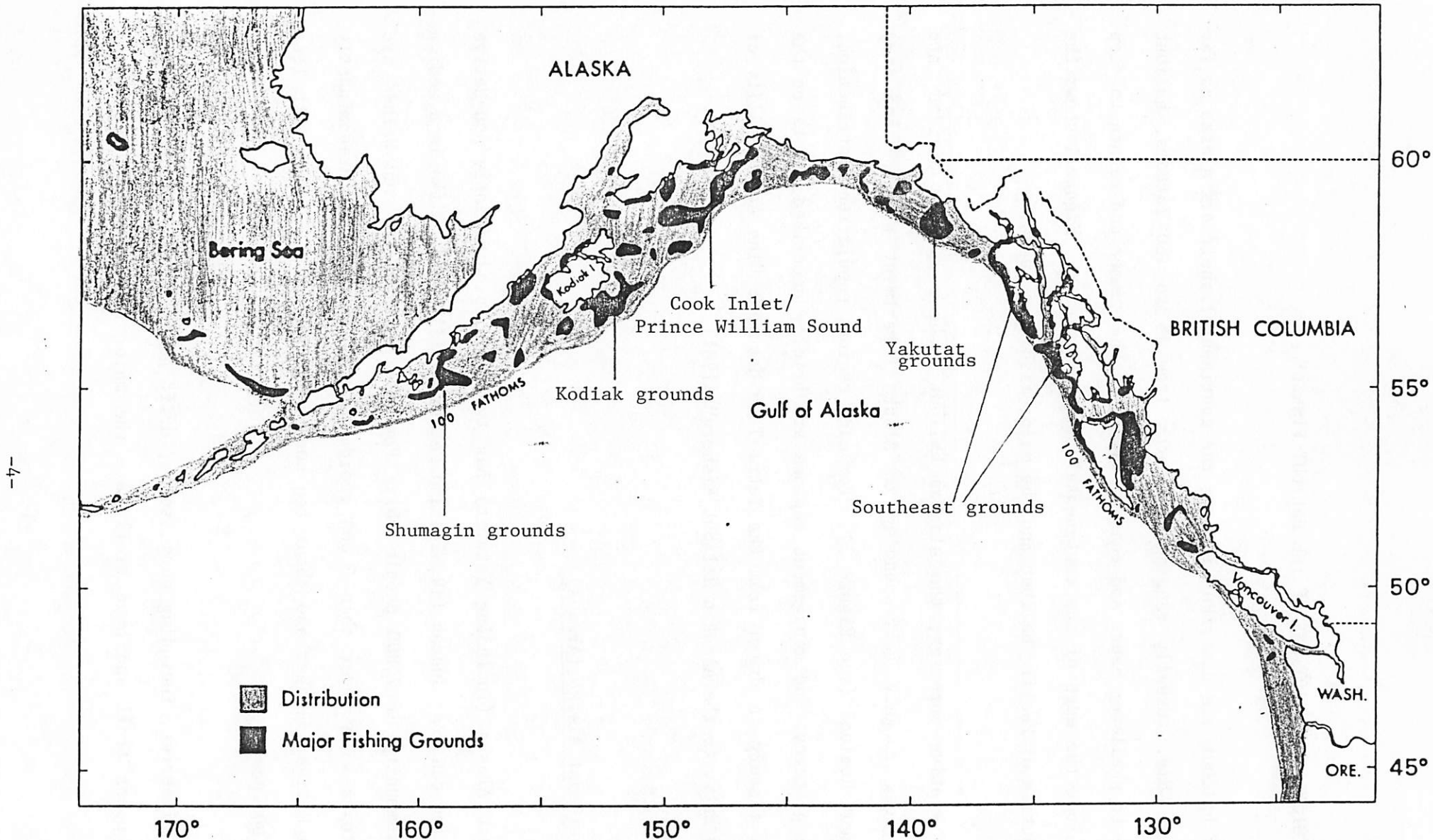


Figure 1. North American distribution of Pacific halibut and major fishing grounds.

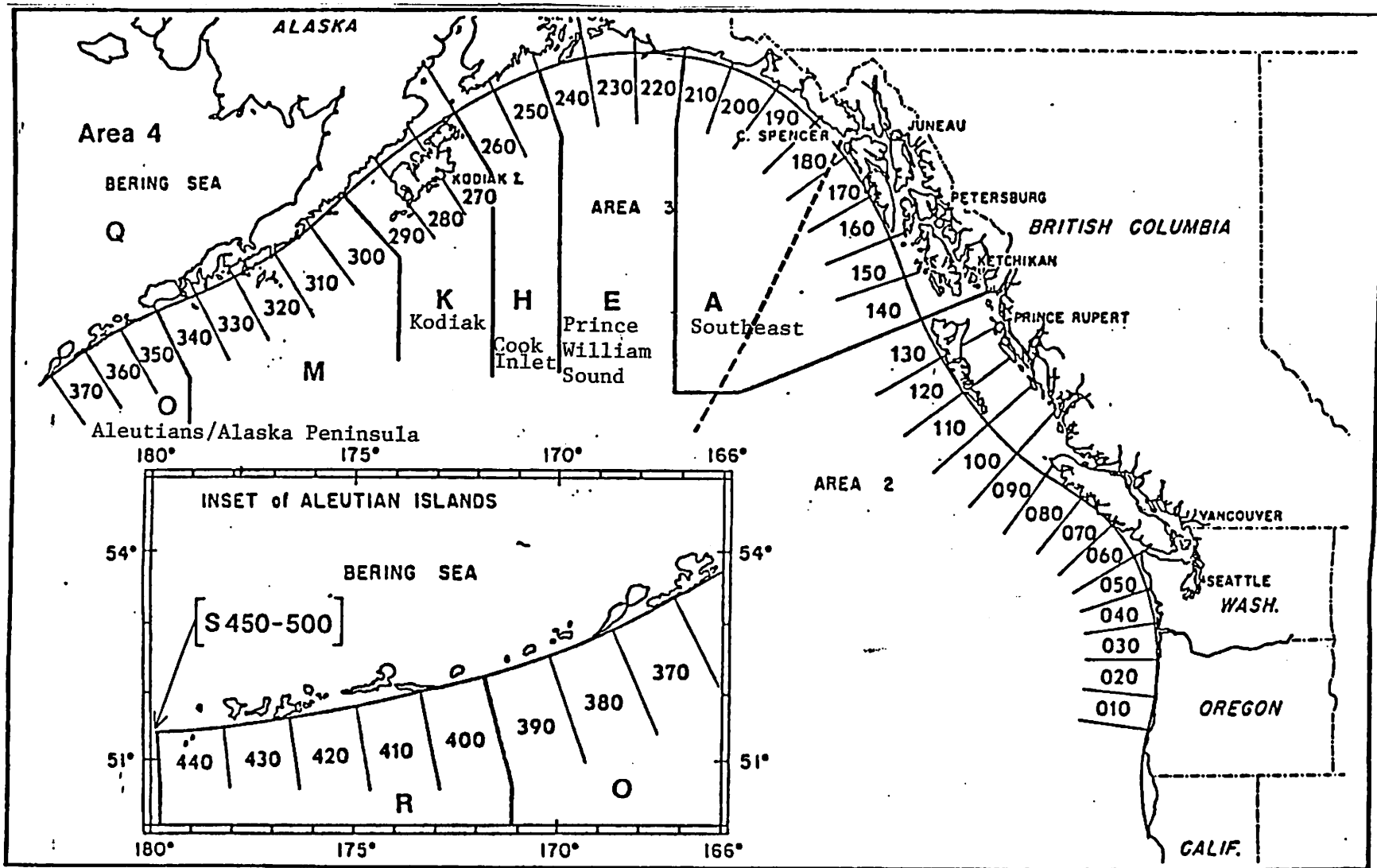


Figure 2. IPHC regulatory areas and statistical areas by ADF & G management areas.

contributing an average of 73% of the landed values from 1975 to 1979. Secondary fisheries include: herring (purse seine, set gillnet), halibut (longline), and black cod (longline). Landings from these fisheries increased in importance relative to salmon between 1975 and 1979. Halibut generally ranged from 15 - 20% of the landed value for fisheries in the region from 1975 to 1979. Crab, shrimp, rockfish, and groundfish constitute miscellaneous fisheries in the region.

There are five limited salmon fisheries and two limited herring fisheries in the region. Limited salmon fisheries include: purse seine (413), drift gillnet (463), set gillnet (161), and power troll (934). There are 2,150 salmon hand troll permits available, not all of which are transferable. Herring permits by gear type are: purse seine (41) and set gillnet (110).

Vessels from Southeastern ports fish inside waters of insular Southeast and outside waters the entire length of Southeast. Halibut vessels also fish grounds off the Kenai Peninsula and Kodiak to the west. Most vessels rarely venture west of 145° except for halibut. Ketchikan, Petersburg, Sitka, Juneau, and Pelican are the major processing plant locations for the region. There are a number of fishermen, primarily out of Petersburg, who have traditionally pursued halibut as their primary fishery. However, for the vast majority of Southeast Alaskan fishermen, halibut has been a supplementary species pursued when seasons allowed or income needs demanded it. Power trollers, for example, account for 3.3% of the total halibut landings in this region despite the fact that it is only an incidental catch to them.

2.2 Prince William Sound (Area E)

Valdez (3,079) and Cordova (1,879) are the two major population centers in the Prince William Sound area. There are approximately five smaller communities in the region, one of which is an Alaskan Native village.

Purse seine, drift gillnet, and set gillnet salmon are the major fisheries. Secondary fisheries include: herring (purse seine), shrimp (trawl and pots), and crab (pots). Halibut, black cod and groundfish are miscellaneous fisheries. There are three limited salmon fisheries with the following distribution of permits: purse seine (257), drift gillnet (528) and set gillnet (28). There are 91 permits for the one limited herring fishery in the region.

The fishing grounds include the waters of Prince William Sound and grounds off the Kenai Peninsula. It is unclear whether vessels travel west to Kodiak or east to Yakutat for additional fishing areas. Fishermen generally deliver their catch to Cordova.

There is little data on the role of halibut in this region's fishing strategies. The Tetra Tech document indicates a 67% increase in fleet size and a doubling of landings between 1978 and 1979. Small boats (up to 15 net tons) predominate, comprising up to 79% of the fleet, whereas there are less than ten schooner-size vessels for which halibut is the primary species landed.

2.3 Cook Inlet (Area H)

Cook Inlet is the most populous region of the state. Kenai (4,324), Soldotna (2,320), Homer (2,209), and Seward (1,843) are the major communities associated with fishing. There are a number of smaller communities in the Lower Cook Inlet area, including four predominantly Alaskan Native villages, whose residents are involved in the fishery.

As with Prince William Sound, purse seine, drift gillnet, and set gillnet salmon are the most important fisheries in Cook Inlet. Halibut, crab and herring (purse seine) are the secondary fisheries of the region, while shrimp and groundfish make up the miscellaneous fisheries. There are three limited salmon fisheries and one herring fishery with the following distribution of permits: salmon - purse seine (74), drift gillnet (549), set gillnet (742); herring - purse seine (67).

Cook Inlet vessels fish the Lower Cook Inlet and grounds off the Kenai Peninsula, making deliveries to processing plants in Seward, Homer, and Kenai. While there are few large vessels specializing in halibut, this is the second largest region in terms of vessels fishing and numbers of vessels landing halibut. Most 40-foot to 60-foot vessels utilize salmon, halibut, herring, crab and shrimp in different combinations. There is a sizable number of small boat (under 40 foot) fishermen without salmon or herring limited entry permits who fish halibut and crab. Vessels under 40 foot comprise 75-80% of those landing salmon.

2.4 Kodiak (Area K)

The Kodiak archipelago is dominated by the major port city of Kodiak (4,756). This is a predominantly Caucasian community with significant Alaskan Native and Filipino minority populations. In addition, there are four Alaskan Native villages on the island.

The major fisheries are: crab (pots), halibut (longline), and salmon (purse seine, beach seine, and set gillnet). Herring (gillnet) and shrimp constitute the secondary fisheries, and groundfish the miscellaneous. There are three limited salmon fisheries in the region, and the Commercial Fisheries Entry Commission is presently in the process of limiting the gillnet herring fishery. The salmon gear types and number of limited entry permits are as follows: purse seine (371), beach seine (33), and set gillnet (183).

The larger, specialized Kodiak vessels range over the entire North Pacific halibut fishing grounds from the Bering Sea to Southeast Alaska although the primary grounds are those of the Northern Gulf of Alaska off Kodiak Island and the Kenai Peninsula. Landings are made at Kodiak. More than any other region, the fishermen of the Kodiak region, both small- and big-boat, have specialized in halibut. One main reason for this is the close proximity of very productive grounds. Another reason for the small-boat fishermen's attraction to the resource is the lack of alternatives to be pursued. The Tetra Tech document indicates that 80% of Kodiak small boats (Class 1) caught halibut almost exclusively.

2.5 Alaska Peninsula and Aleutians (Areas O,M,R)

The southside of the Alaska Peninsula and the Aleutian Islands is a sparsely populated area. The only major population center is Unalaska (Dutch Harbor), population 1,322, a predominantly Caucasian fishing community located on Unalaska Island. Two other large villages in the region with predominantly Aleut populations are Sand Point (625) and King Cove (460). In addition, there are four smaller Aleut villages and five smaller Peninsula Eskimo villages in the region.

The major fisheries are: salmon (purse seine, beach seine, drift gillnet, set gillnet), and king and tanner crab (pots). Shrimp (pots) and halibut (longline) are the secondary fisheries. Miscellaneous fisheries include: sablefish (longline), cod (longline), and groundfish (trawl). Within the Chignik area there is one limited fishery, salmon (purse seine), for which there are 90 permanent permits. In the Alaska Peninsula-Aleutian area there are three limited salmon fisheries - purse seine (115), drift gillnet (150), and set gillnet (108).

The predominant areas fished by local vessels are the grounds off the Shumagin Islands and off of Sanak Island. Grounds on the southside of the Alaska Peninsula opposite Kodiak Island are fished mostly by Kodiak vessels. Landings are made at processing plants at Unalaska and Sand Point.

2.6 Bering Sea (Area Q)

The major fisheries in the inshore waters of the Bering Sea are salmon and herring. There are 1,958 salmon gillnet (drift and setnet combined) permanent permits in the Arctic/Yukon/Kuskokwim area excluding the Upper Kuskokwim. For herring there are 692 gillnet, 6 beach seine, and 1 purse seine permits.

Halibut in the Bering Sea is a relatively new fishery, emerging within the last five years. This region is fished by a small fleet (35 vessels in 1979) dominated by larger boats (greater than 35 net tons) from Southeast Alaska and Seattle. Given the provisions of the 1982 Halibut Act which grant a three-year exemption from the halibut moratorium to fishermen from rural coastal villages north of 56° north latitude in the Bering Sea, the future structure of halibut fishing in the region will be markedly different than at present. Nelson Island fishermen inaugurated their commercial halibut fishery this year with 19 boats landing 8,147 pounds.

3.0 CHRONOLOGY OF EVENTS: MANAGEMENT AND FISHERMEN INTERACTION

Discussion of limited entry for the Pacific halibut fishery goes back to 1978 with the drafting of the (never implemented) Halibut Fishery Management Plan and endorsement of the concept by the Fishing Vessel Owners' Association (FVOA). The bulk of responses from fishermen and their representative organizations (the data on which this report is based), however, came in 1982 following the discussion of an individual quota or "share system" as a possible form of limited entry, and the decision to implement a moratorium on new entrants in the halibut fishery. This section provides a chronology of North Pacific Fishery Management Council (NPFMC) actions related to halibut limited entry and public and industry response.

1979

The Limited Entry Workgroup, organized by the NPFMC in June 1979, recommended to the August Council meeting that the Council undertake a study to (a) analyze alternative forms of limited entry and (b) examine the applicability of limited entry to the halibut fishery. In the September 1979 newsletter the Council solicited public comments on halibut limited entry and a moratorium for 1980 to be heard at the October meeting in Sitka. In October, the Council approved a proposed addition to Section 5 of the State Department's Halibut Convention Implementing Legislation authorizing the Secretary of Commerce to promulgate regulations, including limited entry, applicable to U.S. nationals or vessels in addition to regulations adopted by the International Pacific Halibut Commission (IPHC). Sole testimony was given by a Sitka halibut fisherman requesting the study of limited entry as quickly as possible due to

a perceived crisis in the fishery. In a written statement to the Council, the FVOA requested a moratorium for the 1980 season and supported limited entry for halibut while noting that the current limited entry program for salmon would not be suitable for the halibut fleet. A Kodiak fisherman wrote to the Council expressing concerns over the inflationary effect of permit transferability if limited entry were to be applied to the halibut fishery. In subsequent public testimony (December 1979) and written correspondence (November 1979), the Petersburg Vessel Owners Association (PVOA) endorsed halibut limited entry, suggesting a point system along the lines of the Alaska salmon limited entry system.

1980

During 1980, the Limited Entry Workgroup, including Council members, formulated the goals for a halibut limited entry system and urged the Council to expedite the institution of a moratorium. The workgroup recommended eligibility criteria for permits based on past participation, gear and boat ownership, income dependence, and availability of alternative occupations. In April 1980, the Council awarded a contract to Tetra Tech to study the applicability of limited entry to the Pacific halibut fishery.

1981

The individual fisherman's quota or "share system" was first proposed for the halibut fishery in May 1981 at an economists' workshop attended by university economists and fishery management representatives from NPFMC, National Marine Fisheries Service (NMFS), and IPHC. The purpose of the workshop, sponsored by

the NPFMC, was to examine alternative forms of effort limitation potentially suitable for the halibut fishery. At the July 1981 NPFMC meeting the workgroup reported: "The share system was agreed to as the approach which would best facilitate achievement of the fishery objectives." Rebuilding the depleted halibut resource to produce long-term optimal yield and providing for a viable halibut setline fishery for U.S. fishermen were stated as objectives. The management policies deemed necessary to achieve these objectives called for: (1) (initially) prevention of additional effort in the halibut fishery; and (2) (ultimately) reduction of the level of effort in the halibut fishery over time.

The Council moved to further consider halibut limited entry and appointed a special halibut limited entry workgroup to formulate objectives. Nine objectives for a limited entry program were drafted and subsequently adopted by the Council in September 1981 (see Appendix A). At this time, the Alaska Longline Fishermen's Association voiced their support for limited entry and a moratorium for the halibut fishery. The workgroup recommended that the individual fisherman's quota be one of the alternatives evaluated. The Council instructed the workgroup to draft a proposal (RFP) for a study to evaluate and analyze the long-term benefits and costs of specific alternatives for a limited entry program.

In December 1981 the PVOA urged adoption of the "share system." This was prompted by Canadian plans to institute a share quota system in 1982. It was reasoned that if the Canadian fishermen could fish over a longer period of time and supply more fresh product, U.S. fishermen adhering to the present management regime with short openings could find themselves at an economic disadvantage.

1982

At the January 1982 meeting of the NPFMC, a representative of the PVOA again testified in favor of the proposed share system. He stressed the economic disadvantages of the majority of the catch going to the market as frozen product. The Advisory Panel asked the Council to promote a moratorium in 1982 or 1983 and requested that a schedule for implementing a limited entry or moratorium be presented at the March 1982 meeting.

The share system and moratorium was similarly endorsed by the American members of the Fishermen's Conference Board at the annual IPHC meeting in Seattle, February 1982. In a letter to Clem Tillion, representatives of twelve fishermen's organizations in Washington, Oregon and Alaska requested that the NPFMC draft a limited entry program for the halibut fishery based on a share system and expedite the implementation of a moratorium (see Appendix B). The signatories recommended limiting participation in the halibut fishery to those who made landings during the 1981 season. This letter was signed by Dave Ausman representing the Kodiak Halibut Fishermen's Association (KHFA) in accordance with a January vote by KHFA members to endorse a moratorium. However, in a subsequent March meeting convened to discuss the Seattle delegates' support for limited entry and the individual quota concept, KHFA voted unanimously to oppose limited entry, the share system, and the moratorium. On March 18, 1982 Mr. Ausman retracted his signature from the Seattle group's letter.

At its March 1982 meeting, the NPFMC voted to impose a moratorium on entry to the fishery pending passage of implementing legislation by Congress. The Council also adopted the RFP for the study of the shares system and other

alternatives for halibut limited entry. Individuals and representatives of fishermen's organizations gave their opinions of halibut limited entry during the public comment segment of the March meeting. With few exceptions, letters to the Council expressing fishermen's concerns and opposition to the proposed moratorium and "share system" postdate this Council meeting.

Prior to the March Council meeting, the limited press coverage of the halibut moratorium and limited entry proposals was either neutral or favorable towards increased effort limitation in the halibut fishery. In subsequent months, however, opposing views appeared in the media in letters to the editor from Kodiak fishermen, interviews with boat owners and crew, editorials, and ads by the newly formed Kodiak-based "Alaskans Opposed to Fishery Shares." The greatest amount of coverage of the controversy and the most consistently anti-limited entry position can be found in the Kodiak Daily Mirror and the Alaska Fisherman's Journal. One Associate editor for the Journal is also a regular columnist for the Kodiak Daily Mirror.

An Anchorage Associated Press release circulated widely in Alaska papers reported on the March NPFMC meeting. It described the moratorium, the RFP, and the shares system of limited entry, noting the Kodiak opposition. The April passage of the Halibut Act in the Senate, and Congressional and Presidential approval of the Act in May occasioned other media coverage at which time Kodiak opposition was further aired.

The Council's adoption of a moratorium and the study of the shares system plus the Senate approval of implementing legislation also prompted a series of resolutions from fourteen Alaskan communities and voluntary organizations

opposing the share quota system for the halibut fishery. The resolution was initiated by the Kodiak Island Borough in April and sent to other cities in May by the City of Kodiak.

In May, the Council awarded a contract to Northwest Resources Analysis to study the share system and alternative forms of limited entry. Progress on Phase I of the study was reported to the Halibut Limited Entry Workgroup and the NPFMC in July. While public response to the issue has waned in the past two months, recent news coverage of this report stating that Kodiak stands to lose the most under a share system of limited entry may generate more comments from fishermen there.

In a reciprocal fashion, fisherman opposition appears to be influencing media coverage. Paul Thomas, writing for National Fisherman, reports in the September issue that fishermen's letters have led him to consider the pitfalls of the share system and temper his earlier optimism for the concept expressed in two previous articles in this journal. Editors of Pacific Fishing noted recently that the response to their earlier favorable treatment of halibut limited entry has prompted them to initiate a study of the issue to be published in a forthcoming issue.

4.0 FISHERMEN'S VIEWS

In order to identify public interest issues concerning limited entry, the following were examined: letters to the NPFMC from individuals and fishermen's organizations; oral testimony at the March 1982 Council meeting; and press coverage in Alaskan newspapers and industry journals from January to September 1982. As expected, of the three sectors of the fishery potentially affected by limited entry, (i.e., fishermen owner/operators, crew members, processors) vessel-owning fishermen were the most vocal in their response to limited entry issues.

4.1 Written Comments

While some of the written correspondence to the Council from individuals acknowledged the need for some effort limitation, all 27 letters and 17 telegrams expressed opposition to the share system and most rejected limited entry in general. The majority were from persons identifying themselves as Alaskan small-boat owners. Reflecting the composition of the Pacific halibut fleet, these letters came predominantly from the Central area including Prince William Sound (3), Cook Inlet region (5), and the Kodiak region (14). The only letters specifically addressing the impact of the share system on crew members were from two Petersburg residents. However, two of the most vocal opponents of the share system, and co-founders of "Alaskans Opposed to Fishery Shares", are Kodiak crewmen.

In contrast, written communications to the Council from fishermen's organizations have largely supported the moratorium and the share system of limited entry. Representatives of 13 fishermen's organizations endorsed the February 1982 letter from the IPHC Fishermen's Conference Board urging adoption of the moratorium and the study of the share system (see Appendix B). In addition, the Deep Sea Fishermen's Union, FVOA and PVOA have written to the Council urging a limited entry program and share system for the halibut fishery. Only the Kodiak Halibut Fishermen's Association (KHFA) and the Seward Fishermen's Association have expressed their members' opposition in writing to the Council.

Communications from several rural communities, including a petition from 35 King Cove residents, have requested a three-year exemption from the moratorium in order to make the transition from subsistence to commercial halibut fishing now that marketing opportunities are becoming available.

The United Fishermen of Alaska (UFA), representing 16 fishermen's organizations and 1,500 individuals, has yet to take a stand on the share system. While the UFA has been a proponent of salmon limited entry, opposition to halibut limited entry by some of its members (notably Kodiak fishermen), and uncertainty over the ramifications of the share system have prevented the UFA from taking a united stand for or against the share system for halibut.

While the response from organizations has been predominantly in favor of halibut limited entry, it should be noted that respondents to date represent only 15 of the 65-plus fishermen's organizations in the North Pacific Fishery.

4.2 Oral Testimony

In public testimony presented at the March 1982 Council meeting in Anchorage, nine individuals voiced their opposition to halibut limited entry focusing primarily on the perceived impacts of individual fishermen's quotas on the small boat owner/operator.

Of the eight representatives of fishermen's organizations present, four testified in favor of the share system and moratorium, two objected to the proposed share system, and two raised questions regarding the problems of incidental troll catch and enforcement. Several proponents and opponents of limited entry urged that the Council study other alternatives for limited entry in addition to the share system.

In weighing the significance of this public testimony, one should consider that proximity to Anchorage and availability of travel funds are factors which influence who could attend to give public comments.

4.3 Response Through News Media

Some opponents of halibut limited entry have used the news media, both industry journals and Alaskan newspapers, to air their views. Letters to the editor from nine individuals appeared a total of 24 times in the press between April and August 1982. These letters are reproduced in Appendix C. "Alaskans Opposed to Fishery Shares" placed ads in three Alaskan dailies in March and April to rally support for their position (see Appendix D).

Aside from this media coverage initiated by fishermen, the discussion of halibut limited entry, the moratorium and the share system in the general press has mostly followed AP releases and other news reporting of NPFMC meetings and other related actions. The Kodiak Daily Mirror and, to a lesser extent, the Kadiak Times are notable (and predictable) exceptions, providing more continuous coverage and taking more of an adversary position (see Appendix E, Kodiak Daily Mirror editorial).

On the other hand, the Seward Phoenix Log, which might be expected to mirror some of the anti-share opinion of the Seward Fishermen's Association, actually presented a favorable view of individual quotas in three articles during the month of June. Notably lacking in coverage of halibut limited entry are the newspapers from the Southeastern communities of Ketchikan and Petersburg.

Fishermen's journals have provided a more in-depth analysis of the limited entry/shares controversy and less of a strictly Alaskan view of the issue. They have presented profiles of halibut fishermen, both large and small operators; guest editorials by both advocates and opponents of quota shares; and articles discussing halibut limited entry within the context of the general debate over limited entry in other U.S. and Canadian fisheries. Over the past year, fishermen's journals have shown a tendency to move from a positive view of halibut limited entry and the shares concept to a more cautious skepticism as Council actions unfolded and fishermen's reactions were articulated. A schematic summary of newspaper and journal coverage is presented in Appendix F.

4.4 Fishermen's Assumptions and Concerns

Most of the arguments against limited entry and the share system articulated by fishermen in letters and testimony and through news media are based on one or more of the following basic assumptions:

- (1) A fishery is a common property resource to which individual ownership rights do not apply.
- (2) People should be able to pursue traditional patterns of fishing.
- (3) Diversification is essential today to a successful fishery.
- (4) Competition is the cornerstone of a healthy capitalist economy.
- (5) U.S. fishermen have an inalienable right to the pursuit of the American Dream which is equated with upward mobility.
- (6) Market principles and environmental exigencies are sufficient to regulate the domestic fishery (since imposition of the 200 mile limit has constrained foreign trawlers).

Flowing from these postulates are the following arguments against limited entry in general and the share system in particular. We use the fishermen's own words from letters, testimony and interviews to illustrate.

- (1) Assuming the fishery to be a common property resource, a share system which would allocate portions of this resource to individuals is deemed illegal, unconstitutional, unnatural and un-American.

"I believe the U.S. Government is bound by the constitution, and the offshore resources we have been blessed with are part of the public domain." (Kodiak)

A modified, regional version of this argument holds that the Pacific halibut fishery is an Alaskan resource.

"Limited entry is illegal. The State constitution states so in that the resources belong to the people - not a chosen few." (Craig)

Given the nature of the resource, fishermen perceive themselves as different from the farmer or wage worker. Independence and tolerance for risk, uncertainty and adversity are part of the fisherman's ethos and the basis for pride in the profession. A share system is deemed contrary to this pride and way of life.

"It would transform the hunter into a collector of government portions."

"The idea of a fixed harvest is so contrary to the thinking of most fishermen. Your pride in coming in with a load of fish would be gone." (Kodiak)

"The idea of a guaranteed quota . . . is as unnatural to the North Pacific fishing tradition as it is to the American form of business as a whole." (Petersburg)

- (2) To many small-boat fishermen, traditional patterns of fishing means using the resource when it is needed or desired - to augment an average year or to offset losses in a bad year in other fisheries. One type of traditional pattern is linked to the ethnic cultures of Southeast, Prince William Sound and Kodiak in which pursuit of halibut is part of the ebb

and flow of the total cycle of resource utilization. It is argued that halibut limited entry will exclude those who have fished halibut as need and the state of other fisheries determined.

"Halibut, to me, is like the hand troll fishery. You (will take away) the last thing. It's a right. It's the last open opportunity for a fisherman to do what they have traditionally done." (Southeast)

- (3) The small boat owner relies on diversification to succeed in the fishery and regards the share system as inhibiting the flexibility needed to shift from one fishery to the next depending on market, climate and resource fluctuations. As expressed by fishermen: "The concept of owning a fishing boat for the sole purpose of catching only one species of fish is not prevalent in Alaskan fishing communities."

"The way things are going, very few vessels owners can make a living by participation in only on fishery." (Petersburg)

"I make my living in a fairly uncertain environment; biologically, meteorologically and politically. One fishery may be good, the next may be poor and by the end of the year I hope the good ones outweigh the bad. If a quota share system of limited entry or participant management is implemented then I will be placed into a specific category as a resource user and my economic flexibility will be seriously impaired. (Kodiak)

- (4) Competition is essential to a successful fishery because it provides the incentive for innovation, efficiency, hard work and initiative. The share system, in eliminating competition, is perceived as undermining this incentive.

"The 'share system' can only stifle initiative." (Port Baily)

"Why bother if you must stay within a certain quota? There is no incentive to do better." (Anchorage)

Opponents argue that the loss of any advantage from competition will have ramifications for crew members.

"When you're not competing, you do not need the quality deckhand." (Petersburg)

"It would not supply jobs for deckhands since the vessels would hire the smallest crew possible and fish all summer to fill their personal quotas." (Gig Harbor, WA)

Paul Thomas, in an overview of the debate (National Fisherman 9/82) notes: "Perhaps nothing is more contrary to a fisherman's instinct than what the share system might do to the age-old spirit of competition." He speculates that if fishermen are denied the chance to out-do each other in size of the catch, they may compete to see who gets their fish in the least time. This, of course, would negate one of the aims of the share system which is to lengthen the season and provide fresh fish over a longer period of time.

Competition and free enterprise is the opposite of monopoly in the fishermen's eyes. Much of the argument against the share system is centered upon the fear of monopoly made possible by the allocation of exclusive rights to the resource coupled with freely transferable shares. It is feared that the share system will lead to the concentration of shares in the hands of a few wealthy individuals or corporate entities.

"The share system of limited entry will take away the small boat fishermen's right to make a living and hand it to a small group of investors who can afford to buy the shares." (Kodiak)

"The halibut shares quota system is the hard fast road to monopoly in all fisheries." (Kodiak)

"Limited entry effectively closes the market and denies opportunity to anyone that does not have substantial capital backing. I don't believe the "trickle down" theory of economics is necessarily applicable to the fishing industry unless it implies 'Give the fish to the big boys and maybe you'll be lucky enough to get a cannery job in the future'." (Kodiak)

"The canneries could buy up all the shares, and totally own the whole fishery." (Cordova)

Another aspect of the concentration argument used by fishermen against the share system is that monopolistic control could disrupt local community economies. Fishermen argue that even a limit on maximum individual shareholdings of 1% of the total fishery shares does not protect against consolidation of interests. Further, because halibut shares "guarantee" an income (cp. salmon limited entry permits which only guarantee access), an individual with property rights in the fishery could easily borrow against the future.

"If you had 100,000 pounds, you could borrow a quarter of a million to half a million dollars. Then, using the State's easy loan program, you could turn around and buy other (shares). It would change the complexion of the fishing industry." (Kodiak)

One fisherman elaborated on this point by speculating that such cartels could effectively displace not only fishermen, but shore-side processors and labor. Small groups of fishermen could, he reasoned, collaborate to finance a catcher/processor. They could then catch various species at leisure, and finally take the entire catch to ports paying the highest ex-vessel prices.

"A few people, twenty or more, could control the fishery. They might not even want to bring it (the multi-species accumulated catch) into Kodiak."

"A 'Halibut Shareholder's Association' could bypass towns or processors . . . to jack up the prices. Did you see '60 Minutes' about the hops, orange and almond industries?"
(Kodiak)

- (5) The share system blocks upward mobility by setting the maximum allowable catch in a given season. Part of the attractiveness of fishing in the open access context is the opportunity of making a big catch and moving up in the fishery. The small boat fishermen envisions a big enough catch to get a medium-size vessel while the medium-size skipper envisions a big enough haul to get a large vessel capable of participating in a wide variety of areas.

". . .this would keep the small operation small with no chance for growth. This hardly seems fair and certainly sounds like a caste system by having to stay within a set quota."
(Anchorage)

"If this share system wasn't instituted, we resident fishermen would successfully compete for a bigger and bigger share of the halibut resource. The bulk of the U.S. share is right in our front yard." (Whale Island, Ouzinkie)

"We need an area where free enterprise can operate, beginners can start and small-scale fishermen can become larger."
(Homer)

In addition, fishermen argue for an open access system that will allow entrance to the fishery for the next generation.

"This share program will make it even harder for crew members to buy their own vessels and make a go of it." (Petersburg)

"As in the case of salmon limited entry the price of a permit is astronomical so as to prevent most younger people from purchasing them." (Anchorage)

- (6) On the basis of the assumption that market principles and environmental conditions can adequately regulate the fishery, most contend that the present management regime is adequate. Adding to this conviction is the biological evidence (presented at the March 1982 NPFMC meeting by D. McCaughran of IPHC) that the resource is recovering which led to an increase in the 1982 quota over that of 1981. Fishermen argue that the biological data indicate no need for further effort limitation for conservation purposes. Rather, the move to institute a moratorium and impose limited entry is motivated by the economic concerns of those who stand to benefit the most from it. This brings forth cries of favoritism and arguments phrased in terms of "big" vs. "little" operators, Alaskan vs. Outsiders, newcomers vs. the traditional schooner fleet, and young vs. old.

"This would permanently place small boats and village skiffs fishermen at a disadvantage. The resource would be permanently allocated to a few outside boats and those with money connections that could buy up some of the smaller shares." (Whale Island, Ouzinkie)

"The biggest catch is taken by the Seattle-based big schooners who come up here to Alaska, catch our halibut and then return to Seattle. But, by the dint of highly effective lobbyists, they have put in a proposition to provide not only a limited entry for halibut, but a SHARE SYSTEM. This is a literal legal Piracy of the right to fish, cutting out all the small fishermen. That's the most un-American thing I have ever heard of, Mr. President. The big boys from Seattle are throttling us, capitalism and all that our land stands for." (Kodiak)

"The quota system is geared totally toward the larger boat owners and fishermen . . . Only the bigger boats will be able to fish in the winter which in itself will bankrupt most smaller boats." (Anchorage)

While fishermen advocate market mechanisms to regulate the fishery, and fishery managers and theorists assume that government intervention is abhorrent to the fisherman, many respondents have expressed a preference for government management of share transfers rather than freely transferable shares. This is a reflection of the perceived and experienced problems with the high prices of salmon limited entry permits.

Aside from these larger themes running through the objections to limited entry and individual shares, there are many other points raised by fishermen which warrant clarification and consideration.

Management Action

Fishermen object that the Council has moved too fast on this issue and that the study by Northwest Resources Analysis does not give equal consideration to alternative forms of limited entry. They also contend that the Seattle meeting of representatives to the IPHC in February 1982 was not representative of all fishermen and that most fishermen in rural communities are not aware of the decisions being made in Anchorage and Seattle.

Processors and the "Fresh Fish" Argument

One popular argument for the share system holds that there are fresh product benefits for the processor (in the form of reduced cold storage and interest costs), the fisherman (in increased ex-vessel prices), and the consumer (in better quality fish and passed down savings). However, there are fishermen

who challenge the promise of a developing fresh halibut market. Kodiak fishermen, in particular, do not foresee fresh halibut originating out of Kodiak. The reasons are twofold. First, the distance between Kodiak and the best markets (e.g., Seattle, Bellingham) translates into prohibitively high shipping costs (some fishermen insist that the time it takes to ship to Puget Sound ensures that no fish are "fresh"). Second, it is unrealistic to suppose that fishermen would land halibut in small amounts required for most of the product to go to market as "fresh". As fishermen point out, operating costs are the same whether a full or half-load is landed.

"I think it's a misconception this (the share system) would spread out the fishery over the course of the year. I'd catch it (halibut quota) all at one time if I could, and then get into something else. It's a pipe-dream if they think those boats will go out and get a little at a time." (Kodiak)

A recent communication from the Halibut Association of North America lends some support to these arguments by insisting that the overall quality of halibut has risen over the past few years with the advent of shorter fishing periods. They contend the shortened season ensures a higher quality fish, both to fresh and frozen markets, than in the early seventies when boats fished as long as twenty-eight days before delivering their fish.

Then too, marketing requirements must be considered. In his history of the Pacific Halibut fishery, Bell (1981) indicates that the transition from fresh to frozen marketing for the majority of the halibut catch is more a function of improvements in refrigeration technology and the requirements of large supermarket chains than a function of shorter halibut seasons. This leaves some doubt as to whether longer seasons will reverse the trend even though it makes a return to the marketing of more fresh halibut theoretically possible.

"They said we could have fresh fish most of the year, but I think it will be frozen anyway. We don't (for example) sell king crab fresh much. Restaurants like things frozen. And they get a good product that way." (Kodiak)

Kodiak residents are also concerned that big boats will by-pass Kodiak processors if time is no longer a factor, since the ex-vessel prices are higher in Seattle. Others are concerned that processors themselves will not be adversely affected, but that they will not respond in the desired fashion to gear up for small quantities of halibut over a lengthened season.

Enforcement

A major weakness inherent in the share-quota system concerns the practical and logistical problems of enforcement. The most articulate proponents of the system generally allow that the system cannot function unless fishermen give it their support by the imposition of negative sanctions on the patently illegal activities of, for example, theft, under-reporting, blackmarketing and the like. Of course, many fishermen cannot envision anything other than a major increase in unapprehended violations.

"(It's) unenforceable. There will be more poaching than ever before because it will be legal to have halibut on board. It will be a bureaucratic nightmare, but that's what the bureaucrats want." (Kodiak)

Further, many have pointed out that the proposed regulations do not address the incidental catch problem. No fisherman wants to cut back on his/her own production for the sake of protecting the resource only to see the trawlers catching more halibut.

5.0 MAJOR INTEREST-GROUP POSITIONS

The arguments and attitudes identified in the last section are generally available to all fishermen, but in practice are never fully utilized by any one individual. Fishermen pick and choose from this inventory to meet the demands of the situation at hand (e.g., casual conversation, heated dialogue, political opportunity). There is no "typical fisherman", and one cannot predict with a great deal of certainty how an individual will align himself with these competing view points.

In this section, we make preliminary assignment of elements of the basic arguments to the fisherman and interest groups in the regions identified earlier.

5.1 Seattle/Petersburg Fishermen

This category places together the principal instigators and most vigorous proponents of the sustained effort (within the harvesting sector) to establish a limited entry system for halibut. The "big boat" fishermen from Puget Sound and Petersburg perhaps are the most vulnerable of all fishermen to pressures from ever-increasing operating costs, bank interests and loans, rises in total harvesting effort, number of fishermen and increasingly short seasons (see, for example, Thompson 1981). Limited entry commonly is perceived by this group as the best of many unhappy solutions to over-crowding:

"The share system is the most equitable to everyone . . .It gives a guy who's been in the fisheries consideration." (Petersburg)

The quota-share system is advanced by these advocates as the management tool most capable of protecting the resource and their vested interests, while at the same time compelling economic efficiency within the harvesting sector. The longer fishing season made possible by the share system, it is argued, provides rewards (to fishermen, to processors) for the increased availability of fresh halibut products.

It is important to note that many long-time observers of the inter-connected Pacific fisheries feel that discussion of halibut limited entry must pay attention to consequences for the domestic trawl interests. Leading Seattle and Petersburg fishermen (as well as some managers) have for years expressed their concern for the viability of the halibut fleet if a giant American trawl industry ever emerges.

"The biggest fear in Petersburg, and it's something the Kodiak fishermen haven't addressed yet because they haven't been in the game long enough, is that we're going to lose the longline fishery entirely (to trawlers)." (Petersburg)

"The longliners are afraid of halibut becoming an incidental fishery (dominated by trawlers and crabbers)." (Kodiak)

The fear is twofold. If trawlers can purchase halibut shares they may increase political pressure to be allowed to market halibut and would then have an incentive to target on this species. Secondly, if trawlers hold halibut shares and therefore can legally possess halibut (although still restricted to longline gear) how can such a system be effectively enforced?

"If shares are up for sale, there's no reason to insist halibut be caught on hook and line. Why waste a halibut?" (Seattle)

5.2 Kodiak and Northern Gulf of Alaska

Kodiak is an extreme case of a community mobilized to combat limited entry in the halibut fishery. Much of the resistance to the share system has its origins in Kodiak and has diffused elsewhere in central and western Alaska.

In communities such as Cordova, Seward, Homer and Kenai there are small-boat fishermen who share with Kodiak small-boat fishermen similar multiple-use adaptations including halibut. The degree of dependence on halibut is, however, significantly greater among Kodiak fishermen than it is among other northern Gulf of Alaska fishermen. Taken together, these are the most urban, capital intensive, productive and politically organized halibut fishing communities north of Southeast Alaska.

The key elements of the Kodiak entrepreneurial position have to do with the value accorded individual initiative, free enterprise, competition, ability to diversify, and mobility. This is the posture of fishermen who insist on the opportunity to grow, and to grow at one's chosen pace. The unit of importance is the owner-operator uninhibited by complex ties to banks, financial advisors/accountants and attorneys.

Holders of the position have as a major concern the precedent-setting significance of limited entry in the halibut fishery. Limited entry in halibut would pave the way, it is argued, for similar management of herring, cod, crab and other fisheries.

This position also opposes the disruption of local community economies, cultural practices and fishing styles. Kodiak's geographical proximity to diverse, substantial and year-round fishery resources has led its fishermen to develop the adaptative strategies of rapid switchings of gear and target species. This is achieved in concert with standards not exclusively economic in nature; that is they value a mix of fisheries over a single fishery.

"Our security here is in being diversified . . . I haven't fished shrimp for four years, but I still have my gear. It's my security. My security is my ability. Having a share system is putting people in boxes. It creates artificial barriers, curtains, between fisheries. If you're boxed in, where are you going to go? . . . (and why, for example,) penalize a guy who is a tender?" (Kodiak)

"There are things in fisheries more important than total number of pounds." (Kodiak)

Kodiak fishermen fear they will be denied the freedom to plan fishing activities in ways which are prescribed by the local market conditions, environmental exigencies and fishing ethic. At issue here are the rights to fish (or not to fish, or not to have to fish defensively) and not to be coerced into the speculative business of high finance.

"With the shares, they're trying to decrease capitalization . . . (but, there are so many factors encouraging overcapitalization, to wit:) the capital construction fund, investment credit, fishing vessel obligation . . . One week a guy from the limited entry commission comes up here and holds hearings, the next week guys from financial assistance programs with the National Marine Fisheries Service are up here showing us tax loopholes. We call those programs 'rabbit laws'; you can build boats as fast as rabbits multiply. We don't want to subsidize other guys buying boats . . ." (Kodiak)

"(the share-quota system) leads to everyone trying to do everything so they qualify for points. You're not fishing for profits; you're not fishing to enjoy it; you're fishing to protect your ass . . . You can have a money losing proposition just to get your quota." (Kodiak)

"With a share thing, you'd have more guys on the beach bankrolling shares."

"I wouldn't know what to do with myself in the summer if I couldn't go fishing. I couldn't see myself on the beach. I'd go ape."

Kodiak fishermen also argue that the quota-share system quite simply exacerbates an already difficult situation for crew:

"How are you going to get a loan? You're in debt for the boat and the gear, and now a permit. How are you going to write a pro forma? (And now you say) You're going to make money?"

Kodiak crew have voiced their concern over possible changes in the labor supply in the event of a share-quota system. With unlimited time to catch his/her share, the argument proceeds, the economically rational skipper exploits local labor and frustrates tenured deckhands by employing raw recruits. And this ultimately results in high labor turnover, inefficiency and lowered crew shares:

"They wouldn't have to pay the crew because there'd be no gamble involved. (They would) take a green crew (and would reason) it doesn't make any difference if we lose a few fish if they can't gaff." (Kodiak)

"I believe you'll end up with salaried fishermen on company boats. And less skilled crew." (Kodiak)

"If I were a skipper (who operated according to economic rationality) I'd tell a guy I'd pay him a hundred dollars a day and that's it. (If he didn't want it) there are ten other guys on the dock." (Kodiak)

5.3 Native Fishermen - Kodiak, Alaska Peninsula and Aleutians

This category embraces Alaskan Natives in Kodiak (city and six outlying villages), the Alaska Peninsula and Aleutians including Sand Point, King Cove, Chignik and five villages. For the most part, these are small-boat salmon and crab fishermen who land a relatively small total amount of halibut. In the early 1970s, however, when salmon runs and earnings were very low, many of these fishermen pursued halibut and it was a significant component in their earnings at that time. They consider it unfair to be cut off from a resource which they regard as a part of their overall fishing adaptation just because their salmon fishery has been so productive for the past five years.

Although the specific details and configuration of the share system have not been determined, there appears to be a consensus (by marine/social program/economic advisors, and by Alaskan Native and non-Native fishermen alike) that virtually any limited entry scheme for halibut will put Alaskan Native small-boat fishermen at a severe disadvantage [cp. Langdon (1980) and Petterson (1982) for analyses of unanticipated consequences of salmon limited entry programs for Alaskan Native fishermen]. Many of these small-boat village fishermen have historically not had ready access to markets for their fish since Kodiak and Sand Point have been the only communities with halibut processing facilities. More recently, the setting of halibut seasons has conflicted with salmon openings, their major fishery, thus precluding them from participation in the halibut fishery.

"The impact (of a share-quota system) on small Alaskan communities is inestimable . . .the limited entry share system for halibut would effectively displace every Native fisherman in the state -

most from the initial allocation . . .(and those who did qualify) would be induced to sell. That's the problem with economic models." (Kodiak)

5.4 Southeast Native and Small-Boat Fishermen

This category puts together the Alaskan Native and non-Native small-boat fishermen in Southeast Alaska (including Yakutat) in obvious contrast to the halibut fishermen of Seattle/Petersburg who initiated the drive for a limited entry program. These small-boat fishermen, many of whom reside in rural communities, have been attuned to the possibility of limited entry for some time. The dimensions of conflict, as these fishermen view the process, pit the "big" against the "little" boats, the "established" fishermen against the newcomers/part-timers, and the "local" population (sometimes rural Southeast, sometimes greater Southeast, sometimes all of Alaska) against "the Outsiders." Not surprisingly, many small-boat fishermen oppose limited entry.

Small-boat Southeast fishermen are not large producers of halibut. Clearly, part of the reason for this derives from the scale of their operations (small vessel size discourages intensive fishing in unprotected North Pacific waters). But, there is also a cultural reason having to do with why fishermen fish. Many of the small-boat fishermen (who fish traditional Native ways, and/or with nuclear families or in nontraditional/counter-cultural ways) do not aspire to be upwardly mobile or to expand in fisheries commitment. In the de-emphasis of material rewards, some fishermen pursue the fishing life for expressive, rather than economic reasons.

"Most of the fishermen in Southeast don't make money. They just want to be in the environment. They don't like being on the docks." (Craig)

The thrust of the objection of many of the small-boat fishermen to limited entry is not that it inhibits growth and initiative (as is commonly asserted in Kodiak), but that it prevents fishermen from sustained activity. In their view, traditional patterns (as well as some non-traditional patterns) of shifting from fishery to fishery (e.g., herring in March, halibut in May, hand-troll/seine for salmon in June, July and August) are made less possible by halibut limited entry.

Small-boat fishermen argue that limited entry in halibut is but one more closed option. Southeast fishermen have already had to choose, it is argued, between salmon seining and troll permits, few fishermen being able to purchase both. Few Southeast Natives have herring licenses. It is clear that what they would like to see is a return to a situation that allowed use of different fisheries from season to season and year to year as they were needed.

"One fishery after another will go under to limited entry. Limited entry is here to stay. You don't have a choice as to whether or not you want it. It's whether or not you can scream loud enough so that when they set up the system, they have your needs in mind. With halibut it used to be that you went out for your month and this fit in (with other fishing activities). Now with the season so short and choppy, people have to move so quick that it doesn't feel the same." (Craig)

Fishing as a way of life can be claimed by all segments of the fishing community. Yet it does seem clear that (sub)cultures of fishermen organize the way they fish in different ways and fish for different reasons. Southeast

and other Alaskan small-boat fishermen regularly cite differences between their situation and those of "big boat", urban fishermen.

"Where I'm coming from is from rural communities. Before, limited entry seemed okay because it would keep the outsiders out. But now people are against limited entry because it didn't work the way it was supposed to (in the salmon fisheries). It didn't keep the outsiders out because the outsiders are the only ones with money to buy the permits. People are looking at limited entry in the halibut fishery in the same way. It's not going to help the rural residents. It's going to help the big boats from Seattle."
(Craig)

"The fishermen of Petersburg are economically efficient fishermen. They don't fish because of the culture or the tradition. They fish for money. Those guys for Petersburg, they don't like the small boats because they are a nuisance. They get in their way."
(Craig)

Many small-boat fishermen in Southeast value their activity because it provides an undemanding, seasonal, sometimes-subsistence job. In addition, autonomy and the feeling of being one's own boss is perhaps what small-boat fishermen value most of all about their occupation.

5.5 Native Fishermen - Bering Sea

This category includes Alaskan Natives who inhabit the rural coastal and island communities of the Bering Sea (esp. the Pribilof, Nunivak, Nelson Islands). Fishermen in these areas (i.e., areas in the Bering Sea north of 56° north latitude) have only recently begun to produce halibut for the market, and as a consequence have been exempted from moratorium provisions to

the extent they have been granted three years to establish records of participation. No segment of the halibut (or any other) commercial fishery opposes this arrangement (although Alaskan Natives in the Alaska Peninsula/Aleutian area have asked for comparable treatment).

Despite these provisions, Aleut fishermen from the Pribilofs and Yupik fishermen from Nelson Island have concerns about how they are being allowed to participate in the fishery. Both groups feel a need for longer periods of time for fishing. Not only are they vulnerable to bad weather, but the short season, coupled with intense competition for the area quota from already established big boats, does not give the Native fishermen sufficient opportunity to make landings and establish a catch record.

5.6 The Processing Sector

The perspective of the processing sector vis-a-vis limited entry in the halibut fishery is not presently clear. Two lines of argument relevant to the processing sector, however, do appear in the general pro and anti-limited entry debates.

Pro-Limited Entry Argument

The rationale for a share system suggests that halibut processors stand to gain from a share system for two main reasons. First, a lengthening of the halibut season spreads landings over a longer period reducing processors' cold storage costs and interest costs necessary to finance the buying of halibut in

large quantities. Second, longer seasons permits processors to sell more halibut in the fresh markets at higher prices relative to the frozen product.

Anti-Limited Entry Argument

Those opposed to limited entry suggest that halibut processors stand to suffer from a limited entry system in that they would have to adjust operating procedures, work schedules and equipment to adapt to the irregular supply of (small quantities) halibut.

Judging from the paucity of input from the processing sector, and building from the observations of one processor representative, it may not be far from wrong to presume that the sector is indifferent to the matter of limited entry in the halibut fishery. That is, given that no processing firm is primarily dependent on halibut, the entire issue may not be of major importance. Alternatively, it may be the case that processor interests will co-vary with the regional positions of fishermen. Thus, Kodiak processors would be seen to support local fishermen opposing limited entry, and Seattle processors would similarly side with the fishermen who help them to satisfy consumer demand. It does seem likely that fishermen and processors would see fit to reorganize the present pattern of halibut landings. The reorganization might include pre-determination of the time of landing or setting standards of minimal poundage to be handled at one time. This in turn may lead to fishermen coordinating landings if a share system is created.

6.0 DISCUSSION AND RECOMMENDATIONS

6.1 Discussion

Underlying the concern for the economic implications of the share system, both real and imagined, perceived and experienced, lies a deep concern for the future of fishing. Indeed, what is at stake to some is the very ethic of commercial fishing. Limited entry of any form, any species, has traditionally been anathema to fishermen. The Alaska salmon limited entry system generated some problems that fishermen fear for the halibut fishery: inequitable distribution of permits; inflated permit prices; increasingly complicated financing; and potential for non-fishermen to speculate in the fishing industry. Yet salmon limited entry based on license limitation still enabled permit holders to increase their catch through competition on the fishing grounds. Now, by placing a ceiling on an individual's catch through the imposition of the share system, the possibility of advancement through a combination of fishing skill and luck is removed, leaving only the subsequent purchase of more shares (deemed difficult to impossible by many) as a means of increasing one's portion of the overall quota. This denial of competitive fishing plus the perceived transformation of the fishery from a common property resource to private property under the proposed share system shakes the cultural framework of fishing. This form of limited entry in halibut may symbolize the end of an era. As one highliner who has come to support limited entry with some reluctance commented:

"It's going to be a hell of a change. A change in how you fish, in outlook, in lifestyle, everything . . . Sometimes I don't like the change. It's not the way I was raised." (Seattle)

Most fishermen could support limited entry if the resource upon which they depend was threatened. However, when limited entry is seen to be justified largely on economic grounds (i.e., increased economic efficiency), there cannot be any easy compromise among the interest groups most vitally affected. In the case at hand, all agree that the resource is rebounding and the current quota system can adequately protect the halibut stocks. At issue obviously is the distribution of those stocks among competing fishermen. The arguments an individual presents and how he or she will be affected by halibut limited entry depends on a complex set of factors including his or her structural position in the fishery plus the social, cultural and economic factors influencing commitment to the occupation.

There is significant regional diversity in the Alaskan halibut fishery and significant with-in region differences which preclude any facile assignment of fishermen's position or confident prediction of future outcomes. It is this diversity that requires attention if we are to approximate a future picture of the halibut fishery post-imposition of a limited entry system.

A cursory look at the Pacific halibut fishery gives the impression that the halibut fleet consists of (1) large specialized boats from Seattle and Petersburg, and (2) small boats from other areas (notably Kodiak) where halibut is but one of plural species pursued in a fishing strategy dependent upon diversification. The postures taken by the major adversaries in the current debate, (i.e., Seattle/Petersburg big-boat owners for, Kodiak small-boat fishermen against), reinforce this impression. Given this polarization, it is reasonable to examine aggregated data for the whole fishery and conclude that those relatively few large-boat operators that

harvest the majority of the catch are the most economically dependent on the fishery and should reasonably expect a management regime that protects this interest. By the same analysis, the small boats, overall highly diversified and utilizing multiple fisheries, appear to depend less on the halibut and therefore stand to lose a small percent of their fishing income even under the more restrictive qualifying rules of the share system. However, breaking down the catch statistics by regions presents a different picture. In comparing annual catches from 1977 to 1979 in Kodiak and Southeast according to vessel size, the Tetra Tech document indicates that while less than 20 percent of the small boats in Area A (Southeast) caught halibut exclusively, over 80% of the small (less than 5 net tons) Kodiak vessels caught halibut almost exclusively (see Figure 3). Considering that halibut has the greatest ex-vessel price of all species, these fishermen are heavily dependent on halibut for their fishing income.

		Class 1 Vessels	# vessels halibut = 90 - 100%	% vessels halibut = 90 - 100%
Southeast (Area A)	1977	259	43	16%
	1978	364	36	10%
Kodiak (Area K)	1977	106	86	81%
	1978	213	175	82%

Figure 3: Distribution of halibut in the total catch of Class 1 vessels in Area A and Area K.
Source: Tetra Tech 1981, Appendix II.

Discrepancies in the Tetra Tech data prevent translating these percentages into pounds of halibut by vessel size and area. An updating of the data base of the Tetra Tech document to include figures for 1980 and 1981, and a similar breakdown of catch statistics by other areas in addition to Southeast and Kodiak are needed for a fuller understanding of the dynamics of the halibut fishery. At present we lack information on the relative contribution of halibut to the total catch in Prince William Sound and Cook Inlet. Nor do we know the relative importance of fishing in the gross income of residents of the fishing communities referred to in Section 2.

Still other important questions pertain to the relationship between salmon limited entry and the halibut fishery. For example: (1) Are many new entrants to the halibut fishery refugees from the limited salmon fisheries; (2) Will salmon permit holders have an advantage over other fishermen in obtaining financing for the purchase of halibut shares; and (3) Will the same fishermen who were denied salmon limited entry permits be excluded from the initial allocation of halibut shares?

6.2 Recommendations

Some objections to limited entry and the share system may be mitigated simply through the broader dissemination of information and the clarification or reiteration of certain points. For example: (1) How an individual's quota share will increase absolutely as the resource increases and the overall quota is raised commensurately; and (2) How market mechanisms may act to hold down the price of shares.

The Council may be well advised to present to the small-boat operators other advantages of the share system besides increased landings of fresh fish and therefore the possibility of higher ex-vessel prices. This outcome is predicated on how processors respond to a lengthened season with periodic, low volume deliveries. It also assumes that processors will earmark this catch for the fresh market and pay fishermen accordingly. These processor responses are as yet unknown. If fishermen were persuaded to assent to the share system in the hope of higher ex-vessel prices, and if processors did not respond in the desired fashion, the Council stands to lose credibility with the fishermen.

To ameliorate other concerns of the fishermen, a rethinking or modification of the share system design may be required. Specifically, the Council could further consider ways to:

- (1) Protect the interests of the small-boat fisherman [possibly through retention of some portion (10 - 15%) of the quota by area for open entry use].
- (2) Enable crew members to participate in the initial distribution of shares. This may entail reconsideration of some kind of point system to allocate shares to them.
- (3) Safeguard against monopolization of shares. (Fishermen have pointed out that even a 2% maximum on allowable share holdings could theoretically result in control of the halibut fishery by 50 individuals.)

In order for the public to determine how access to the fishery will be structured in the future, it is crucial that the Council develop a clear statement of the legal status of halibut shares. For example: (1) Can it be mortgaged and foreclosed upon; and (2) Is it to be conveyed as fee simple or government title?

These suggestions stem from our reading of fishermen's perceptions of potential problems with the share system. Further recommendations for designing a limited entry scheme to meet the Council's objectives of protecting the resource, and preventing further overcapitalization in the halibut fishery while minimizing the disruption of the present fleet, must await the more detailed analysis of social, cultural and demographic data and the projection of sociocultural impacts of limited entry alternatives planned for Phase II of this project.

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Objectives for Halibut Limited Entry; Adopted by NPFMC, September 1981.

- (1) Distribute the hook and line fishery, both in time and space to ensure conservation of the resource.
- (2) Avoid further overcapitalization, thus encouraging development of an economically viable and efficient year-round multispecies domestic hook and line fishery that:
 - (a) is made up of owner/operator rights holders; and
 - (b) makes it possible for fishermen to earn a major share of their income from hook and line fishing.
- (3) Make certain cost of administration and enforcement while effective are not excessive relative to the benefits of the program.
- (4) The program would not preclude the extraction of rents or royalties from the fishery at some point in the future.
- (5) Minimize adverse biological impacts of the program on related fisheries.
- (6) Insures that no particular entity acquires excessive control of rights to participate in a fishery.
- (7) Attempt to be compatible with IPHC objectives.
- (8) Minimize disruption of the present fleet by using past performance to distribute initial rights.
- (9) Use the market to transfer fishing rights after initial distribution.

Letter from IPHC Fishermen's Conference Board Representatives

Mr. Clem Tillion, Chairman
North Pacific Fisheries Management Council
P.O. Box 3136 DT
Anchorage, Alaska 99510

February 3, 1982

Dear Mr. Clem Tillion:

At the annual meeting of the International Pacific Halibut Commission the following signed organizations and individuals with interest in the halibut fishery support the following request to the North Pacific Fishery Management Council.

The below signed organizations request the North Pacific Fishery Management Council to draft a limited entry program for the halibut fishery based on a share system at the earliest possible time and distribute the plan for public comment and to pursue simultaneously to enact a moratorium for the halibut fishery limiting participants to those who made landings during the 1981 season.

The below signed organizations further request that the share system include but not be limited to the following considerations.

1. In I.P.H.C. areas known as area 2c, 3a, and 3b limited entry shares would be based on the average of the annual percentage of landings of halibut that a vessel made for the years 1979, 1980, and 1981.

(Example, a person who fished during the last three years and landed 1% of the harvest each of those years would divide 3% of the harvest by 3 years and his share would be 1%. If he fished two of the last three years he would receive 2/3 of his landed percentage for the two years he fished.

2. Shares would be freely transferable to be bought and sold.

3. The owner of a permit would be required to be aboard a vessel when his share was being fished and must sign a fish ticket upon sale of the fish. A provision for sickness or disability should be provided.

4. Prepare a system such that the Bering Sea village fishermen who do not have a commercial fishery are granted a three year period to enter the halibut fishery. Such a system should recognize that this fishery should be allowed to fish during June and July.

5. An upper limit of the number of shares any one person can own should be set to protect the independent character of the fishery.

Sig Mathisen
Petersburg Vessel Owners Ass'n
Petersburg, Alaska

Robert Chironom, Manager
Fishing Vessel Owners Ass'n Seattle

Albert Dacus
KAKE Vessel owners
Kake, Alaska 99830

Gary C. Brevik
Deep Sea Fishermen Union
Seattle

Don Rogers
Petersburg Fishermen's U.
Petersburg, Alaska

Marvin Bellamy
NPFA Homer

Ima Koker
Newport Fisherman

Ed Hagan - Astoria
David E. Newman
Ketchikan Halibut Fishermen's Ass'n

Sydney Jeger for
Tansylvania Corp. - St. Paul, Ak

Jack Phillips for
Halibut Producers COOP

Greg Baker,
Alaska Longline Fishermen's Assoc.

Fishermen's Published Letters

Alaska Fisherman 2/82

Halibut crisis

Editor's Note — The following letter was sent to the United Fishermen of Alaska. The *Alaska Fisherman* obtained a copy.

Recently, the North Pacific Fishery Management Council chairman, Clem Tillion was quoted as saying, "It is now very clear that the NPFMC would have to make some hard choices on halibut limited entry, that doing nothing was equivalent to making a conscious decision to let halibut become an incidental fishery."

Limited entry schemes to date have not been acceptable. A workshop held in May determined that some type of a program would benefit the fishery. The system that appeared to be acceptable to the workshop participants was a share system. Individual fishermen would be assigned shares based on their past landings during a certain period.

Dr. Donald McCaughran (director of the International Pacific Halibut Commission) was recently in Petersburg and met with the Petersburg Vessel Owners. He indicated that if we do nothing it would be virtually impossible to manage in a few years. Dr. McCaughran also informed us that Canada will be implementing a new plan based on a share system for the 1982 season. A major benefit is that the season can be lengthened, enabling a larger proportion of the quota to go to the fresh fish markets, thereby increasing prices considerably. One of the problems we are faced with is that our catch is landed within the space of a few days and is for the most part frozen. If the Canadians are permitted to have an expanded fishing season, it places the United States fishermen at a distinct economic disadvantage.

The Petersburg Vessel Owners have discussed the "share system" and feel that we can and will support such a system. We also feel that there should be safeguards written into the program, limits should be set, and that it is enforceable.

If such a system is acceptable and if it can be implemented for the 1982 season, we must act quickly. We urge your organization to support us in our attempts to find a solution to what many feel is an unacceptable situation.

Sig R. Mathisen
President, Petersburg Vessel
Owners Association

Kodiak Daily Mirror 3/18/82

Dear Editor:

Were you born in this state or have you lived here a long time and don't get to fish salmon commercially? I've been commercial fishing since 1969 and I watched with disgust the implementation of the state limited entry program, denying all but a few the right to fish salmon.

Years later I saw the formation of a halibut association in Kodiak as a response to the threat of limited entry. Now this association says it favors the most unfair form of limited entry conceivable, a share system. And on a federal level no less. If you didn't like salmon limited entry you'll really think the halibut share system stinks. You who favor limiting halibut fishing in such a manner, I hope you're fishing crab with your boat because the federal people will look at that fishery with a precedent already set. To give a person a share of the quota based on his production record is the most unfair form of limited entry conceivable. Do we give all the gold, timber, and oil from now until eternity to the companies who have taken the most in the past?

Are you aware that the Canadians had a study done on their salmon limited entry program and it proved that the rual Native population decreased as a direct result of its implementation. Is genocide the purpose of limited entry? Ask your state officials why this report was ignored by the commission forming the limited entry program for salmon in this state.

Speak out now against limiting entry into the halibut fisheries. From March 22 to 26 the state of Alaska Board of Fisheries and the National Pacific Fisheries Management Council will be having a joint conference to discuss this among other things. Their address is: NPFMC, P. O. Box 3136 OT, Anchorage, Alaska 99510. Phone: 274-4563.

Your testimony can influence the outcome.
John Jaskoski

Kodiakans speak out against 'Halibut Shares'

Dear Editor,

The Small Vessel Halibut Fisherman is a group of men and women who feel that the chairman of the North Pacific Fisheries Management Council, Clem Tillion's purpose in giving full support to the Seattle Halibut Vessel Owners Assn. and the International Pacific Halibut Commission, in a joint venture to rob the State of Alaska of its resources, is with the ulterior motive that he looks upon us as some strange concoctions that he is about to analyze and betray to the rest of his political, bureaucratic set. We wish him not to do us a kindness. For we wish him neither to disabuse us of, no (sic) to confirm us in our fears and suspicions as to his intellectual (sic) superiority, as we consider him not only incommunicative, but completely, and incompetently, incommunicado.

I, like many other Alaskans who earn their living in this state's fishing industry, have been wondering, for many years now, just how in the hell long it is going to take British Columbia and Seattle to finally accept the fact that Alaska now is, and has been for over twenty years, a state. And that, under the State's rights, has the right to manage its fishery resources. But it seems as though there are still many people outside the state, and a few within, that refuse to face the facts. Many of these people are past and present lawmakers of this state, who, for some strange reason, suddenly lower the high standards they have set and maintained throughout their political years and will do anything within the power of their offices to sell the State of Alaska, and its rich fishery resources, to Japan, British Columbia, a few Seattle vessel owners, and even the federal government.

Alaska continues to grow each year, and thousands of new people who come have the right to have access to this state's fishery resource. And yet, it seems that it takes an act of the United States Congress to gain state control of our many fish and game resources. We were forced to go to the United States Supreme Court to show the Seattle king crab fishermen that the State has the power to manage its fishery beyond the three-mile limit, and that no one may any longer come into this state's fishery without paying his taxes, or in any other way be excluded from the laws of this state. We are no longer the territorial horn of plenty for the hit and run fishermen from Seattle and Canada who prefer to maintain their families and homes in less pioneer atmosphere, and, in doing so, spend the dollars they earned in Alaska's fat and juicy fishery supporting another state's highways, schools, and urban programs.

Just how a few names on the back of a letter addressed to Mr. Clem Tillion, from some Seattle halibut fishermen, could have set into motion the rip-off of the State of Alaska's halibut resource, with an estimated value of hundreds of millions of dollars to the state and its commercial fishermen, does not really take the mind of Einstein to figure out. I believe that this conspiracy to take away the halibut resource, and deny state fishermen access to this resource, to be a joint effort of the International Pacific Halibut Commission, the North Pacific Fisheries Management Council and the Seattle and British Columbia Vessel Owners Assn. For the only people who could possibly benefit from such a cold-blooded abuse of political power are the aforementioned.

In my thirty years as a commercial fisherman in this state, I have never witnessed a more blatant violation of states' rights. When a few Seattle boat owners, under the guise of a management program, may dictate to the North Pacific Fisheries Management Council, that the year 1981 is the year carved in stone that every fisherman in the State of Alaska must have landed halibut in order to get a share of his own state resource in the future. That all the years of effort and expense matter not. And, what of a buy back program for those who invested in vessel and gear? There is not time for that, as they are busy cutting the state's halibut into shares for Seattle, British Columbia, and a few token Alaskan vessels that went the way of all flesh, because they were in the high production class and saw visions of a fat share of the spoils of a corrupt political "coup de grace".

And now comes the proverbial icing on the cake. It is also a part of this program that the shares of Alaska's halibut be given in such a way that a shareholder may sell his halibut to another shareholder. Yes, I can see it now in Seattle's Fishermen's Terminal...halibut heads turned broker trading in Alaska halibut futures.

If this comedy of errors in politics should ever become the reality that these powerful special-interest groups are shooting for, it will go down as the biggest rip-off of Alaska's resources since Ronald Reagan's appointment of Secretary of the Interior, James Watt.

I cannot competently conceive in my own mind's eye, how the State of Alaska's legislative body, or its court system, would consider for one minute allowing this "punch below the belt" to Alaska's fishermen to become law (and I use the word law "hilariously"), without using every possible legal move within reach to put a stop to this power play, that is so obviously money motivated, and yet poorly camouflaged. For even to the most inexperienced eye, if you will, there seems to be a slight tinge of "red" attached.

John A. Anderson

Kodiak Daily Mirror 3/18/82

Dear Editor:

Dear Governor Hammond:

I am writing regarding the shares system of limited entry as proposed by the North Pacific Management Council. I am a life-long Alaskan resident born into fishing. I am a member of the Kodiak Fish and Game Advisory Board and the owner-operator of a 44 foot combination boat fishing five different fisheries around Kodiak. I started running my own fishing operation in 1965 when I was seventeen. Recent statements by Clem Tillion regarding the shares system show a complete lack of understanding of the fishing industry in Western Alaska.

We resident fishermen are mostly operators of small and medium sized combination vessels. If this shares system wasn't instituted we resident fishermen would successfully compete for a bigger and bigger share of the halibut resource. The bulk of the U.S. share is right in our front yards. Instituting the shares system would actually reduce our shares because a lot of us don't fish the same fisheries every year.

Diversification is essential to a healthy fishing fleet due to fluctuating climates, resources, and markets. The shares system will rob the resident fleet of its competitive advantages. The only competition will be in the halls of government, banks, brokers, and lawyers. This would permanently place small boats and village skiff fishermen at a disadvantage. The resource would be permanently allocated to a few outside boats and those with money connections that could buy up some of the smaller shares. A share equal to a hundred thousand pounds last year will have a market value of approximately a million dollars as soon as the systems' stability is assured. Our processing industry relies on diversification to survive also. They will lose the bulk of their halibut landings.

The large boats will be able to arrange their fishing so they can haul their fish directly to Seattle or points south, probably creating a tremendous quota enforcement problem. The state fish tax and economy will be completely bypassed. A few large boats, from Seattle and Southeastern stand to gain an unprecedented guaranteed pension under the shares system, but the shares system is not in the best interest of the state's fisheries as a whole. A similar system was imposed on wheat growing by the federal government. It proved so discriminatory against small farmers that an insurrection occurred that finally got Congress to make it non-mandatory.

Clem Tillion's zeal to impose this system is such that the shares system is the only form of limited entry being considered for halibut despite a N.P.M.C. advisory council motion to study other systems. Since Clem is an official representative of the state on fisheries matters and a friend of yours, I implore you to influence him to reconsider this error.

Sincerely,
Oliver N. Holm

No Halibut Limited Entry Pacific Fishing 5/82

I am writing this letter to voice my opposition to the recent request made by the International Pacific Halibut Commission [IPHC] that limited entry be implemented in the Alaska halibut fishery.

I am a Kodiak resident and fisherman and feel that limited entry is wrong. It threatens the very lifeblood of any fishing fleet by radically inhibiting an individual's ability to diversify between fisheries as his needs require and the natural health fluctuations of the fisheries dictate. Limited entry does *not* address the question of the health of a fishery (by "health" I mean the harvestable population of the target species), only the economic comfort of those who were fortunate enough to qualify for permits at the time limited entry was implemented.

Resourcefulness, hard work, and flexibility have made *fishermen* successful at their trade, not government handouts of permits worth so many tens of thousands of dollars. That's for successful, lazy part-timers. Why do these people feel that they deserve to not have to work for a living? Is it too hard?

Simple capitalistic economics is the best, most effective means of regulating the number of boats in a fishery. An unhealthy, distressed fishery will not be entered by a large number of boats for the simple reason that there is no money in it. A healthy fishery, such as halibut at this time, will naturally have an influx of participating fishermen, some who choose to enter that fishery perhaps because another fishery they had been involved in is no longer profitable for them. If halibut does not prove profitable for them, they will leave that fishery and try another. But at least they should have the right to try.

Gear and "rigging up" for a new fishery can itself be a major expense for a fisherman without having to contend with the additional government-induced, inflated and inflationary expense of a limited entry permit. Permit or not, the bottom line remains, "Can he catch them, and at what price?" Others enter only to gain points toward proposed limited entry permits.

The "share system" proposed by the IPHC is a sham. That anyone could even seriously suggest a guaranteed income from uncaught fish seems incomprehensible. The concept disgusts me, and I offer no further comment on that point.

Thank you for allowing me to air my views.

David Shrader
Kodiak, AK.

Halibut fishery share system

Editor's note: The following letter to Clem Tillion, chairman of the North Pacific Fishery Management Council, was submitted to the Journal for publication.

Dear Clem Tillion,

This letter is written in response to the recent halibut limited entry proposal. It's not limited entry per se that I'm objecting to at this point, but rather the "share" concept. Selling the right to catch Alaskan fish is one thing, but selling a guaranteed percentage of the quota is another story.

Of course this "share" idea, if adopted, would guarantee certain fishermen's catch and income. They would be subject to no competition ever again. I guess some people think it would be nice to be able to plan one's fishing trip around weekends and calm weather, and still be able to keep the shore job intact. But to my mind it's not the government's job to guarantee that ideal lifestyle to anyone. Evidently the 200 mile limit law would have to be amended to allow any "share" limited entry program. If this happens then of course the precedent is set for crab, bottom-fish and shrimp, so this can't be regarded as merely a halibut controversy.

My husband and I began halibut fishing in 1973, but by 1977 we realized that as the seasons grew shorter we had to diversify into other fisheries and would no longer be able to depend on just halibut for our entire year's income. I'm sorry that other fishermen can no longer make their whole year's income from just halibut fishing; but neither can those who fish only for salmon, crab or shrimp. So far none of us has a guaranteed bonanza such as this "share" concept would provide. At

least under present limited entry programs we have to work and compete for our portion of the catch.

You are probably aware of the situation in a few agriculture programs in the Lower 48 where, long ago, "market shares" were allotted in crops like peanuts and oranges, for example. These programs which guarantee hefty incomes to a select few are falling under increased scrutiny and are receiving very bad press as more people become aware of their existence. The CBS 60 Minutes program recently exposed this scandal and in Congress there is a growing effort to get rid of these questionable practices.

There is certainly no reason to extend this "share" concept to Alaskan fisheries. These are supposed to be the times in which we re-open the markets for free trade, and provide for less government intervention in business. How could this halibut shares plan be excused?

The most ironic part of this whole limited entry subject is that halibut stocks are on the rise. The quota this year is 2.5 million pounds more than in 1981. So for years we have tightened our belts to conserve the resource only to have it be proposed that we divide the fish up like real estate and award the biggest shares to the largest boats free of charge.

On March 18, the Kodiak Halibut Fishermen's Association voted 111 to 0 to reject the share system, the moratorium, and limited entry. The group also voted to order its president, Dave Ausman, to retract his earlier endorsement of such a plan, which he gave without the group's permission.

Sincerely,
Barb Monkiewicz
Kodiak, AK

More on halibut limited entry

Dear Editor:

I have been reading with deep concern the proposal making halibut fishing limited entry based on a share quota system. This system, in my opinion, would be unfair to small fishing operators and directly violates every fisherman's right to equal fishing and free enterprise. In the March 1982 issue of the "Journal", an article by Brad Matsen stated that "Fishermen met in Seattle to come up with a plan for deciding who gets what." What fishermen? I, as a fisherman, was not asked what I thought nor made aware of the meeting. How were those selected who attended? Do not all fishermen have the right to a voice in planning for their future? Being new to the fishing industry and attempting to get started, perhaps I am not aware of certain lists I must be on for information regarding meetings, etc. Please advise.

After reading the proposal as stated in the article, it appears that those in attendance made decisions affecting those unable to be there or unaware of the meeting. They have decided that large operations may continue fishing and, based on past years, continue being a large operation. It seems this would keep the small operation small with no chance for growth. This hardly seems fair and certainly sounds like a caste system by having to stay within a set quota. What happened to the free enterprise system and the Great American Dream? If I choose to work my heart out investing time, money, and energy to make my operation a success, why should I be kept from growing? Being new or having the past three years be lean years seems to negate any chance to get ahead by expanding one's operation. Why bother if you must stay within a certain quota? There is no incentive to do better.

Last year was my first year to be able to fish halibut commercially. Having lived here for 26 years, I have always dreamed of the day I could see my way clear to purchase a boat and gear. Last year I was able to realize my dream, but this year it appears it could be shot to hell!

I object to the limited entry, but can probably live with it, as I expected it to eventually come. However, I adamantly object to the share quota. I see in the same issue of the "Journal" where the Halibut Commission has increased the catch quota by 2.5 million pounds. Now they are going to be deciding on limited entry and share quota in order to "protect" the industry? How does one action justify the other?

The article went on to include a statement from Don Young's aide, Rod Moore, who stated "We're going to try to get it passed as quickly as we can." Clem Tillion was also quoted as saying "I can't promise you that you'll get everything that you want, but we'll do the best we can." I do not see how any of the above three people can claim to be a representative of the fishermen when they are listening to only a few people and not considering the majority. Perhaps they will enjoy a larger benefit from limited entry than what meets the eye, since they are in such a hurry to get it passed.

During the past few weeks I have talked to other fishermen who believe as I do, and are also opposed to limited entry and share quotas. What this one letter may do, I don't know, but I hope it reaches someone who cares what happens to the small fishing operations and cares about what the small operator has to say. In my opinion, limited entry and share quotas are not the answers.

Sincerely,
John N. Glenn

LETTERS

Opposition to halibut share system

Mr. Editor,

I am writing this letter in response to the recent move by the North Pacific Fisheries Management Council to implement a moratorium on halibut fishery entry permits and initiate studies regarding the viability of the institution of an "individual quota" or "share system" form of limited entry in that fishery. I am strongly and unalterably opposed to any form of limited entry in any fishery, and find this "individual quota" concept so blatantly contrary to the most basic precepts of capitalism and free enterprise that it is especially hard to believe its implementation can be seriously considered on a federal level in light of the current administration's "hands-off" economic policies and "anti-big-government" rhetoric. Apparently an exception has been made in the case of fisheries management, and a perverted form of communism is now acceptable.

Limited entry in any form is a travesty. It is inflationary, creates overcapitalized fleets which target on only one fishery no matter what the condition of that fishery, inhibits the ability to diversify between fisheries as needed, abrogates citizens rights to try to make a living as they choose, and in the end cannot accomplish what its original proponents set out to do—set an optimum level of participation by fishermen.

I am a resident of Kodiak and have made a living from its crab fisheries for the past seven years. Kodiak is strictly a fishing town, and as such, its economy will be subject to the ramifications of the spread of

limited entry and the share system through the fisheries more than areas in which fishing does not play such a major role. The general feeling in Kodiak runs very strongly AGAINST limited entry in the halibut fishery, and the share system in particular. Yet we seem to be in the position of having it rammed down our throats, in the name of a misguided effort to "conserve the fishery." Limited entry can only attempt to manage the fisherman, not the fish.

Fish populations can fluctuate naturally, regardless of fishing effort, for many reasons. The halibut population in Alaskan waters is certainly not suffering from over-exploitation—their abundance is very evident and increasing, as reflected in the increasing quotas. There is a significant amount of halibut caught incidentally in other fisheries, which further attests to their abundance. What to do about this incidental catch is another matter, but I don't see that limiting the number of participants in the halibut fishery will alter the incidental catch in any other fishery.

The value accrued by Alaska's salmon LE permits should give some idea of the expense facing a fisherman who would have to consider the purchase of "shares" to enter the halibut fishery. In the case of salmon, the "right to harvest" is being bought and sold now for approximately what a fisherman might expect to gross in that fishery in one year (\$80,000 to \$100,000). In the case of halibut shares, not only is the right to harvest being transferred, but the catch guaranteed for as long as the holder owns the permit. I don't see why the shares shouldn't accrue astronomical values. Who will be able to afford them? Certainly not a professional fisherman whose other fisheries might have slipped into a state of temporary ill health.

The need to fluctuate between fisheries generally becomes apparent when a fisherman "isn't

making it anymore" in the fisheries he had been participating in, whether because of natural population fluctuations, poor management from lack of funds for research and enforcement, market conditions such as a botulism scare, etc. If the halibut fishery, for example, is healthy and the market conditions good, why close that door to him? What happened to the concepts of flexibility, hard work, and fair competition in the commercial fishing industry? Is a government grant in the amount of the value of a guaranteed successful season and the exclusive right to harvest now the viable replacement to free enterprise? If so, I am disgusted. Why don't we just ask for government welfare checks?

It is imperative that opponents of the share system VOICE their opposition, or no one will realize that there IS any opposition. Letters should be sent to legislators in Washington, D.C., and to the members of the NPFMC. Some of their names are: Clem Tillion, Bart Eaton, Robert McVey, Ronald Skoog, James O. Campbell, Rolland Schmitt, and Harold E. Lokken. Letters directed to individual members might be more effective than to the council itself. They can all be reached through the North Pacific Fisheries Management Council office, P.O. Box 3136 DT, Anchorage, Alaska 99510.

Thank you for the opportunity to express these views.

Sincerely,
David Shrader

LETTERS

Thursday afternoon fishery: 'a fish on every hook'

To the Editor:

I have been commercial fishing since 1969, the year I graduated from high school and came to Kodiak from Tucson, Arizona. I have fished westward for crab, Kodiak for shrimp, dungeness, king and tanner crab, halibut, herring, codfish, both seined and set-net salmon, and I crewed a seiner in Puget Sound. My wife, two children, and I run a set-net operation in the Shelikof Straits and fish other species with open skiffs. Our seven-year-old son and four-year-old daughter have been in the skiff with us for years fishing. By far the fishery they enjoy the most is jigging or longlining halibut. To land a sixty pounder is such an event I've feared they might become too airborne and fall overboard.

I attended and testified at the North Pacific Fisheries Management Council hearings on management proposals for the North Pacific Halibut Fishery. I heard no logic to back up their actions. The representative for the International Pacific Halibut Commission stated their research could not explain the recent appearance of huge halibut stocks. They count more fourteen-year-old fish than their count of ten-year-old fish four years ago.

I heard no discussion as to why present management tools were inadequate in preventing the over-harvest of these unexplainably high levels of fish. They just stated that last year the unexpected high catch per unit gear average combined with good weather brought about a slight over-harvest. Some council members kept asking Kodiak attendees if they wanted a very short season, even mentioning the possibility of a "Thursday afternoon fishery."

I recall my initiation into halibut

fishing in 1971 when we caught one legal-size halibut per day for the first five days of the trip. We ran twenty-five skates, well over two thousand hooks per set, fished twenty-one days and wound up throwing every fish over the side five minutes away from the freezer plant dock after they looked at the fish.

I would prefer a fish on every hook Thursday afternoon.

At any rate, the council concludes that here was an emergency in the fisheries. It was necessary to call it an emergency to waive normal Federal protocol which requires a law to be published for ninety days in the Federal Register before it takes effect. The emergency, as I saw it, was too many fish—too many halibut for the council to rationalize limited entry. They attempted to shove this moratorium through before even greater numbers of fish show up.

However, the legal council for the Federal Government was asked by Clem Tillion if the council did in fact have the legal authority to institute this moratorium. The lawyers questioned the legal authority of the council, but mentioned legislation currently before the U.S. Senate and House of Representatives which would give the council these explicit powers. Anticipating the passage of these bills, House Bill 5074 and Senate Resolution S2244, the council voted to implement a moratorium on entry into the halibut fisheries and voted to fund a study on one form of limited entry, the shares quota system.

I now ask whether this is a study or an apology. I think the outfit that has to write this up is going to earn the \$85,000.

In the hearings, the shares quota system was put forth by the IPHC representative as the easy method of managing the halibut stocks. How absurd.

Fishermen would be sorely tempted to sell their fish without reporting the catch to the authorities, then go out again to catch their quota, and on and on.

This law would entail tremendous enforcement effort and would spawn a cutthroat black market for these fish.

The halibut shares quota system is the hard fast road to monopoly in all fisheries. I would suggest that our administration in Washington, in line with their stated desire to minimize federal regulation and maximize state authority wherever possible, limit the North Pacific Fisheries Management Council to an advisory body with the sole function of determining maximum sustainable yield figures and return all fisheries management to the state whose waters extend to the extent of the 200 mile limit. The council had demonstrated that common logic need not be considered in their decisions and this blatant grab for dictatorial power.

I suggest that the \$85,000 would be better spent in tutoring these gentlemen in Logic, Ethics and the Constitution of the United States.

This shares quota system is the final blow to free enterprise. I'm sorry for you fishermen who favor this law. You or your children will be slaves and will witness the disappearance of hope which is all a fisherman can depend on.

John Jaskoski
Kodiak

Kodiak fisherman opposes shares

To the Editor:

In reference to Paul Thomas' article [see NF April '82, p. 26 and May, p. 27] on personal shares, fishermen are constantly being seduced by would-be intellectuals on how to conduct the business of fishing. The personal share system is the most frightening to date. Fishermen would no longer be hunters of the sea but collectors of government portions. No more gambling; your catch is guaranteed to be the same amount every year, for better or worse.

Fish are highly mobile animals and should not be compared to rocks. Most fish have short life cycles. Under the share system your private property would be dead every two to eight years. Who would own the new year classes? To bring in an element of competition, the government might hold lease sales as it does for oil. The only fair way would be to bid on poundage for a year. This would drive up the price to the consumer and probably drive the fishermen crazy.

Enforcement in the halibut fishery would be impossible. Changing from set seasons to year-round fishing would allow a larger vessel to deliver to any unsupervised port on the West Coast. If the vessel was undetected, he could again go out and catch the full share.

From their lofty chairs, these pseudo-managers tell us the fisheries will collapse unless we limit. You dangle that permit in front of people, it's like a blank check. Mention any kind of limited entry, and you draw people into the fishery.

In Alaska we are faced with an immediate threat. The politically powerful Seattle Fishing Vessel Owners Association, the halibut commission and the chairman of the North Pacific management council are trying to impose the private share system on the Alaska halibut fishery. If implemented, the people of Kodiak Island would no longer have the chance to fish commercially one mile from their homes. It would be like giving boats from California the exclusive right to fish salmon in Puget Sound.

Daniel R. Miller
Box 2037
Kodiak, Alaska 99615

The Fishermen's News

7/82

Editor:

It was interesting to note during the N.P.F.C. meeting held in Anchorage May 19 and 20, 1982 that during the Commission's discussions of the proposed halibut moratorium and individual quota distribution plan, several Commission members and in particular N.P.F.C. chairman Clem Tillion publicly stated that those individuals and communities commenting unfavorably on the moratorium-quota proposal were nothing but "idiots and liars."

The Commission then authorized an \$85,000 study of the various plans to limit entry into the halibut fisheries.

I ask why conduct a study along with fake public hearings when it's obvious that the Commission has already made up its mind on the action it is going to take and anyone who testifies in opposition is nothing but an idiot and liar?

The quota system and limited entry in the halibut fisheries is one of the biggest sellouts of the state's resources to the big boat operators that Alaska has ever experienced. The political power and influence of big boat interests is truly ominous.

Frank W. Sharp
Anchorage, Alaska

Alaskan's Opposed to Fishery Shares Ad



ATTENTION FISHERMEN

Recently the federal government through the North Pacific Fisheries Management Council voted to impose a moratorium in the halibut fishery, which is the first phase of implementing a "share-quota" system of limited entry.

Under this system a fisherman will be allotted shares based on an average of his past years' production. These shares will be a fixed percentage of the quota and can be bought and sold to the highest bidder.

The share system means the end of the competitive nature of commercial fishing. Hard work, imagination and intelligence are no longer needed. All you need is a good line of credit. Since a share will be a lifetime guarantee to a portion of the quota, the price will be outrageous. Ultimately

the bulk of the shares will end up in the hands of a few.

At the present the NPFMC has proposed the share-quota system only for halibut. **THE THREAT OF THIS SYSTEM SPREADING TO OTHER FISHERIES, HOWEVER, IS VERY REAL AND IS BEING DISCUSSED BY FEDERAL FISHERIES ECONOMISTS AND CONSULTANTS.** There has already been discussion of using the shares concept for salmon.

Several Alaskan fishermen have started a movement: **"ALASKANS OPPOSED TO FISHERY SHARES"** for one purpose only. We intend to form a statewide coalition to fight the use of a "shares" plan for halibut or any other fishery.

WE NEED YOUR HELP IN SEVERAL WAYS:

1. SB 2244 is now on the U.S. Senate floor. It can be voted on at any minute. This legislation would amend the International Halibut Treaty to allow the NPFMC to implement federal limited entry. If SB2244 passes, the shares system will be legally possible. Write, telegram or call your federal legislators; tell them you are against the bill and the shares system.

Stevens 1-202-224-3004
Murkowski 1-202-224-6665
Young 1-202-225-5765

2. Write or talk to the NPFMC and advisory panel members. These are the people who will make the shares decision. Address is NPFMC P.O. Box 3136 DT, Anchorage, 99501.

3. Write your state senators and representatives to alert them to the shares problem. Write Gov. Hammond, as the efforts of Clem Tillion and the

NPFMC are inconsistent with Alaska's Fishery Policies.

4. If you are a member of a fishermen's organization, urge the membership to take a public and vocal stand against "shares".

5. We need contacts throughout the state and we need people to circulate our petition among fishermen this summer.

6. We need more ideas and most of all we need **MONEY** for statewide Newspaper Ads, Informational Mailouts, etc.

**MAKE CHECKS PAYABLE TO:
"ALASKANS OPPOSED TO
FISHERY SHARES"
Pouch 490
Kodiak, Alaska 99615**

Editorials

Shares Unfair

Kodiak fishermen have been accused of "overreacting" ever since the North Pacific Fishery Management Council initiated its study of a "shares system" for limiting entry into the halibut fishery.

Why shouldn't they be upset? Kodiak stands to lose more fish under the proposed entry scheme than any other community in Alaska or the Lower 48.

Kodiak fishermen suspected it all along, and now there is an "empirical study" which confirms their fears.

The report, commissioned by the NPFMC, states that the individual quota system has gained popularity because of its "theoretical superiority" over more conventional limited entry programs. The primary advantage of the new system stated in the report is that it would actually "freeze" individual fishing effort, preventing licensed fishermen from adding gear to increase their proportion of the quota.

Presumably the system would distribute the fishery over a greater period of time, giving fisheries managers a better handle on the stocks and possibly allowing processors to sell fresh, rather than frozen, halibut to everyone's benefit.

We don't dispute that these are worthy goals. And despite all the inequities of the current limited entry system for salmon, we feel that some system is needed to prevent the annual Alaska halibut fishery from degenerating into a half-hour free-for-all.

Still, we can't condone a system that effectively would lock local fishermen and their communities into a minor role in developing nearby fisheries. Better a traditional limited entry scheme with all its inadequacies!

Especially threatening to Alaskan interests is the possibility that the "shares" system could be expanded to other fisheries.

Suppose that Kodiak crab fishermen were held to their harvest in the late 70s when many were fishing in the Bering Sea. Suppose participation in the Shelikof Strait pollock fishery were frozen at the 1982 level, when one vessel from Kodiak participated.

Alaska depends on fisheries as its most stable base of revenue. To confound free enterprise with a shares system would be to relegate Alaska to colonial status forever.

Washington state has had its own experience with a type of "shares" system. In 1974 Judge George Boldt ruled that local Indian tribes were entitled to 50 percent of the state's salmon resource, and the non-Indian "newcomers" were entitled to the other 50 percent.

You may remember that the "new kids on the block" screamed bloody murder.

Appendix F. Summary of News Coverage of Halibut Limited Entry 1982

Industry Journals	January	February	March	April	May	June	July	August	Sept.
Alaska Fisherman	+ Tillion interview; favorable re: morator. & l.e.	+ L Mathisen (PVOA) share system w/safequards		Incidental catch problem; blames foreign vessels.	L - Shrader L - Monkiewicz NPFMC supports moratorium	UFA supports l.e. and moratorium but has doubts about share system. Reports RFP; notes Kodiak opposition			
Alaska Fisherman's Journal			(1)IPHC meeting. (2)Seattle IPHC reps' letter re: shares	L - Monkiewicz Ausman retraction	L - Shrader L - Glen L - Holm (1)KHFA fight l.e. (2)History of the dispute. (3)Article anti-l.e.	(1)Kodiak resolution (2)AOFs objections; pro & con points. L - Jaskoski	Tillion letter (1)Congress passes hal. legislation. NPFMC favors shares; Kodiak opposition.		
Bering Sea Fisherman					(1)NPFMC votes on moratorium;RFP. Kodiak opposition. (2)House passes bill. (3)Nunivak/Nelson Is. halibut fish. starts. (4)Re:RFP, questions to be studied.	Nelson Is. starts commercial hal. fishing.			
Fishermen's News			+ Crutchfield interview; shares for troll salmon	L - Shrader PFMC studies l.e., shares.	L - Jaskoski (1)AOFs views (2)NPFMC Mar. meeting report. (3)Moratorium (4)Anti-l.e. Editorial				
National Fisherman				+ P.Thomas re: shares for N.W. salmon fishery	+ (1)Thomas re: share quotas= property rights. (2)Background on share system; Pearse.	Kodiak opposition; Seattle/S.E.support. Moratorium = 1st step to limit entry.			Thomas re: pros & cons of shares.
Pacific Fishing				+ Opinion col. Greg Baker	L - Shrader + Profile of hal. fisherman	Opinion col. Don Kuiper anti-share	Announcing moratorium, 1982 prices	L - Monkiewicz Ed. note re: opposition, upcoming study	
Western Fisheries						A.Meadows col. cautions re:shares	Meadows on pros of shares w/ concerns re: concentration of shares	Meadows:anti-personal quotas; danger of monopoly	

Key: + Pro limited entry and share system; L Letter to the editor;
 AOFs Alaskans Opposed to Fishery Shares; ALFA Alaska Longline Fishermen's Assoc.;
 KHFA Kodiak Halibut Fishermen's Assoc.; PVOA Petersburg Vessel Owners' Assoc.

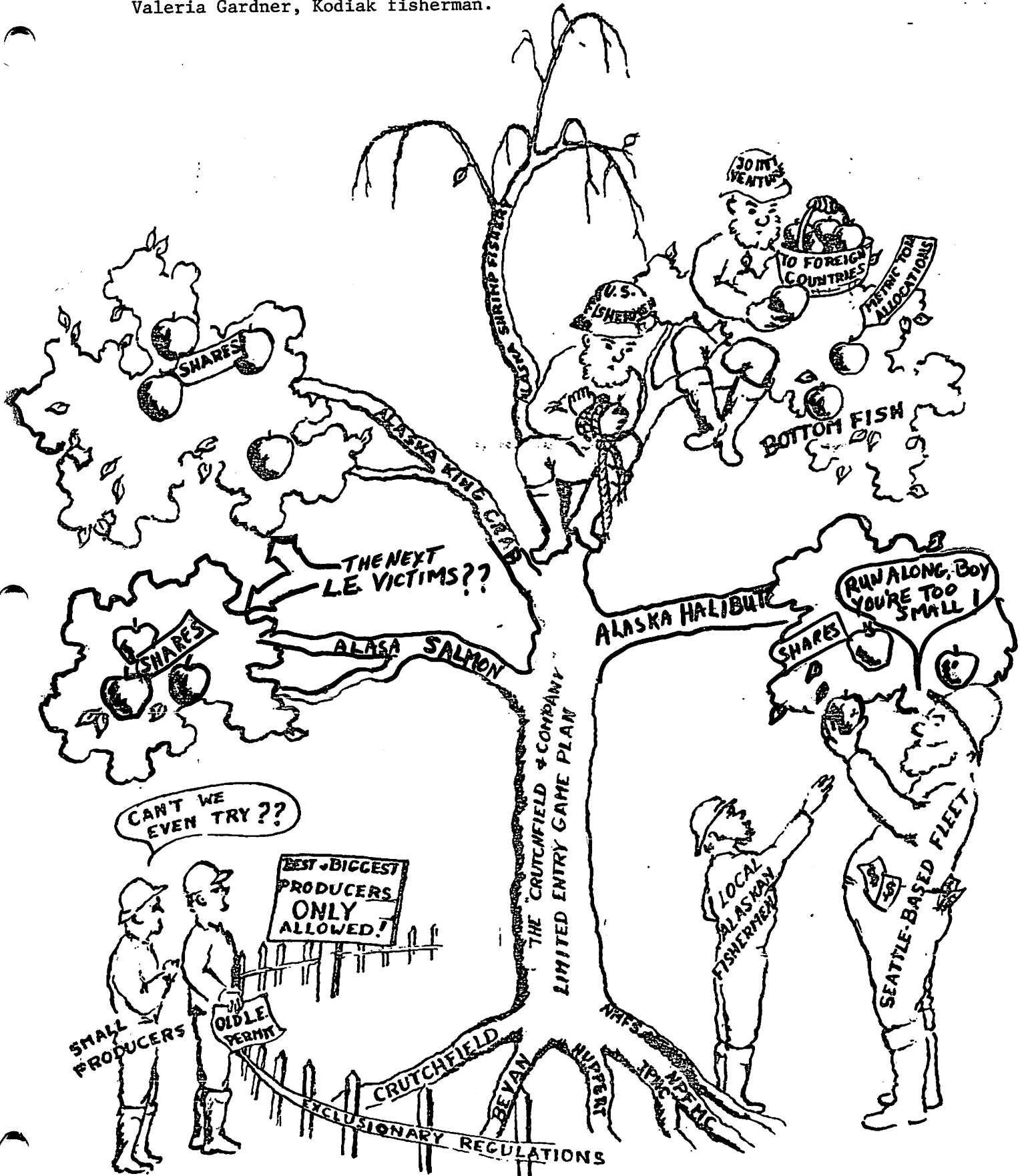
General Press 1982	January	February	March	April	May	June	July	August
Anchorage Daily News			Mar. NPFMC meeting; moratorium 1st step to limit entry			pros and cons of share system		
Anchorage Times		Seattle(AP) NPFMC to study share system		L - Shrader L - Anderson Senate approves hal. legis.; Pribiloff, Nunivak exemptions.	(1)House approves hal. legis., (2)Reagan signed. Both note Pribiloff exemptions	No moratorium for 1982; pros & cons of shares. Seattle, Petersburg, Kodiak views		
Cheechako News (Kenai)				L - Shrader				
Cordova Times			Mar. NPFMC meeting; RFP, moratorium L - Holm	Announcing 1st opening; explains shares				
Homer News				(1)Editorial pro & con. (2)Sen. Stevens interview (3)Mar. NPFMC meeting (4)Moratorium unlikely L - Jaskoski	(1)Will moratorium pass for '82? (2)Congress passed hal. legis.		Announcing July council meeting	
Juneau Empire			Mar. NPFMC meeting; moratorium, RFP, Kodiak opposition	L - Shrader	AOFS ads Announcing 1st opening, impending moratorium	AOFS ad		
Kodiak Times	KHFA vote to support moratorium		KHFA vote to oppose morat. & shares	(1) AOFS views (2)Seidell edit. (3)Hal. Act passes Senate	Don Baker Editorial		l.e. options to be narrowed	
Kodiak Daily Mirror	(1)KHFA to meet to discuss l.e. (2)herring l.e. opposed	IPHC meeting requests morat./l.e. Quotes letter	L - Jaskoski 4 articles re:KHFA retraction. (5)Anch(AP) NPFMC Mar. meeting	L - Shrader L - Holm L - Anderson AOFS ad Senate passes hal. legis.	(1)Borough resolution (2)RFP awarded; City, Chamber resolutions, Congress passes leg. resolution. (3)Chamber of Comm. resolution. (4)No moratorium '82	Sen Stevens comments; Herrnsteeen opposition	(1)July NPFMC meets; Stokes report. (2)Editorial anti-share system	'82 halibut landings count for shares

General Press 1982	January	February	March	April	May	June	July	August
Petersburg Pilot					Senate passes halibut legis.			
Seward Phoenix Log						(1)History of halibut l.e.; Seward Fish.Assoc. opposed to shares (2)pros & cons; Kodiak vs. FVOA, PVOA. (3)ALFA;Alverson views		
Sitka Daily Sentinel		Seattle(AP) NPFMC studies l.e.	Anch.(AP) NPFMC Mar. meeting;RFP, moratorium, Kodiak opposition	Senate passes halibut act				
South-eastern Log						Senate passes halibut act		
Tundra Drums				Anch.(AP) NPFMC Mar. meeting;RFP, moratorium, Kodiak opposed			Nelson Is. 1st year in halibut fishery	
Tundra Times			NPFMC Mar. meeting(no mention of moratorium or l.e.)	L - Shrader				

Others newspapers surveyed, no references to halibut limited entry located:

Bering Straits
Lynn Canal News
Ketchikan Daily News
Valdez Vanguard
Wrangel Sentinel

Cartoon sent to President Reagan from Valeria Gardner, Kodiak fisherman.



.by values and beliefs

Methods

The primary method used will be a series of interviews with knowledgeable persons in the major halibut fishing communities. These persons, all community leaders and fishermen, will be selected from the fishing community (including processors, fishery managers/advisors, and business people). Since some 100 fishing communities in Alaska and Washington have been identified as participating in the halibut fishery, a sampling frame will need to be developed so that some twelve or fifteen communities are sampled directly and representation of both large and small communities is obtained. Information on the other communities will be gathered from secondary sources (e.g., Department of Interior socio-economic impact studies, census materials) and from the key informant interviews. It will probably be necessary to conduct interviews with some 75 key informants. Data from Phase I activities will be used where appropriate.

Report

A draft report will be completed by 12/31/82, and a final report submitted to the NPFMC by 1/31/83.

Personnel

Key informant interviews are time consuming. The project outlined will require twenty person-weeks divided among the principal investigator(s) and research associates/assistants.

Travel

Extensive travel in Alaska will be necessary. Sampling fifteen communities will require personal visits by researchers, and gathering secondary source materials will necessitate visits to State and Federal offices in Anchorage, Juneau and Seattle.

Objective 2

*Describe possible sociocultural impacts of the limited entry alternatives and enforcement procedures developed by Northwest Resources Analysis, Inc. for the NPFMC.

Discussion

In order to make timely decisions on the limited entry alternatives, the NPFMC will need to know of the probability of impacts on existing social systems in the halibut fishery, and the social acceptability of the proposed enforcement procedures. Through choosing socially appropriate mechanisms, the NPFMC can reduce the likelihood of the rejection of the measures to control fishing effort by the fishermen affected. In Phase II of the Northwest Resources Analysis project, the economic effectiveness of alternatives will be evaluated. Objective 2 of this study is associated with the economic study in that the measures discussed will be evaluated for sociocultural impacts.

Tasks

Examine limited entry scheme alternatives and assess their sociocultural impacts:

- . by community and region
- . by size of vessel and multiple fishery commitment
- . by cultural group

Methods

This portion of the study will rely on data collected in Phase I and Phase II, Objective 1, of the sociocultural study. The social accepta-

bility of possible limited entry schemes will be determined via extended discussions with a small group of key informants. Close cooperation with Dr. Robert L. Stokes (Northwest Resources) will be necessary to ensure a fully iterative process.

Reports

A draft report will be submitted to the NPFMC on 12/31/82, and a final report on 1/31/83.

Personnel

It is estimated that six weeks of investigator and research associate/assistant time will be necessary.

Travel

Visits to Anchorage and Seattle are necessary to coordinate with the NPFMC and Dr. Stokes.

Work Plan

Dr. Miller will coordinate research activities in the Seattle area (including coordination with Dr. Stokes). Dr. Langdon is primarily responsible for fieldwork conducted in Alaskan communities. Other research associates/assistants will work under the direct supervision of these principal investigators.

Budget

Research Personnel

Principal Investigators

Marc L. Miller	10 work days @ 225	2250	
Steve Langdon	25 days	4000	
Research Associate	(1) 5 days @ 225	1125	
Research Associate	(2) 6 wks @ 411/wk	2466	
Research Assistant	(1) 14 wks @ 411/wk	5754	
Research Assistant	(2) 1 wk @ 411/wk	411	
Secretary	3 wks @ 400/wk	1200	
		<u>17206</u>	17206

Travel

Airfare

Anchor-Juneau (2 days) RT	304	
Anchor-Kodiak (2) RT	142	
Anchor-Seward (2) RT	72	
Anchor-Cordova (2) RT	100	
Anchor-Valdez (2) RT	138	
Anchor-Dutch Harbor (2) RT	678	
Anchor-Cold Bay-King Cove (4) RT	564	
Seattle-Ketchikan-Wrangell-Peters- berg-Sitka-Juneau-Yakatat-Cordova- Anchor (15) RT [special fare] two trips, one originating Anchor.	1200	
Seattle-Anchor (4) RT; 2 trips	800	
Seattle-Ketchikan-Craig (4) RT	215	
	<u>4213</u>	4213
Per Diem 40 days @ 80/day		3200

Report Preparation

Telephone	600
Copying	100
Misc. supplies	100
	<u>800</u>

800
\$25419