M E M O R A N D U M

TO: Council, SSC, and AP members

FROM: Jim H. Branson
Executive Director

DATE: July 13, 1981

SUBJECT: Status of Contracts and RFP's

ACTION REQUIRED

Mainly informational. However, some items may be ready for final approval.

BACKGROUND

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

Current Council Contracts

80-3: Seasonal Use and Feeding Habits of Walruses in the Proposed Bristol Bay Clam Fishery Area
(IMS at UA, $97,220, 57%, April 1, 1980 to September 1, 1981)

Objective: To assess the distribution and abundance of walruses in inner Bristol Bay monthly for one year and describe their feeding habits near and in the clam fishery area.

Status: Draft Final report is due on August 1, 1981.

80-4: To Expand and Enhance the Domestic Commercial Fisheries Catch Data Reporting System Off Alaska.
(ADF&G, $145,300, 60%, June 1, 1980 to December 30, 1981)

Objective: To enhance the quality and timeliness of domestic catch data required for fisheries management by developing and implementing a flexible and responsive data reporting system for catch summaries.

Status: The progress report for May 1981 has been received and distributed to the SSC review group. The project appears to be on schedule.

81-2: Processing of Fisheries Data
(ADF&G and CFEC, $55,000, 20%, October 1, 1980 to December 31, 1981)

Objective: To enhance capabilities of ADF&G and CFEC to provide harvest and processor data for 1977-79 to the Council.

Status: Second quarterly report #2 for April - June 1981 has been received and distributed to the SSC review group.

81-4: Marine Mammal Feeding Habits
(ADF&G, $41,397, 0%, July 13, 1981 to March 31, 1982)

Objective: To establish a baseline of current knowledge on marine mammals feeding habits and food requirements in the Bering Sea, evaluate its adequacy for use in ecosystems models, and indicate a general plan for further research.

Status: The new contract was signed in early July. An outline of the final report and a description of the evaluation methodology are due on July 31, 1981.

Future Research

* The RFP on Determinations of Stock Origins of Chinook Incidentally Caught in Foreign Trawls in the U.S. Eastern Bering Sea and Gulf of Alaska FCZ received one response (item F-1(a)) from the College of Fisheries at the University of Washington, Seattle. Their proposal has been approved with minor modifications by an SSC review group. The full SSC will review the proposal at this meeting. Given their approval, the Council should be able to award the contract.

* Council action may be required at this meeting.

AGENDA F-1(a)
July 1981

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

TO:	NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
TYPE OF SUPPORT REQUESTED	Research Contract
TITLE OF PROJECT:	Determination of Stock Origins of Chinook Salmon Incidentally Caught in Foreign Trawls in the U.S. Eastern Bering Sea and Gulf of Alaska FCZ (RFP 81-2)
PRINCIPAL INVESTIGATOR:	Donald E. Rogers Research Associate Professor Fisheries Research Institute College of Fisheries, WH-10 University of Washington Seattle, Washington 98195 (206) 543-7628
AMOUNT REQUESTED:	$108,930
DESIRED PERIOD:	1 July 1981 - 30 June 1983
UNIVERSITY OFFICE TO BE CONTACTED REGARDING GRANT OR CONTRACT NEGOTIATION:	Grant and Contract Services Room 22, Administration Bldg., AD-24 University of Washington Seattle, Washington 98195 (206) 543-4043
DATE: 2 June 1981	Principal Investigator
OFFICIAL AUTHORIZED TO GIVE UNIVERSITY APPROVAL:	Donald R. Baldwin, Director Grant and Contract Services

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DETERMINATION OF STOCK ORIGINS OF CHINOOK SALMON INCIDENTALLY CAUGHT IN FOREIGN TRAWLS IN THE U.S. EASTERN BERING SEA AND GULF OF ALASKA FCZ

INTRODUCTION AND SUMMARY

Chinook salmon (Oncorhynchus tshawytscha) are the least abundant species of Pacific salmon in Alaska (Major et al. 1978). However, since the passage of the Fishery Conservation and Management Act of 1976, 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 (Nelson et al. 1978, 1979, 1980) and the Gulf of Alaska (Wall et al. 1978, 1979, 1980). 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 (Nelson et al. 1980), or 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, subsistance, and sport chinook fisheries (Table 1), as well as on escapement of mature adults to the spawning grounds. 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) reports 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 orignating 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.

We propose to study the feasibility of using scale analysis to determine the stream or area of origin of chinook salmon in foreign trawl catches in the FCZ off Alaska using the following approaches: 1) Because a comprehensive report is not available on the incidental catch of chinook salmon in the foreign trawl fishery off Alaska or on stocks thought to contribute to this catch, existing biological data and information on this subject will be compiled, summarized, and reported. 2) Scale samples provided by resource agencies and collections made by U.S. observers in 1978, 1979, and 1981 will be processed and examined visually to determine age or life history patterns which might aid in stock separation. 3) Most of the research effort will be devoted to discriminant analysis of scale growth patterns. Scale samples needed to construct "training" samples for Bering Sea and Gulf of Alaska stocks will be obtained from government agencies associated with these stocks. 4) Measurements and counts of scale characters of fish of known origin will be made using a micro-computer based digitizing system, and characters most likely to give the best separation of chinook salmon stocks will be statistically selected. 5) Training samples using selected scale characters of fish of known origin for each area or stream to be classified will be constructed. Training samples will be classified using a direct density, leaving-one-out approach to establish the level of accuracy that would be attained in classifiying chinook of unknown origin.

If these approaches prove scale pattern analysis to be feasible, and if samples of chinook scales collected by observers are adequate, a provisional classification of unknowns in the 1978, 1979, and 1981 foreign trawl catches will be made using direct density discriminant analysis. Recommendations on the application of techniques used in this study to chinook salmon caught in the S.E. Alaska troll fishery will be made on the basis of the outcome of classification of Gulf of Alaska chinook training samples.

DISCUSSION AND APPROACHES

Scale analyses have been used since the early 1900's to separate stocks of chinook salmon (Koo 1967, review of early literature). Recently, discriminant analysis techniques have been used to separate stocks of chinook salmon caught on the high seas (Major et al. 1978, summarization and review).

We propose to use scale pattern recognition techniques similar to those described by Cook et al. (1980) and Harris et al. (1980a) to determine the feasibility of scale analyses to identify the stream or area of origin of chinook caught incidentally in the foreign trawl fisheries of the FCZ off Alaska.

Determination of the degree of stock or area separation feasible using scale pattern recognition techniques

Collection of Scales

Because information on chinook stocks, particularly those in the Gulf of Alaska, is limited (Major et al. 1978), initial analyses must include all major hatchery and wild chinook stocks from California to

the Yukon River. Scales will be collected from public resource agencies associated with these stocks. Although this will require an extensive amount of scale collecting, we plan to streamline our efforts through coordinating with INPFC related chinook scale collection activities. The Fisheries Research Institute has recently obtained chinook salmon scales collected in 1980 by TINRO biologists from the Kamchatka and Bolshaya rivers. These will be utilized if Asian stocks need to be included in the analysis.

Preparation, Aging, and Measurement of Scales

Laboratory preparation and visual aging of chinook salmon scales will be done using techniques similar to those described by Koo (1962), which are now standard for all species of Pacific salmon. Because chinook salmon are known to have a large number of regenerated scales, non-regenerated scales, identified by their small, regularly shaped nucleus, will be selected under a binocular microscope for U.S. observer and other unprocessed scale samples prior to mounting scales on gummed cards.

Major et al. (1978) reported that "reader interpretation (of freshwater age) may be a significant source of error in (chinook) data already assembled." Therefore, scale samples provided by resource agencies will be re-aged using a standard set of criteria established by aging chinook of unknown origin in U.S. observer collections. The criteria will be explained in our final report.

Although freshwater age patterns will be categorized by visual examination of scales, they may prove to be of limited value in stock separation. Koo (1967) found that scales of spring and fall chinook were better distinguished by measurements of circulus spacing in the first and second summers of ocean growth than by subjective judgements of freshwater age.

Measurements and counts of freshwater and marine scale characters will be made using a micro-computer based digitizing system developed by the Fisheries Research Institute in 1979 for INPFC-related research (Harris et al. 1980b).

As with scale collection, we plan to streamline scale digitizing activities through coordination with INPFC-related chinook research at the Fisheries Research Institute.

Data Storage and Retrieval

Raw scale and biological data will be stored in computer retrievable form on floppy discs and magnetic tape.

Differences in the Degree of Resolution for Gulf of Alaska and Bering Sea Chinook

Because much less is known about the origin and composition of chinook stocks in the Gulf of Alaska than in the Bering Sea (Major et al. 1978), and because stocks in these two areas probably originate from different geographical areas, scale pattern analysis for Gulf of Alaska chinook and Bering Sea chinook will be handled separately. We anticipate a much higher degree of resolution for Bering Sea stocks, possibly to sub-populations within the large streams, than will be possible for Gulf of Alaska stocks.

Gulf of Alaska stocks will probably only be separable on the basis of large geographic areas, e.g. California, Washington-Oregon, British Columbia, and Alaska.

In addition, the degree of resolution for stock separation for both areas will depend on the quality and quantity of scale samples available from public resource agencies.

Scale Character Generation and Selection

Scale character data will be generated from measurements of scales from all major stocks thought to contribute to Bering Sea and Gulf of Alaska incidental chinook catches, and characters most likely to give the best separation of chinook salmon stocks in the Gulf of Alaska and the Bering Sea will be selected using the techniques described by Cook and Lord (1978) for sockeye salmon, and Harris et al. (1980) for coho salmon.

Construction and Classification of Training Samples

Training samples of selected scale characters of fish of known origin for each area or stream to be classified will be constructed using techniques similar to those described by Cook et al. (1980).

If enough information is available, sample sizes of stocks within a training sample will be proportionalized to reflect abundance. To aid in this task, existing resource data and information sources on incidental salmon catches in the foreign trawl fisheries and on stocks that may be present in the fishery will be compiled, summarized, and reported. This information may also aid in the construction of training samples pooled over years and ocean age groups.

Training samples will be classified using a direct density, leaving one-out approach (Cook et al. 1980) to establish the level of accuracy that would be attained in classifying chinook of unknown origin.

Determination of adequacy of observer scale samples collected in 1978, 1979, and 1981

The adequacy of observer scale samples collected in 1978, 1979, and 1981 will be examined in terms of quality and quantity. In terms of quality, scale samples will be examined to determine if they are regenerated. If scales from a significant number of fish in the samples are all regenerated, regeneration rates will have to be calculated. In addition, scales will be examined to determine if they were taken from the "preferred" area of the fish. In terms of quantity it will be necessary to determine if sample sizes are area significant, i.e., if enough fish have been sampled from each area to make classification to area, stream, or subpopulations within streams meaningful. Because statistical areas for the foreign trawl fisheries are so large, these will be broken down into 1° x 1° areas, and sample sizes

for each of these areas will be determined. Because sizes of samples collected in the Bering Sea in 1978 (458) and in the Gulf of Alaska in 1978 (306) and 1979 (354) are small, various schemes for pooling data over time and space will probably have to be developed. This may result in broad confidence intervals in those cases.

Gaps in Stock Data

Gaps in stock data will be identified by reviewing existing resource data and scale collections. Current studies related to the proposed research will be identified and researchers will be encouraged to collect data where gaps exist. If U.S. observer data or scale collections are inadequate to determine stock of origin of chinook salmon in the catch, suggestions will be made for improvement of sampling techniques. Resource agencies from which scale samples are obtained will be encouraged to collect data on chinook where gaps exist, even if data collection is only incidental to studies on more abundant species.

Classification of trawl-caught chinook as to probable area or river of origin

If the above approaches to scale pattern analysis prove to be feasible, and if scale samples collected by U.S. observers are adequate, a provisional classification of unknowns in the 1978, 1979, and 1981 foreign trawl catches will be made using existing FORTRAN programs for a direct density discriminant analysis (described by Cook et al. 1980). Mixing proportion estimates would then be calculated from the results of classifying chinook caught in the foreign trawl fishery. Separate analyses will be performed on chinook of unknown origin from the Gulf of Alaska and Bering Sea.

Recommendations on application of scale pattern analysis to chinook salmon caught in the S.E. Alaskan troll fishery

Because the analysis used to classify Gulf of Alaska chinook will be similar to analyses for S.E. Alaska, recommendations will be made on the basis of the outcome of the Gulf of Alaska analysis.

Table 1. Annual catches of chinook salmon, in thousands of fish, 1956-1980. (Source: INPFC Bull. 39 and unpublished INPFC reports.)

Area	Averages 1956-66	Averages 1967-76	1977	1978	1979	1980
U.S.S.R.	100	161	290	310	280	-
North Pacific Mothership and landbased fisheries	228	430	230	310	290	860
Bering trawl	-	-	44	39	100	-
Western Alaska[1]	265	308	392	454	511	405
Yukon R.[1]	147	166	182	175	228	243
Kuskokwim R.[1]	13	47	117	102	110	88
Nushagak R.[1]	71	62	93	115	165	73
Central Alaska	42	35	40	55	41	29
Gulf of Alaska trawl	-	-	5	42	17	-
Southeastern Alaska	290	312	310	389	374	320
Northern B.C.[2]	213	375	320	-	-	-
Southern B.C.[2]	809	1053	1440	-	-	-
Washington[2]	640	950	1085	-	-	-
Oregon[2]	380	420	641	-	-	-
California[2]	720	500	734	-	-	-
Calif.-Ore.-Wash. trawl	-	-	-	13	6	7

[1] Includes subsistence catch

[2] Includes sport catch

PROGRAM ORGANIZATION

Dr. Rogers, as principal investigator, will actively lead and supervise the proposed work, and will take full responsibility for timely completion of all objectives. He will edit the quarterly reports, participate in data analyses and write the annual reports.

Ms. Myers, as project leader, will train a graduate student in aging and digitizing scales, be responsible for the collection of scales from coastal fisheries, assist in aging and digitizing, and write quarterly reports.

Ms. Rogers will assemble available statistics on the abundances and age-sex compositions of commercial catches and escapements of the major chinook stocks along the North Pacific. She will also sort and mount the 1978 and 1979 trawl samples.

It is anticipated that a graduate student will utilize much of the material from this project for a thesis. The schedule of work accomplishment is somewhat dependent on the condition of the trawl scale samples, the timely cooperation of agencies providing the inshore scale samples and the proficiency of the trained students; however, we anticipate accomplishment of the following schedule.

PROGRAM SCHEDULE

July-September 1981

a. Compile chinook salmon abundance and age statistics.
b. Sort, mount and age 1978-1979 trawl samples.
c. Quarterly report, September 30.

October-December 1981

a. Sort, mount and age 1981 trawl samples.
b. Collect scales from inshore fisheries from agencies.
c. Quarterly report, December 31.

January-March 1982

a. Digitize scales from inshore fisheries.
b. Statistical analysis of 1978-1979 data.
c. Quarterly report, March 31.

April-June 1982

a. Digitize scales from inshore fisheries.
b. Annual report, June 30.

July-September 1982

a. Digitize trawl samples.
b. Plan sampling program and analysis for the 1982-83 trawl fishery.
c. Quarterly report, September 30.

October-December 1982

a. Collect and digitize scales from 1982 inshore fisheries.
b. Evaluate 1978-82 data, i.e., origin of trawl-caught chinook.
c. Quarter report, December 31.

January-March 1983

a. Determine applicability of this study to the S.E. Alaskan troll fishery.
b. Quarterly report, March 31.

April-June 1983

a. Project evaluation and final report preparation.
b. Final report draft in May and final report in July.

PERSONNEL QUALIFICATIONS

Dr. Donald Rogers (Principal Investigator) has over 20 years of experience in fisheries biology with emphasis on Alaskan salmon research in Bristol Bay (Nushagak), Kodiak, Chignik, and the high seas. He has written approximately 60 reports or publications and is an editor for "Research in Fisheries", a University of Washington annual publication. His major fields of research include estimating and forecasting abundances of salmon stocks, environmental impacts on the growth and age of salmon, ecological relationships (modeling), and North Pacific salmon fisheries. He was principal investigator for an NPFMC contract entitled "Investigations on Continental Origin of Sockeye and Coho Salmon in the Area of the Japanese Landbased Fishery" which was on the methodology of applying scale character analyses to stock separation of sockeye and coho salmon in the high seas fishery.

Ms. Katherine Myers is currently a biologist working on stock separation studies of salmon in the high seas landbased fishery (INPFC research through NMFS). She has a Master's degree and two years of experience with salmon scale analysis.

Ms. Brenda Rogers is also currently a biologist working on high seas stock separation. She has a Master's degree and 12 years of experience in fisheries biology, most of which has been on Alaskan salmon research.

Mr. Rod Cook (Ph.D. Candidate) and Mr. Colin Harris (Fishery Biologist) will also be available for consultation on this project. They are currently working on the high seas stock separation study.

INFORMATION SOURCES

Cook, R.C. and G.E. Lord. 1978. Identification of stocks of Bristol Bay sockeye salmon, Oncorhynchus nerka, by evaluating scale patterns with a polynomial discriminant method. Fish. Bull. 76(2):415-423.

Cook, R.C., R.H. Conrad, K.W. Myers, R.V. Walker and C.K. Harris. 1980. The mixing proportion of Asian and Alaskan sockeye salmon in and around the landbased driftnet fishery area as determined by scale pattern recognition. (Document submitted to Annual Meeting of the INPFC, Anchorage, U.S.A., November 1980.) 58 pp. Fisheries Research Institute, University of Washington, Seattle, Washington 98195.

Harris, C.K., R.H. Conrad, K.W. Myers, R.V. Walker, R.W. Tyler, and R.L. Burgner. 1980a. Monitoring migrations and abundance of salmon at sea. 1980. (Document submitted to annual meeting of the INPFC, Anchorage, U.S.A., November 1980.) 37 pp. Fisheries Research Institute, University of Washington, Seattle, Washington 98195.

Harris, C.K., R.C. Cook, S.L. Marshall, R.H. Conrad, R.L. Burgner, and J.P. Graybill. 1980b. High seas salmon studies. Pages 8-10 in D.B. Beall (ed.). 1979 Research in Fisheries. Annual Report of the College of Fisheries. Contrib. 515. University of Washington, Seattle, Washington 98195.

Koo, T.S.Y. 1962. Studies of Alaska red salmon. University of Washington Press, Seattle. 449 p.

Koo, T.S.Y. 1967. Objective studies of scales of Columbia River chinook salmon, Oncorhynchus tshawytscha (Walbaum). Fish. Bull. 66 (2):165-179.

Major, R.L., J. Ito, S. Ito, and H. Godfrey. 1978. Distribution and origin of chinook salmon (Oncorhynchus tshawytscha) in offshore waters of the North Pacific Ocean. Int. N. Pac. Fish. Comm. Bull. 38. 54 p.

Meacham, C.P. 1980. Summary of western Alaska chinook salmon catch and escapement data. (Document submitted to annual meeting of the International North Pacific Fisheries Commission, Anchorage, Alaska, October 1980. 20 pp. Alaska Department of Fish and Game. Commercial Fisheries Division, 333 Raspberry Road, Anchorage, Alaska 99502.

Nelson, Jr., R., R. French, J. Wall, and D. Hennick. 1978. Summary of U.S. observer sampling on foreign fishing vessels in Bering Sea/Aleutian Islands areas, 1977. (Processed report) 73 p. Northwest and Alaska Fisheries Center, National Marine Fish. Serv., NOAA, Seattle, Washington 98112.

Nelson, Jr., R., R. French, and J. Wall. 1979. Summary of U.S. observer sampling on foreign fishing vessels in Bering Sea/Aleutian Islands Region, 1978. (Processed report) 75 pp. Northwest and Alaska Fisheries Center, National Marine Fish. Serv., NOAA, Seattle, Washington 98112.

Information Sources cont'd

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PROPOSED BUDGET

	July 1, 1981-June 30, 1982	July 1, 1982-June 30, 1983
Salaries		
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	-
Research Assistant 6 mos @ 50% first year	3,600	9,150
Student Helper 6 mos @ 50%	2,400	-
TOTAL DIRECT SALARIES	$ 30,231	$ 29,080
Benefits		
Faculty (18%), staff (23%), student (7%)	5,487	4,693
Supplies and Services	500	400
Computer	2,000	1,200
Travel and Per diem	1,000	500
Cost Center		
Secretarial, data processing, report preparation, and in-house administration	3,200	3,000
TOTAL DIRECT COSTS	$ 42,418	$ 38,873
Indirect Costs (34%)	14,422	13,217
TOTAL BUDGET	$ 56,840	$ 52,090