

M E M O R A N D U M

TO: Council, SSC, and AP Members

FROM: Jim H. Branson
Executive Director

DATE: November 30, 1982

SUBJECT: Status of Contracts and Proposed Projects

ACTION REQUIRED

- (a) *Halibut Limited Entry Sociocultural Study - Phase II: review and approve revised study proposal.*
- (b) *Joint Venture Analysis: A progress report will be given by Dr. Rich Marasco.*
- (c) *Review ADF&G request for an extension of the crab observer program into the Tanner crab fishery.*

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, \$100,000, 52%, October 1, 1981 to September 30, 1983)

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: In September, the Council approved the second year of funding for this study and the contractor was requested to trim his budget by \$8,930 from \$108,930 to \$100,000, the total provided by NMFS. This reduction has been made and the contract amended. The next quarterly progress report is due on December 31.

*82-2: Crab Observer Program
(ADF&G, \$69,489, 3%, 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 10 and some observers may still be in the field. A progress report will be given at this meeting under agenda item D-3. ADF&G has requested a contract extension of this program into the Tanner crab season. There are sufficient funds leftover in the contract to support this request. An ADF&G staff member will be available at the Council meeting to explain the circumstances.

82-3: An Economic Profile of the Southeast Alaska Salmon Industry

(UA, \$10,000, 70%, April 1, 1982 to March 31, 1983)

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

Status: A quarterly report for July 1 to September 30, 1982 has been submitted to the SSC for review. The contract was extended to March 31, 1983. A draft final report is due in March 1983.

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: The Halibut Limited Entry Steering Group met in Seattle on October 6, 1982 to review a draft report by the contractor on the design of a share-type limited entry system. After the meeting, the draft report was revised and sent with a meeting summary to the Council, SSC, AP and Limited Entry Workgroup. The contractor will complete his economic analysis in early December. The workgroup agreed to postpone the deadline for receiving the draft final report on this study to late January.

*Halibut Limited Entry Sociocultural Study

The revised Phase I final report when received will be distributed to the SSC for review and possible comment at the January meeting.

A proposal for Phase II has been distributed to the SSC for review. This study will develop information responding to MFCMA requirements that the Council consider the cultural and social framework relevant to a fishery for which limited entry is proposed. In September the Council approved \$25,000 for this study but requested that the proposal be revised. The revised proposal is under agenda item E-1(a).

*Marine Mammal Workshop

A planning group for the workshop met in Seattle on November 9 to discuss scope, participants and timing. The group recommended postponing the workshop until fall of 1983 to allow more thorough preparation by participants. A report of the planning meeting has been given to the SSC for review and comment at their January meeting.

*Joint Venture Analysis

A progress report will be given at this meeting by Dr. Marasco. The work is being done at the NWAFC.

Update on Programmatic Requests

In July the Council approved programmatic funding requests totalling \$751,300 as follows:

<u>Title</u>	<u>Amount</u>
Rapid Response	\$ 80,000
FMP Development ADF&G	60,000
Sablefish Symposium	4,000
Domestic Trawl Logbook Program	167,300
Bering Sea Herring Scale Analysis	60,000
High Seas Tagging of Salmon	60,000
Golden King Crab Study	20,000
Analysis of biology and management of herring and sablefish and economic analysis of fisheries in the Gulf of Alaska and Bering Sea	<u>300,000</u>
TOTAL	\$751,300

The only progress so far has been a priority submission for funding of the FMP Development for ADF&G for \$60,000. NMFS recently notified us that this funding has been approved. Other requests do not look promising under the current budget climate. We plan on funding the sablefish symposium for \$4,000 out of administrative funds. Additionally, there will be a small scale joint venture logbook program for 1983 supported by Pacific Coast Fisheries Information Network funds through the Pacific Marine Fisheries Commission. More information is under agenda item C-6.

DRAFT

SOCIAL AND CULTURAL ASPECTS OF
THE PACIFIC HALIBUT FISHERY

Research Proposal to the
North Pacific Fishery Management Council

Steve J. Langdon and Marc L. Miller

November 1982

1.0 Background

The North Pacific halibut fishery, stretching from Oregon to the Bering Sea, is one of the most traditional, biologically studied and managed of west coast commercial fisheries. The ^{recent} sustained high market value of halibut, in conjunction with the continuity of the resource has generated a situation which fishermen and managers feel requires action. In particular, concern centers around increases in fishing effort and capitalization, and the resulting reduction in season length. It appears likely that a moratorium on halibut licenses will be put into effect for the 1983 season, and consideration of various limited entry options for the fishery continues to be a prime agenda for the Council.

As these important new policies are initiated by the Council, it is imperative that they be developed in accordance with the Magnuson Fishery Conservation and Management Act of 1976 (P.L. 94-265) and the Northern Pacific Halibut Act of 1982 (P.L. 97-176). In explicit recognition of sociocultural phenomena as critical to systems of limited entry, both acts require the Council and the Secretary of Commerce to "take into account...the cultural and social framework relevant to the fishery" (P.L. 94-265 Sec. 303 (b) (6)).

2.0 Objectives

The broad objective of this study is to gather social, cultural, and demographic information descriptive of the contemporary Pacific halibut fishery important to management decisions. The research framework distinguishes fishery characteristics (i.e., a basic set of descriptive indices) from fishery organization (i.e., social and cultural relationships of the fishery) and addresses itself to both.

2.1 Objective 1

*Identification of the characteristics of the fishery

Characteristics of halibut fishermen and communities in which halibut fishermen live and work are basic to a description of the fishery. We will provide community-level census data where available for a general set of demographic characteristics including population, number of households, average household size, average household income, and educational level. Communities will be organized into the six basic regions used in the TetraTech report and in our preliminary report.

At the individual level we will identify characteristics of halibut fishermen and organize them by community and region. We will identify the following fisheries-related and social characteristics of individual fishermen:

2.1.1 Fisheries-Related Characteristics

- Vessel size (NORFISH vessel classes)
- Vessel ownership
- Occupational category where available (captain, crewman, owner)
- Areas fished for halibut
- Degree of participation in the halibut fishery (proportion of total gross fishing earnings derived from halibut)

2.1.2 Social Characteristics

- Age
- Ethnicity or cultural group
- Education
- Marital status
- Number of dependents
- Fishing earnings as a proportion of total earnings
- Nonfishing sources of income
- Community residency

(Based on discussions with the steering committee and further refinement, this set of variables may be added to or altered prior to field collection of data.)

2.1.3 Trends

Information compiled by Northwest Resources, Inc. reveals that the composition of the halibut fleet has changed substantially over the last five years. For certain characteristics for which data over the period 1977-1981 are available, a trend analysis of changes will be prepared at community and regional levels.

2.2 Objective 2

*Description of the organization of the fishery

Describing the social and cultural organization of the fishery requires basic descriptive indices identified above, but focuses on the institutional arrangements and dynamic processes through which the fishery gets conducted. Important components of the fishery organization include:

- the nature and role of fishermen's associations
- patterns of participation in fishing associations
- patterns of recruitment into the halibut fishery
- captain-crew relationships
- patterns of capital ownership and finance
- special local or cultural conditions
- attitudes concerning the management of the fishery

3.0 Methods of Procedure

The research objectives outlined above will be accomplished through a complementary methodology requiring 1) analysis of secondary and computer source materials, and 2) ethnographic investigation.

3.1 Secondary and computer source materials

- The U.S. census for 1980 contains community level information noted above in section 2.1. These data will be accessed through the computer facilities of the Institute for Social and Economic Research of the University of Alaska in Anchorage.
- Computerized data bases brought together for the Tetra Tech and Northwest Resources research contracts will provide the majority of the fisheries-related information. For most variables identified above, presently organized files can be accessed through the SPSS program. However, it will be necessary for additional programming to be done to include age as a variable and to organize individual and community characteristics into regional levels.

3.2 Ethnography

This method of field-based research includes informal discussions, systematic interviews, and general participant observation.

3.2.1 Communities

The sample of communities selected for ethnographic attention will be stratified to reflect differences in 1) regional location (Puget Sound, Southeast, Prince William Sound, Cook Inlet, Kodiak, Alaska Peninsula) and 2) a combination of population size and the importance of halibut to the community in terms of local fishermen's participation. Depending on the level of funding available for this research, the sample of communities will consist of 1) the three primary halibut communities of Seattle, Petersburg, and Kodiak; 2) three to six secondary com-

munities (from among Ketchikan, Wrangell, Sitka, Juneau, Haines, Cordova, Homer, Kenai, Sand Point, and perhaps others) and 3) three to six smaller, rural communities. Communities characterized by a significant processing as opposed to harvesting sector (Seward, Pelican) can be substituted or added as the Steering Committee wishes.

3.2.2 Individuals

Informal discussions in the halibut communities will involve community leaders, fishermen, processors, fishery managers and advisors, and business people directly linked to the fishery. For purposes of inter-community comparison, captains and crew will be systematically interviewed (ideally, twenty captains and crew for primary communities; ten captains and ten crew for secondary and small, rural communities).

3.2.3 Interview Protocols

Separate protocols will be designed for parallel data collection from captains and crewmen. The intent in systematic data collection is to provide for maximum comparability at the individual, community, and regional levels. Because of time and budget constraints, only a limited set of questions can be asked, and it is therefore crucial to focus on important dimensions of social relationships not accessible through secondary data sources. Preliminarily, we have identified the following areas for development into systematic protocols:

For Captains

- Age
- Ethnicity
- Education
- Marital status
- Number of dependents
- Experience in the halibut fishery (number of years)
- Membership in fisheries organizations
- Fishing earnings as a proportion of total earnings
- Nonfishing sources of income
- Vessel ownership and financing
- Crew recruitment
- Attitudes toward management of the halibut fishery

For Crew

- Age
- Residency
- Ethnicity
- Education
- Marital Status
- Number of dependents
- Experience in the halibut fishery (years)
- Other fisheries participated in
- Halibut and other fisheries income as a proportion of total income
- Nonfishing sources of income
- Recruitment to fishery
- Attitudes toward management of the halibut fishery

4.0 Logistics

This research project is coordinated with 1) the Northwest Resources Analysis study of economic aspects of the halibut fishery, and 2) the North Pacific Fishery Management Council timetable and agenda. Research will begin 1 January 1983; a draft report will be made available to the Council on 5 May 1983, and a final report will be submitted 31 May 1983. Advisory meetings with the steering Committee and Council staff will be held as needed.

4.1 Personnel

Key informant interviewing and protocol collection are time-consuming activities. The project as outlined will require several research associates and assistants (who have already been identified) in addition to the co-principal investigators, to conduct field research and computer analysis.

4.2 Travel and Field Research

Extensive travel in Alaska will be necessary to meet the research objectives of this study. Sampling halibut communities will necessitate personal visits by researchers, and, in addition, coordination and report preparation will require travel to State and Federal offices in Anchorage, Juneau, and Seattle. The majority of the travel associated with the fieldwork component of the research will be conducted from the latter part of January to the first of April. It is hoped that this schedule will be most conducive to contacts in the various communities without disrupting the cycle of fishing activities. Letters will be sent to relevant contact persons in each community prior to the researchers arrival to inform them of the nature and purpose of the research.

5.0 Budget

Personnel

		<u>Amount</u>
S. Langdon (co-principal investigator)	20 days plus benefits	\$4000
M. Miller (co-principal investigator)	10 days @ \$225	\$2250
research associate	5 days @ \$225	\$1125
Research Associate	5 weeks @ \$625	\$3125
research assistant	5 weeks @ \$411	\$2055
Research Assistant	4 weeks @ \$411	\$1644
Research assistant	1 week @ \$411	\$ 411
Computer programmer	20 hours @ \$25	\$ 500
Secretary	3 weeks @ \$400	\$1200
<u>Travel and Per Diem</u>		
Travel		\$3240
Per Diem	70 days @ \$65	\$4550
<u>Other Expenses</u>		
Photocopying		\$150
Mail		\$ 50
Phone		\$500
Miscellaneous supplies		\$200
<u>TOTAL</u>		\$25,000

WORKSHOP ON THE BIOLOGICAL INTERACTIONS AMONG MARINE MAMMALS AND
COMMERCIAL FISHERIES IN THE SOUTHEASTERN BERING SEA

Alternative to paragraph 2, page 3 of notes from Steering Committee Meeting draft dated 11/16/82 (provided by Lloyd Lowry)

The task of each working group will be to define and develop a plan for research and experimentation needed to answer the general question of how marine mammals and commercial fisheries in the Bering Sea interact. It may be necessary for each working group to deal with a single marine mammal species or group and a specific fishery. Topics to be considered by each working group are:

What general approach (i.e., correlative studies, monitoring, modelling, etc.) is presently most appropriate for examining biological interactions among marine mammals and commercial fisheries?

What data is required to answer the question of how marine mammals and commercial fisheries interact using the chosen approach?

What of the required data is presently available or is being gathered by ongoing research programs?

If all the required data are collected what will be the nature and value of the conclusions? Will the results be definitive or ambiguous? Will a specific postulated interaction be proved or disproved? Will a predictive ability be developed which can be applied in a variety of specific situations?

Progress Report #2 for North Pacific Fishery Management Council
Contract 82-3: "An Economic Profile of the Southeast Alaska Salmon Industry"

Submitted by Douglas M. Larson, Principal Investigator

This report covers project activities from July 1 to September 30, 1982.

The fisherman survey effort was closed in July, after the responses had slowed to one per week. Responses were received from 820 of the 2,282 individual permit holders samples, for an overall response rate of 36 percent. This is well over twice the response rate obtained in the Sea Grant survey of 1979, and is due to improved follow-up efforts and the close cooperation of local association officials and the UFA. Another contributing factor may have been the recognition of Southeast Alaska fishermen that Canadian salmon interception and potential litigation over chinook harvest may require cutbacks in Southeast fisheries, and that management decision-making can be improved by better information on impacts to user groups. Table 1 details the response rates by mailing for each of the gear types sampled.

Project research during this period focused on the specification of models to be used for estimation of impacts on salmon subfleets of changes in OY for certain salmon species (e.g., chinook). Subfleets will be defined by cluster analysis of economic performance and fleet physical characteristics, for each gear type; their production functions and cost curves will be estimated cross-sectionally for each subfleet. Effort (measured either by days fished or operating hours logged) is the key variable relating production and costs. It is expected that OY cutbacks would be implemented either by means of a quota or by effort restrictions (time-area closures). Each subfleet may have harvested different species mixes in their salmon catch in 1981, which would cause different initial impacts when restrictions in chinook OY were imposed. Changes in producer's surplus which accompany these restrictions can be predicted by the model; it is not yet clear whether the simple simulation model developed here will be adequate to capture substitution effects between areas or between species. Computer programs were written to handle the preliminary cluster analysis defining subfleets and to summarize costs and earnings for each subfleet.

An unexpected delay in receipt of the data tape from NMFS may push back the time frame for analysis somewhat. It appears that this delay is the result of two factors: longer-than-anticipated time required for keypunch and tape creation, and problems with the mail. As mentioned in Progress Report #1, a data tape was expected in mid-July, based on discussions at the Seattle meeting. This tape was mailed from the Northwest and Alaska Fisheries Center on September 3, and had not been received by September 24. On that date, a duplicate tape was requested and sent airmail. Though as of this writing neither tape has arrived, the duplicate tape should arrive shortly.

Table 1. Total number of responses and response rates by mailing, for each gear type sampled and overall.

Gear Type/	1	Mailing 2	3	a/ ?	Total
Power Troll - completed	151	49	8	1	209
- other ^{b/}	3	4	5	0	12
Total Power Troll	154(.313)	53(.108)	13(.026)	1(.002)	221(.449)
S.E. Hand Troll - completed	138	78	37	2	255
- other	3	1	5	1	10
Total Hand Troll	141(.181)	79(.101)	42(.054)	3(.004)	265(.340)
Drift Gillnet - completed	114	40	13	1	168
- other	0	2	3	2	7
Total Drift Gillnet	114(.256)	42(.094)	16(.036)	3(.007)	175(.392)
Purse Seine - completed	57	33	15	1	106
- other	0	0	1	1	2
Total Purse Seine	57(.158)	33(.092)	16(.044)	2(.006)	108(.300)
Yakutat Hand Troll - completed	6	1	0	0	7
- other	0	0	0	0	0
Total Yakutat Hand Troll	6(.150)	1(.025)	0	0	7(.175)
Yakutat Set Net - completed	24	13	6	0	43
- other	0	1	0	0	0
Total Yakutat Set Net	24(.146)	14(.085)	6(.036)	0	43(.268)
Total Completed Surveys	490	214	79	5	788
Total Other Responses	6	8	14	4	32
TOTAL SURVEY RESPONSES	496(.217)	222(.097)	93(.041)	9(.004)	820(.359)

a/ "?" refers to questionnaires returned with mailing label torn off.

b/ Other responses: Deceased (3), Did not fish in 1981 (3), A typical season (6), Sold permit (4), No reason/fed up (13), No records (3); Total = 32

Notes from Steering Committee Meeting

Workshop on Biological Interactions Among Marine Mammals
Commercial Fisheries in the Southeastern Bering Sea

November 9, 1982, Seattle

Present

Lloyd Lowry
Bruce Mate
Bob Francis
Tom Laughlin
Doug Chapman

Jeff Fujioka
Clarence Pautzke
Gordon Swartzman
Brenda Melteff

Absent

Dick Gard
Bob Hofman

Workshop Objective

The major portion of the discussion centered on the objective and products of the workshop.

Two workshops already scheduled were briefly discussed. The first to be held by the Southwest Fisheries Center on entanglement of fur seals and monk seals and the second to be held by the Northwest and Alaska Fisheries Center on pollock/Bering Sea interactions. In addition, there has been a project underway studying the Columbia River estuary fish being taken by mammals and direct kill of mammals in that area.

The objective of this workshop will be a 5- to 10-year plan for scientific research needed by the management agencies in order to properly manage the commercial fisheries in the eastern Bering Sea with regard to marine mammals. Recommendations to the North Pacific Fishery Management Council for changes to the Bering Sea Management Plan will also be formulated.

Workshop Topics

The three main aspects which could be covered are 1) the taking of fish by marine mammals, 2) the taking of marine mammals by fishermen, and 3) entanglement of marine mammals in nets and debris, etc. It was decided that topic 3) should be adequately covered by the workshop held by the Southwest Fisheries Center and no major focus would be made at this workshop.

It was also decided to limit the geographical area discussed to the Eastern Bering Sea.

Since there are 26 species of marine mammals in the Eastern Bering Sea, it may be necessary to consider as the major species beluga, fur seal, sea lion, harbor seal, harbor porpoise, spotted seal, and ribbon seal. Likewise, fisheries may be limited to pollock, herring, and Pacific cod.

Among topics considered were the following:

- Are fish stocks changing in response to fishing pressure?
- How do marine mammals change their physical activities with changes in available food and environment?
- What is the effect of commercial fisheries in the Bering Sea on marine mammal strategies?
- Is the pollock fishery affecting the fur seal population?

The following major topics were identified on which papers will be requested for presentation by one of the individuals listed in parentheses after the topic:

1. Background of the problem: Why is marine mammal/commercial fisheries interaction in the Bering Sea of interest?
(Marine Mammal Commission - Hofman)
2. PROBES: Relevancy of oceanography to fisheries.
(University of Alaska - Goering, McRoy)
3. Evaluation of existing fisheries data base and existing research and management programs for Bering Sea fisheries.
(Northwest and Alaska Fisheries Center)
4. Evaluation of existing marine-mammal data base and existing research and management programs for Bering Sea marine mammals.
(Northwest and Alaska Fisheries Center, National Marine Mammals Laboratory)
5. Conceptual assessment of Bering Sea marine mammals/fisheries interactions.
(Alaska Department of Fish and Game - Lowry)
6. Review of status of knowledge of fisheries density dependence.
(Carl Walters, Ricker, Cushing)
7. Review of status of knowledge of marine mammal density dependence.
(Southwest Fisheries Center - DeMaster, Fowler, Eberhardt, May, Siniff)
8. Review of status of knowledge of marine mammal energetics.
(Brodie, Kooyman, Lavigne, Elsner, Geraci)
9. Existing and potential predator/prey models relevant to examining stocks of marine mammals and fisheries in the Bering Sea.
(Swartzman, Tim Smith, Fowler, Quinn, Dariso, Leavestu)

Workshop Structure

The first day of the workshop will be spent in plenary session with presentations being made on the nine topics outlined above.

An overall chairman for the workshop will be selected by Pautzke, Lowry, and Hofman at a later date.

The second and third days of the workshop will be spent in group working-meetings. Four groups will meet concurrently to discuss the same problems, and after the meetings the chairmen will meet to synthesize the input. Chairmen for these groups will be Bruce Mate, Bob Francis, Doug Chapman, and Tom Laughlin.

Workshops will focus on the following topics as they pertain to both fisheries and marine mammals:

- Environmental - spatial
- Energetics
- Density dependence
- Key species
- Distribution and abundance
- Feeding
- Reproduction
- Mortality

On the fourth day the plenary session will reconvene, and reports will be given by the chairmen of the working groups.

Participant Identification

A list of participants was generated. See Appendix 1. Please provide corrections to names and additions to list.

Logistics

The workshop will be three to four days beginning on a Tuesday. Dates will be scheduled so as not to conflict with the International North Pacific Fisheries Commission which will meet in Anchorage in October or November, the North Pacific Fishery Management Council, and Fish Expo.

NOTE: INPFC meeting will begin Tuesday, November 1, 1983.
NPFMC currently has no meeting scheduled for October 1983;
but if it should have one, it would be the week of
October 24.
Fish Expo is October 26-29, 1983.

Accommodations are being solicited for the week of
October 17, 1983 in Anchorage.

It was decided that announcements would be put out but no official call for papers made. Announcements would request interested parties to prepare position papers for use in the workshops. The only formal scientific presentations will be made by invitation on the nine major topics identified.

Document Publication

A document will be published as a product of the workshop. It will include the background papers presented, the reports of the working groups, and the recommendations and research plans developed.

Clarence Pautzke, North Pacific
Fishery Management Council

Northwest and Alaska Fisheries Center

Taivo Leavestu
Bill Aron
Kevin Bailey
Vidar Weststad
Sam Bledsoe
Roger Gentry
Murray Hayes
Rich Marasco

National Marine Mammal Laboratory

Chuck Fowler
Cliff Fiscus
Bob DeLong
Mike Perez
Tom Laughlin
Mike Tillman
R. V. Miller

Alaska Department of Fish and Game

John Burns
Steve Pennoyer
Don Calkins
Kathy Frost
Lloyd Lowry

Bob McVey, National Marine Fisheries
Service - Alaska Region

University of Alaska

Bob Weeden
Bob Elsner
Bud Fay
Vera Alexander
John Goering
Peter McRoy

Bob Hofman, Marine Mammal Commission

University of Washington

Doug Chapman
Gordon Swartzman
Don Bevan

*Southwest Fisheries Center

Doug DeMaster
Don Polachek

Fisheries and Oceans Canada

Mike Bigg (Nanaimo)
*Paul Brodie (Dartmouth)

*U.S. Fish and Wildlife Service

Jerry Sanger
George Hunt
Jim Estes
Ansel Johnson

*University of Guelph

Dave Lavigne
Joe Geraci

*? Ricker,
*Carl Walters, UBC
*? Cushing,
*? Dariso,
*? Quinn,
*Tim Smith,
*? Kooyman,
*Guy Oliver, NOAA/OMPA
Bruce Mate, Oregon State Univ.
*Don Siniff, University of Minn.
*Cleve Coles, BLM/OCS
Wally Perrera, Marine Resources
*Katherine Green Hammond,
*Rocky Beach, Oregon Dept. of
Fish and Wildlife
*Bob Everett,
*Dan Miller, Cal. Fish and Game,
Monterrey
Lee Alverson, Natural Resources
Consultants
*Lee Eberhardt,
*Bob May, Princeton

*Need full names and addresses

14.7 Modeling and Ecosystem Simulations

This project focused on a review of available data on feeding and status of Bering Sea marine mammals and was not intended to be an intensive review of existing and applicable models and simulations. However, in order to assess utility of available data and suggest priorities for future research, we conducted a partial review and assessment of numerical models. In this section we make some suggestions regarding future modeling efforts but must emphasize that this is not a comprehensive plan for research involving models and simulations.

Several programs and agencies are presently conducting research relating to various components of the Bering Sea ecosystem (Table 14.7-1). Although some major summaries of results have been published (e.g., for the NOAA/OCSEAP projects, Hood and Calder 1981a, b), most of the projects are still ongoing and data are in various stages of analysis. The major multidisciplinary programs each have a specific emphasis. NOAA/OCSEAP has funded physical and biological studies relevant to possible impacts of offshore oil and gas development. NOAA/NMFS/NMML is studying finfish, shellfish, and marine mammal stocks and their interactions. PROBES is investigating physical and biological processes important to Bering Sea resources, with emphasis on pollock. Groups such as UA, UW, FWS, and ADF&G are gathering data relating to the biology of fishes, seabirds, and marine mammals.

Although models of obvious levels of sophistication are involved in most if not all of the research programs, and the data requirements and products for them are closely linked, integration and coordination

Table 14.7-1. Programs and agencies conducting research relating to the Bering Sea ecosystem.

Physical/chemical oceanography	Plankton and productivity	Fishes/fisheries	Seabirds	Marine mammals
NOAA/OCSEAP PMEL PROBES	NOAA/OCSEAP PROBES	NOAA/NMFS PROBES ADF&G UW	NOAA/OCSEAP FWS PROBES	NOAA/OCSEAP NMFS/NMML FWS UA ADF&G PROBES

among programs are not generally apparent. We suggest that a workshop to consider possible integration of recently gathered information and to investigate the most productive directions for future work is appropriate. In addition to simulating ecosystem processes, attention should be given to identification of logical subunits for which models may be more readily developed and verified. The utility of various approaches for addressing management questions relating to fish and mammal stocks and their harvesting should be emphasized.

Realizing that ecosystem models which can generate reliable predictions useful for management of fish and mammal stocks may not become available for a decade or more, other models may be useful for directing research, estimating the probability of interactions, and investigating possible effects of predation and fisheries on fish stocks. We suggest the development of a model simulating the effects of harvesting and predation on fish stocks which incorporates discrete age or size classes. With respect to marine mammals, the proximate need is for models dealing with feeding ecology and energetics and how they are affected by prey availability. A review of the present state of knowledge of density dependence in marine mammals is greatly needed. This topic might well be addressed by a workshop.

Based on presently available data, likelihood of interaction with fisheries, and feasibility of future research, several species are obviously the most suitable subjects for feeding and energetic studies. They include fur seal, sea lion, harbor seal, spotted seal, belukha whale, and harbor porpoise. Since functional differences among major taxonomic groups are likely, research should address at least one

species in each major taxon (i.e., otariid, phocid, odontocete). With respect to possible laboratory studies, three species seem particularly appropriate--fur seal, harbor seal, and belukha.