OUTER CONTINENTAL SHELF ENVIRONMENTAL ASSESSMENT PROGRAM

BERING SEA-GULF OF ALASKA
PROJECT OFFICE
P.O. Box 1808
Juneau, Alaska 99802

VOLUME THREE *MAY 1978*

Bering Sea-Gulf of Alaska Newsletter

Editorial Staff:

Herb Bruce
Francesca Cava
Debra Drummond

Telephone:

907-586-7436

P.I. ANNUAL REPORT HIGHLIGHTS

RESULTS ON OCSEAP MEETINGS

INTEGRATED BIOLOGICAL STUDIES BEGIN IN KODIAK

This Newsletter is published for the National Oceanic and Atmospheric Administration by the Bering Sea-Gulf of Alaska Project Office (Juneau Project Office), coordinators of the BLM/NOAA outer continental shelf studies in the Gulf of Alaska and Bering Sea. Responsibility for its contents lies with the Bering Sea-Gulf of Alaska Project Office.

TABLE OF CONTENTS

Calendar

17-21 April : OCSEAP Hydrobiology Review
Santa Cruz, California

21 April-May 4: Lower Cook Inlet Field Camp Set Up

> A field camp will be established on Cottonwood, Iliamma and Kamishak Bays to facilitate field operations on the west side of lower Cook Inlet. This camp will be used primarily by Dames & Moore, R.U. 417, the Alaska Department of Fish & Game, R.U. 512, and the University of Washington, R.U. 424. This camp will consist of three vans, a van with a nine-bunk sleeping facility, a van with a laboratory and van with mess facilities. Diesel generators will be installed for power.

2-4 May : Physical Oceanography Workshop
Orcas, Washington

16-18 May : User's Panel Meeting
Homer, Alaska

To be announced : Renewal proposals for FY 79 due in the JPO

> NOTE: A change in proposal instructions requires that only five copies of the proposal be submitted. One signed original and four copies should be submitted.

30 June : P.I.' Quarterly Reports are due

15 August : Distribution date for next Newletter

> The Newsletter will be distributed quarterly as follows: February 15, May 15, August 15 and November 15. Scientific articles and/or comments on the Newsletter are heartily solicited. The deadline for acceptance of input material into the subsequent issue is three weeks prior to the distribution date. Please send any comments to the JPO, attention Francesca Cava.

KODIAK LEASE AREA COORDINATOR APPOINTED

Dr. Jawed Hameedi will provide management assistance to OCSEAP Project Office for the Gulf of Alaska and Bering Sea as Lease Area Coordinator for Kodiak and Aleutian areas. As part of his responsibilities, Jawed will coordinate research activities of existing research units, define and update information and research requirements for future research, and provide recommendations and consultation relative to program restructuring decisions when necessary.

Jawed has multidisciplinary academic background and research expertise in oceanography and biology. He has published research papers on plankton physiology and metabolism, the distribution of plankton and benthos, water column primary productivity, statistical assessment of the significance of marine environmental parameters and modeling of marine systems. He is also familiar with OCSEAP objectives and research program to date.

It is hoped that open channels of communication and active dialogue will be established between OCSEAP investigators in the Kodiak and Aleutian areas and the Lease Area Coordinator. This would help us in identification of any operational/research problems, evaluation and redirection of specific program elements and assessment of results against BLM needs. Dr. Hameedi will be located at the Juneau Project Office and can be contacted there by phone or letter.

*****

CLEAN SWEEP SELECTED FOR COOK INLET DUTY*

The Cook Inlet Response Organization (CIRO) of Anchorage, Alaska, has selected Lockheed Missiles & Space Co.'s Clean Sweep type 3100 oil retrieval vessel to handle oil spills in the upper Cook Inlet and Anchorage Harbor.

The type 3100 is a twin-screw, self-propelled, catamaran-hulled vessel 27 feet long with an overall beam of 16 feet. A deckhouse for the two-man crew is located amidships, and the Clean Sweep device is immediately forward on a lifting frame which raises the unit during transit. The oil retrieval device is six-feet long, four-feet diameter, and can recover up to 350 gallons of oil per minute.

Inboard/outboard drives in each catamaran hull are hydraulically powered by an 86-horsepower diesel engine. Maximum speed of the vessel is five-and-one-half knots; operating speed is one-and-one-half knots.

The 10-ton vessel is modularly designed and can be dissassembled and stored on two trucks for easy transport to the site of an oil spill. Assembly can be accomplished by four men in one hour.

The Clean Sweep device retrieves oil by using a drum-like series of discs which rotate into the oil and water. The oil which adheres to the discs is wiped away, collected, and pumped to storage tanks. The process is extremely efficient and recovers approximately 96 percent pure oil.

The sometimes ice-filled waters of Cook Inlet will be overcome by the paddle wheel design that separates chunks of ice from the floating oil.

Members of CIRO are: Mobil Oil Corp., Union Oil of Calif., Kenai Pipeline Co., Atlantic Richfield Co., Standard Oil Co. of Calif., Texaco Inc., Amoco Production Co., Cook Inlet Pipeline Co., Phillips Petroleum Co., and Shell Oil Company.

CIRO's Clean Sweep unit is being leased through Triple C Leasing, San Rapha.

*****

*(reprint from Sea Technology, Feb. 1978)

SHIP	CRUISE PERIOD	PRINCIPAL INVESTIGATOR	WORK AREA	NATURE OF INVESTIGATION	SPECIFIC OPERATIONS	NO. OF STATISTICS
NOAA Ship SURVEYOR	Feb 13-Mar 1	J. Schumacher, R.U. 138 L. Coachman, R.U. 138 M. Reynolds, R.U. 367	Bristol Bay	Phys Ocea/Meteorology	CTD's (BBOP Grid) XBT's Ice Observations Airsonde Releases Mammal Observations	63 12 14 hours 7
NOAA Ship SURVEYOR	Mar 3-Mar 19	J. Schumacher, R.U. 138 S. Hayes, R.U. 138 M. Reynolds, R.U. 367	Lower Cook Inlet Kodiak Island Alaska Peninsula	Phys Ocea/Meteorology	CTD's (WGOA Grid) Drift card Deployments Airsonde Releases Mammal Observations	182 1300 cards/ 13 locations 11
NOAA Ship DISCOVERER	Feb 28-Mar 24	J. Schumacher, R.U. 138 S. Hayes, R.U. 138	Lower Cook Inlet Kodiak Island Alaska Peninsula	Phys Ocea	CTD's (PMEL Grid) Current Meter Array Recoveries	180 20
ACONA	Feb 16-Feb 25	T. Royer	Prince William Sound	Phys Ocea	CTD's	48
UH-1H NOAA N57RF	Feb 18-Mar 1	J. Schumacher, R.U. 141 L. Coachman, R.U. 141 B. Charnell, R.U. 141	Bering Sea	Phys Ocea	CTD's Mammal Observations	19
UH-1H NOAA N56RF	Feb 20-Mar 4	K. Aagaard, R.U. 541/550 D. Drake, R.U. 430 D. Cacchione, R.U. 430	Kotzebue Sound Chukchi Sea	Phys Ocea Suspended Sediments	CTD/HYdrocasts (NCOP Grid)	39
UH-1 H NOAA 57RF	Mar 7-Mar 13	K. Aagaard, R.U. 91	Beaufort Sea	Phys Ocea	Current Meter Array Deployments (Lonley 5 and Lonley 6)	2

1978 Spring Field Accomplishments

The above summarizes the OCSEAP field accomplishments from the spring quarter, February 14-April 1, 1978. This information was obtained from cruise reports, chief scientist reports and ROSCOP II forms.

INTEGRATED BIOLOGICAL STUDIES IN KODIAK LEASE AREA

For the past year and a half we have heard rumors of the Kodiak Food Web Study but little hard evidence could be found. The rumors are true. The study exists and is now in the field. However, it is more than a food web study, as it includes specific projects addressing seasonal aspects of spatial distribution, trophic relations, spawning, and growth of plankton, especially meroplankton, and selected nearshore pelagic and demersal fish, especially forage fish species. Research Units 551, 552 and 553 are principal components of these studies. Besides utilizing data available in the literature and from privious OCSEAP studies, these research units are expected to participate in joint field sampling programs, exchange data and information among each other and with other relevant research units, including R.U. 138 (physical oceanographic processes), R.U. 5 (subtidal benthos distribution and food habits), R.U. 341 (trophic relations of principal bird species), among others. Appropriately these studies are now called Integrated Biological Studies for the Kodiak Lease Area.

The overall objective of these studies is to describe, analyze and verify the ecological community structure and productivity of selected coastal ecosystems with respect to potential impacts of oil and gas development (PDP Task F-9). In realizing this objective, several other subtasks, especially those of Task E, will also be addressed and their objectives accomplished.

Specifically, objectives of individual components of these studies include:

1. *Determine seasonal composition, distribution and relative abundance of major life-stages of selected planktonic taxa including fish eggs and larvae, euphausiids, copepods, and larvae of shrimps and crabs.*

2. *Determine changes in the food and feeding habits of selected species of nearshore subtidal invertebrates, fish, birds and mammals.*

3. *Determine the relationship between seasonal variation in oceanographic conditions and the timeing of occurrence, distribution, and food habits of selected marine organisms.*

4. *Synthesize resulting data and results into a comprehensive description of the biological environment and trophic dynamics over the Kodiak Shelf and on selected areas.*

These studies are expected to continue through FY 80, and possibly beyond. Gradual and progressive shift in emphasis in data collection and analysis is envisaged during the course of these studies. During the first phase, key species and habitats will be identified and a description of food web structure presented. Subsequently, new research units will be engaged to address other relevant aspects of these studies, such as the assessment of non-faunal entities in organic productivity of the Kodiak shelf, evaluation of interdependence of biological-chemical-physical components of the environment and synthesis of data.

Field sampling program for these studies began during the last week of March, 1978. Jean Dunn was the Chief Scientist on NOAA vessel Discoverer which departed Kodiak on March 27th for a plankton/meroplankton survey offshore. Doug Rabin was the Chief Scientist on R/V Commando, chartered from the University of Washington, which also departed Kodiak on March 27th to initiate intensive plankton/meroplankton sampling nearshore and marine bird studies in four bays surrounding Kodiak Island. Jim Blackburn was the Chief Scientist on the chartered vessel Yankee Clipper, which departed on April 3rd to initiate intensive juvenile and forage fish surveys, and study food habits of marine birds and epibenthic invertebrates of commercial importance. These field efforts will continue through summer, with fall and winter cruises planned for later this year.

This overview of the Integrated Biological Studies is by necessity brief. We suggest that persons interested in more detailed information contact the Kodiak Lease Area Coordinator at the Juneau Project Office.

*****

NEW CTD USED THROUGH THE ICE IN BRISTOL BAY

Measurement of salinity and temperature versus depth in ice-covered seas requires an instrument which is easily transportable and as small as possible to fit through small diameter holes in the ice. Such an instrument, of recent design, was used by Jim Schumacher of PMEL and Charles McLean of PMC to conduct a February, 1978 oceanographic survey of Bristol Bay as part of the Bristol Bay Oceanographic Processes study.

The new instrument was designed and built by Ocean Data Equipment division of Data Industries Inc., Providence, Rhode Island; to specifications developed by Charles McLean and George Lapiene, OCSEAP logistics specialist. Dimensions of the self-contained unit are 18 cm diameter by 111 cm long, allowing it to be lowered through a 23 cm hole. The CTD package consists of a sensor assembly mechanically and electrically connected to a second package containing a rechargeable battery and digital (cassette) recorder. The total weight of the under-water unit is 32 kg, and the winch package, with 400 meters of wire, weighs 20 kg. A tape reader, which allows immediate read out of data after recovery and which weighs 16 kg, completes the field equipment. An 8 kg ice auger was used, yielding a full-up equipment load of only 75 kg for the helicopter.

During the February 1978 survey, Jim Schumacher found that Bristol Bay water under the ice is stratified beyond the 50 meter isobath, with warmer, saltier water below and fresher, colder water above a depth of 20 meters. In-shore of the 50 meter isobath, isopycnal conditions were found. These conditions, with a mixing front along the 50 meter bathymetric contour are one of the subjects of OCSEAP's study of general circulation.

Operation of the CTD system, though it was being used for the first time in the field, presented no problems, according to McLean. Calibrations before, during, and after the ten-day trip, which included twelve stations, showed that calibration factors were 0.00°C and 0.99 gm - K^{-1}, respectively. These factors indicate that the system is comparable to shipboard systems in accuracy. The small size and weight of the system resulted in an overall saving estimated from 50% to 70% in helicopter and other transportation costs compared to use of comparable, but heavier and bulkier, CTD equipment.

McLean pointed out the feasibility of obtaining digital CTD data, with "at sea" read out of data in engineering units, from a small boat with the system. He used a 24 foot boat in the Duwamish River (Seattle) during engineering acceptance tests and field trials prior to the Bristol Bay field study. The system, though intended for use through the ice by R.U. 549, is available for use by others in OCSEAP with a specialized need.

*****

NOAA SOR TEAM RESPONDS TO THE AMOCO CADIZ

The Spilled Oil Research (SOR) Team arrived in Brest the 19th of March with standard equipment to measure currents and differential oil/water velocities, obtain surface and subsurface water samples and map the distribution of oil. After an initial reconnaissance and discussion of local conditions, a set of four scientific priorities were established for study at this particular spill. They were as follows:

1. *Obtain data for statistical analysis of the area covered by spilled oil as a function of both time and space (i.e., percent of ocean surface covered by oil).*

2. *Examine the extent to which the oil entered and interacted with the beach substratum and the effects of the successive tidal cycles on the beached oil.*

3. *Obtain measuements of subsurface oil concentrations in the water column.*

4. *Obtain samples of the oil along the coastline and in the immediate vicinity of the source for analysis and estimates of the weathering of oil as a function of time.*

Sampling for hydrocarbon concentrations in subsurface waters was conducted on March 24 and 25 in the Abers-Wrach estuary and immediate offshore area. This estuary lies about 15 km to the east of the wreck site and received extensive amounts of oil. Tidal flats were heavily oiled and oyster aquaculture tanks were filled with mousse which was retained on low tide. Surface mousse moved in and out of the estuary on each tidal cycle. The high wave energy at the shoal area in the estuary mouth forced high concentrations of oil into the water. Apparent concentrations offshore were approximately 100 ppb oil in water. Around the shoals, concentrations rose abruptly to 1-4 ppm, then declined inside the shoals to 500 ppb.

From March 30 to April 4, the French research vessel (LE SUROIT) occupied 46 stations along the coast from Brest to St. Brieuc. Water samples were collected by the French for salinity, temperature, dissolved oxygen, cholorophyll and dissolved hydrocarbon measurements. Zooplankton tows were made for biomass, taxonomy and a few enzymatic parameters. Subsurface, near-surface and near-bottom samples were collected by NOAA personnel for hydrocarbon analysis. Preliminary data indicated that near-surface water under mousse patches may have 30 ppb oil in water with background levels of about 0.8 ppb.

Samples of mousse were collected from March 23-27 near the AMOCO CADIZ and at shore locations from Portsall, near the wreck, to Roscoff, about 100 km away. Mousse collected near the tanker contained 40 to 60% water, while that collected from the onshore locations contained 65-75% water. Samples collected from onshore locations other than Portsall were very difficult to break down.

Long-term biological and chemical studies are planned in the Abers-Wrach estuary, involving French personnel in collaboration with NOAA.

THE LOWER COOK INLET SYNTHESIS MEETING

January 17-19, 1978 Anchorage, Alaska

Attendance and Objectives

The second OCSEAP Lower Cook Inlet Synthesis Meeting was held on January 17-19, 1978 at the Captain Cook Hotel in Anchorage. The seventy-five individuals that attended the meeting included OCSEAP investigators, representatives from the OCSEAP management of NOAA, OCS office of BLM, USGS Conservation Division, NMFS, USEPA, U.S. Coast Guard, and representatives from the oil and gas industry. The principal objectives of the meeting were to summarize and synthesis the most up-to-date information on the environment of Lower Cook Inlet, to discuss the principal problems and identify related problems of the impacts oil and gas exploration and development activities on the environment of Lower Cook Inlet, and to discuss and evaluate feasible approaches to addressing these problems through OCSEAP research.

Meeting Summary

The first day's activities included a presentation by Tom Warren of the OCS office, BLM, of the results of the lease sale in Lower Cook Inlet plus a most probable scenario of oil and gas development in the lease area. This development scenario represented an update of the previous one presented at last year's Synthesis Meeting. An additional short presentation was made by Mike Walker of BLM of the new Intergovernmental Planning Program of the Department of Interior. The remainder of the day was spent in disciplinary group sessions which updated the status of knowledge of hazards, transport, and the ecology of Lower Cook Inlet.

The morning of the second day, presentations were made by representatives of the oil and gas industry. Speakers were Don Lilly, Shell Oil Co., Dwight Goldman, Arco, E.W. Mertens, Chevron, and Hans Matheson, Shell Oil Co. The presentations included a description of the mode of operation and equipment that would probably be used during exploration, development, and production in Lower Cook Inlet, the relative timing of the activities in each phase (as well as those factors affecting timing), factors affecting design of structures, industry's evaluation of environmental impacts of accidental oil spills based on past histories of spills, and a description of equipment and most probable operations involved in oil spill clean up. In addition, a description was given of the function and operation of the Cook Inlet Response Organization, an inter-company coordinating committee established for the development of oil spill clean-up operational plans. Many important points were brought up and discussed; however several of the more pertinent items include:

1. *Based on present industry opinion, the need for major shorebased development is not foreseen; however, this does not preclude the expansion of existing facilities such as at Nikiski.*

2. *If everything went well and if oil was discovered in the middle of 1978, production could begin by 1985.*

3. *Based on experiences in other geographical areas, as well as in Upper Cook Inlet, industry feels that it can design to handle wind, waves, current conditions and ice loads in Lower Cook Inlet. Industry also feels that it has enough information to design for earthquakes in Lower Cook Inlet. This feeling is partly based on attenuation and acceleration equations developed by the Japanese who have conducted a comprehensive monitoring of a subduction zone offshore of Japan.*

The last half of the second day, including evening sessions, was devoted to interdisciplinary discussions of information requirements, most probable problems and research approaches to address problems related to accidental oil spills, environmental sensitivity to oil transport and environmental sensitivity of nearshore areas to OCS related activities.

The results of this meeting will be published about the middle of the year and will include a synthesis of all disciplinary information, BLM presentations, industry presentations and the findings of the interdisciplinary group sessions.

*****

BERING SEA-GULF OF ALASKA GEOLOGICAL STUDIES REVIEW MEETING

January 31-February 3, 1978, Menlo Park, California

Attendence and Objectives

A long overdue gathering of geological investigators and others involved or interested in the OCSEAP subarctic geological program took place for four days in late January and early February of this year in Menlo Park. The meeting was hosted by Dave Scholl (Chief, USGS Pacific-Arctic Branch) and chaired by Rod Combellick (NOAA/OCSEAP Juneau Project Office). Approximately 70 people attended, including principal investigators, management personnel from NOAA, BLM, and USGS, outside reviewers, and representatives from the petroleum industry, USGS Conservation Division and the State of Alaska. There were three objectives:

1. *To provide input for an evaluation of the program's effectiveness in satisfying geological information needs relative to the OCS leasing process.*

2. *To identify information gaps and research needs as inputs to future program planning.*

3. *To provide a forum for information exchange and cooperative planning.*

Meeting Summary

After introductory comments and a program overview by the OCSEAP director (Rudy Engelmann), presentations were made by the Bureau of Land Management, (Joe Dygas) and the Conservation Division (John Whitney and Gerry Shearer) summarizing the leasing management and regulatory process. These presentations focused on defining geological information needs during each stage of the leasing process, data sources, and uses of OCSEAP-derived information. Most of the following two and a half days of the meeting were spent in P.I. presentations for individual research units. A total of 14 projects were presented, divided equally between the Gulf of Alaska and Bering Sea areas. Principal investigators were asked to prepare a short written summary of their project; these are presented in Appendix 1 of this newsletter.

One of the most important aspects of the meeting was the exchange of ideas during discussions that followed each presentation and at the end of the meeting, when the subject of future program directions was addressed. Although no concrete resolutions or decisions were made, it is certain that both management personnel and principal investigators left the meeting with new ideas and viewpoints that will be used in future planning.

Valuable contributions to these discussions were made by representatives from the Alaska Oil and Gas Association (AOGA). They expressed the opinion that OCSEAP is performing an important function, from their standpoint, and that much valuable geological data is being produced that cannot be duplicated by industry efforts. Industry's primary concern is the possibility that government decision makers might establish extreme environmental design criteria or restrictions based on uncertainty, insufficient data, and an inadequate knowledge of industry's capabilities to cope with certain natural hazards. Large earthquakes and ice were cited as the most serious hazards to their activities in Alaskan OCS areas, and as the two for which OCSEAP could provide the most useful information. The AOGA representatives expressed an interest in engaging in cooperative hazards research programs, including the possible release of industry data that up until now has been considered proprietary.

On Friday, the last day of the meeting, Dave Scholl conducted tours of the USGS research vessels SEA SOUNDER and S.P. LEE for interested meeting participants.

Outside Review

A review panel was assembled consisting of four outside marine geologists in hopes of providing an independent assessment of the geology program's effectiveness and to provide recommendations for improvement. This review took two approaches: 1) A general critique of the overall geological studies program, and 2) a critique of individual research projects. Comments on the overall program addressed coverage of information needs, research priorities, timing of studies relative to the leasing process, choice of investigators, and recommendations for changes. Individual projects were critiqued on the basis of scientific quality, applicability of work to information needs, funding level, and future changes.

After all the review comments have been received and evaluated, OCSEAP plans to send copies of appropriate comments to principal investigators and administrators. Program management is now considering ways to implement the major recommendations resulting from the meeting. These recommendations include:

1. *Improvement of the calibration and reliability of the existing seismic networks plus expansion of the earthquake studies to provide better information on the activity of offshore faults and on ground accelerations associated with major earthquakes.*

2. *Addition of seafloor geotechnical studies to improve our understanding of sediment properties and processes in areas identified as potentially unstable.*

3. *A requirement that all P.I.'s conducting offshore geo-hazard surveys synthesize their reconnaissance mapping to special process studies. The purpose of this would be to provide leasing management and regulatory bodies with a concise, preliminary product on which early decisions could be made relative to potential seafloor hazards.*

4. *Addition of more geological input to the OCSEAP management system.*

*****

MESA WORKSHOP
March 7-9, 1978, Anchorage, Alaska

Attendance and Objectives

On March 7-9, 1978 a Marine Ecosystems Analysis (MESA) Workshop on Prince William Sound was convened in Anchorage by the Alaska Sea Grant Program, University of Alaska. MESA, a part of the National Oceanic and Atmospheric Administration's Environmental Research Laboratory, sponsored the workshop to discuss resource development, uses and use conflicts in the Prince William Sound region. The results of the meeting are to be used to determine needs for environmental research in the region.

Meeting Summary

The workshop began with introductory remarks on the MESA program. These were followed by a series of summary presentations on the PWS region's fishery, marine plant, marine mammal, marine bird, forest product, water and mineral resources. The meeting then divided into working groups to discuss the following topics: renewable resources, non-renewable resources, recreation, urbanization and transportation. Each group was directed to address the following questions:

1. *What is the present and future development of industry and resources in the Prince William Sound region?*

2. *What are the significant marine environmental concerns?*

3. *What is the relative order of importance of these concerns?*

4. *What are the major resource use conflicts?*

5. *What sort of environmental information is required to deal with the concerns?*

The wrapup session consisted of presentations of the results of the working group sessions.

The proceedings of the workshop are to be made available. For information, contact the Alaska Sea Grant Program, University of Alaska, Fairbanks, Alaska 99701. (Telephone 907-479-7086).

*****

SELECTED P.I. ANNUAL REPORT HIGHLIGHTS

The following exerpts were taken as highlights from all the 1978 P.I. Annual Reports received by the JPO prior to April 14, 1978. These reports will be completely reproduced and distributed by the Boulder Program Office in the volumes of OCSEAP Principal Investigator Annual Report.

BIRDS

COMMUNITY STRUCTURE DISTRIBUTION AND INTERRELATIONSHIPS OF MARINE BIRDS IN THE GULF OF ALASKA

Initial applications of computer simulation modeling of avian energetics to Alaskan OCS marine bird systems are as follows:

Total energy flow through pelagic bird populations in the Gulf of Alaska was greatest in the Kodiak area during August-September (24,300 kcal km^{-2} day^{-1}), but varied both between areas and with season, primarily as a consequence of movements of species populations associated with reproductive status. Shearwaters were usually the dominant species, energetically, in these systems, accounting for up to 92% of the total community energy demand. In the Pribilof Islands, total community energy demand was concentrated in the area about St. George, largely as a result of the major contribution of murres to community energetics. There, also, energy demands vared both with season and year, and different species populations exhibited different spatial patterns of energy demands in relation to distances from islands and depth of water, especially in relation to the continental shelf break. The area about St. George is obviously quite important in terms of overall avian energy demands, and some other foci of apparent feeding concentration may also be critical. Activities related to petroleum development in these areas may be especially hazardous to bird populations. (R.U. 108, Wiens)

FEEDING ECOLOGY AND TROPHIC RELATIONSHIPS OF ALASKAN MARINE BIRDS

Site specific studies of marine birds were conducted at eight locations in the Gulf of Alaska and Southern Bering Sea during the 1977 field season. The locations contained diverse habitat and species assemblages which were believed to be the most representative of other colony locations in the Northern Gulf and Southern Bering Sea. Studies at six locations focused on traditional seabirds while two studies focused primarily on shorebirds or shorebirds and waterfowl.

Species best represented on the study areas included murres, Tufted and Horned Puffins, Black-legged Kittiwakes, Glaucous-winged Gulls and Pelagic Cormorants. Other species such as the Northern Fulmar and some small alcids were represented on only one study area. The present report provides a brief synopsis of the results of seabird colony studies conducted during the summer field season of 1977. More detailed discussion of specific colony studies, as well as ecological and trophic relationships, beached bird surveys and the colony catalog, is contained in the eleven appended reports. (R.U. 341, Lensink, et al.)

CHEMISTRY

DISTRIBUTION COMPOSITION AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN THE GULF OF ALASKA AND SOUTHEASTERN BERING SHELF

The most significant conclusions of the suspended matter program in Lower Cook Inlet are listed below.

1. The suspended matter distributions appear to follow the general pattern of circulation in Lower Cook Inlet and Shelikof Strait.

2. Chemical analysis of the suspended material from Lower Cook Inlet reveals that aluminosilicate minerals from the coastal rivers comprise about 80–95% of the suspended matter, with biogenic material making up the rest.

3. Comparisons of regional average concentrations of major and trace elements in the particulate matter indicate regional differences which can be related to differences in the average composition of source material and the relative amounts of biogenic and terrigenous components.

4. Controlled laboratory studies of the interactions between Cook Inlet crude oil and suspended matter from Cook Inlet show that the accommodation capacity of suspended matter for crude oil increases with the concentration of added oil. (R.U. 152 Feely, Cline and Massoth).

HYDROCARBONS NATURAL DISTRIBUTION AND DYNAMICS ON THE ALASKAN OUTER CONTINENTAL SHELF

A striking finding is the observation that sediments from Beaufort Sea and from Cook Inlet contain suites of aromatic hydrocarbons. The data indicate that the sources of these hydrocarbons are multiple and complex. It appears that anthropogenic pyrolysis may be a contributing source. This is the first hint that the Alaskan marine environment may not be generally pristine.

A preliminary statistical treatment of multiple determinations of hydrocarbons in sediment is reported. Although this treatment is not complete, important conclusions can be reached about the relationship of present analytical variability to natural environmental variability. A smaller study of the variability of hydrocarbon determination in biota is also reported.

A detailed report on the study of the interaction of hydrocarbons with suspended sediments of Southcentral Alaska is presented. Data show that this is not an efficient process for the transport of hydrocarbons under the conditions investigated. (R.U. 275, Shaw, et.al.)

EFFECTS

LETHAL AND SUBLETHAL EFFECTS ON SELECTED ALASKAN MARINE SPECIES AFTER ACUTE AND LONG-TERM EXPOSURE TO OIL AND OIL COMPONENTS

The toxicity of water-soluble fractions of Prudhoe Bay crude oil and Cook Inlet crude oil to a variety of marine fish and crustaceans was compared using flow-through and static bioassays. For "sensitive" species such as pink salmon, the toxicity did not vary significantly with the type of exposure. However, species identified as being "tolerant" due to their ability to withstand static exposure, such as the shore crab, *Hemigrapsus*, were much more sensitive when exposed in a flow-through system. Thus, some animals will be protected from short-term exposure to water-soluble fractions of oil and have high survival rates if concentrations decline within 24 to 48 hours. If concentrations continue to be relatively high, all animals will be vulnerable. Larvae were shown to be generally more sensitive than adults, and molting larvae were the most sensitive species tested. Coonstripe shrimp larvae molting from stage I to stage II were killed by ppb levels of water-soluble fractions. (R.U. 72, Kauneir, Rice and Korn)

SUBLETHAL EFFECTS AS REFLECTED BY MORPHOLOGICAL CHEMICAL PHYSIOLOGICAL AND BEHAVIORAL INDICES

Coho salmon exposed to sublethal (ppb) levels of petroleum hydrocarbons were found to accumulate much lower levels in their tissues, and to depurate these much more rapidly than bottomfish such as starry flounder. Salmon may thus be less susceptible to oil pollution than flounder. Environmental temperature did not influence accumulation and depuration of hydrocarbons in adult salmon and fry (R.U. 72 and 73). Both salmon and flounder were found to have significant capacities for metabolizing hydrocarbons, as demonstrated by the presence of a spectrum of metabolites in the tissues and detectable levels of the hydrocarbon metabolizing enzyme, aryl hydrocarbon monooxygenase.

Starry flounder exposed to petroleum-impacted sediments for up to four months developed pathological abnormalities such as hepatocellular lipid vacuolization; however, this was reversible upon removal of the impacted sediment. Salmon exposed to diesel oil were found to have cloudy, hydrated lenses. a condition which may prove useful for monitoring petroleum pollution in the environment. Salmon were also deterred from migrating up their home stream when the concentration of a model mixture of petroleum hydrocarbons in the water was greater than 0.7ppm. (R.U. 73, Weber, Malins McCain, Hawkes, Varanasi, et al.)

INFLUENCE OF PETROLEUM ON EGG FORMATION AND EMBRYONIC DEVELOPMENT IN SEABIRDS

Ingestion of relatively high doses of bunker C oil (300-600 mg) did not affect reproduction in a small alcid, the Cassin's auklet. Egg production, hatching success and fledging success were comparable in dosed and control birds. Experiments are being continued in 78 to determine whether feeding at the time of oil ingestion will lengthen its retention time, thus increasing the possibiltiy of oil effects on reproduction.

Species responded to ingested oil differently: Auklets defecated; gulls regurgitated, and common murres both defecated and regurgitated. (R.U. 423, Ainley, Grau, Roudybush and Morrell)

ACCUMULATION OF ORGANIC CONSTITUENTS AND HEAVY METALS FROM PETROLEUM-IMPACTED SEDIMENTS BY MARINE DETRITIVORES

Long-term (40 day) exposures to petroleum-impacted sediments showed that mode of feeding may be a determinate factor in the availability of sediment-sorbed by hydrocarbons to benthic organisms. Two deposit feeders, *Phascolosoma agassizii* and *Macoma inquinata*, accumulated detectable levels of hydrocarbons, whereas a filter-feeder, *Protothaca staminea*, did not. Measurements of the physiological state of *Macoma* demonstrated that hydrocarbon exposure is "stressful" to the animal. Growth ("condition index") is reduced slightly and free amino acid content is altered.

Uptake of hydrocarbons into detritivores in all likelihood occurs via uptake from interstitial water, rather than the sediment itself. No tissure magnification above sediment levels was observed. Moreover, petroleum did not alter the availability of trace metals in sediments to detritivores. (R.U. 454, Anderson, et al.)

FISH/PLANKTON/BENTHOS

THE DISTRIBUTION ABUNDANCE DIVERSITY AND PRODUCTIVITY OF BENTHIC ORGANISMS IN THE BERING SEA (AND GULF OF ALASKA)

A [preliminary] Kodiak Island food web has been developed. The major food items in the web were polychaetes, gastropods (snails), pelecypods (clams), amphipods, hermit crabs, true crabs, and shrimps. Snow and king crabs fed heavily on benthic animals that, in turn, relied in whole or in part on sediment-associated organic material, detritus, bacteria, and benthic deatoms for food. The invertebrates in two Kodiak bays relied on a variety of feeding methods while fishes tended to be predators. The principal food groups used by the Pacific cod, *Gadus macrocephalus*, at all sites in the Northeast Gulf of Alaska and the Kodiak shelf were molluscs, crustaceans and fishes. There were some small quantities (less than 10% of the total occurrence) of annelids, euphausiids and mysids, isopods and echinoderms taken by cod. The frequency of occurrence of snow crab, *Chionoecetes bairdi*, as food for cod for 1973-75 on the Kodiak Shelf was 40, 36, and 36 percent, respectively. A [preliminary] food web, inclusive of major epifaunal species, is also available for Cook Inlet. (R.U. 5/281/303, Feder, et al.)

ECOSYSTEM DYNAMICS - BIRDS AND MARINE MAMMALS

The factors and processes controlling the abundance of pelagic fish in the eastern Bering Sea were studied quantitatively with the dynamic numerical marine ecosystem model (DYNUMES III). This model permits a relative assessment of the total ecosystem and allows, among others a detailed quantitative computation of ecosystem internal consumption, which has been the greatest unknown quantity in estimating conventional natural mortality coefficients. Some of the more important results of this model are listed below:

1. The "Equilibrium biomass" (E.B.) of the herring in the eastern Bering Sea is 2.7 million tons, which compares favorably with Shaboneev's (1965) evaluation of 2.2 million tons.

2. The annual turnover rate of herring is 0.5 and of other pelagic fish, 0.95. The magnitude of the annual biomass fluctuation in herring decreases with decreasing biomass.

3. Some "herring equivalences" are given which show that grazing by marine mammals, interspecies interactions (e.g., consumption by squid), and winter time water temperature anomalies have greater effects on herring biomass fluctuation than a modest fishery. (R.U. 77, Favorite)

BASELINE CHARACTERIZATION LITTORAL BIOTA GULF OF ALASKA AND BERING SEA

The following comprise early and tentative results:

1. Frequent and widespread physical disturbance from boulder movement and ice scouring at Ocean Cape and Cape Yakataga offset the tendency for increased species richness in exposed localities.

2. Total species richness tends to be greater in patches of intertidal area dominated by *Mytilus* than in patches dominated by *Fucus* in the eastern Gulf of Alaska.

3. Small species tend to be greater in number and show a greater eveness in the distribution of individuals among species in *Mytilus*-vs *Fucus*-dominated areas.

4. *Mytilus* as a dominant competitor for space does not appear to have a greater adverse effect on associated larger subdominants through competition for primary space than does *Fucus*.

5. The success of multispectral scanning (MSS) imagery for mapping the distribution of intertidal macrophytes requires the simultaneous collection of MSS and "ground truth" data/ (R.U. 78/79, O'Clair, et al.)

INCIDENCE OF PATHOLOGY IN THE GULF OF ALASKA, BERING AND BEAUFORT SEA

Three of the four major pathological conditions involving six species of fish were tumors with a possibly common etiology. The three types of tumors--epidermal papillomas of pleuronectids, pseudobranchial tumors of gadids, and epithelioid tumors of *Sebastes* sp.--all contained morphologically identical, tumor-specific cells known as X-cells. The origin of X-cells is not known, although they could be virally or chemically transformed host cells, or single-cell parasites.

For reasons not yet understood, all but one of the pathological conditions occurred most often and in highest frequencies in the northwestern Gulf of Alaska, east and northeast of Kodiak Island. The one exception, epithelioid tumors of *Sabastes* sp., was geographically distributed along the northeastern and eastern periphery of the Gulf of Alaska.

Thus, the Gulf of Alaska contains at least four demersal fish diseases which are endemic in certain areas. The overall prevalence of the conditions was relatively low, ranging from 0.2 to 2.5%, although some sampling stations had epizootic levels of disease frequency ranging from 14.3 to 50% for five of the six fish species affected. (R.U. 332, McCain, et al.)

PLANKTON OF THE GULF OF ALASKA - ICHTHYOPLANKTON

The following conclusions were presented:

1. Early life history stages of many economically important fish and shellfish populations occur in the Lower Cook Inlet region.

2. The temporal and spatial variability of density distributions is large and complex because spawning is both seasonal and localized.

3. The time series sampling has been too diffuse to sample all life history stages of the several species to date, but FY 78 focuses on intensified spatial and temporal sampling schemes.

4. Kachemak Bay, primarily, and Kamishak Bay, secondarily, are locations of spawning aggregations of fishes and shellfish. (R.U. 424, English)

PLANKTON OF THE GULF OF ALASKA

The first of five observational periods was recently completed (March 24-26) to determine environmental conditions and phytoplankton population size in Lower Cook Inlet shortly before the spring plankton bloom. Although no major conclusions are available, in late March, chlorophyll concentrations were low, indicating that the spring bloom was not in progress, and water characteristics reflected the general patterns of circulation documented elsewhere. (R.U. 425, Larrance)

ZOOPLANKTON AND MICRONEKTON IN THE BERING-CHUKCHI/BEAUFORT SEAS

The animal plankton and micronekton communities of the southeastern Bering Sea are similar in their composition and relative dominance structure to assemblages reported for the North Pacific, the Northern Gulf of Alaska and the Northwestern Pacific Ocean.

The distribution of taxa within and between specific bathymetric regimes is related to the physical structure of the shelf water masses and the biology of the major species. Evidence is presented that suggests water shallower than about 80 m is isolated biologically from the rest of the shelf environment.

Seasonality in the plankton community is associated with ontogenetic migration and responses to the annual production of organic matter. Interzonal copepods, with the exception of *Calamus plumchrus*, leave the shelf in the fall and reappear in late winter and early spring.

The notion of "critical habitat" or "critical season" seems to apply most clearly to members of the temporary plankton community i.e., commercial species. Walleye pollock, *Theragra chalcogramma*, survives its planktonic early life history during a narrow time window in the spring in waters of the open ocean and outer self. In respect to this species the area and timing are critical. (R.U. 426, Cooney)

PLANKTON STUDIES-BERING SEA

Studies of primary productivity related to the edge of the seasonal ice pack in the Bering Sea enable us to draw the following tenative conclusions:

1. The major effects of the ice field appear to be in limiting light energy to the water column and reducing windmixing at the surface. This means that water column plant production is probably negigible until the pack begins to break up. While loose ice is present at the sea surface (in the retreating edge zone) it tends to stabilize the wind mixed layer and hence, greatly inhances the opportunity for rapid plant production. With reduced mixing, ample light, and nutrients, an exceedingly intense bloom of short duration often occurs. This band of production follows the ice northward in the late spring.

2. The very cold ice-related water tends to sink away from the surface as warming progresses. We present evidence that algal populations also sink with the water mass. The ramifications of oil contamination are obvious, particularly since a surface spill could become incorporated and carried to depth with the sinking algal cells to enter benthic food webs on the sea bed.

A bibliography of over 1500 references was also completed. References on the following subjects were included: Uptake of organic and inorganic nutrients by primary producers, primary production, trophic interactions, distribution, and population dynamics of marine mammals and sea birds; trophic interactions, population dynamics, and distribution of benthic invertebrates and fishes; the taxonomy and ecology of parasites of invertebrates and vertebrates; microbial decomposition of marine organic matter. (R.U. 427, Alexander, Cooney)

SEASONAL COMPOSITION AND FOOD WEB RELATIONSHIP OF MARINE ORGANISMS IN THE NEARSHORE ZONE

Ichthyoplankton samples were collected from October 30-November 15, 1977. To date, 206 samples of fish eggs and larvae have been processed. The 206 samples contained 6,059 fish larvae, of which 59% came from the Neuston samples. Only 157 fish eggs were captured. Cottids of the genus *Hemilepidotus* accounted for 70%, by number, of the fish larvae captured followed by hexagrammids *Pleurogrammos monopterygius*, 13%; and *Hexagrammos* spp., 12%. Of the fish eggs captured, most were *Leuroglossus schmidti*, a bathylagid smelt. (R.U. 551, Dunn and Favorite)

GEOLOGY

Significant results of the past year's efforts in OCSEAP subarctic geological projects are summarized in reports prepared by the principal invesigators for the geology review meeting. These are included in Appendix 1 of this newsletter.

MORBIDITY AND MORTALITY OF MARINE MAMMALS

Predation and parasitism seem to be the principal causes of natural illness and death in marine mammals, followed closely by malnutrition. Investigations have centered on necropsy of samples drawn from the living populations in the eastern Bering Sea and Gulf of Alaska. In the 96 collected specimens examined, the most frequently occurring gross pathological conditions were: 1) hepatitis, probably of helminthic origin, 2) pneumonitis, also principally caused by helminths, 3) dermatitis, of fungal, bacterial, and possible viral origin, 4) wounds, from various causes, and 5) gastric ulcers caused by parasitic invasions. Serological analysis indicated frequent exposure of Steller sea lions to leptospirosis and sea lion vesicular disease. Parasites and microbiological infections seem often to be sufficiently debilitating to predispose these animals to predation, which may account in part for the apparent predominance of predation as a cause of mortality. The drift of carcasses from known sources in the northern Bering Sea-Bering Strait region suggests that the rate of drift is very slow (about 5 km/day) and that the larger carcasses may drift for up to two months and for distances of at least 300 km. (R.U. 194, Fay)

BIOLOGY OF THE HARBOR SEAL, PHOCA VITULINA RICHARDI, IN THE GULF OF ALASKA

A total of 254 animals, of various age and sex groups have been collected to date around Kodiak Island, the outer Kenai coast, and the northeastern Gulf of Alaska. From analysis of these specimens, it appears that most females attain productive maturity during their fifth and sixth years. The pregnancy rate for mature females collected exceeded 90 percent. Growth of a harbor seal (both weight and length) appears to be completed by the age of 10 years and possibly as early as age 7 years. Comparison of blubber thickness (as an index to physical condition) of adult females collected in the various areas in the spring and winter, indicates that a considerable year to year variation in thickness does occur.

In the Kodiak area, octopus was found to be the dominant prey item being utilized by the harbor seal. Along the outer Kenai coast, pollock and herring were the dominant prey. In the northeastern gulf of Alaska, pollock and two species of Osmerid smelts were the major prey. (R.U. 229, Pitcher)

MICROBIOLOGY

ASSESSMENT OF POTENTIAL INTERACTIONS OF MICROORGANISMS AND POLLUTANTS RESULTING FROM PETROLEUM DEVELOPMENT ON THE OUTER CONTINENTAL SHELF IN THE BEAUFORT SEA (AND LOWER COOK INLET)

BASELINE STUDY OF MICROBIAL ACTIVITY IN THE BEAUFORT SEA AND GULF OF ALASKA AND ANALYSIS OF CRUDE OIL DEGRADATION BY PSYCHROPHILIC MICRO-ORGANISMS

One of the most important findings, resulting from integration of the results of several OCSEAP investigators, was that surface oil spills in Cook Inlet could lead to incorporation of crude oil into the sediments of Cook Inlet and Shelikof Strait. Studies have shown that crude oil can be absorbed onto suspended matter found in the waters of Upper Cook Inlet (R.U. 152 and 153), probably due to the presence of bacteria on these particles (R.U. 190). It has been reported that surface water circulation patterns have indicated that the net flow of water is along the western edge of the inlet and down Shelikof Strait. Suspended matter settles out of the water column in lower Kamishak Bay and Shelikof Strait R.U. 152 and 190). Thus, there is a strong possibility that crude oil spilled on the surface in upper Cook Inlet will be carried along with suspended particles and deposited in the sediments of Kamishak Bay and Shelikof Strait.

Taxonomic studies showed that numbers of hydrocarbon utilizing bacteria increase in the presence of petroleum. High numbers of hydrocarbon utilizers in certain areas of Cook Inlet, including Kachemak Bay, Kennedy Entrance and upper Cook Inlet, are thus indicative of previous hydrocarbon exposure (R.U. 29).

Sediments east of Prudhoe Bay also showed high oil biodegradation potentials, suggesting prior exposure to natural or polluting hydrocarbons (R.U. 190). Experiments with pure hydrocarbons showed that isolated microorganisms are much more capable of degrading unsubstituted paraffins and simple aromatics than paraffins and polynuclear aromatics. (R.U. 29, Atlas, R.U. 190, Morita and Griffiths)

PHYSICAL OCEANOGRAPHY/METEOROLOGY

LAGRANGIAN SURFACE CURRENT MEASUREMENTS FOR OCSEAP-ALASKA

The generally successful operation of 1976 was if anything improved upon in 1977. Six buoys were deployed in two lines across the continental slope of the St. George Basin. All six of these buoys functioned well, exhibiting a generally similar behavior, extensive eddy motion with only very weak net displacements.

The principle conclusion emerging from the past year's results are: the perception that surface materials deposited in the northern Gulf of Alaska, or possibly in a sizable part of the North Pacific Ocean tend to be trapped and ground on northern Gulf beaches, and that circulation in the southeast Bering Sea is exceedingly variable, quite unlike the Gulf of Alaska. Preliminary results indicate that steady state circulation modelling may be of extremely limited utility in the southeast Bering Sea. (R.U. 217, Hansen)

MESOSCALE CURRENTS AND WATER MASSES IN THE GULF OF ALASKA

The most important result of the past years work is that the coastal currents in the northern Gulf of Alaska respond seasonally to precipitation and wind stress. The precipitation affects the currents through the input of fresh (low density) water at the coastline. This high rate of inflow at the coastline is due to a cross-shelf precipitation gradient (decreasing offshore), and coastal runoff.

The precipitaiton effect, and possibly the wind stress are larger scale phenomenon than were previously assumed. For example, flow into or out of Prince William Sound depends not only on the oceanographic and meteorological conditions within the sound, but on the meteorological conditions in the Copper River Valley which control the river flow and precipitation along the southeast and British Columbia coasts. Therefore, the oceanographic conditions in the northeastern Gulf of Alaska area are responding to larger scale forcing. (R.U. 289, Royer)

MODELING OF TIDES AND CIRCULATIONS OF THE BERING SEA

Substantial improvement has been made in both the computational scheme and the graphical system for the Bristol Bay and Norton Sound model of tides and circulation in the Bering Sea. These improvements have the advantage that they consider the intensity and transport of the sub-grid scale (turbulent) energy in a system. The vertical exchange computation is computed from the local turbulent energy intensities, thus removing the most critical stability conditions associated with the computational scheme. In the horizontal direction, the diffusion co-efficient contains two parts. The first part represents the local sub-grid scale horizontal mixing which cannot be resolved by the computational grid as advective terms. This part is estimated considering the characteristic length scale. The second part is calculated as a function of the deformation of the local velocity field. With the new scheme, requirements for field defusion experiments are minimized.

The calculation of sub-grid scale turbulent energy in the model may be a mechanisim by which the model is able to reproduce the prototype data which show complete mixing above and below a sharp pyconocline, but apparently suppressed mixing across the pycnocline. This effect occurs along a well defined front on the shelf.

Another major improvement in the computation is the new scheme that gives an accurate account of the arbitrary bathymetry at each spatial grid location, thus allowing for more precise computation of wave propagation in the model. (R.U. 435, Leendertse)

*****

INDEX OF OCSEAP FINAL REPORTS AND RELATED PUBLICATIONS

The following is a partial list of P.I. Final Reports and OCSEAP-related publications received by the Juneau Project Office. The Final Reports have been identified by three asterisks (***) to the left of the title. These reports have or will be published and distributed in the volumes of OCSEAP Principal Investigator Reports available from the Boulder Program Office. For further information on the availability of these reports, send enquiries to Marion Cord, OCSEAP Writer-Editor, Environmental Research Laboratories, 325 Broadway, Boulder, Colorado 80302. Requests for copies of any publications should be directed to the author. All investigator's addresses are available from the JPO. An updated list of these addresses will be included in the next issue of the Newsletter.

R.U. Chemistry/Microbiology

043 H. Hertz, 1976
Trace Hydrocarbon Analysis - NBS Technical Note 889

047 L. Barnes, 1977
*** Research and Evaluation of Trace Element Methodology for the Analysis of Water and Sediments

162 D. Burrell, D. Shaw, H. Feder, 1976
Special Data Submission - Lower Cook Inlet OCS (report submitted with R.U. 275 and 281).

D. Burrell, 1975
Environmental Assessment of the Northeastern Gulf of Alaska:
*** Chemical Oceanography (Trace Metals)

275 D. Shaw, 1976
Natural Distribution and Dynamics of the Alaskan Outer Continental-Shelf - A Special OCSEAP Data Report

275 D. Shaw, 1974
FY 1974 Data For Environmental Assessment of the Northern Gulf of Alaska: Chemical Oceanography (Hydrocarbons) - Special OCSEAP Data Report

Effects of Contaminants

062 A. Devries, 1977
*** The Physiological Effects of Acute and Chronic Exposure to Hydrocarbons on Near-Shore Fishes of the Bering Sea

071 G. Kooyman, R. Gentry, W. McAlister, 1976
*** Physiological Impact of Oil on Pinnipeds

075 D. Malins, 1976
*** Assessment of Available Literature of Oil Pollution on Biota in Arctic and Sub-Arctic Waters

R.U.

123 R. Smith, J. Cameron, 1977
*** Acute Effects - Pacific Herring Roe in the Gulf of Alaska

183 R. Caldwell, 1976
Effects of a Seawater-Soluable Fraction of Alaskan Crude Oil and Its Major Aromatic Components on Larval Stages of the Dungeness Crab - Oregon State University Technical Paper 4377.

305 P. McRoy, S. Williams, 1977
*** Sublethal Effects on Seagrass Photosynthesis

Fish/Plankton

005 S. Jewett, H. Feder, 1976
*** Distribution and Abundance of Some Epibenthic Invertebrates of the Northeast Gulf of Alaska with Notes on Feeding Biology

019 I. Warner, P. Shafford, 1977
*** Forage Fish Spawning Surveys - Southern Bering Sea

024 R. Kaiser, D. Konigsberg, 1977
*** Razor Clam (*Siliqua patula, Dixon*) Distribution and Population Assessment Study

027 D. Lees, R. Rosenthal, 1977
*** An Ecological Assessment of the Littoral Zone Along the Outer Coast of the Kenai Peninsula for State of Alaska Department of Fish and Game

058 G. Anderson, R. Lam, B. Booth, J. Glass, 1977
*** A Description and Numerical Analysis of the Factors Affecting the Process of Production in the Gulf of Alaska

064 J. Wall, P. Macy, 1976
*** An Annotated Bibliography on Non-Salmonid Pelagic Fishes of the Gulf of Alaska and Eastern Bering Sea

077 T. Laevastu, J. Dunn, F. Favorite, 1976
Consumption of Copepods and Euphausids in the Eastern Bering Sea As Revealed by a Numerical Ecosystem Model- Northwest and Alaska Center Processed Report

T. Laevastu, F. Favorite, 1976
Evaluation of Standing Stocks of Marine Resources in the Eastern Bering Sea - Northwest and Alaska Fisheries Center Processed Report

T. Laevastu, F. Favorite, 1977
Preliminary Report on Dynamical Numerical Marine Ecosystem Model (Dynumes II) For Eastern Bering Sea - Northwest and Alaska Fisheries Center Processed Report

T. Laevastu, F. Favorite, 1978
The Control of Pelagic Fishery Resources in the Eastern Bering Sea (A numeri-ecosystem study of factors affecting fluctuations of pelagic fishery resources with emphasis on herring) - Northwest and Alaska Fisheries Center Processed Report

R.U.

078 S. Zimmerman, T. Merrell, 1976
*** Baseline Characterization, Littoral Biota, Gulf of Alaska and Bering Sea

R. Rosenthal, D. Lees, T. Rosenthal, 1977
*** Ecological Assessment of Sublittoral Plant Communities in the Northern Gulf of Alaska

H. Sears, S. Zimmerman, 1977
*** Alaska Intertidal Survey Atlas

174 L. Ronholt, H. Shippen, 1978
*** Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass, 1948-1976 (4 volumes)

175 W. Pereyra, J. Reeves, R. Bakkala, 1976
*** Demersal Fish and Shellfish Resources of the Eastern Bering Sea in the Baseline Year 1975

R. Wolotira Jr., T. Sample, M. Morin Jr., 1977
*** Baseline Studies of Fish and Shellfish Resources of Norton Sound and the Southeastern Chukchi Sea

282 H. Feder, 1977
*** Summarization of Existing Literature and Unpublished Data on the Distribution, Abundance, and Productivity of Benthic Organisms of the Gulf of Alaska and Bering and Chukchi Seas, Bibliography of Northern Marine Waters with Emphasis on Benthic Organisms (indexed by Author and Title Keywords)

284 R. Smith, A. Paulson, J. Rose, 1978
*** Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea

285 J. Morrow, 1977
318 Illustrated Keys to Otoliths of Forage Fishes of the Gulf of Alaska, Bering
*** Sea and Beaufort Sea

332 C. Alpers, B. McCain, M. Myers, S. Wellings, 1977
Lymphocystis Disease in Yellowfin Sole (*Limanda aspera*) in the Bering Sea

C. Alpers, B. McCain, M. Myers, S. Wellings, 1977
Pathology of Pharyngeal Tumors in Pacific Cod, *Gadus macrocephalus*, of the Bering Sea - Fish. Bull., In press.

B. McCain, S. Wellings, C. Alpers, M. Meyers, W. Gronlund, 1977a
The Frequency, Distribution, and Pathology of Three Diseases of Demersal Fishes in the Bering Sea - Fish. Bull., In press.

B. McCain, M. Myers, W. Gronlund, S. Wellings, 1977b
Baseline Data on Diseases of Fishes from the Bering Sea for 1976 - U.S. Natl. Mar. Fish. Service, NWAFC, Seattle, WA Submitted to Fish. Bull.

G. McArn, B. McCain, S. Wellings, 1978
Skin Lesions and Associated Virus in Pacific Cod (*Gadus macrocephalus*) in the Bering Sea - Fed. Am. Soc. Exp. Biol. (Abstr., In press).

R.U.

332 B. McCain, 1978
The Effects of Alaskan Crude Oil on Flatfish, and the Prevalence of Fish Pathology in Alaskan Marine Waters. In: Sublethal Effects of Petroleum Hydrocarbons and Trace Metals Including Biotransformations, as Reflected by Morphological, Physiological, Pathological and Behavioral Indices - NOAA Tech. Memo. (in press)

B. McCain, W. Gronlund, M. Myers, S. Wellings, 1978
Tumors and Microbial Diseases of Marine Fishes in Alaskan Waters -J. Fish Diseases (submitted).

349 T. English, 1976
*** Alaska Marine Ichthyoplankton Key

353 D. Rogers, 1976
*** Determination and Description of Knowledge of the Distribution, Abundance and Timing of Salmonids in the Gulf of Alaska and Bering Sea - (A supplemental to the Final Report)

L. Stern, A. Hartt, D. Rogers, 1976
Determination and Description of the Status of Knowledge of the Distribution, Abundance and Migrations of Salmonids in the Gulf of Alaska and Bering Sea

417 D. Lees, 1977
*** Reconnaissance of the Intertidal and Shallow Subtidal Biota, Lower Cook Inlet

425 D. Damkaer, J. Larrance, 1976
Phytoplankton and Primary Productivity in Lower Cook Inlet -PMEL Special Report

Initial Zooplankton Investigations in Lower Cook Inlet - PMEL Special Report

426 T. Cooney, 1978
*** Environmental Assessment of the Southeastern Bering Sea: Zooplankton and Micronekton

485 C. Harris, A. Hartt, 1977
*** Assessment of Pelagic and Nearshore Fish in Three Bays on the East and South Coasts of Kodiak Island, Alaska

490 W. Smoker, 1976
Distribution of King Crab, Pandalid Shrimp and Brachyuran Crab Larvae in Kachemak Bay, Alaska -NWFC Auke Bay Report

W. Smoker, 1976
Qualitative Results of Zooplankton Sampling in the Kasitsa Bay Area of Lower Cook Inlet, Alaska 1962-65 -NWFC - NMFS Report

517 H. Feder, S. Jewett, 1977
*** The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in Two Bays (Alitak and Ugak) of Kodiak Island, Alaska

No R. Rosenthal, 1978
RU# Preliminary Observations on the Distribution, Abundance and Food Habits
*** of Some Nearshore Fishes in the Northeastern Gulf of Alaska

R.U.

059 D. Nummedal, M. Stephen, 1976
Coastal Dynamics and Sediment Transportation, Northeast Gulf of Alaska- Technical Report No. 9-CRD

J. Boothroyd,(co-principal investigator), M. Cable, R. Levey, 1976
Coastal Morphology and Sedimentation, Gulf of Alaska (glacial sedimentation), in Environmental Assessment of the Alaskan Continental Shelf- P.I. Repts., Vol 12, Geology, pp. 87-213.

D. Nummedal, M. Stephen, 1976
Coastal Dynamics and Sediment Transportation, Northeastern Gulf of Alaska- Tech. Rept. No. 9-CRD, Dept. of Geology, Univ. of South Carolina, 148 p.

M. Hayes, C. Rudy, M. Stephen, S. Wilson, 1976
Geomorphology of the Southern Coast of Alaska- Proc. 15th Internatl. Conf. of Coastal Eng., Vol.II, p. 1992-2008.

C. Ruby, 1977
Coastal Morphology, Sedimentation and Oil Spill Vulnerability Northern Gulf of Alaska- Tech. Rept. No. 15-CRD, Dept. of Geology, Univ. of South Carolina, 223 p.

206 T. Vallier, J. Gardner, 1976
Preliminary Report on the Regional Geology, Oil and Gas Potential and Environmental Hazards of the Bering Sea Shelf, South of St. Lawrence Island, Alaska- USGS Open File Report 76-785

T. Vallier, J. Gardner, 1977
Underway Geophysical Data Collected on USGS Cruise 4-76, Southern Beringian Shelf- USGS Open File Report 77-524

212 B. Molnia, P. Carlson, 1976
Report on the Environmental Geology, OCS Area, Eastern Gulf of Alaska- USGS Open File Report 76-206

B. Molnia, P. Carlson, 1975
Preliminary Isopach Map of Holocene Sediments, Northern Gulf of Alaska- USGS Open File Map 75-507

B. Molnia, P. Carlson, 1975
Surface Sediment Distribution Map, Northern Gulf of Alaska- USGS Open File Map 75-505

B. Molnia, P. Carlson, 1975
Base Map of the Northern Gulf of Alaska- USGS Open File Map 75-506

216 P. Carlson, B. Molnia, 1975
Seismic Profiles of the Offshore Gulf of Alaska Tertiary Province - USGS Open File Report 75-664

P. Carlson, B. Molnia, 1976
Submarine Faults and Slides that Disrupt Surficial Sedimentary Units, Northern Gulf of Alaska- USGS Open File Report 76-294

P. Carlson, B. Molnia, 1975
Preliminary Structural Map of Part of the Offshore Gulf of Alaska Tertiary Province -USGS Open File Map 75-508

P. Carlson, B. Molnia, 1975
Submarine Slides and Nearshore Faults, Northern Gulf of Alaska- USGS Open File Map 75-504

R.U.

327 M. Hampton, A. Bouma, 1976
Preliminary Report on the Surface and Shallow Subsurface Geology of Lower Cook Inlet and Kodiak Shelf, Alaska -USGS Open File Report 76-695

M. Hampton, A. Bouma, 1976
Seismic Profiles of Lower Cook Inlet and Kodiak Shelf- Open File Report 76-848

A. Bouma, M. Hampton, T. Frost, M. Torresan, R. Orlando, J. Whitney, 1978
Bottom Characteristics of the Lower Cook Inlet- USGS Open File Report 78-236

352 H. Meyers, 1976
Catalog of Tsunamis in Alaska- RPT SE-1

H. Meyers, 1976
A Historical Summary of Earthquake Epicenters In and Near Alaska- NOAA Tech. Memo EDS/NGSDC

H. Meyers, 1976
An Analysis of Earthquake Intensities and Recurrence Rates In and Near Alaska- NOAA Tech. Memo EDS/NGSDC

General/Multiple Discipline

428 N. Roller, F. Polcyn, 1977
*** Airborne Multispectral Mapping of the Intertidal Zone of Southern Alaska

499 J. Mattson, 1977
The Argo Merchant Oil Spill - A Preliminary Scientific Report Plus a Summary Fact Sheet

Marine Birds

038 J. Hickey, L. Craighead, 1977
*** A Census of Seabirds on the Pribilof Islands

077 G. Sanger, P. Baird, 1977
*** Ecosystem Dynamics, Birds and Marine Mammals, Part II - Aspects of the Feeding Ecology of Bering Sea Avifauna

096 S. Patten, 1977
*** Evolution, Pathobiology and Breeding Ecology of the Gulf of Alaska Herring Gull Group

337 C. Lensink
*** Populations and Distribution of Marine Birds in the Northeast Gulf of Alaska- Part I

341 C. Lensink, et.al., 1978
*** Population Dynamics and Relationships of Marine Birds in the Gulf of Alaska and Southern Bering Sea (13 Parts)

M. Amaral, 1977
A Comparative Breeding Biology of the Tufted and Horned Puffins in the Barren Islands, Alaska,- Master's Thesis, University of Washington.

R.U.

Marine Mammals

067 H. Braham, R. Everitt, D. Rugh, 1977
Preliminary Evidence of a Northern Sea Lion (*Eumetopias Jubatus*) Population Decline in the Eastern Aleutian Islands - Northwest & Alaska Fisheries Center Processed Report

H. Braham, R. Everitt, B. Krogman, D. Rugh, D. Withrow, 1977
Marine Mammals of the Bering Sea: A Preliminary Report On Distribution and Abundance, 1975-76 - Northwest & Alaska Fisheries Center Processed Report

068 C. Fiscus, H. Braham, R. Mercer, R. Everitt, B. Krogman, P. McGuire, C. Peterson, R. Sonntag, D. Wighrow, 1976
Seasonal Distribution and Relative Abundance of Marine Mammals in the Gulf of Alaska - Northwest & Alaska Fisheries Center Processed Report

069 H. Braham, B. Krogman, 1977
Population Biology of the Bowhead (*Balaena mysticetus*) Whale in the Bering, Chukchi and Beaufort Seas - Northwest & Alaska Fisheries Center Processed Report

240 K. Schneider, 1976
*** Assessment of the Distribution and Abundance of Sea Otters Along the Kenai Peninsula, Kamishak Bay and the Kodiak Archipelago

241 K. Schneider, 1976
*** Distribution and Abundance of Sea Otters in the Southwestern Bristol Bay

Physical Oceanography/Meteorology

048 D. Barrick, M. Evans, B. Weber, 1977
Ocean Surface Currents Mapped by Radar - Science Vol. 198 P.138-144.

138 S. Hayes, 1978
Variability of Current and Bottom Pressure Across the Continental Shelf in the Northeast Gulf of Alaska - submitted to J. Phys. Oc.

S. Hayes, J. Schumacher, 1977
Description of Wind Current and Bottom Pressure Variations on the Continental Shelf in the Northeast Gulf of Alaska from February to May 1975 — J. Geo. Res. Vol. 81 No. 36, Dec. 20, 1976.

R. Muench, H. Nofjeld, R. Charnell, 1978
Oceanographic Conditions in Lower Cook Inlet; Spring and Summer 1973 - to be submitted to J. Geo. Res.

140 J. Galt, 1977
Development of a Simplified Diagnostic Model for use in the Interpretation of Oceanographic Data - to be submitted to Journal of Physical Oceanography

141 R. Reed, 1978
Heat Budget in the Eastern Bering Sea, Journal of Geophysical Research - (In Press)

L. Coachman, R. Charnell, 1978
Lateral Water Mass Interactions, A Case Study, Bristol Bay, Alaska - submitted to J. Phys. Oceanography

R.U.

L. Coachman, R. Charnell, 1977
Fine Structure in Outer Bristol Bay, Alaska - Deep Sea Res. 24 (10): 869-889.

J. Schumacher, 1977
A Structural Front Over the Continental Shelf of the Eastern Berring Sea - submitted to the Journal of Physical Oceanography

289 H. Solomon, K. Ahlnas, 1977
Eddies in the Kamchatka Current

T. Royer, 1977
Precipitation Driven Ocean Circulation in the Northwest Pacific

S. Worley, T. Royer, 1977
Current Gyres on the Continental Shelf of the Gulf of Alaska

307 R. Muench, R. Charnell, 1977
Observations of Medium-Scale Features Along the Seasonal Ice-Edge in the Bering Sea - Journal of Physical Oceanography 7(4): 602-606

357 W. Ingraham Jr., A Bakun, F. Favorite, 1977
Physical Oceanography of the Gulf of Alaska

435 J. Leendertse, S. Liu, 1977
The Bristol Bay and Norton Sound Models--A Progress Report - available from NOAA and Rand Corporation)

496 W. Brower, H. Searby, 1977
*** Climatic Atlas of the Outer Continental Shelf Waters and Coastal Regions of Alaska, Volume I (Gulf of Alaska), Volume II (Bering Sea), Volume III (Chukchi-Beaufort Sea)

541 T. Kinder, J. Schumacher, R. Tripp, D. Pashinski, 1977
550 The Physical Oceanography of Kotzebue Sound, Alaska, during Late Summer, 1976 - Tech. Report University of Washington.

No D. Halpern, J. Holbrook, 1977
RU# Moored Near-Surface Current Measurements During February 1975 on the Outer Continental Shelf in the Northeastern Gulf of Alaska

*****

WHY CONDUCT STUDIES OF SEABIRDS?

or

WHAT ECOLOGICAL STUDIES OF SEABIRDS OFFER OCSEAP

Composed at the Pacific Seabird Group Workshop
by G. Hunt, W. Drury, et al.

Dr. George Hunt Jr.
Dept. of Ecology & Evolutionary Biology
University of California
Irvine, California 92664

Dr. William Drury
College of the Atlantic
105 Eder
Bar Harbor, Maine 04609

Value of Seabird Studies

Seabirds are an extremely visible element of the marine ecosystem and are the center of attention for a large segment of the conservation-minded public. As such, when populations are fouled with oil, regardless of the long-term effect of the impact, oiled seabirds generate public outcry. For this reason, if no other, efforts to minimize impact are of value.

Seabirds may also occur in local concentrations involving millions of birds and thousands of metric tons of biomass in a relatively small area. Given that these birds probably consume on the order of 20 percent of their body weight daily, the destruction or removal of large segments of the bird population could alter the ecological situation that now exists in the ocean.

However, perhaps of greater long-term importance is the potential role seabirds may play as indicators of environmental quality. They are more conspicuous and also probably less expensive and easier to study and monitor than any other marine species. Thus, these birds, many of which are highly vulnerable to floating oil, should provide, through changes in numbers or distribution, indices of contamination. More importantly, as high order consumers at the top of the marine food chain, these birds may provide sensitive gauges of the functioning of the marine ecosystem. Since we do not have time or resources to study all areas or to study the biology of all species, we need to make generalization from a few hopefully typical species. To this end we need to select "indicator" species and target areas for concentration of research effort.

Monitoring and Remote Sensing

Given the vast areas of the Alaskan outer continental shelf potentially exposed to the impact of oil development and the immense cost of monitoring and assessing impact on the large and remote areas involved, it appears essential to develop means of remote sensing that will allow us to monitor not only environmental quality but also the abundance and distribution of pelagic birds. In the event of a spill, the latter information will be essential if deployment of clean up efforts and protection of marine birds is to be effective.

Except for areas close to shore (such as Kodiak or Nome) regular censusing from aircraft is not practical due to the difficulty of providing adequate year-round coverage. Two alternatives exist. One, the possibility of developing direct monitoring on concentrations of birds at sea using SEASAT radar, has yet to be tried. There is however the strong possibility that large flocks of birds, either flying or on the water, will give a radar signature different from that obtained from the ocean's surface. In the event that we are able to use remote radar sensing, we would have a powerful tool for predicting the impact of spills and assigning clean-up priorities.

A second alternative is to learn the relationships between features easily monitored by remote sensing systems (such as sea surface temperature and chlorophyl density), features assessible to other techniques (water depth, productivity) and seabird distribution. If these sorts of linkages between physical oceanography, biological oceanography, and bird numbers and distribution are adequately developed, again a prediction of the impact of any given spill may be possible. Linkages of these sorts will have to be developed for each of the OCS regions, as their oceanographic regimes may differ significantly. Either of these systems would have the added value that the remote sensing data obtained would be directly available to automatic data processing.

<u>Linkage Between Marine Birds and the Marine Ecosystem</u>

While it is clear that generalizations must be built on "indicator" species, we must nevertheless recognize that the use of certain species as indicators of "environmental quality" or "ecosystem health" depends upon the assumption that the linkage between these species and the ecosystem is deterministic. The closed system models used to relate the impact of events in an ecosystem to the components of that system assume direct, tight linkages between components. We need to learn what the linkages between seabirds and their food resources are, and we need to learn which of these linkages will be sensitive not only to the acute but also to the chronic impact of oil pollution.

In order to establish the strengths and limitations of the use of birds as indicators we need both long-term studies within regions and comparative studies between regions that relate food resource availability with the distribution, numbers and reproductive success of seabirds. Studies need to be long-term so that fluctuations in components of local resource bases can be correlated with changes in seabird ecology. Studies must also be conducted in the several OCS areas in Alaskan waters because the preliminary studies undertaken to date suggest that birds in these geographically widely separated regions depend upon strikingly different resource bases. Such information is of critical importance if mathematical ecosystem models are to be successfully used to predict the impact of spills.

*****

<u>REMINDER TO DATA PROCESSORS</u>

Please include the logical record length and record block size for each data submission when filling in the accompanying Data Documentation Form (DDF). OCSEAP requires non-labelled data tapes or IBM standard label tapes and fixed record length data records. If you have any questions on this, contact Francesca Cava, JPO Data Manager (phone # 907-586-7436).

A request form containing the primary items required to complete digital data requests is below. The list is divided into technical and scientific requirements, physical requirements and administrative information. The completed list should be sent to:

John J. Audet, NODC/OCSEAP Coordinator
National Oceanographic Data Center
Environmental Data Service, Page Bldg. 1
Washington D.C. 20235

OCSEAP DATA REQUEST FORM

NAME ____________

REQUEST NO.____ OF ____________

DATE ____________

DATA SPECIFICATIONS

Geographic Boundaries

From: Latitude____Longitude____

To : Latitude____Longitude____

Dates and Times

From: Year____Month____Day____

To : Year____Month____Day____

Other Specific Times ____________

Platform (s)____________

Investigator (s)____________

Date File Description

File Type____________

File I.D.s____________

Station Numbers____________

Specific Data Parameters

File Type Parameters

____ ____ ____ ____ ____

NODC Taxonomic Codes or Scientific Names

____

Scientific Restrictions

Methodology

File Type Methods

____

Units of measure, precision, ranges of data or other considerations

____

Minimum number of observations/data to be considered

____

PHYSICAL REQUIREMENTS

Magnetic Tape Characteristics

Tracks______ Density______

Recording Mode______ Parity______

Special labels or headings for plots or listings

____

Data Listing Layout____________

Plot size/scale/chart projections

____

ADMINISTRATIVE INFORMATION

Date required by____________

Priority of request (if request is one of several)____________

Delivery information and/or contact

Send to Name____________

Address____________

Accounting Information for job cost

OCSEAP funds ____________

Other____________

Is there a maximum allowable cost for this request?

How much?

____

FORMATTING IN THE FIELD

OCSEAP Beached Marine Mammal Reporting Card

A beached mammal reporting card (see below) has recently been developed for use by all principal investigators conducting work in Lower Cook Inlet. The information collected from these cards will improve efforts by Dr. Bud Fay (R. U. 194) to develop charts of Lower Cook Inlet showing the location of beached mammal carcasses and their probable drift trajectory. In addition, as the opportunities permit, a post mortem examination of these reported beached carcasses will provide valuable information on the kinds and incidences of pathological conditions present, identification of the causative agents, and assessment of the potential relationships with regard to future stresses brought to bare by offshore oil exploration and development.

BEACHED MARINE MAMMAL SURVEY FOR LOWER COOK INLET (RU 194)

DATE SURVEYED ____________

TYPE OF TRANSPORTATION ____________

AREA SURVEYED (MARK ON CHART AT RIGHT) ____________

CARCASSES SIGHTED (MARK LOCATION AND MAMMAL SPECIES, IF POSSIBLE) ____________

PHOTOGRAPHS AVAILABLE?
YES____ NO____

OBSERVER ____________

RECORDER ____________

RESEARCH UNIT # ____________

COMMENTS (FOR ADDITIONAL COMMENT CALL (907) 479-7026)

____

____

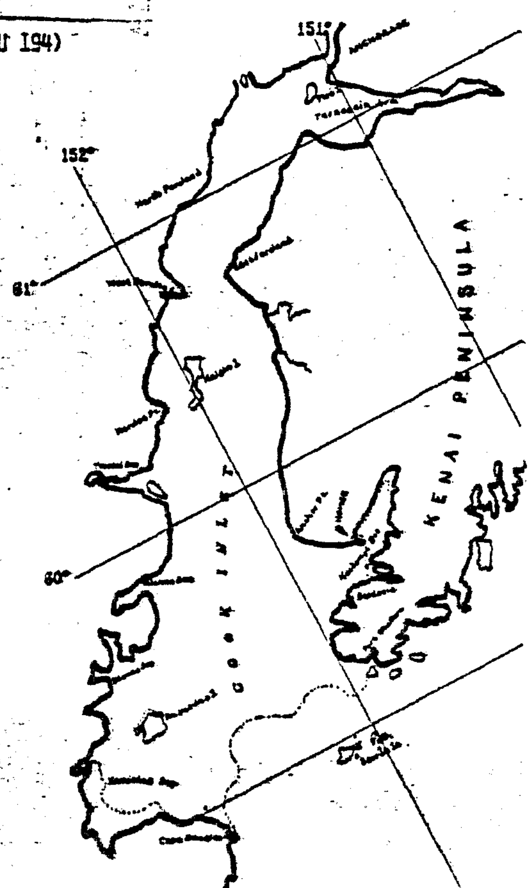
____

____

____

____

____



A large increase in the quota for North Pacific sperm whales and a small subsistence take of bowhead whales by Alaskan Eskimos was approved by the International Whaling Commission (IWC) on December 6-7. IWC accepted the recommendations that the catch limit for sperm whales be decreased from the 1976 limit to 6,444 in 1978. IWC approved a take of 12 landed or 18 struck, whichever is first, for the bowhead catch limit.

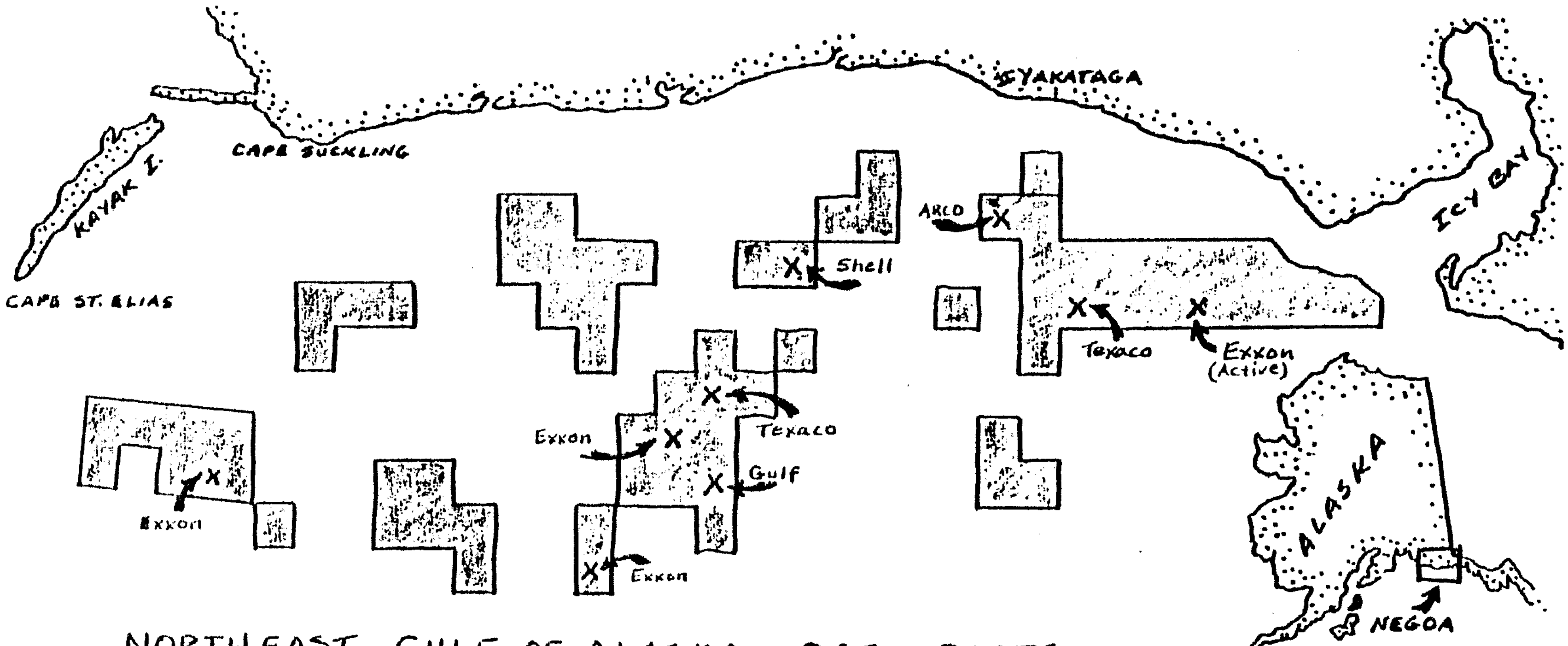
OCS EXPLORATION REVIEW

"Lest we forget"... This feature in the newsletter is a summary of what industry is doing, or perhaps more honestly, what it is rumored to be doing in the Alaska OCS. These notes are based upon published and unpublished reports, industry, agency and cocktail party conversations, and a significant percentage of unabashed WAGing. This sort of information is standard in "Frontier" oil areas such as ours, where little is known that's not proprietary and where there's much unleased and potentially rich acreage. In such situations, news of large unequivocal discoveries leaks fairly rapidly, but other information is scattered and often intentionally confusing. Neither NOAA, nor BLM, nor the Editor or Columnist certify any material here... but remember that the national need for the discovery and development of oil and gas from the Alaskan OCS is the reason for our entire research program. All our research is meaningless unless it contributes directly to planning and management decisions for OCS oil development and particularly to the mitigation of adverse impacts. That's the bottom line, here, and all of us who are involved in OCSEAP should always keep it in mind. End commercial!

The Northeast Gulf of Alaska sale was in April of 1976, and well over a billion dollars was offered for exploration leases in the area between Icy Bay and Kayak Island (see table below and map on page 37). Aside from a single unsuccessful wildcat in 1968 on a State Offshore Lease near Middleton Island, there had been no drilling offshore, but seeps and shows in exploratory wells onshore had suggested sizeable deposits offshore; estimates ranged to 10 billion barrels of oil. Industry had originally prepared for a sale in the late 1960's, but the sale had been postponed during the Santa Barbara Blowout furor. Drilling started here in October of 1976, and within weeks there were rumors of a sizeable gas discovery. Four semisubmersible rigs were at work in the summer of 1977. By now a total of eight test wells have been drilled and only one firm, Exxon, is still at work. All this exploration has been done as 'tight holes', with no information released except location and drilling depth. The presumption is that all tests were on major structures and that they were all dry holes (no commercial quantities of oil). This doesn't mean that there's no oil in NEGOA, but it certainly suggests that it's not in tremendous, Prudhoe Bay quantities and that it'll be relatively hard to find. Under the difficult weather and logistic circumstances of the Gulf of Alaska, this could mean that the area will be abandoned... on the other hand, it's just as possible that after careful study of the new information from the completed wells, industry will go back in and make substantial discoveries on less obvious structures. There's a follow-up lease sale proposed for NEGOA in June of 1980; we'll probably not learn much about the real reserves of the area until then. Rumors suggest that industry is particularly interested now in testing the areas west of Kayak Island which were withdrawn before the 1976 sale.

Table A — ALASKA FRONTIER OCS LEASE SALES

	Northeast Gulf of Alaska (April 1976)	Lower Cook Inlet (October 1977)
Tracts Offered	189	135
Acres Offered	1,008,000	768,580
Tracts bid on	81	91
Total Number bids	244	240
Percentage area bid upon	43%	67%
Tracts leased	76	87
Acreage leased	409,057	495,307
Total bids	$ 1,732,170,868.12	$ 676,920,608.72
Accepted bids	$ 559,836,586.92	$ 398,471,313.36



NORTHEAST GULF OF ALASKA - OCS TRACTS

LEASED IN APRIL 1976

X = EXPLORATORY WELLS

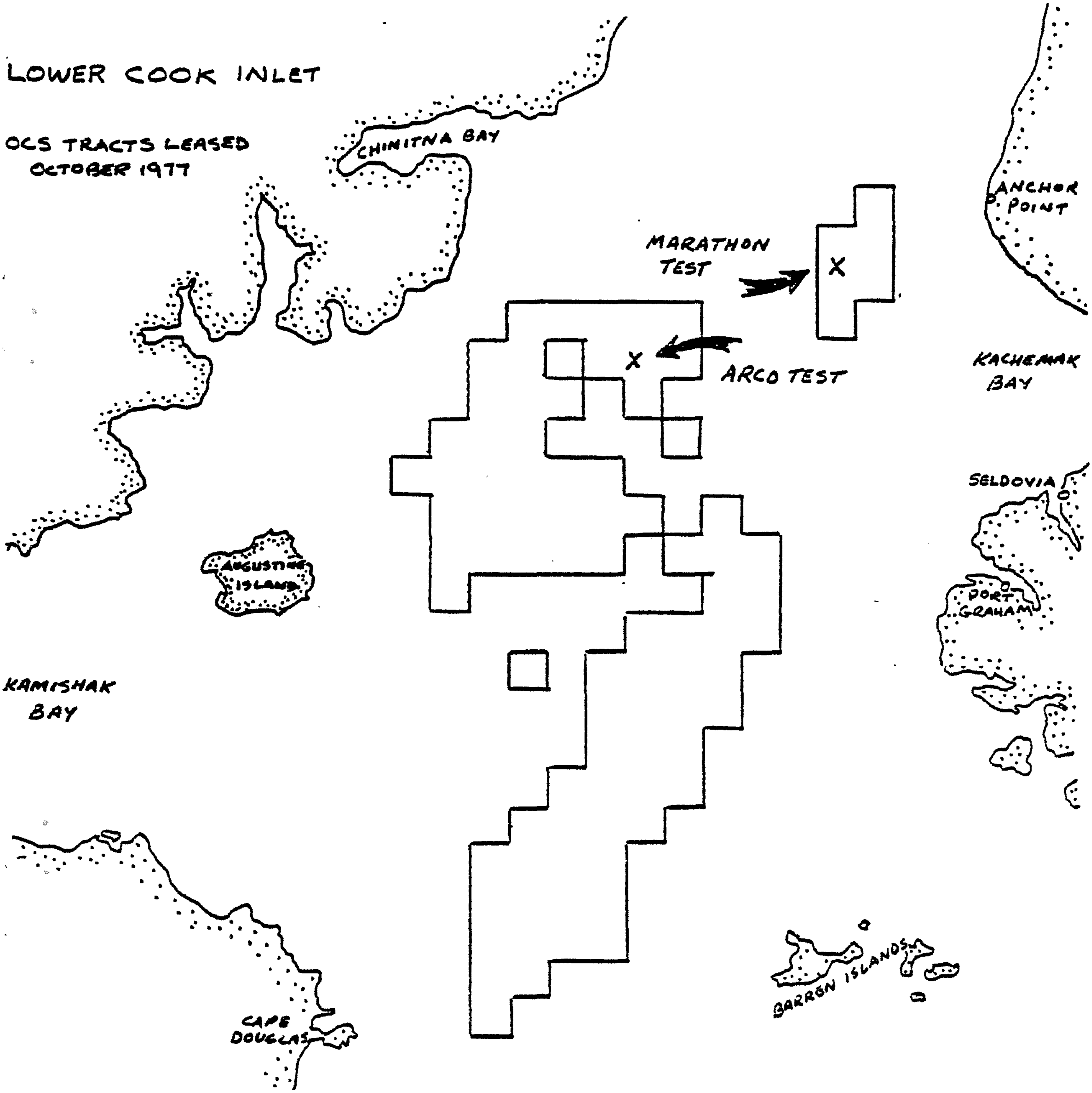
Lower Cook Inlet is the focus of excitement now. The OCS sale there was in October of last year, and most observers were surprised at the substantial bids, both cash bonus bids (the normal system) and royalty bids (an experimental leasing scheme in which there's a fixed bonus, but competition in the share of oil "paid" to the Government if there is production). Well over a half billion dollars was bid in cash; royalty bids over 50% were accepted. Lower Cook isn't touted by anyone as a probable bonanza, but it is a relatively sheltered, shallow water prospect, and it is close to the offshore production in state waters in Upper Cook Inlet, so there are nearby facilities. Exploration may start in a rush, this summer. There are rumored to be plans for eleven wildcats in lower Cook this summer; permits are now being processed for two tests (see map on page 39). Other rumors suggest only a single wildcat, by Marathon. Operations are expected to begin in late June and there could be several rigs at work by late summer. It's reported that Marathon will be using the dramatically-titled Diamond M Dragon drillship to drill the first offshore wildcat west of Anchor Point.

The other lease area of very immediate interest is outside our bailiwick, the Beaufort Inshore sale in December of 1979. There is much, much interest in the area, for economic, social and environmental reasons...see the Arctic Project Office Bulletin for details.

The State is also in the oil lease business, of course, and has recently conducted a survey of the industry to help planning their own sales, both offshore and onshore. Twenty-one companies were asked to rank 36 possible state lease sites by both petroleum potential and leasing order preference.

AREA	PETROLEUM POTENTIAL	LEASING ORDER
*Beaufort Sea-Canning River to Beechey Pt.	1	1
*Beaufort Sea-Beechey Pt. to Pitt Pt.	2	2
*Beaufort Sea-Canadian Border to Canning River	2	3
Prudhoe Bay Drainage-South	2	4
Prudhoe Bay Drainage-West	3	5
Upper Cook Inlet (onshore)	4	6
Upper Cook Inlet (offshore)	3	7
*Bristol Bay-Port Heiden to Port Moller	6	8
*Lower Cook Inlet (onshore)	5	9
*Beaufort Sea-Pitt Pt. to Barrow	3	10
*Lower Cook Inlet (offshore)	5	11
*Beaufort Sea-Barrow to Cape Lisburne	4	12
*Bristol Bay-Port Moller to Izembeck	6	13
Western North Slope	5	14
*Bristol Bay (onshore)	6	15
*Norton Sound	6	16

* = areas near OCS Frontier sales
(Data from Alaska Department of Natural Resources)


LOWER COOK INLET
OCS TRACTS LEASED
OCTOBER 1977
CHINITNA BAY
MARATHON
TEST
ARCO TEST
ANCHOR
POINT
KACHEMAK
BAY
SELDOVIA
AUGUSTINE
ISLAND
PORT
GRAHAM
KAMISHAK
BAY
BARREN ISLANDS
CAPE
DOUGLAS

Based upon the industry response, the judgement of the Dept. of Natural Resources and apparently some crystal ball gazing, Governor Hammond announced in early April a series of State lease sales. These sales end a four year moratorium on State oil sales, since the ill-considered Kachemak Bay sale in 1974, and will follow a completely restructured procedure which guarantees reasonable public input and consideration for the environmental and social impacts of a sale, as well as the economic. The State schedule now has both major and minor sales, including several sales related to OCS activity.

STATE COASTAL SALES

Beaufort inshore, Flaxman Island area-limited acreage	Oct. 1978
Beaufort Inshore (w/BLM)	Dec. 1979
Prudhoe Bay	--- 1981
Norton Sound-Joint State-Federal Sale	Dec. 1981
Beaufort (unspecified)	--- 1982

How State activity will interact with the Federal is still unclear, but the orientation of the State effort, clearly, is to complement but not augment Federal OCS activity. One of the State's primary aims is to maintain a level pace of development, in contrast to the "boom and bust" cycles of the past. For the December 1979 sale in the Beaufort, the State and BLM have agreed to integrated, joint management of all phases of the operation. It is hoped that a similar agreement on operations in Norton Sound will evolve.

*****