AGENDA F - 2
OCTOBER 1979

MEMORANDUM

Date: October 2, 1979

To: Council Members, SSC, and AP

From: Jim H. Branson
Executive Director

Subject: St. George Basin Lease Sale

COUNCIL ACTION:

Comments on the proposed lease sale are due to NMFS by October 5. Council recommendations should go directly to Harry Rietze at this meeting.

BACKGROUND:

The St. George Basin area was originally scheduled for a 1985 lease sale and all research in that area by OCS is geared to that date, with completion of most studies planned for 1983. The sale has now been moved up to December 1982 and the original area split into two parts. St. George Basin is the western portion on the original and includes the shelf edge north of Unimak Pass to (and including) the Pribilof Islands. The eastern portion is now called the Northern Aleutian Shelf area and includes all of outer Bristol Bay.

St. George Basin is the most productive fishery area in the eastern Bering Sea and the most heavily fished. It also includes the largest northern fur seal rookeries in the world on the Pribilofs. Values are given in the enclosed background material.

The Council staff makes the following recommendations:

1. Postpone the sale indefinitely.

2. If #1 can't be done, postpone until at least 1983, better yet 1985, until the ongoing studies are completed that may give us a clearer picture of the problems involved.

   In any case some tracts should be deleted from the sale, specifically, St. Paul, St. George, Pribilof Canyon and the Davidson Bank.

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North Pacific Fishery Management Council

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Agenda Item F-2
October, 1979

Comments on St. George Basin Oil Lease Sale

The National Marine Fisheries Service has asked the North Pacific Council to comment on the St. George Basin oil lease scheduled for sale in December, 1982. The following is a brief report on the sale with emphasis on areas of special concern to the North Pacific Fishery Management Council; the areas critical to domestic fisheries, the conflicts that may be anticipated and alternatives to the sale.

The eastern Bering Sea supports one of the richest and most productive marine resource centers of the world. The Pribilof Islands are critical habitat areas for many marine bird species as well as for the fur seal. The Blue King Crab is not found anywhere else in the Bering Sea. Certain species here are some of the largest groundfish resources found anywhere in the world and comprise a third of the United States fisheries. Shrimp, halibut, king and Tanner crabs are other commercially important species that reside in the St. George Basin region, worth millions of dollars.

An oil industry in the St. George Basin would adversely impact the fisheries, the marine resources, the environment and the coastal communities. Intense conflicts can be expected as a result of these impacts. The crab industry is growing in the area and a domestic groundfish fishery is struggling to get off the ground. Potential exists for an off-shore herring fishery as well as a shrimp fishery.

The NPFMC staff recommends that the St. George Basin sale be post-poned indefinitely. In the event the Department of Interior decides to go

ahead with the sale, we recommend the Council advise delaying the sale until all studies are completed in 1983 and coastal zone management programs are in effect in the coastal areas to be impacted. In addition, modifications should be made to the sale area, deleting critical tracts and sections of tracts. To help minimize environmental and socio-economic impacts, mitigating measures should be recommended in detail. These alternatives are described at the end of this report.

ST. GEORGE BASIN
Sale No. 70

Call for Nominations	July, 1979
Nominations Due	October, 1979
Tentative Tract Selections	February, 1980
Draft Environmental Statement	October, 1981
Public Hearings	January, 1982
Final Environmental Statement	May, 1982
Proposed Notice of Sale	July, 1982
State Comments Due	September, 1982
Energy Review	October, 1982
Notice of Sale	November, 1982
Sale	December, 1982

The probable sale size involved in the St. George Basin Oil lease is approximately one million acres. The same amount of acreage is estimated for the Northern Aleutian Shelf.

There are an estimated 660 million barrels of oil and 1.65 trillion cubic feet of gas in the St. George Basin region and based on that volume, a spill frequency estimate of 3.79 spills greater than 1000 barrels each. Smaller spills are not included in the estimate.

St. George is listed 5th of 22 sale areas nationwide as far as industry expectations of resource potential and 9th of 22 as far as industry exploration interest. The inference is that St. George is high in potential, but also high in exploration and production costs.

Conflicts with commercial fisheries in the area are expected to center mainly in competition for shore facilities, labor and goods with a short period of intense gear conflicts (3-5 years). Other conflicts will be over fish population reductions, which the Environmental statement for the 5-year plan considers minor in comparison.

Drilling can be conducted in depths up to 1829m from drill ships; "jack-ups" and "semi-submersibles" can work in up to 130m and approximately 610m respectively. Completion and production or raising the oil can only be accomplished in much shallower water. The deepest commercial wellhead completion is in 164m off Brazil. For the present time, then, much of the canyon area in the St. George Basin will be unexploitable due to these depth restrictions.

There are four platforms estimated for the area, twelve exploratory wells drilled and eighty producing wells. Oil transportation will be from pipeline to tanker. Gas will be transported by pipeline to the LNG facility and from there to tankers for transporting to the lower 48. Unalaska is the most probable site for facilities (marine terminal, LNG plant, pipeline yards, etc.). It is not considered likely that the natural gas will be flared off.

AREAS CRITICAL TO FISHERIES

Crab species in the sale area include Tanner (C. opilio, C. bairdi and their hybrids), Red King Crab and Blue King Crab. The Blue King Crab have vulnerable spawning and rearing areas which center around the Pribilof Islands in the St. Paul and St. George tracts of the sale, while Tanner crab, both C. opilio and C. bairdi, have rearing areas in the Davidson Bank and NO 3-7 tracts of the sale between 50m-100m, as well as rearing areas around the Pribilofs. Red King Crab rearing areas within the sale region are within three miles in shallow water off Umnak, Unalaksa, Akutan and Akun Islands.

Japan and the U.S. both fish the Tanner crab population in a relatively small area of its concentration, selectively fishing for the large C. bairdi males. The domestic Tanner crab fishery in the Bering Sea brought in approximately four million dollars in 1976 (ex-vessel value) with 66 vessels participating. In 1978 70.4 million pounds of Tanner crab were harvested, bringing in about 14 million dollars.

Fishing effort for Red King Crab is concentrated from 167°W by 56.5°N and 55.7°N inland toward Bristol Bay. Only a small portion of that fishery is located within the sale areas in tracts numbered NO 307 and NN 3-1. Commercial fishing for Blue King Crab is concentrated in a radius around the Pribilofs out to approximately 70 fms., entirely within the St. George and St. Paul tracts of the sale area. In 1978, 102.8 million pounds of king crab were harvested in the eastern Bering Sea, making Unalaska the top dollar port for fish landed in the United States.

Pacific halibut and other groundfish species range throughout the St. George Basin sale area. Halibut probably cover the largest range from slope waters over 500m in depth to very shallow bays on the shelf. The population seems to concentrate on the slope and outer shelf in depths from 70m to 90m. Studies conducted by the National Marine Fisheries Service 1975 and 1976 indicated that the majority of the halibut population in the St. George Basin were juveniles. The Groundfish Catch Atlas, also compiled by the National Marine Fisheries Service, indicates that peak catches for adult halibut from the years 1964 to 1976 ranged between 175°W by 58°N and 181°W by 61.0°W, outside the sale area.

Pollock and Pacific cod, two other commercially important species, range from the outer continental shelf in summer to the slopes in winter, while juveniles are more abundant in shallower shelf areas; both species covering large areas of shelf and slope. Many flatfish species migrate seasonally from inner shelf areas in summer, to the warmer Pacific waters of the outer shelf and slope areas in winter. These include the yellowfin sole, Alaska plaice, rock sole, flathead sole, Greenland turbot and arrowtoothed flounder.

Records from the Groundfish Catch Atlas for the years 1964 through 1976 indicate that peak catches for seven of these species, pollock, yellowfin sole, Greenland turbot, Pacific cod, rock sole, flathead sole and Alaska plaice, were between 165°W-171°W by 53°N-59°N which are the approximate coordinates for the St. George Basin sale.

Shrimp stocks in the Bering Sea are currently at depressed levels, although there was a high abundance in the early sixties when over 80,000 mt were harvested in four years. United States fishermen have the capability and desire to harvest any allowable catch in this area once abundance levels have recovered, creating another viable fishery in the sale area. The major commercial species, P. borealis, is found along the continental shelf and slope of the sale area near the 150m isobath. P. goniurus is in shallower water back from the shelf edge.

There is no commercial fishery for salmon in the eastern Bering Sea outside three miles of the Alaskan coast. Salmon do migrate through the sale area to spawning streams on the coast. The salmon catch for 1978 was approximately 40 million fish, mostly sockeye.

Although there is no domestic fishery for herring in the sale area, there are large migrating stocks that pass through from wintering grounds northwest of the Pribilofs towards the Alaska coast for spawning. A commercial fishery in the Unalaska area suggests that spawning may occur in the Aleutians area and Shaboneev (1965) reported small numbers of herring spawning near the Pribilofs. The ex-vessel value of the Bering Sea herring fishery is estimated at $2.4 million and $124 thousand for herring spawning-on-kelp.

SOURCES OF POTENTIAL CONFLICT

Loss of gear from oil spills or by snagging will be the most frequent source of conflict. Trawls and pots coated with oil will have to be disposed of and loss of fishing time, income and space will result. Cables, pipelines and other underwater equipment can snag fishing gear, causing other losses. The resource can be contaminated in the area of a spill, making marketing of the product difficult and forcing fishermen to go elsewhere. As the rig and platform areas will be avoided, actual fishing area will be diminished. Collisions between fishing vessels and floating debris or other structures can also occur. There were 12 major collisions with OCS strucutres from 1963 to 1977, eight of which occured at night.

Competition for support facilities, housing, transportation, services, goods, and supplies, labor and utilities is certain to be intense between the oil industry and the fishing industry. None of these infrastructural resources is adequate enough for the current crab industry. It has created a large transient workforce which is housed in temporary bunkhouse and shipboard facilities capable of accommodating 2,400 workers. The groundfish and oil industries will compound this problem to the detriment of the local communities.

Local coastal zone programs have not yet been developed; communities will be unable to control enclave facility siting. Dutch Harbor has the only deep water port available and it has inadequate moorage and harbor facilities for the hugh crab industry, let along for oil and groundfish development.

Land will be another conflict source. Land is limited in areas where oil facilities and fish processing plants will be located. Both need large amounts of waterfront acreage, perhaps thousands of acres.

OIL INDUSTRY LAND USE NEEDS

Marine Terminals - less than 100 acres - waterfront site

Ancillary Facilities - mud and cement companies, special tool companies, trucking firms, catereres and welding shops - many small parcels

Platform Fabrication Yards - 400-800 acres - ocean access with dockside depths of 15-30 feet

Pipelines, Pipeline Coating and Pipeline Terminals - 100 acres or more with water frontage and ocean access

Service or Support Bases - 25 acres for 2 or 3 wells; 50-100 acres if more (St. George Basin is scheduled for 80 wells)

Liquid Natural Gas Plant - 100-150 acres of waterfront adjacent to deep water

OTHER CONSIDERATIONS

I. Waste Disposal, Pollutants

"Drilling fluids, drill cuttings, deck drainage, and sanitary wastes will be discharged into the marine environment during development of the areas to be leased." "Overall, the effect of sales included in the proposal will be moderate to severe degradation of water quality in localized areas around platforms and rigs and in areas, particularly those nearshore, that are effected by oil spills." From Draft Environment Statement for Five-Year Plan.

The estimate of 3.79 spills for the St. George Basin sale area will occur over the period of oil exploration and production, perhaps 20-30 years. Reductions or changes in marine populations can result and last several years.

In addition to the spills, there are other pollutants which are routinely released in the course of production, although the quantities are small in comparison to the volume of sea water in the area. If cable or pipelines are to be buried, digging the trenches to bury them will stir up sediment in addition to drilling, temporarily diminishing photosynthesis and causing gill abrasions or smothering. Disposing of radionuclides and low level hydrocarbons with the water column will cause changes within the marine ecosystem, but the nature and extent of these changes have not been fully documented. Some marine micro-organisms can utilize petroleum hydrocarbons as an energy source and will shift to the area of the platform disposing of them. Drilling fluids and muds contain toxic chemicals, heavy metals and other components which persist in the water column.

II. Potential Natural Hazards

Potential hazards include numerous shallow faults in the area, shallow gas-charged sediments, possible slump areas near the shelf edge, coastal erosion and depositional processes. Other potential hazards could

result from the fast moving pack ice which Potocsky documented covering the continental shelf south to the Pribilofs and extending from there eastward to Port Moller. The ice reaches this maximum in late March and begins to recede in April or May. One other consideration is the current flow in this area. Water comes into the Bering Sea through the Aleutian Island passes. Most of it moves northward towards St. Matthews Island and eastward towards Bristol Bay and from there up the coast until it passes through the Bering Straits. A large part, however, is deflected westward at Bristol Bay by the Kvichak and Nushagak Rivers and southward by the Kuskokwim River, forming a gyre in the southeastern Bering Sea. Oil spilled in this area would tend to either circulate in the gyre or move onto the coast and into the Arctic Ocean.

III. Information Available

Studies are planned to be initiated in the St. George Basin region in the early part of 1980. Oil spill trajectory modelling will have to be contracted for, as the U.S.G.S. model now used is inadequate for this area. Pollution transport data will be collected as well as oceanographic, meterologic and living resources data. When the Draft Environmental Statement comes out in October, 1981, one year's worth of information will have been collected from these studies. All data OCSEAP research has uncovered in past years for the area will also be used. However, the trajectory model is not expected to be finished until late 1983, one year after the sale. Individual studies for the oceanographic, meterologic and living resources will not be complete until that time either.

ALTERNATIVES

I. Proceed

The first alternative would be to allow the St. George sale to proceed as is. Coastal zone programs will not be in effect in the area and information available will be minimal. Conflict on shore and in the sale area can be anticipated to be intense, while impact on coastal communities, fishermen and marine resources will be moderate to high.

Development of the groundfish fishery may be slowed and fisheries now operating in the area will have problems harvesting and marketing resources tainted by pollutants.

II. Delay

Delay of the sale for approximately one year is an alternative. Additional information would be available that could result in fewer impacts. Oil spill trajectory analysis would be complete and could result in a decision to exclude certain tracts from the sale area. Additional information could also lead to a decision not to hold the sale. Coastal zone planning in the area would be developed enough to help control on-shore impacts and land use conflicts could be minimized.

III. Require Measures to be Taken for Environmental and Socio-Economic Protection

Protective measures could be taken as an alternative to delaying, or in addition to delaying the sale. The most obvious and harmful activities could be controlled and regulated to some degree in the event the sale proceeds, such as:

A. Restrict mud and cuttings disposal to certain locations and seasons;

B. Require pipelines and cables to be buried at deeper water depths than is now required (200 ft.);

C. Restrict vessel traffic and corridors;

D. Restrict enclave facilities for oil development away from fishing ports;

E. Restrict pipeline and cable routes to certain locations;

F. Prohibit certain toxic persistent components from being used in drilling muds and fluids; and,

G. Restrict drilling by seasons, perhaps during winter months when trawling is not allowed in "Winter Halibut-savings Areas."

IV. Modify the Sale Area

The St. George Basin could be modified by deleting certain tracts or particularly vulnerable areas within tracts from the sale. This alternative can be chosen in addition to delaying the sale and/or taking protective measures.

In the event modification of the sale area is required, the St. George and St. Paul tracts should be deleted. They are both areas of utmost importance to marine birds and mammals, including the fur seal population, as well as to the Blue King Crab, Tanner crab and many other species essential to the ecosystem if not commercial fisheries.

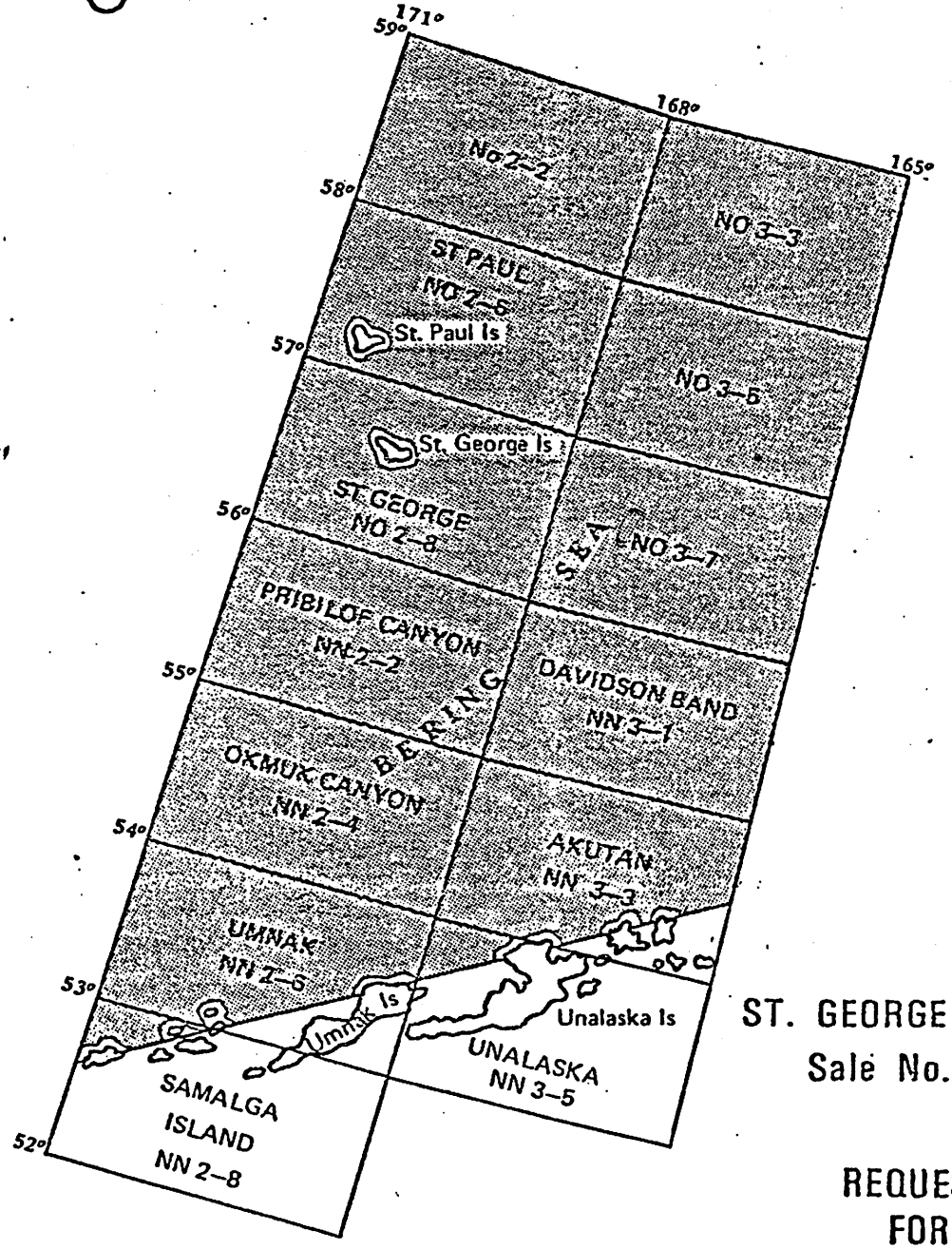
Although groundfish and other species are distributed throughout the sale area by species and by season, some sections of the shelf and slope may be more critical than others and should be excluded. Peak groundfish catch statistics indicates that commercially important spots are located in a narrow band occupying the eastern side of the sale area from 165°W-166°W by 54.5°N-56.5°N, while crab catches are important around the Pribilofs and in depths from 40-120m in the tracts numbered NO 3-7 and NN 3-1 of the sale. Distribution and abundance studies show that some flounder species range in toward shallow (less than 100m) shelf water in summer, but they and other groundfish species occupy a range from 100m-500m (sablefish to 1000m) during most of the year. Somewhere in this range a critical area should be identified and excluded.

V. Cancel the St. George Basin Sale

One final alternative would be to recommend cancelling the St. George Basin sale. If this route is taken all impacts and conflicts resulting from an oil industry in this area would be eliminated.

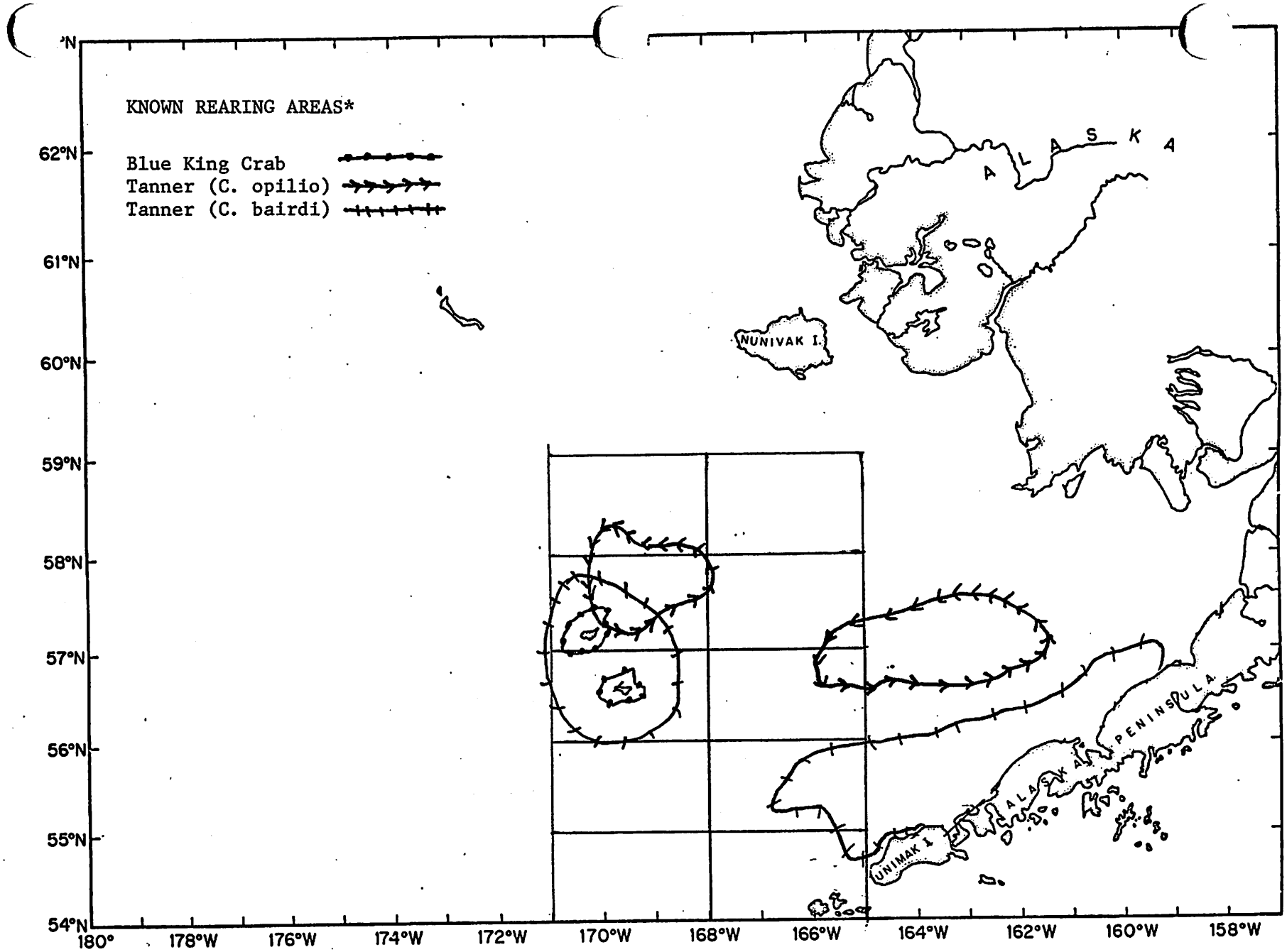
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Alaska Outer Continental Shelf Office

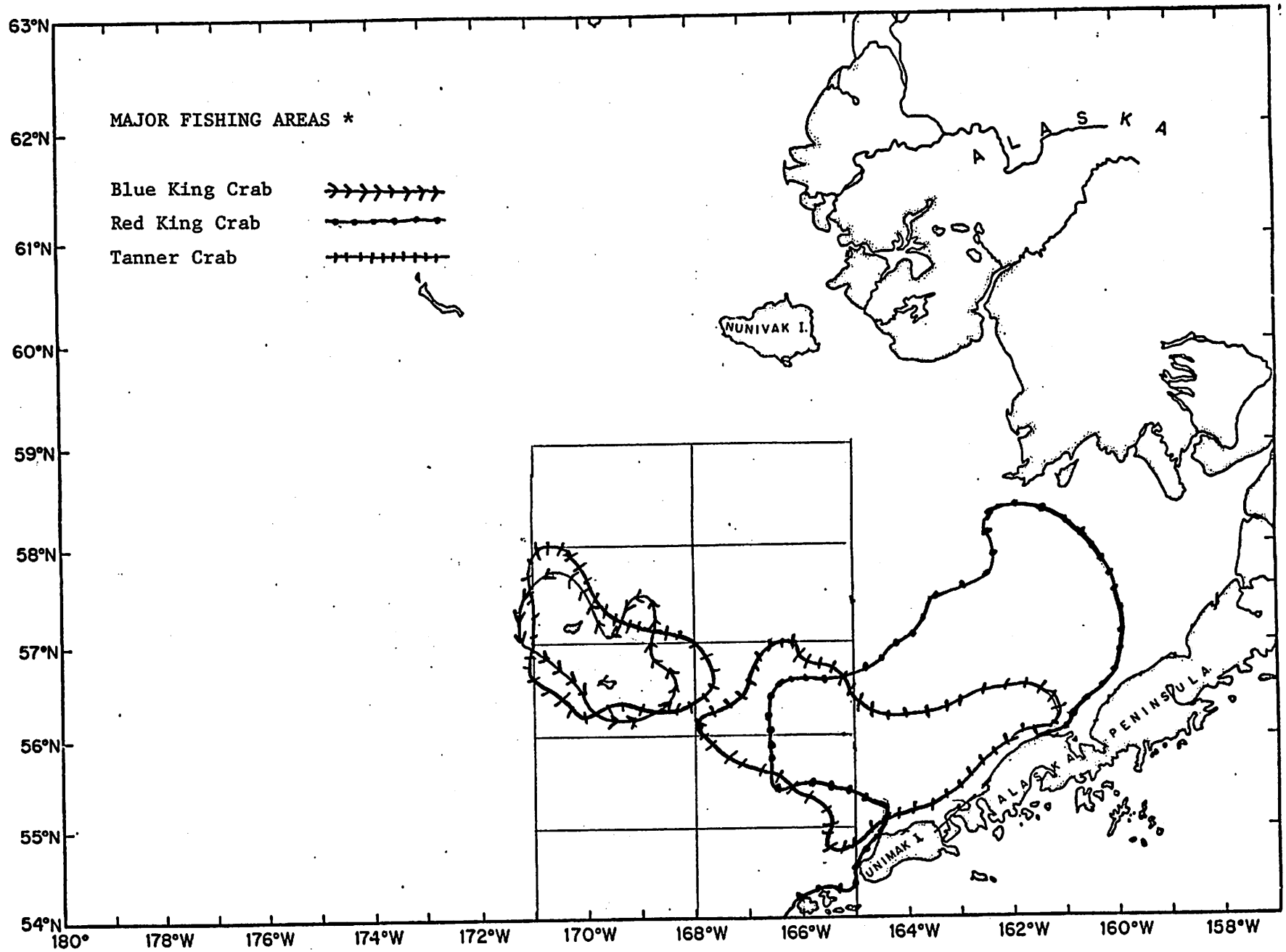


ST. GEORGE BASIN
Sale No. 70

REQUEST
FOR
RESOURCE REPORTS



*ADF & G Fisheries Atlas


MAJOR FISHING AREAS *
Blue King Crab
Red King Crab
Tanner Crab
ALASKA
NUNIVAK I.
UNIMAK I
ALASKA PENINSULA
63°N
62°N
61°N
60°N
59°N
58°N
57°N
56°N
55°N
54°N
180°
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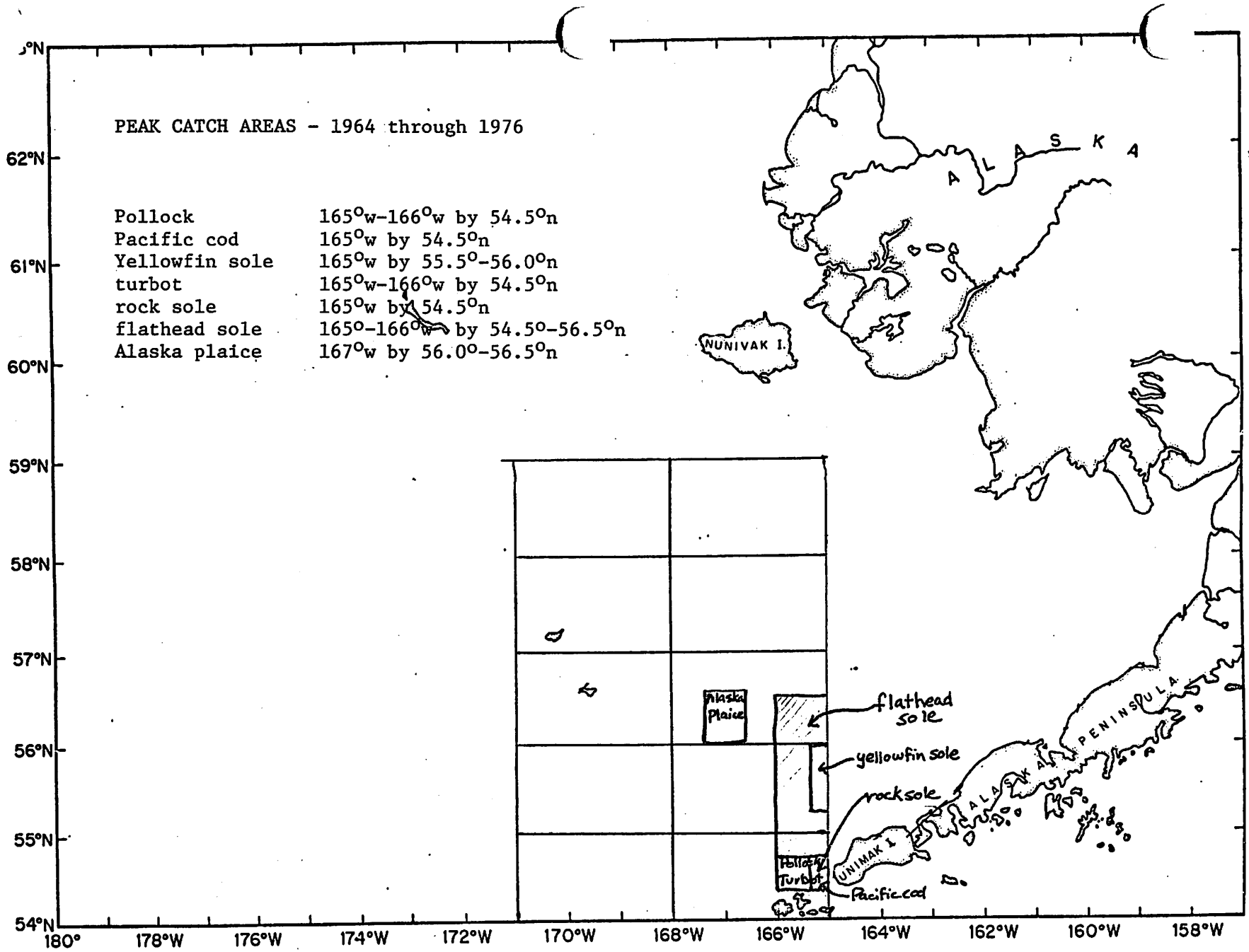
168°W
166°W
164°W
162°W
160°W
158°W


PEAK CATCH AREAS - 1964 through 1976
Pollock 165°w-166°w by 54.5°n
Pacific cod 165°w by 54.5°n
Yellowfin sole 165°w by 55.5°-56.0°n
turbot 165°w-166°w by 54.5°n
rock sole 165°w by 54.5°n
flathead sole 165°-166°w by 54.5°-56.5°n
Alaska plaice 167°w by 56.0°-56.5°n
NUNIVAK I.
ALASKA
PENINSULA
UNIMAK I
Alaska Plaice
flathead sole
yellowfin sole
rock sole
Pollock Turbot
Pacific cod
62°N
61°N
60°N
59°N
58°N
57°N
56°N
55°N
54°N
180°
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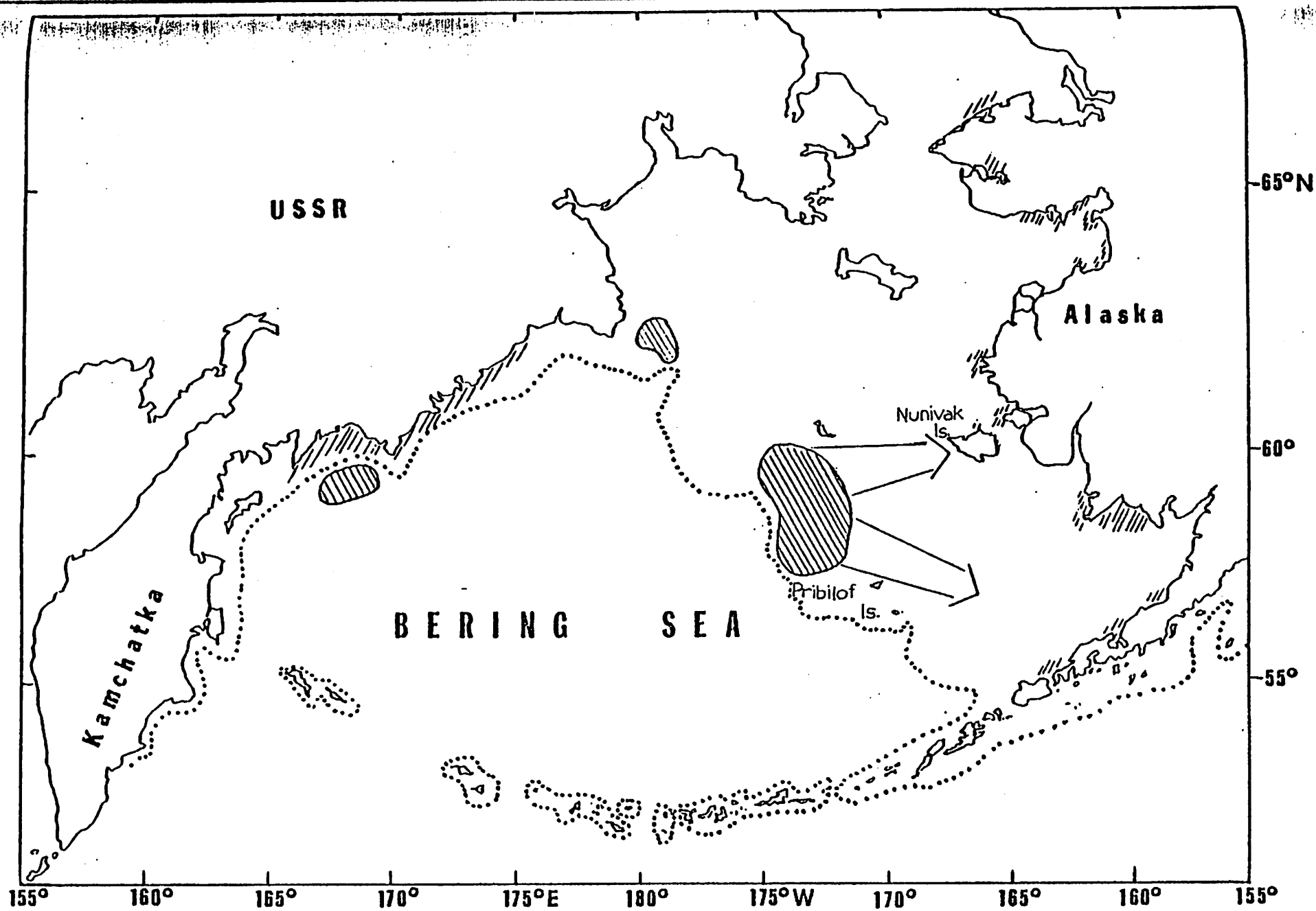

Figure 11. Location of the spawning and winter grounds (oval areas) of main eastern and western Bering Sea herring stocks and routes of migration of eastern stocks to spawning areas.

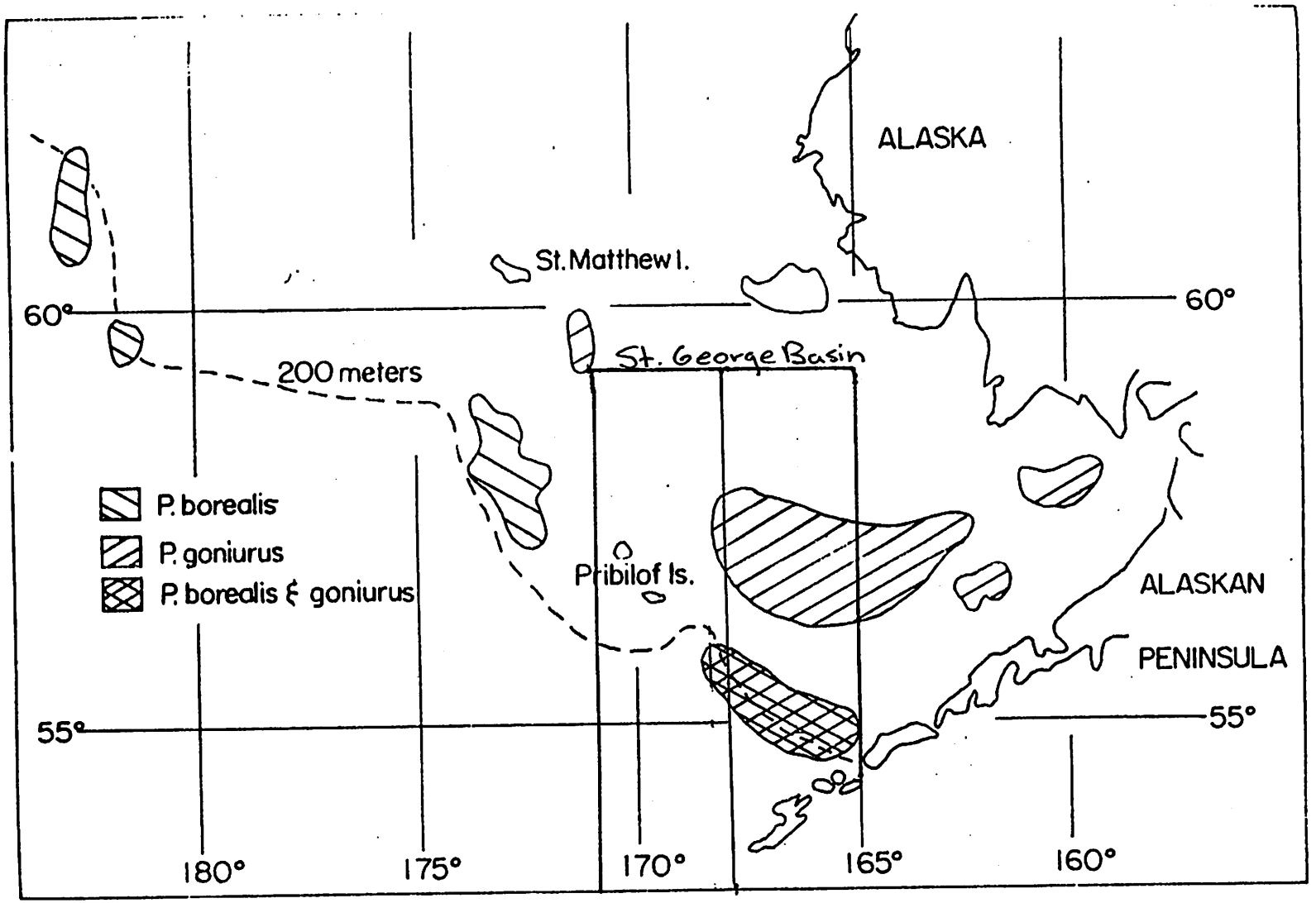

Figure 2: Distribution of pandalids in the eastern Bering Sea, August-November 1975

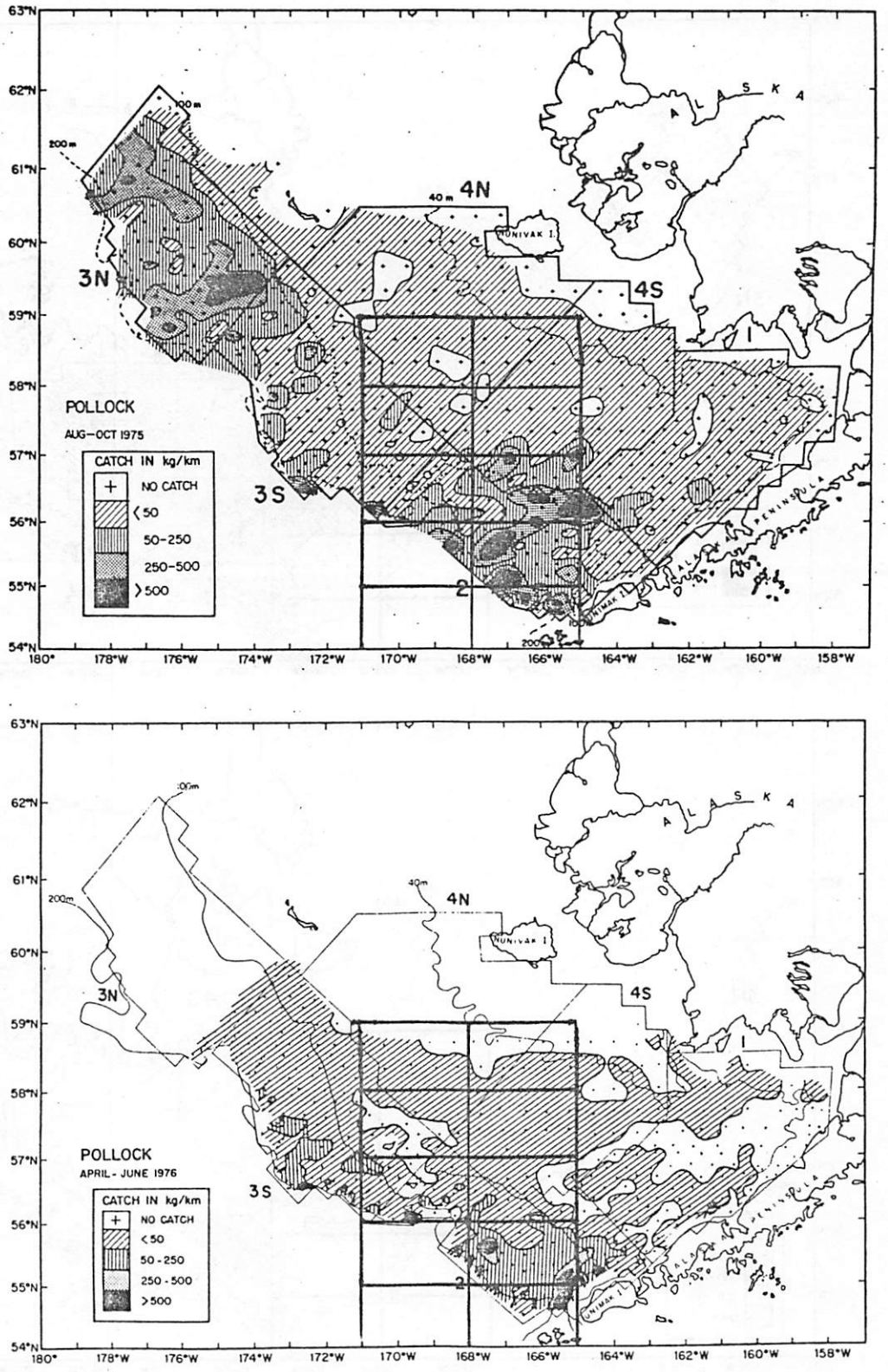

Figure 97.--Comparison between the apparent distributions and relative abundance of pollock during the 1975 and 1976 surveys; 1975 survey area boundary lines are superimposed upon both illustrations as a common reference.

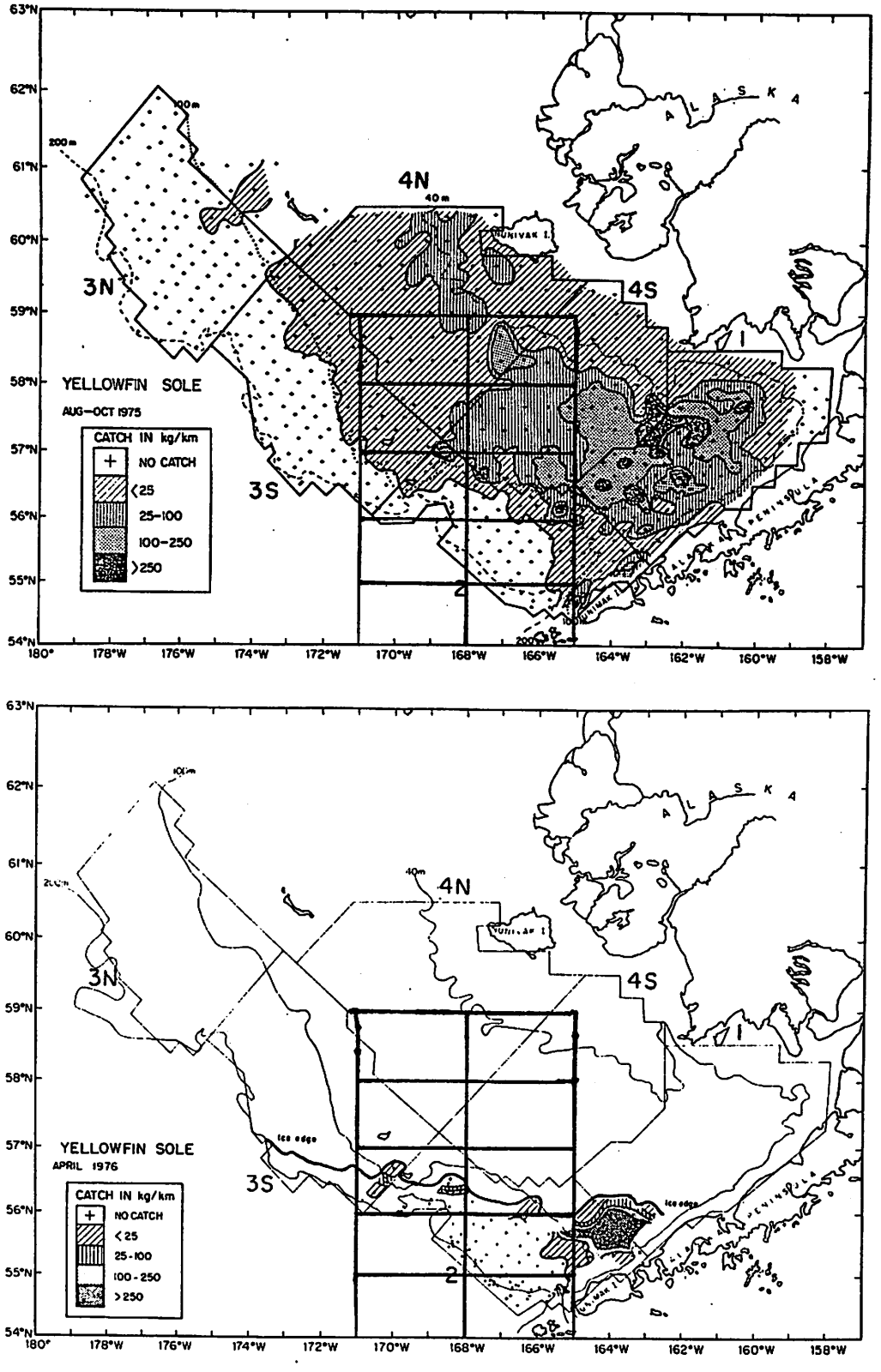

Figure 98.--Comparison between the apparent distributions and relative abundance of yellowfin sole during the 1975 survey and April 1976.

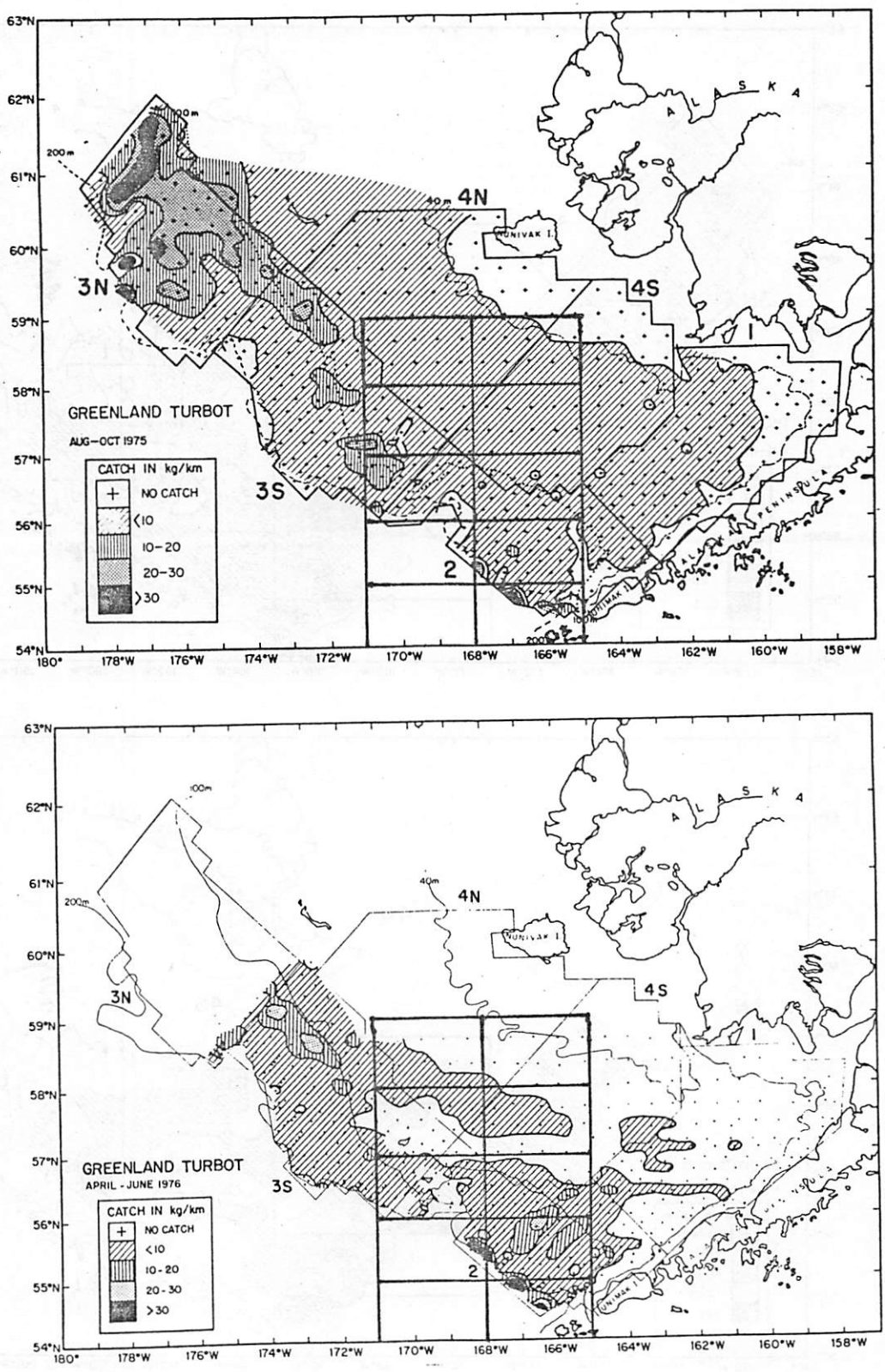

Figure 105.--Comparison between the apparent distributions and relative abundance of Greenland turbot during the 1975 and 1976 surveys.

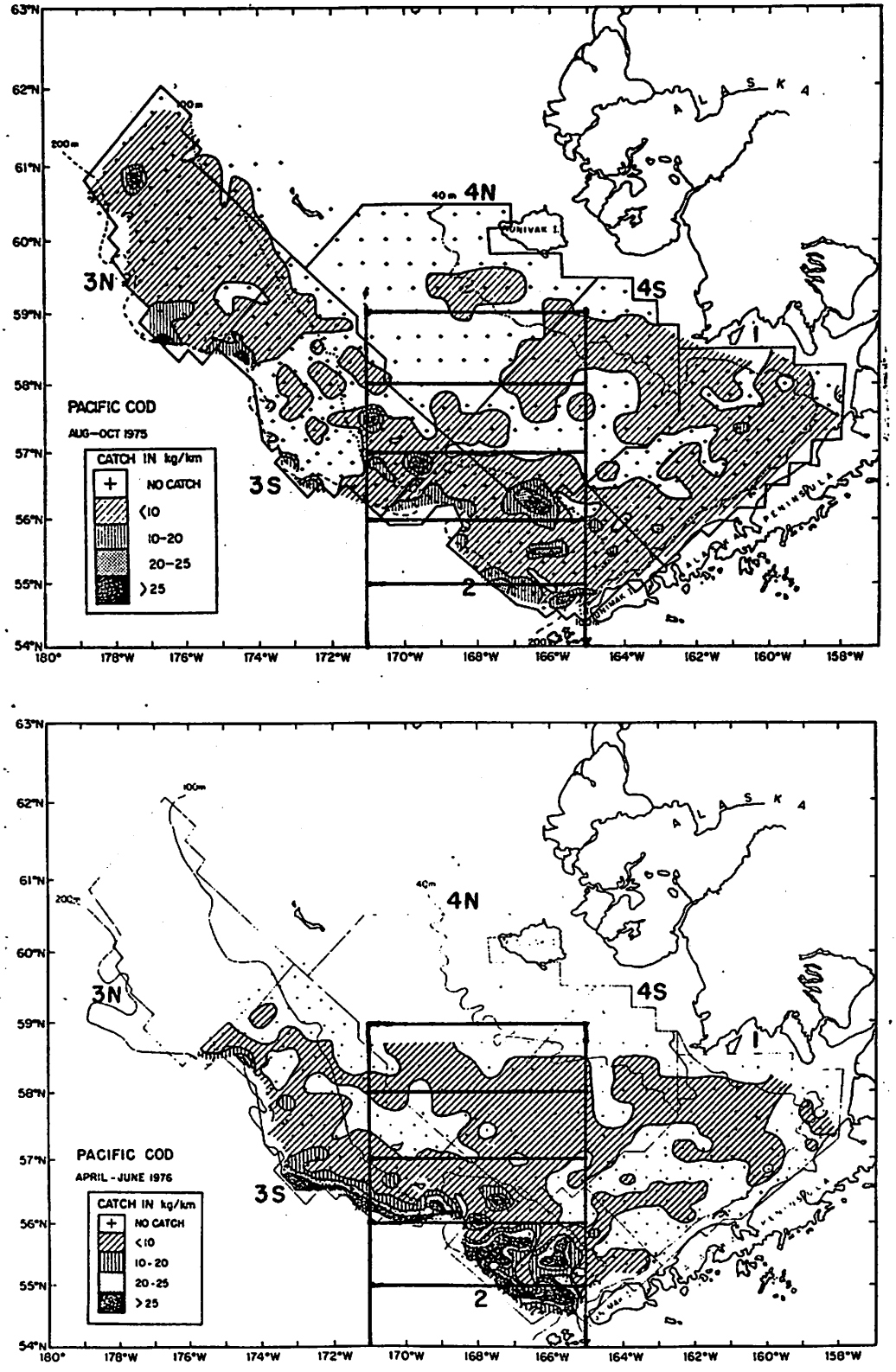

Figure 102.--Comparison between the apparent distributions and relative abundance of Pacific cod during the 1975 and 1976 surveys.

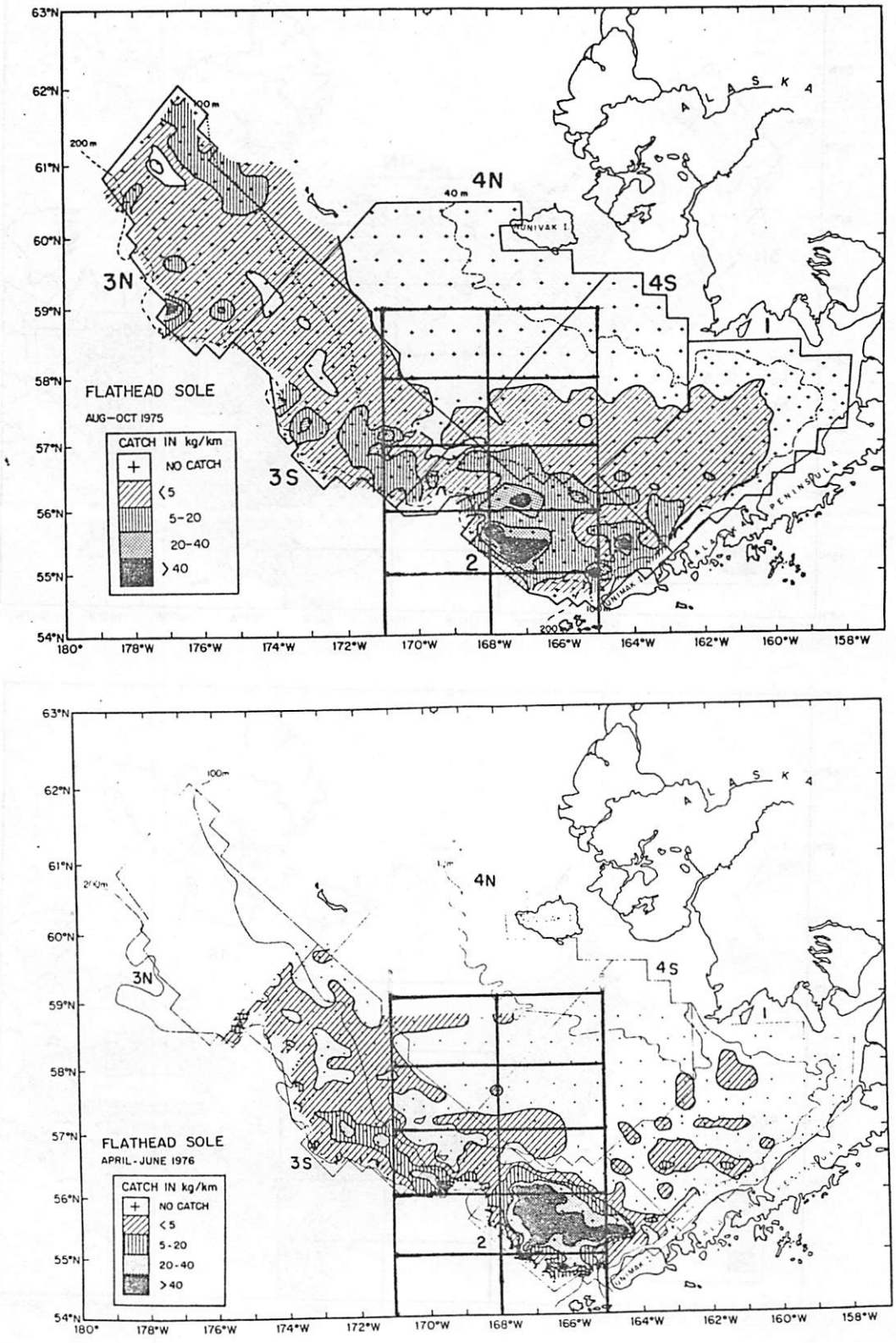

Figure 101.--Comparison between the apparent distributions and relative abundance of flathead sole during the 1975 and 1976 surveys.

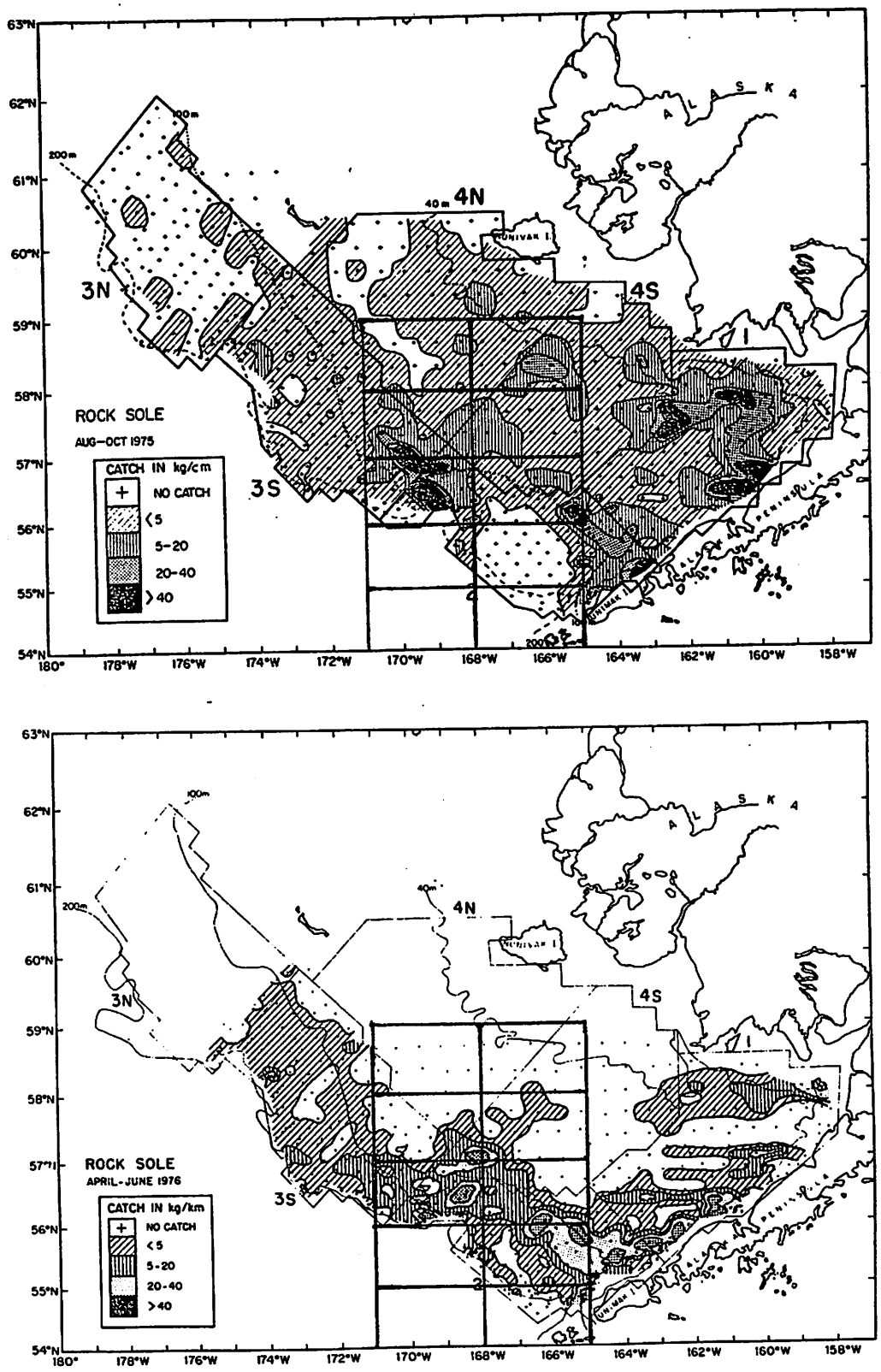

Figure 100.--Comparison between the apparent distributions and relative abundance of rock sole during the 1975 and 1976 surveys.

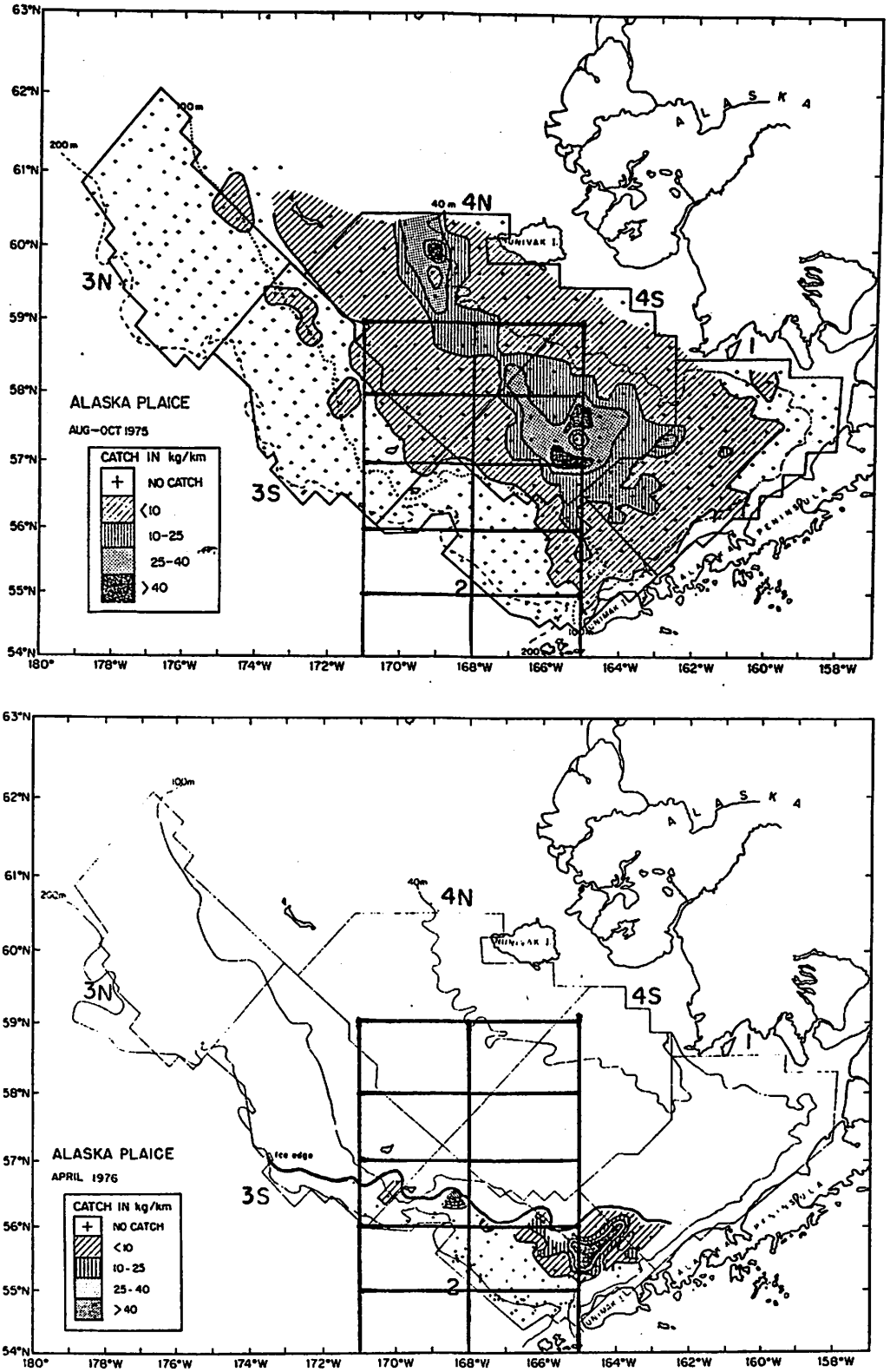

Figure 103.--Comparison between the apparent distributions and relative abundance of Alaska plaice during the 1975 survey and April 1976.

Response to letter dated May 4, 1979, from Governor Jay S. Hammond, State of Alaska.

Comment: Believes the March 9 schedule strikes a good balance, and urges that Interior resist any backsliding toward accelerated leasing philosophy that prevailed a few years ago. In general, the comments received from local government support the leasing sequence proposed by Alaska in December. Community representatives tend to emphasize concerns or questions they may have rather than the year in which leasing should or should not occur. Alaska recommends that the following leasing sequence be followed:

(1) There is no objection to proceeding with sales in nearshore Beaufort Sea, Gulf of Alaska and Cook Inlet;

(2) Sales in Navarin Basin, Norton Basin, Hope Basin, and the Kodiak Shelf should be delayed until safe technology is developed in the nearshore Beaufort Sea;

(3) Sales in the nearshore areas of Norton and Navarin Basins may be appropriate for leasing by 1983-1985; and

(4) Sales in the Chukchi Sea, Southern Aleutian Shelf, St. George-Bristol Basin, and the Beaufort Sea ice shear and offshore pack ice zones need to be postponed indefinitely.

Eight evaluation criteria were used by the State to ensure consistency with State goals and policies. One State policy which has received increased emphasis since the December submission is the need to develop a viable bottomfish industry in Alaska. Keenly interested in Interior doing all it can to maintain and even enhance the productivity of Alaska's fisheries by coordinating leasing operations, stipulations and port development so as to comply with the needs of Alaska's developing fisheries industry.

Response: Because of the need to develop additional, secure supplies of oil and gas, and in order to comply with the President's Energy Message of April 5, the decision has been made to provide for earlier consideration of Alaskan areas where there is an indication of high potential for hydrocarbon discovery. The changes affecting Alaska are as follows: Norton Basin has been moved from December 1982 to September 1982; St. George Basin has been moved from February 1985 to December 1982 and is no longer identified as a second category sale; a sale is listed for October 1983 in a new planning region called the North Aleutian Shelf; the 1984 Cook Inlet sale has been dropped; the Navarin Basin sale has been moved from January 1985 to December 1984; and the Chukchi Sea sale has been moved from December 1984 to February 1985 and is no longer identified as a second category sale. Careful attention has been given to our ability to collect environmental and geotechnical data which we believe will be useful for the pre-sale decision points. A discussion of how the environmental studies program has been considered in determining sale dates can be found under Tab B - Part 5 of the background material. We also have considered the availability of technology to ensure safe operations in the respective areas. Industry views on the availability of technology can be found under Tab B - Part 4 of the background material.

We believe the broad authorities which have been provided to the Department to control oil and gas activities offshore and the procedures we have put in place to implement those authorities, as determined by both legal and policy requirements, will enable us to resolve possible difficulties so that oil and gas leasing can be conducted in a safe manner.

MUD COMPONENTS USED IN SEAWATER - LIGNOSULFONATE SYSTEMS
TO 15,000 FEET. WEIGHT IN THOUSAND POUNDS 1/

	Interval 0-900 Ft.	Interval 900-3500 Ft.	Sub-total 3500 Ft.	Interval 3500-10,000 Ft.	Sub-total 10,000 Ft.	Interval 10-15,000 Ft.	TOTAL 15,000 Ft.
Barium Sulfate (Barite)	3	3	6	529	535	625	1,160
Bentonitic Clay	10	10	20	36	56	9	65
Attapulgite Clay	5	5	10	-	10	-	10
Caustic	.5	.5	1	20	21	23	44
Aromatic Detergent		1	1	2	3	-	3
Organic Polymers		1	1	3	4	-	4
Ferrochrome Lignosulfonate				26	26	69	95
Sodium Chromate						2	2
TOTALS	18.5	20.5	39	616	655	728	1,383 (691.5 tons)

1/ These are "typical" values and quantities may vary by as much as 50 percent from well to well.

Deck drainage includes all effluents resulting from platform washings, deck washings, and run-off from curbs, gutters, and drains including drip pans and work areas. The constituents of concern in this effluent are oil and grease. No quantitative information on concentration ranges is available; however, these discharges are strictly controlled. See Section I.B. for pertinent regulatory requirements.

The sanitary wastes from offshore oil and gas facilities are composed of human body waste and domestic waste such as kitchen and general housekeeping wastes. Variables which affect the volume and concentration of these wastes include time, space, occupancy, platform characteristics, and operational situation. Floating solids are of great concern from this effluent due to the adverse aesthetic effects created thereby.

b. Onshore Water Effluents

The significant onshore water effluents which could result from OCS development would be those associated with the construction of new onshore facilities and the operation of those new gas processing facilities, and marine terminals constructed as a result of the proposal.

The significant alterations to onshore water quality accompanying construction activities include temporary increases in suspended sediment and nutrient load to water bodies which receive runoff from construction sites. Important variables include size of area disturbed, topographic relief, soil type, precipitation, time under construction, and environmental engineering considerations such as catch basins and turbidity dams.

Gas processing plants generate 85 percent of their wastewater output from cooling water and 10 percent from boiler feed. Water consumption is assumed to be 1.5 gallons per day per thousand cubic feet of gas processed. The approximate waste water constituents are presented in the table below.

GAS PROCESSING PLANT WASTEWATER POLLUTANTS

USE	POLLUTANT	CONCENTRATION (LBS/1000 GAL)
Cooling	Chromate	0.25
	Zinc	0.025
	Chlorine	0.0012
Boilerfeed	Phosphates	0.34
	Sulfite	0.17
	Sludge conditions	0.17
	Oil and grease	0.08

Marine terminals discharge waste water as a result of deballasting tankers. Important variables controlling the constituents of ballast water include the type of product previously transported, and the degree of treatment applied to the ballast water prior to discharge. The approximate constituents of the effluent from a ballast water treatment facility are given in the table below.

MARINE TERMINAL BALLAST WATER POLLUTANTS

POLLUTANTS	POUNDS PER MILLION GALLONS
Biochemical Oyxgen Demand	88
Total Suspended Solids	84
Chemical Oxygen Demand	320
Oil and Grease	18

Petrolum refineries produce process waste water which contains concentrations of contaminants such as oil and grease, suspended solids, phenols, chromium and sulfides and exerts great biological and chemical oxygen demand on receiving water. This raw effluent is normally treated to reduce these constituents prior to discharge. New refinery construction is not anticipated as a direct result of the proposed action.