UNITED STATES

(DEPARTMENT OF THE INTERIOR)

GEOLOGICAL SURVEY. [Reports - Open file series]

NOTES on the acquisition of

High resolution seismic profiles, side scan sonar records, and sampling locations from lower Cook Inlet and Kodiak Shelf, R/V SEA SOUNDER cruise S7-77-WG, September - October, 1977.

Arnold H. Bouma, 1932-

Monty A. Hampton

U.S. Geological Survey

345 Middlefield Road

Menlo Park, California 94025

U.S. GEOLOGICAL SURVEY

OPEN FILE REPORT 78-727

Menlo Park, California

August, 1978

This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards and nomenclature.

INTRODUCTION

During the period from September 14 through October 10, 1977 the second U.S. Geological Survey geo-environmental cruise was conducted in lower Cook Inlet and on the Kodiak shelf and adjacent upper continental slope, Gulf of Alaska, aboard the R/V SEA SOUNDER (Figure 1, Tables 1, 2 and 3). The objective of this curise was to study in detail specific potentially hazardous environmental conditions identified as a result of the first reconnaissance geo-environmental cruise conducted from June 18 through July 30, 1976 (Bouma and Hampton, 1976; Hampton and Bouma, 1976). In particular, the distribution and movement of seafloor bedforms were studied in lower Cook Inlet, and sediment dispersal patterns and submarine sediment slides were investigated on the Kodiak shelf and slope. High resolution seismic profiling (sparker, uniboom, minisparker, 3.5 khz, 12 khz) and side-scanning sonar surveys formed the basis for selecting stations for observations with bottom television and 70 mm bottom camera as well as for different types of sampling of surficial sediments (piston corer, gravity corer, hydroplastic corer, Soutar grab sampler). The success of the 1977 cruise was limited by adverse weather conditions.

Generalized trackline charts are given in Figures 2 and 3. Detailed shot-point charts could not be constructed clearly, because of the overlap and coincidence of many of the lines. Station locations are shown in Figure 4 and 5, and sampling information is given in Table 4. Table 5 is a computer output of data pertaining to start and end of the survey lines.

The results of our investigations to date can be found in the references listed at the end of this text. Background information on lower Cook Inlet with several references is given in open-file report 75-429 (Magoon and others), and on the Kodiak shelf in open-file report 76-325 (von Huene and others).

In addition, this report accompanies the basic seismic-reflection and side-scanning sonar records acquired on the cruise, that are publicly available ~~on microfilm~~ from the National Geophysical

and Solar Terrestrial Data Center EDS/NOAA, Boulder, Colorado 80302. These records can be inspected at U.S. Geological Survey offices at Rm B-164, Deer Creek Facility, 345 Middlefield Road, Menlo Park, California 94025.

INSTRUMENTATION AND PROCEDURES

Navigation

Two independent navigational systems were used by the scientific party. One unit consisted of a Magnavox integrated satellite-Loran C system, the other was a Motorola Mini-Ranger unit. The data from the integrated system were automatically recorded on magnetic tape, as well as typed out on a keyboard printer. The Mini-Ranger data were recorded on paper.

Every 15 minutes the positions were plotted manually on a 1:250,000 scale chart. For easy reference a shot-point number was given to each 15-minute position. In addition to the routine plots, the locations of major course changes were also plotted. Furthermore, dead-reckoning positions, based on satellite data, the ship's single-axis speed log and the gyro, were computed every two seconds by the integrated system and stored on magnetic tape.

The Mini-Ranger system received its return signals from shore-based transponders positioned at desirable locations by a land-based support group. A maximum line-of-sight range over 80 nautical miles was obtained for some transponder locations.

The Mini-Ranger was used as the primary navigational system because of the high frequency and accuracy of the data and because most tracklines were within range limits of the system. Also, many positions obtained by the intergrated system were of low quality due to lack of adequate Loran C coverage in this region and because of a high percentage of satellite passes with elevations that precluded good position determinations.

In addition to the navigation by the scientific party, the ship's officers frequently succeeded in using radar and obtaining line-of-sight bearings. Correspondence between the ship's and scientific positions generally was very high.

Seismic Profiling and Visual Format Systems

Sparker: Sparker data were recorded in Cook Inlet and on the Kodiak shelf, using a Teledyne system at a power of 40, 80, 120 or 160 kilojoules. Seismic signals were received on a Teledyne 100-element, single-channel hydrophone, and the record was printed on a Raytheon model 1900 Precision Recorder. Usually, sweep and firing rates were at 2 seconds. Although several different settings were used, filters generally were adjusted to receive signals between 20 and 160 hertz. Records were annotated at 15-minute intervals with shot-point number, time (Greenwich Mean Time, GMT), and water depth.

Uniboom: The uniboom system used four EG&G model 234 power sources of 200 joules each driving hull-mounted plates. The hydrophone was an EG&G model 265. Data were recorded on an EPC 4100 recorder. Sweep and firing rates were typically at one-half second although some quarter-second and one second rates were used. Filter settings typically were at about 600 to 1600 hertz.

Annotations were made in the same manner as those on the sparker system, but at 5-minute intervals.

High-resolution: A Raytheon TR-109 3.5 kiloHertz seismic system, with a Raytheon 105 PTR transceiver and a CESP-II correlator, was used to gather high-resolution shallow-penetration seismic data, as well as bathymetry. The system operated with 12 hull-mounted transducers, and the data were recorded on an EPC 4100 recorder. Sweep and firing rates typically were at one-half second, but quarter-second and one second rates also were used. Annotations were made in the same manner as those on the uniboom system.

Record quality: Four factors that significantly affected quality of the seismic records were the typically coarse-grained and hard nature of the unconsolidated surficial sediments, the shallow water depth throughout most of both areas, acoustic vibrations from the vessel, and rough seas.

Coarse-grained and hard sediments had the most severe effect on the uniboom and 3.5 kHz records, causing much of the outgoing energy from these high-frequency systems to be reflected directly from the sea bottom with only a minor amount of energy penetrating through to subbottom reflectors. Some of the uniboom records show subtle, irregular traces of subbottom reflectors, which can be traced and correlated only with difficulty. Many of the 3.5 kHz records show no sign of subbottom reflectors and can be used only as indicators of water depth.

The shallow water depth caused multiples to appear at small distances below the initial sea-bottom reflection, partially or totally obscuring signals from deeper reflectors.

Although these four factors each have a deleterious effect on record quality it was found by varying ship speeds and filter settings that the nature of the bottom sediments was the main reason for the seismic systems to display "poor" subbottom acoustic reflections on the records. Depth of penetration and details in the record consequently varied with type of bottom and water depth. Except for certain parts, the records allow adequate subbottom interpretation of geology.

Side scan sonar: The side scan sonar unit used was an EG&G model, normally operated at a 125 m scale and towed above the bottom at 10% of the scale employed. Some high quality records were obtained. Although all side scan sonar surveys were run at a ship speed of 4-41/2 knots, currents could be responsible for a higher speed over the bottom.

Normally the uniboom and 3.5 kHz units were run simultaneously with side scan sonar for depth control and possible subbottom information.

Bottom television and bottom camera: A Hydro Products bottom television unit, underwater mercury lights, together with a 70 mm camera, were mounted in a large frame. Photographic exposures could be made by remote control by the TV screen observer. A multiconductor cable, leading to the camera and light, was taped at 5-m intervals to the winch cable.

Since currents are always present in the lower Cook Inlet area it was impossible to fly the sled slowly and at a uniform distance over the bottom. Consequently a system of jumping had to be used, lowering the sled to the bottom and giving some slack wire. Due to ship's drift the cables became taut after a few seconds and the sled was then dragged over the bottom. The monitor operator then informed the winch operator to raise the unit, straighten the wire angle and lower it again.

Sampling Devices

Piston corer: A typical arrangement for the piston corer consisted of a 2000 or 1500-pound weight stand to which three 10-foot, 3-inch ID coring pipes were attached. Butyrate and polycarbonate plastic liner were used, usually both types alternatingly to avoid liner collapse. A free fall of 15-feet (5 m) proved to work very well. A brass-fingered core catcher was inserted in the cutting ring. We also found out that a solid piston caused less problems than a break-away type.

The cores were cut into 1.5 m sections, capped and taped. Prior to final sealing a water content sample was removed with a steel syringe, and if time permitted a vane shear measurement made at the tip of each section with a laboratory vane shear apparatus. The core sections were then recapped, taped, labelled and sealed with wax, after which they were stored vertically in a walk-in refrigerator.

Gravity corer: The gravity corer consisted of an 1500-pound weight to which one 10-foot, 3-inch ID core tube was attached. A clear liner was used with a brass-fingered core catcher. Processing of the core was similar to the one given for the piston core.

Hydroplastic corer: The hydroplastic corer is a modification of the gravity corer (see Bouma, 1969). The type used had external weights up to 600 pounds, a valve, and a double ring clamp in which a 10-foot long, 3.5-inch ID, bevelled PVC pipe was inserted. The larger diameter facilitates subsampling for geotechnical purposes. The cores were treated in a similar way as described above.

Van Veen grab samplers: The normal Van Veen grab sampler proved to be too light for adequate sampling of the typically sandy-gravelly bottoms. Generally successful attempts were obtained with a heavy modified grab sampler constructed by Andy Soutar of Scripps Institution of Oceanography.

A four-legged frame houses two vertical rails along which the actual grab could move. The top covers of the sampler could be opened completely for full access. The addition of weight up to 400 pounds on top of the grab provided sufficient force for the half-round sides to dig into coarse material during the closing operation. When rock fragments got caught between both halves of the grab, incomplete closure resulted and part or all of the sample was lost. In general the results were good to adequate, and this instrument retrieved samples where other devices failed.

REFERENCES PERTAINING TO ENVIRONMENTAL GEOLOGY
IN LOWER COOK INLET AND KODIAK SHELF-SLOPE

Bouma, A. H., 1969. Methods in the Study of Sedimentary Structures: John Wiley and Sons, New York: 458 p.

Bouma, A. H., and Hampton, M. A., 1976. Preliminary report on the surface and shallow subsurface geology of lower Cook Inlet and Kodiak Shelf, Alaska: U.S. Geological Survey Open-file Rept. 76-695, 36 p.

Bouma, A. H., Hampton, M. A., Wennekens, M. P., and Dygas, J. A., 1977. Large dunes and other bedforms in lower Cook Inlet, Alaska: Preprints Offshore Technology Conf., Paper 2737, p. 79-85.

Bouma, A. H., Hampton, M. A., and Orlando, R. C., 1977. Sandwaves and other bedforms in lower Cook Inlet: Marine Geotechnology, v. 2, p. 291-308.

Bouma, A. H., Hampton, M. A., Frost, T. P., Torresan, M. E., Orlando, R. C., and Whitney, J. W., 1978. Bottom characteristics of lower Cook Inlet, Alaska: U.S. Geological Survey Open-file Rept. 78-236, 90 p.

Bouma, A. H., Hampton, M. A., Rappeport, M. E., Teleki, P. G., Whitney, J. W., Orlando, R. C., and Torresan, M. E., 1978. Movement of sand waves in lower Cook Inlet, Alaska: Preprints Offshore Technology Conf., Paper 3311.

Hampton, M. A. and Bouma, A. H., 1976. Seismic profiles of lower Cook Inlet and Kodiak Shelf, R/V SEA SOUNDER, June - July 1976: U.S. Geological Survey Open-file Rept. 76-848, 36 p., 4 maps, 4 rolls microfilm.

Hampton, M. A., and Bouma, A. H., 1977. Seismic reflection records showing stable and unstable slopes near the shelf break, western Gulf of Alaska: U.S. Geological Survey Open-file Rept. 77-702, 9 p.

Hampton, M. A., and Bouma, A. H., 1977. Slope instability near the shelf break, western Gulf of Alaska: Marine Geotechnology, v. 2, p. 309-331.

Hampton, M. A., Bouma, A. H., Torresan, M. E., and Colburn, I. P., 1978. Analysis of microtextures on quartz sand grains from lower Cook Inlet, Alaska: Geology, v. 6, p. 105-110.

Hein, J. R., Bouma, A. H., and Hampton, M. A., 1977. Distribution of clay minerals in lower Cook Inlet and Kodiak shelf sediment, Alaska: U.S. Geological Survey Open-file Rept. 77-581, 18 p.

Magoon, L B., Adkson, W. L., Chmelik, F. B., Dolton, D. G., Fisher, M. A., Hampton, M. A., Sable, E. G., and Smith, R. A., 1976, Hydrocarbon potential, geologic hazards, and infrastructure for exploration and development of the lower Cook Inlet, Alaska: U.S. Geol. Survey Open-file Report 76-449, 124 p.

von Huene, R., Bouma, A. H., Moore, G. W., Hampton, M. A., Smith, R. A., Dolton, G. L., 1976, A summary of petroleum potential, environmental geology, and the technology, time frame, and infrastructure for exploration and development of the western Gulf of Alaska: U.S. Geol. Survey Open-file Report 76-325, 92 p.

Table I. Cruise itinerary of the R/V SEA SOUNDER during 1977 in lower Cook Inlet and on Kodiak shelf and upper slope, Alaska.

Port	Arrive	Depart	Remarks
Kodiak		14 Sept. 8:08a (257/1708)	to lower Cook Inlet
Homer	16 Sept. 8:23a (259/1723)	17 Sept. 5:57a (260/1457)	loading
Homer	18 Sept. 9:45a (261/1845)	18 Sept. 12:53p (261/2253)	loading
Homer	21 Sept. 7:00a (264/1700)	22 Sept. 9:04a (265/1804)	weather
Homer	25 Sept. 10:30a (268/1930)	27 Sept. 10:00a (270/1900)	to Kodiak area
Kodiak	29 Sept. 6:00a (272/1500)	29 Sept. 2:01p (272/2301)	drop crew member off
Kodiak	10 Oct. 8:00a (283/1700)		end of cruise

Note: between brackets are given the Julian day and times in GMT.

Leg I, Sept. 14 - Sept. 25, lower Cook Inlet.

Leg II, Sept. 27 - Oct. 10, Kodiak shelf and upper slope.

Total underway time 517 hours, of which 69 hours on stations.

Table II. Types and amounts of data collected on board the R/V SEA SOUNDER during the 1977 cruise in lower Cook Inlet and the Kodiak shelf-upper slope.

Data type	Trackline	Remarks
Single channel arcer	655 nm = 1213 km	4 rolls recording paper
Uniboom	418 nm = 775 km	13 rolls recording paper
Minisparker	274 nm = 508 km	3 rolls recording paper
Side scan sonar	401 nm = 743 km	28 rolls recording paper
3.5 kHz	2029 nm = 3758 km	27 rolls recording paper
12 kHz	1809 nm = 3351 km	25 rolls recording paper
Navigation	2142 nm = 3967 km	7 reels digit mag. tape
Shipboard gravity	816 nm = 1513 km	6 reels digit mag. tape
Gravity core		10 recoveries
Piston core		1 recovery
Hydroplastic core		1 recovery
Soutar grab		30 recoveries
TV/camera		4.8 - 4.9 hours
Temp. salinometer		497 hours, 4 rolls
Penetrometer		3 lowerings

Table III. Scientific personnel on board the R/V SEA SOUNDER during the 1977 cruise in lower Cook Inlet and the Kodiak shelf - upper slope. (Unless specified the USGS, P.A.B. refers to the Pacific-Arctic Branch of Marine Geology in Menlo Park, California).

Arnold H. Bouma	USGS, PAB	co-chief scientist	I-II
Monty A. Hampton	id.	co-chief scientist	I-II
John A. Baltierra	id.	geologist	I
Ray M. Batson	USGS, Flagstaf	geologist	I till 21 Sep.
Robert P. Britch	Dames and Moore, Anchorage	geologist	Sept. 18-21
Edward Clukey	USGS, PAB	soil engineer	II
Ivan P. Colburn	Cal. State Univ., L.A.	geologist	I
Joseph A. Dygas	BLM, Anchorage	geologist	I till 17 Sep.
Christina E. Gutmacher	USGS, PAB	geologist	I-II
Barry Irwin	USGS, Woods Hole	navigator	I-II
Randy Koski	USGS, PAB	geologist	II
David T. McTique	id.	geologist	I-II
James Nicholson	id.	electronics	1)
Robert Novak	id.	electronics	II
Rcbert C. Orlando	id.	geologist	I
Charles Parson	Cal. State Univ., L.A.	geologist	I
Mel L. Rappeport	USGS, PAB	geologist	I
Dwight A. Sangrey	USGS, Denver	soil engineer	II
William Schwab	USGS, PAB	geologist	I-II
Andrew Stevenson	id.	marine tech.	I-II
William E. Sweet	USGS, Metairie, La	geologist	II

Table III. (cont.)

Phyllis Swenson	USGS, PAB	cartographer	I-II
Gordon L. Tanner	id.	electronics	I-II
Paul G. Teleki	USGS, Reston	geologist	I
Dennis Thurston	USGS, Anchorage	geologist	I till Sept. 17
Michael E. Torresan	USGS, PAB	geologist	I-II
Bruce W. Turner	USGS, Anchorage	geologist	II
John W. Whitney	id.	geologist	I

Ships Officers

Alan McClenaghan	captain
Howard Sheppard	chief engineer
Ornulf Johannesen	chief mate

1) Jim Nicholson was the electronics engineer for the small boat operation that failed due to rough weather.

TABLE IV. INFORMATION ON SAMPLING STATIONS AND SAMPLES, CRUISE S7-77-WG

Station Number	Latitude Longitude	Water Depth (m)	Equipment Type	Comments	Physiographic Location
200	58° 36.8'N 151° 50.3'W	159	Soutar Van Veen	Pebbly muddy sand	Transition Kodiak Shelf to lower Cook Inlet
201	58° 41.4'N 152° 14.9'W	126	"	Pebbly sand layer over pebbly muddy sand.	"
202	58° 45.6'N 152° 42.5'W	190	"	Sandy mud	"
203	58° 46.4'N 153° 02.5'W	149	Gravity corer	Mud (100 cm)	"
204	58° 51.3'N 152° 54.2'W	164	Soutar Van Veen	Pebbly muddy sand	"
205	58° 58.8'N 153° 11.3'W	118	"	Muddy sand	"
206	59° 28.5'N 152° 41.7'W	66	Bottom TV and 70 mm camera		
	to			Bedforms observations	medium-sized bedforms
	59° 32.3'N 152° 37.2'W	64			
207	59° 33.9'N 151° 56.3'W	41	"	Station abandoned due to equipment malfunction.	small-sized bedforms
	to				
	59° 33.9'N 151° 56.1'W	33			
208	59° 33.4'N 152° 15.2'W	?	"	"	"
209	59° 31.3'N 151° 56.0'W	41	"	Bedform observations	different types of bedforms, mainly small-size ones
	to				
	59° 34.0'N 151° 58.3'W	46			
210	59° 33.2'N 152° 08.5'N	45	"	Bedform observations	"
	to				
	59° 32.8'N 152° 11.0'W	45	"	"	"

TABLE IV. INFORMATION ON SAMPLING STATIONS AND SAMPLES, CRUISE S7-77-WG

Station Number	Latitude Longitude	Water Depth (m)	Equipment Type	Comments	Physiographic Location
211	59° 33.0'N 152° 16.3'W	71	"	Station abandoned due to equipment malfunction	small-medium sized bedforms
	to				
	59° 34.4'N 152° 15.6'W	69			
212	59° 31.0'N 152° 33.6'W	70	"	Bedform observations	small-sized bedforms
	to				
	59° 31.3'N 152° 30.9'W	58			
213	59° 29.6'N 152° 28.3'W	63	Soutar Van Veen	Sand	large-sized bedforms
214	59.° 27.6'N 152.° 25.7'W	63	"	Sand	medium-sized bedforms
215	57° 11.4'N 152° 25.9'W	115	Gravity corer	Shell and ash-bearing sand (19 cm)	Depression north of middle Albatross Bank
216	57° 06.0'N 152° 20.6'W	96	Soutar Van Veen	Ash-bearing sand	Shallow depression on middle Albatross Bank
217	57° 00.0'N 152° 12.9'W	75	"	Sandy mud	Middle Albatross Bank
218	56° 51.4'N 152° 03.5'W	97	Gravity corer	No recovery	Shelf-break trough, middle Albatross Bank
219	56° 42.6'N 151° 53.6'W	79	Soutar Van Veen	Sandy gravel	Seaward of bedrock high, middle Albatross Bank
220	56° 43.8'N 151° 55.9'W	62	"	One boulder recovered	Bedrock high, middle, Albatross Bank
221	56° 41.4'N 151° 51.9'W	191	Gravity corer	15cm sand overlying clayey, pebbly sand (57cm)	Shelf break, middle Albatross Bank
222	56° 36.9'N 151° 46.5'W	942	"	Muddy sandy gravel (10cm)	Continental slope, off middle Albatross Bank
223	56° 45.4'N 151° 33.0'W	1303	Soutar Van Veen	Mud (silt and clay)	Slope basin below. Slump, off middle Albatross Bank

TABLE IV: INFORMATION ON SAMPLING STATIONS AND SAMPLES, CRUISE S7-77-WG

Station Number	Latitude Longitude	Water Depth (m)	Equipment Type	Comments	Physiographic Location
224	56° 46.8'N 151° 34.8'W	992	Gravity corer	Olive green mud (270cm)	Within slump, off middle Albatross Bank
	to				
	56° 46.5'N 151° 34.8'W	1034	Piston corer	" (415cm)	
225	56° 47.9'N 151° 37.5'W	601	Gravity corer	Slightly sandy mud (290cm)	Headwall scarp above Slump, off middle Albatross Bank
226	56° 48.1'N 151° 40.0'W	370	"	Muddy sand (101cm)	Undisturbed slope above slump, off middle Albatross Bank
227	57° 05.6'N 151° 40.0'W	358	Soutar Van Veen	Sandy, silty clay	Continental slope, off Chiniak Trough
228	57° 07.5'N 151° 15.2'W	185	"	Shell layer over gravelly sand	Shelf break, Chiniak Trough
229	57° 14.2'N 151° 20.0'W	172	"	Silty ash	Shelf-break trough, Chiniak Trough
230	57° 12.4'N 151° 27.2'W	102	"	Station abandoned due to rough weather	Progradational wedge, Chiniak Trough
231	57° 24.3'N 151° 22.4'W	182	Gravity corer	Ash (70cm)	Chiniak Trough
232	57° 22.0'N 150° 35.9'W	262	Soutar Van Veen	Sandy gravel	Shelf break, northern Albatross Bank
233	57° 17.4'N 150° 35.7'W	633	"	No recovery	Continenal slope of northern Albatross Bank
234	57° 31.3'N 150° 49.7'W	94	"	Gravelly sand	Northern Albatross Bank
235	57° 31.7'N 150° 18.0'W	258	"	No recovery	Continental slope, off northern Albatross Bank
236	57° 04.2'N 149° 28.2'W	230	"	Sandy mud layer over slightly muddy sand grading to sand (20cm)	Stevenson Trough, breach through sill
237	57° 57.3'N 149° 40.6'W	134	"	Station abandoned due to rough weather	Stevenson trough, on sill

TABLE IV. INFORMATION ON SAMPLING STATIONS AND SAMPLES, CRUISE S7-77-WG

Station Number	Latitude Longitude	Water Depth (m)	Equipment Type	Comments	Physiographic Location
238	57° 56.0'N 150° 10.0'W	191	Bottom TV and 70 mm camera	Bedform observations	Stevenson Trough, bedform field.
	to				
	57° 56.0'N 150° 10.1'W	200			
239	57° 51.0'N 149° 07.9'W	975	Gravity corer	Slightly gravelly and sandy mud (290 cm)	Headwall scarp above slump, off Portlock Bank.
240	57° 48.4'N 149° 05.4'W	1415	"	Slightly pebbly and sandy mud (70 cm)	Within slump, off Portlock Bank
241	57° 41.4'N 149° 39.0'W	572	"	Pebbly sand in core catcher	Continental slope off Stevenson Trough
	57° 41.3'N 149° 39.2'W	606	Soutar Van Veen	Sand	
242	57° 31.3'N 150° 16.6'W	300	"	Muddy sand	Continental slope, off northern Albatross Bank
243	57° 48.5'N 150° 01.2'W	190	"	Slightly muddy sand layer over sand	Stevenson Trough, on sill
244	57° 51.7'N 149° 50.9'W	257	"	Sand	Stevenson Trough, wide breach through sill
245	57° 57.6'N 149° 39.7'W	135	"	Gravel layer over muddy sand	Stevenson Trough, on sill
246	58° 12.8'N 149° 13.4'W	134	"	Sand	Portlock Bank
247	59° 32.3'N 152° 41.2'W	58	"	"	small-sized bedforms
248	59° 32.0'N 152° 39.5'W	62	"	"	"
249	59° 31.2'N 152° 38.6'W	69	"	"	"
250	59° 31.2'N 152° 38.5'W	69	"	"	"

TABLE IV. INFORMATION ON SAMPLING STATIONS AND SAMPLES, CRUISE S7-77-WG

Station Number	Latitude Longitude	Water Depth (m)	Equipment Type	Comments	Physiographic Location
251	59° 30.8'N 152° 38.9'W	62	Soutar Van Veen	Sand	small-sized bedforms
252	59° 36.7'N 152° 38.1'W	73	"	"	"
	59° 32.5'N 152° 38.1'W	73	"	"	"
253	59° 30.4'N 152° 36.9'W	60	Soutar Van Veen	Sand	small-sized bedforms

TABLE V. COMPUTER PRINTOUT OF DATA PERTAINING TO START AND END OF SURVEY LINES

TRACKLINES

257	2319.0	LINE	200	START	L#	200	STN/SP#	0	58	31.16	-151	20.22
258	218.0	LINE	200	END	L#	200	STN/SP#		58	50.72	-151	1.09
258	237.0	LINE	201	START	L#	201	STN/SP#	0	58	49.94	-151	1.87
258	429.0	LINE	201	END	L#	201	STN/SP#		58	34.93	-151	19.31
258	431.0	LINE	202	START	L#	202	STN/SP#	0	58	35.04	-151	19.79
258	639.0	LINE	202	END	L#	202	STN/SP#		58	36.50	-151	49.45
258	8 0.0	LINE	203	START	L#	203	STN/SP#	1	58	37.52	-151	52.94
258	927.0	LINE	203	END	L#	203	STN/SP#		58	40.51	-152	12.36
258	1048.0	LINE	204	START	L#	204	STN/SP#	0	58	42.17	-152	18.66
258	12 0.0	LINE	204	END	L#	204	STN/SP#		58	43.80	-152	39.58
258	1257.0	LINE	205	START	L#	205	STN/SP#	0	58	45.80	-152	44.59
258	1354.0	LINE	205	END	L#	205	STN/SP#		58	45.50	-153	2.38
258	1526.0	LINE	206	START	L#	206	STN/SP#	0	58	46.31	-153	2.83
258	16 6.0	LINE	206	END	L#	206	STN/SP#		58	51.22	-152	54.31
258	1644.0	LINE	207	START	L#	207	STN/SP#	0	58	51.27	-152	54.11
258	1811.0	LINE	207	END	L#	207	STN/SP#	6	58	58.79	-153	15.95
258	1920.0	LINE	208	START	L#	208	STN/SP#	0	59	1.24	-153	14.36
258	2125.0	LINE	208	END	L#	208	STN/SP#	9	59	12.13	-152	52.23
258	2128.0	LINE	209	START	L#	209	STN/SP#	0	59	12.29	-152	51.70
258	2225.0	LINE	209	END	L#	209	STN/SP#	5	59	10.03	-152	38.17
258	2230.0	LINE	210	START	L#	210	STN/SP#	0	59	10.25	-152	37.12
258	2252.0	LINE	210	END	L#	210	STN/SP#	2	59	12.96	-152	34.86
258	2255.0	LINE	211	START	L#	211	STN/SP#	0	59	12.97	-152	34.45

SHIP: R/V SEA SOUNDER

CRUISE LOCATOR: S7-77-WG
ID -YR-AREA

CHIEF
SCIENTIST: BOUMA / HAMPTON

JUL. DAY	TIME (GMT)	CRUISE/DATA INFO RECORD. MEDIUM	SEQNCE NUMBER	DATA STATUS/ INSTITUTE	PERSONNEL,PORTS,EQUIPMENT DESCRIPTION OR: LINE#		STA./SHOT PT.#	WATER DEPTH UNCOR.	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN
		TRACKLINES				(CONTINUED)						
259	028.0	LINE	211	END	L#	211	STN/SP#	7	59	14.68	-152	21.08
259	035.0	LINE	212	START	L#	212	STN/SP#	0	59	14.76	-152	19.96
259	110.0	LINE	212	END	L#	212	STN/SP#	3	59	15.05	-152	14.24
259	145.0	LINE	213	START	L#	213	STN/SP#	1	59	14.79	-152	16.81
259	247.0	LINE	213	END	L#	213	STN/SP#	5	59	17.41	-152	26.81
259	252.0	LINE	214	START	L#	214	STN/SP#	0	59	17.70	-152	27.58
259	318.0	LINE	214	END	L#	214	STN/SP#	3	59	15.50	-152	27.95
259	322.0	LINE	215	START	L#	215	STN/SP#	0	59	15.38	-152	27.30
259	4 0.0	LINE	215	END	L#	215	STN/SP#	3	59	15.69	-152	21.22
259	417.0	LINE	216	START	L#	216	STN/SP#	0	59	16.77	-152	20.92
259	530.0	LINE	216	END	L#	216	STN/SP#	5	59	22.85	-152	31.04
259	542.0	LINE	217	START	L#	217	STN/SP#	0	59	21.90	-152	32.11
259	620.0	LINE	217	END	L#	217	STN/SP#	4	59	19.39	-152	34.90
259	639.0	LINE	218	START	L#	218	STN/SP#	0	59	20.71	-152	34.09
259	724.0	LINE	218	END	L#	218	STN/SP#	4	59	20.76	-152	26.67
259	738.0	LINE	219	START	L#	219	STN/SP#	0	59	20.17	-152	27.94
259	856.0	LINE	219	END	L#	219	STN/SP#	6	59	30.35	-152	39.78
259	9 8.0	LINE	220	START	L#	220	STN/SP#	0	59	30.52	-152	39.73
259	10 8.0	LINE	220	END	L#	220	STN/SP#	5	59	29.58	-152	33.89
259	1055.0	LINE	221	START	L#	221	STN/SP#	0	59	28.96	-152	33.51
259	1128.0	LINE	221	END	L#	221	STN/SP#	3	59	31.36	-152	33.97
259	1350.0	LINE	222	START	L#	222	STN/SP#	0	59	28.72	-152	9.90
259	15 0.0	LINE	222	END	L#	222	STN/SP#	5	59	29.25	-151	57.52
260	2322.0	LINE	223	START	L#	223	STN/SP#		59	25.91	-152	40.56
261	0 3.0	LINE	223	END	L#	223	STN/SP#		59	28.80	-152	41.44
261	134.0	LINE	224	START	L#	224	STN/SP#	0	59	26.88	-152	40.09
261	314.0	LINE	224	END	L#	224	STN/SP#	6	59	23.67	-152	40.14
261	345.0	LINE	225	START	L#	225	STN/SP#	1	59	25.38	-152	39.31
261	411.0	LINE	225	END	L#	225	STN/SP#		59	27.27	-152	39.45
261	445.0	LINE	226	START	L#	226	STN/SP#	1	59	29.14	-152	37.95
261	5 5.0	LINE	226	END	L#	226	STN/SP#		59	27.41	-152	40.62
261	734.0	LINE	227	START	L#	227	STN/SP#		59	30.75	-152	37.25
261	949.0	LINE	227	END	L#	227	STN/SP#		59	37.31	-152	2.04
261	1112.0	LINE	228	START	L#	228	STN/SP#	0	59	37.26	-152	4.40
261	1356.0	LINE	228	END	L#	228	STN/SP#		59	21.70	-152	2.01
261	1412.0	LINE	229	START	L#	229	STN/SP#	0	59	22.21	-152	0.03
261	15 8.0	LINE	229	END	L#	229	STN/SP#	5	59	28.79	-152	0.67
262	237.0	LINE	230	START	L#	230	STN/SP#	0	59	32.24	-152	3.67
262	8 5.0	LINE	230	END	L#	230	STN/SP#		59	36.51	-152	45.17
262	831.0	LINE	231	START	L#	231	STN/SP#	0	59	35.45	-152	44.76
262	11 2.0	LINE	231	END	L#	231	STN/SP#		59	36.47	-152	24.23
262	1146.0	LINE	772	START	L#	772	STN/SP#	0	59	33.22	-152	23.80
262	1940.0	LINE	772	END	L#	772	STN/SP#		59	13.92	-152	46.39
262	2130.0	LINE	233	START	L#	233	STN/SP#	1	59	18.87	-152	46.32
262	23 8.0	LINE	233	END	L#	233	STN/SP#	8	59	22.27	-152	46.02
262	2310.0	LINE	234	START	L#	234	STN/SP#	0	59	22.41	-152	45.92
263	052.0	LINE	234	END	L#	234	STN/SP#		59	28.31	-152	39.28

SHIP: R/V SEA SOUNDER CRUISE LOCATOR: S7-77-WG
ID -Y-R-AREA

CHIEF
SCIENTIST: BOUMA / HAMPTON

JUL. DAY	TIME (GMT)	CRUISE/DATA INFO RECORD. MEDIUM	SEQNCE NUMBER	DATA STATUS/ INSTITUTE	PERSONNEL,PORTS,EQUIPMENT DESCRIPTION OR: LINE#	STA./SHOT PT.#	WATER DEPTH UNCOR.	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN
		TRACKLINES			(CONTINUED)						
263	055.0	LINE	235	START	L# 235	STN/SP# 0		59	28.54	-152	39.32
263	134.0	LINE	235	END	L# 235	STN/SP#		59	31.57	-152	39.55
263	2 4.0	LINE	236	START	L# 236	STN/SP# 0		59	30.97	-152	39.22
263	220.0	LINE	236	END	L# 236	STN/SP# 2		59	30.73	-152	36.90
263	238.0	LINE	237	START	L# 237	STN/SP# 0		59	31.22	-152	37.02
263	4 8.0	LINE	237	END	L# 237	STN/SP#		59	26.48	-152	38.10
263	1050.0	LINE	238	START	L# 238	STN/SP# 0		59	27.59	-152	39.77
263	1440.0	LINE	238	END	L# 238	STN/SP#		59	4.66	-152	35.95
263	1444.0	LINE	239	START	L# 239	STN/SP# 0		59	4.62	-152	35.97
263	1551.0	LINE	239	END	L# 239	STN/SP#		59	4.86	-152	29.28
263	1555.0	LINE	240	START	L# 240	STN/SP# 0		59	4.96	-152	28.67
263	1810.0	LINE	240	END	L# 240	STN/SP#		59	18.40	-152	20.77
263	1815.0	LINE	241	START	L# 241	STN/SP# 1		59	18.34	-152	20.57
263	2250.0	LINE	241	END	L# 241	STN/SP# 20		59	4.03	-152	50.71
263	23 0.0	LINE	242	START	L# 242	STN/SP# 1		59	3.81	-152	49.99
264	016.0	LINE	242	END	L# 242	STN/SP# 7		59	2.97	-152	39.82
265	2145.0	LINE	243	START	L# 243	STN/SP# 1		59	34.80	-152	3.54
265	2340.0	LINE	243	END	L# 243	STN/SP# 9		59	36.40	-152	20.51
266	0 0.0	LINE	244	START	L# 244	STN/SP# 1		59	35.44	-152	20.25
266	230.0	LINE	244	END	L# 244	STN/SP# 11		59	34.31	-151	57.45
266	246.0	LINE	245	START	L# 245	STN/SP# 0		59	34.60	-151	56.79
266	6 2.0	LINE	245	END	L# 245	STN/SP#		59	33.32	-152	19.05
266	618.0	LINE	246	START	L# 246	STN/SP# 0		59	34.04	-152	17.08
266	851.0	LINE	246	END	L# 246	STN/SP#		59	34.26	-151	54.94
266	11 3.0	LINE	247	START	L# 247	STN/SP# 0		59	34.93	-151	57.30
266	12 6.0	LINE	247	END	L# 247	STN/SP#		59	34.62	-152	5.06
266	1233.0	LINE	248	START	L# 248	STN/SP#		59	32.85	-152	5.24
266	1356.0	LINE	248	END	L# 248	STN/SP#		59	33.14	-151	55.73
266	1439.0	LINE	248	START	L# 249	STN/SP#		59	34.91	-151	55.99
266	1620.0	LINE	248	END	L# 249	STN/SP#		59	35.60	-152	22.93
266	1636.0	LINE	250	START	L# 250	STN/SP# 0		59	36.65	-152	23.41
266	1910.0	LINE	250	END	L# 250	STN/SP# 11		59	49.40	-152	23.44
266	1920.0	LINE	251	START	L# 251	STN/SP# 0		59	49.39	-152	23.52
266	2012.0	LINE	251	END	L# 251	STN/SP#		59	46.45	-152	25.45
266	2045.0	LINE	251	START	L# 251	STN/SP#		59	46.48	-152	25.19
267	018.0	LINE	251	END	L# 251	STN/SP# 21		59	32.11	-152	37.22
267	2 8.0	LINE	252	START	L# 252	STN/SP# 0		59	31.47	-152	28.99
267	325.0	LINE	252	END	L# 252	STN/SP#		59	31.23	-152	21.99
267	338.0	LINE	253	START	L# 253	STN/SP#		59	30.89	-152	21.71
267	9 7.0	LINE	253	END	L# 253	STN/SP#		59	9.78	-152	34.80
267	924.0	LINE	254	START	L# 254	STN/SP#		59	9.48	-152	34.72
267	1125.0	LINE	254	END	L# 254	STN/SP#		59	10.65	-152	13.89
267	1142.0	LINE	255	START	L# 255	STN/SP#		59	10.41	-152	12.35
267	16 0.0	LINE	255	END	L# 255	STN/SP#		59	15.82	-152	34.28
267	1614.0	LINE	256	START	L# 256	STN/SP# 0		59	14.82	-152	31.08
267	19 9.0	LINE	256	END	L# 256	STN/SP# 12		59	11.75	-152	15.06
267	1915.0	LINE	257	START	L# 257	STN/SP# 1		59	12.27	-152	14.89

SHIP: R/V SEA SOUNDER

CRUISE LOCATOR: S7-77-WG
ID -YR-AREA

CHIEF
SCIENTIST: BOUMA / HAMPTON

JUL. DAY	TIME (GMT)	CRUISE/DATA INFO RECORD. MEDIUM	SEQNCE NUMBER	DATA STATUS/ INSTITUTE	PERSONNEL,PORTS,EQUIPMENT DESCRIPTION OR: LINE#	STA./SHOT PT.#	WATER DEPTH UNCOR.	LATITUDE DEG	MIN	LONGITUDE DEG	MIN
		TRACKLINES			(CONTINUED)						
268	3 2.0	LINE	257	END	L# 257	STN/SP#		59	46.80	-152	3.46
268	319.0	LINE	258	START	L# 258	STN/SP#		59	46.30	-152	3.87
268	640.0	LINE	258	END	L# 258	STN/SP#		59	45.55	-152	30.10
268	645.0	LINE	259	START	L# 259	STN/SP#	1	59	45.30	-152	30.86
268	930.0	LINE	259	END	L# 259	STN/SP#	12	59	36.15	-152	40.67
268	937.0	LINE	260	START	L# 260	STN/SP#		59	35.79	-152	40.61
268	1320.0	LINE	260	END	L# 260	STN/SP#		59	35.21	-152	2.58
271	818.0	LINE	261	START	L# 261	STN/SP#		59	28.14	-152	36.29
271	916.0	LINE	261	END	L# 261	STN/SP#		59	31.88	-152	31.53
271	1023.0	LINE	262	START	L# 262	STN/SP#	0	59	29.35	-152	29.09
271	1126.0	LINE	262	END	L# 262	STN/SP#		59	27.67	-152	38.69
271	1133.0	LINE	263	START	L# 263	STN/SP#		59	28.35	-152	38.63
271	1213.0	LINE	263	END	L# 263	STN/SP#		59	31.26	-152	32.89
271	2051.0	LINE	264	START	L# 264	STN/SP#		59	26.41	-152	33.63
271	2128.0	LINE	264	END	L# 264	STN/SP#		59	27.10	-152	36.99
274	411.0	LINE	268	START	L# 268	STN/SP#		56	47.91	-151	36.79
274	648.0	LINE	268	END	L# 268	STN/SP#		56	54.69	-151	26.74
274	944.0	LINE	269	START	L# 269	STN/SP#	0	56	56.26	-151	37.98
274	1140.0	LINE	269	END	L# 269	STN/SP#		56	50.32	-151	26.14
274	1314.0	LINE	270	START	L# 270	STN/SP#	0	56	52.56	-151	43.58
274	15 6.0	LINE	270	END	L# 270	STN/SP#	9	56	47.65	-151	32.35
274	1515.0	LINE	271	START	L# 271	STN/SP#	1	56	47.41	-151	32.77
274	1615.0	LINE	271	END	L# 271	STN/SP#	5	56	50.81	-151	45.89
274	1623.0	LINE	272	START	L# 272	STN/SP#	0	56	50.93	-151	46.70
274	1930.0	LINE	272	END	L# 272	STN/SP#	13	56	42.90	-151	24.44
275	1130.0	LINE	273	START	L# 273	STN/SP#	1	56	48.44	-151	40.81
275	14 0.0	LINE	273	END	L# 273	STN/SP#	11	57	5.71	-151	13.91
275	1830.0	LINE	274	START	L# 274	STN/SP#	1	57	7.97	-151	15.31
275	1924.0	LINE	274	END	L# 274	STN/SP#	5	57	14.19	-151	20.29
275	2038.0	LINE	275	START	L# 275	STN/SP#	0	57	14.14	-151	21.57
275	2133.0	LINE	275	END	L# 275	STN/SP#		57	11.68	-151	28.76
275	2248.0	LINE	276	START	L# 276	STN/SP#	0	57	12.73	-151	27.97
276	0 9.0	LINE	276	END	L# 276	STN/SP#		57	24.03	-151	22.24
276	057.0	LINE	277	START	L# 277	STN/SP#	0	57	24.50	-151	23.16
276	223.0	LINE	277	END	L# 277	STN/SP#	7	57	16.00	-151	14.51
276	235.0	LINE	278	START	L# 278	STN/SP#	0	57	16.38	-151	13.27
276	340.0	LINE	278	END	L# 278	STN/SP#		57	18.27	-151	6.40
276	345.0	LINE	279	START	L# 279	STN/SP#		57	18.13	-151	5.93
276	1012.0	LINE	279	END	L# 279	STN/SP#	27	56	52.29	-150	37.66
276	11 8.0	LINE	280	START	L# 280	STN/SP#		56	51.38	-150	36.33
276	1449.0	LINE	280	END	L# 280	STN/SP#	16	57	22.02	-150	36.29
276	19 4.0	LINE	281	START	L# 281	STN/SP#	0	57	17.30	-150	35.39
276	2236.0	LINE	281	END	L# 281	STN/SP#		57	31.53	-150	48.86
277	049.0	LINE	282	START	L# 282	STN/SP#	0	57	31.67	-150	48.41
277	320.0	LINE	282	END	L# 282	STN/SP#		57	31.54	-150	17.81
277	434.0	LINE	283	START	L# 283	STN/SP#		57	31.87	-150	16.47
277	721.0	LINE	283	END	L# 283	STN/SP#		57	47.84	-150	2.77

SHIP: R/V SEA SOUNDER

CRUISE LOCATOR: S7-77-WG
ID -YR-AREA

CHIEF
SCIENTIST: BOUMA / HAMPTON

JUL. DAY	TIME (GMT)	CRUISE/DATA RECORD. MEDIUM	INFO SEQNCE NUMBER	DATA STATUS/ INSTITUTE	PERSONNEL,PORTS,EQUIPMENT DESCRIPTION OR: LINE#	STA./SHOT PT.#	WATER DEPTH UNCOR.	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN
		TRACKLINES			(CONTINUED)						
277	732.0	LINE	284	START	L# 284	STN/SP#		57	48.36	-150	1.90
277	1330.0	LINE	284	END	L# 284	STN/SP#		58	7.20	-149	23.23
277	1718.0	LINE	285	START	L# 285	STN/SP#		57	57.06	-149	42.88
277	19 0.0	LINE	285	END	L# 285	STN/SP#		57	58.93	-150	2.98
277	1957.0	LINE	286	START	L# 286	STN/SP#		57	58.39	-150	5.07
277	2132.0	LINE	286	END	L# 286	STN/SP#		57	52.23	-150	17.20
277	2141.0	LINE	287	START	L# 287	STN/SP#		57	51.65	-150	17.15
277	2250.0	LINE	287	END	L# 287	STN/SP#		57	51.93	-150	7.95
277	2317.0	LINE	288	START	L# 288	STN/SP#		57	52.23	-150	6.90
278	230.0	LINE	288	END	L# 288	STN/SP#		57	59.42	-150	16.38
278	412.0	LINE	289	START	L# 289	STN/SP#		57	53.05	-150	16.52
278	621.0	LINE	289	END	L# 289	STN/SP#		57	56.89	-150	6.01
278	1030.0	LINE	290	START	L# 290	STN/SP#	1	57	57.12	-150	10.62
278	1319.0	LINE	290	END	L# 290	STN/SP#	13	58	3.79	-149	26.17
278	1350.0	LINE	291	START	L# 291	STN/SP#		58	4.24	-149	23.15
278	1745.0	LINE	291	END	L# 291	STN/SP#	16	57	48.14	-149	4.45
278	1753.0	LINE	292	START	L# 292	STN/SP#		57	48.12	-149	3.74
278	1842.0	LINE	292	END	L# 292	STN/SP#	4	57	54.09	-149	0.52
278	1848.0	LINE	293	START	L# 293	STN/SP#		57	54.08	-149	0.37
278	2112.0	LINE	293	END	L# 293	STN/SP#		57	47.84	-149	16.89
278	22 1.0	LINE	294	START	L# 294	STN/SP#		57	46.62	-149	20.57
278	2257.0	LINE	294	END	L# 294	STN/SP#		57	51.96	-149	9.17
279	322.0	LINE	295	START	L# 295	STN/SP#		57	48.11	-149	5.59
279	5 6.0	LINE	295	END	L# 295	STN/SP#		57	41.47	-149	38.74
279	7 0.0	LINE	296	START	L# 296	STN/SP#	1	57	41.06	-149	41.34
279	845.0	LINE	296	END	L# 296	STN/SP#	8	57	32.80	-150	12.81
279	1031.0	LINE	297	START	L# 297	STN/SP#		57	31.19	-150	17.12
279	1230.0	LINE	297	END	L# 297	STN/SP#	8	57	48.77	-150	0.61
279	1622.0	LINE	298	START	L# 298	STN/SP#		57	57.15	-149	39.00
279	1835.0	LINE	298	END	L# 298	STN/SP#		58	12.98	-149	12.96
279	1956.0	LINE	299	START	L# 299	STN/SP#	0	58	12.33	-149	11.34
280	054.0	LINE	299	END	L# 299	STN/SP#		58	18.12	-148	27.32
280	058.0	LINE	300	START	L# 300	STN/SP#	0	58	18.47	-148	27.44
280	153.0	LINE	300	END	L# 300	STN/SP#		58	20.83	-148	36.10
280	156.0	LINE	301	START	L# 301	STN/SP#	0	58	20.69	-148	36.27
281	235.0	LINE	301	END	L# 301	STN/SP#	100	57	49.72	-152	2.83
281	237.0	LINE	302	START	L# 302	STN/SP#	0	57	49.95	-152	2.88
281	334.0	LINE	302	END	L# 302	STN/SP#		57	57.00	-152	2.26
281	1815.0	LINE	303	START	L# 303	STN/SP#		58	16.49	-151	54.09
282	1630.0	LINE	303	END	L# 303	STN/SP#		60	3.02	-149	23.28

CAPTIONS

Fig. 1 Generalized location map of the study area.

Fig. 2 Trackline map 1977 (cruise S7-77-WG), lower Cook Inlet

Fig. 3 Trackline map 1977 (cruise S7-77-WG), Kodiak shelf and upper slope.

Fig. 4 Station location map for lower Cook Inlet

Station numbers 1-199: cruise S3-76-WG

Station number > 200: cruise S7-77-WG (1977)

Fig. 5 Station location map for Kodiak shelf and upper slope

Station number 1-199: cruise S3-75-WG

Station number > 200: cruise S7-77-WG (1977)

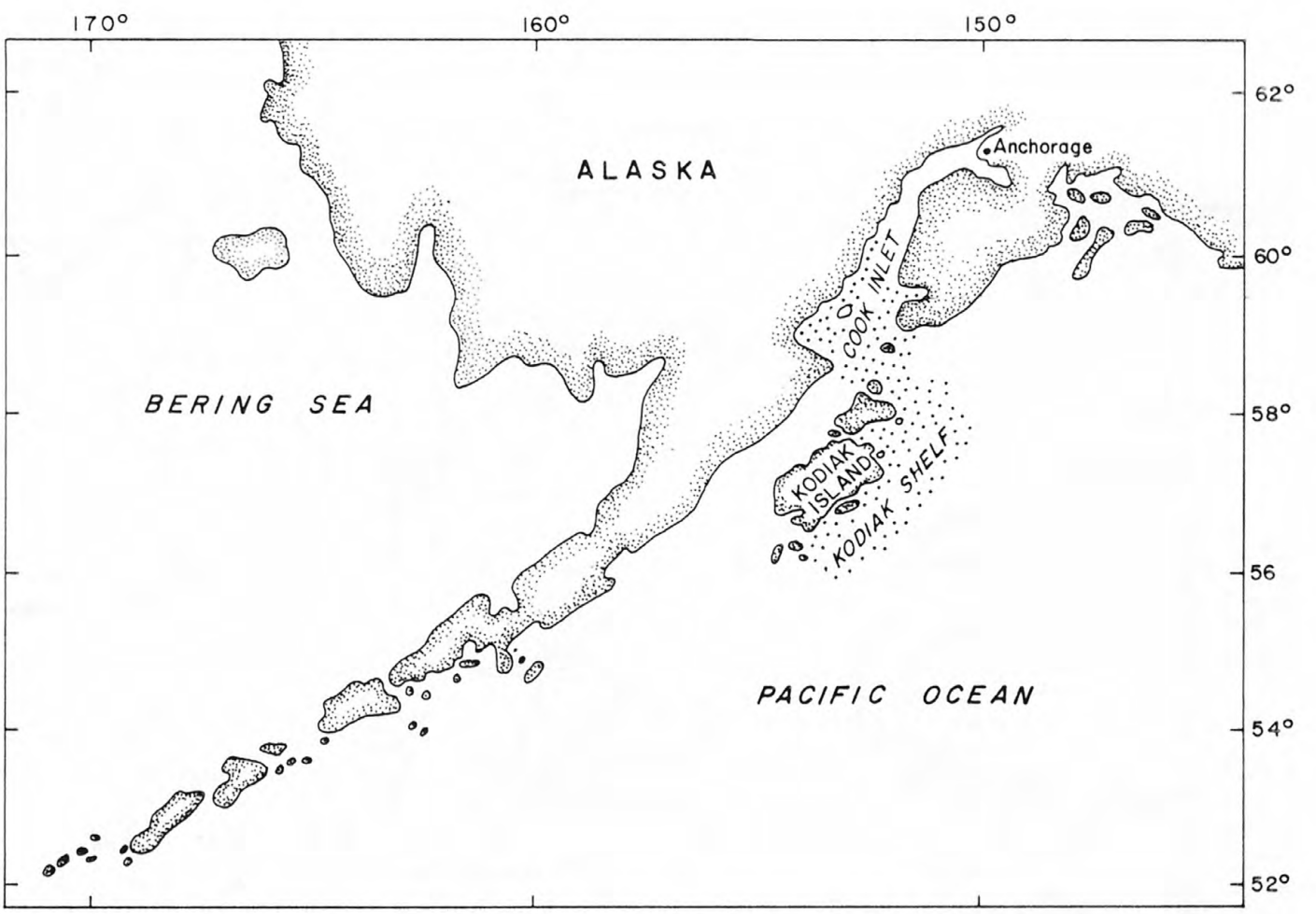

Figure 1.- Generalized location map of the study area

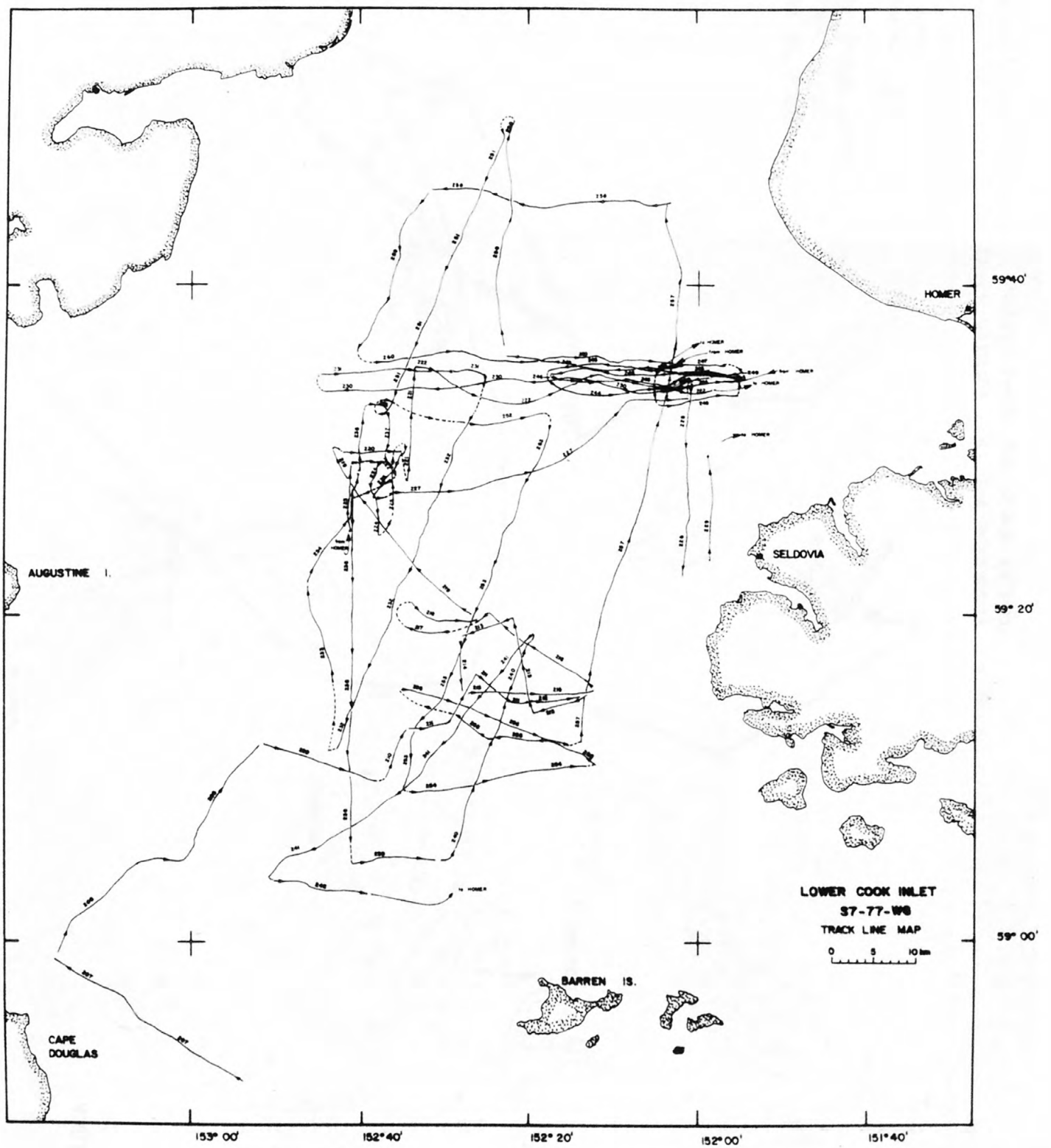

Fig. 2. Trackline map 1977 (cruise S7-77-WG, lower Cook Inlet.

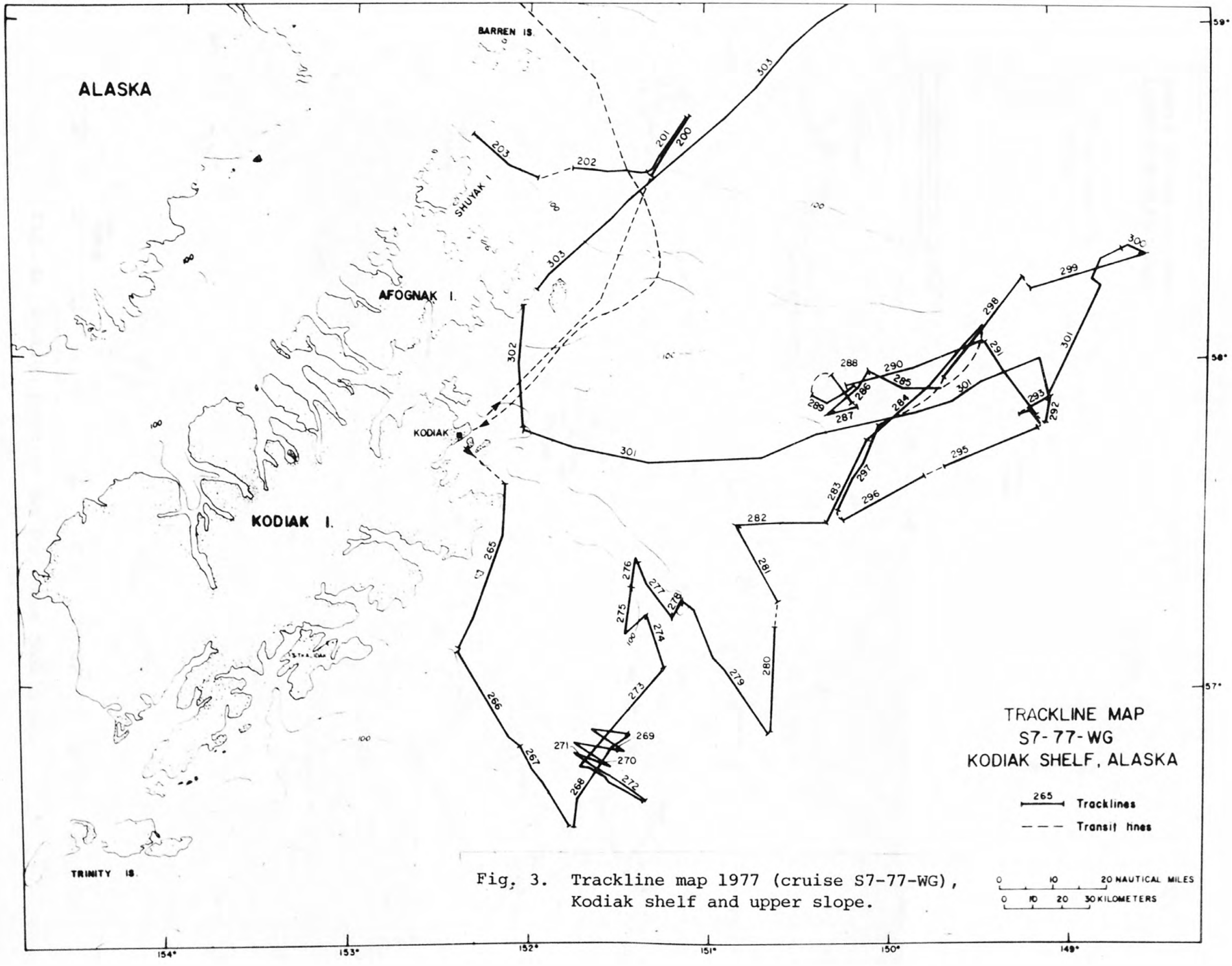

Fig. 3. Trackline map 1977 (cruise S7-77-WG), Kodiak shelf and upper slope.

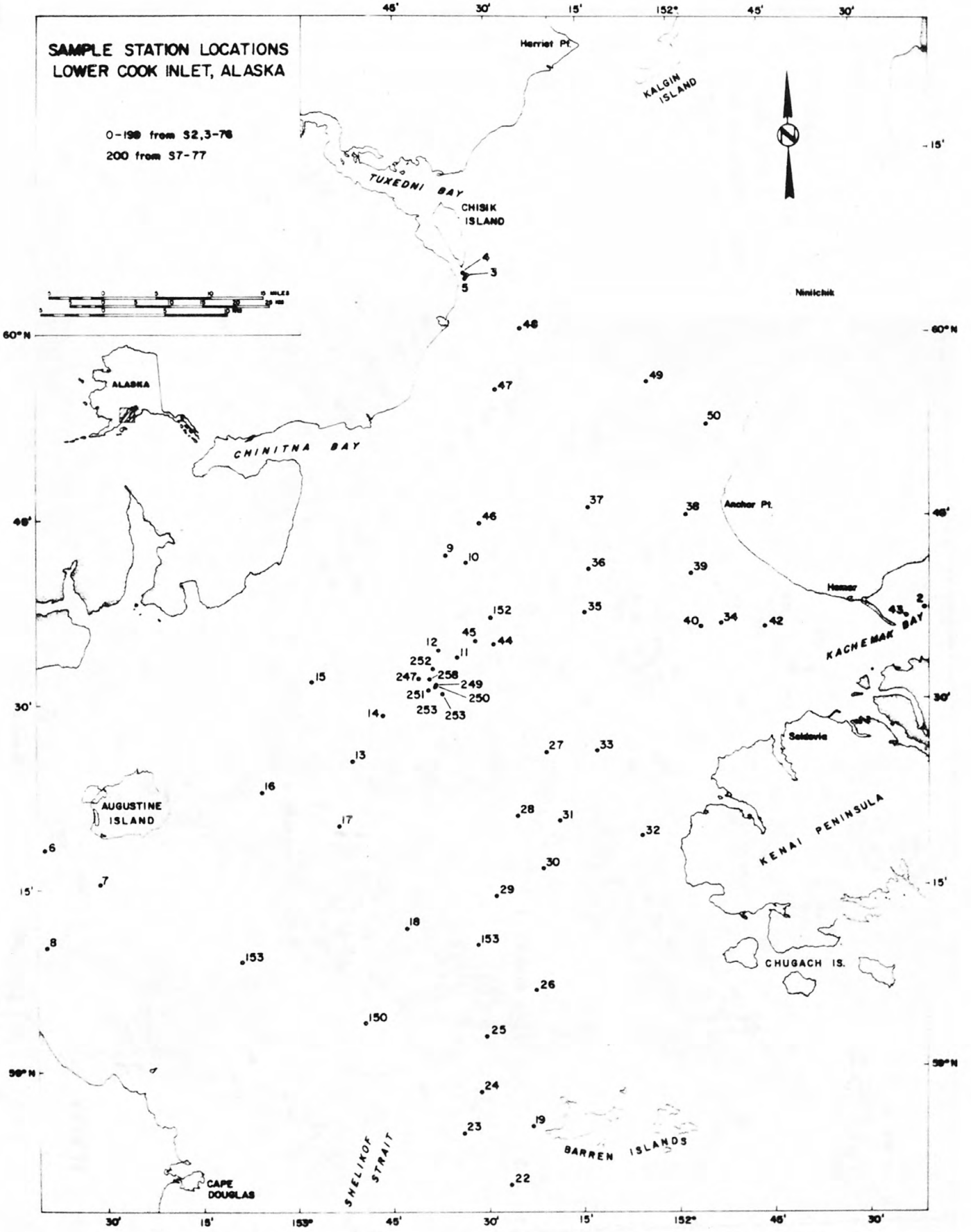

Fig. 4. Station location map for lower Cook Inlet.

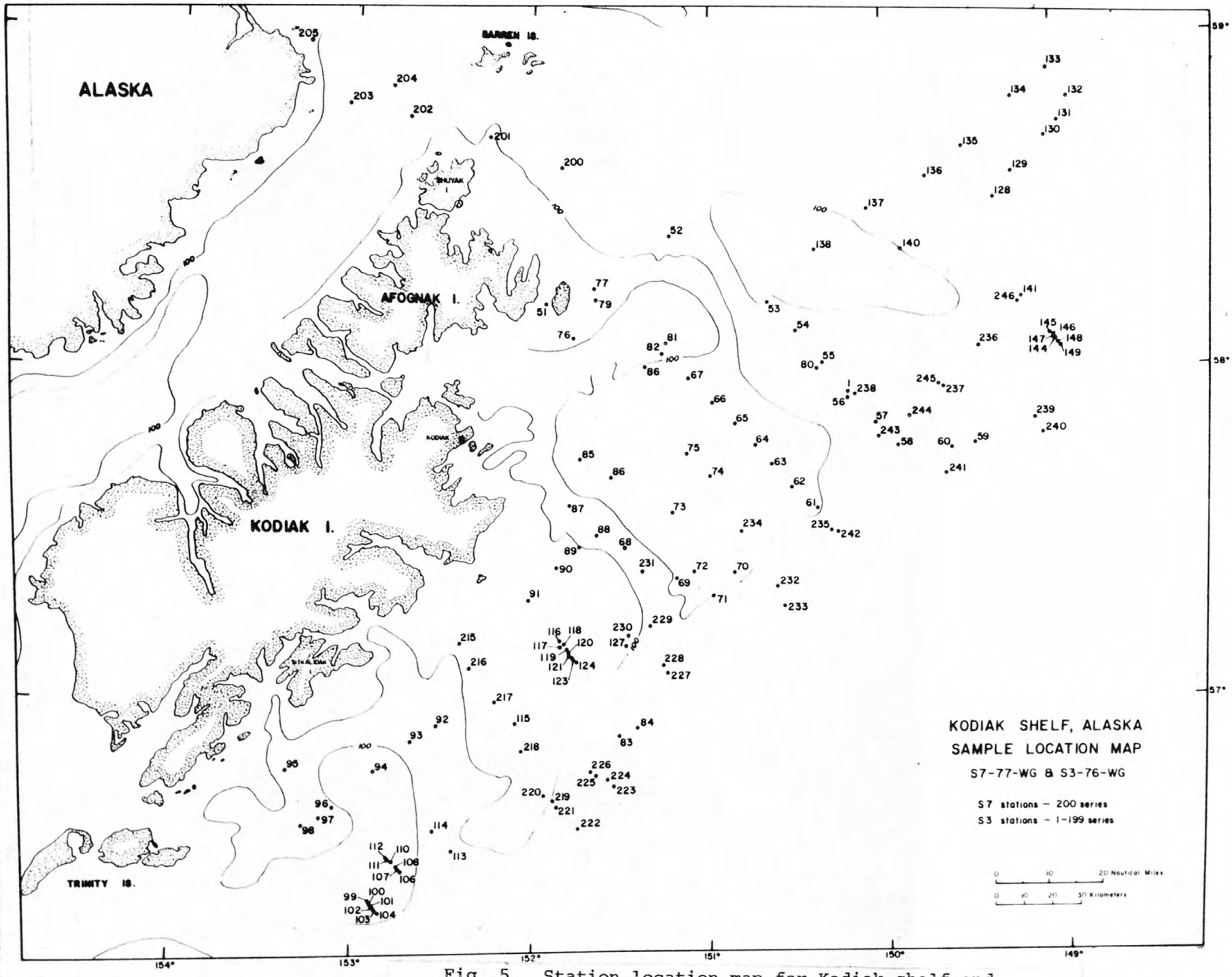

Fig. 5. Station location map for Kodiak shelf and upper slope.