NATURAL DISTRIBUTION AND ENVIRONMENTAL BACKGROUND OF TRACE HEAVY METALS IN ALASKAN SHELF AND ESTUARINE AREAS

by

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Final Report
Outer Continental Shelf Environmental Assessment Program
Research Unit 506

November 1979

ACKNOWLEDGMENTS

This study was supported by the Bureau of Land Management through interagency agreement with the National Oceanic and Atmospheric Administration, under which a multi-year program responding to needs of petroleum development of the Alaskan continental shelf is managed by the Outer Continental Shelf Environmental Assessment Program (OCSEAP) Office.

SUMMARY

Data are presented which help describe the natural distribution and environmental background of trace metals in Alaskan shelf and estuarine areas selected for future offshore oil exploration and recovery. This baseline information will provide a basis for assessing any future environmental perturbations of the trace metal distribution in the Alaskan shelf environment by the oil production operations. The suite of trace metals which have been emphasized in our phase of the overall Outer Continental Shelf Environmental Assessment Program (OCSEAP) are those most amenable to measurement by neutron activation analysis and include V, As, Sb, Zn, Co, Ba, Mn, Fe and Cr. These analyses complement the measurements of other investigators using atomic absorption spectrometry and X-ray fluorescence techniques. In addition to the above elements we have also measured other major and trace elements automatically detected by the instrumental neutron activation methods which we employ. This multielement approach is extremely valuable because much additional information is available to more completely characterize the biogeochemistry and history of the many samples which have been analyzed.

Between June, 1975 and September 1978, we have participated in five separate cruises off the Alaskan shelf to collect sediments, suspended particulate matter and seawater for trace metal analyses. These cruises covered the Bering Sea, the Gulf of Alaska, Cook Inlet and the Shelikof Strait. In addition sediment samples from Norton Sound, the Chukchi Sea and the Beaufort Sea were supplied by Dr. David Burrell of the University of Alaska. Biological samples of shelf and intertidal marine organisms were supplied to us from the April-June, 1976 sampling set by Drs. David Burrell and Howard Feder. During the program field efforts 631 samples

ranging from sediments (300 samples), suspended particulate (109 samples), water (137 samples) and biota (85 samples) were collected from the various study areas. Of this total of 631 samples, analyses were conducted on 451 including **109** suspended particulate samples, **133** sediments samples, 124 water samples, and 85 biota samples. All samples including the remainder of those analyzed have been frozen and retained for archival purposes.

In general, the Alaskan OCS study areas are characterized by trace metal concentrations and distributions in the sediments, suspended particulate, seawater and biota which are quite typical of uncontaminated coastal regions at the mid-latitudes. Considerable variability in trace metal distributions in sediments, suspended matter, seawater and biota is evident. However, these variations fall within the expected range when compared with literature values for other mid-latitude locations.

This baseline data will be of value in assessing any future potential trace metal impacts due to offshore oil recovery. However, based on the data at hand we cannot conceive of any activities related to offshore oil recovery that could significantly alter or provide a detrimental impact upon the trace metal distributions in the lease areas. Any impact from these activities would likely be so small as to be masked by the natural geographical and temporal variations in trace metal distributions in the sediments, suspended matter, water and biota. The trace metal concentrations in the oil itself (with the possible exception of vanadium) are so low compared with the concentrations naturally present in the sediments, suspended particulate, seawater and biota that no foreseeable trace metal contamination could result directly from oil pollution. More probable trace metal impacts, although viewed as non-problems, might result from the physical disturbances created by the platform construction, drilling operations and dredging that accompany the oil recovery operations. However, natural disturbances or processes such as storms, tidal cycles and river drainage would probably overshadow the small scale and localized perturbations in trace metal distributions which could possibly result from the oil related activities.

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I. INTRODUCTION

The projected recovery of crude oil from the Alaskan continental shelf carries with it the risk of altering this environment by physical perturbations or spillage of crude oil. Such disturbances could result in detrimental impacts on the natural cycling of trace metals in the shelf environment. It is therefore necessary to perform pre-development evaluations of the trace metal distributions and behavior in promising shelf areas so that any future contamination or perturbation may be identified, quantified and assessed.

The primary objective of this study is to determine environmental baseline concentrations of selected trace metals in seawater (both dissolved and suspended fractions), in sediments, and in selected marine "indicator organisms" of the Alaskan Outer Continental Shelf study area.

The research plan that has been formulated was designed to complement the University of Alaska's program under the direction of Dr. David C. Burrell by measuring those trace metals most amenable to neutron activation analysis. Of the total suite of elements measured in the overall programwe have concentrated our efforts on the analyses of V, As, Sb, Co, Ba, Mn, Fe, and Cr in sediments, biota and seawater. We do, however, measure additional major and trace metals automatically detected by the instrumental neutron activation analysis methods which we employ, and these measurements are included in this report.

This final report includes results of all analyses performed during our research efforts associated with the Alaskan shelf program including first field efforts in June 1975 through finalsamplingin September, 1978. Areal coverage extends from the Gulf of Alaska to the Bering Sea, Norton Sound, the Chukchi Sea, and to the Beaufort Sea.

This report contains information detailing the elemental composition of sediments, biota, and within the water column (both soluble and dissolved) for extensive areas of the Alaskan continental shelf. This information is useful since for many of the areas covered herein, previous data concerning elemental composition was scant to nonexistent, and the data reported provides a benchmark against which alterations caused by anthropogenic activities, including petroleum and other mineral extraction, can be measured.

II. SOURCES, METHODS AND RATIONALE OF DATA COLLECTION

A. Sources of Samples

During our participation in the Alaskan OCS program from first field efforts in June, 1975 to final field sampling in September, 1978, sediments, suspended particulate matter, and seawater samples were obtained from the Bering Sea (0SS Discoverer, June, 1975), the Western Gulf of Alaska (0SS Discoverer, October, 1975), the Eastern Gulf of Alaska (0SS Discoverer, November-December, 1975), and Cook Inlet and Shelikof Strait (0SS Discoverer, May, 1978 and August-September, 1978). In addition, samples from cruises in Norton Sound (0SS Discoverer, September, 1976), the Chukchi Sea (0SS Discoverer, September,1976) and the Beaufort Sea (USCGC Glacier, August-September, 1976) were supplied to us by Dr. David Burrell of the University of Alaska Institute of Marine Science.

Biological samples of intertidal organisms were supplied to us from the May-June, 1976 sampling set by Drs. David Burrell and Howard Feder. Benthic biota samples from the South Bering Sea (0SS Miller Freeman, April, 1976) were likewise supplied to us by Drs. Burrell and Feder.

Information regarding geographical station locations, types of samples obtained, and sample disposition are shown in Tables A.1 through A.9 of Appendix A. Regional sampling grids are displayed in Appendix B, Figures B.1 through B.8. During the program field efforts 631 samples ranging from sediments (300 samples), suspended particulates(109 samples), water (137 samples) and biota (85 samples) were collected from the various study areas. Of this total of 631 samples, analyses were conducted on 451 including 109 suspended particulate samples, 133 sediments samples, 124 water samples, and 85 niota samples. All samples including the remainder of analyzed samples, as well as those unanalyzed have been frozen and retained for archival purposes as noted in the Tables A.1 through A.9.

B. Methods of Sample Collection

Water samples were obtained via the stern hydrowinch and rosette aboard the 0SS Discoverer using Top Drop® Niskin Bottles during the 1975 field work and Teflon coated Go Flo® Niskin Bottles during 1978 field work. The Niskin Bottles were acid washed prior to use and kept closed until the last possible moment before water sampling to avoid potential contamination from the ships atmosphere. Water samples were filtered through 0.4P Nuclepore filters using a specially designed all plastic filtration system. During filtration the

10ℓ Niskin bottle was pressurized using N_2 and the water forced through an in-line filter assembly which was attached to the Niskin bottle outlet by a short piece of acid-washed polyethylene tubing. The water sample for analysis was taken after approximately 4-5 liters of water had washed through the filter assemb y; in this way potential contamination during filtration was minimized.

The 0.4P Nuclepore filter was saved for suspended particulate analysis after O or more liters of seawater had been filtered. Where possible the fil ter was further rinsed with an aliquot of distilled deionized water to remove the sea salts and thus facilitate analysis by neutron activation.

Sediment cores were obtained using a HAPS corer of Danish design. Surficial sediment cores of up to 30 cms were obtained with very minimal disturbance of the sediment surface. These cores were then sectioned into 2 cm intervals on shipboard using all plastic tools, the core segments placed into wide mouth 500 ml plastic bottles and frozen for return to the laboratory for subsequent analysis.

Biota samples were placed in plastic bags and kept frozen until analysis.

C. Rationale of Data Collection

Since little or no information existed previous to these field efforts concerning trace metal distributions in the OCS Alaskan shelf study areas, the initial phases of the program were designed to give maximum geographical coverage and thus generate baseline information concerning as wide an area of the Alaskan shelf as possible. Since potential impacts from oil production and transportation were the primary concern and the top of the sediment column would be first likely effected by oil spills, sediment examinations focused upon shallow coring and examination of the upper few centimeters of sediment. Likewise, water sampling was conducted in the nearshore shelf areas. Here the water column is generally well-mixed in most locations excepting estuaries and thus only near-surface and near-bottom water and suspended matter samples were felt necessary. In locations less than 50M only a near-surface sample was taken.

Biological samples focused upon intertidal organisms such as mytilus, while benthic organisms such as Neptunia and crab and the fin fish, rock sole and pollock were analyzed from nearshore waters.

III. ANALYTICAL METHODS

A. Sediments - "Whole Rock" Analyses

Some 300 sediments were collected during the sampling activities. Of these, 133 samples were subjected to neutron activation analysis. Samples were thawed and homogenized, a subsample was then withdrawn and oven dried at 85°C, and the remainder of the original sample refrozen. A wet-to-dry weight ratio was obtained after oven drying and a further subsample taken for neutron activation after the dried sample had been ground in an agate mortar and pestle. The subsample for neutron activation (10-100 mg) was placed into a sealed poly-ethylene bag and neutron activated along with standard reference materials (NBS Orchard leaf) or well-characterized materials such as USGS standard rocks. Two irradiation intervals and three counting periods were employed for quantitative measurement of short, medium and long-lived activation products via Ge(Li) gamma-ray spectrometry. In this manner the following elements were measured: Al, As, Ba, Ca, Co, Cr, Cs, Eu, Fe, K, La, Mn, Sb, Sc, Ta, Tb, Ti Th, and V. Although such elements as Al, Ca, Fe, Mn and Sc were not considered to be toxic metals, they do play Important roles in various marine geochemical cycles which could potentially be altered by severe oil impaction. These elements are also good indicators of the origin and type of sediment, and their measurement is important in understanding the distribution and geochemistries of the more toxic trace metals of major concern.

Silver concentrations in selected sediment samples were measured by dissolution of the neutron activated sediments by lithium metaborate fusion and then separating the silver by solvent extraction with dithizone. The extracts were counted in an anticoincidence NaI(Tl) well crystal to measure the ^{110m}Ag activity for determining the silver concentrations.

B. Sediments - "Available Fraction" Analyses

In addition to the "whole rock" analyses performed during the earlier baseline survey of the Alaskan shelf, selective leaching experiments were performed to determine the fraction of metals which are presumed to be readily "available" from sediments for biological assimilation. This readily "available" fraction is thought to best represent the part of the total sedimentary repository which might be subject to alteration and/or release due to petroleum related activities.

The methodology settled upon for the determination of "available" metals is that published by Malo, 1977. Briefly, it involves sequential exposure to dilute hydrogen peroxide followed by exposure to 0.3M HCl. Elements investigated by us were V, Mn, Fe, Co, and Sc. Scandium was chosen since it should indicate whether any degradation of mineral matter took place during the weak acid leaching.

C. Suspended Particulate Matter

The suspended particulate matter collected on the Nuclepore filters was analyzed in essentially the same manner as the sediments. The filters were encapsulated in 2/5 dram polyethylene vials and irradiated, along with appropriate standards (NBS Orchard Leaf and USGS Standard Rocks), in the Washington State University Trigs reactor. Two irradiation intervals and three counting periods were employed to measure the short, medium and long-lived neutron activation products

D. Seawater

Instrumental neutron activation analysis was employed to measure Zn, Co, Sb, U, Cs, Fe and Rb in selected OCS seawater samples. This was accomplished by evaporating 30 ml of seawater and transferring the salts into 2/5 dram polyethylene irradiation vials. The vials, together with appropriate standards, were neutron irradiated for 16 hours in the Hanford Reactor. Because of the large amounts of ^{24}Na (15 hr) and ^{82}Br (36 hr) which interfere with the measurement of other activation products, the samples were stored for 4 weeks following the irradiation to permit the decay of these interferences. The samples were then counted overnight (1000 minutes) on a Ge(Li) gamma-ray spectrometer.

Vanadium analyses require pre-separation from the seawater matrix to eliminate interferences. This was accomplished as follows: to 100 ml aliquots of seawater in precleaned polystyrene beakers was added 5 mg high purity iron solution and 250 µl of phenol red indicator (0.1 gm per 250 ml of 0.001M NaOH). High purity 1.5M NH_4OH was then added dropwise while stirring until the first permanent color change from yellow to red occurred at a pH of about 7.8 ± 0.3. The $Fe(OH)_3$ precipitates were allowed to settle for about 20 minutes and the precipitates were then centrifuged and washed 3 times with 0.5M ammonium acetate containing 1g/ℓ of Magnifloc. The precipitates were then transferred to 2/5 dram precleaned polyethylene snap-top vials and were dried slowly under a heat lamp. The vials were then sealed in polyethylene bags and encapsulated in 2-dram polyethylene vials for neutron activation. Vanadium standards (14.2 µg) were prepared by pipetting 10 µl of standard solution onto discs of high purity IPC filter media, drying the discs and encapsulating them in the same manner as the $Fe(OH)_3$ precipitates. The samples and standards were neutron irradiated at the Washington State University Triga reactor, one at a time, standards interspersed between samples, for 2.0 minutes each. Following the irradiation the samples were allowed to decay for 2.0 minutes and were then counted directly on a Ge(Li) diode detector for 10 minutes to measure the 1434 KeV y-ray of ^{52}V (3.8 minutes).

The chemical recovery of vanadium for this procedure was 95.6 ± 1.4%, and the precision and accuracy were estimated to be less than 10%. The average procedural blank amounted to 0.11 ± 0.03 µg/ℓ.

Dissolved manganese concentrations in seawater were determined by neutron activation analyses. The manganese was pre-concentrated by solvent extraction of 500 ml of seawater with 8-hydroxy-quinoline. The organic extract was washed with high purity water and back extracted into dilute nitric acid. The acid was evaporated and transferred into 2/5 dram vials and activated with appropriate standards in the WSU Triga reactor for 6 hours. Several hours after the irradiation the samples were counted for 20 minutes on a Ge(Li) gamma-ray spectrometer to measure the ^{56}Mn (2.58 hr) activation product.

E. Biota

The instrumental neutron activation analysis of biological tissue samples consisted of encapsulating a 10-100′ mg sample of dried tissue (fresh to dry weight ratios were obtained) in a cleaned plastic irradiation vial, and neutron irradiating the sample and appropriate standards to an integral thermal neutron exposure of about 10^{17} n/cm^2. After the irradiation, the samples and standards were transferred into standard counting geometries and counted on a Ge(Li) detector at optimum times following the irradiation to measure both short- and long-lived neutron activation products. Two to four days out of the reactor the major neutron activation products were ^{24}Na and ^{82}Br, but normally high enough concentrations of ^{42}K and 76As were present for accurate measurements.

After the samples had been out of the reactor for about two weeks, most of the 24Na and much of the ^{82}Br had decayed to tolerable levels, and a new suite of long-lived neutron activation products were instrumentally measured including Rb, Cs, Fe, Zn, Ag, Co, Cr, Hg, Se, Sb and Sc.

Muscle tissue from the rock sole and pollock were dissected from the dorsal muscle midway between the head and tail. The King Crab muscle tissue was removed from the leg joints which were directly adjacent to the body. The soft parts of the Neptunia were removed from the shell and the upper end of the digestive system was used for analysis. The mytilus soft parts were removed from the shell and analyzed whole.

IV. RESULTS AND DISCUSSION

A. "Whole-Rock" Analyses of Sediments

Table C.1 contains Al, Ca, Mn and V concentrations in Bering Sea and Northwest and Northeast Gu fof Alaska surficial sediments. Core segment: down to 24 cm were analyzed and showed no systematic variability in trace meta distribution versus depth. A" uminum and calcium are good indicator elements of the sediment types encountered in these study areas.

Vanadium is an element of particular concern from a potential oil pollution aspect because it is contained in crude oils in relatively high concentrations, ranging from a few ppm to as high as 1200 ppm. The vanadium distribution in sediments within each region is normally rather uniform. However, two stations in the western Gulf of Alaska (GASS-105 and GASSW-122) exhibited unusually low vanadium concentrations in the sediments. Table C.2 contains As, Ba, Co, Cr, Fe, Sb, and Sc concentrations for these same locations. Again no systematic variability versus depth is noted, at least down to 24 cm. Because no variability was noted in the upper 20 cm, only surficial segments were analyzed in water samples from Cook Inlet, Shelikof Strait, the Chukchi Sea, Norton Sound, and the Beaufort Sea. Al, Ti, Mn, and V concentrations are shown for 0-2 cm segments in Table C.3 for these areas while Table C.4 caontains Na, K, As, La, and Sm concentrations, and Table C.5 contains Sc, Cr, Fe, Co, Sb, Ba, Cs, Eu, Tb, Ta, and Th concentrations.

Regional average surface sediment concentrations were calculated for the Eastern Bering Sea, the Northwest Gulf of Alaska, the Northeast Gulf of Alaska, Norton Sound, the Chukchi Sea, and the Beaufort Sea and are shown in Table C.6. The regional averages are in some cases based upon only a few samples, numbers ranging from 5 to 15, however certain conclusions can be made from the table. First, there is considerable variability within each region, perhaps best exemplified by calcium concentrations in the Northwest and Northeast Gulf of Alaska, where the standard deviation about the means are 119% and 54%, respectively. This might well be expected for calcium since its primary source to the sediments may be shells and other biological debris.

The Al and Fe variability are often much less than Ca, being on the order of 15-20% of the mean for most locations.

There appear to be differences in regional average concentrations in certain elements. For example, manganese appears to be lower in the Bering Sea, Norton Sound, Chukchi Sea and Beaufort Sea than in the Northwest or Northeast Gulf of Alaska. The Chukchi Sea appears to be lower in Al, Fe, Mn, Co, and Sc than the other regions. The Beaufort Sea has a much higher regional average arsenic concentration than the other study areas and a somewhat higher iron average concentration.

Correlation matrices were run for the surficial sediments from the Northwestern and Northeastern Gulf of Alaska and the Bering Sea area. These are shown in Tables C.7 through C.9.

Correlations in the Western Gu' fappearas expected between Fe and As, Co, Sc, Al, Mn, and Vwith an inverse Fe, Ca correlation. Calcium correlates negatively with Co, Cr, Fe, Sc, Al, which · ndicates its source is different, and undoubtedly biologically related.

In the Eastern Gulf and Bering Sea, the correlations are not as strongly developed. In the Eastern Gulf, Fe correlates with Co, Cr, and Mn. Al correlates only with Mn, V and negatively with Ca.

In the Bering Sea, Fe correlates with Co, Sc, Mn, and V. Chromium correlates with Ba and negatively with Sc and Mn. Aluminum and calcium do not correlate at the 95% level with any other elements.

Silver concentrations were determined in surficial sediments in Bristol Bay and in the Northwestern and Northeastern Gulf of Alaska, and are shown in Table C.10. Mean values for the three areas were calculated and are also shown in the table. Additionally, the depth distribution of silver was determined in two cores, Bristol Bay Station MB-64 and Eastern Gulf Station 49. The silver concentrations versus depth to 24 cm at MB-64 and to 18 cm at GASSE-49 are shown in Table C.11, and no systemic variability with depth was noted.

The elemental concentrations versus station locations are shown on the geographical grid maps. These are Figures D.1 through D.11 for the Northwest Gulf of Alaska; D.12 through D.22 for the Northeast Gulf; D.23 through D.33 for the Bering Sea; D.34 through D.43 for Cook Inlet and Shelikof Straight; D.44 through D.55 for Norton Sound; D.56 through 0.65 for the Chukchi Sea; and D.66 through D.75 for the Beaufort Sea.

B. "Available Metals" in Surficial Sediments

In addition to the "whole rock" analyses performed during the earlier baseline survey of the Alaskan shelf, selective leaching experiments were performed to determine the fraction of metals which are readily "available" from sediments. This readily "available" fraction is thought to best represent that part of the total sedimentary repository which might be subject to biological assimilation or to alteration and/or release of metals due to petroleum related activities.

Elements investigated by us were V, Mn, Fe, Co, and Sc. Scandium was chosen since it should probably indicate whether any degradation of mineral matter took place during the weak acid leaching. Table E.1 shows the peroxide leachable vanadium, weak acid leachable and total available vanadium based upon "whole rock" analysis of a separate sediment split. The fraction leached by the H_2O_2 treatment (supposedly organically bound vanadium) was usually small and ranged from 1.17 to 7.63 μg/g of dry sediments, or about 1 to 6% of the total vanadium present in the sediments. The 0.3M HCl treatment released significantly more vanadium than the H_2O_2, ranging from 7.7 to 28.3 μg/g dry sediment, or about 3 to 24% of the total vanadium present. The combined "available" fraction (H_2O_2 + HC1 leachable) ranged from 5 to 29% of the total vanadium in the sediment. No systematic geographical trends in the amounts of "available" vanadium were observed from region to region, but considerable differences in "available" vanadium (by factors of 2 to 3) were often observed within regions. This is not unexpected, however, since sediment types and textures vary considerably within each Alaskan shelf region.

The "available" manganese fractions, determined by the same technique, are presented in Table E.2. The total "available" manganese was much higher than for vanadium, and ranged from 21 to 82% of the total manganese present in the sediments. Usually, less than 1% of the manganese was leached by the H_2O_2 treatment; the 0.3M HCl treatment removed, by far, the majority of the "available" manganese.

"Available" fractions of Fe, Co, and Sc were also determined and are shown in Table E.3. Peroxide exposure released very small fractions of these elements, well less than 1% in all cases, indicating minimal organic association in the sediments, However, differing behaviors are noticeable during the hydrochloric acid leaching. Only 1 to 10% of the scandium was available during hydrochloric acid leaching, in fact ranging from 1.63 to 4.97% in all cases except one where 9% was available. This indicates the weak acid exposure was minimally degrading the silicate minerals as should be the case. The Fe and Co fractions available via hydrochloric acid leaching ranged from4.5 to 27.4%, and 10.6 to 59.1%, respectively.

The "available" Fe, Co, and Sc in Cook Inlet and Shelikof Strait were relatively uniform averaging 15.4% ± 1.6%, 33.1%22.3% and 3.83% ± 0.79% for the elements, respectively, where the ± is one standard deviation. The variability in the available fraction of Fe, Co, and Sc in the Eastern Gulf, Bristol Bay, and Western Gulf of Alaska areas was far higher; ranges to as much as approximately a factor of 4 within the study area for Fe, and to a factor of 5 for Sc were observed.

c. Suspended Particulate Matter

The suspended particulate matter in seawater sampled from the OCS study areas is composed of alluvial discharges from rivers, resuspended bottom sediments and planktonic matter or detritus. Thus, the relative trace metal composition of the suspended particulate, as well as the absolute amounts of particulate matter present in the seawater can vary substantially. Table F.1 contains Mn, Al, and V concentrations in μg/ℓ of seawater for samples from the Eastern Gulf, Western Gulf and the Bering Sea. Table F.2 contains concentrations of As, Ba, Co, Cs, Fe, Sb, Hg, Sc, Se, and Zn for these same locations.

Suspended matter concentrations for Cook Inlet sampled in May and August of 1978 and for the Shelikof Strait during 1978 are shown in Table F.3. The trace metal concentrations in suspended particulate matter (μg/ℓ of seawater) in Cook Inlet appeared similar on the two dates except for Station CB-1 where larger differences in Al and Mn concentrations are noted. The samples in Shelikof Strait were taken simultaneously with Dr. Feely during the August cruise in the near-bottom nepheloid layers. Dr. Feely had earlier reported anomalously high Mn concentrations in suspended particulate matter from the Shelikof Strait. We also observed elevated Mn concentrations (as well as Al and V) in suspended matter from these locations. There are noticeable differences in the Mn/Al ratios in the Cook Inlet and Shelikof Strait areas. The Cook Inlet averaged ratio of Al/Mn is 0.024:1 while in Shelikof Strait the ratio is 0.051/1, and at Stations SS-6 and SS-13 in the Shelikof Strait the suspended particulate samples show ratios as high as > 0.80/1.0. Thus it appears that the high Mn anomaly associated with the Shelikof Strait is a real phenomenon.

Suspended particulate were also analyzed at the time series station occupied at CB-10 in Cook Inlet during the August 1978 cruise leg. As shown in Table F.4 , only slight variability during the tidal cycle occurred during the sampling interval from t = 0 hr through t = 48 hr. However, the 1σ statistical error associated with the elemental concentration for most elements is generally greater than the differences observed in concentrations over the 8-hr sampling intervals, indicating the variability may not be statistically valid. It should be pointed out that fault does not lie in the analytical method being imprecise, for the 1σ errors for aluminum, manganese, arsenic, lanthanum, and samarium are 5% or less. Thus, this indicates changes in the suspended particulate composition are approximately equal to or less than 5% over the sampling, intervals. The variability of the replicate samples at t = 0 hr. indicates that sample inhomogeneity is of similar magnitude to the water mass changes from sampling interval to sampling interval.

Table F.5 shows the type of variability in suspended matter concentrations which are encountered in Alaskan shelf waters. As can be seen variation of nearly two orders of magnitude occur indicating the shelf is a very dynamic and complex system with regard to suspended matter transport. Figure F.1, an Earth reconnaissance photograph of the Eastern Gulf of Alaska, gives further visual evidence of the extremely dynamic suspended matter system. The lightened areas represent fresh water plumes having high suspended sediment loads.

D. Biological Specimens

Intertidal and benthic biota, supplied by the principal investigators in the biological programs, have been analyzed for trace metal content. It was our objective to select "indicator" organisms which are ubiquitous in the shelf study areas and which might serve as early indicators of the impacts of potential oil pollution. To provide this baseline data for trace metals in the shelf biota, collections of the seaweed Fucus, unidentified seaweed samples, the bivalve Mytilus, the snail Neptunia, the finfish rock sole and pollock, and King crab specimens were analyzed for 16 trace elements by neutron activation analysis.

Table G.1 contains the resulting elemental concentrations for rock sole, Neptunia, pollock, crab, fucus, seaweed, and mytilus. Table G.3 shows the average concentrations and variance for some of the more toxic trace metals, including Ag, As, Cr, Hg, Se, and Zn. In general, the trace metal concentrations in the Alaskan shelf biota are very similar to the levels observed in organisms collected from lower latitudes and reflect a typically pristine environment. Several naturally high trace metal accumulation processes by certain animals are noteworthy. High Zn, Ag and As concentrations are found in King crab. Neptunia are remarkable concentrators of several heavy metals 'including As, Se, Zn, Hg, Fe, Sb, Co and V.

Because of their ubiquitous distribution throughout the Alaskan shelf, Mytilus are probably best suited as "indicator" organisms. Also, the fact that they are filter-feeders and would concentrate oil and other contaminants sorbed onto suspended particulate matter make them especially useful for this purpose. Fortunately, the variability in the trace metal concentrations in

Mytilus sampled over diverse areas does not appear to be too large to obviate their usefulness in establishing baseline values for assessing future potential perturbations. The variability of the truly assimilated trace metals, such as As, Hg, Se and Zn is indeed quite small. The large variability in the other elements appears to be clue to the adsorption of suspended sediment particles on the Mytilus. This is easy to recognize because of the relatively high concentrations of trace elements which are rarely associated with biological tissues, such as Sc and Cr. This mineral contribution from sorbed sediment particles can be subtracted out of the truly biologically assimilated fraction, thus giving a more constant set of baseline data.

Vanadium concentrations were also determined by a chemical separation followed by neutron activation and are shown in Table G.2. The data are reported in nanograms per gram. The Pollock, Rock Sole and crab muscle tissue are less than 100 rig/g (0.1 ppm). However the Fucus, Mytilus and Neptunia are significantly higher. The Fucus ranging from 318 to 945 rig/g (0.3 to 0.8 ppm) and the Mytilus from 389 to 783 rig/g (0.39 to 0.78 ppm). The Neptunia are even higher; 2500 to 2700 rig/g or 2.5 to 2.7 ppm.

E. Dissolved Trace Elements in Seawater

The dissolved, or non-filterable fraction, of the following trace metals in Alaskan coastal waters have been determined by neutron activation analysis: V, Mn, Zn, Fe, Co, Sb, U, Cs, and Rb. With the possible exception of V, it is not anticipated that oil spills will directly alter the dissolved trace element concentrations in coastal waters. However, serious chronic or episodic releases of oil to coastal waters could possibly alter the chemical environment of the sediments by creating more reducing conditions at the sediment interface. Reducing sediments can release a number of dissolved trace elements to the water column causing significantly elevated concentrations.

Vanadium has been an element of focus in marine waters since there exists some slight potential for perturbation due to oil development. Therefore, dissolved vanadium concentrations were determined as a part of our baseline efforts. Table H.1 shows that the vanadium concentrations throughout the Alaskan shelf waters are quite uniform. Even in waters containing relatively large amounts of suspended matter, the filtered seawater does not show significantly elevated concentrations of dissolved vanadium. Table H.4 shows that the Bering Sea and the Eastern and Western Gulf of Alaska average for vanadium concentrations are not significantly different, nor are surface water concentrations significantly different from these in bottom waters. An overall water column average for Alaskan shelf waters appears to be 1.42 ± 0.15 μg/ℓ. Vanadium concentrations in Cook Inlet appear to vary seasonally, being somewhat higher in spring, and lower during the high runoff period in August. This, coupled with the generally higher values observed in the Shelikof Strait in August, and the higher overall shelf average indicate that the riverine concentration of vanadium entering Cook Inlet may be lower than general shelf concentrations in Alaskan waters.

The natural conservative nature and uniform distribution of dissolved vanadium in Alaskan shelf waters should permit a rather sensitive assessment of vanadium contamination of seawater by large oil spills. A 1 μg/ℓ increase in dissolved vanadium concentration would be highly significant, and would only require the release of the vanadium contained in 0.1 ml of crude oil (assuming a vanadium concentration of 10 ppm in crude oil) to one liter of seawater to accomplish this increase.

Dissolved manganese concentrations were also determined in Cook Inlet and Shelikof Strait and are shown in Table H.3. Unlike vanadium, the dissolved manganese concentrations are elevated in waters with relatively high concentrations of suspended sediments. The manganese concentrations in these shelf waters are about 10 to 100-fold higher than in open ocean waters. Dissolved manganese in Cook Inlet waters is shown to be higher during the peak runoff period of August compared with earlier spring samples collected in May, 1978. The samples taken at depths in Shelikof Strait show extremely elevated dissolved Mn below a depth of 200 meters. This area has been shown to have anomalously high manganese concentrations associated with the particulate matter. Possible sources of the manganese could be releases from reducing sediments or effluents from hydrothermal vents.

The concentrations of Zn, Fe, Co, Sb, U, Rb and Cs in the shelf waters of the Eastern, Western and Southwestern Gulf of Alaska are presented in Table H.5. These data indicate baseline trace element levels in Alaskan shelf waters are similar to concentrations observed in coastal waters at lower latitudes. The concentrations of the conservative elements Sb, U, Rb and Cs are very uniform in the Alaskan coastal waters. However, the dissolved Zn, Fe and Co concentrations are highly dependent upon the levels of suspended particulate matter in the water column, and are about tenfold higher than observed in open ocean waters.

No systematic geographical or vertical gradients for the dissolved Zn, Fe and Co were observed in the Alaskan coastal waters. The large variations are undoubtedly due to the relative quantities of suspended matter in the water and the degree of fresh water input (river drainage).

A major discrepancy in Zn and Fe concentrations at Station 121 in the Southwest Gulf of Alaska was observed. Surface seawater collected in polyethylene bottles from a Zodiac rubber raft contained significantly lower Zn and Fe concentrations compared to seawater collected approximately 10 meters below the surface in Niskin bottles. It is not certain that this is due to a real difference in the small-scale vertical distribution of these elements or if the Niskin bottles resulted in contamination of the water.

V. CONCLUSIONS

With the completion of the analysis of all sediment, water and biota samples from the major study areas, a more comprehensive picture of the ambient trace metal concentrations and distributions in the Alaskan coastal environment has been achieved. As expected, the trace metal distributions in the shelf environment are quite typical of mid-latitude regions. Considerable variability in trace metal distributions in sediments, suspended matter, water and biota is evident. However, these variations fall within the expected range when compared with literature values for other mid-latitude locations. These baseline data will be of great value in assessing any future potential impacts from offshore oil recovery. However, based on the data at hand we cannot conceive of any activities related to offshore oil production that could significantly alter or provide a detrimental impact upon the trace metal distributions in the lease areas. Any impact from these activities would likely be so small as to be masked by the natural geographical and temporal variations in trace metal distributions in the sediments, suspended matter, water and biota.

The following conclusions have been reached regarding the natural distributions and ambient background concentrations of trace metals in sediments, suspended matter, seawater and biota of the Alaskan shelf environment.

Sediments

- The geographical distributions of major and trace elements in surface . sediments from the Bering Sea, Western GOA, Eastern GOA, Norton Sound, the Chukchi Sea and the Beaufort Sea show significant regional variability. In going from the Bering Sea + to the Western GOA → to the Eastern GOA, the regional average concentrations of Fe, Mn, V, Cr, Co and Sc increase by nearly 2-fold. The Norton Sound and Beaufort Sea sediments were characterized by intermediate trace metal contents, whereas the sediments of the Chukchi Sea normally had relatively low trace metal concentrations except as noted below.

- Several anomalies were observed such as the relatively high Ba concentrations in Bering Sea Stations MB-59 and MB-64. Relatively high As concentrations were observed at several stations in each region, and the Beaufort Sea, Chukchi Sea and Norton Sound sediments consistently contained 3 to 8 times higher As concentrations compared to the Bering Sea and the Western and Eastern GOA. High Cr concentrations were observed in the Chukchi Sea sediments. Shelikof Strait sediments contained high Mn concentrations.

- No systematic concentration gradients of major and trace elements between near-shore and deep water stations were observed. However, large variations in elemental concentrations occurred in patchy distributions within each region. This was particularly true for Ca. When highly calcareous sediments were encountered, such as at Sta. 122 in the Western GOA, most of the other elemental concentrations were very low. This can be seen by the high negative correlation coefficients between Ca and most other elements.

- No systematic vertical variations in elemental concentrations were observed in HAPS sediment cores. Although significant variability with depth was noted for all of the elements, it appeared to be of a random nature.

- "Available" metal concentrations, as determined by a sequential leaching technique, indicated the following order of a' ailability or leachability: Mn > Co > V > Fe > Sc. "Available" Mn, Co, V, Fe and Sc ranged from 21-82%, 11-59%, 5-29%, 5-27% and 1-10%, respectively, of their "total" concentration in the sediments. The " ow Sc leachability indicated that the crystalline structure of the sediments were not appreciably being attacked by the leachates. The H_2O_2 leaching removed very little (usually less than 1%) of the trace metals from the sediments, indicating little organically-bound metals associated with the sediments. The fraction leached by the 0.3M HCl is considered to be composed primarily of hydrous metal oxides.

Suspended Particulate Matter

. Suspended particulate trace metal concentrations in surface seawater from the Bering Sea, Western GOAand Eastern GOA generally show increasing concentrations in near-shore versus deep waters. The concentrations of these elements are usually much higher in near-bottom waters compared to surface waters, but significant, systematic exceptions have been noted. At Stations 44, 49, 50 and 59A in the Eastern GOA the particulate trace metal concentrations in surface waters are much higher than in near-bottom waters, indicating a surface plume of relatively high suspended sediment load or intense plankton blooms.

● Ranges in particulate trace metal concentrations in the Alaskan shelf waters are extremely variable and indicate a very dynamic shelf environment that reflects both fluvial input and transport of terrigenous materials, storm resuspension of sediments and biological processes. This extreme variability from station to station does not allow for meaningful comparison from one lease area to another.

● Elemental ratios in the particulate matter are very similar to those observed in surface sediments, especially in near-bottom samples where the ratios of Fe/Al and Fe/Mn appear identical for both suspended particulate and sediments. A notable exception are the Al/Mn ratios in the Shelikof Strait stations, which show substantial enrichments of Mn. It is likely that the excess Mn is derived from reducing sediments or submarine hydrothermal activity in this region.

● Trace metal concentrations in suspended particulate matter collected at a time series station in Cook Inlet to determine short-term temporal variations over tidal cycles showed very small fluctuations.

Dissolved Trace Metals

. Concentrations of dissolved V, Sb, U, Cs and Rb in Alaskan coastal waters appear to be very uniform and characteristic of open ocean waters. Their concentrations are essentially independent of the amount of suspended particulate matter in the water.

• Vanadium is a trace metal of special interest in this study because of its potential toxicity and its relatively high abundance in crude oil. The soluble vanadium concentrations in the Bering Sea, Western GOA and Eastern GOA appear to be very homogeneous. The average concentration for surface and near-bottom waters was 1.42 ± 0.15 μg/ℓ, and the total range in concentrations was from 1.0 to 1.7 μg/ℓ. The high concentrations of vanadium in suspended particulate matter in some of these waters had no effect or correlation with the soluble vanadium levels. The particulate vanadium concentrations ranged from 0.007 to 0.77 μg/ℓ but averaged about 0.05 μg/ℓ or approximately 3% of the total vanadium.

• The geographical and vertical distribution of Mn, Zn, Co and Fe in shelf waters is highly variable and greatly influenced by the amount of suspended matter. No systematic geographical or vertical concentration gradients were observed.

• Extremely high concentrations of dissolved Mn was observed in bottom waters at several stations in the Shelikof Strait. These elevated concentrations could be the result of either submarine hydrothermal venting or dissolution from reducing sediments. The former explanation appears most likely since: 1) high dissolved manganese concentrations are associated with hydrothermal effluents; 2) ferromanganese coatings containing up to 12% Mn were observed in rocks dredged from these areas; and 3) this area is highly volcanic and near recently erupted volcanoes.

Biota

• The trace element concentrations in Alaskan shelf biota are very typical of the ranges observed in similar species of mid-latitudes. No systematic regional variations for these metal contents of the organisms was observed. Thus, the baseline data generated here will be very useful for assessing any potential environmental impacts from any natural or manmade disturbances of the shelf areas.

• Because of their ubiquitous distribution and their inter-tidal habitat, which is an important repository of oil residues and other pollutants from oil impacted waters, and because of their filter feeding, the Mytilus are probably the best indicator organisms for the lease areas. The trace metal concentrations in the Mytilus from various locations show a rather good standard deviation around the average. This indicates that Mytilus can be used as an effective indicator organism. Several metals, notably chromium, showed a somewhat large standard deviation from the average concentration. However, by examining the concentrations of geochemical indicator elements, such as Sc and Fe, it is obvious that the Mytilus from Boswell Bay, Cape Pasashak, Port Dick and Katalla contained appreciable amounts of mineral matter (probably suspended sediments). This sediment contribution seriously contaminates the Mytilus with such metals as Cr, Sb and Co, but when the sediment contribution is assessed the standard deviation associated with the average concentration of these metals becomes much smaller.

- The mercury concentrations are the most intercomparable with other areas of the world because of the large amount of baseline data now available for this toxic heavy metal. The mercury concentrations in the Alaskan biota studied here are very typical of those found in any uncontaminated shelf areas of the world. None of the edible animals exhibited mercury concentrations which exceed the 0.5 ppm FDA limit, although the internal organs of the snail, Neptunia, contained mercury levels as high as 3.9 ppm.

- Several interesting distributions,of trace metals in the biota were observed. Arsenic concentrations are relatively high in King crab muscle tissue and in the internal organs of the Neptunia. Extremely high concentrations of zinc (up to 0.79% in dry tissue) were observed in the internal organs of the Neptunia. However, this ability to highly concentrate zinc is well known and not unusual for these animals.

- Vanadium concentrations of selected Alaskan shelf biological materials ranged from several tens of rig/g for rock sole, pollock and Alaskan King crab. Intertidal organisms, Fucus and Mytilus, showed considerably higher vanadium levels. These ranged from approximately 0.3 to 0.8 µg/g dry weight for Fucus and Mytilus. Neptunia (internal organs) showed much higher levels than either finfish or intertidal Fucus and Mytilus. The samples analyzed indicated levels of 2.5 µg/g dry weight.

APPENDIX A

Sample Inventory and Disposition

TABLE A.1

SEDIMENT AND WATER SAMPLING STATIONS
WESTERN GULF OF ALASKA - OSS DISCOVERER - OCTOBER 16, 1975

STATION	LATITUDE	LONGITUDE	DEPTH, m	WATER			PARTICULATE			SEDIMENT		
				COLLECTED	ANALYZED	ARCHIVED	COLLECTED	ANALYZED	ARCHIVED	COLLECTED	ANALYZED	ARCHIVED
GASW-156	54°29.2'	160009.4'	160	2	2	2	2	2	2			
GASW-157	54%7'	164°58.8'	67	2	2	2	2	2	2			
GASW-158	54%4.5'	164%5.2	101	2	2	2	2	2	2			
GAS W-159	53051.9'	164°34'	100	2	2	2	2	2	2			
GASW-160	53043.3'	164%,6'	143	2	2	2	2	2	2			
GASW-145	55%3.1'	161°244'	71	2	2	2	2	2	2			
GASW-146	54%9.4'	161°125'	73	2	2	2	2	2	2			
GASW-147	54%6.2'	161°00.7'	104	2	1	2	2	2	2			
GASW-148	54°23.5'	160%. 1'	110	2	2	2	2	2	2			
GASW-137	540543'	157°59'	99	2	2	2	2	2	2			
GASW-135	55%3).3'	15$25.1'	150	2	2	2	2	2	2	5	3	5
GASW-134	55033.4'	158°38.3'	154							9	5	9
GASW-133	55%.3'	158051'	73	2	2	2	2	2	2	1	1	1
GASW-124	56%7.1'	154039.4'	112	2	2	2	2	2	2	5	3	5
GASW-122	56%.3'	155°12	45	2	1	2	2	2	2	2	2	2
GASW-121	56°43.2'	155°27.9'	230	2	2	2	2	2	2	6	3	6
GASW-120	56°55'	1550441'	290	2	2	2	2	2	2	10	4	10
GASW-119	57006.9'	156°00'	207	2	2	2	2	2	2	6	3	6
GASW-110	59019.8	152°24.1'	89	2	2	2	2	2	2			
GASW-102	59%9.9'	152%41'	108	2	1	2	2	2	2			
GASW-103	59°00'	151045.1'	135	2	2	2	2	2	2			
GASW -104	58°50'	151°26.4'	106	2	2	2	2	2	2	5	3	5
GASW-105	58°59'	152°51.6'	168							2	2	2

TABLE A.2

SEDIMENT AND WATER SAMPLING STATIONS
EASTERN GULF OF ALASKA - OSS DISCOVERER - NOVEMBER 24-DECEMBER2, 1975

					WATER		PARTICULATE			SEDIMENT		
STATION	LATITUDE	LONGITUDE	DEPTH, m	COLLECTED	ANALYZED	ARCHIVED	COLLECTED	ANALYZED	ARCHIVED	COLLECTED	ANALYZED	ARCHIVED
EGA-29	59034.6'	140°06'	76	1	1	1	1	1	1			
EGA-26	59010.8'	140038.9'	146	2	2	2	2	2	2	7	4	7
EGA-24	58%4.3'	I410DO.5'	420	2	2	2	2	2	2			
EGA-33	59017.5'	141054.8	215	2	2	2	2	2	2	6	3	6
EGA-30	59'%4.1'	141°27.9'	52	1	1	1	1	1	1	1	1	1
EGA-44	59035'	143°54,2'	175	2	2	2	2	2	2	4	2	4
EGA-15	58018,1'	145%0.5'	3700	2	2	2	2	2	2			
EGA-48	59%?7.5'	145011.5'	457	2	2	2	2	2	2	6	3	6
EGA-49	59037.5'	145°10'	131	2	2	2	2	2	2	9	5	9
EGA-5(I	59°47.7'	145009'	177	2	2	2	2	2	2	11	5	11
EGA-51	59057.6'	145°07.8'	143	2	1	2	2	2	2	3	2	3
EGA-52	60437.6'	145%6.5'	84	1	1	1	1	1	1	9	5	9
EGA-59A	59017.1'	146014'	381	2	1	2	2	2	2	1	1	1
EGA-58	59036.2'	146°25.5'	92	1	1	1	1	1	1	5	3	5
EGA-57	59045.6'	146031'	77	1	1	1	1	1	1	3	2	3
EGA-56	59055.2'	146°36.8'	68	1	1	1	1	1	1	4	4	4
EGA-55	60%4.5'	146°42.6'	120	2	2	2	2	2	2	8		8
EGA-54	60°13.9'	146°48.6'	212	2	2	2	2	2	2	7		7
EGA-53	60°23'	146054'	294	2	2	2	2	2	2	5		5
EGA-11	58°23.2'	148%4.8'	1385	2	1	2	2	2	2			
EGA-110	57°55.8'	1490143.4'	183	2	1	2	2	2	2			
EGA-108	58009.1'	150009.1'	236	2	2	2	2	2	2			
EGA-106	58028.1'	150047.4'	91	1	1	1	1	1	1			
EGA-8	58049.7'	148030'	284	2	2	2	2	2	2	11		11
EGA-5	59016'	148056'	172	2	2	2	2	2	2	8	2	8
EGA-2	59041.5'	149°22'	188	2	2	2	2	2	2	10	5	10

TABLE A.3

SEDIMENT AND WATER SAMPLING STATIONS
COOK INLET AND SHELIKOF STRAIT - MAY 4-MAY 11, 1978
- AUGUST 25- SEPTEMBER 5, 1978

STATION	WATER COLLECTED	WATER ANALYZED	WATER ARCHIVED	SEDIMENT COLLECTED	SEDIMENT ANALYZED	SEDIMENT ARCHIVED
CB-1	2	2	2	2	1	2
CB-2	1	1	1	1		1
CB-3	1	1	1	2	1	2
CB-4	2	2	2	1		1
CB-5	2	2	2	1		1
CB-6	2	2	2	1	1	1
CB-7	2	2	2	2	1	2
CB-8	2	2	2	2	1	2
CB-9	1	1	1			
CB-10	1		1			
SS-1				1		1
SS-2	1		1	1	1	1
SS-3						
SS-4	1		1	1	1	1
SS-5				1	1	1
SS-6	1		1	1		1
SS-7						
SS-8				1	1	1
SS-9						
SS-10				1	1	1
SS-11	1			1		1
SS-12						
SS-13	1			1		1

TABLE A.4

SEDIMENT AND WATER SAMPLING STATIONS

BERING SEA - 0SS DISCOVERER - JUNE 2-19, 1975

				WATER			PARTICULATE			SEDIMENT		
STATION	LATITUDE	LONGITUDE	DEPTH, m	COLLECTED	ANALYZED	ARCHIVED	COLLECTED	ANALYZED	ARCHIVED	COLLECTED	ANALYZED	ARCHIVED
MB 53	56°29′	171°38’	139	2	2	2	2	2	2			
MB 48	56°19'	169°42'	155	2	2	2	2	2	2			
MB 34	55°53'	168°45'	255	2	2	2	2	2	2			
MB 14	54°39'	165°25’	162	2	2	2	2	2	2			
MB 02	55°51'	162°17'	45	2	2	2	2	2	2			
MB 08	58°17'	159°32'	24	2	2	2	2	2	2	7	4	7
MB 12	56°09'	162°56'	83							1	1	1
MB 19	56°40'	163057’	77	1	1	1	1	1	1	2	1	2
MB 24	58°46'	162°29'	48	1	1	1	1	1	1	1	1	1
MB 28	57°10'	165%4’	69							1	1	1
MB 41	58°47'	164015’	33	1	1	1	1	1	1	2	1	2
MB 43	58°42'	166017’	38	1	1	1	1	1	1	4	2	4
MB 59	59°12'	167018’	38	1	1	1	1	1	1	3	2	3
MB 64	58°01'	171007’	85	1	1	1	1	1	1	10	6	10
MB 56	58’%6’	169°05’	71	1	1	1	1	1	1	7	4	7
MB 37	57°06'	167°01'	75	1	1	1	1	1	1	5	3	5
MB 30	550591	166053’	134	1	1	1	1	1	1	13	3	13
MB 17	55°29’	165°50’	121	1	1	1	1	1	1	9		9

TABLE A.5

SEDIMENT AND WATER SAMPLING STATIONS
BERING SEA - NORTON SOUND - 0SS DISCOVERER - SEPTEMBER 8-24, 1976

	WATER		SEDIMENT		
STATION	COLLECTED	ARCHIVED	COLLECTED	ANALYZED	ARCHIVED
N-1			1	1	1
N-4			1		1
N-5		1	1	1	1
N-6			1		1
N-9			1	1	1
N-12D			1		1
N-13			1		1
N-15			1	1	1
N-17	1	1	1		1
N-20	1	1	1	1	1
N-21			1		1
N-23			1		1
N-25	1	1	1		1
N-26			1	1	1
N-28A			1		1

TABLE A.6

SEDIMENT AND WATER SAMPLING STATIONS
CHUCKCHI SEA - OSS DISCOVERER - SEPTEMBER 8-24, 1976

STATION	WATER COLLECTED	WATER ARCHIVED	SEDIMENT COLLECTED	SEDIMENT ANALYZED	SEDIMENT ARCHIVED
C-3-S76			1	1	1
C-5-S76	1	1	1		1
C-6-S76			1		1
C-7-S76			1	1	1
C-7A-S76			1		1
C-9-S76			1		1
C-10-S76			1	1	1
c-12-S76			1		1
C-13-S76	1	1	1		1
C-14-S76			1	1	1
C-15-S76	1	1	1		1
C-16-S76			1		1
C-19-S76			1		1
C-20-S76			1	1	1
C-22-S76			1		1
C-23-S76			1	1	1
C-24-S76			1		1
C-25-S76			1	1	1
C-29-S76			1		1

TABLE A.?

SEDIMENT SAMPLING STATIONS
BEAUFORT SEA - USCGC GLACIER - AUGUST 7- SEPTEMBER 4, 1976

STATION	LATITUDE	LONGITUDE	DEPTH, m	SED	COLLECTED	ANALYZED	ARCHIVED
B-1	71°11’	153°09’	25	1	1	1	1
B-3	70036’	148°12'	16	1	1	1	1
B-4	70°32’	147033’	25	1	1		1
B-5	70039’	147037’	25	1	1		1
B-6	700571	149°33'	30	1	1		1
B-7	71°08'	151°19’	34	1	1	1	1
B-8	71°43'	151°47’	1700	1	1	1	1
B-9	71°22’	152°20'	75	1	1		1
B-10	71°19'	152032’	52	1	1		1
B - n	71°08’	152057’	22	1	1		1
B-12	71°23'	154°21’	30	1	1	1	1

TABLE A.8

BIOLOGICAL SAMPLING STATIONS FOR INTERTIDAL ORGANISMS
ALASKA OCS STUDY AREA- MAY-JUNE, 1976

	ORGANISM								
	FUCUS			SEAWEED			MYTILUS		
LOCATION	COLLECTED	ANALYZED	ARCHIVED	COLLECTED	ANALYZED	ARCHIVED	COLLECTED	ANALYZED	ARCHIVED
CAPE NUKSHAK	1	1	1	1	1	1	2	2	2
PORT DICK	1	1	1	1	1	1	1	1	1
SUNDSTROM ISLAND	1	1	1	1	1	1	2	2	2
LaTOUCHE	1	1	1	2	2	2			
UNIMACK ISLAND - CAPE LUPIN	1	1	1						
McLEOD HARBOR	1	1	1						
OTTER ISLAND	1	1	1				1	1	1
ANCHOR COVE	1	1	1	1	1	1			
UNALASKA ISLAND- EIDER POINT	1	1	1						
KAYAK ISLAND				1	1	1			
ZALKOF BAY	1	1	1						
SAINTS BAY	2	2	2				1	1	1
LaCOON POINT	1	1	1				1	1	1
CAPE PASSASHAK	1	1	1				1	1	1
UNIMACK ISLAND- SONNETTPOINT	1	1	1						
KATALLA				1	1	1	1	1	1
CAPE HUPIT							1	1	1
SPECTACLE ISLAND				1	1	1			
MAKUSHIM BAY				1	1	1	1	1	1
PORTETCHES							1	1	1
BOSWELL BAY							1	1	1
DAY HARBOR							1	1	1
SENNETT POINT							1	1	1
EIDER POINT							1	1	1
LaTOUCHE POINT							1	1	1

TABLE A.9

BIOLOGICAL SAMPLING STATIONS FOR BENTHIC ORGANISMS
SOUTH BERING SEA - OSS MILLER FREEMAN - APRIL, 1976

				ROCK SOLE			NEPTUNIA			POLLOCK			CRAB			CRAB LEG		
STATION	LATITUDE	LONGITUDE	DEPTH, m	COLLECTED	ANALYZED	ARCHIVED	COLLECTED	ANALYZED	ARCHIVED	COLLECTED	ANALYZED	ARCHIVED	COLLECTED	ANALYZEO	ARCHIVED	COLLECTED	ANALYZED	ARCHIVED
3	54041.3'	165°18.3'	161.9										1	1	1			
5	54'343.6'	165017.2'	161.9	1	1	1				2	2	2						
7	54040.4'	165042'	409.5							1	1	1						
18	55°09.8'	163%14.1'	83.1										1	1	1			
25	54050.4'	166035.8'	183.8							1	1	1	1	1	1			
27	55°00'	166°15.2'	112.8	1	1	1	1	1	1				1	1	1			
29	55%9.3'	166002'	134.6				1	1	1	1	1	1				1	1	1
30	55020.1'	165°42.5'	104,6	1	1	1	1	1	1	1	1	1	1	1	1			
31	55032.1'	165°26'	114.3							1	1	1	1	1	1			
32	55°41'	165°09.8'	119.9	1	1	1				1	1	1	1	1	1			
38	56010.1'	166°08.6'	111				1	1	1									
39	%001.6'	164019.2'	1242	1	1	1				1	1	1				1	1	1
48	55°18.3'	167°28.9'	151							1	1	1				1	1	1
49	55°15.4'	167°37.7'	178.3	1	1	1				1	1	1				1	1	1
56	55035.7'	168°29.1'	167.4	1	1	1				1	1	1						
57	55031.2'	168°21.2'	249.3	1	1	1				1	1	1						
58	55%31.2'	168°26'	33a5							1	1	1						
60	55031.2'	168017.6'	196.7	1	1	1												
64	55048.2'	168024.8'	143.7							1	1	1				1	1	1
80	54%9.8'	165°08.9'	116.4				2	2	2									

APPENDIX B

Sample Grids Utilized During Alaskan Shelf Studies

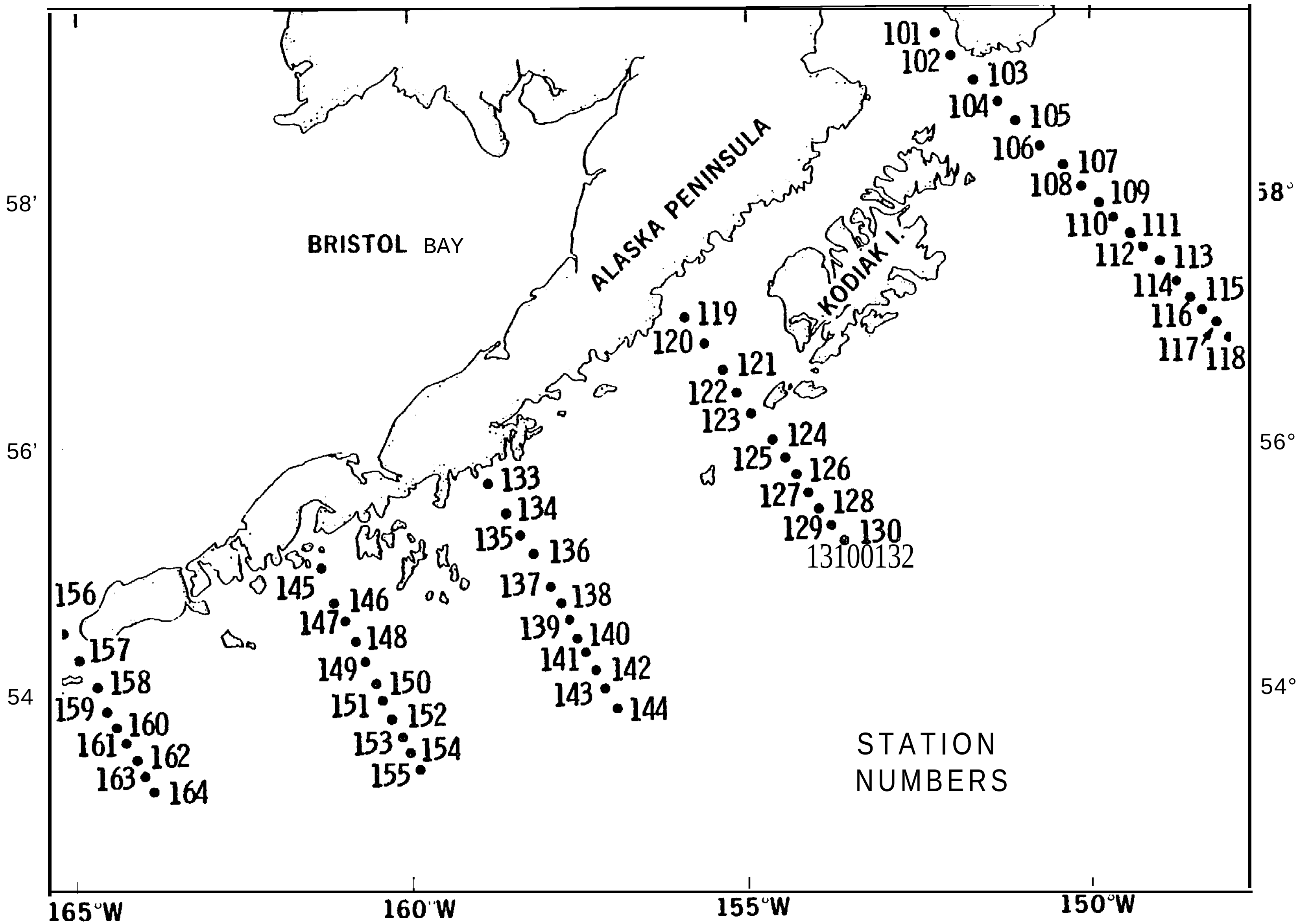


FIGURE 6.1 Sampling Locations in the NW Gulf of Alaska

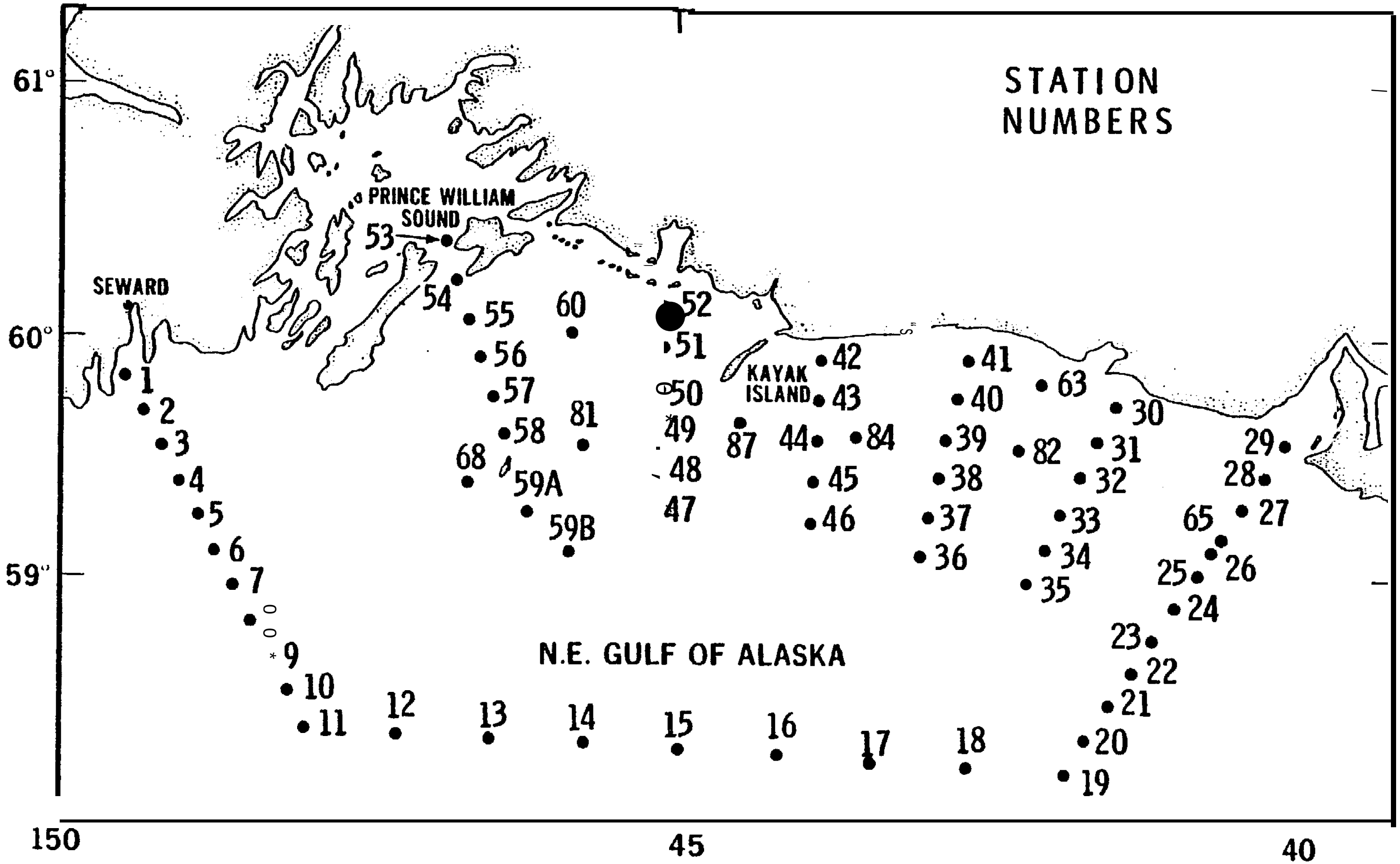


FIGURE B.2 Sampling Stations in the NE Gulf of Alaska

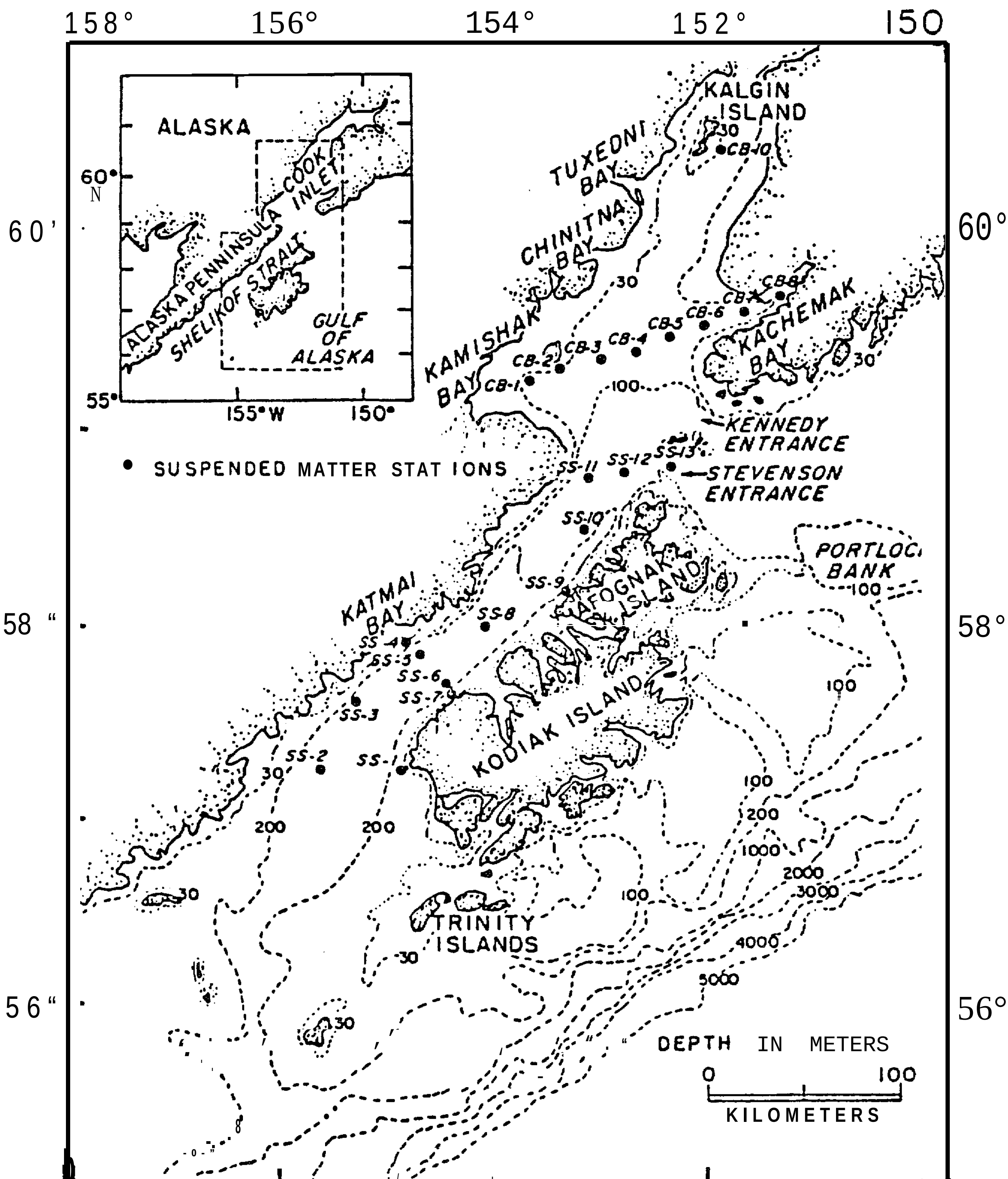


FIGURE B.3 Sampling Stations in Cook Inlet and Shelikof Strait
Discoverer, August 1978

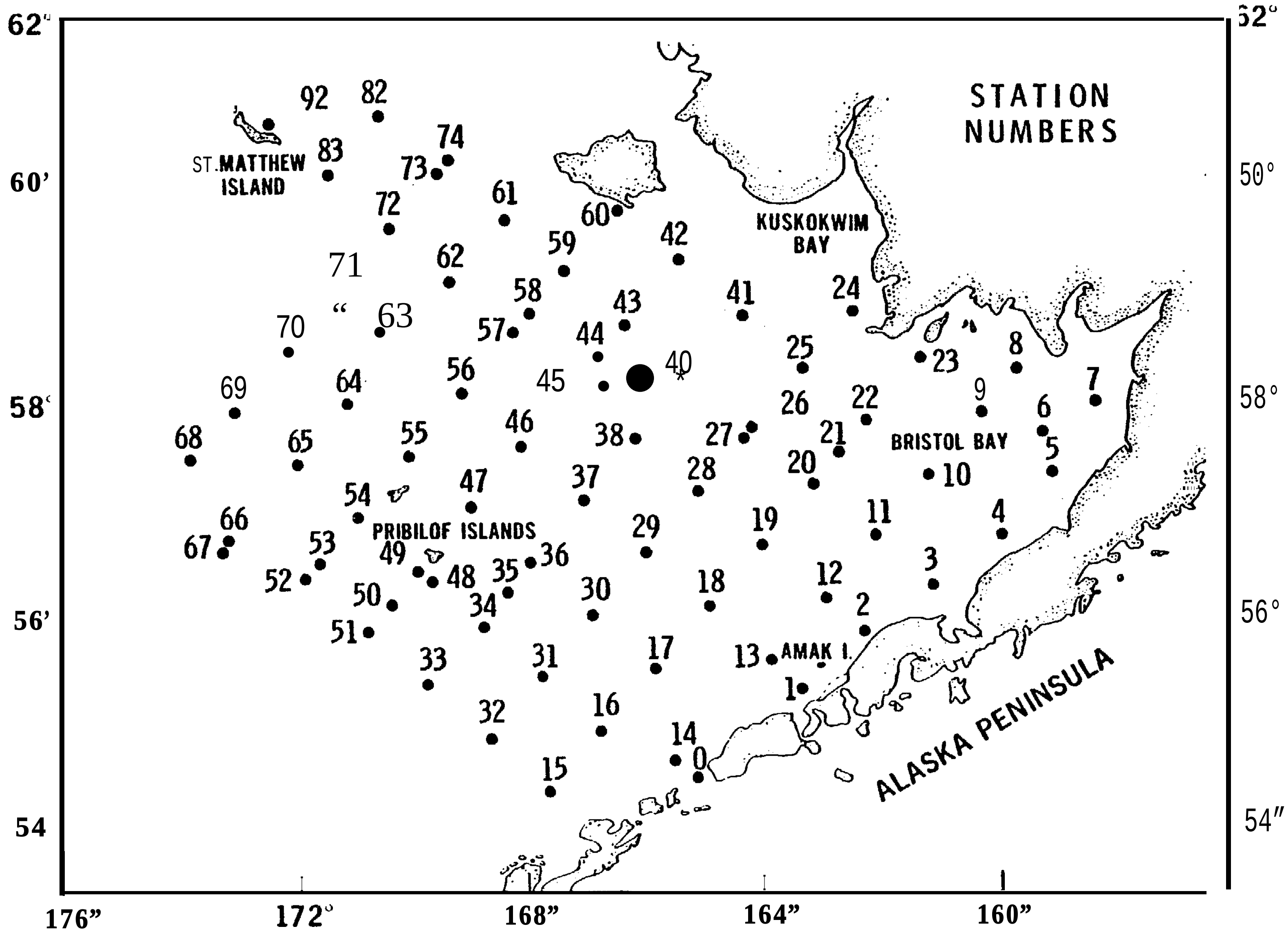


FIGURE B.4 Sampling Locations in the Bering Sea

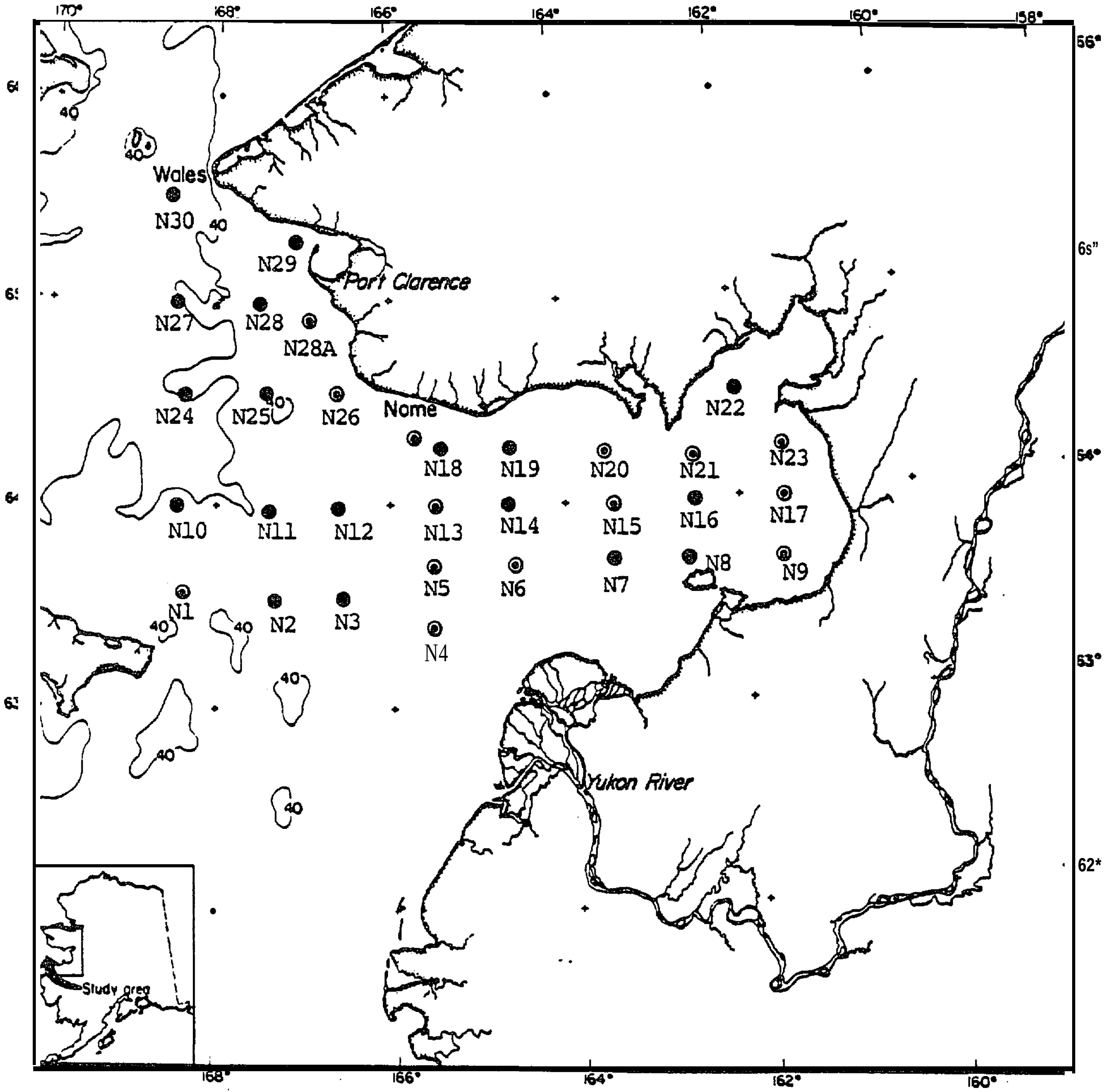


FIGURE B.5 Sampling Stations in Norton Sound
Discoverer, September 1976

FIGURE B.5 (continued)

NORTON SOUND (N. BERING SEA)

Discoverer Leg IV - September 8-24, 1976
Station localities and operations

Station No.	Depth	Latitude	Longitude	Sampling Operations
N 1	29 m	63"31.8	168"32.2	van Veen Grab, NAPS, water
N 2	29	63"30.6	167029.0	van Veen Grab, water
N 3	26.5	63"29.9	166"29.7	van Veen Grab, water
N 4	21	63°19.7	165029.9	van Veen Grab, NAPS water
N 5	22	63"39.5	165"32.1	van Veen Grab, NAPS water
N 6	13	63"38.4	164"31.0	van Veen Grab, NAPS water
N 7	15	63"38.2	163•30.3	van Veen Grab, water
N 8	15.5	63042.0	162•28.5	van Veen Grab
N 9	15	63*41.5	161'31.1	van Veen Grab, HAPS, water
N10	37*5	64001.0	168026.0	van Veen Grab
N11	40	64000.4	167"32.1	van Veen Grab
N12	31	63"59.2	166"29.8	van Veen Grab
N12D	26	64"23.5	165"44.8	van Veen Grab, NAPS, water
N13	20	63"59.7	165029.7	van Veen Grab, RAPS
N14	20	64"01.2	164"28.7	van Veen Grab, water
N15	20	64"00.3	163"30.5	van Veen Grab, HAPS, water
2?16	19	64"00.0	162"30.0	van Veen Grab
N17	18.5	64•00.0	161030.3	van Veen Grab, HAPS, water
N18	23	64"20.2	165"30.0	van Veen Grab
N19	15.5	64019.4	164"30.4	van Veen Grab
N20	20	64"20.1	163"31.0	van Veen Grab, HAPS, water
N21	19	64"15.25	162029.7	van Veen Grab, HAPS, water
N22	13	63•30.3	162000.5	van Veen Grab, water
N23	15	64"17.5	161'30.7	van Veen Grab, NAPS, water
N24	40	64-29..7	168"28.3	van Veen Grab, water
N25	31	64•29.6	167•29.6	van Veen Grab, water
N26	28	64°30.2	166°31.5	van Veen Grab, HAPS, water
N27	46.5	65"00.5	168026.7	van Veen Grab, water
N28	30	65"00.1	167"31.5	van Veen Grab
N28A	24	64*44.6	167001.0	van Veen Grab, HAPS
N29	14.5	65"17.8	167"00.4	van Veen Grab
N30		65"30.5	168031.0	van Veen Grab, water

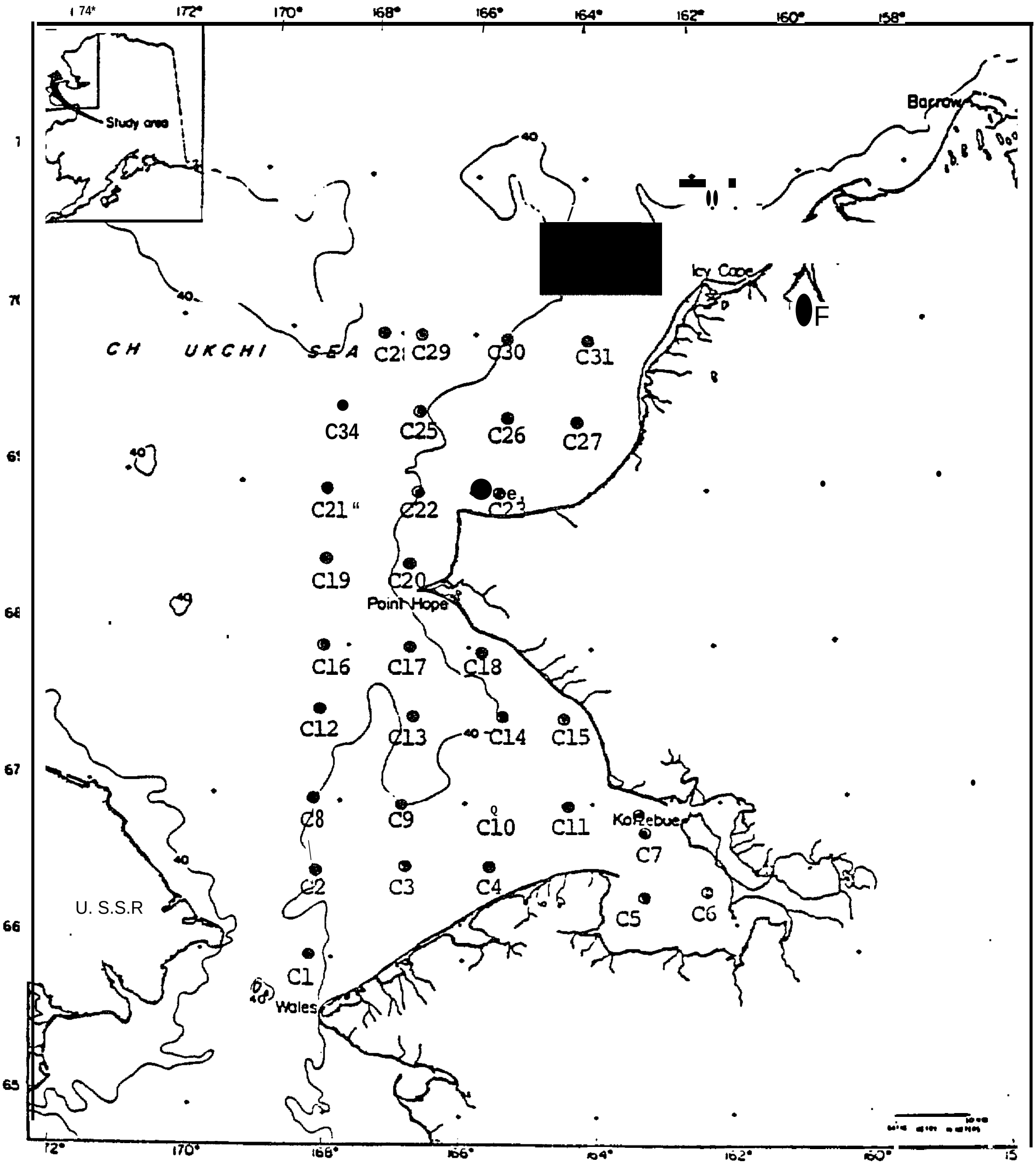


FIGURE B.6 Sampling Stations in the Chukchi Sea
<u>Discoverer</u>, September 1976

FIGURE B.6 (continued)

S. CHUKCHI SEA

Discoverer Leg IV - September 8-24, 1976
Station localities and operations

Station No.	Depth	Latitude	Longitude	Sampling Operations
C 1	53	65”59.8	168020.5	van Veen Grab, water
C 2	49	66”30.1	168”24.1	van Veen Grab, water
C 3	31	66°30.5	167001.6	van Veen Grab, HAPS, water
C 4	15.5	66030.0	165”39.2	van Veen Grab
C 5	14	66”18.1	163”13.5	van Veen Grab, HAPS, water
C 6	15	66°23.3	162014.4	van Veen Grab, HAPS, water
C 7	14	66’44.5	163017.0	van Veen Grab, HAPS, water
C 7A	13.5	66052.5	163”09.4	van Veen Grab, HAPS, water
C 8	35	67”00.3	168”26.2	van Veen Grab, water
C 9	42	67000.2	167001.9	van Veen Grab, HAPS, water
C10	24	66”58.0	165”46.9	van Veen Grab, HAPS, water
C11	26.5	67”00.0	164”20.0	van Veen Grab
C12	48	67”31.6	168”20.0	van Veen Grab, HAPS, water
C13	46.5	67”30.3	167002.5	van Veen Grab, HAPS, water
C14	38.5	67”28.9	165039.5	van Veen Grab, HAPS, water
C15	17	67”26.2	164’18.2	van Veen Grab, HAPS, water
C16	59	68001.2	168028.6	van Veen Grab, HAPS, water
C17	52	67”58.8	167001.5	van Veen Grab, water
C18	28	67”57.3	155047.8	van Veen Grab, water
C19	52	68”30.0	168”22.0	van Veen Grab, HAPS, water
C20	31*5	68”28.1	167”03.0	van Veen Grab, HAPS, water
C21	51	69”00.3	168029.3	van Veen Grab
C22	46	68”59.2	166*59.7	van Veen Grab, HAPS
C23	20	69”00.9	165”37.0	van Veen Grab, HAPS
C24	51	69030.0	168”21.9	van Veen Grab, HAPS
c25	46	69’30.0	167”04.1	van Veen Grab, HAPS
C26	33	69”30.1	165”32.0	van Veen Grab
C27	22	69029.5	164011.2	van Veen Grab
C28	45	70’00.7	168”19.4	van Veen Grab
C29	46.5	70000.0	167”01.2	van Veen Grab, HAPS
C30	40	69*58.5	165”33.4	van Veen Grab
C31	30	69058.1	164000.4	van Veen Grab

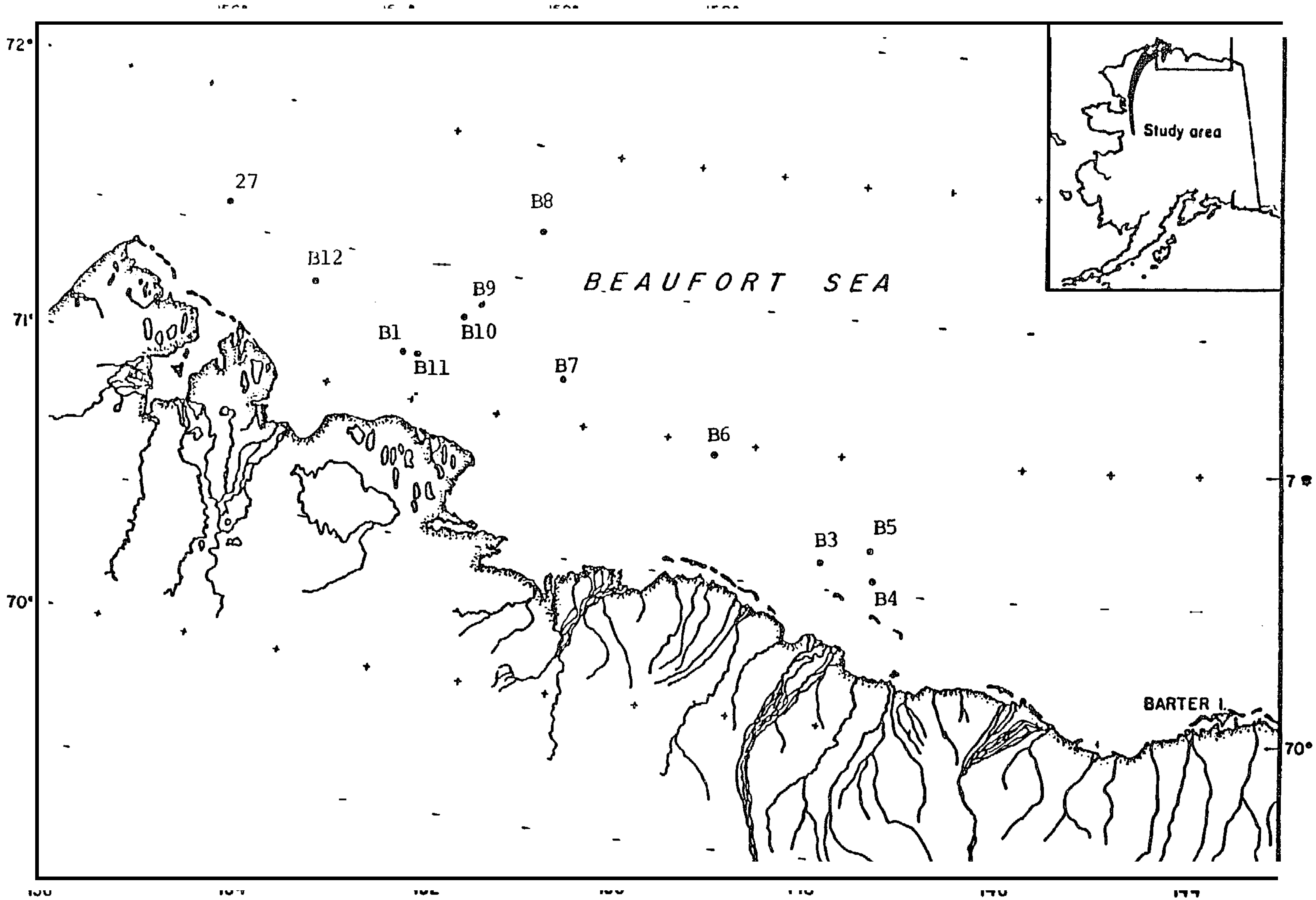


FIGURE B.7 Sampling Stations in the Beaufort Sea Glacier, August 1976

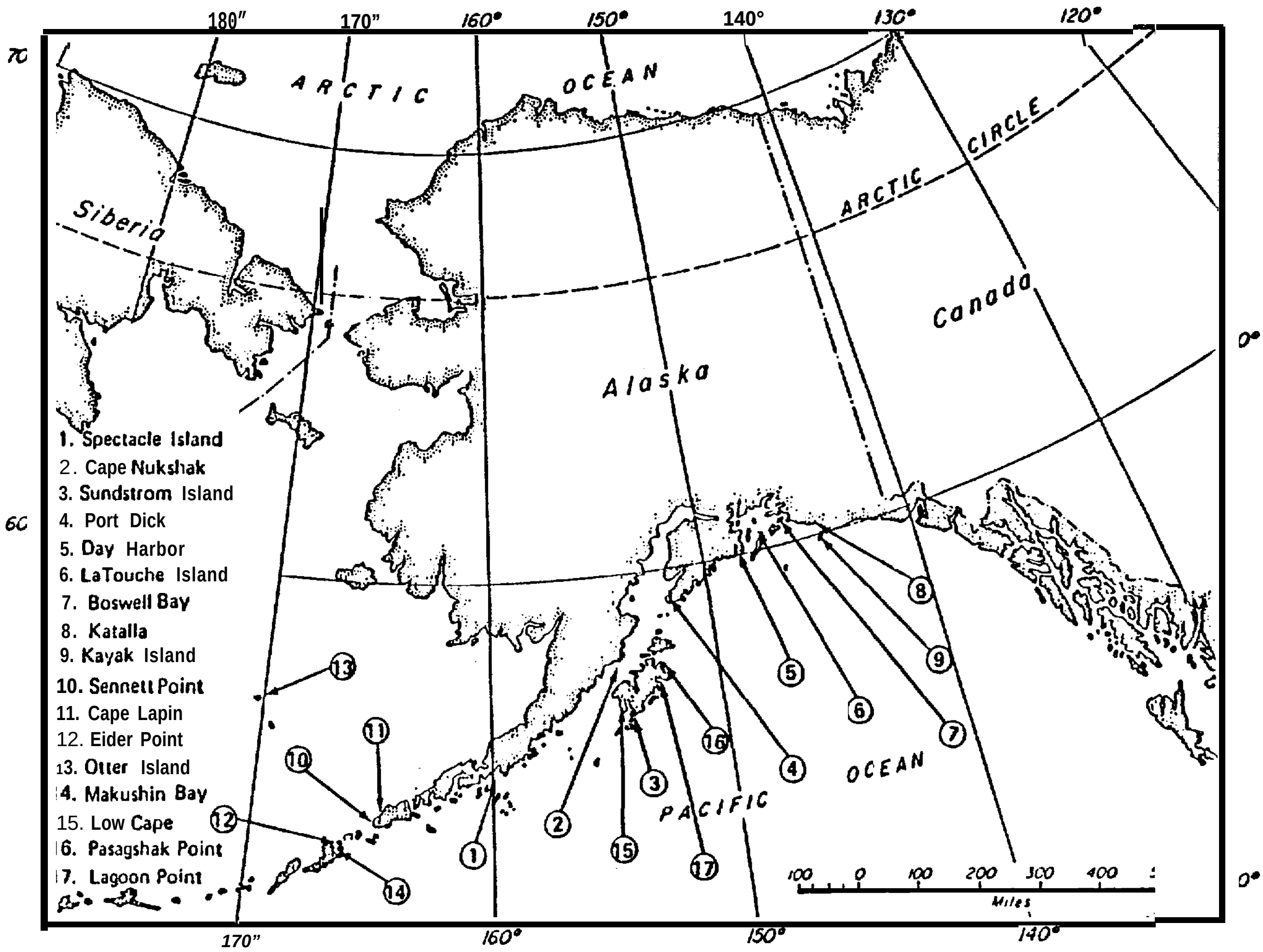


FIGURE B.8 Sampling Locations for Intertidal Biota

APPENDIX C

Elemental Composition of Alaska Shelf Surficial Sediments

TABLE C.1. Al, Ca, Mn, and V Concentrations in Bering Sea, Northwestern Gulf of Alaska, and Northeastern Gulf of Alaska Surficial Sediments.

Station	Depth Interval	Al (%)	Ca(%)	Mn (ppm)	V (ppm)
MB-8	0-2 cm	7..29 ± 0.03	3.69 ± 0.84	720 ± 38	126 ± 26
	4-6 cm	7.18 ± 0.03	3:29 ± 0.65	567 ± 36	87 ± 25
	8- 10cm	9.38 ± 0.04	3.22 ± 0.37	715 ± 43	165 ± 29
	12- 14cm	7.23 ± 0.03	2.92 ± 0.64	629 ± 37	90 ± 25
MB-1 2	0-3 cm	6.66 *0.03	1.93 ± 0.80	573 ± 49	118 ± 25
MB-1 9	O-2 cm	7.9420.03	4.63 ± 0.70	628 ± 43	93 ± 27
MB- 28	o-3 cm	6.05 ± 0.03	2.31 ± 1.03	524 ± 50	92 ± 25
MB- 29	0-4 cm	5.91 ± 0.02	2.09 ± 0.33	572 ± 45	77 ± 23
MB-30	0-4 cm	6.10 ± 0.03	2.97 ± 1.34	571 ± 43	112 ± 24
	4-8 cm	6.26 ± 0.03	1.86 ± 1.25	574 ± 38	114 ± 25
	8-1 2cm	6.09 ± 0.04	2.45 ± 1.63	574 ± 43	106 ± 27
MB-37	0-2 cm	5.50 ± 0.03	2.32 ± 1.00	358 ± 42	85 ± 23
	4-6 cm	5.75 ± 0.02	2.37 ± 0.70	360 ± 38	85 ± 21
	8-11cm	6.12 ± 0.06	1.85 ± 0.66	441 ± 17	82 ± 22
MB-41	0-2 cm	5.01 ± 0.05	<0.74	392 ± 15	79 ± 19
MB-43	o-2 cm	5.05 ± 0.07	1.70 ± 0.25	400 ± 13	90 ± 21
	4-6 cm	4.79 ± 0.04	1.91 ± 0.35	379 ± 8	77 ± 12
MB-56	0-2 cm	5.01 ± 0.10	1.73 ± 0.50	341 ± 7	85 ± 17
	4-6 cm	5.23 ± 0.03	2.82 ± 0.53	425 ± 38	83 ± 22
	8-10cm	5.42 ± 0.03	1.61 ± 1.13	427 ± 45	86 ± 23
	12-18cm	5.60 ± 0.03	2.55 ± 1.25	427 ± 49	98 ÷ 23
MB-59	0-2 cm	5.10 ± 0.02	2.08 ± 0.47	366 ± 42	77 ± 22
	4-6 cm	4.97 ± 0.02	1.87 ± 0.69	393 ± 40	77 ± 20
MB-64	0-2 cm	5.10 ± 0.03	3.73 ± 1.25	397 ± 48	82 ± 24
	4-6 cm	5.44 ± 0.16	2.20 ± 1.66	414 ± 22	87 ± 43
	8-10cm	5.49 ± 0.03	2.82 ± 1.02	403 ± 47	89 ± 23
	12-14cm	5.81 ± 0.03	2.52 ± 0.89	422 ± 45	96 ± 24
	16-20cm	5.64 ± 0.03	2.62 ± 0.89	420 ± 46	89 ± 23
	20-24cm	5.89 ± 0.02	1.96 ± 0.73	422 ± 45	89 ± 23

TABLE C.1 (cent'd.)

Station	Depth Interval	Al(%)	Ca(%)	Mn (ppm)	V (Pm)
GASSE-2	0-2 cm	7.11 ± 0.04	1.89 ± 0.82	738 ± 49	150 ± 29
	6-8 cm	7.91 ± 0.04	2.47 ± 0.80	847 ± 48	190 ± 28
	10-12cm	7.73 ± 0.03	1.86 ± 0.76	845 ± 55	173 ± 29
	14-16cm	7.85 ± 0.03	2.44 ± 1.03	995 ± 48	185 ± 28
	18- 20cm	7.86 ± 0.04	2.70 ± 0.73	817 ± 46	170 ± 28
GASSE-5	8-1 0cm	7.61 ± 0.04	4.33 ± 1.37	777 ± 48	165 ± 29
	14-16cm	7.24 ± 0.04	2.51 ± 0.98	774 ± 49	181 ± 28
GASSE-26	o-2 cm	6.19 ± 0.03	5.29 ± 0.92	924 ± 51	92 ± 16
	4-6 cm	6.68 ± 0.03	6.93 ± 1.03	879 ± 48	147 ± 25
	8-1 0cm	6.38 ± 0.03	5.52 ± 0.97	836 ± 48	141 ± 24
	12-14cm	6.81 ± 0.04	5.46 ± 1.25	810 ± 53	135 ± 30
GASSE-30	0-2 cm	6.70 ± 0.03	1.56 ± 1.27	600 ± 51	91 ± 26
GASSE-33	0-2 cm	4.06 ± 0.03	9.62 ± 1.11	635 ± 45	108 ± 24
	4-6 cm	4.17 ± 0.02	7.42 ± 1.20	432 ± 40	75 ± 20
	8-1 0cm	5.16 ± 0.02	12.65 ± 0.60	562 ± 42	108 ± 20
GASSE-44	o-2 cm	7.15 ± 0.03	3.81 ± 0.68	851 ± 43	146 ± 26
	4-6 cm	7.32 ± 0.12	2.45 ± 1.15	786 ± 18	174 ± 30
GASSE-48	0-2 cm	7.63 ± 0.03	3.29 ± 1.06	799 ± 44	161 ± 27
	4-6 cm	7.52 ± 0.03	4.24 ± 1.22	812 ± 46	143 ± 27
	8-1 0cm	7.72 ± 0.03	4.39 ± 0.74	756 ± 56	174 ± 28
GASSE-49	0-2 cm	7.07 ± 0.03	3.42 ± 1.32	776 ± 51	157 ± 28
	4-6 cm	7.78 ± 0.03	3.07 ± 0.77	746 ± 40	168 ± 27
	8-1 0cm	8.29 ± 0.04	4.22 ± 0.69	731 ± 41	165 ± 27
	12-14cm	7.77 ± 0.03	3.98 ± 0.92	731 ± 38	145 ± 25
	16-18cm	7.76 ± 0.03	2.43 ± 0.99	713 ± 40	166 ± 27
GASSE-50	0-2 cm	7.52 ± 0.04	3.34 ± 1.41	776 ± 40	163 ± 27
	4-6 cm	8.45 ± 0.04	3.14 ± 0.97	812 ± 43	183 ± 28
	8- 10cm	8.08 ± 0.04	2.61 ± 1.41	782 ± 45	169 ± 29
	12-14cm	7.77 ± 0.03	2.51 ± 1.21	740 ± 39	169 ± 26
	18- 20cm	7.89 ± 0.03	2.16 ± 1.04	763 ± 40	166 ± 27
GASSE-51	0-2 cm	8.20 ± 0.04	2.32 ± 1.15	969 ± 50	179 ± 30
	4-6 cm	7.10 ± 0.04	2,46 ± 1.06	912 ± 46	177 ± 28

Station	Depth Interval	Al (%)	Ca(%)	Mn (ppm)	V (ppm)
GASSE-52	0-2 cm	8.07 ± 0.04	3.79 ± 1.24	936 ± 41	165 ± 27
	4-6 cm	8.76 ± 0.04	3.13 ± 0.69	889 ± 46	183 ± 31
	8- 10cm	8.69 ± 0.04	3.38 ± 0.64	825 ± 45	180 ± 30
	12- 14cm	8.14 ± 0.04	3.46 ± 1.23	816 ± 40	166 ± 27
	14-16cm	8.39 ± 0.04	3.18 ± 1.15	852 ± 44	152 ± 29
GASSE-56	o-2 cm	6.73 ± 0.03	7.52 ± 1.08	734 ± 41	138 ± 25
	4-6 cm	8.25 ± 0.04	7.93 ± 1.20	621 ± 46	158 ± 27
	8- 10cm	7.78 ± 0.03	3.33 ± 0.72	933 ± 43	151 ± 27
	12-14cm	8.10 ± 0.03	3.46 ± 1.16	886 ± 45	197 ± 26
GASSE-57	0-2 cm	7.06 ± 0.03	6.00 ± 1.07	878 ± 51	152 ± 26
	4-6 cm	7.41 ± 0.04	5.31 ± 0.84	747 ± 44	144 ± 27
GASSE-58	0-2 cm	8.52 ± 0.04	2.81 ± 1.32	951 ± 47	176 ± 29
	4-6 cm	7.81 ± 0.03	3.31 ± 0.89	789 ± 44	149 ± 27
	8- 10cm	7.96 ± 0.04	2.72 ± 1.19	779 ± 49	167 ± 29
GASSE-59A	V.V.	7.92 ± 0.03	2.51 ± 0.83	858 ± 57	155 ± 30
GASSI4-105	0-2 cm	5.57 ± 0.02	4.56 ± 0.51	386 ± 45	40 ± 23
	4-6 cm	6.09 ± 0.03	10.52 ± 0.35	651 ± 49	123 ± 24
GASSW-104	0-2 cm	2.40 ± 0.01	15.74 ± 0.79	846 ± 39	72 ± 19
	4-6 cm	6.21 ± 0.02	10.66 ± 1.10	546 ± 48	108 ± 24
	8- 10cm	5.13 ± 0.02	11.40 ± 1.05	570 ± 42	94 ± 22
GASSW-119	0-2 cm	7.36 ± 0.04	2.54 ± 1007	991 ± 48	130 ± 29
	4-6 cm	7.58 ± 0.03	2.53 ± 1.17	802 ± 45	137 ± 27
	8- 10cm	7.66 ± 0.04	2.59 ± 0.75	724 ± 47	119 ± 28
GASSW-120	o-2 cm	7.57 ± 0.04	1.16 ± 1.69	1066 ± 51	164 ± 31
	4-6 cm	7.06 ± 0.04	2.06 ± 1.22	958 ± 47	123 ± 28
	8- 10cm	7.48 ± 0.04	1.94 *1.37	997 ± 57	167 ± 32
	12-1 4cm	7.64 ± 0.04	1.71 ± 0.95	1074 ± 52	150 ± 30
	16-18cm	7.24 ± 0.04	1.42 ± 1.53	931 ± 49	144 ± 28
GASSW-121	0-2 cm	6.95 ± 0.03	1.9 ± 1.2	782 ± 53	118 ± 26
	4-6 cm	6.61 ± 0.04	<1.6%	690 ± 50	121 ± 29
	8- 10cm	6.89 ± 0.04	1.97 ± 1.02	744 ± 44	114 ± 26
GASSW-122	0-2 cm	2.06 ± 0.02	26.9 ± 1.3	312 ± 31	27 ± 15
GASSW-124	0-2 cm	6,07 ± 0.03	1.8 ± 1.3	489 ± 47	83 ± 25
	4-6 cm	5.63 ± 0.03	2.2 ± 0.9	541 ± 45	88 ± 23
	8-10cm	5.55 ± 0.02	2.6 ± 0.7	464 ± 45	70 ± 22

Station	Depth Interval	Al (%)	Ca(%)	Mn (ppm)	V (ppm)
GASSW-133	v. v.	8.13 ± 0.04	7.7 ± 1.0	1170 ± 50	173 ± 28
GASSW-134	0-2 cm	6.69 ± 0.03	3.2 ± 1.4	711 ± 54	126 ± 27
	4-6 cm	5.98 ± 0.03	3.4 ± 1.2	651 ± 52	124 ± 25
	8- 10cm	7.36 ± 0.03	2.8 ± 1.2	844 ± 56	148 ± 28
	12-14cm	7.05 ± 0.04	3.2 ± 1.2	804 ± 46	147 ± 27
	16-1 8cm	6.75 ± 0.04	2.7 ± 1.4	742 ± 51	118 ± 30
GASSW-135	0-2 cm	7.46 ± 0.03	3.6 ± 1.4	806 ± 56	129 ± 28
	4-6 cm	7.46 ± 0.03	3.9 ± 0.9	900 ± 45	140 ± 27
	8-1 0cm	7.73 ± 0.03	3.9 ± 1.1	906 ± 45	132 ± 27
GASSE-48	4-6 cm	7.83 ± 0.03	4.63 ± 0.96	726 ± 39	150 ± 26
	4-6 cm	7.94 ± 0.04	3.10 ± ?.21	732 ± 44	165 ± 28
	4-6 cm	7.75 ± 0.03	4.36 ± 1.08	720 ± 40	159 ± 26
	4-6 cm	7.52 ± 0.03	4.24 ± 1.22	812 ± 46	143 ± 27

TABLE C.2. As, Ba, Co, Cr, Fe, Sb, and Sc in Bering Sea, Northwestern Gulf of Alaska, and Northeastern Gulf of Alaska Surficial Sediments

		As	Ba	CO	Cr	Fe(%)	Sb	Sc
MB-8	o-2	4.1 ± 0.4	370 ± 230	13	47 ± 5	3.87	0.46 ± 0.13	13
	4-6	5.1 ± 0.3	230 ± 210	10	32 ± 4	2.87	0.56 ± 0.22	11
	8-10	4.1 ± 0.4	310 ± 220	14	46 ± 4	4.21	0,68 ± 0.14	14
	12-14	3.9 ± 0.4	<210	7.2	25 ± 4	2.11	0.36 ± 0.08	8
MB-19	o-2	3.7 ± 0.4	440 ± 140	10	48 ± 4	2.49	0.63 ± 0.12	12
MB-30	o-4	3.4 ± 0.6	200 ± 190	10	38 ± 5	3.55	0.55 *0.13	15
	4-8	2.1 ± 0.5	<260	11	36 ± 5	3.53	0.50 ± 0.13	15
	8-12	1.5 ± 0.5	<370	10	46 ± 5	3.42	0.34 ± 0.13	14
MB-37	o-2	4.1 ± 0.6	430 ± 190	9.1	53 ± 4	2.53	0.61 ± 0.11	10
	4-6	3.1 ± 0.5	500 ± 150	8.9	59 ± 4	2.44	0.44 ± 0.11	11
	8-11	5.8 ± 0.4	750 ± 150	11	60 ± 5	2.73	0.79 ± 0.14	10
MB-41	0-2	3.0 ± 0.4	480 ± 140	8.9	64 ± 5	2.39	0.52 ± 0.12	10
MB-43	o-2	3.2 ± 0.5	<420	7.0	61 ± 5	2.06	0.57 ± 0.10	8
MB-56	0-2	0.7 ± 0.6	<260	9	86	2.59	0.63 ± 0.08	10
	4-6	4.3 ± 0.6	460 ± 280	8	73	2.24	0.69 ± 0.08	9
	8-10	2.8 ± 1).6	570 ± 440	10	95	2.87	0.74 ± 0.09	11
	12-18	4.0 ± 0.7	<500”	9	79	2.47	0.82 ± 0.14	10
MB-59	o-2	4.0 ± 0.4	1070 ± 340	9	107	2.52	0.73 ± 0.08	10
	4-6	3.8 ± o.4	<350	8	115	2.20	0.72 ± 0.09	9
MB-64	0-2	2,7 ± 0.8	1030 ± 340	9	93	2.68	0.48 ± 0.09	10
	4-6	3.6 ± 0.6	500 ± 270	9	85	2.81	0.60 ± 0.11	11
	8-10	2.9 ± 0.6	<280	10	102	3.07	0.71 ± 0.07	11
	12-14	3.6 ± 0.6	810 ± 300	8	76	2.47	0.68 ± 0.09	10
	16-20	4.6 ± 0.5	400 ± 260	11	101 ± 5	3.36	0.75 ± 0.19	13
	20-24	6.5 ± 0.4	600 ± 240	11	92 ± 5	3.27	1.02 ± 0.17	13

TABLEC.2 (cent'd.)

		As	Ba	CO	Cr	Fe(%)	Sb	Sc
MB-1 2	0-3	4.3 ± 0.5	650 ± 170	11	48 ± 5	3:42	0.86 ± 0.17	13
MB-28	O-3	2.9 ±˙ 0.5	490 ± 170	9	63 ± 4	2.67	0.56 ± 0.14	12
MB-29	O-4	7.2 ± 0.5	530 * 220	14	58 ± 5	3.29	0.96 ± 0.18	12
GASW-BNW 104								
	0-2	1.9 ± 0.5	260 ± 170	14	56 ± 4	2.94	0.53 ± 0.15	10
	4-6	1.8 ± 0.4	<220	18	83 ± 5	4.08	1.03 ± 0.19	13
	8-10	1.8 ± 0.5	340 ± 250	15	82 ± 4	3.26	0.72 ± 0.15	12
GASW-BNW 119								
	0-2	7.9 ± 0.6	360 ± 200	21	82 ± 6	5.36	1.56 ± 0.24	18
	4-6	7.7 ± 0.6	520 ± 190	18	92 ± 6	4.67	1.15 ± 0.79	17
	8-10	5.3 ± 0.6	470 ± 180	18	69 ± 5	4.64	1.50 ± 0.19	15
GASW-BNW 120								
	0-2	5.2 ± 0.8	1080 ± 230	18	100 ± 4	4.45	1.46 ± 0.17	16

Alaska Outer Continental Shelf Sediment Composition - Concentrations in ppm except where noted (dry weight).

Station	Interval	As	Ba	Co	Cr	Fe(%)	Sb	Sc
120	4-6	2.9	670 ± 60	16	97	3.85	0.49 ± 0.10	14
	8-10	2.6	1100 ± 60	17	1 02	4.18	0.97 ± 0.12	15
	12-14	5.2	790 ± 80	16	i 00	3.96	0.96 ± 0.11	14
	16-18	2.6	610 ± 60	15	89	3.63	0.81 ± 0.09	13
121	0-2	5.4	760 ± 80	15	117	4.10	0.82 ± 0.12	15
	4-6	3.8	710 ± 80	15	106	3.93	0.73 ± 0.12	14
	8-10	5.6	670 ± 70	13	96	3.39	0.82 ± 0.09	13
122	0-2	2.9	260 ± 30	3	15	0.83	0.17 ± 0.06	3
124	0-2	2.8	630 ± 60	8	67	2.75	0.52 ± 0.10	10
	4-6	3.3	570 ± 70	9	61	2.73	0.43 ± 0.09	10
	8-10	3.7	460 ± 60	9	59	2.96	0.33 ± 0.09	9
133	Grab	3.8	400 ± 80	16	31	4.10	0.35 ± 0.10	14
134	o-2	6.6	670 ± 90	16	77	4.17	0.51 ± 0.12	16
	4-6	5.7	620 ± 100	15	75	4.08	0.64 ± 0.14	16
	8-10	7.3	820 ± 120	21	75	4.61	0.69 ± 0.14	18
	12-14	8.8	830 ± 110	18	75	4.73	0.73 ± 0.14	18
	16-18	5.1	490 ± 110	14	66	3.87	0.48 ± 0.10	15
135	0-2	4.3	710 ± 130	16	74	4.90	0.56 ± 0.15	18
	4-6	4.5	680 ± 110	15	54	4.49	0.50 ± 0.12	16
	8-10	5.1	250 ± 110	16	77	4.73	0.56 ± 0.13	17
2	0-2	5.3	700 ± 190	16	115	4.20	0.61 ± 0.19	14
		7.8	930 ± 140	22	166	5.91	0.90 ± 0.16	20
	1:::2	7.7	710 ± 130	19	134	5.02	0.71 ± 0.13	17
	14-16	8.0	890 ± 140	22	156	5.64	0.74 ± 0.16	19
	18-20	6.3	770 ± 110	19	112	4.96	0.81 ± 0.13	17
5	8-10	2.2	500 ± 100	20	130	5.14	0.59 ± 0.10	18
	14-16	9.5	720 ± 140	23	119	5.14	0.90 ± 0.15	18
26	0-2	1.8	540 ± 120	20	124	4.95	0.43 ± 0.11	18
	4-6	<2.0	460 ± 130	16		4.14	0.49 ± 0.12	16
	8-10	3.5	490 ± 120	20	1;;	4.98	0.57 ± 0.10	19
	12-14	3.1	340 ± 140	17	98	4,27	0.58 ± 0.14	16
30	Top 2 cm	7.2	460 ± 110	12	112	3.10	0.16 ± 0.09	14
51	o-2	8.7	540 ± 100	27	162	6.84	0.44 ± 0.28	24
	4-6	7.9	530 ± 130	20	138	4.94	0.37 ± 0.10	17
105	0-2	4.7	460 ± 80	5	192	1.32	0.26 ± 0.06	
	4-6	1.8	560 ± 120	16	82	3.72	0.70 ± 0.08	

Station	Interval	As	Ba	Co	Cr	Fe(%)	Sb	Sc
EGA-BNW								
59A	v.v.	1.6 ± 0.6	570 ± 160	17	156	4.52	0.66 ± 25	19
58	0-2	2.7 ± 0.7	430 ± 160	18	145	4.80	0.35 ± 0.08	20
58	4-6	2.3 ± 0.6	250 ± 160	17	131	4.37	0.40 ± 0.07	15
58	8-10	2.3 ± 0.7	480 ± 170	18	153	5.19	0.45 ± 0.09	21
57	0-2	2.1 ± 0.6	350 ± 180	18	134	4.37	0.46 ± 0.16	16
57	4-6	1.9 ± 0.7	490 ± 170	15	79	3.79	0.43 ± 0,09	12
56	0-2	2.2 ± 0.5	620 ± 740	19	116	4.23	9.24 ± 0.07	20
56	4-6	1.9 ± 0.8	770 ± 180	12	88	2.99	0.30 ± 0.05	9
56	8-10	3.2 ± 0.6	740 ± 160	22	171	5.73	0.56 ± 0.09	24
56	12-14	2.7 ± 0.7	530 ± 170	18	142	4.68	0.47 ± 0.08	17
33	0-2	2.6 ± 0.6	450 ± 160	16	114	5.23	0.81 ± 0.07	16
33	4-6	1.5 ± 0.7	450 ± 140	11	79	3.33	0.63 ± 0.06	12
33	8-10	1.4 ± 0.6	350 ± 100	12	32	2.27	0.40 ± 0.05	10
48	0-2	2.5 ± 0.4	550 ± 130					
48	4-6	2.3 ± 0.7	500* 120	16	104	4.41	0.51 ± 0.09	17
48	8-10	2.1 ± 0.4	440 ± 140					
44	0-2	2.7 ± 0.7	450 ± 120	15	112	4.36	0.42 ± 0.08	18
44	4-6	0.8 ± 0.4	400 ± 130	16	55	2,97	0.33 ± 0.05	16
49	0-2	4.4 ± 0.9	350 ± 150	18	129	4.86	0.41 ± 0.10	23
49	4-6	3.4 ± 0.4	540 ± 120	18	144	5.25	0.36 ± 0.08	22
49	8-10	3.4 ± 0.7	530 ± 140	19	66	3.46	0.35 ± 0.06	21
49	12-14	2.2 ± 0.3	670 ± 110	20	78	3.67	0.29 ± 0.04	25
49	16-18	2.6 ± 0.4	380 ± 60	17	58	3.04	0.39 ± 0.06	18
50	0-2	3.0 ± 0.2	500 ± 70	19	74	3.44	0.26 ± o.o5	21
50	8-10	2.4 ± 0.4	370 ± 130	12	98	2.84	<0.16	9
50	12-14	3.2 ± 0.4	410 ± 140	20	136	5.08	0.35 ± 0.08	20
50	18-20	2.3 ± 0.4	510 ± 110	16	110	3.76	0.28 ± 0.06	10
52	0-2	4.3 ± 0.5	770 ± 140	19	137	4.90	0.59 ± 0.09	14
52	4-6	2.9 ± 0.4	720 ± 120	21	142	5.44	0.57 ± 0.25	17
52	8-10	2.5 ± 0.5	580 ± ?40	20	94	4.26	0.58 ± 0.05	14
52	12-14	2.9 ± 0.4	520 ± 120	17	122	4.12	0.51 ± 0.08	12
52	14-16	3.5 ± 0.5	690 ± 80	22	136	5.41	0.56 ± 0.09	18
48	4-6	1.8 ± 0.4	440 ± 110	20	146	5.15	0.55 ± 0,08	19
48	4-6	1.8 ± 0.3	600 ± 80	18	131	4.81	0.54 ± 0.09	18
48	4-6	1.4 ± 0.4	490 ± 30	19	137	4.77	0.50 ± 0.08	17

TABLE C.3. Al, Ti, Mn and V Concentrations in Cook Inlet, Shelikof Strait, Chukchi Sea, Norton Sound and Beaufort Sea Surficial Sediments.

	Al (%)	Ti (%)	Mn	V
BEAUFORT SEA				
Station B-1	8.00±0.28	0.56±0.14	506±37	176±32
B-3	5.34±0.18	0.31±0.07	369±22	122±12
B-7	6.59?0.22	0.51±0.10	444±25	150±14
B-8	7.26'0.24	0.46±0.11	1003149	163±15
B-12	6.08±0.21	0.42±0.09	491±26	117±12
NORTON SOUND				
Station N-1	5.35±0.18	0.45?.0.09	344±21	82±10
N-5	6.18±0.21	0.46±0.10	586±30	113±12
N-9	7.32±0.24	0.36±0.09	544±29	149±14
N-15	5.88?0.20	0.45±0.09	458±25	102±11
N-20	5.57±0.19	0.46±0.09	396±23	73±10
N-26	4.43?1.5	0.36±0.08	417'54	56±9
CHUKCHI SEA				
Station C-3	4.76±0.16	0.47±0.09	428±24	87±11
C-7	4.31±0.15	0.32±0.08	405±23	91±10
c-lo	6.11±0.21	0.46±0.09	432+24	109±12
C-20	3.36±0.12	0.22±0.06	243±16	66?8
C-23	1.70±0.06	0.16'0.04	143±10	37±8
C-25	5.15±0.17	0.42±0.09	359±21	106±11
SHELIKOF STRAIT				
Station SS-2	7.66±0.26	0.46±0.10	820±40	148±14
SS-2, surface <0.2 cm	7.50±0.26	0.51±0.15	1810±90	142±19
SS-4	7.68±0.26	0.54±0.11	966±46	106±13
SS-5	8.01±0.27	0.34±0.10	867±43	142:15
SS-8	8.21±0.27	0.48±0.11	800±40	149±15
SS-10	7.59±0.25	0.53±0.11	761±38	112±13

TABLEC.3 (cent'd.)

COOK INLET		Al (%)	Ti (%)	Mn	V
Station	CB-1	7.70+0.26	0.38+0.10	698+35	96+13
	CB-3	7.58+0.26	0.56+0.11	726+36	110+14
	CB-6	6.05+0.21	0.26+0.08	415~23	61+11
	CB-7	7.20+0.25	0.42+0.10	652+33	114+14
	CB-8	8.41+0.29	o. 51+0. 11	784+39	148:16
WESTERN GULF					
Station	WG 105	5.4$30.19	0.29+0.08	672+34	89+1 1
	WG 120	7.31+0.25	0.45+0.10	989+43	140+14
	WG 133	8.46+0.29	0.74+0.16	1380+70	216+21
BRISTOL BAY					
Station	MB-8	7.02+0.24	0.50+0.10	692+35	132+13
	MB-12	6.63+0.23	0.31+0.09	574+29	95+1 3
	MB-41	5.36+0.19	0.39+0.09	448+24	89+11
EASTERN GULF					
	EG-33	5.76+0.20	0.3130.09	567+28	120+13
	EG-44	7.45+0.26	0.58+0.11	777+38	132+1 5
	EG-58	8.36+0.29	0.46+0.11	837+40	174+17

TABLE C.4. Na, K, As, La and Sm Concentrations in Cook Inlet, Shelikof Strait, Chukchi Sea, Norton Sound and Beaufort Sea Surficial Sediments.

NORTON SOUND

Station	Na(%)	K(%)	As	La	Sm
N-1	2.03±0.01	1.88±0.24	7.8±1.1	24.6±1.1	3.5±0.1
N-5	2.02±0.01	1.65±0.22	11.8±1.2	30.2±0.9	4.4±0.1
N-9	2.31±0.01	2.14±0.24	19.8±1.1	36.8±0.8	5.5±0.1
N-15	2.01±0.01	1.14±0.18	10.7±1.0	29.0±0.7	4.2±0.1
N-20	1.6530.01	1.60±0.19	6.9±0.8	31.2±0.8	4.7±0.1
N-26	1.72±0.01	1.29±0.17	8.3±0.8	19.7±0.6	3.3±0.1

CHUKCHI SEA

Station	Na(%)	K(%)	As	La	Sm
c-3	1.38±0.01	1.0530.14	9.3±0.9	28.0±0.9	4.3±0.1
c-7	1.12±0.01	0.97±0.12	8.4±0.9	33.3±0.9	4.7±0.1
c-lo	1.23±0.01	0.62±0.11	6.9±0.7	22.5±0.7	3.6±0.1
C-14	2.43±0.01	1.45±0.16	11.7±1.0	30.6±0.9	4.7±0.1
C-20	1.20±0.01	0.59±0.10	13.5±0.7	17.6±0.6	2.8±0.1
C-23	0.53±0.01	0.32±0.07	23.3±0.6	13.8±0.5	2.130.1
C-25	1.66±0.01	1.61±0.15	13.9±0.9	27.1±0.5	4.4±0.1

BEAUFORT SEA

Station	Na(%)	K(%)	As	La	Sm
B-1	1.10±0.01	2.16±0.14	17.6±0.9	35.3±0.6	5.1±0.1
E-3	0.89±0.01	1.65±0.12	15.7±0.8	37.3±0.6	5.1±0.1
e-7	0.95±0.01	1.99±0.13	17.9±0.9	34.8±0.6	5.2±0.1
B-8	3.19±0.01	2.72±0.23	54.6±1.4	35.0±0.7	5.3±0.1
E-12	2.07±0.01	1.68±0.18	22.9±1.0	32.0±0.6	5.0±0.1

TABLEC.4 (cent'd.)

COOK INLET

Station	Na(%)	K(%)	As	La	Sm
CB-1	2.60±0.01	1.28±0.19	8.07±0.9	22.4±0.6	3.8±0.1
CB-3	2.55±0.01	1.50±0.18	6.1±0.9	22.2±0.6	3.9±0.1
CB-6	2.13±0.01	1.49±0.15	7.8±0.8	11.7±0.5	2.0±0.1
CB-7	2.61±0.01	1.34±0.19	7.7±0.9	16.2±0.6	3.0±0.1
CB-8	2.46±0.01	1.24±0.20	12.4±1.0	23.6±0.6	4.3±0.1

SHELIKOF STRAIT

Station	Na(%)	K(%)	As	La	Sm
SS-2 Surface	3.82±0.01	1.71±0.27	11.4±1.1	18.7±0.7	3.8±0.1
5s-2	3.10±0.01	1.39±0.25	9.6±1.2	20.0±0.6	4.1±0.1
SS-4	3.00±0.01	1.56±0.21	10.7±1.1	15.1±0.6	3.3±0.1
SS-5	3.55±0.01	1.56±0.24	10.8±1.1	23.1±0.6	4.4±0.1
SS-8	3.25±0.01	1.85±0.22	14.1±1.1	22.2±0.7	4.4±0.1
SS-10	3.30±0.01	1.45±0.24	8.5±1.4	20.7±0.7	4.2±0.1

TABLE C.5 Sc, Cr, Fe, Co, Sb, Ba, Cs, Eu, Tb, Ta and Th Concentrations in Cook Inlet, Shelikof Strait, Chukchi Sea, Norton Sound and Beaufort Sea Surficial Sediments.

(ppm EXCEPT WHERE NOTED)

	Sc	Cr	Fe(%)	co	Sb	Ba	Cs	Eu	Tb	Ta	Th
NORTON SOUND											
STATION N-1	9.40 ± 0.08	96 ± 2	2.34 ± 0.07	8.49 ± 0.05	0.68 ± 0.06	790*30	1.85 ± 0.09	0.92 ± 0.03	0.58*0.05	0.68 ± 0.05	5.48 ± 0.07
N-5	11.52*0.08	83 ± 1	3.16 ± 0.08	12.53 ± 0.17	0.97 ± 0.05	730*20	0.66*0.05	1.08 ± 0.02	0.78 ± 0.06	0.75 ± 0.08	7.36 * 0.06
N-9	16.98 f. 0.08	114 ± 2	4.92 ± 0.09	I9.O5*O.1O	1.79 ± 0.08	970*30	5.61 ± 0.17	1.36*0.02	0.84 ± 0.06	0.93 ± 0.09	11.6 ± 0.1
N-15	10.49*0.08	71 ± 1	2.76 ± 0.05	11.27 ± 0.23	1.03 ± 0.07	620 ± 30	2.42* O.1O	1.03 ± 0.03	0.69 ± 0.06	0.65 ± 0.07	6.62 ± 0.07
N-20	8.00 ± 0.06	67 ± 1	2.10 ± 0.04	9.31 ± 0.06	0.76 ± 0.04	670*20	2.44 ± 0.08	1.02 ± 0.02	0.64 ± 0.05	0.72 ± 0.07	6.92 ± 0.06
N-26	8.80*0.09	47*1	2.49*0.05	7.29 ± 0.08	0.84*0.06	520 ± 30	2.18 ± 0.09	0.87 ± 0.02	0.62*0.05	1.32 ± 0.13	4.75 * 0.06
CHUKCHI SEA											
STATION C-3	8.62 ± 0.04	229 ± 3	2.26*0.01	8.48*0.05	0.73*0.04	540*20	1.97*0.05	0.92 ± 0.01	0.42 * 0.01	0.65 ± 0.04	6.46 ± 0.07
c-7	8.29 ± 0.03	333 ± 4	2.47 ± 0.02	11.46 ± 0.08	0.69 ± 0.05	480 ± 20	2.08 ± 0.08	0.90 ± 0.02	0.41 * 0.02	0.62? 0.05	6.79 ± 0.08
c-lo	6.81*0.04	247 ± 3	1.91*0.01	7.24 ± 0.07	0.49 * 0.03	430 ± 20	1.27 ± 0.04	0.78 ± 0.01	0.35 * 0.01	0.58*0.05	4.20 ± 0.05
C-14	12.46*0.04	93*1	3.37 ± 0.01	11.68*0.24	0.98 ± 0.07	730 ± 40	3.6I*O.1O	1.11 ± 0.02	0.54 ± 0.02	0.81 ± 0.06	8.15* O.1O
C-20	4.67 ± 0.03	80*1	1.80*0.01	7.31 ± 0.12	0.58 ± 0.03	650*20	1.46*0.03	0.65 ± 0.01	0.34 * 0.01	0.34*0.02	3.87 ± 0.44
C-23	3.31*0.01	150 ± 2	1.89*0.01	5.57*0.03	0.50 ± 0.02	660 ± 20	0.87*0.03	0.49 * 0.01	0.25 ± 0.01	0.17*0.02	2.36*0.03
C-25	4.74 ± 0.02	41 ± 2	1.42 ± 0.01	4.98 ± 0.02	0.40 * 0.03	---	1.47 * 0.04	0.48 ± 0.01	0.24 ± 0.02	0.33 ± 0.03	3.43*0.06
BEAUFORT SEA											
STATION B-1	12.79 ± 0.02	82*3	3.53*0.02	13.93*0.07	0.88 ± 0.04		7.28 ± 0.11	1 .01* 0.02	0.49 * 0.04	0.81 ± 0.07	10.1*O.2
B-3	10. I6*O.O4	85*3	2.97 ± 0.03	11.76 ± 0.07	0.70 ± 0.04		5.48 * 0.09	1.01 ± 0.02	0.47 * 0,04	0.70*0.07	9.13*0.15
B-7	12.%*0.02	95*4	3.81*0.03	15.O3*O.1O	0.72 ± 0.06		6.46 ± 0.12	1.13*0.03	0.52 ± 0.04	0.83*0.08	9.94*0.18
B-8	15.77*0.02	97*4	5.48*0.06	17.05*0.09	1.20 ± 0.06		7.92 ± 0.13	1.19* 0.03	0.53 * 0.04	0.84 ± 0.08	10.7* 0.2
B-12	12.21 ± 0.06	89*4	3.72 ± 0.04	12.93 ± 0.07	0.74 ± 0.05		5.93 * 0.10	1.06 * 0.02	0.51 * 0.04	0.81 ± 0.07	9.29 ± 0.16
COOK INLET											
STATION CB-1	13.23 ± 0.02	65 ± 2	3.52 ± 0.01	12.82 ± 0.06	0.72 ± 0.04		2.38 ± 0.05	0.72 ± 0.01	0.33 * 0.02	0.45*0.03	5.22*0.07
CB-3	7.39 ± 0,05	35* I	2.04 ± 0.01	8.23 ± 0.04	0.48 ± 0.03		1.33* 0.04	0.65 ± 0.01	0.28 ± 0.02	0.38*0.03	2.47*0.05
CB-7	12.77*0.03	69*2	3.33 ± 0.02	14.68*0.12	0.63 ± 0.07		2.33 ± 0.07	0.84 ± 0.02	0.35 ± 0.02	0.51*0.06	4.3I*O.1O
CB-8	18.97*0.16	108* 3	5.15*0.02	20.80*0.11	2.15 ± 0.10		4.85 ± 0.11	1.11 * 0.02	0.45 * 0.03	0.70*0.07	5.84 ± 0.12
SHELIKOF STRAIT											
STATION SS-2 (SURFACE)	16.80*0.03	82*2	4.94 ± 0,02	20.04 ± 0.11	1.23 ± 0.09		4.19 ± 0.09	0.94 * 0.02	0.41 ± 0.04	0.62*0.07	5.50*0.11
SS-2	17.26*0.03	85 ± 2	4.82 ± 0.02	19.63*0.11	1.27 ± 0.08		4.45 * 0.10	1 .00* 0.02	0.51 * 0.04	0.84 ± 0.08	5.80 ± 0.13
SS-4	16.74 ± 0.04	47*2	4.62*0,03	17.84*0.19	0.77 * 0.11		2.17 ± 0.15	0.91 ± 0.03	0.35 ± 0.04	0.30 ± 0.06	3.50 ± 0.18
SS-5	17.55*0.03	98 ± 3	4.95 ± 0.02	19.61 ± 0.27	1.22 ± 0.09		4.76 ± 0.11	1.02 ± 0.02	0.46 * 0.04	0.75*0.08	6.60 ± 0.15
SS-8	18.45*0.03	101 * 3	5.22*0,02	21.0010.28	1.17 ± 0.08		5.02 ± 0.10	1.05 * 0.02	0.53 ± 0.04	0.72*0.08	6.64*0.14
SS-10	16,2* 0.03	73 ± 2	4.29 ± 0.02	15.98*0.33	0.93 ± 0.08		3.34 ± 0,10	0.97 * 0.02	0.42 * 0.04	0.54*0.07	5.66*0.14

TABLE C.6 Regional Average Concentrations of Major and Trace Metals

	Eastern Bering Sea (12 samples)	Northwest Gulf of Alaska (10 samples)	Northeast Gulf of Alaska (15 samples)
Al(%)	6.09±0.96	6.02±2.13	7.24±0.85
Ca(%)	2.86±0.90	6.91±8.24	4.10±2.20
Fe(%)	2.84±0.55	3.25±1.47	4.64±0.88
Ba (ppm)	531±269	558±188	503±118
Mn (ppm)	494±119	756±287	813±111
V (ppm)	93~17	106±49	147±28
Cr (ppm)	64:21	84$55	126±22
Co (ppm)	9.9±1.9	12±5.6	18±3.4
Sc (ppm)	11:1.9	13±4.7	18±3.2
As (ppm)	3.6±1.5	4.8±1.7	3.6±2.1
Sb (ppm)	0.63±0.15	0.47±0.21	0.46±0.18

TABLE C.6 (cent'd.)

	Norton Sound (6 samples)	Chukchi Sea (7 samples)	Beaufort Sea (5 samples)
Al (%)	5.79 ± 0.96	4.23 ± 1.53	6.65 ± 1.03
Fe (%)	2.96 ± 1.03	2.16 ± 0.63	3.90 ± 0.94
Ba (ppm)	720 ± 150	580 ± 120	---
Mn (ppm)	458 ± 92	335 ± 117	564 ± 254
V (ppm)	96 ± 33	83 ± 27	146 ± 26
Cr (ppm)	80 ± 23	168 ± 106	90 ± 6
Co (ppm)	11.3 ± 4.2	8.10 ± 2.64	14.1 ± 2.0
Sc (ppm)	10.9 ± 3.2	6.99 ± 3.12	12.78± 2.01
As (ppm)	10.9 ± 4.7	12.4 ± 5.5	25.7 ± 16.4
Sb (ppm)	1.01 ± 0.40	0.62 ± 0.19	0.85 ± 0.21
Eu (ppm)	1.05 ± 0.17	0.76 ± 0.24	1.08 ± 0.08
Th (ppm)	7.12 ± 2.40	5.04 ± 2.11	9.83 ± 0.64

TABLE C.7 Western Gulf of Alaska Surficial Sediment Elemental Correlation Matrix

	As	Ba	Co	Cr	Fe	Sb	Sc	Al.	Ca	Mn	V
As	1	.285	.707ˣ	.534	.713ˣ	.661	.716ˣ	.466	-.338	.642	.582
Ba		1	.334	.734ˣ	.444	.436	.521	.493	-.550	.487	.582
Co			1	.596	.950ˣˣ	.706ˣ	.921ˣˣ	.863ˣˣ	-.738ˣ	.629	.745ˣ
Cr				1	.648	.679ˣ	.688ˣ	.570	-.774ˣ	.337	.435
Fe					1	.658	.991ˣˣ	.915ˣˣ	-.782ˣ	.715ˣ	.811ˣ
Sb						1	.613	.500	-.544	.495	.474
Sc							1	.906ˣˣ	-.793X	.704ˣ	.814ˣˣ
Al								1	-.847ˣˣ	.733ˣ	.880ˣˣ
Ca									1	-.361	-.569
Mn										1	.948ˣˣ
v											1

x Significant at 0.5
xx Significantat 0.1

TABLE C.8 Eastern Gulf of Alaska Surficial Sediment Elemental Correlation Matrix

	As	Ba	Co	Cr	Fe	Sb	Sc	Al	Ca	Mn	V
As	1	.131	.252	.184	.280	-.209	.077	.236	-.534	-.091	.111
Ba		1	.166	.063	.068	.231	-.348	.212	-.141	.134	.109
Co			1	.433	.801[xx]	.019	.652[x]	.350	-.002	.663[x]	.501
Cr				1	.704[xx]	.312	.202	.403	-.3,92	.590[x]	.343
Fe					1	.400	.475	.136	.087	.604[x]	.371
Sb						1	-.278	-.343	.325	.060	.039
Sc							1	.317	-.089	.351	.472
Al								1	-.744[xx]	.650[x]	.762[xx]
Ca									1	-.242	-.356
Mn										1	.581[x]
V											1

[x] Significant at .05
[xx] Significant at .01

TABLE C.9 Bering Sea - Bristol Bay Surficial Sediment Elemental Correlation Matrix

	As	Ba	Co	Cr	Fe	Sb	Sc	Al	Ca	Mn	V
As	1	-.127	.794*	-.174	.306	.797x	.059	.018	-.385	.212	-.199
13a		1	-.335	.934xx	-.470	.142	-.721x	-.227	-.157	-.622	-.535
Co			1	-.412	.724x	.433	.406	-.253	-.041	.678x	.305
Cr				1	-.549	-.002	-.752x	-.182	-.157	-.691x	-.653
Fe					1	.045	.765x	-.319	-.503	.704x	.774x
Sb						1	-.009	-.091	-.600	-.019	-.274
SC							1	-.393	.088	.762x	.755x
Al								1	-.183	-.453	-.187
Ca									1	.391	.188
Mn										1	.713x
v											1

x Significant at .05
xx Significant at .01

TABLE C.10 Silver Concentrations in Selected Alaskan Shelf Surficial Sediments

Bristol Bay

MB-12	0-3cm	0.072	±	0.015
MB-28	0-3cm	0.075	±	0.014
MB-29	0-4cm	0.054	±	0.014
MB-37	0-2cm	0.088	±	0.010
MB-41	0-2cm	0.042	±	0.010
MB-43	0-2cm	0.089	±	0.012
MB-56	0-2cm	0.091	±	0.014
MB-59	0-2cm	0.074	±	0.013
MB-64	0-2cm	0.102	±	0.013
	Mean	0.076	±	0.019

Western Gulf of Alaska

GASSW-105	0-2cm	0.072	±	0.015
119	0-2cm	0.065	±	0.015
120	0-2cm	0.091	±	0.016
121	0-2cm	0.131	±	0.021
122	0-2cm	0.088	±	0.022
124	0-2cm	0.168	±	0.021
133	Grab	0.299	±	0.020
134	0-2cm	0.058	±	0.018
135	0-2cm	0.036	±	0.019
	Mean	0.112	±	0.081

Eastern Gulf of Alaska

GASSE - 2	0-2cm	0.047 ± 0.018
26	0-2cm	0.057 ± 0.020
33	0-2cm	0.071 ± 0.019
44	0-2cm	0.083 ± 0.018
48	0-2cm	0.077 ± 0.017
49	0-2cm	0.126 ± 0.023
50	0-2cm	0.066 ± 0.016
51	0-2cm	0.102 ± 0.020
52	0-2cm	0.131 ± 0.024
56	0-2cm	0.135 ± 0.019
57	0-2cm	0.078 ± 0.020
58	0-2cm	0.071 *0.014
59A	Van Veen	0.104 ± 0.022
	Mean	0.088 ± 0.029

Concentrations in ppm dry weight

TABLE C.11 Silver Concentrations in Two Sediment Cores from the Alaskan Shelf.

Bristol Bay

MB-64	0-2cm	0.102 ± 0.013
	4-6cm	0.070 ± 0.011
	8-10cm	0.045 * 0.011
	1 2-14cl!l	00090 ± 0.009
	16-20cm	0.064 ± 0.013
	20-24cm	0.143 ± 0.014

Eastern Gulf of Alaska

GASSE -49	0-2cm	0.126 ± 0.023
	4-6cm	0.080 ± 0.018
	8-10cm	0.071 ± 0.019
	12-14cm	0.051 ± 0.014
	16-18cm	0.175 ± 0.020

APPENDIX D

Display of Surficial Sediment Composition

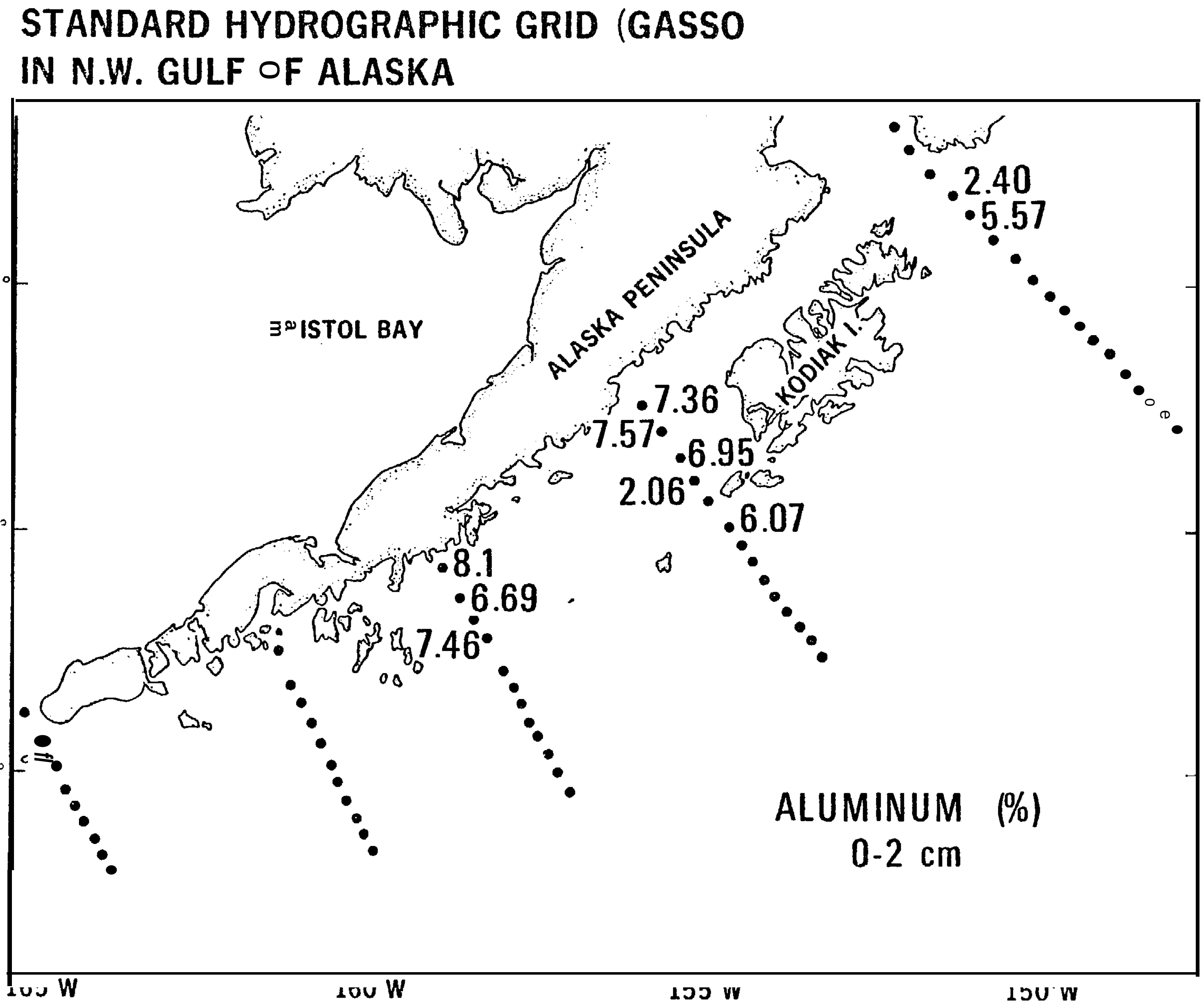


FIGURE D.1 Al Concentrations in N. W. Gulf of Alaska Sediments

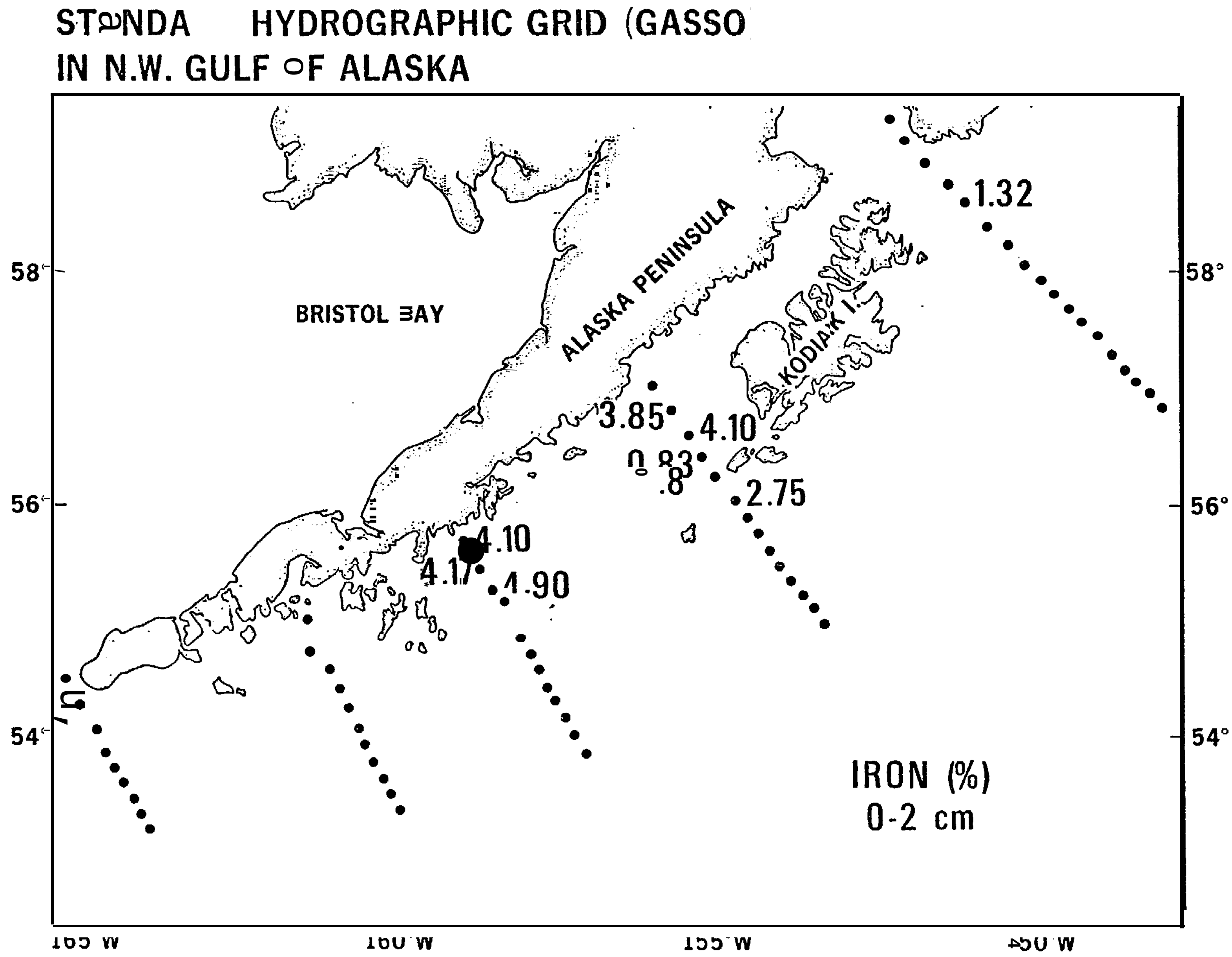


FIGURE D.2 Fe Concentrations in N. W. Gulf of Alaska Sediments

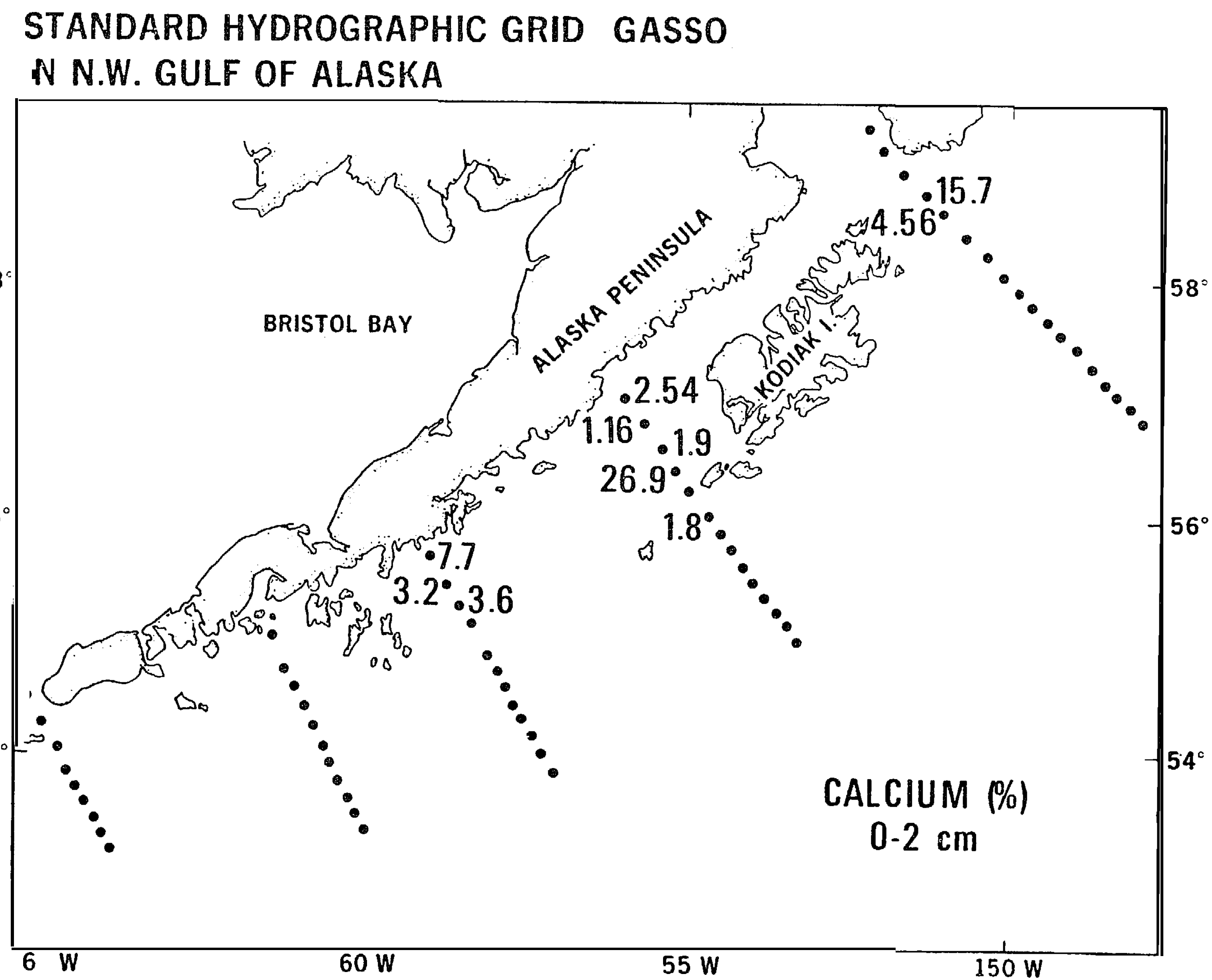


FIGURE #3 Ca Concentrations in N. W. Gulf of Alaska Sediments

STANDARD HYDROGRAPHIC GRID GASSO
IN N.W. GULF OF ALASKA

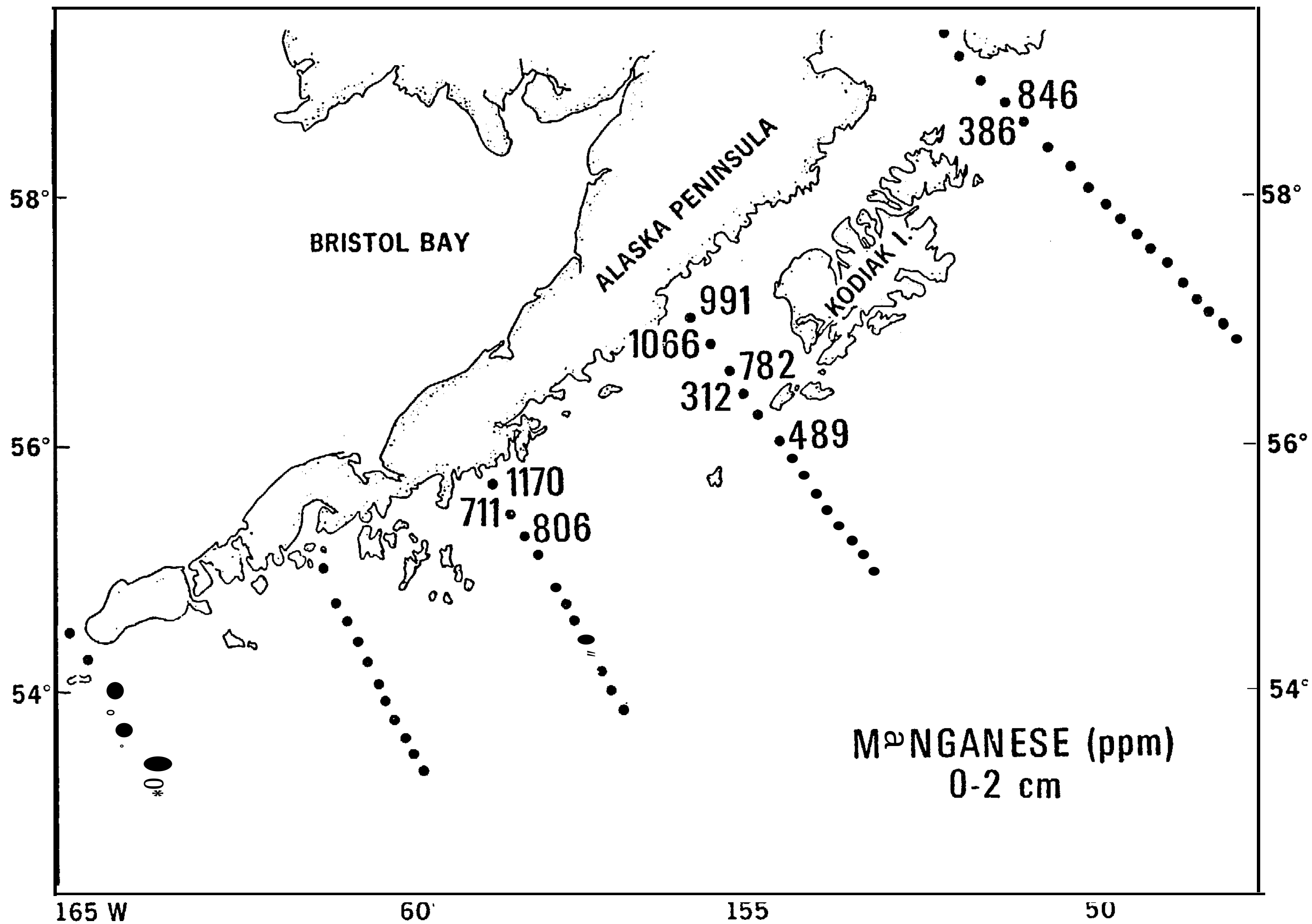


FIGURE 4

STANDARD HYDROGRAPHIC GRID (GASSO)
IN N.W. GULF OF ALASKA

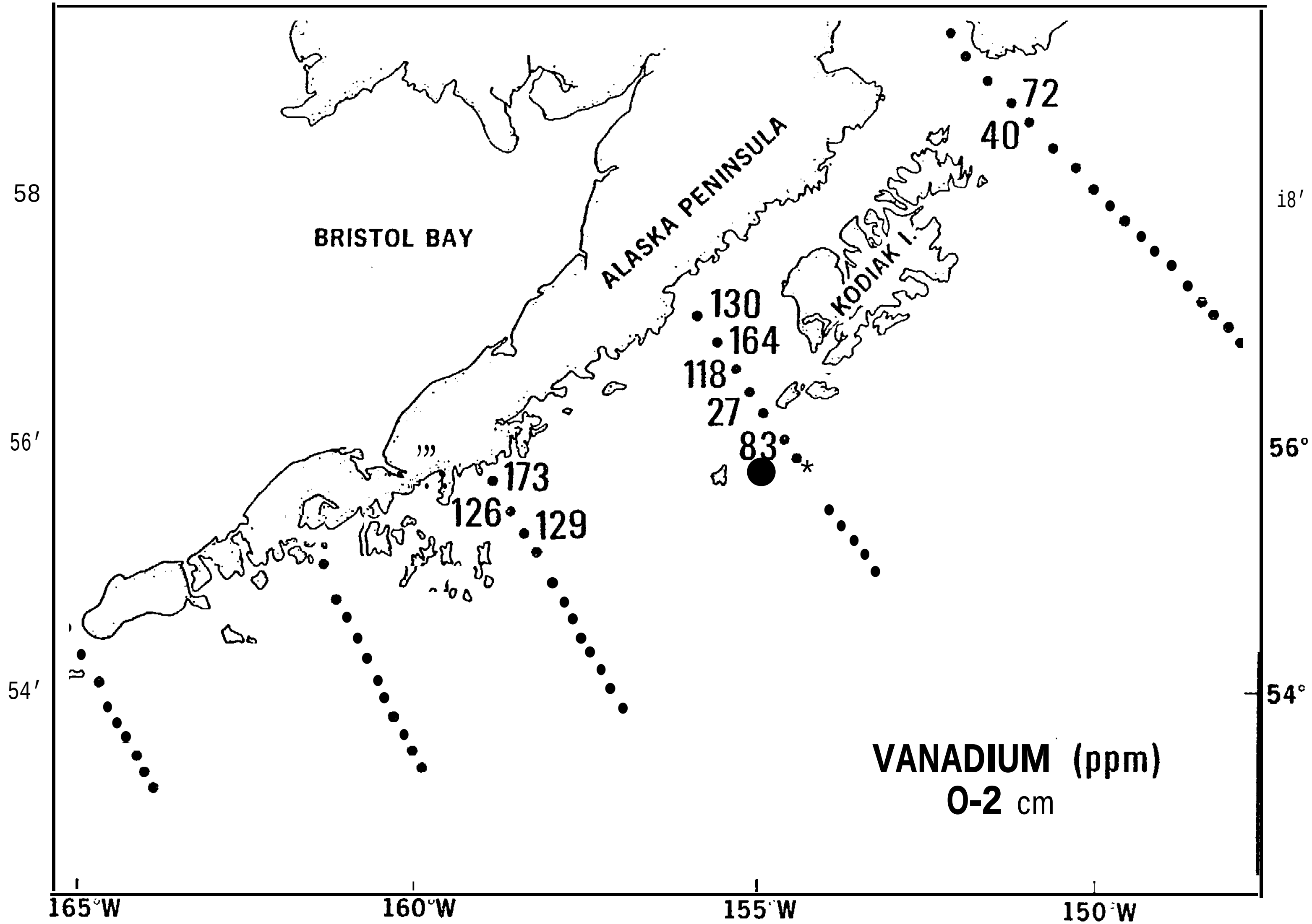


FIGURE D.5 V Concentrations in N. W. Gulf of Alaska Sediments

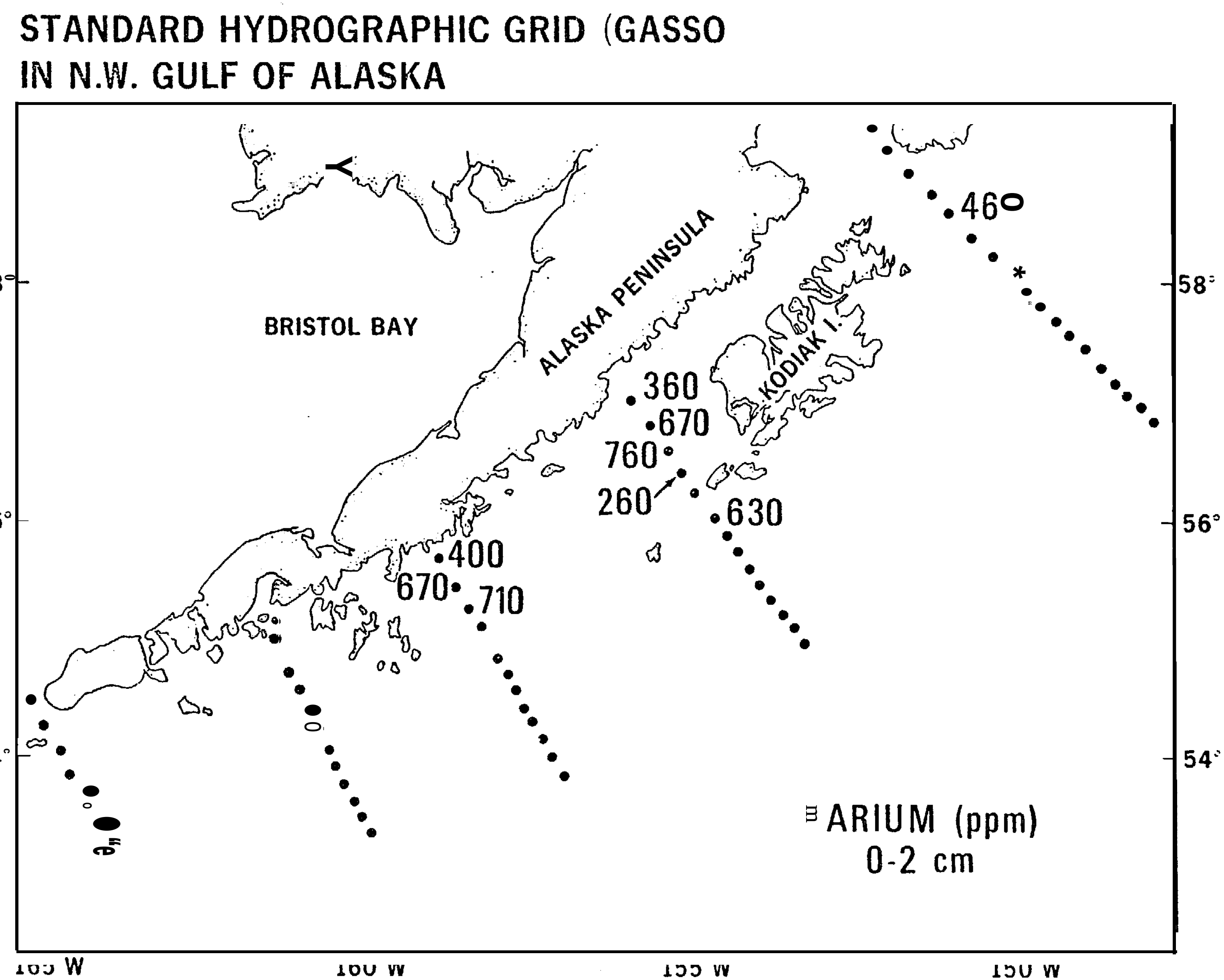


FIGURE D.6 Ba Concentrat ons in N. W. Gulf of Alaska Sediments

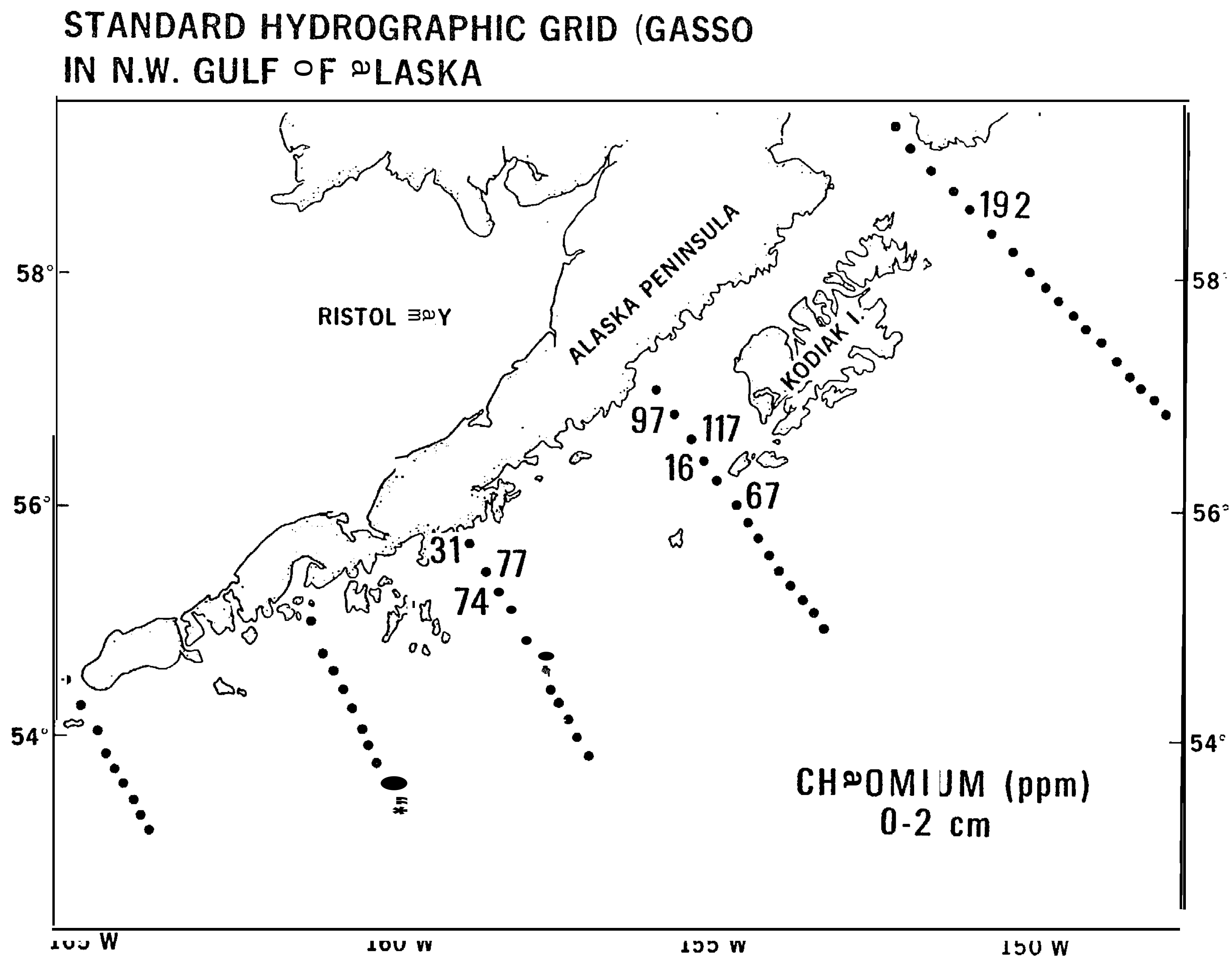


FIGURE D.7 Cr Concentrations in N. W. Gulf of Alaska Sediments

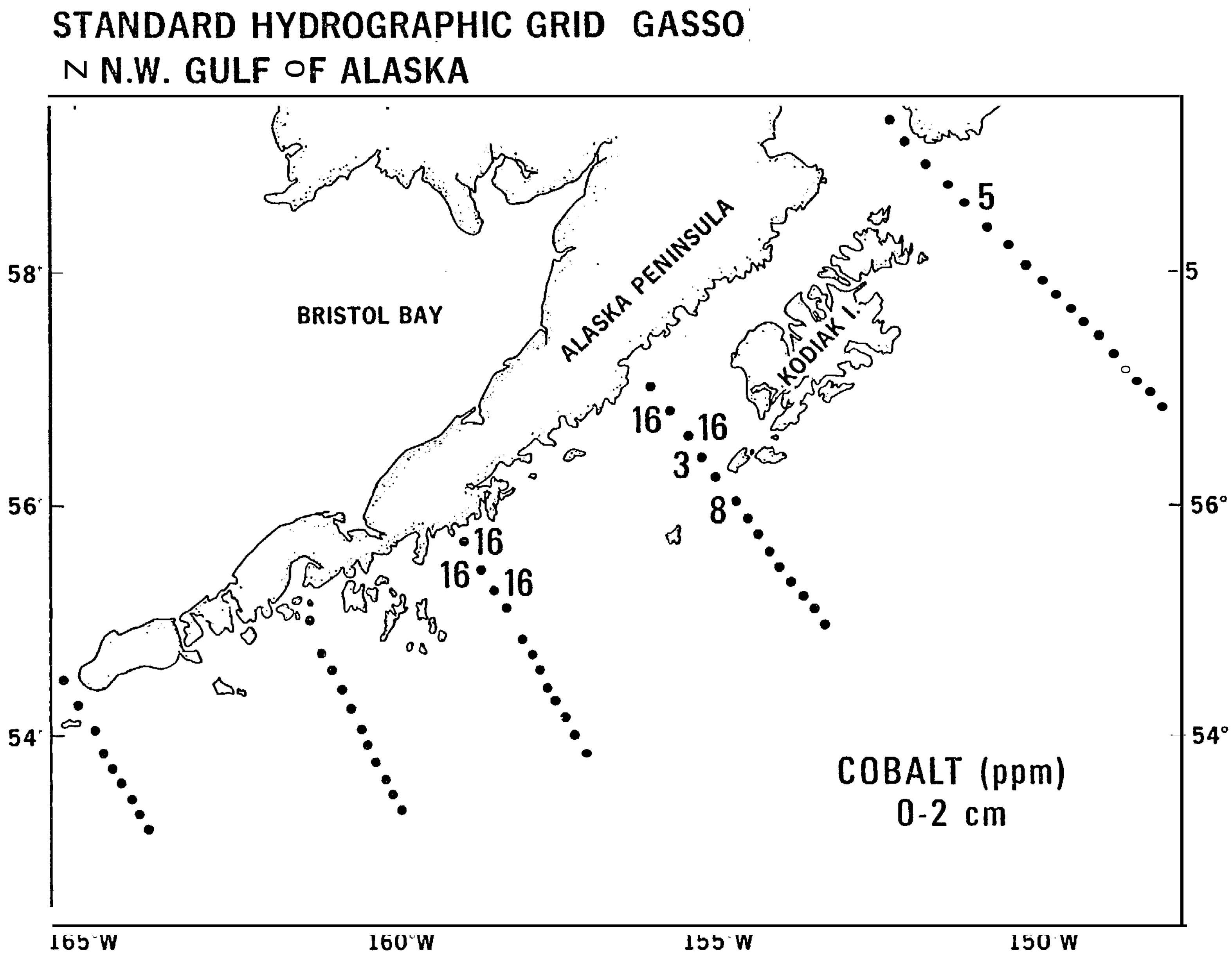


FIGURE D.8 Co Concentrations in N. W. Gulf of A'aska Sediments

STANDARD HYDROGRAPHIC GRID (GASSO)
IN N.W. GULF OF ALASKA

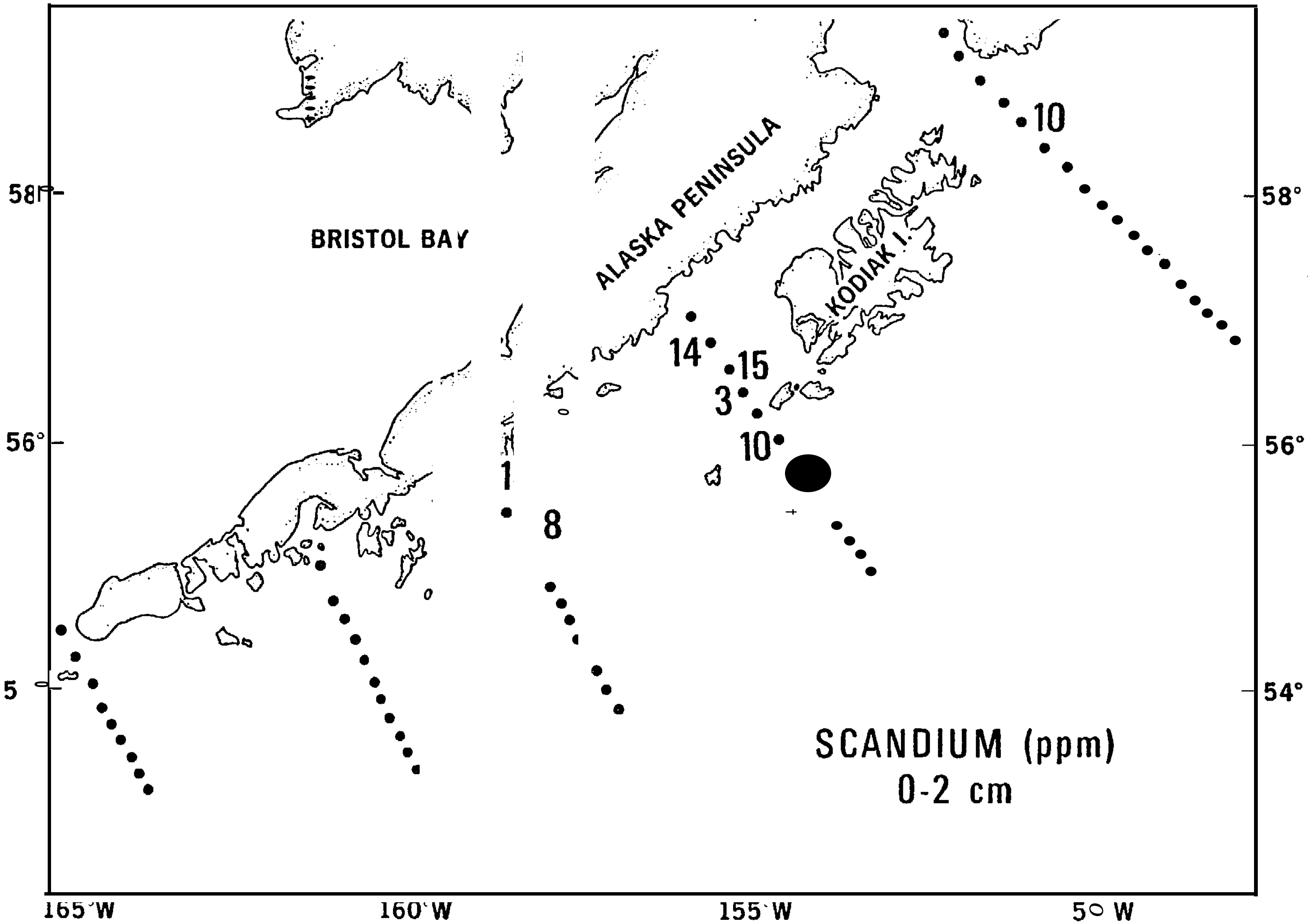


FIGURE D.9 Sc Concentrations in N. W. Gulf of Alaska Sediments

STANDARD HYDROGRAPHIC GRID (GASSO
IN N.W. GULF OF ALASKA

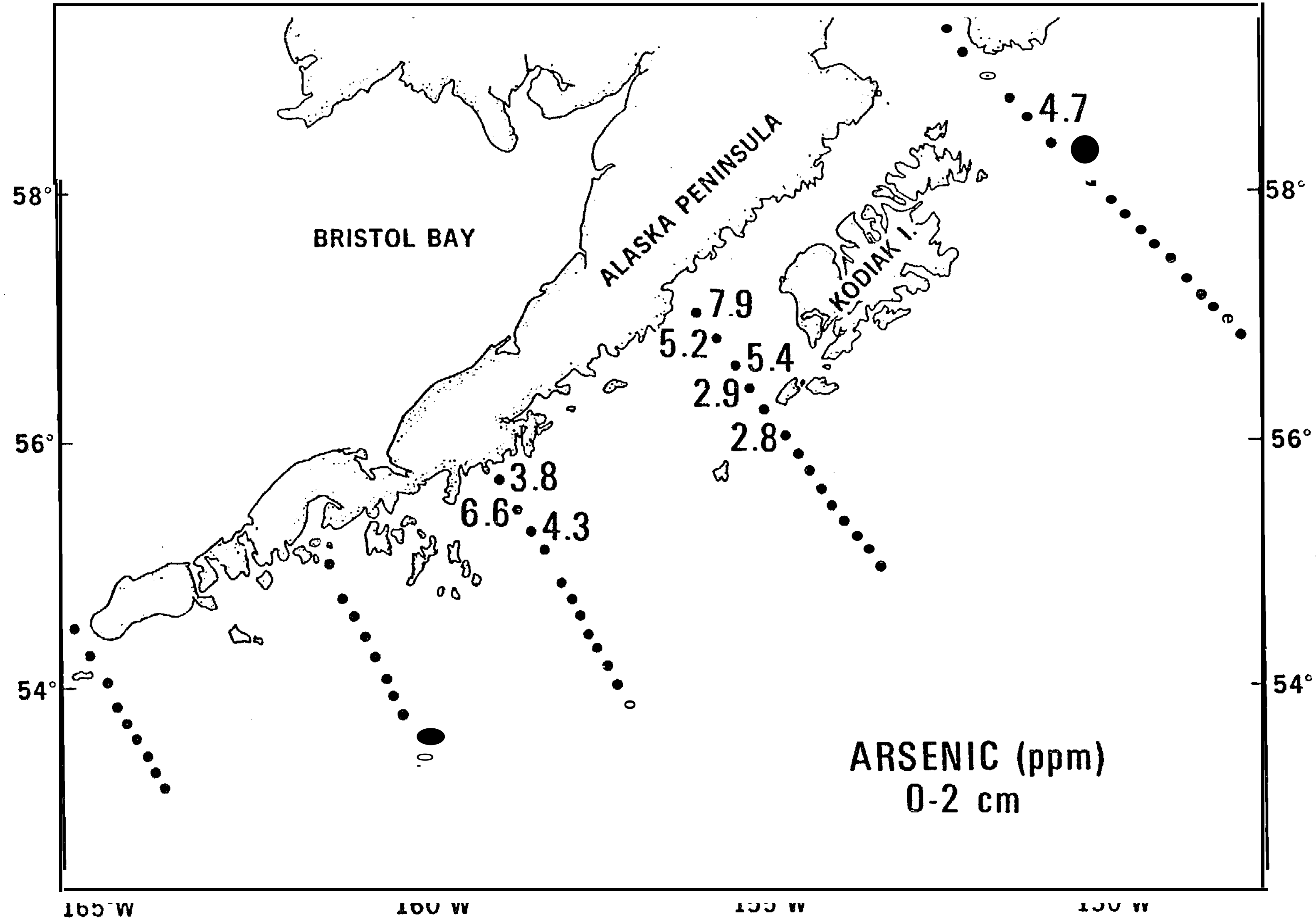


FIGURE D.10 As Concentrations in N. W. Gulf of Alaska Sediments

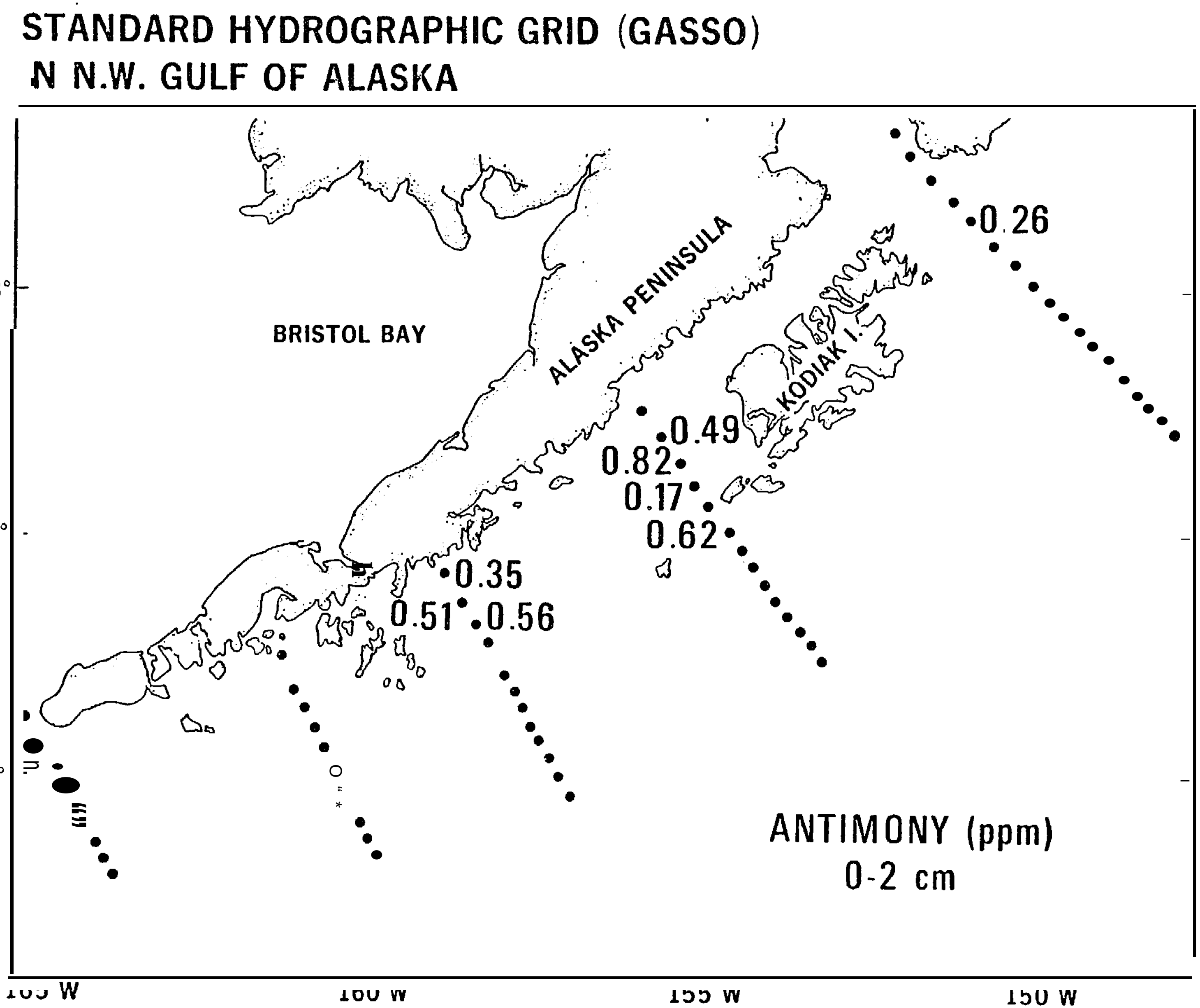


FIGURE D.11 Sb Concentrations in N. W. Gulf of Alaska Sediments

STANDARD TRACE METAL STATION LOCALITIES
(HYDROGRAPHIC GAS GRID IN N.E. GULF OF ALASKA

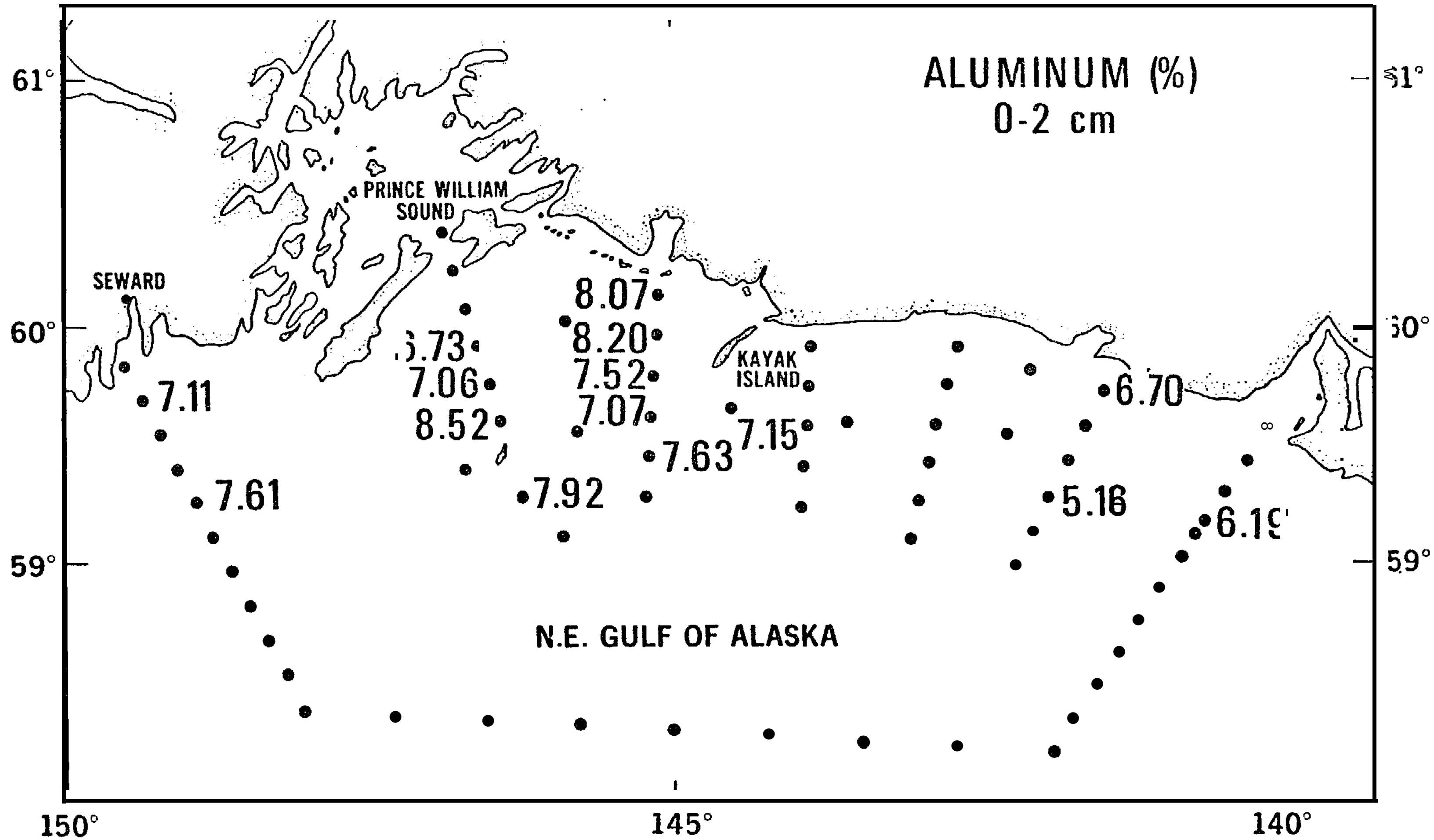


FIGURE D. 2 Al Concentrations in N.E. Gulf of Alaska Sediments

STANDARD TRACE METAL STATION LOCALITIES (HYDROGRAPHIC GAS GRID) IN N.E. GULF OF ALASKA

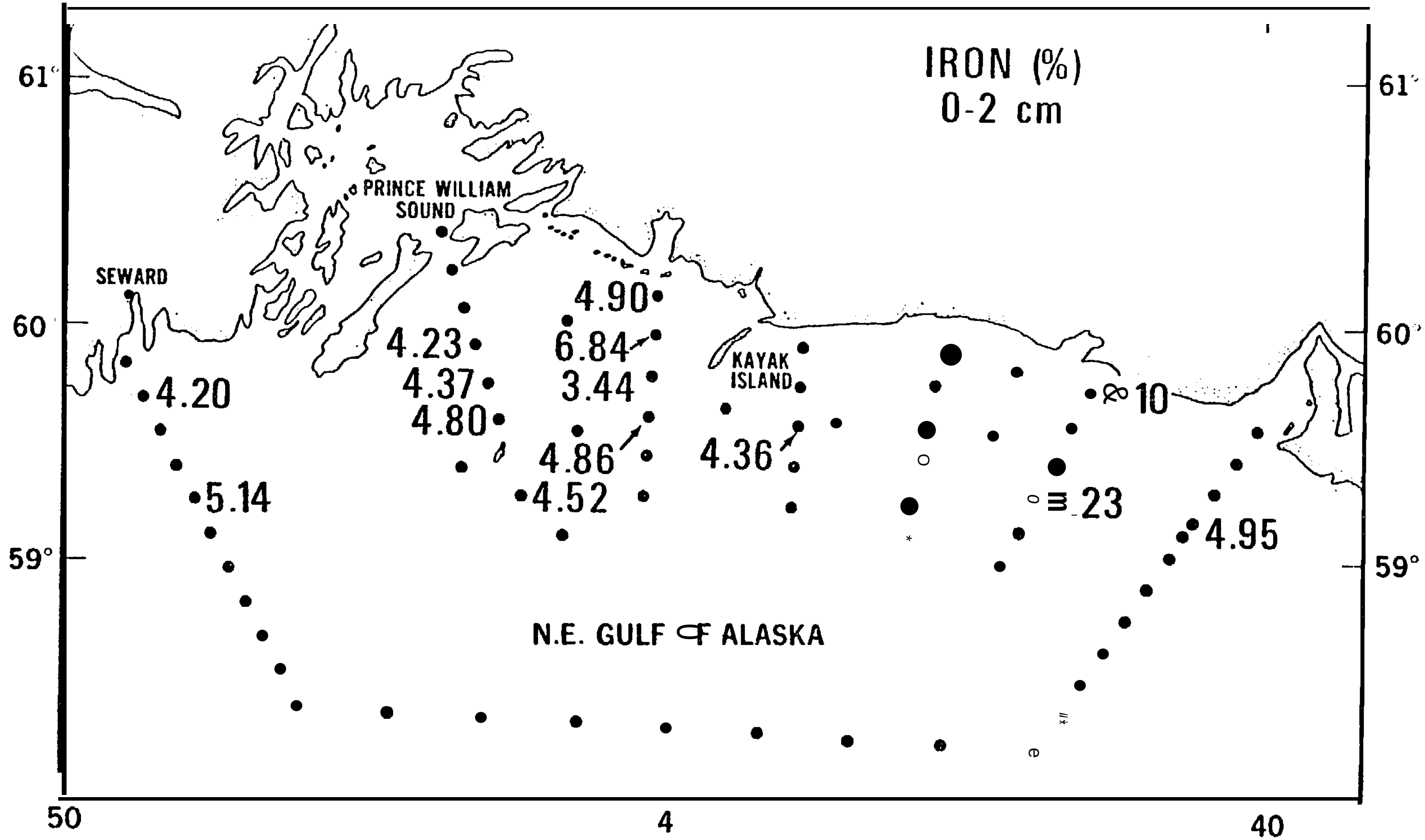


FIGURE D. 3 Fe Concentrations in N. E. Gulf of Alaska Sediments

STANDARD TRACE METAL STATION LOCALITIES (HYDROGRAPHIC GAS GRID) IN N.E. GULF OF ALASKA

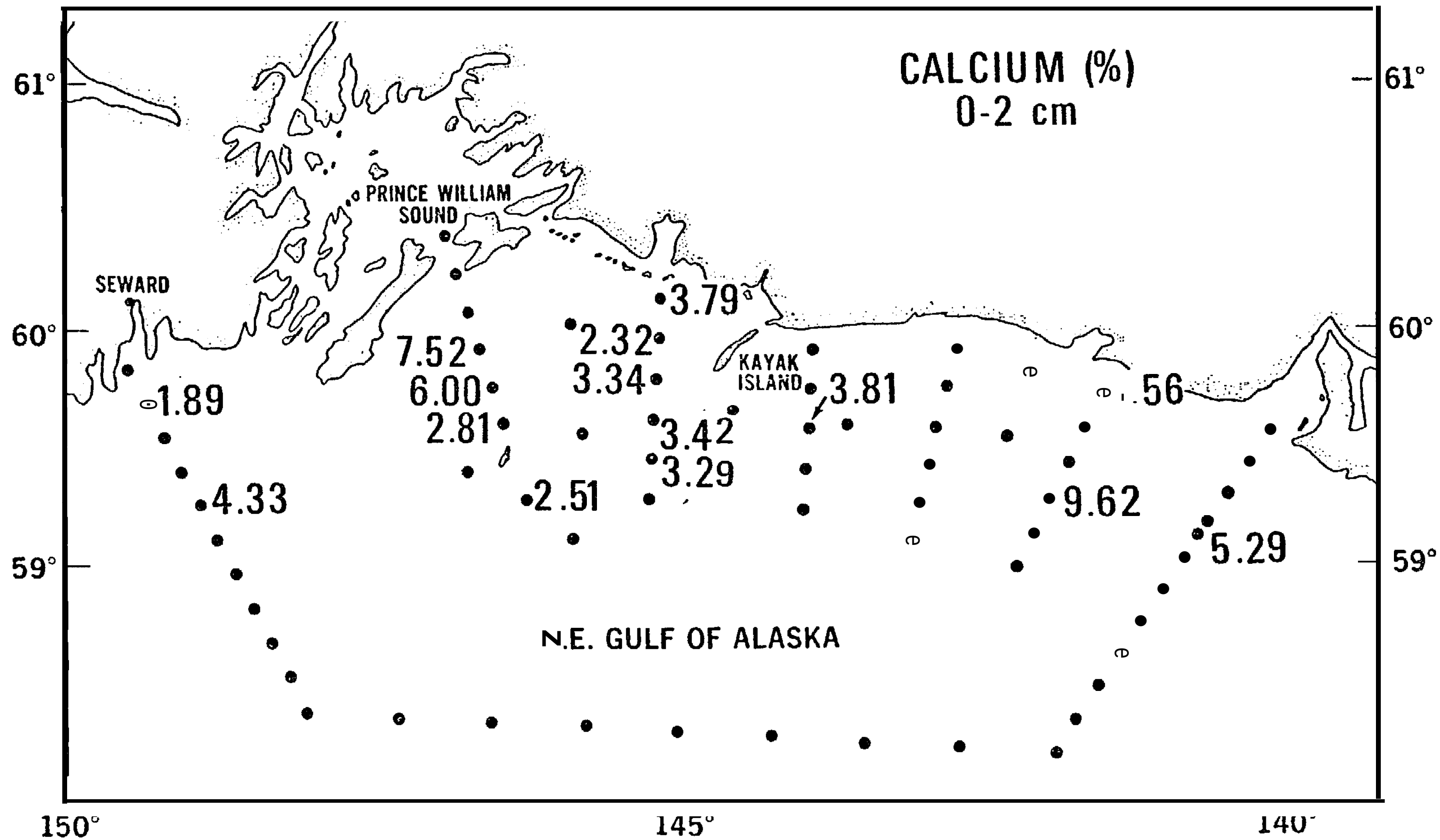
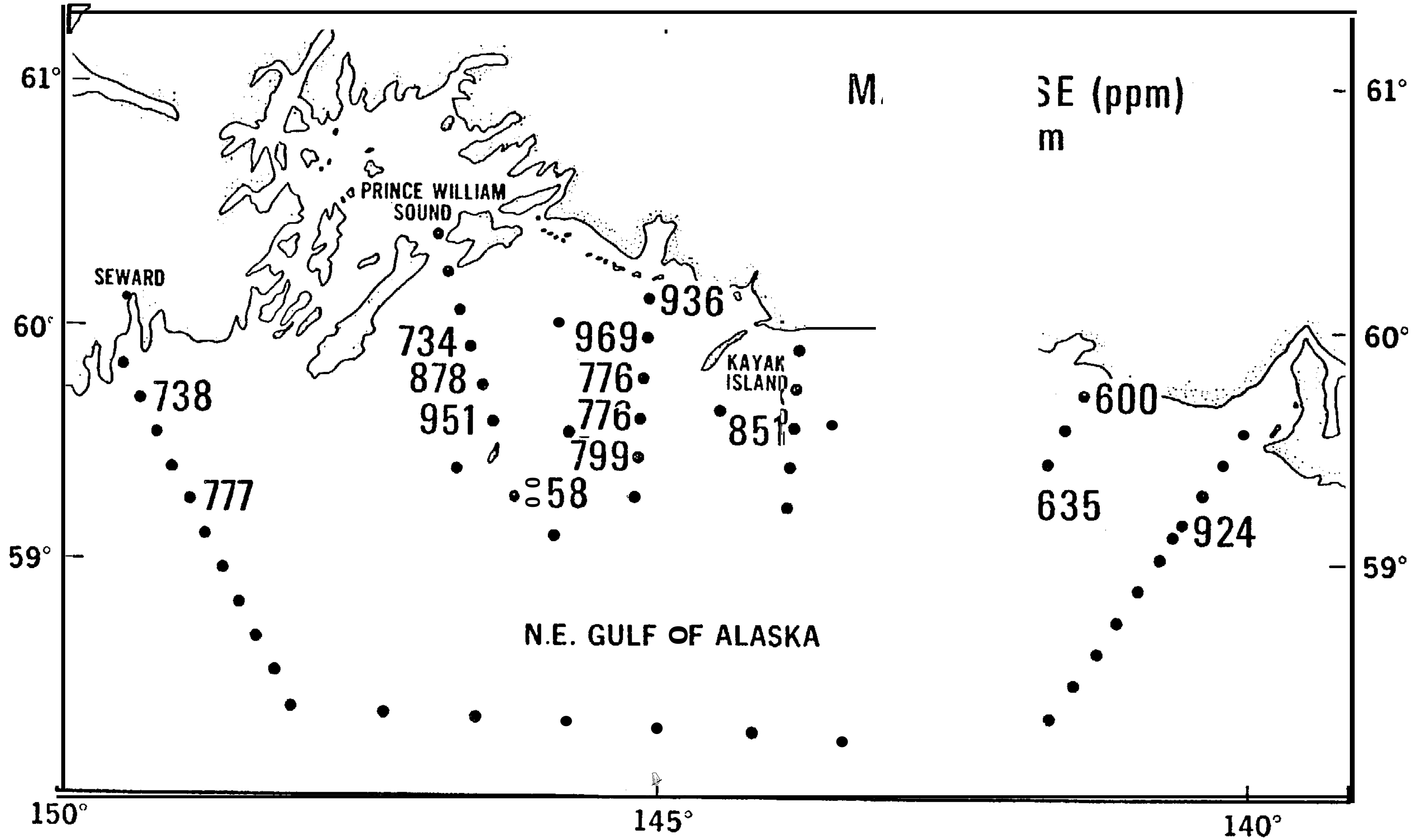


FIGURE D.14 Ca Concentrations in N. E. Gulf of Alaska Sediments

STANDARD TRACE METAL STATION LOCALITIES (HYDROGRAPHIC GAS GRID) IN N.E. GULF OF ALASKA



FIGRUE D.15 Mn Concentrations in N. E. Gulf of Alaska Sediments

STANDARD TRACE METAL STATION LOCALITIES (HYDROGRAPHIC GAS GRID) IN N.E. GULF OF ALASKA

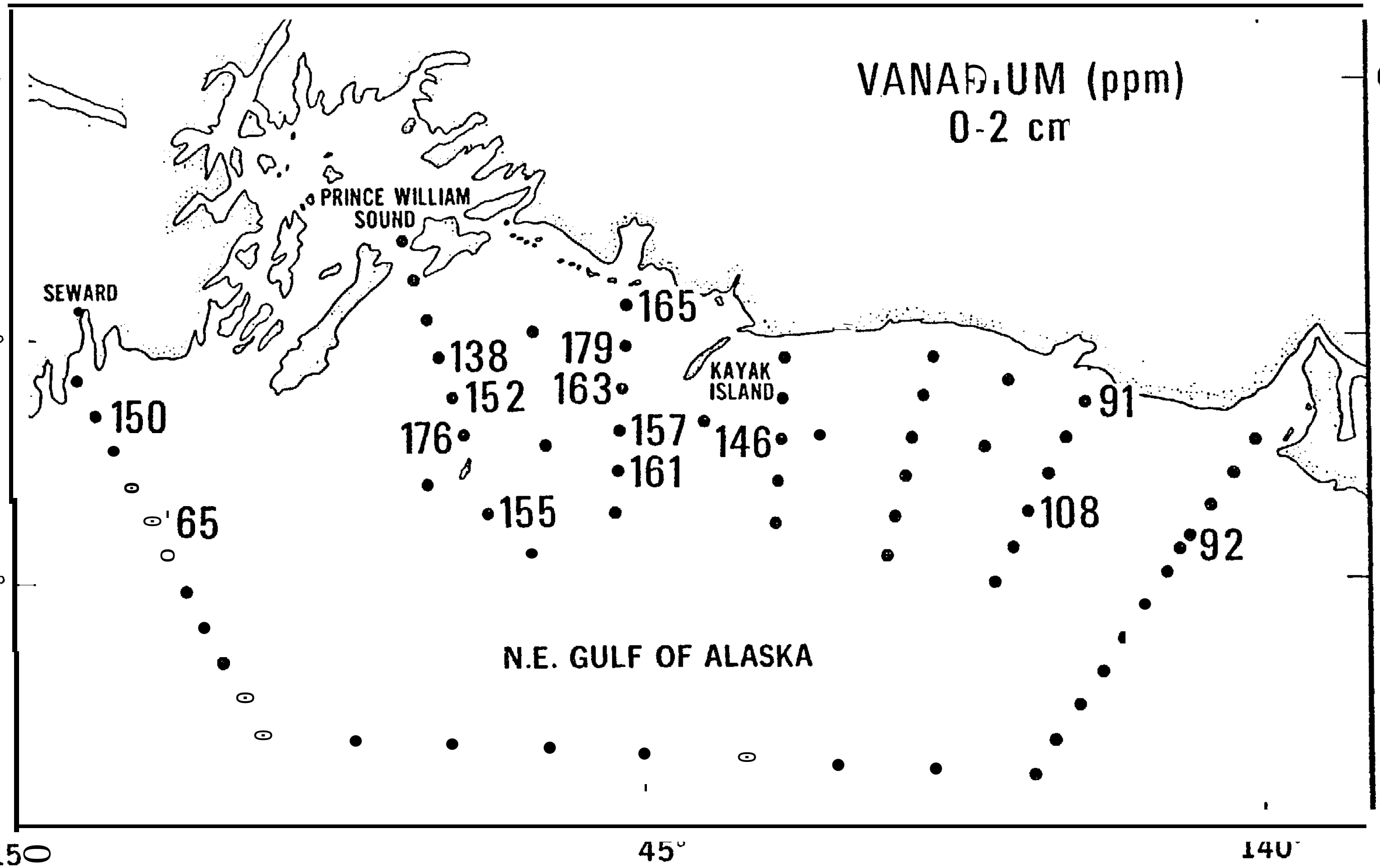


FIGURE D.16 V Concentrations in N. E. Gulf of Alaska Sediments

STANDARD TRACE METAL STATION LOCALITIES (HYDROGRAPHIC GAS GRID) IN N.E. GULF OF ALASKA

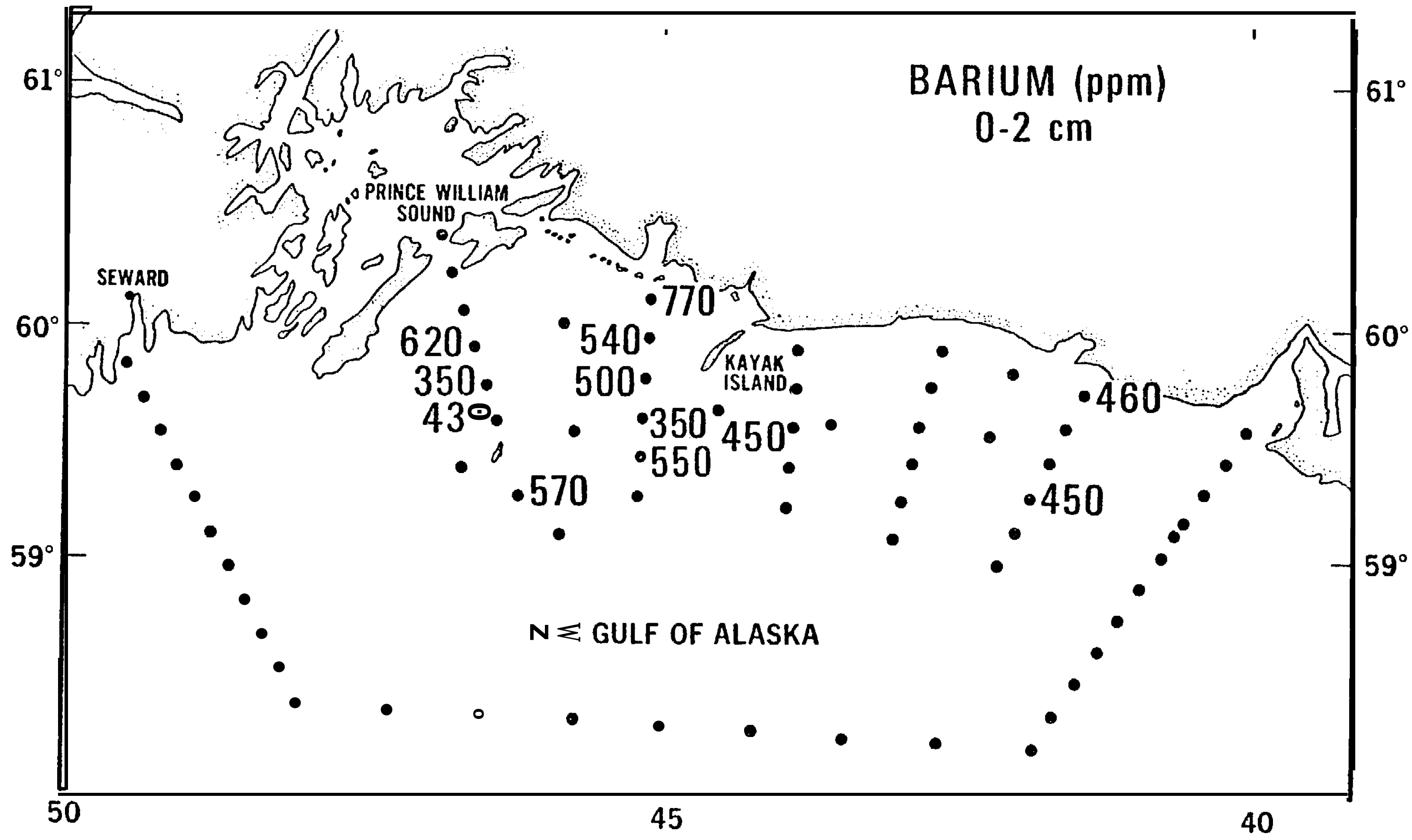


FIGURE D.17 Ba Concentrations in N. E. Gulf of Alaska Sediments

STANDARD TRACE METAL STATION LOCALITIES (HYDROGRAPHIC GAS GRID) IN N.E. GULF OF ALASKA

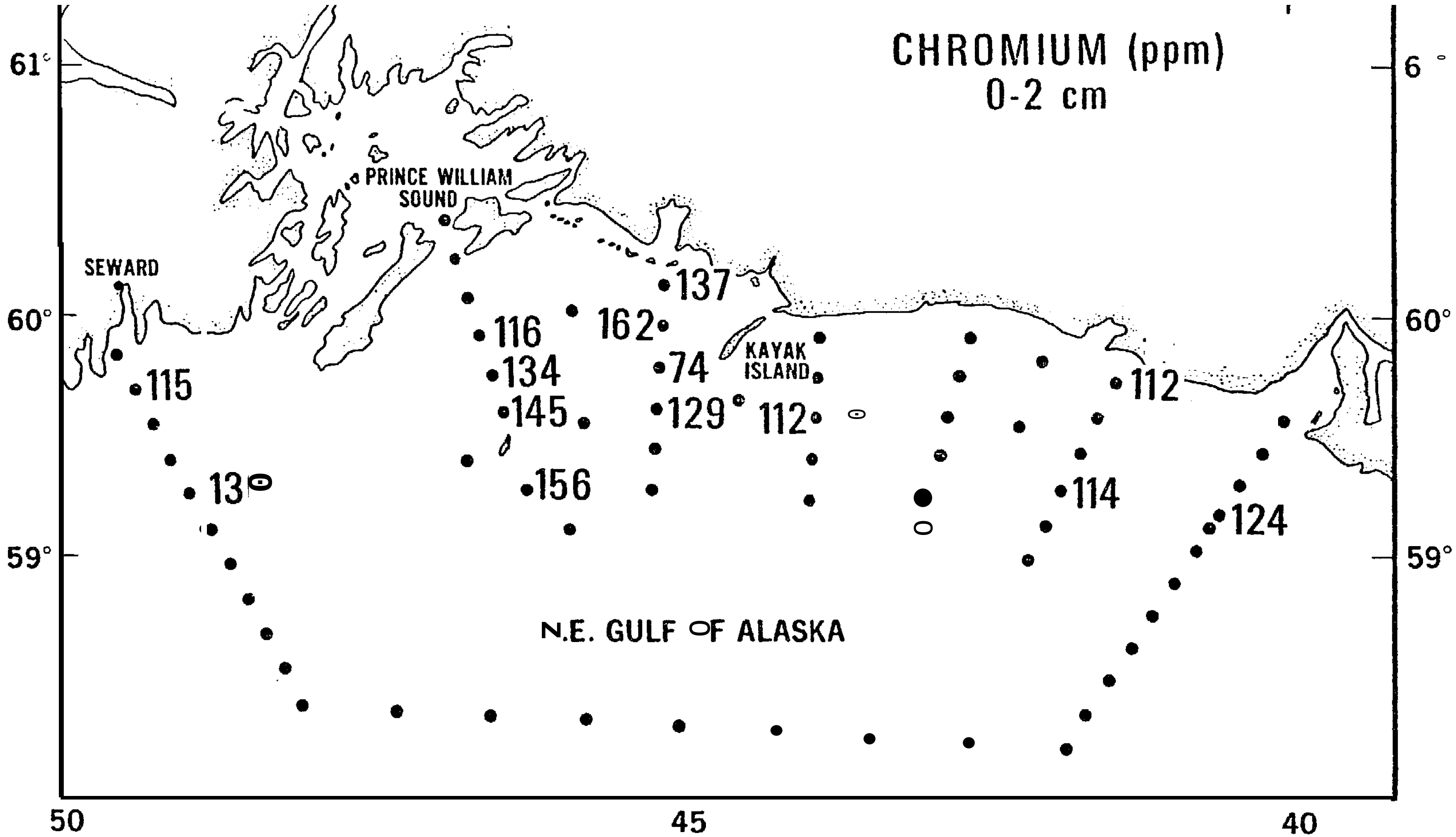


FIGURE D.18 Cr Concentrations in N. E. Gu f of Alaska Sediments

STANDARD TRACE METAL STATION LOCALITIES
HYDROGRAPHIC GAS GRID) IN N.E. GULF OF ALASKA

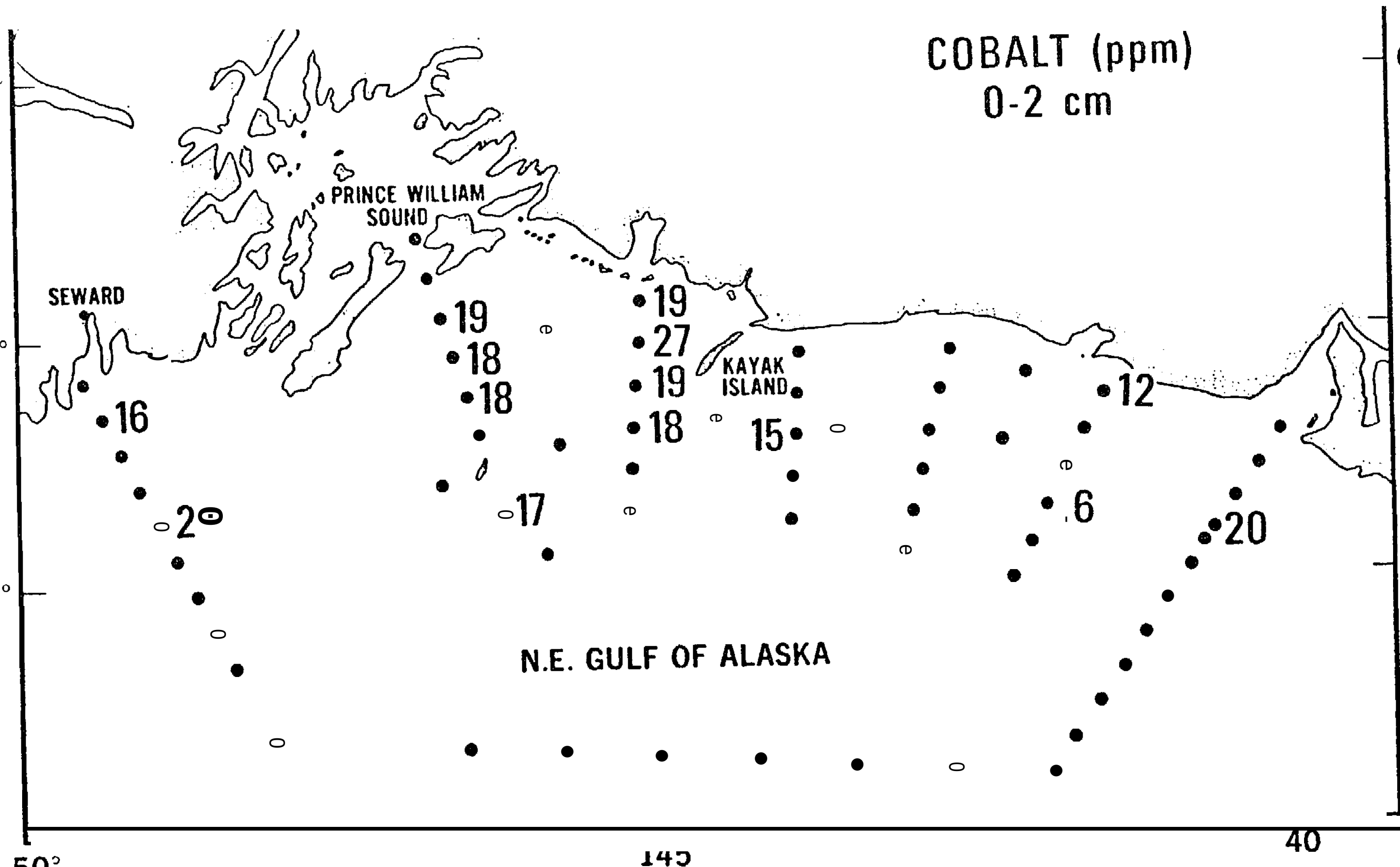


FIGURE D.19 Co Concentrations in N. E. Gulf of Alaska Sediments

STANDARD TRACE METAL STATION LOCALITIES (HYDROGRAPHIC GAS GRID) IN N.E. GULF OF ALASKA

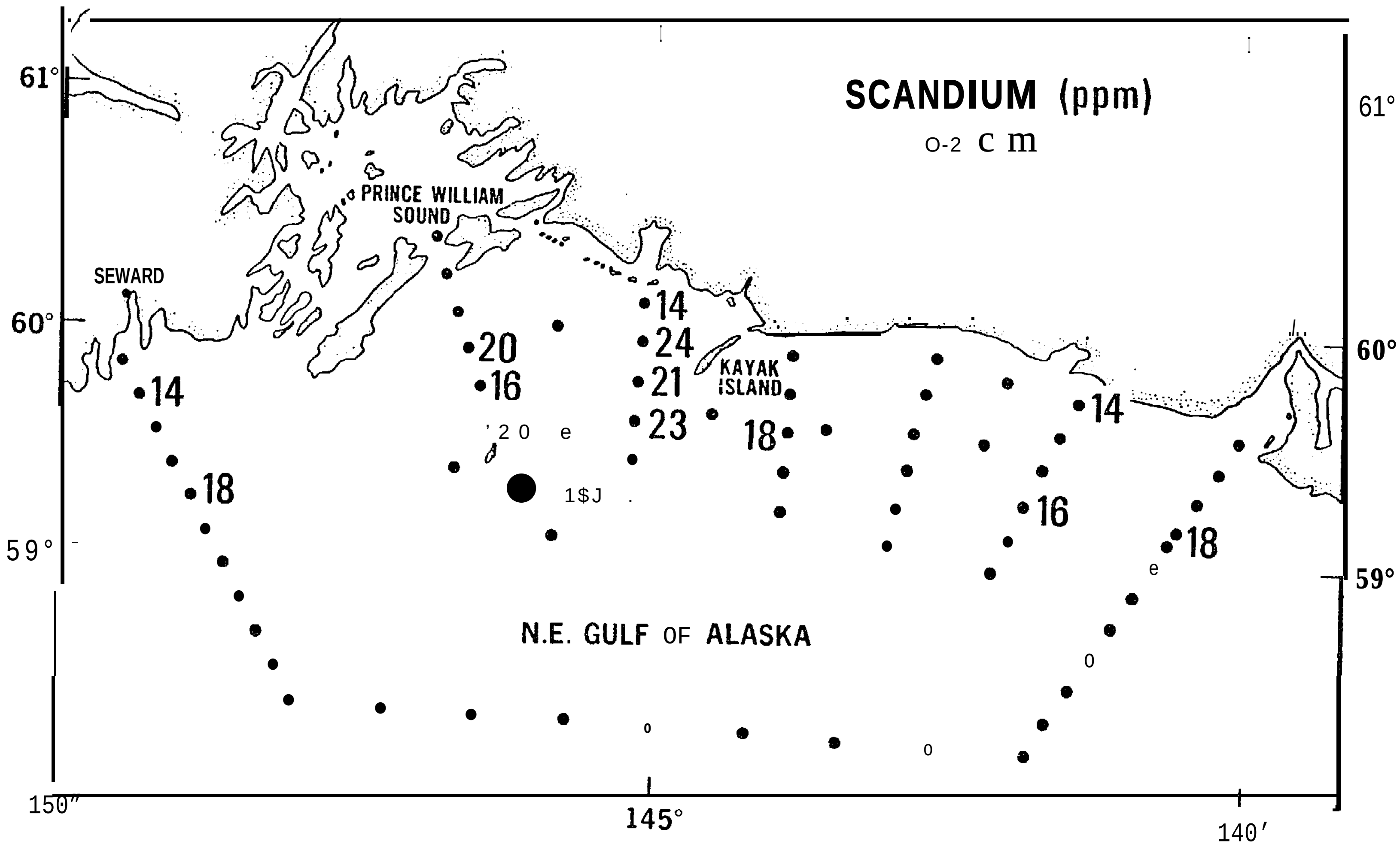


FIGURE 0.20 Sc Concentrations in N. E. Gulf of Alaska Sediments

STANDARD TRACE METAL STATION LOCALITIES (HYDROGRAPHIC GAS GRID) IN N.E. GULF OF ALASKA

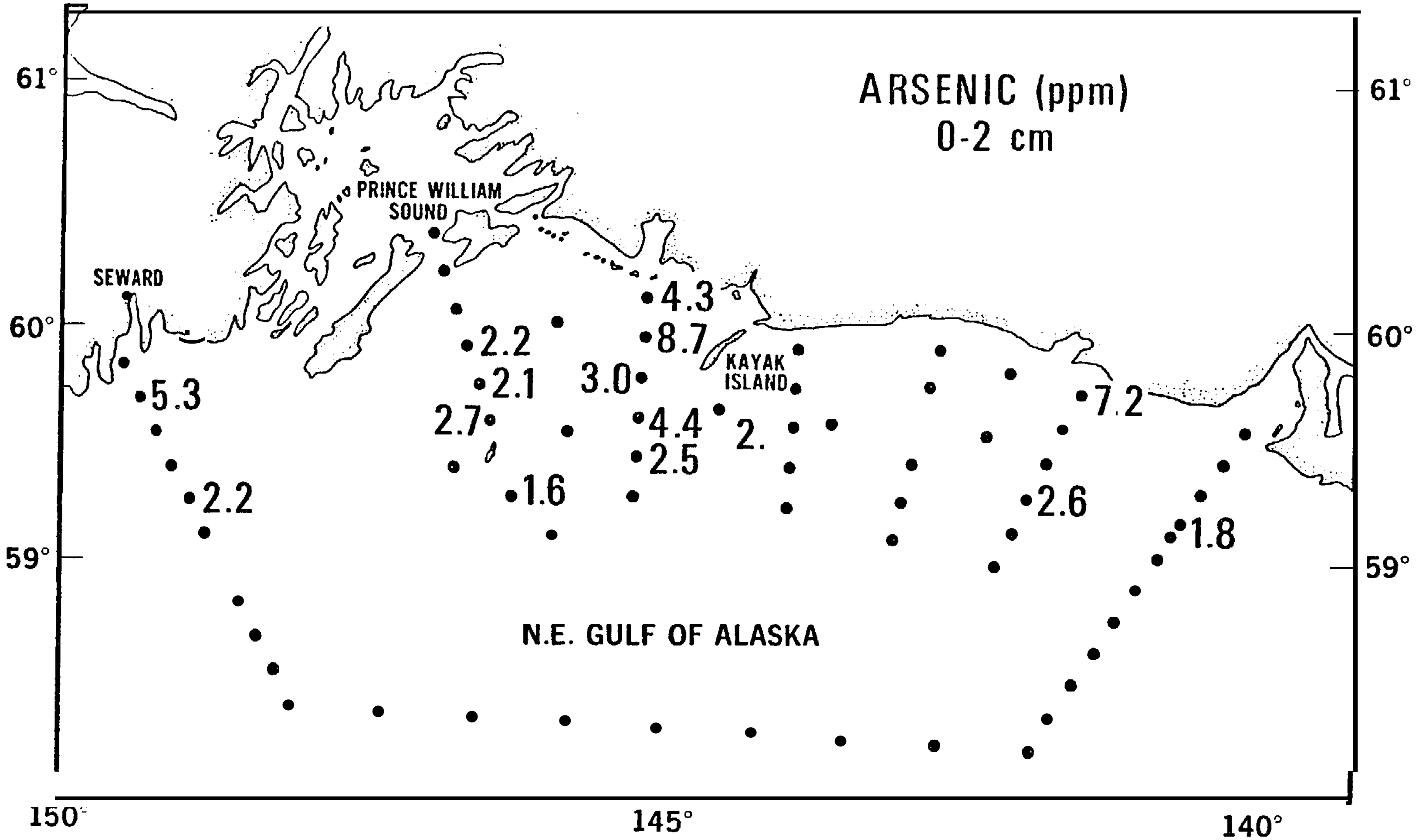


FIGURE D.21 As Concentrations in N. E. Gulf of Alaska Sediments

STANDARD TRACE META STATION LOC LITIES (HYDROGRAPHIC GAS GRID) IN N.E. GULF OF ALASKA

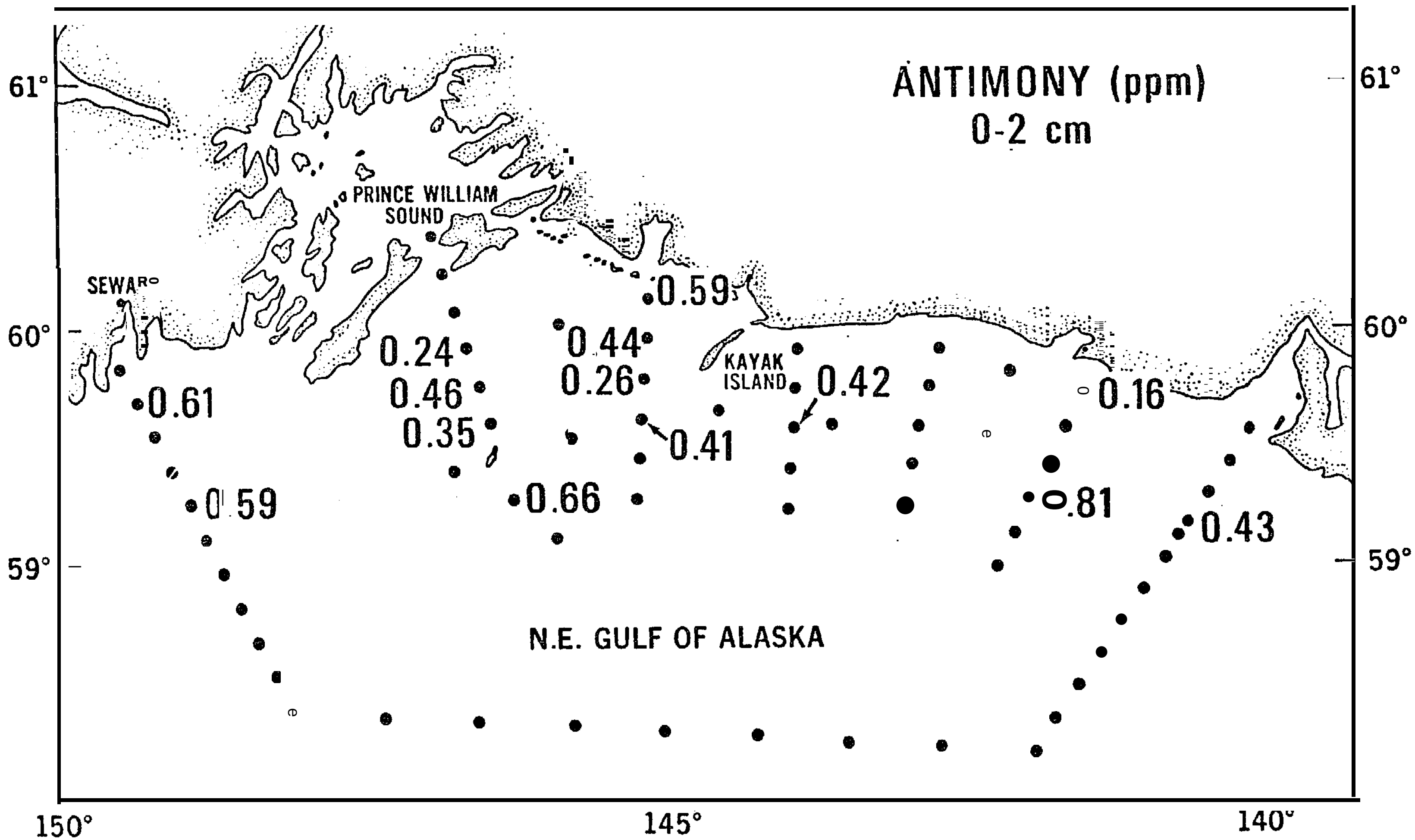


FIGURE D.22 Sb Concentrations in N. E. Gulf of Alaska Sediments

STANDARD HEAVY METAL CHEMISTRY STATIONS
(THE "BENTHIC GRID") IN THE SOUTH BERING SEA

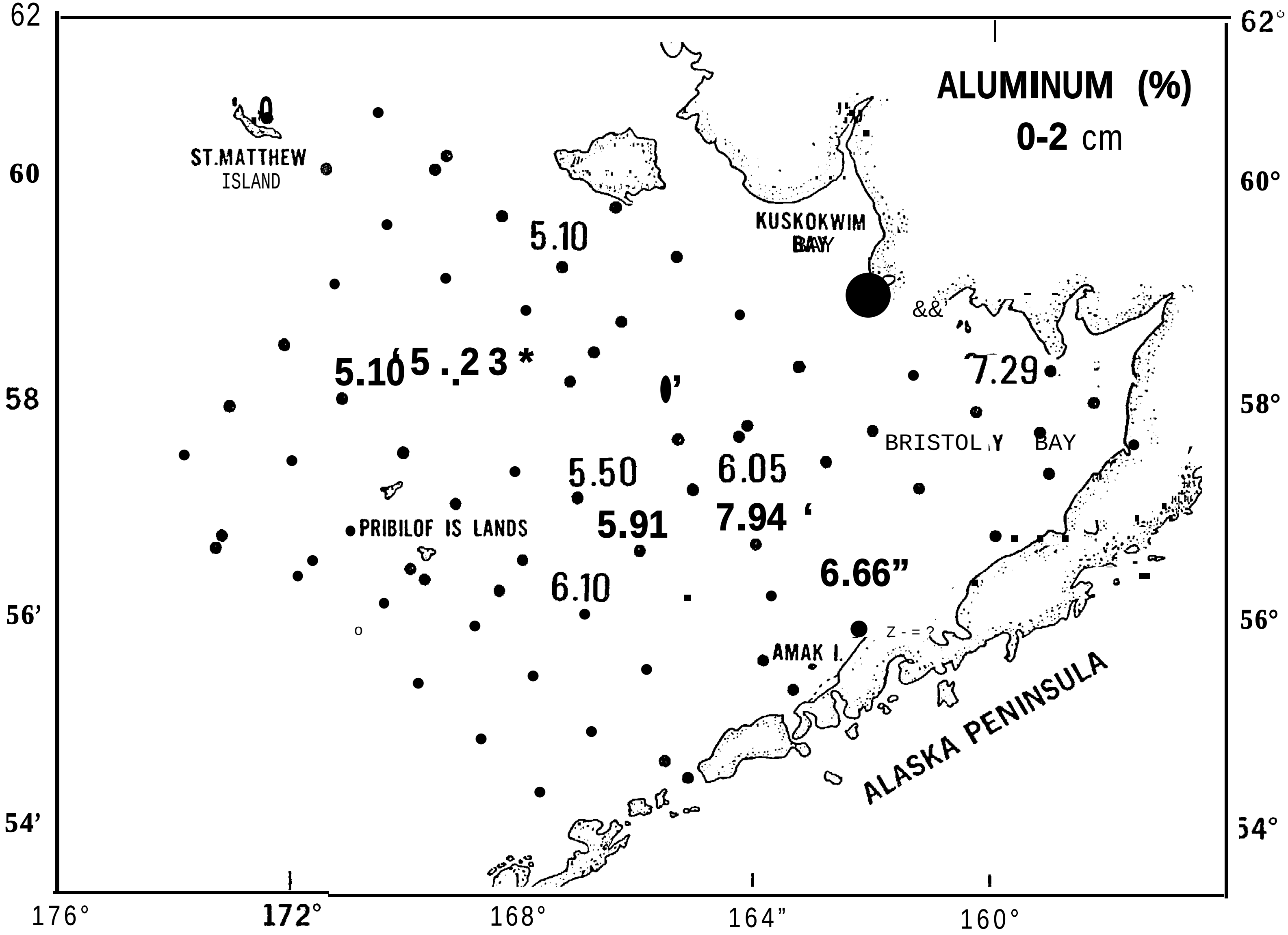


FIGURE D.23 Al Concentrations in Bering Sea Sediments

STANDARD HEAVY METAL CHEMISTRY STATIONS
(THE "BENTHIC GRID") IN THE SOUTH BERING SEA

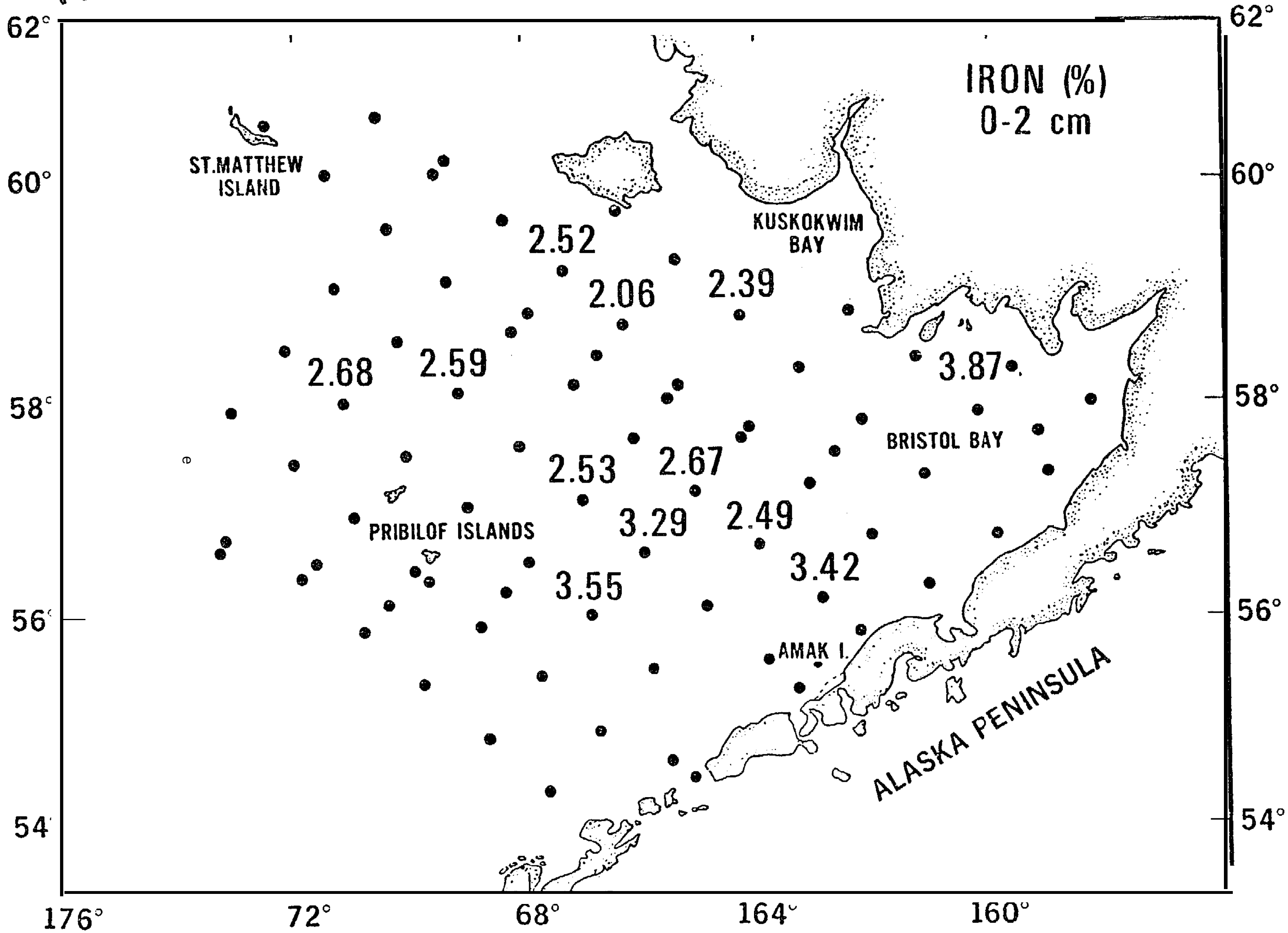


FIGURE D.24 Fe Concentrations in Bering Sea Sediments

STANDARD HEAVY METAL CHEMISTRY STATIONS (THE "BENTHIC GRID") IN THE SOUTH BERING SEA

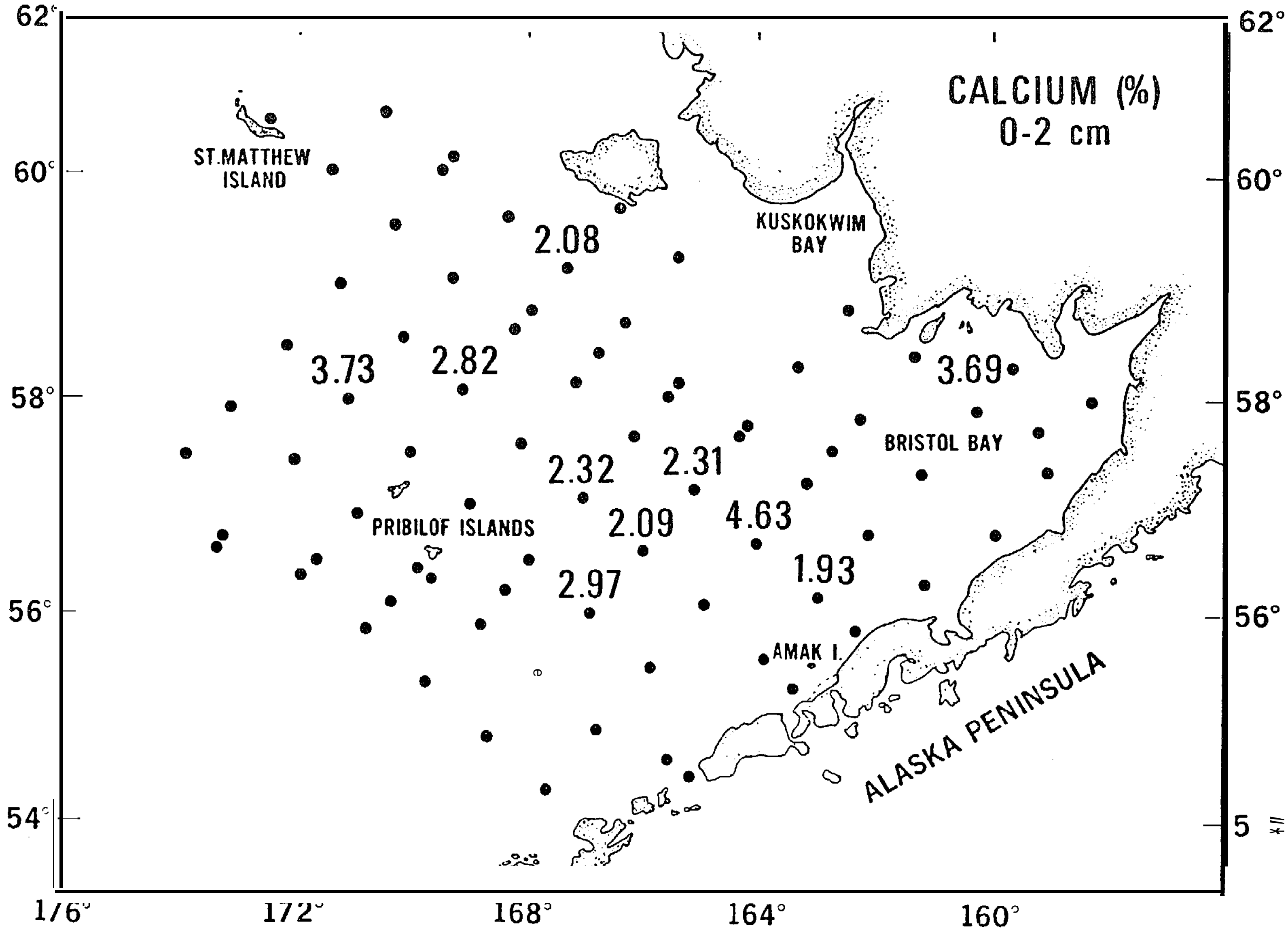


FIGURE D.25 Ca Concentrations in Bering Sea Sediments

STANDARD HEAVY METAL CHEMISTRY STATIONS (THE "BENTHIC GRID") IN THE SOUTH BERING SEA

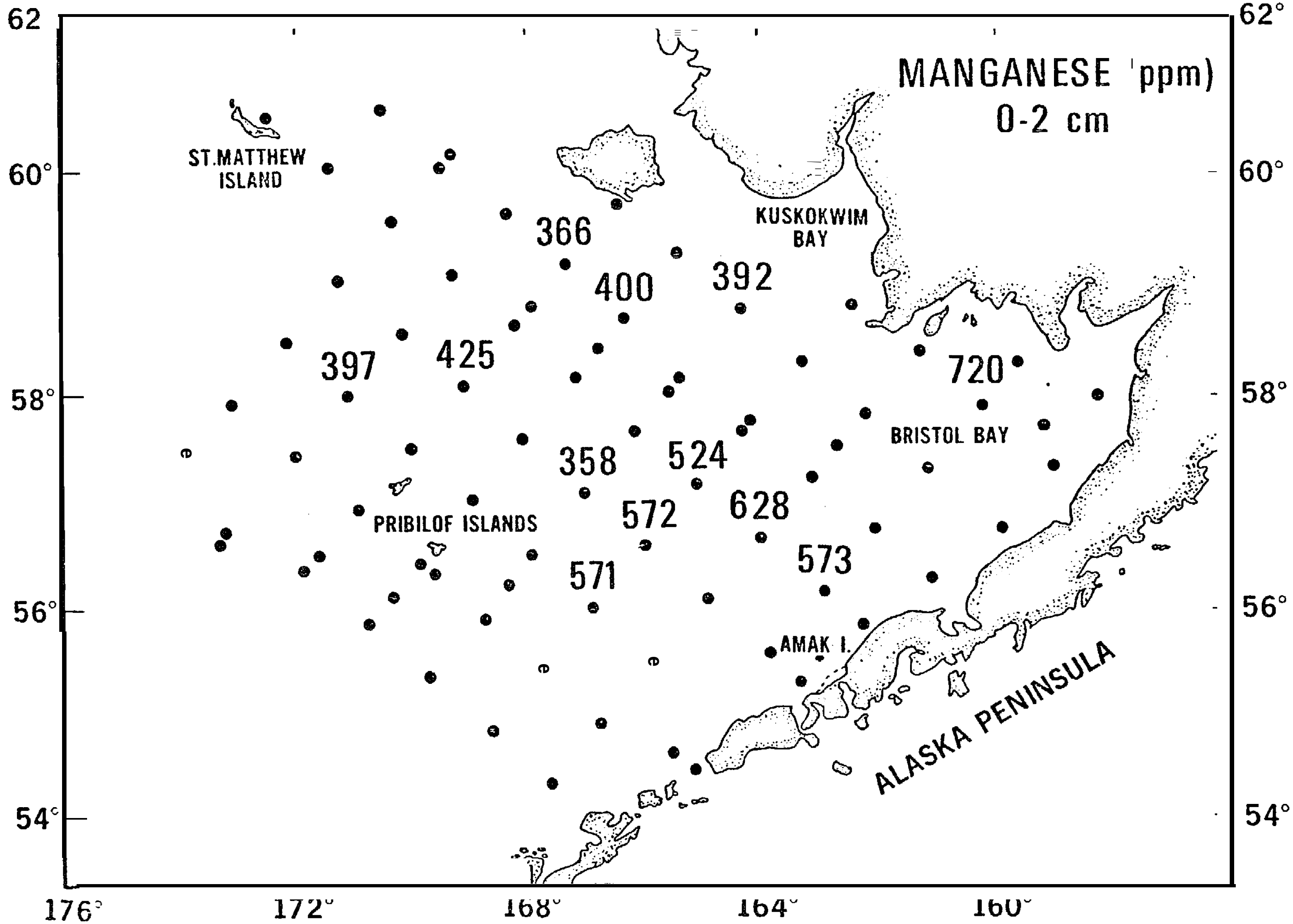


FIGURE D.26 Mn Concentrations in Bering Sea Sediments

STANDARD HEAVY METAL CHEMISTRY STATIONS (THE "BENTHIC GRID") IN THE SOUTH BERING SEA

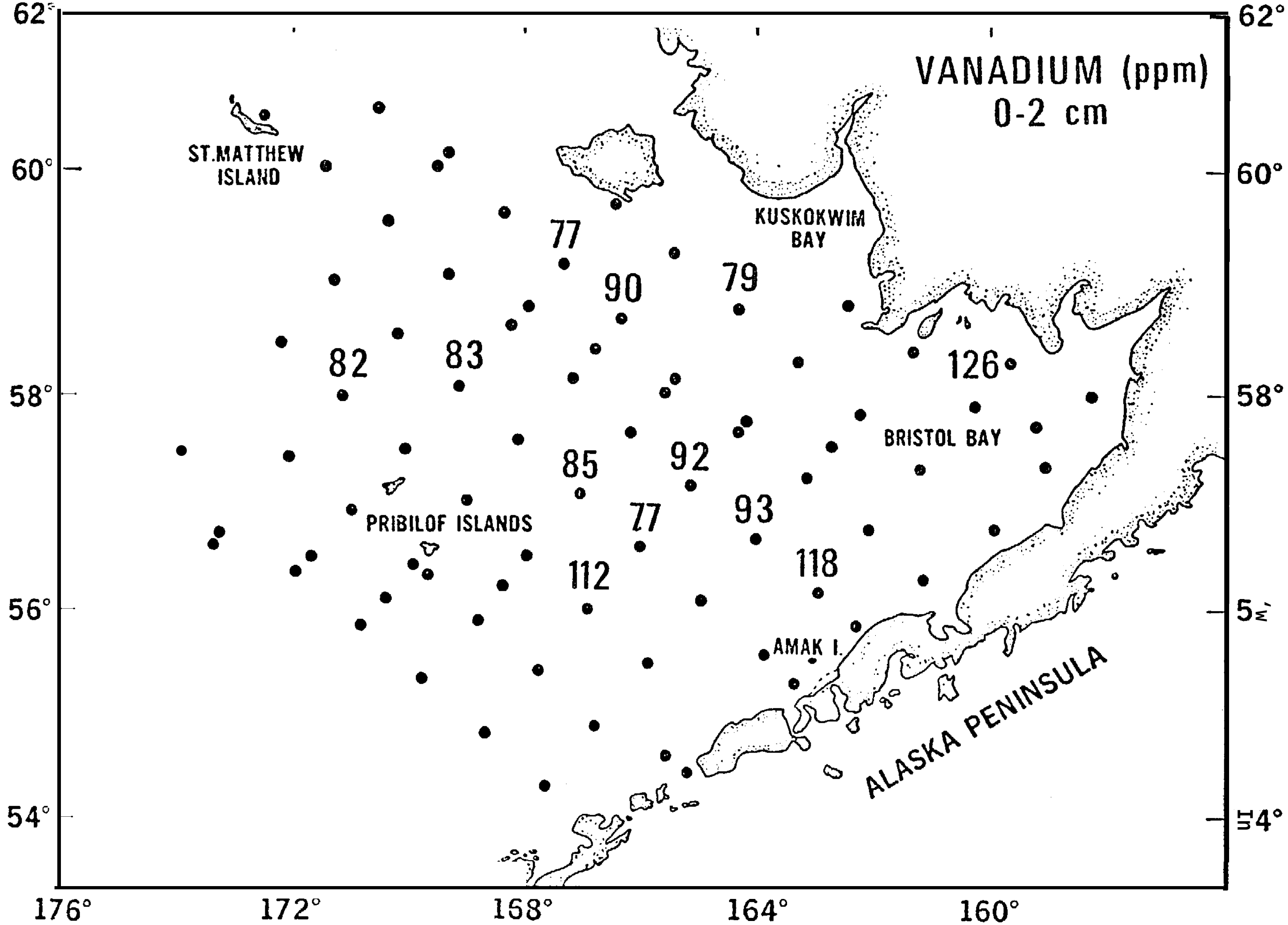


FIGURE D.27 V Conc<.tration in Ber ng Sea Sediments

STANDARD HEAVY METAL CHEMISTRY STATIONS (THE "BENTHIC GRID") IN THE SOUTH BERING SEA

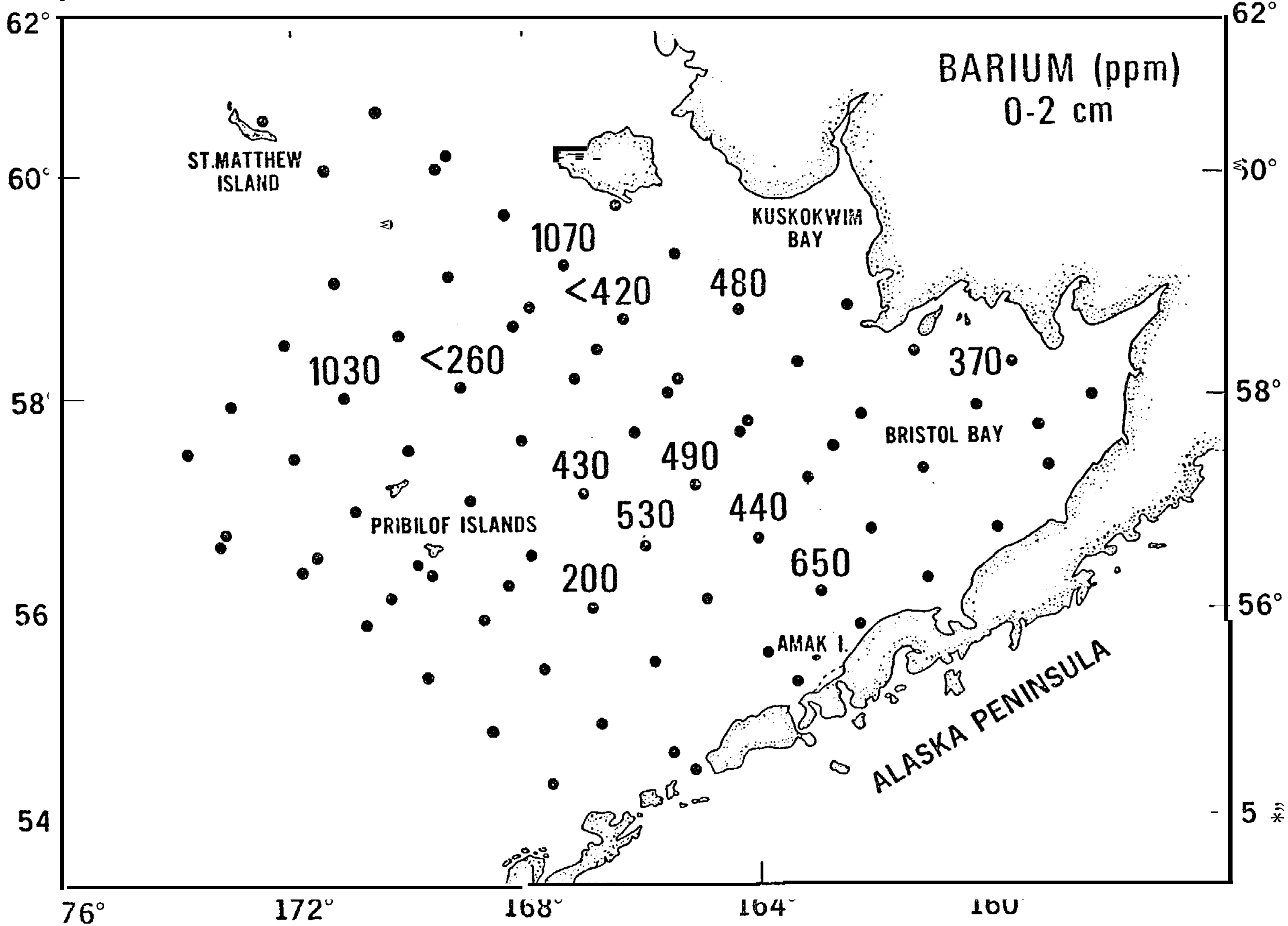


FIGURE D.28 Ba Concentrations in Bering Sea Sediments

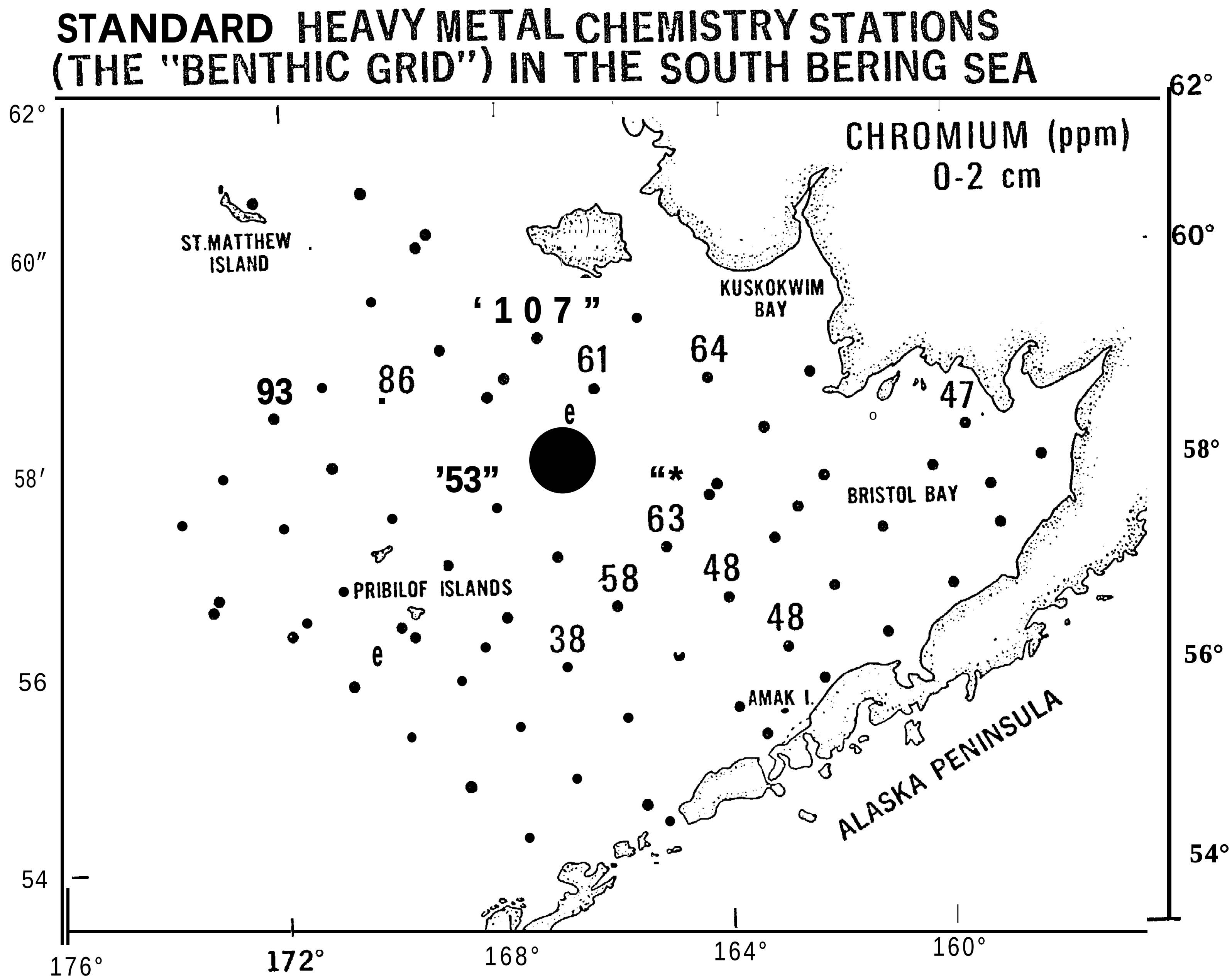


FIGURE D.29 Cr Concentrate ons in Bering Sea Sediments

33
CA

STANDARD HEAVY METAL CHEMISTRY STATIONS (THE "BENTHIC GRID") IN THE SOUTH BERING SEA

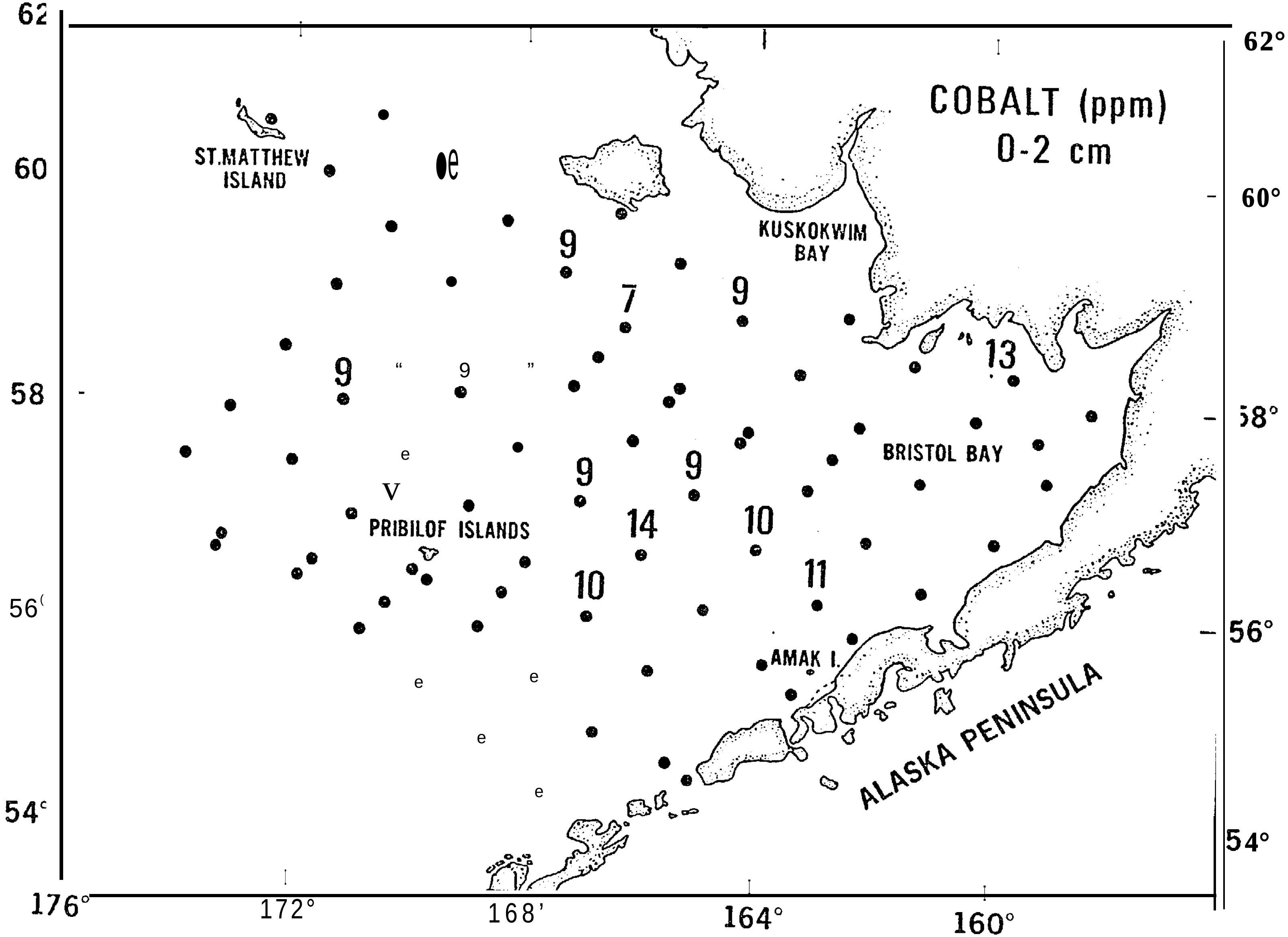


FIGURE D.30 Co Concentrations in Bering Sea Sediments

STANDARD HEAVY METAL CHEMISTRY STATIONS (THE "BENTHIC GRID") IN THE SOUTH BERING SEA

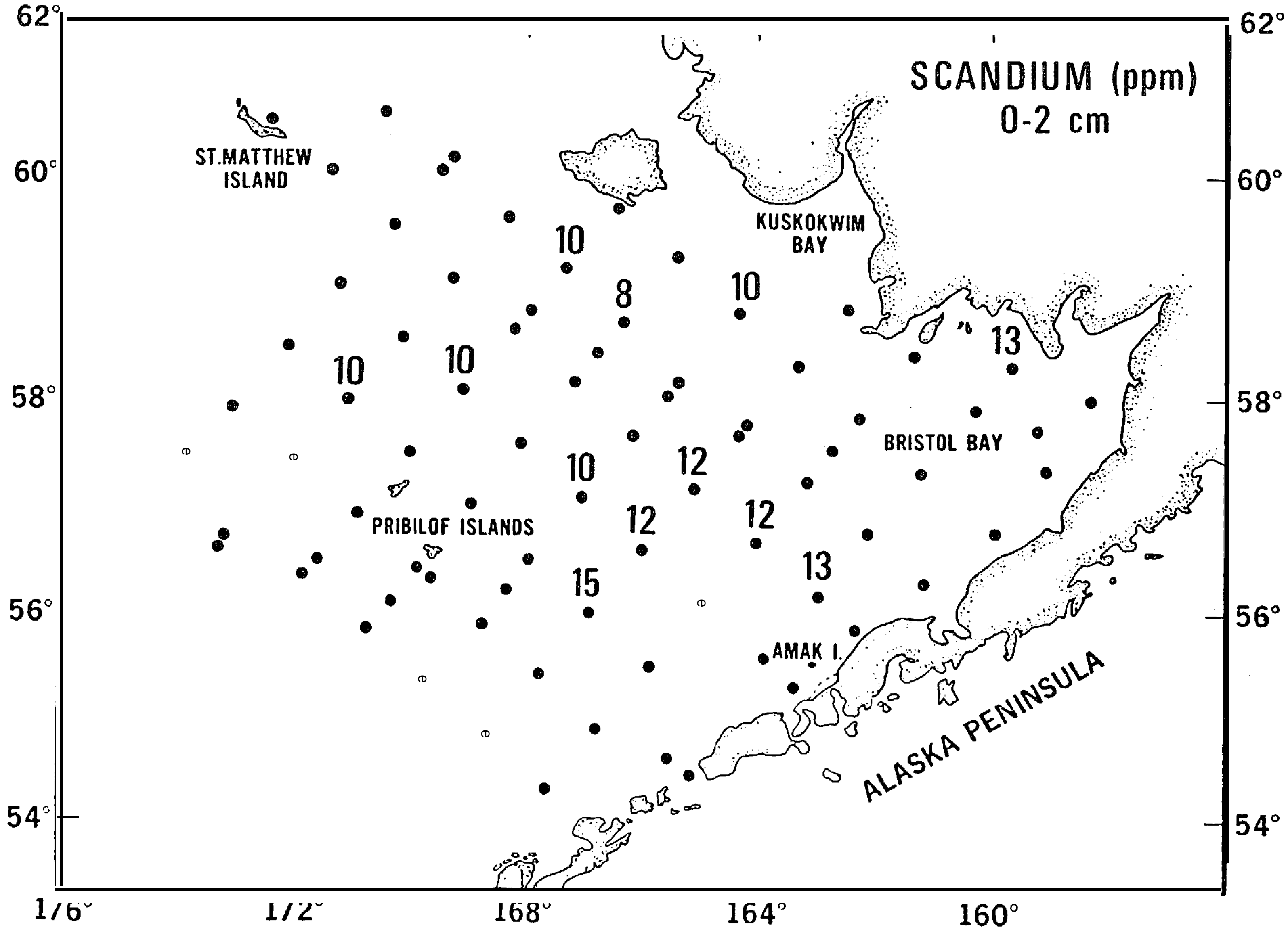


FIGURE D.31 Sc Concentrations in Bering Sea Sediments

STANDARD HEAVY METAL CHEMISTRY STATIONS
(THE "BENTHIC GRID") IN THE SOUTH BERING SEA

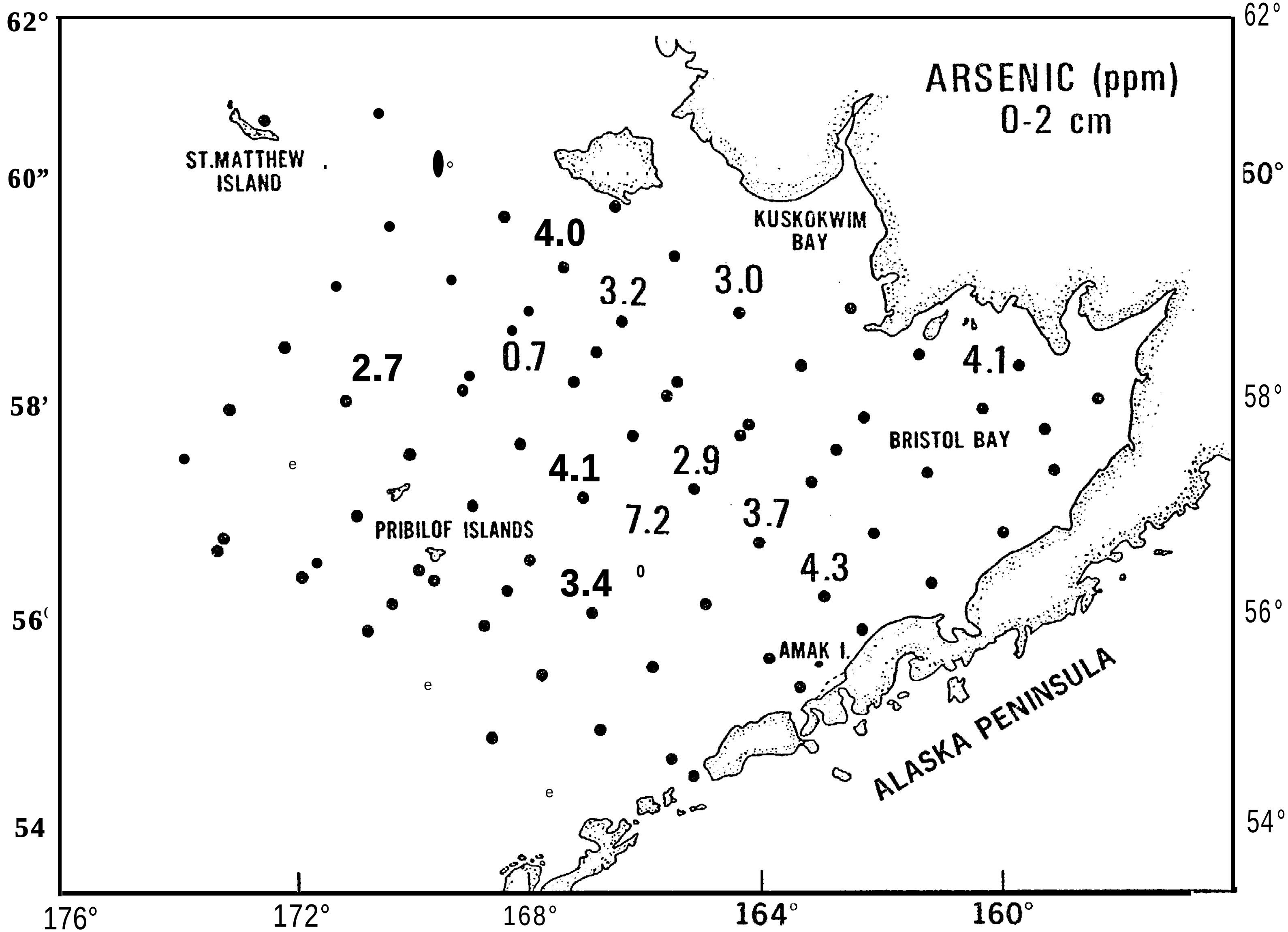


FIGURE D.32 As Concentrations in Bering Sea Sediments

STANDARD HEAVY METAL CHEMISTRY STATIONS (THE "BENTHIC GRID") IN THE SOUTH BERING SEA

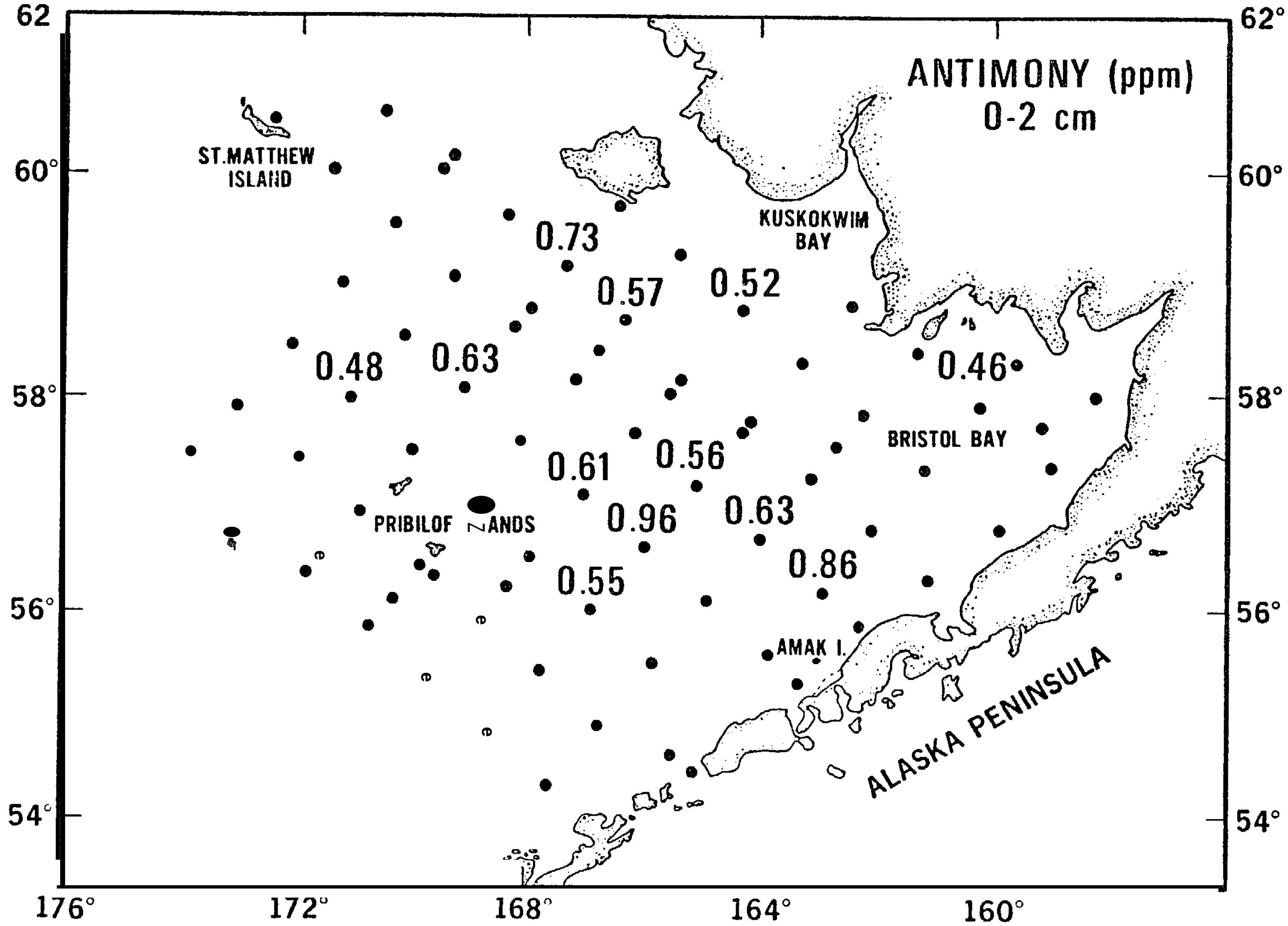


FIGURE D.33 Sb Concentrations in Bering Sea Sediments

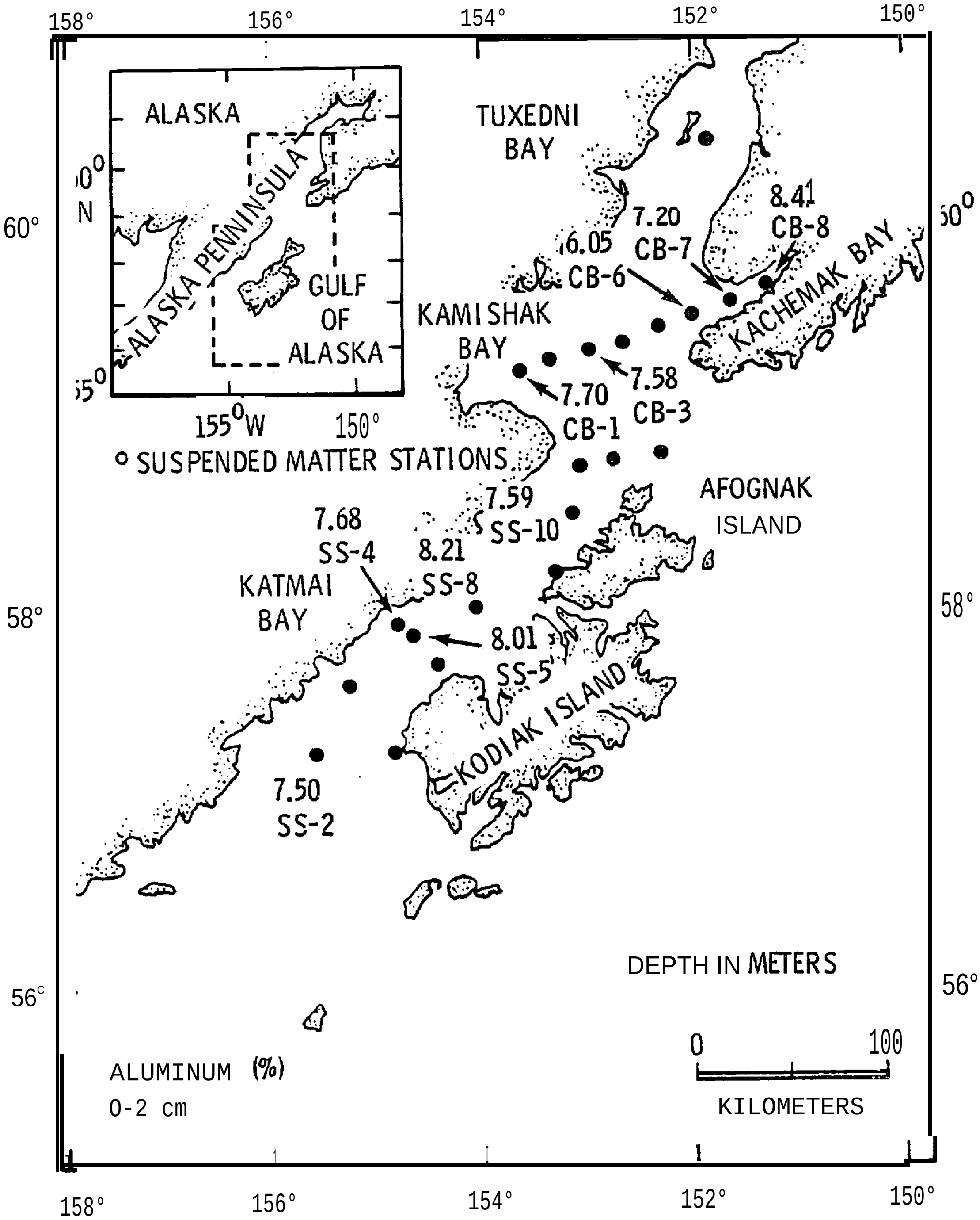


FIGURE D.34 Al Concentrations in Shelik Strait and Cook Inlet Sediments

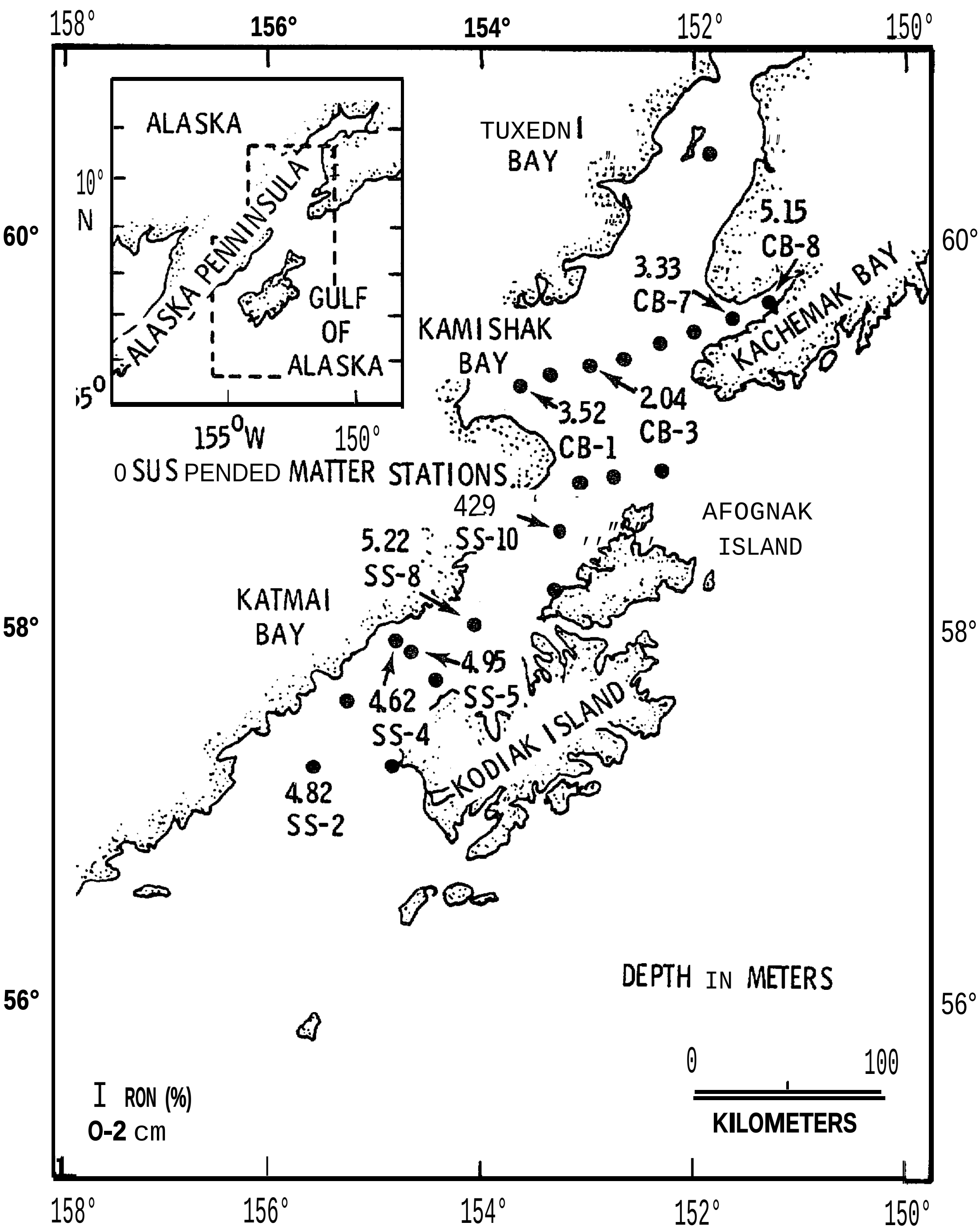


FIGURE 0.35 Fe Concentrations in Shelik Strait and Cook Inlet Sediments

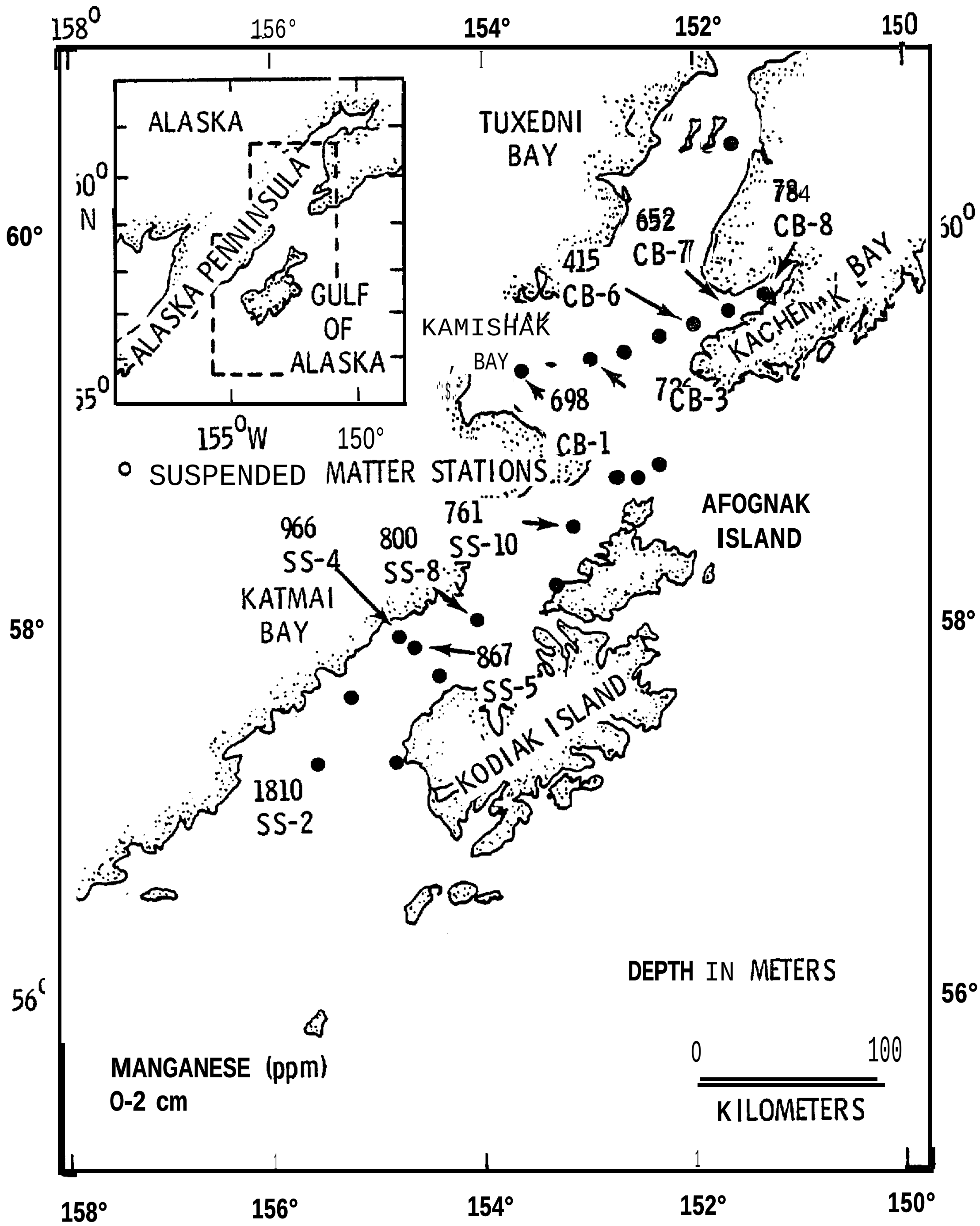


FIGURE D.36 Mn Concentrations in Shelik Strait and Cook Inlet Sediments

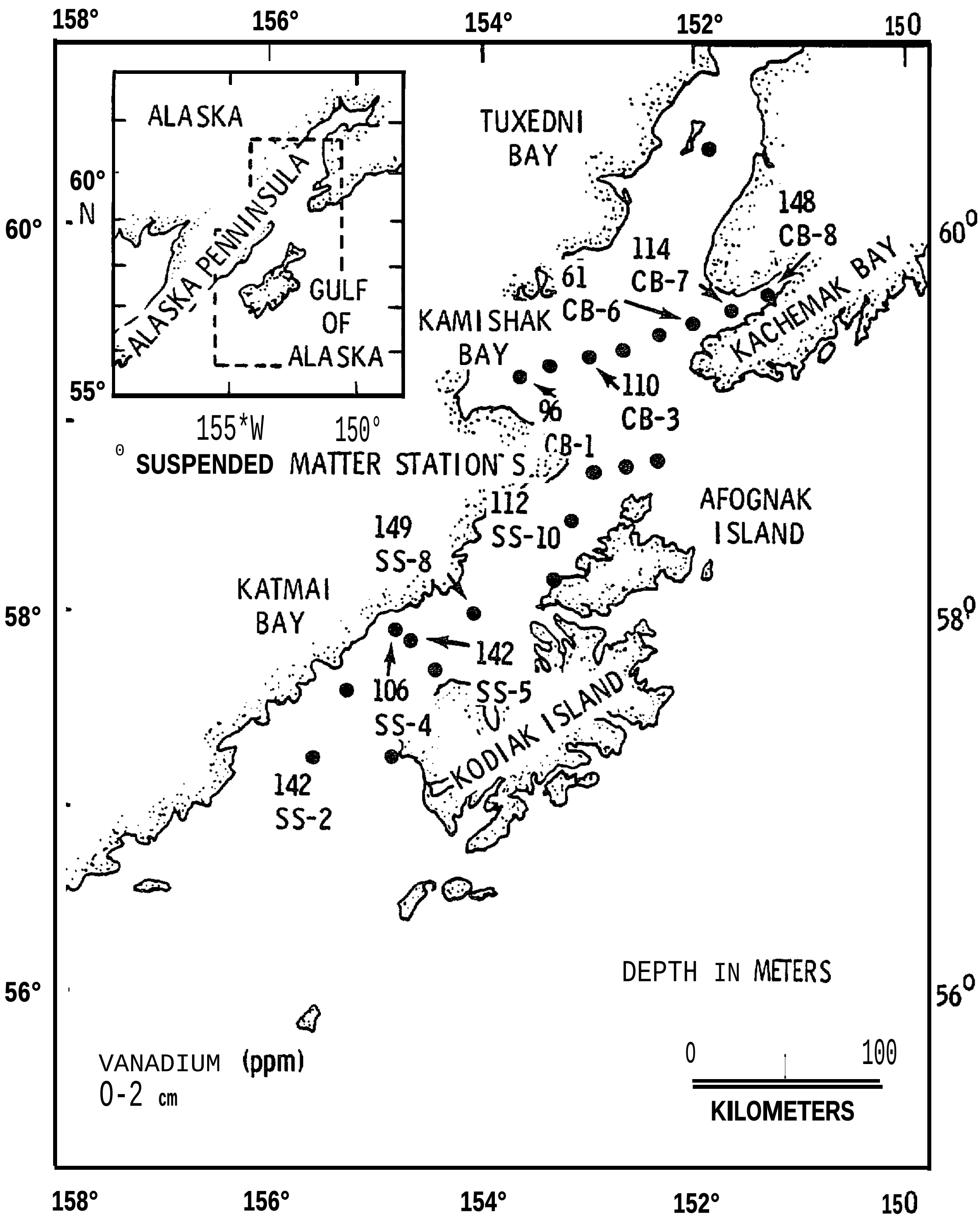


FIGURE 0.37 V Concentrations in Shelik Strait and Cook Inlet Sediments

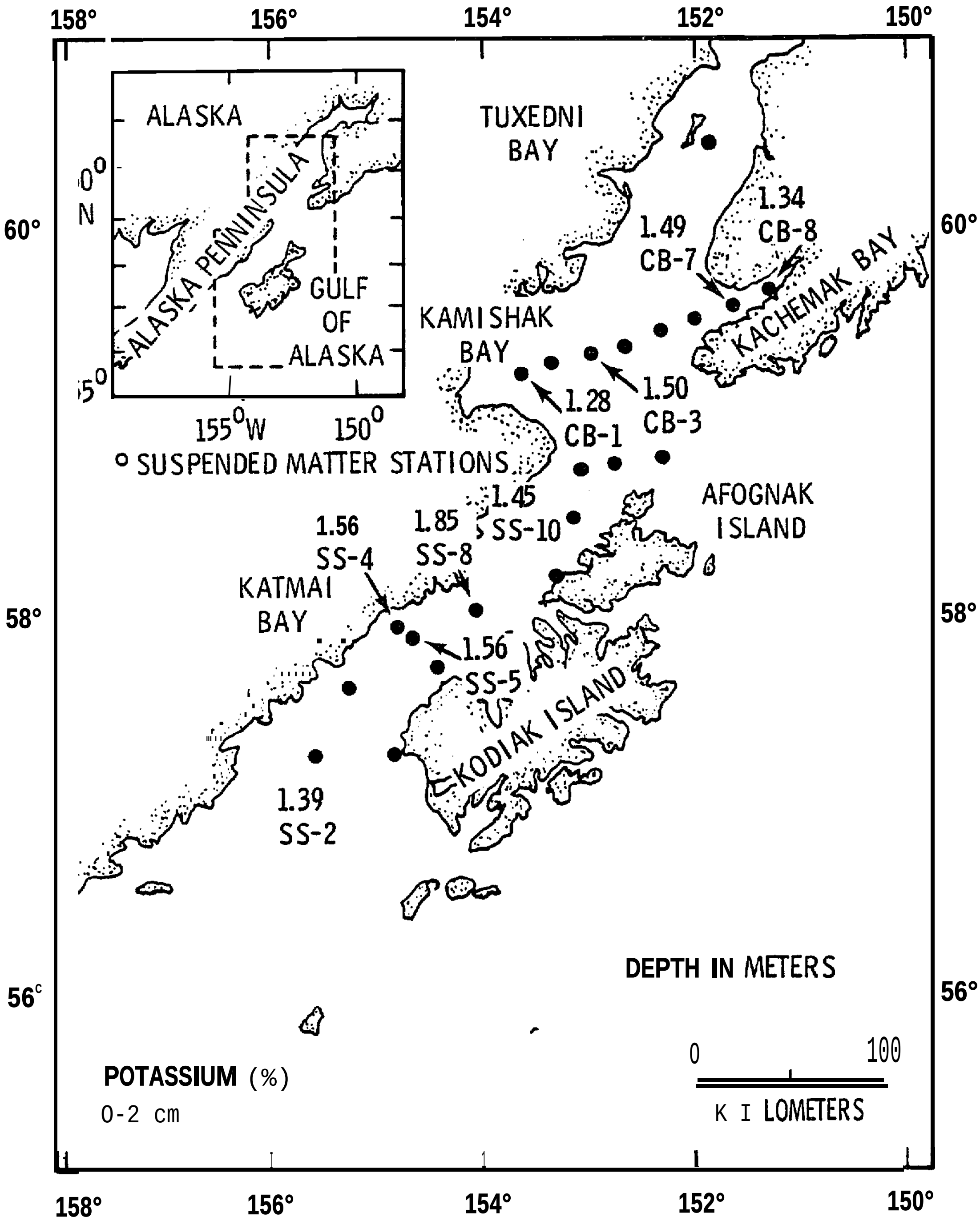


FIGURE D.38 K Concentrations in Shelik Strait and Cook Inlet Sediments

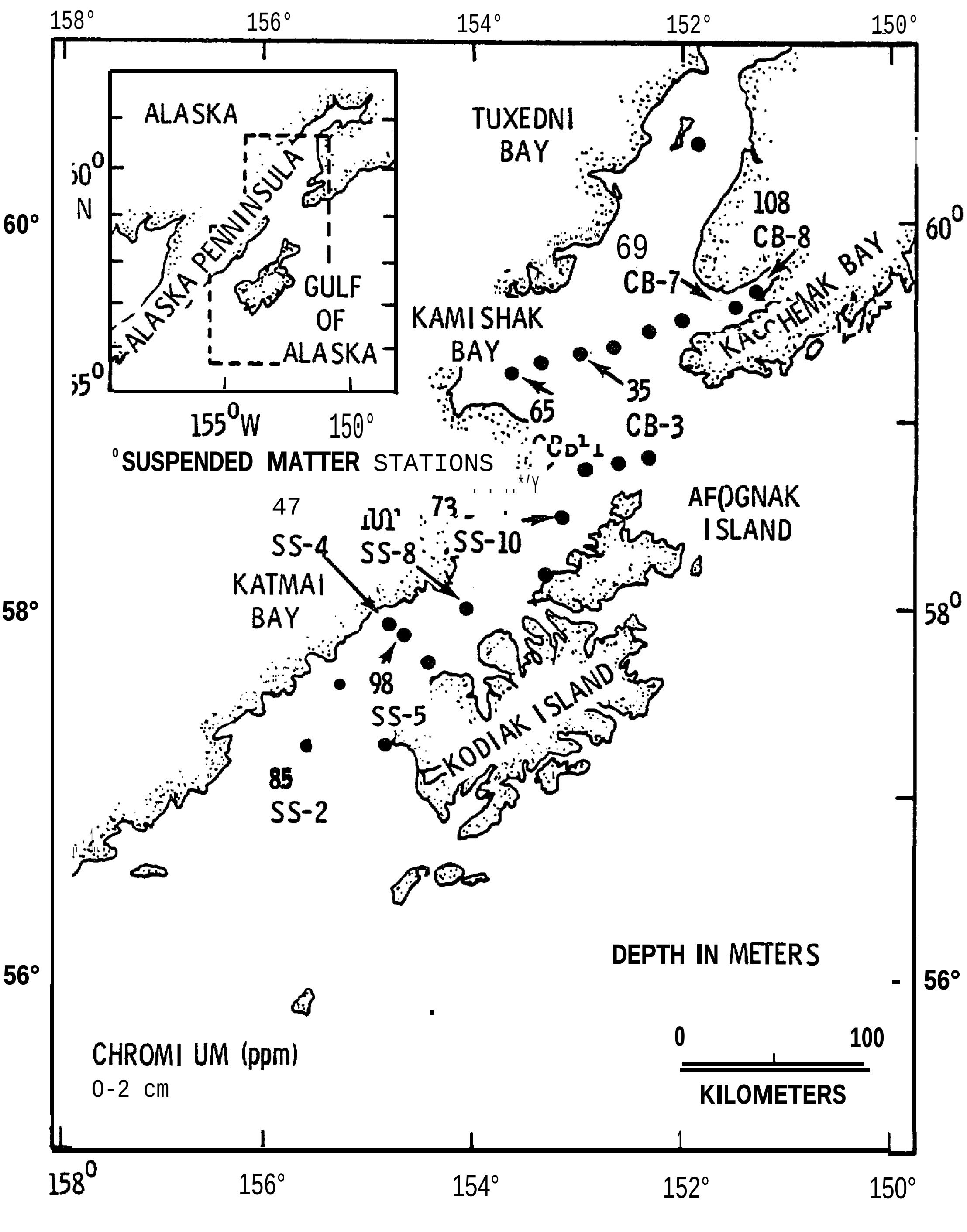


FIGURE D.39 Cr Concentrations in Shelik Strait and Cook Inlet Sediments

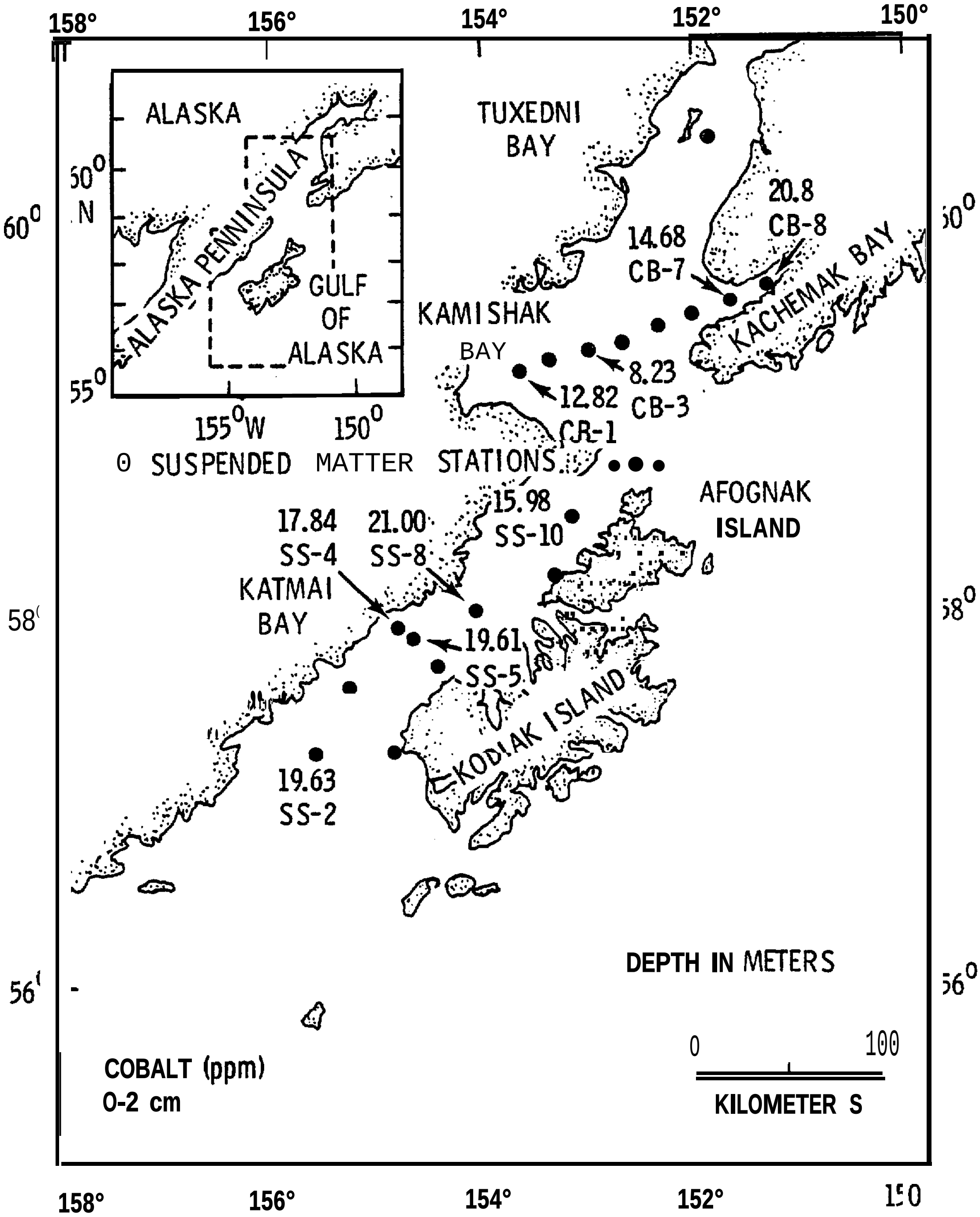


FIGURE D.40 Co Concentrations in Shelik Strait and Cook Inlet Sediments

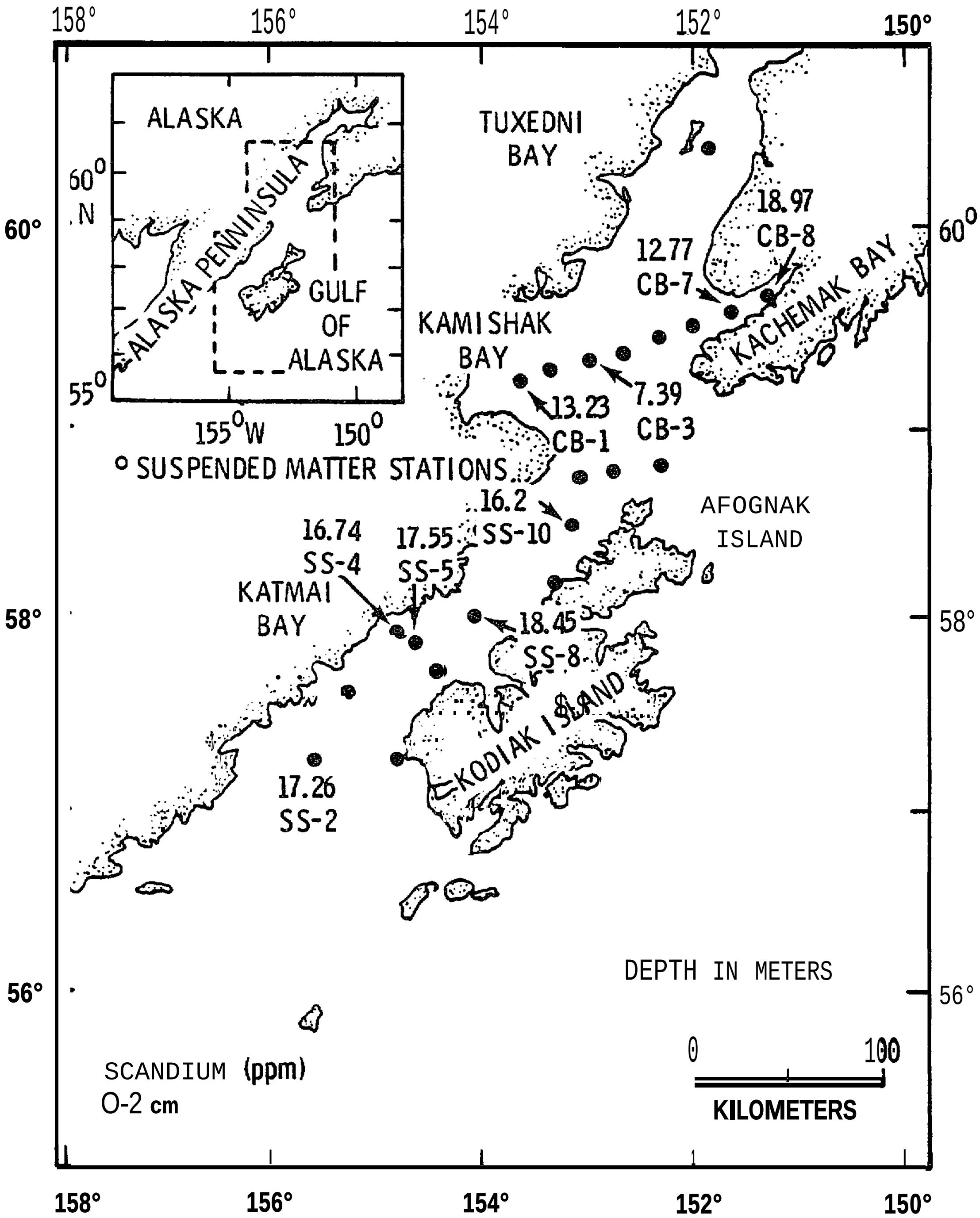


FIGURE D.41 Sc Concentrations in Shelik Strait and Cook Inlet Sediments

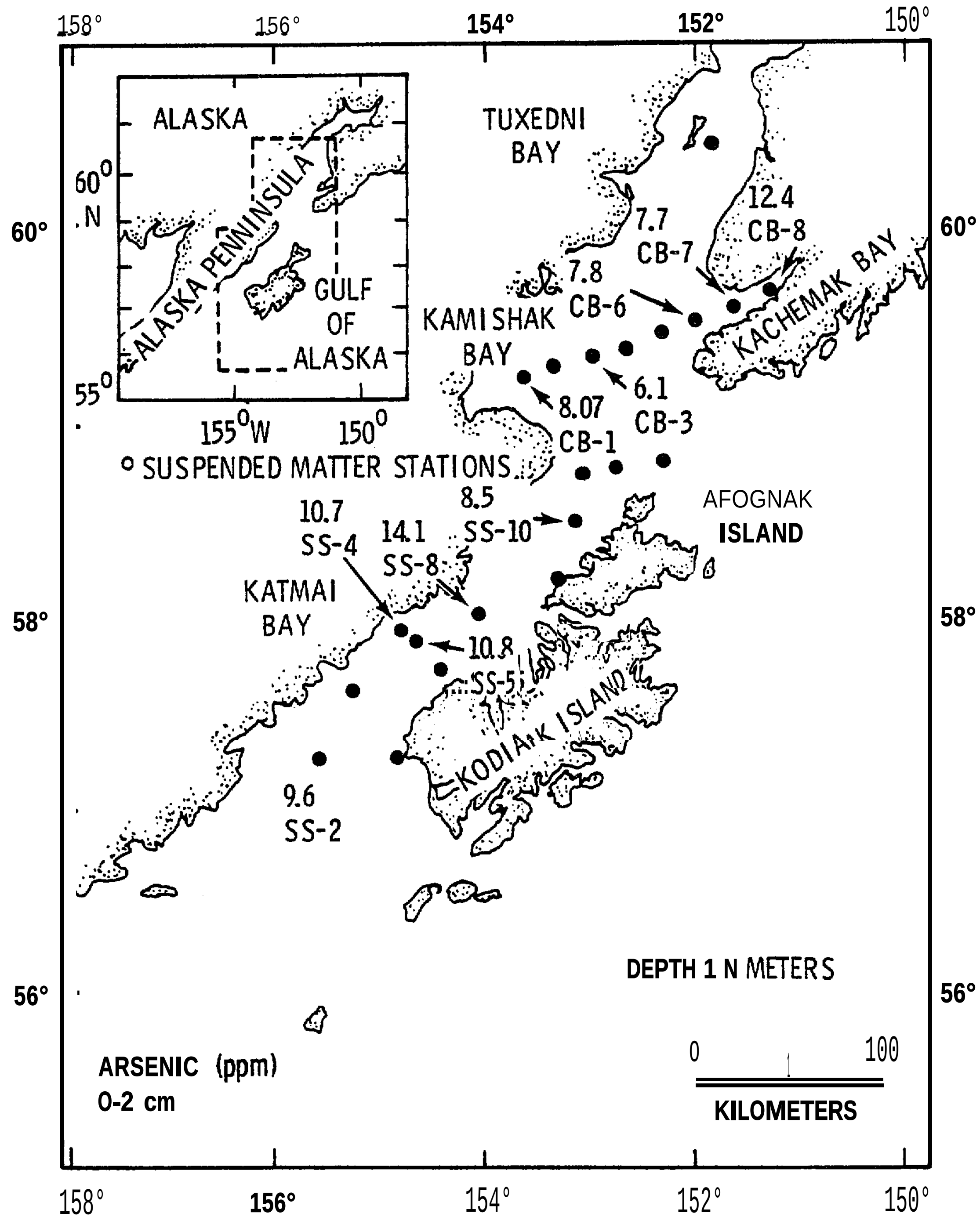


FIGURE 0.42 As Concentrations in ShelikStrait and Cook Inlet Sediments

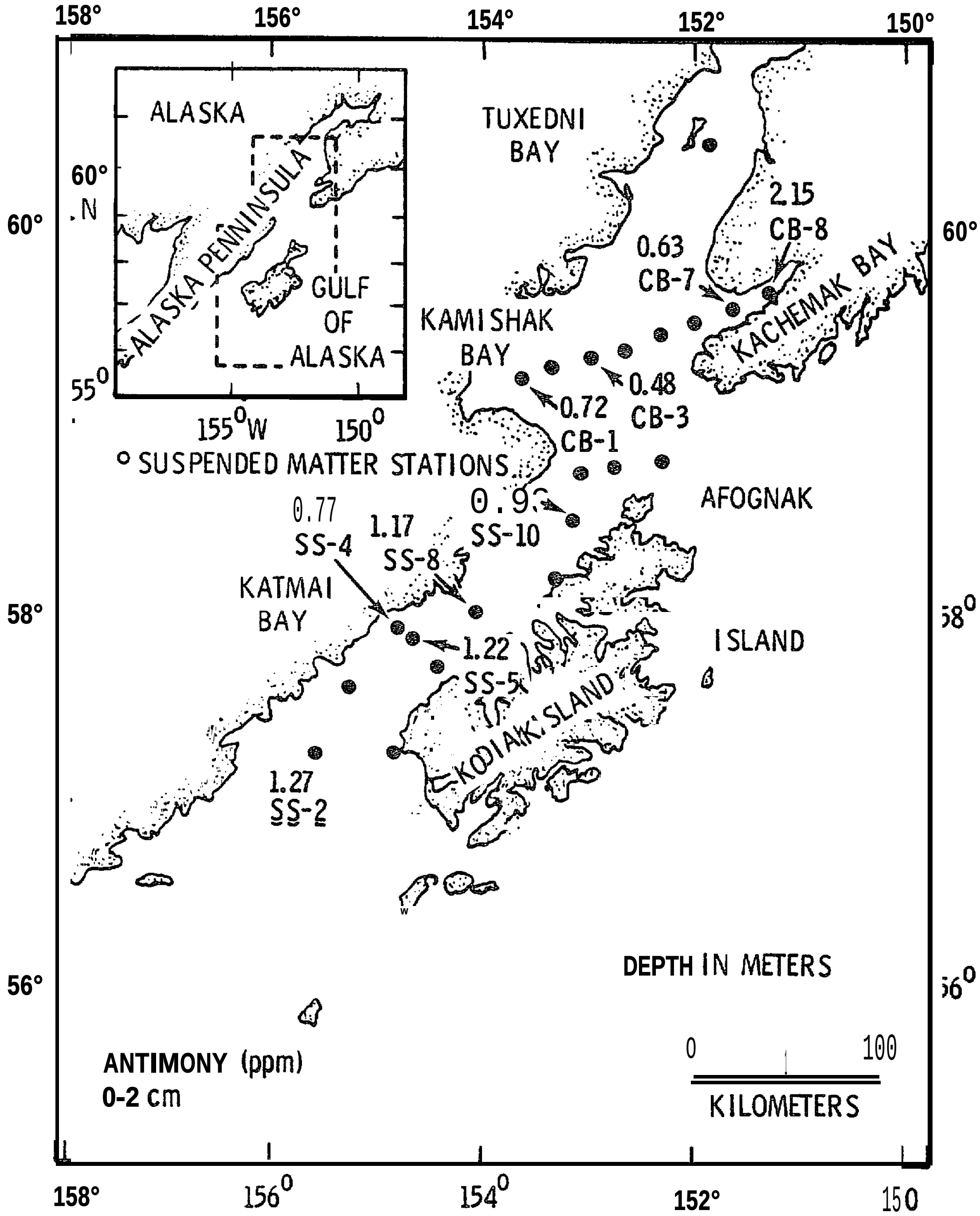


FIGURE D.43 Sb Concentrations in Shelik Strait and Cook Inlet Sediments

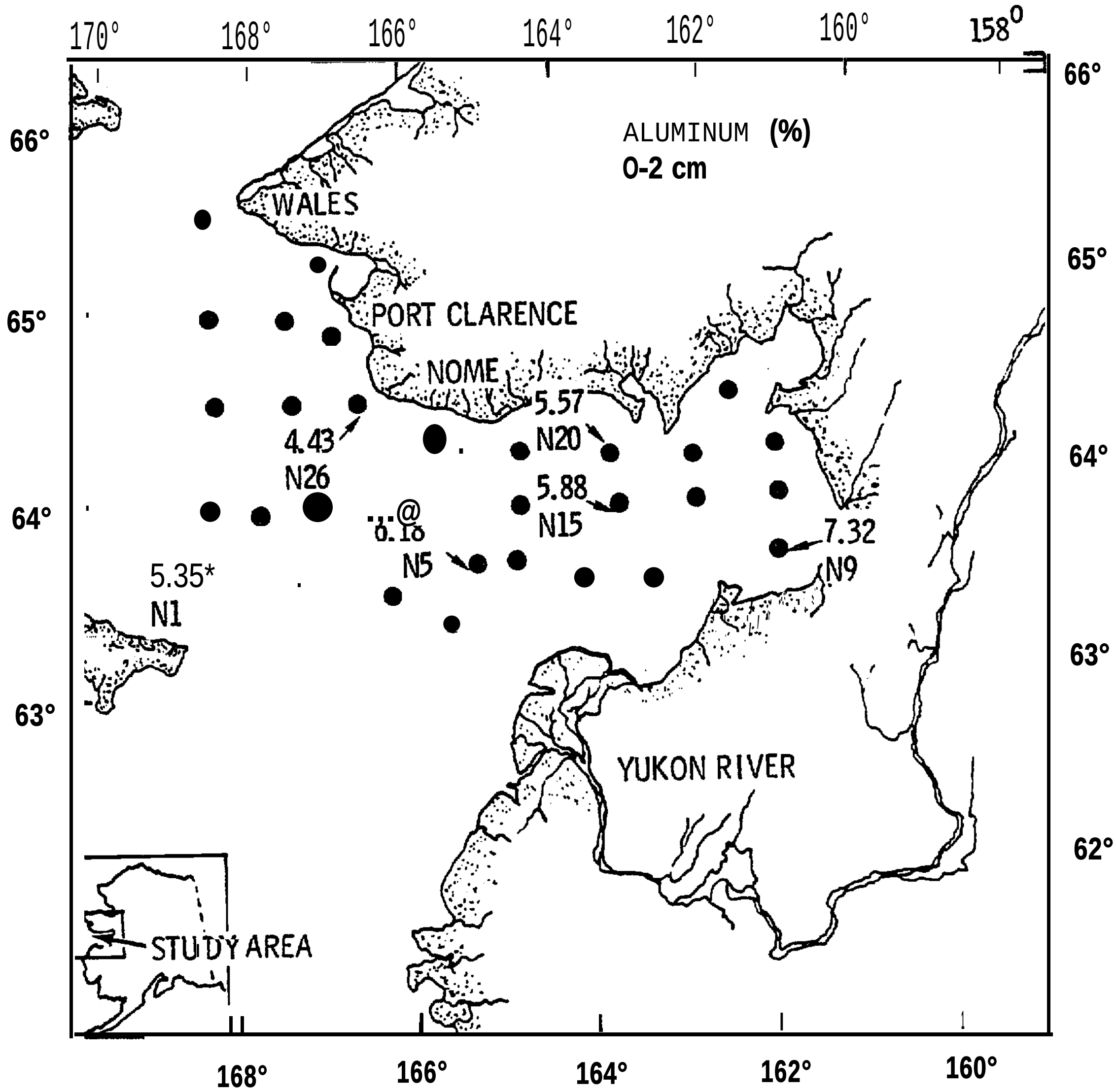


FIGURE D.44 Al Concentration in Norton Sound Sediments

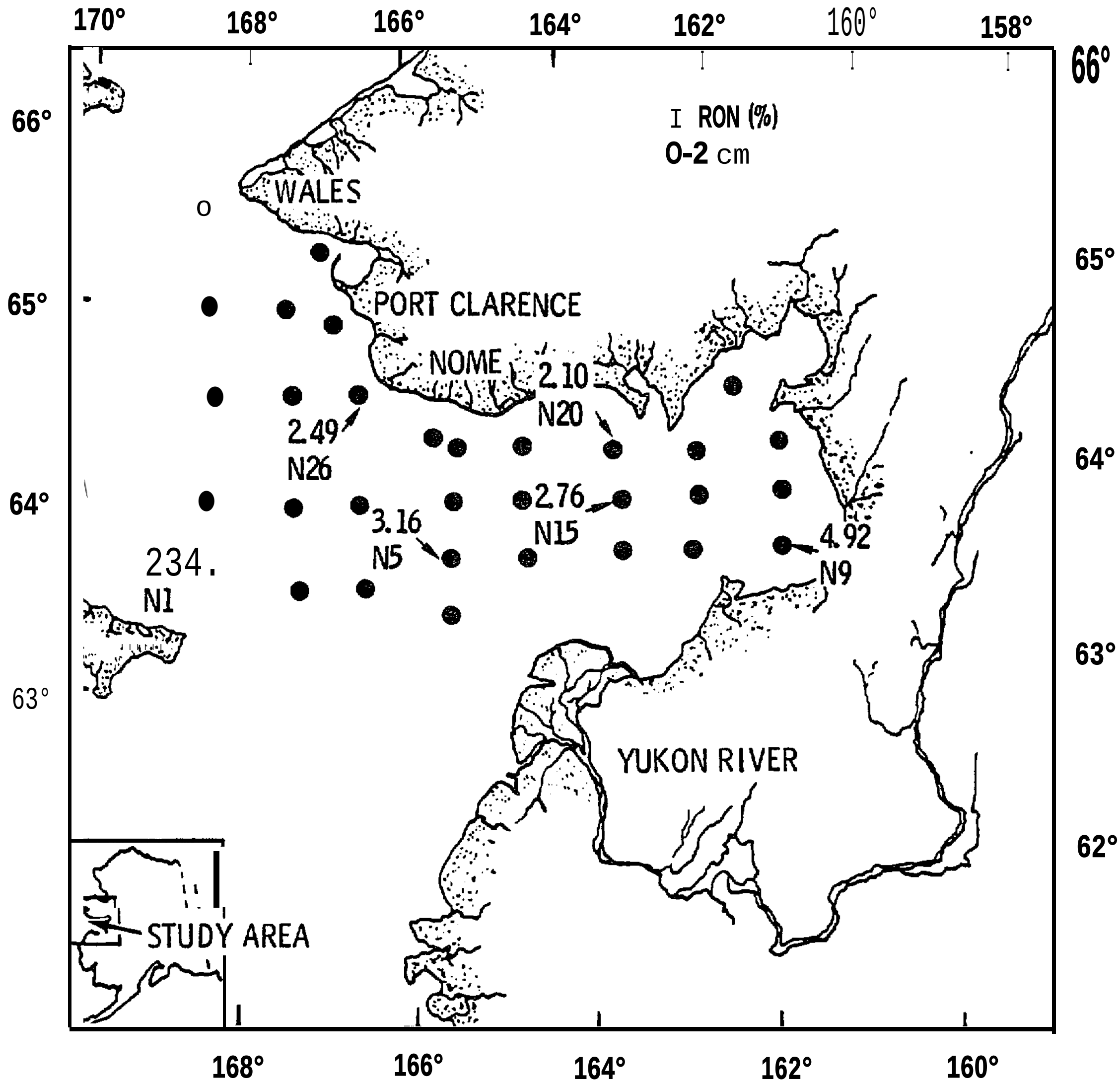


FIGURE D.45 Fe Concentration in Norton Sound Sediments

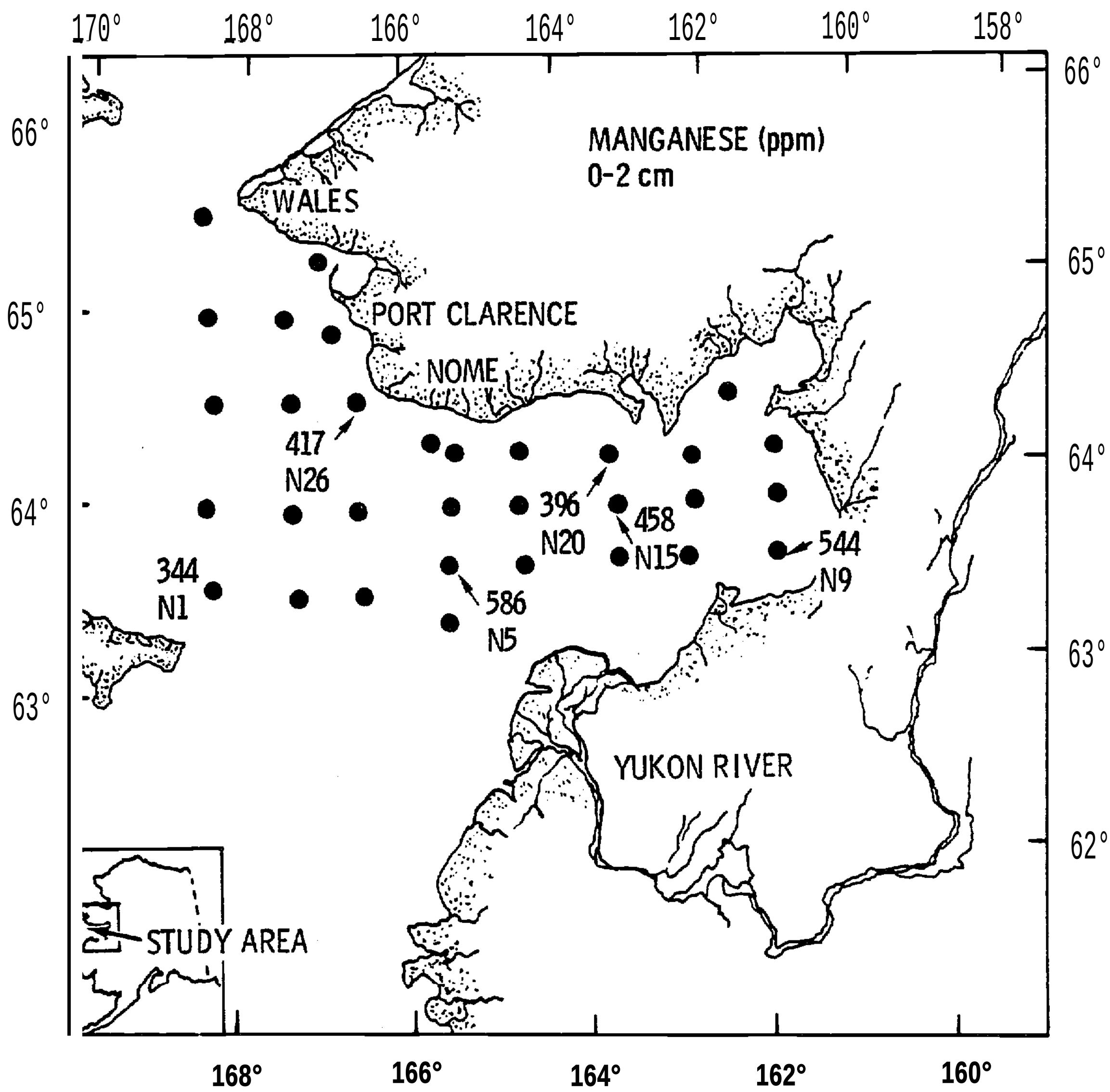


FIGURE D.46 Mn Concentration in Norton Sound Sediments

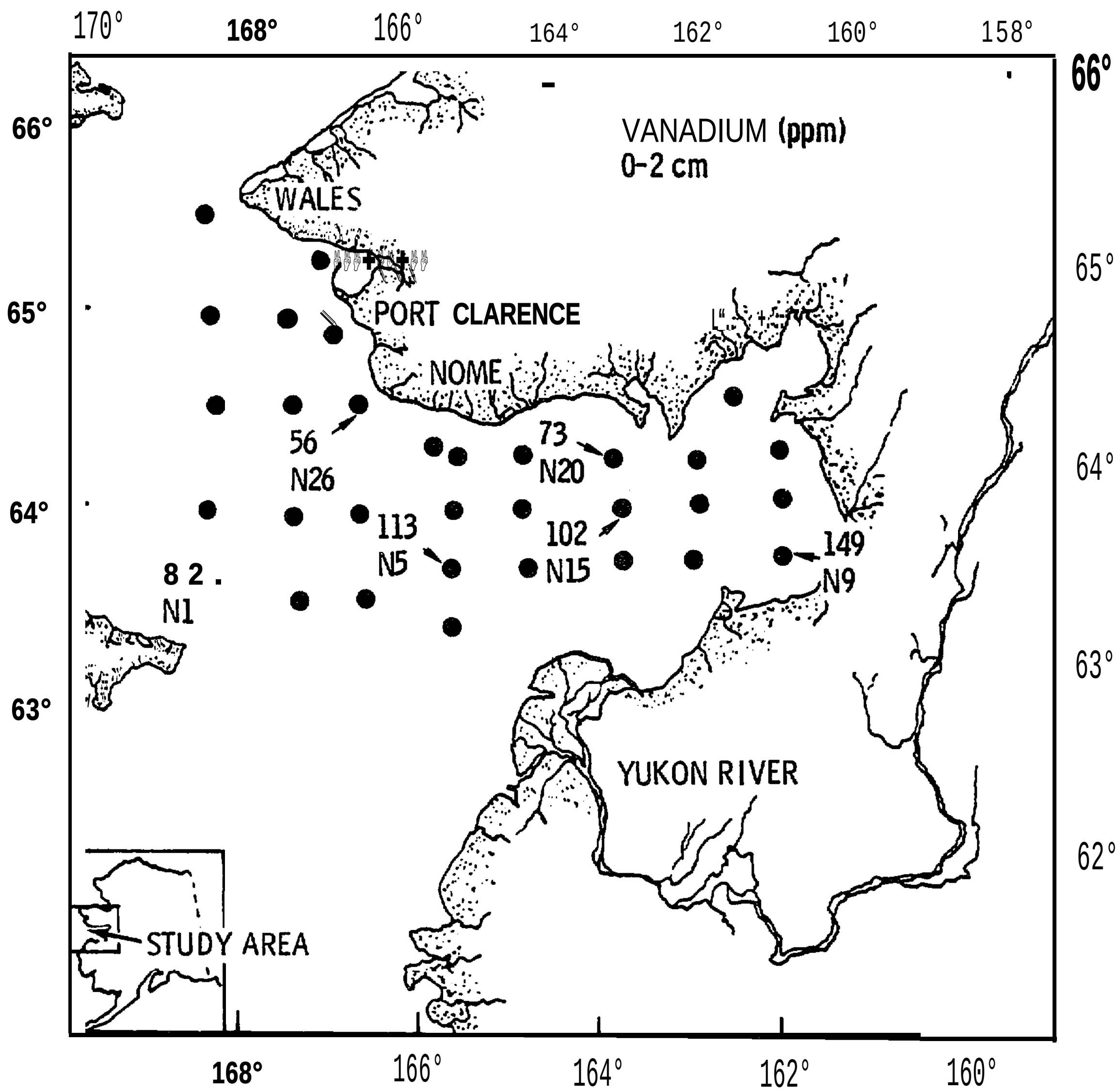


FIGURE D.47 V Concentration in Norton Sound Sediments

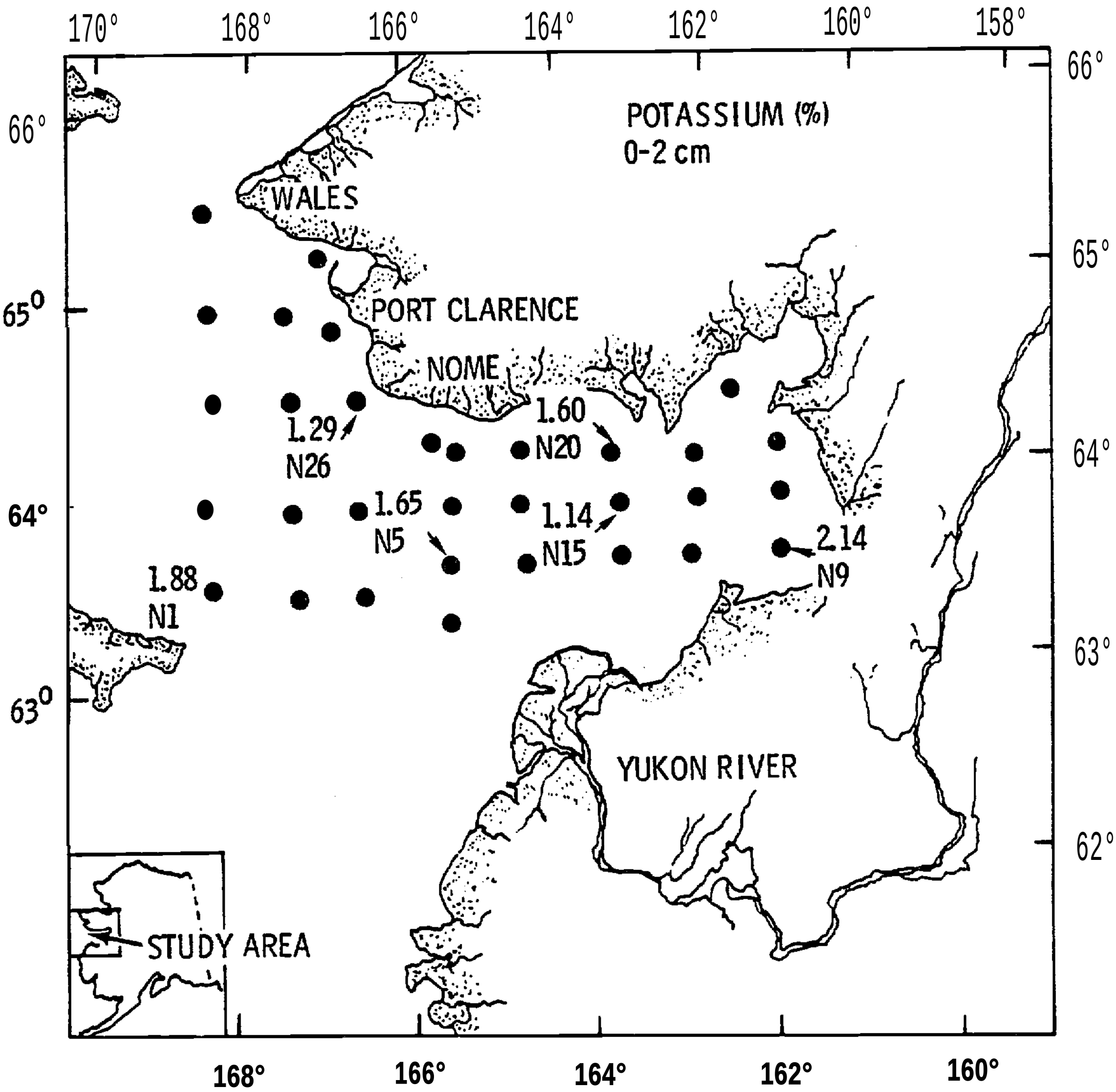


FIGURE D.48 K Concentration in Norton Sound Sediments

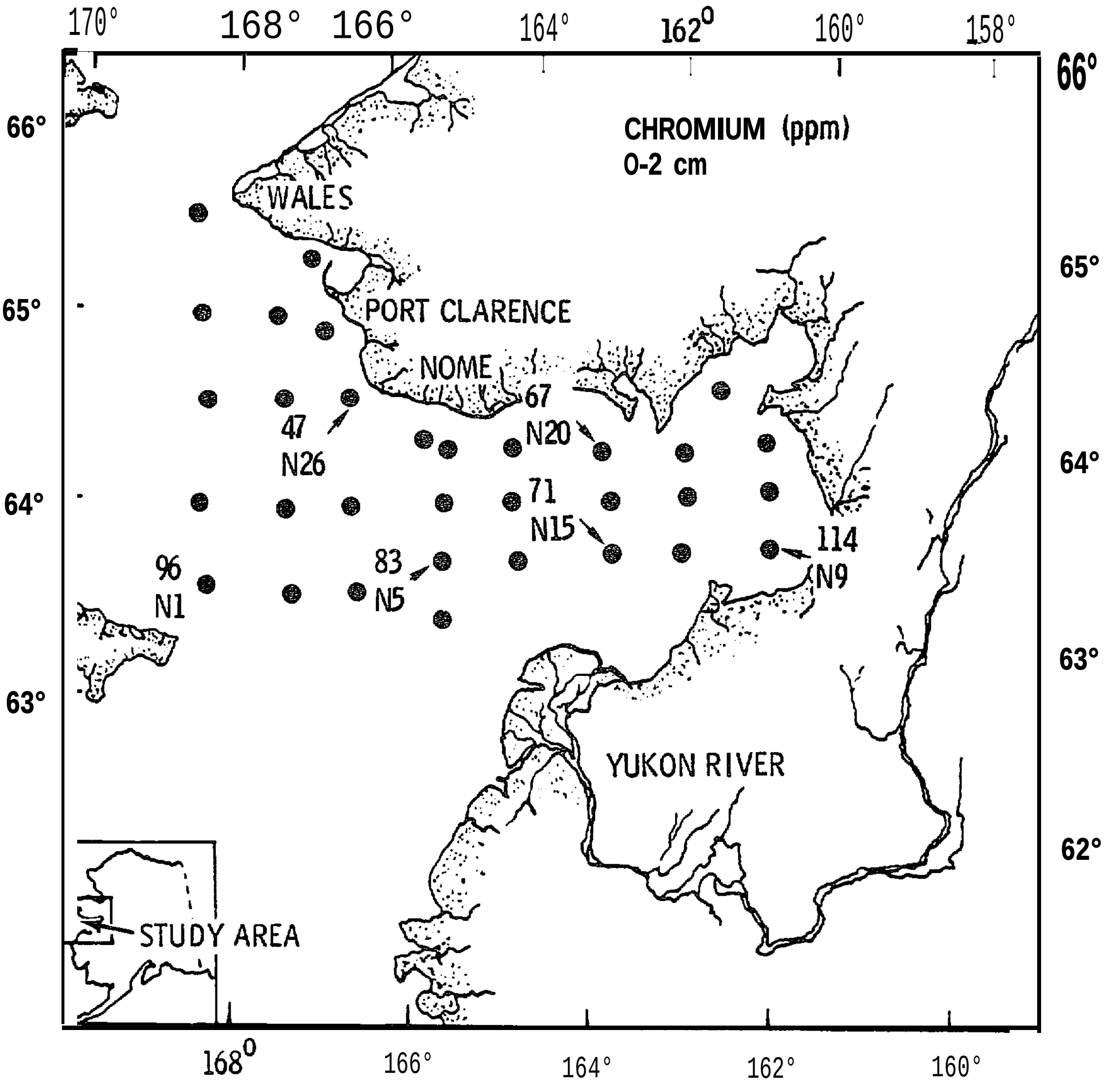


FIGURE D.49 Cr Concentration in Norton Sound Sediments

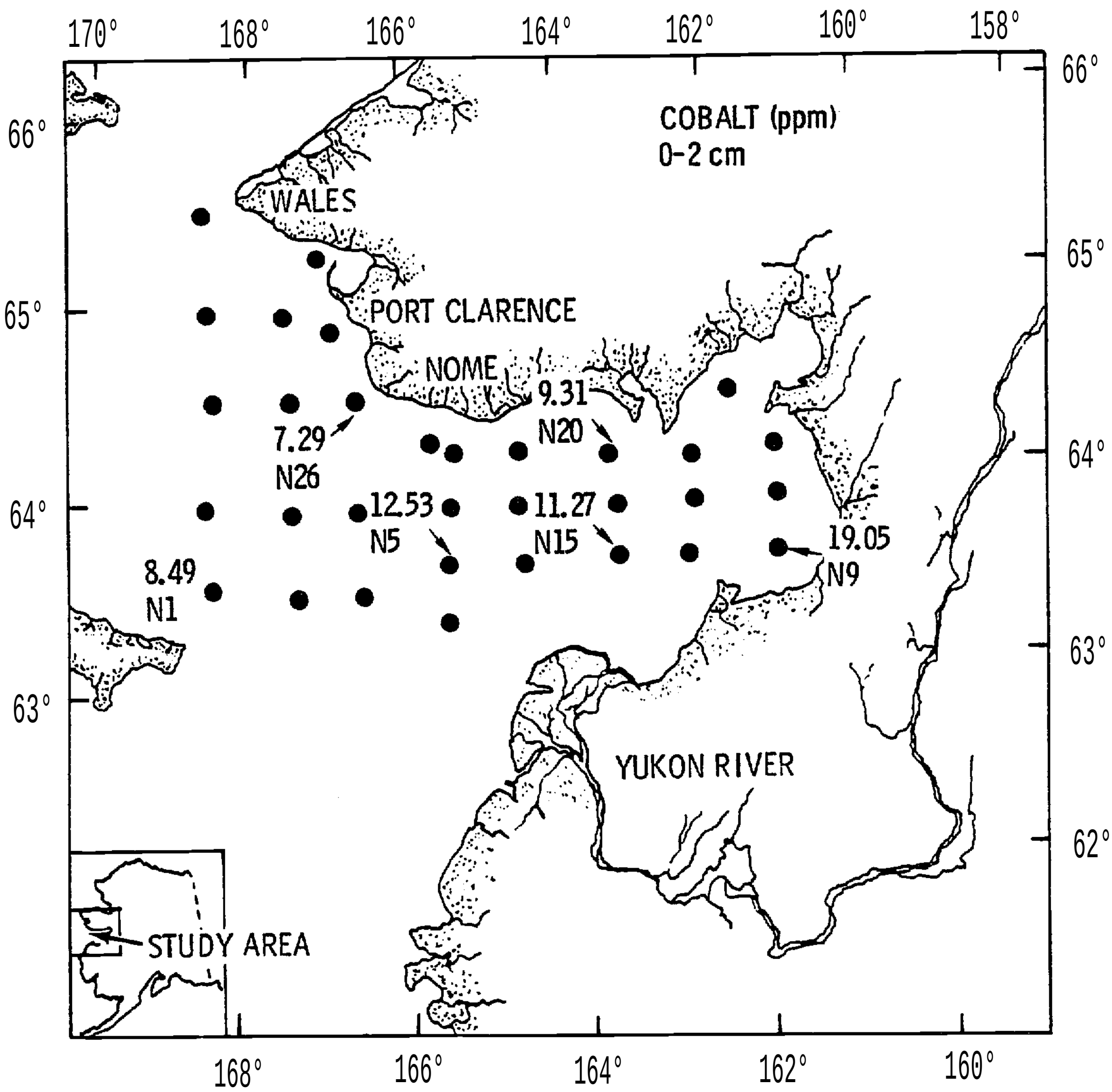


FIGURE D.50 Co Concentration in Norton Sound Sediments

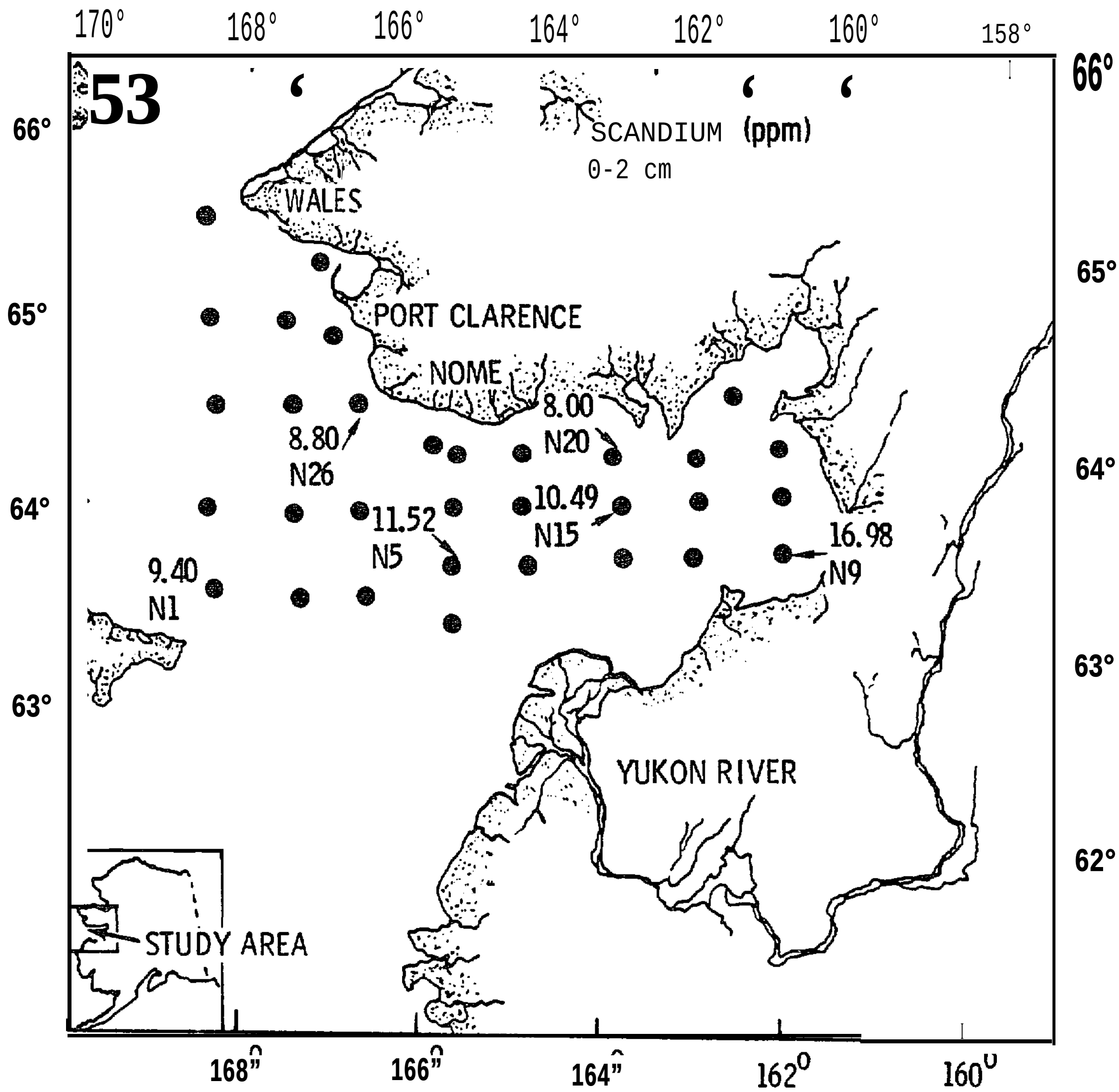


FIGURE D.51 Sc Concentration in Norton Sound Sediments

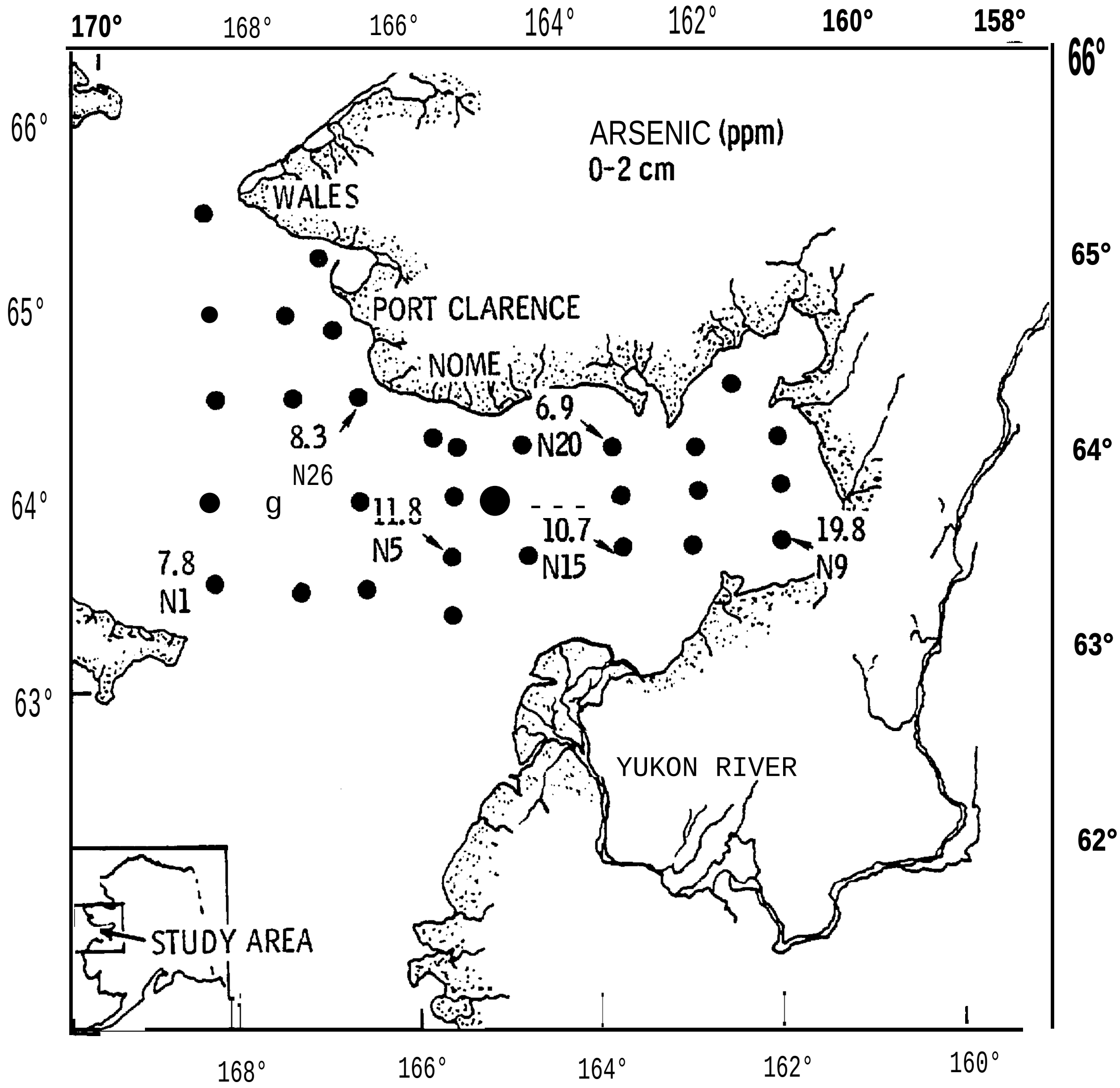


FIGURE D.52 As Concentration in Norton Sound Sediments

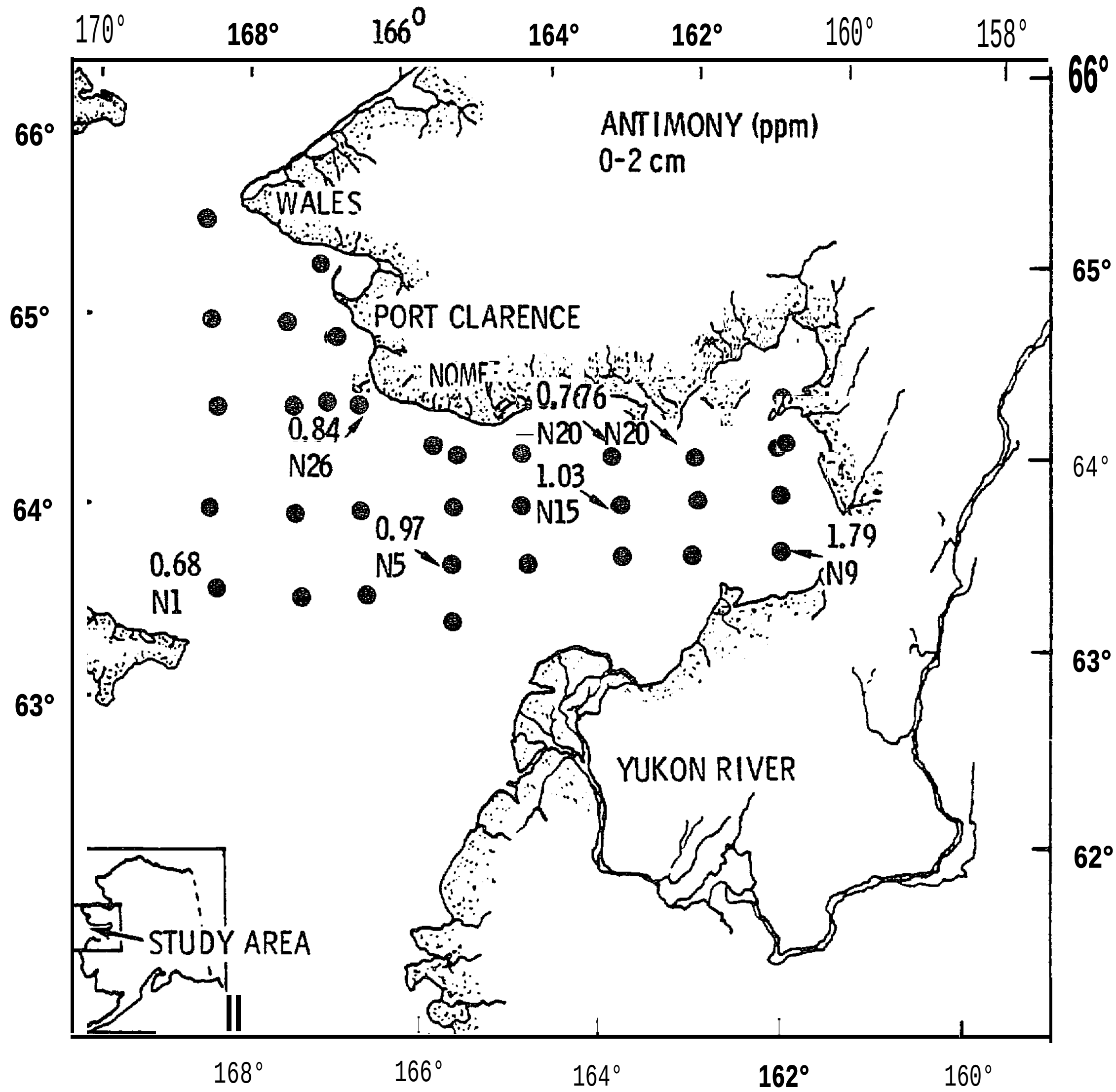


FIGURE D.53 Sb Concentration in Norton Sound Sediments

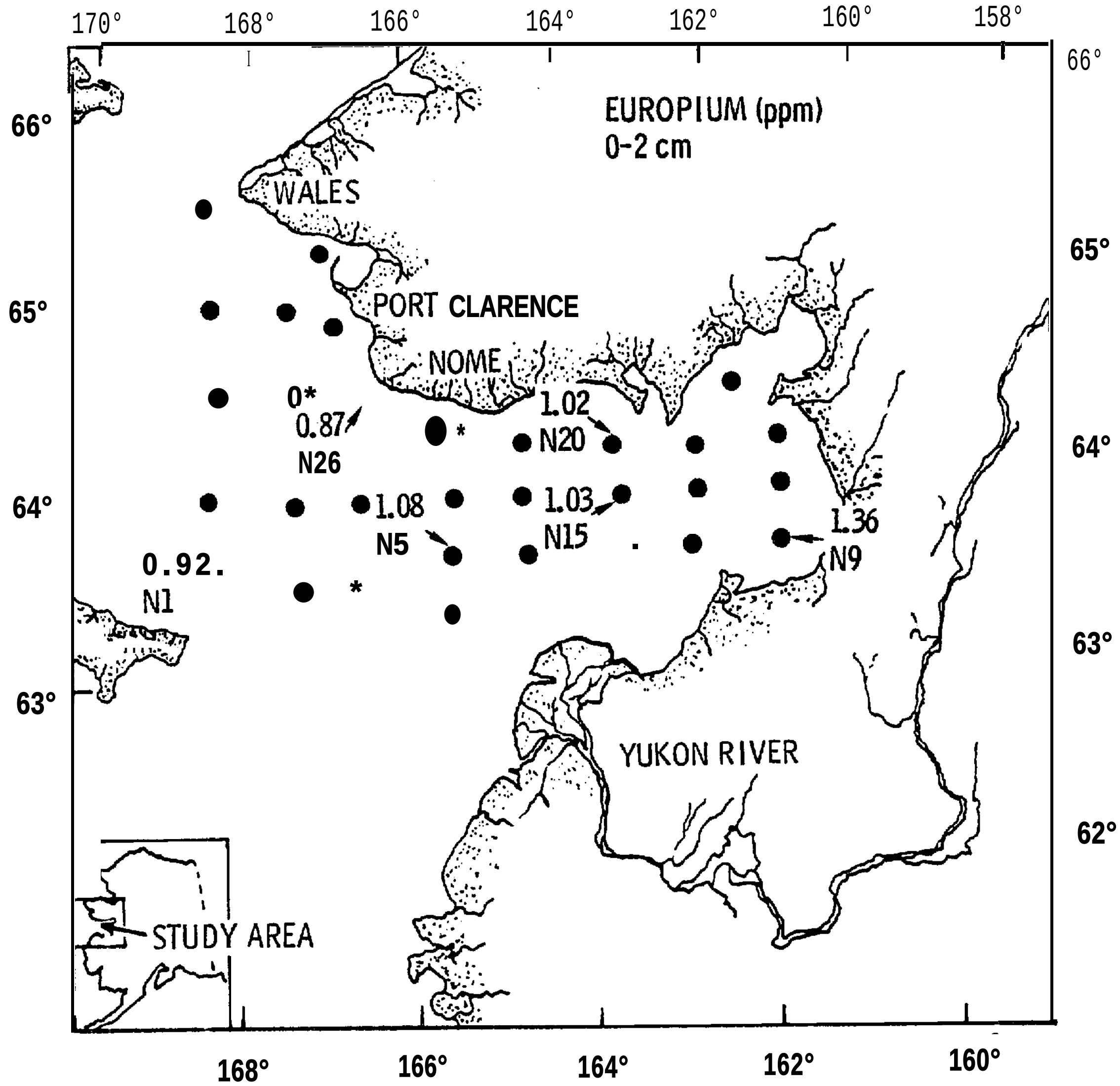


FIGURE D.54 Eu Concentrations in Norton Sound Sediments

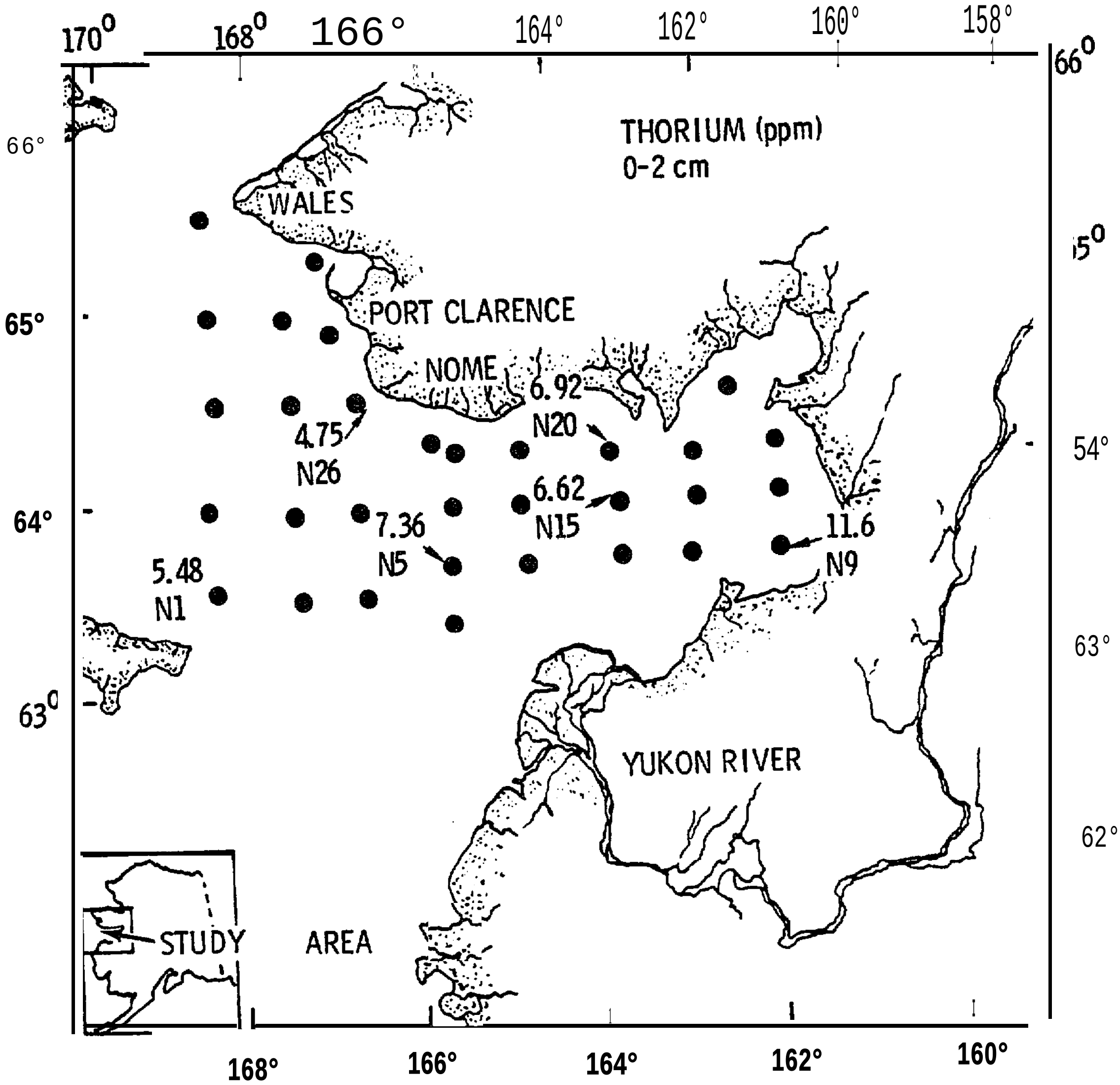


FIGURE D.55 Th Concentrations in Norton Sound Sediments

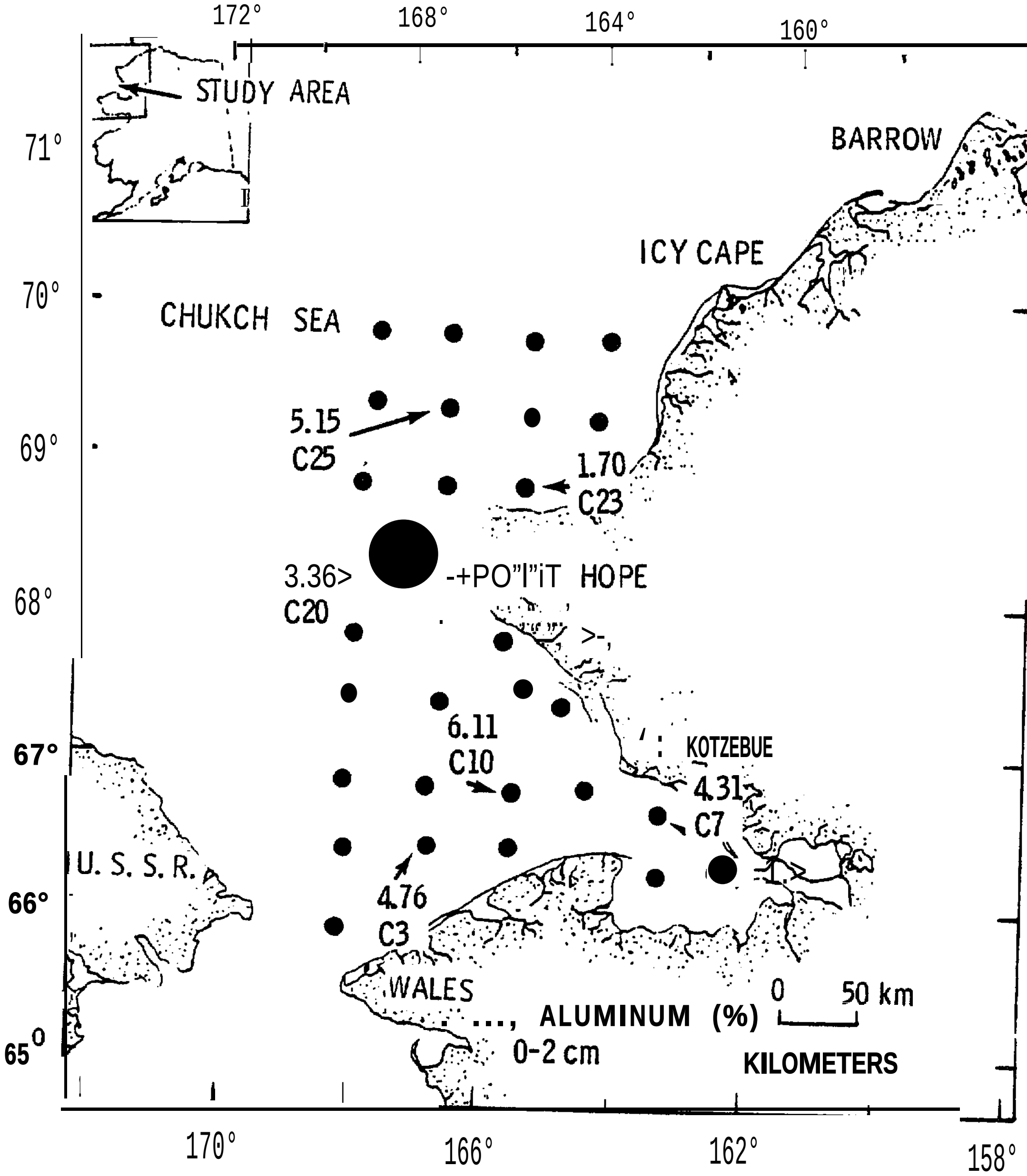


FIGURE D.56 Al Concentration in Chukchi Sea Sediments

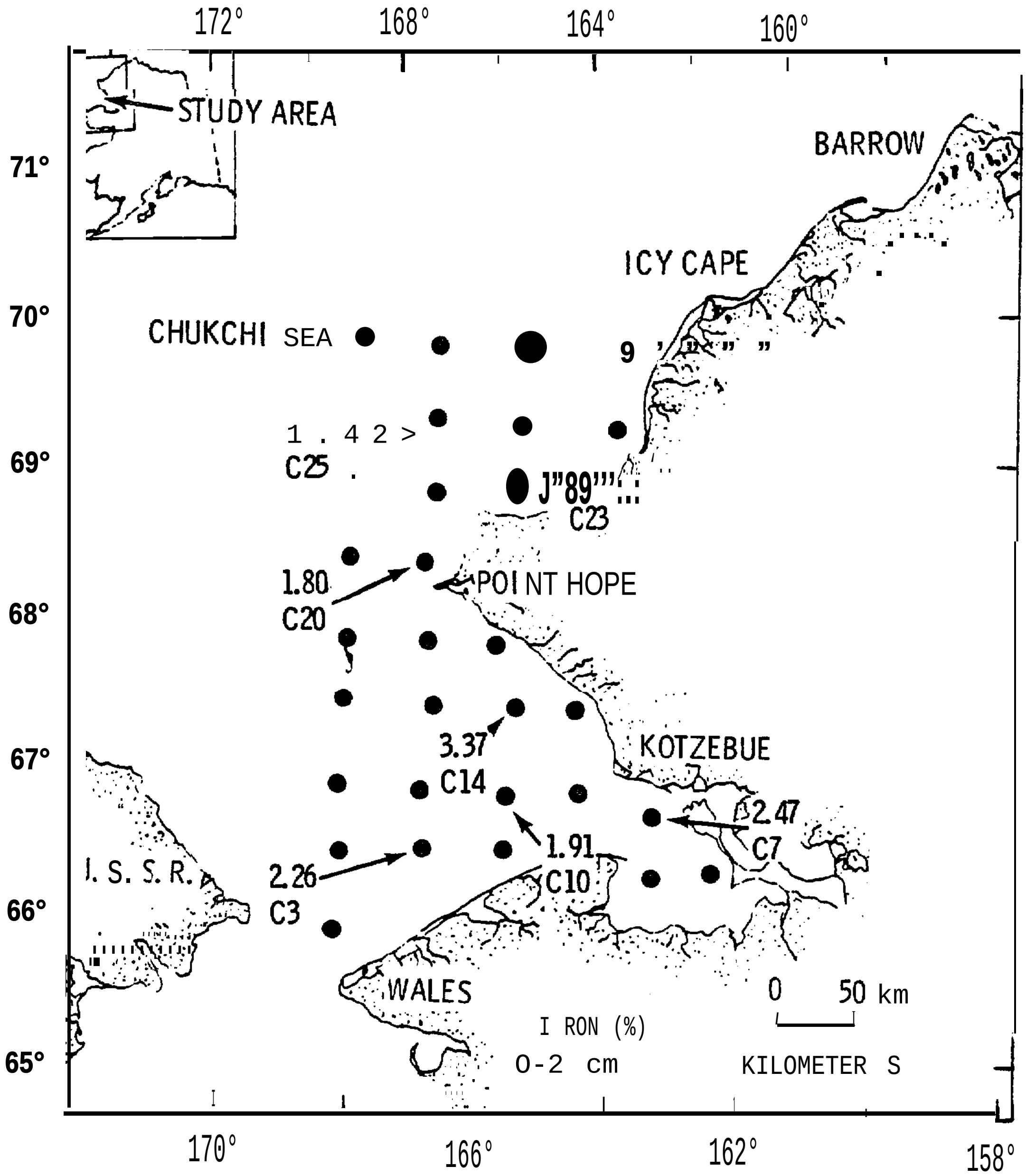


FIGURE D.57 Fe Concentration in Chukchi Sea Sediments

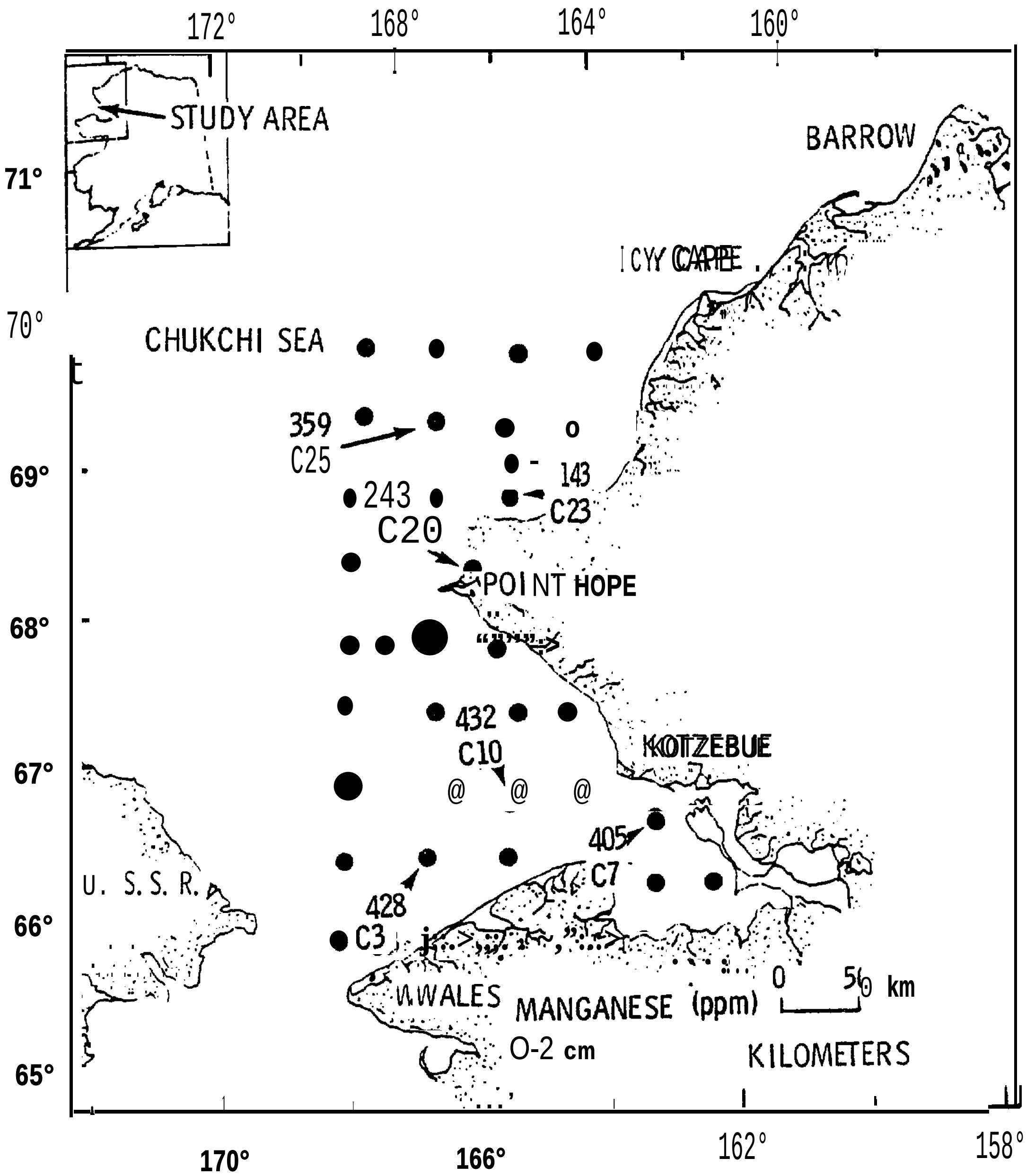


FIGURE D.58 Mn Concentration in Chukchi Sea Sediments

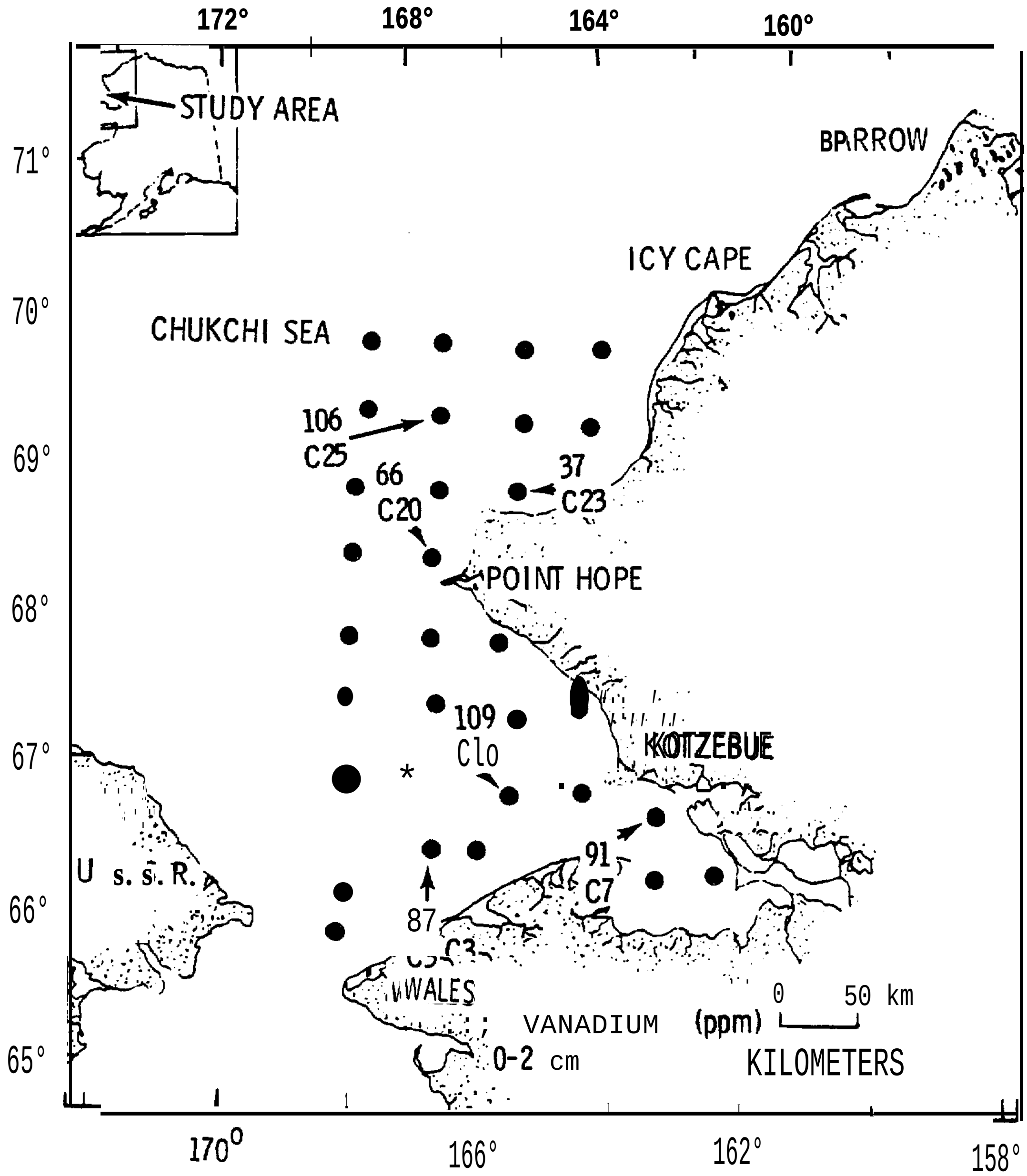


FIGURE 0.59 V Concentration in Chukchi Sea Sediments

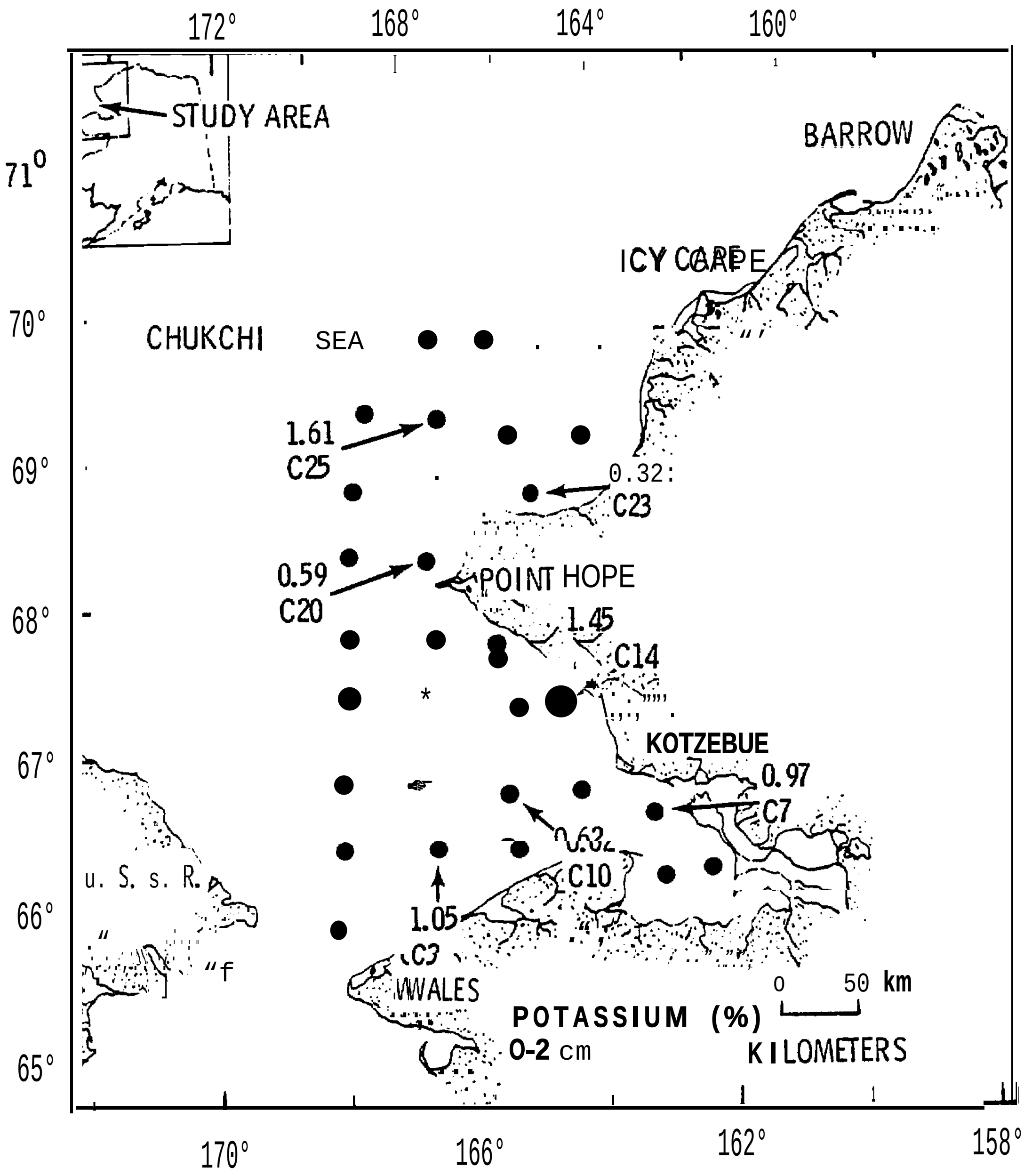


FIGURE D.60 K Concentration in Chukchi Sea Sediments

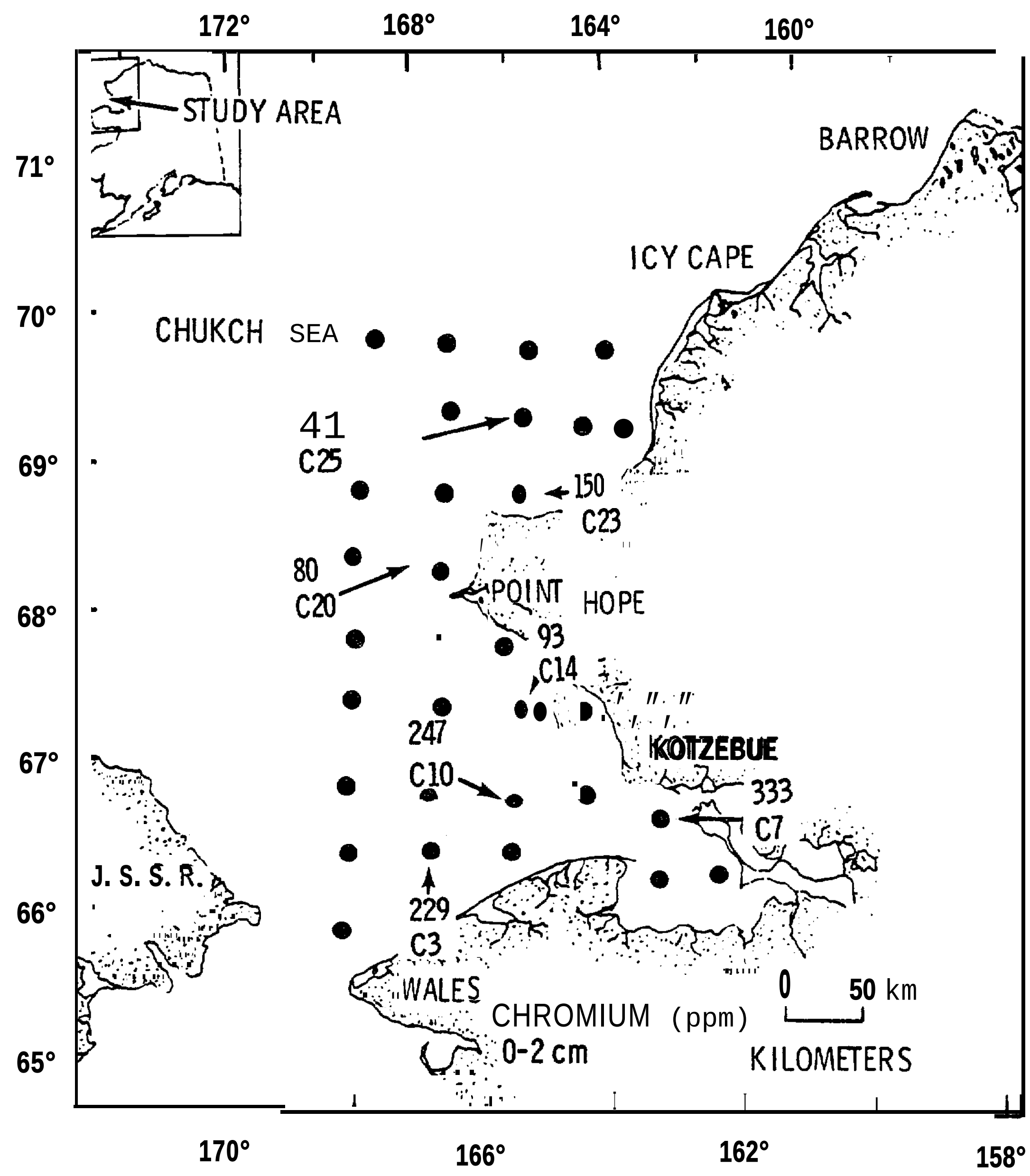


FIGURE D.61 Cr Concentration in Chukchi Sea Sediments

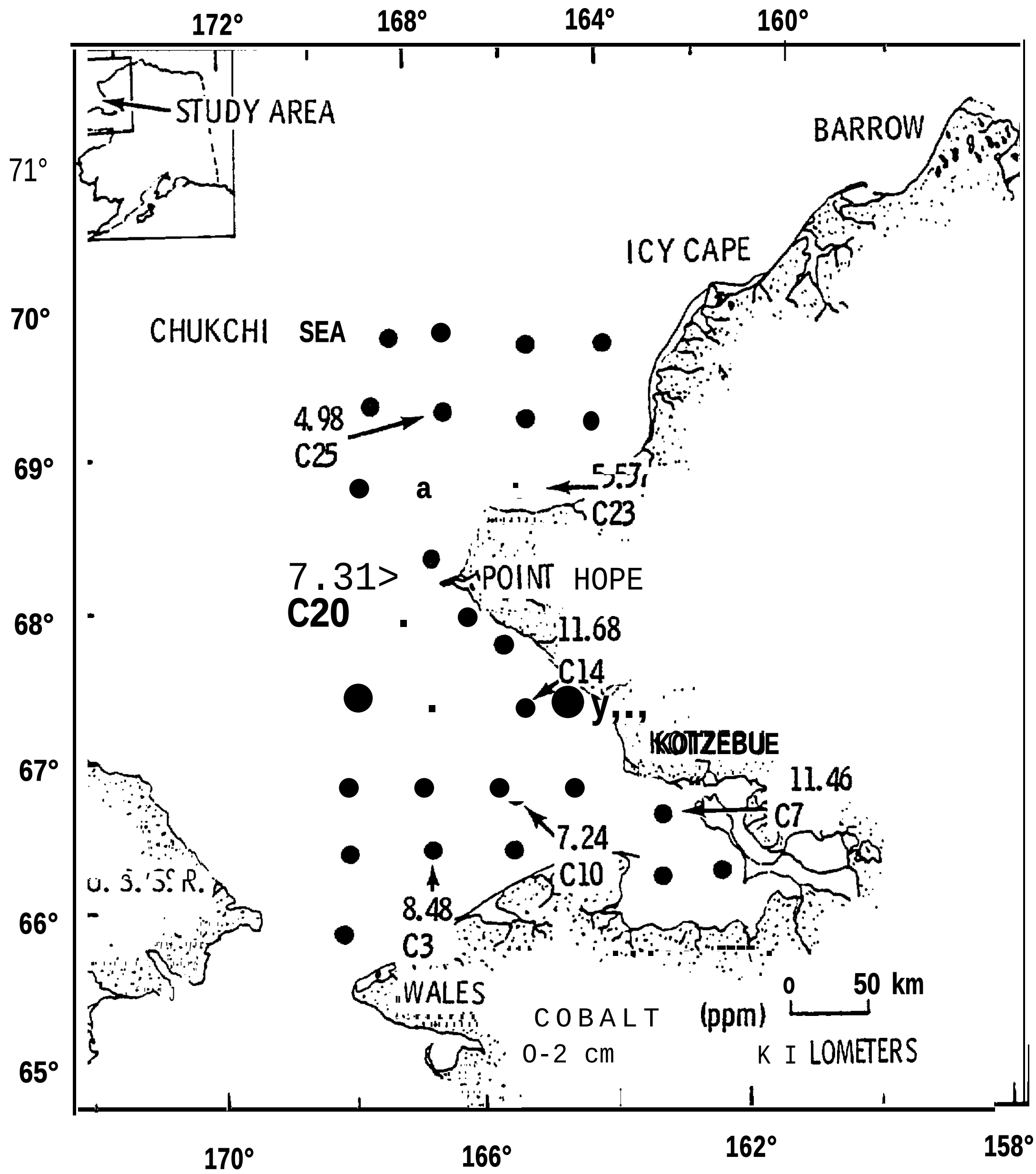


FIGURE D.62 Co Concentration in Chukchi Sea Sediments

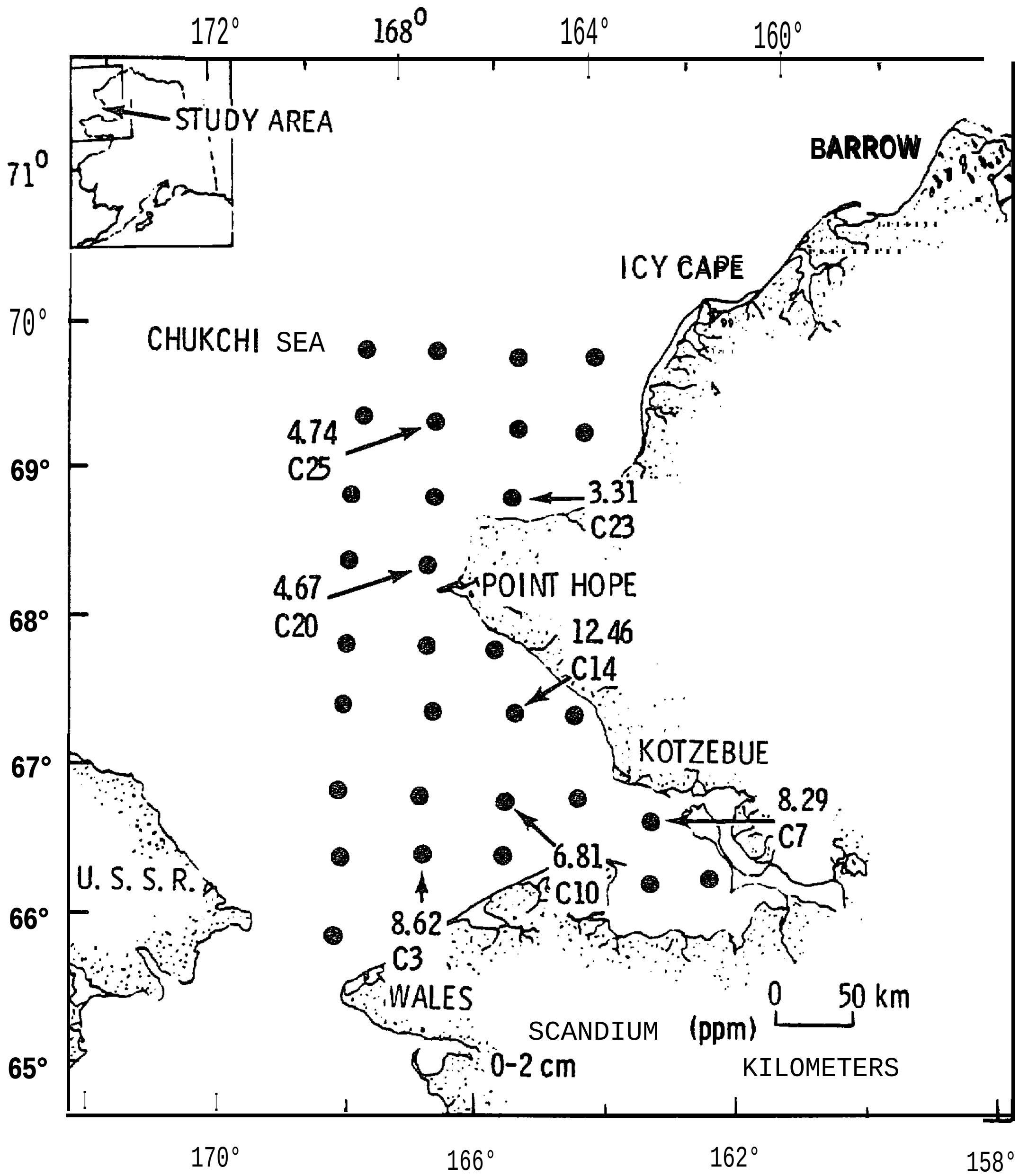


FIGURE D.63 Sc Concentration in Chukchi Sea Sediments

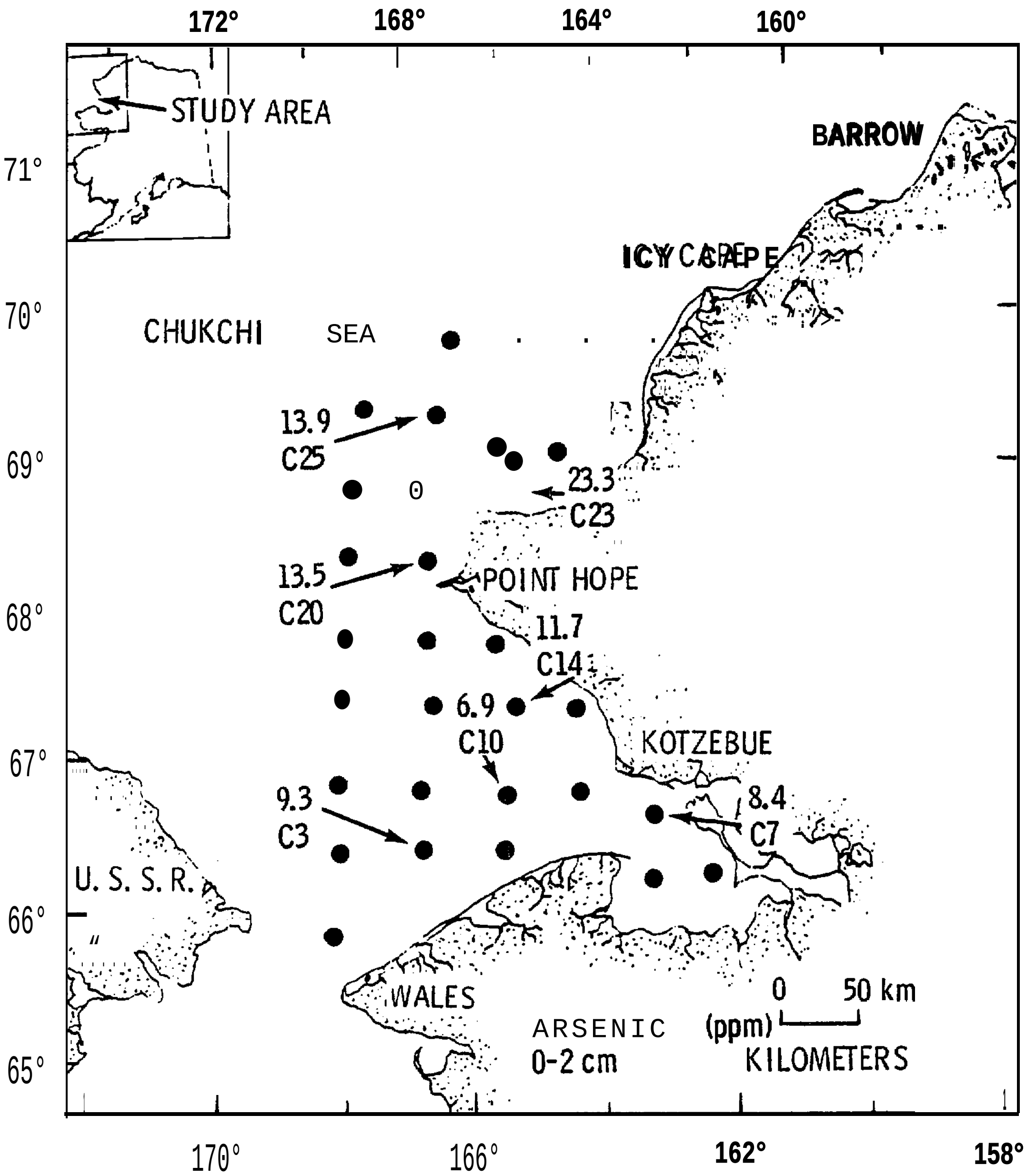


FIGURE D.64 As Concentration in Chukchi Sea Sediments

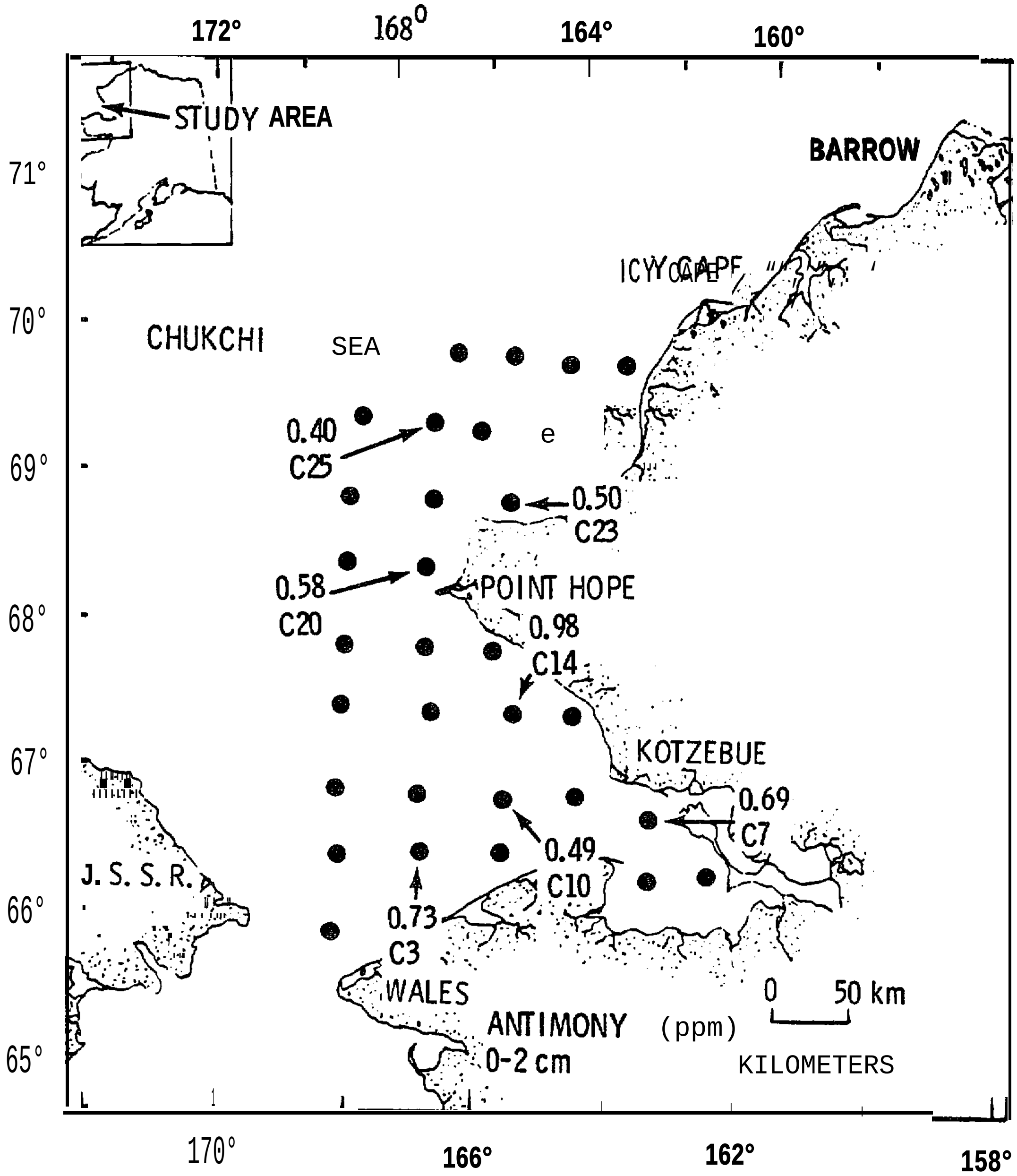


FIGURE 0.65 Sb Concentration in Chukchi Sea Sediments

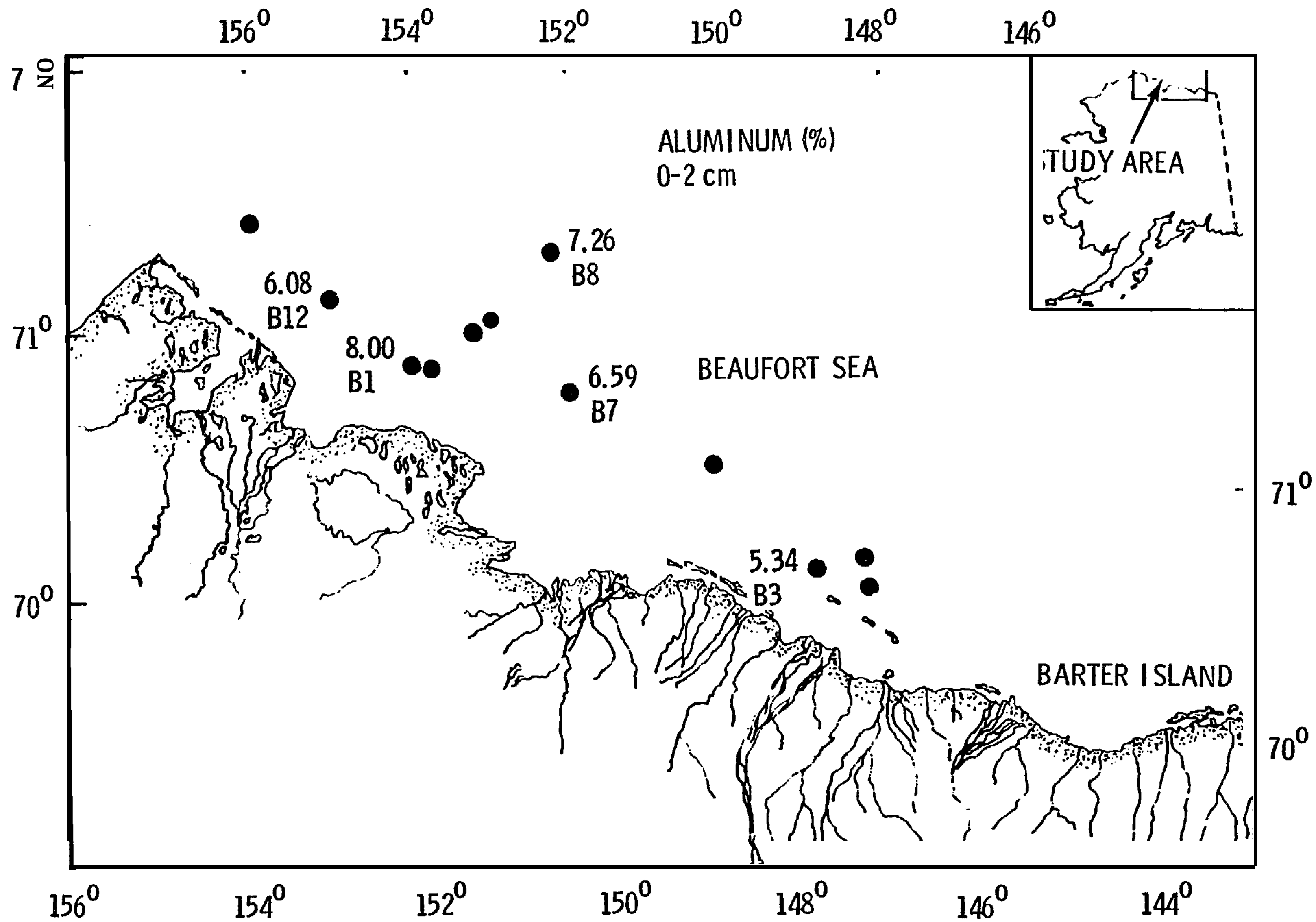


FIGURE D.66 Al Concentrations n Beaufort Sea Sediments

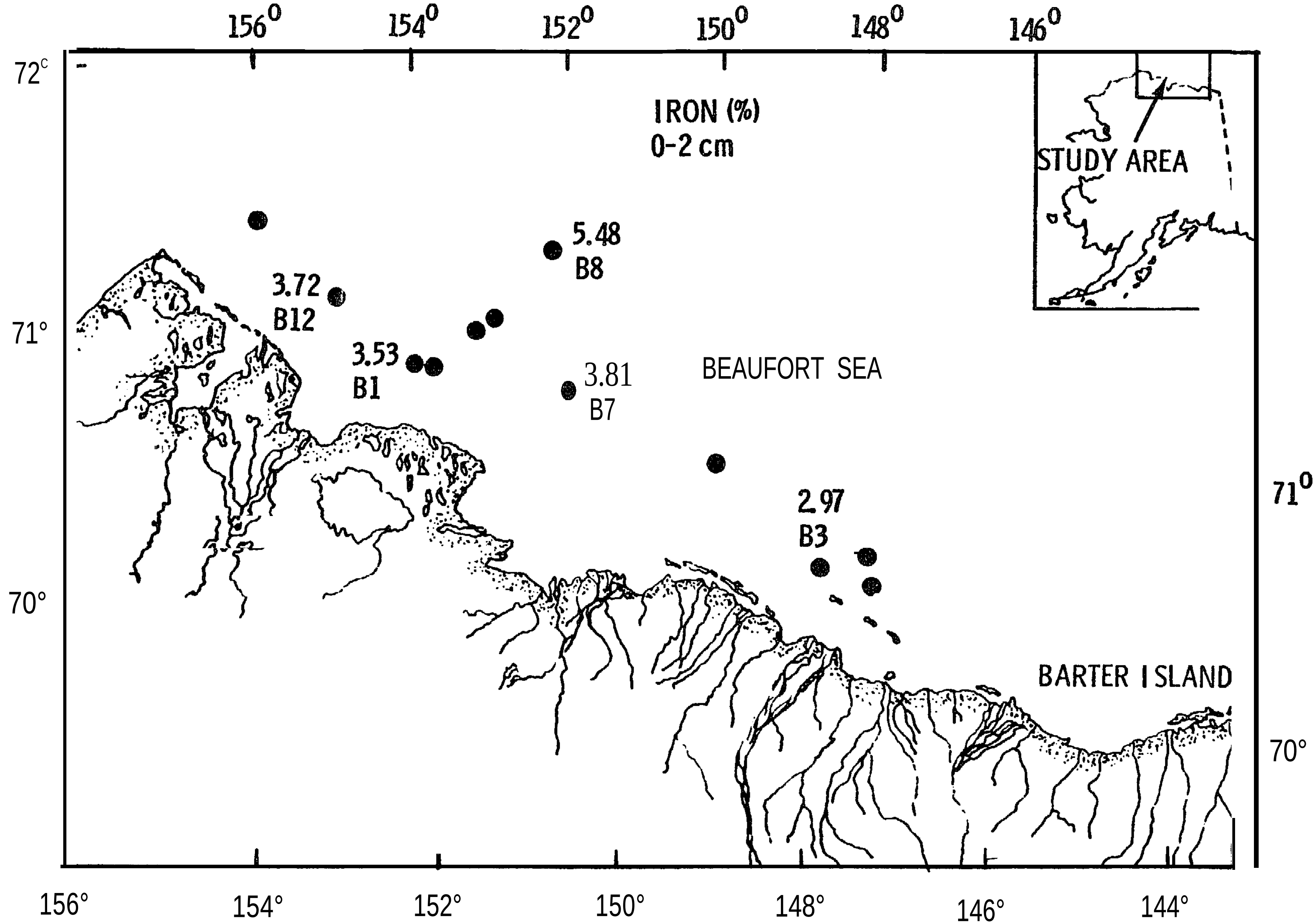


FIGURE D.67 Fe Concentrations in Beaufort Sea Sediments

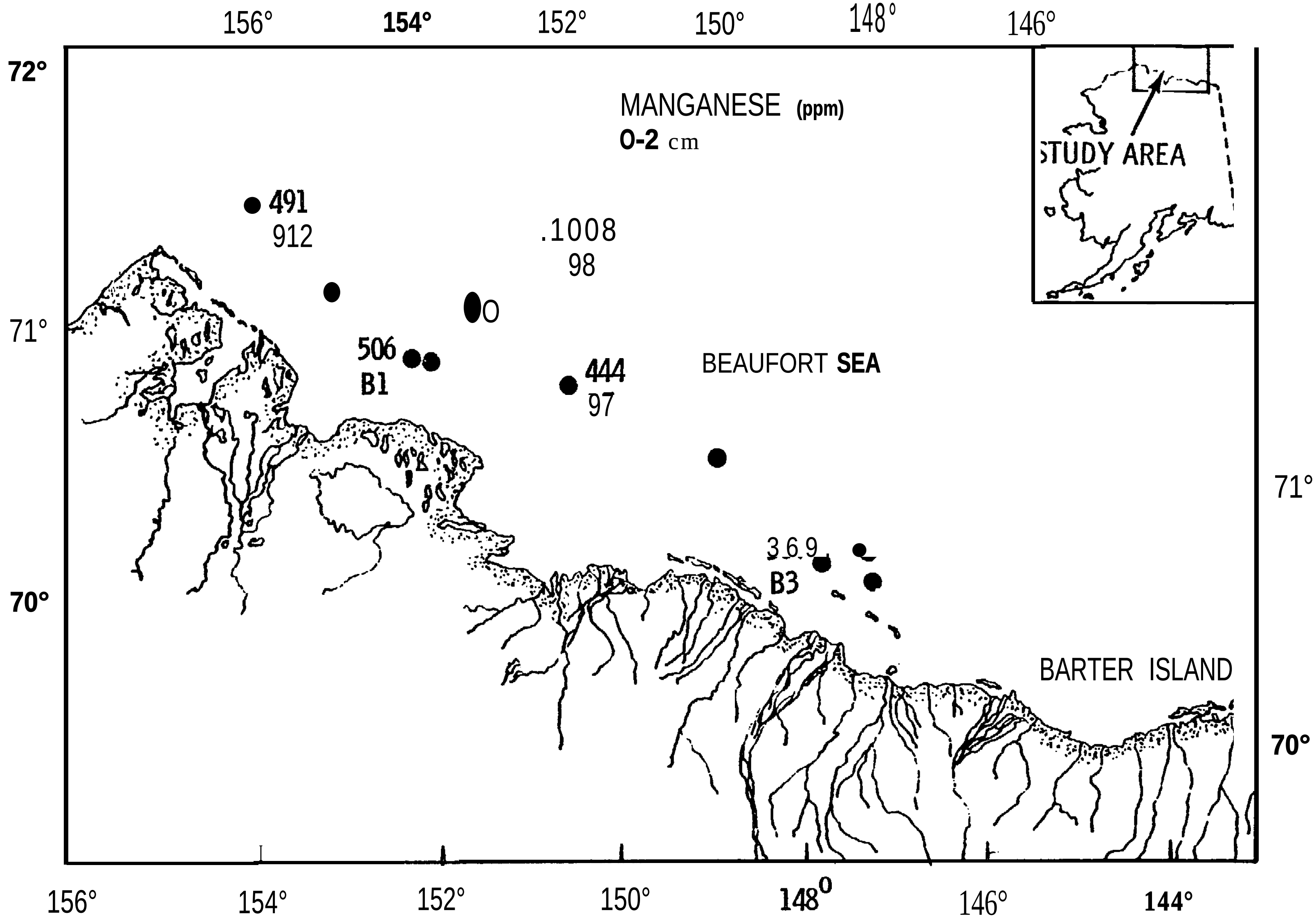


FIGURE D.68 Mn Concentrations in Beaufort Sea Sediments

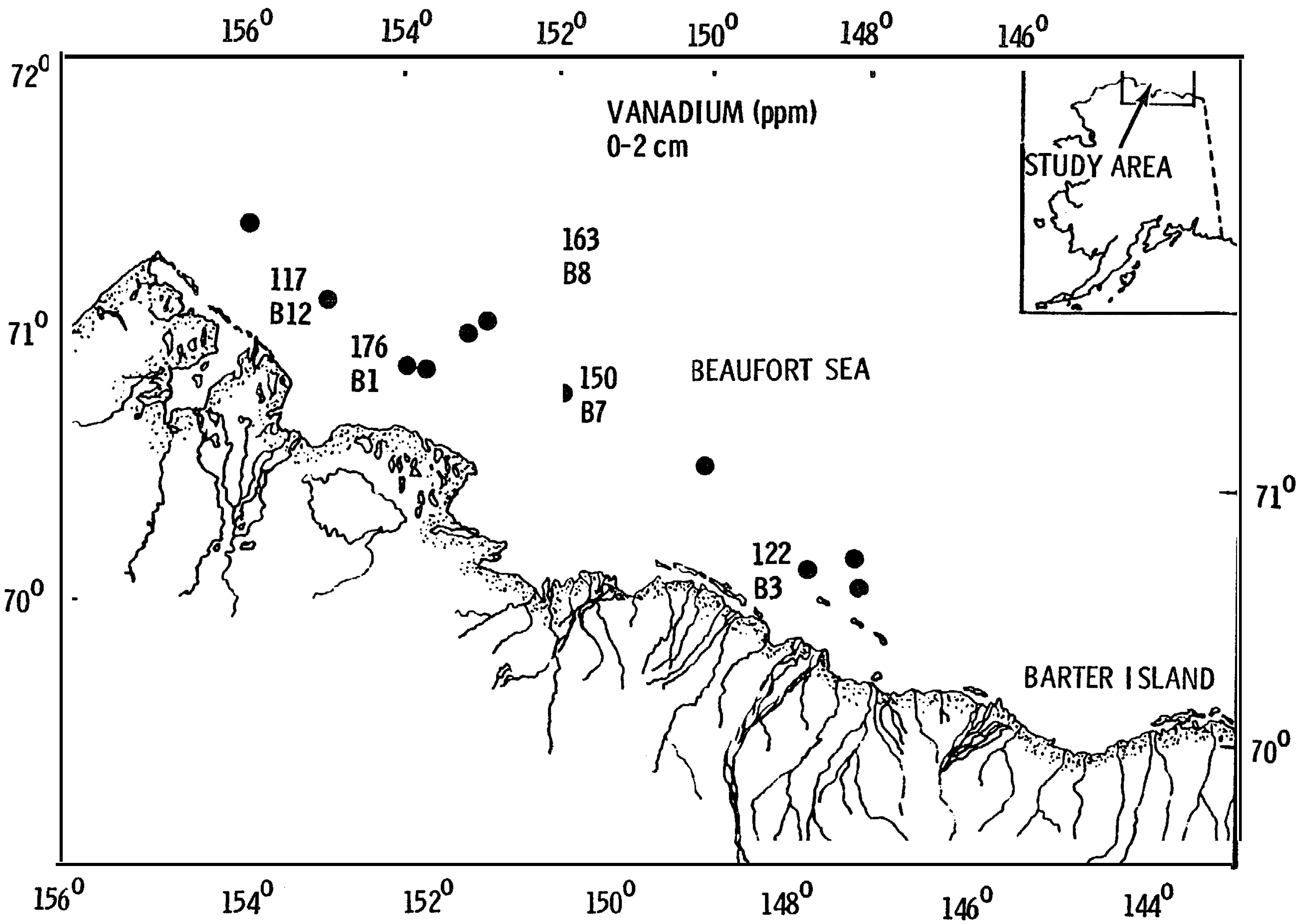


FIGURE 69 V Concentrations in Beaufort Sea Sediments

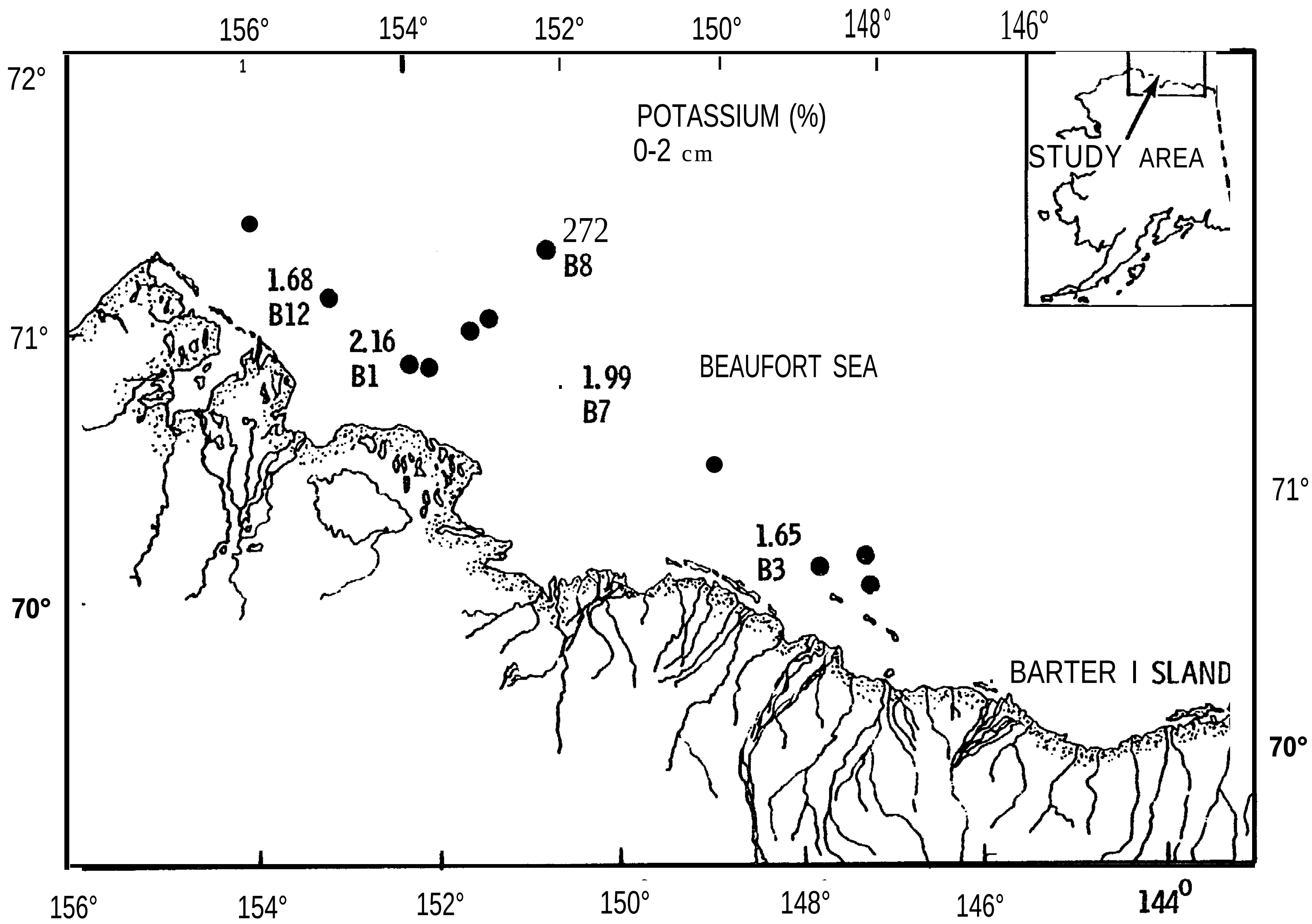


FIGURE D.70 K Concentrations in Beaufort Sea Sediments

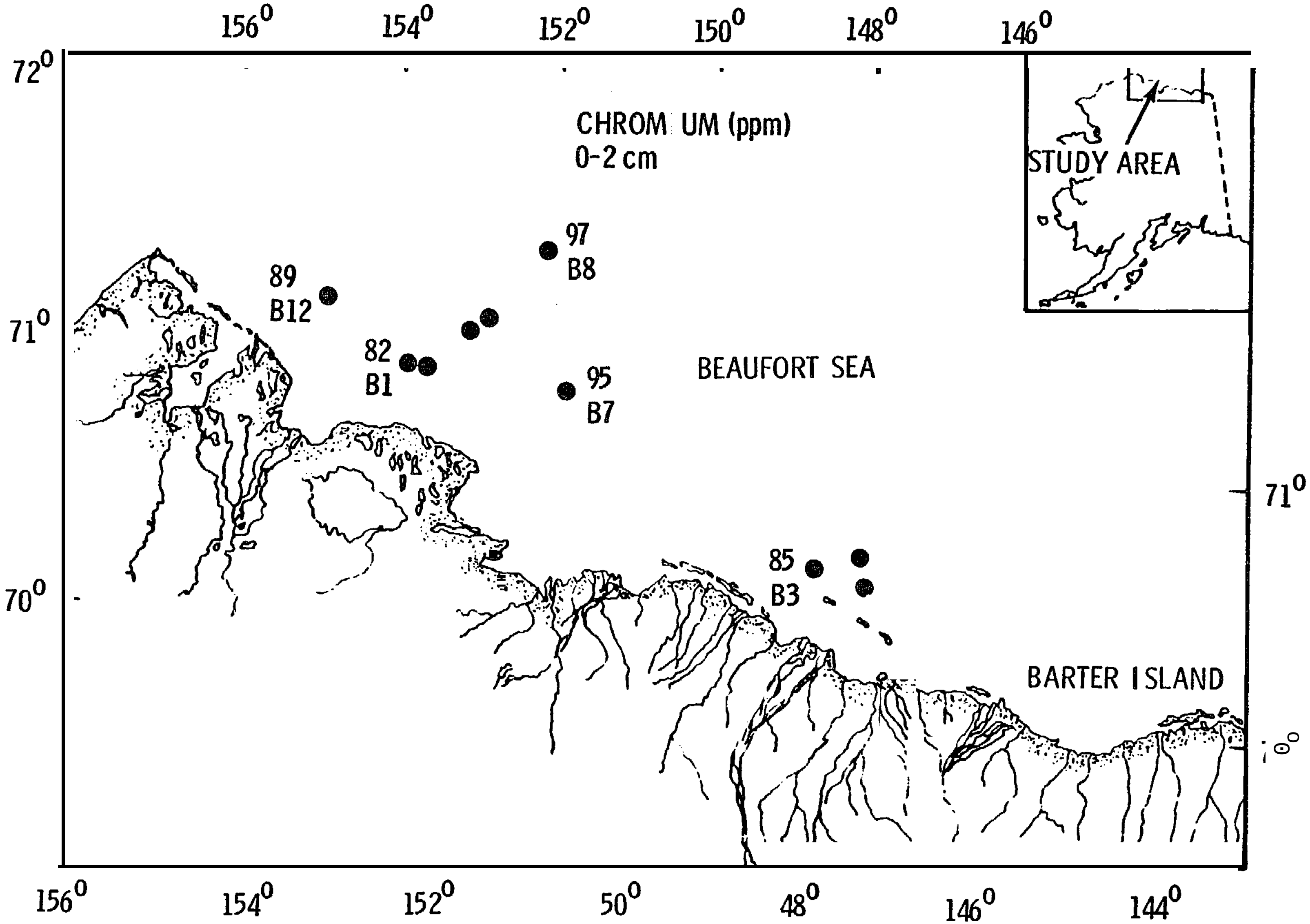


FIGURE D.71 Cr Concentrations n Beaufort Sea Sediments

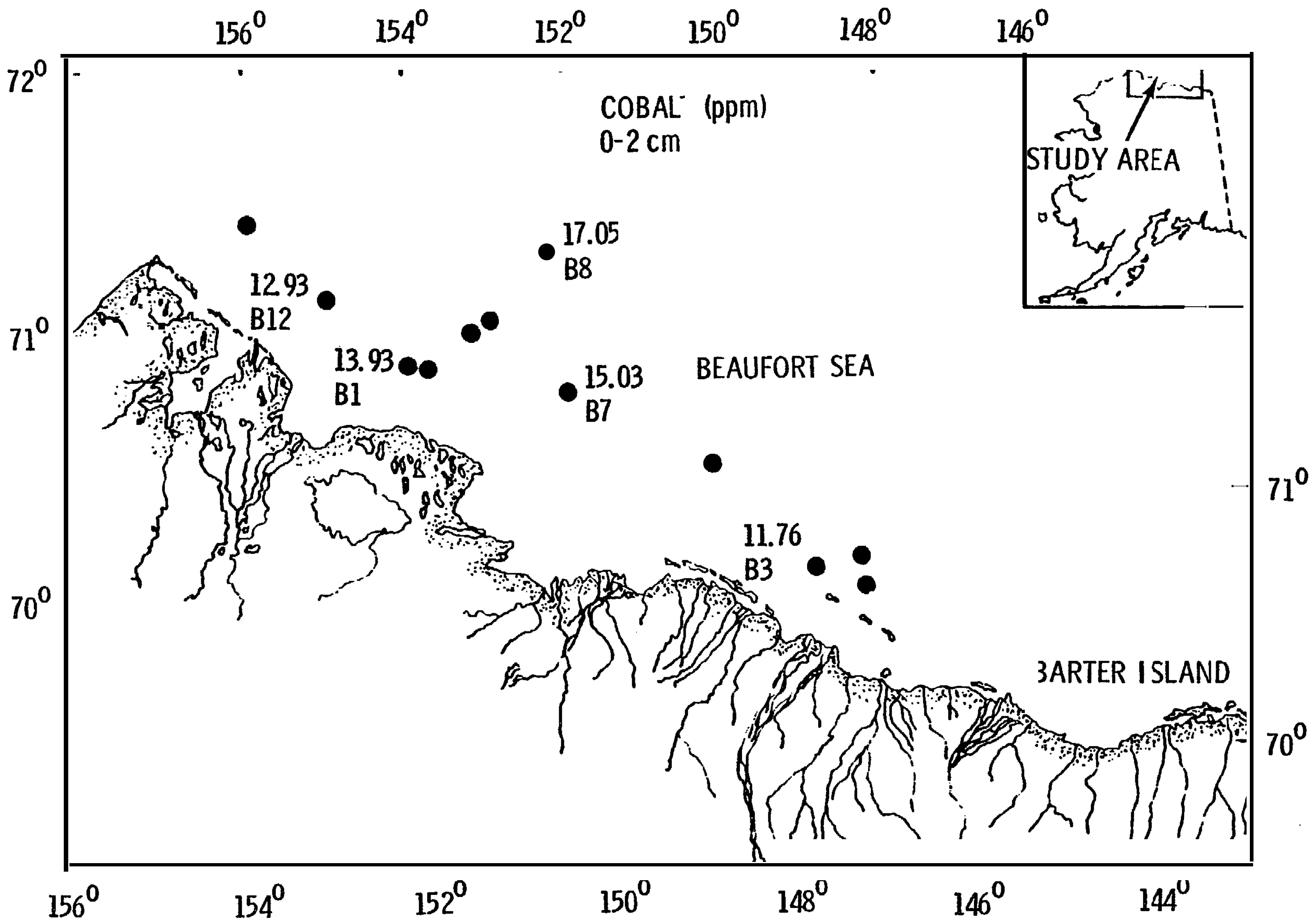


FIGURE D.72 Co Concentrations in Beaufort Sea Sediments

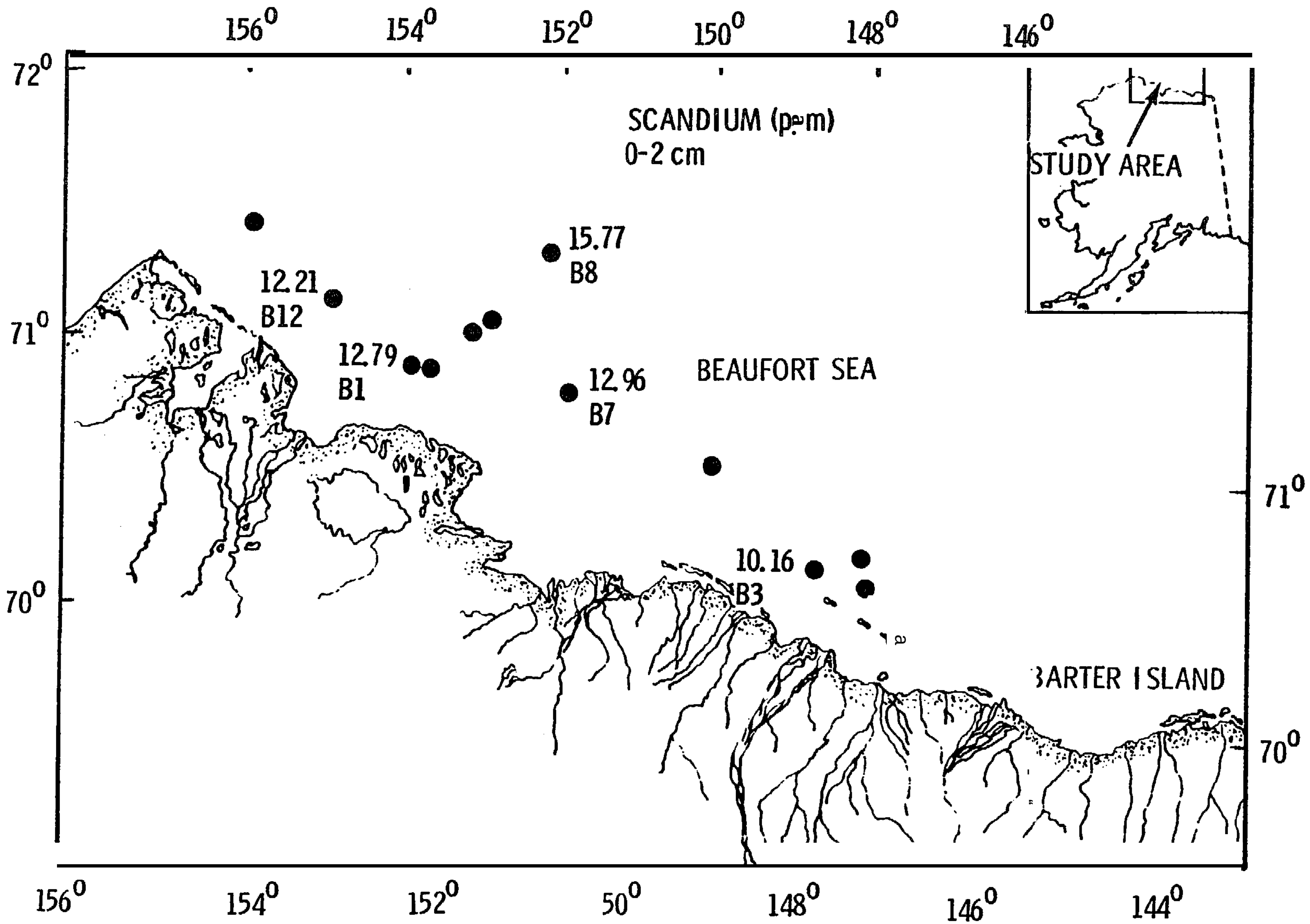


FIGURE D.73 Sc Concentrations in Beaufort Sea Sediments

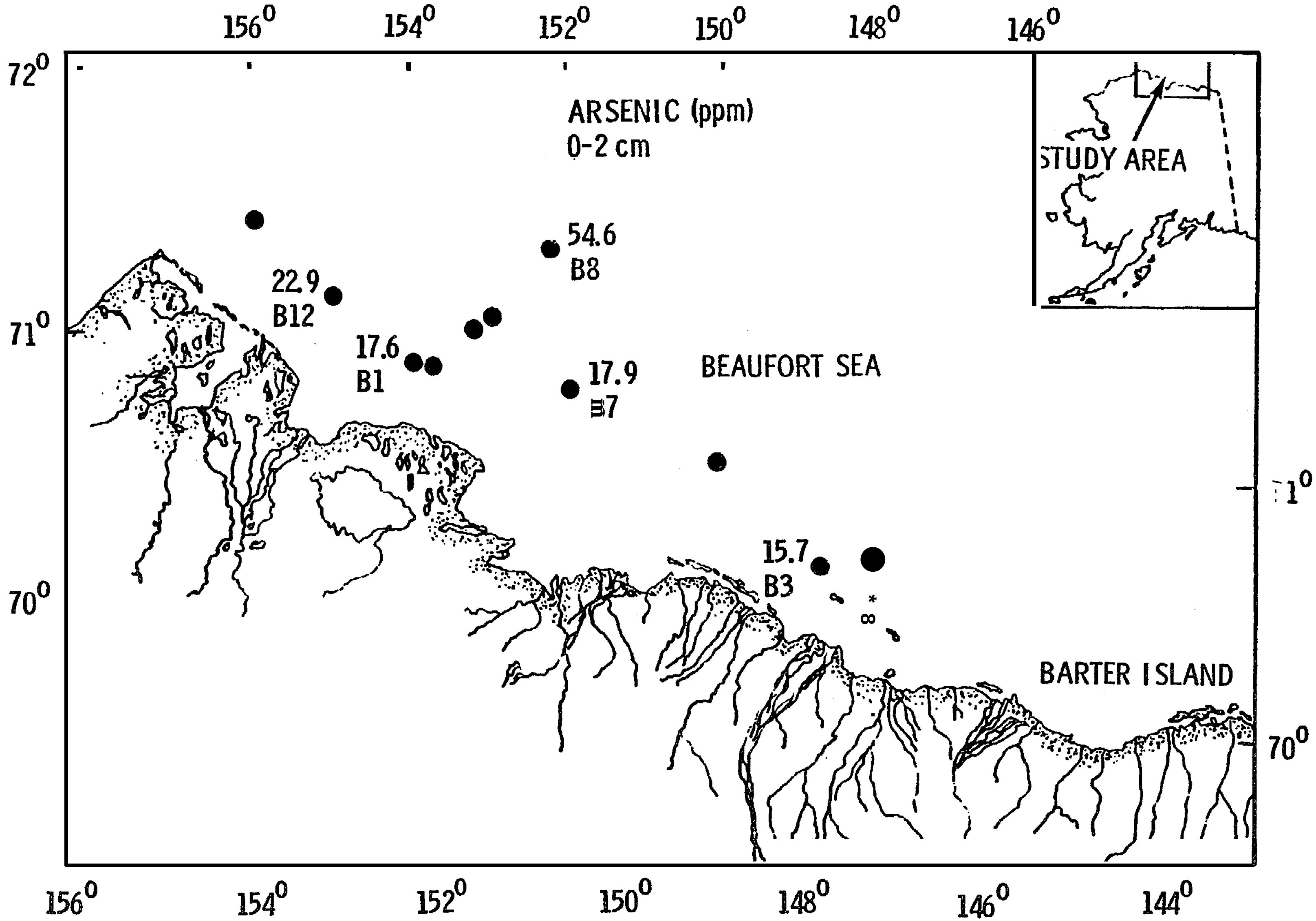


FIGURE D.74 As Concentrations in Beaufort Sea Sediments

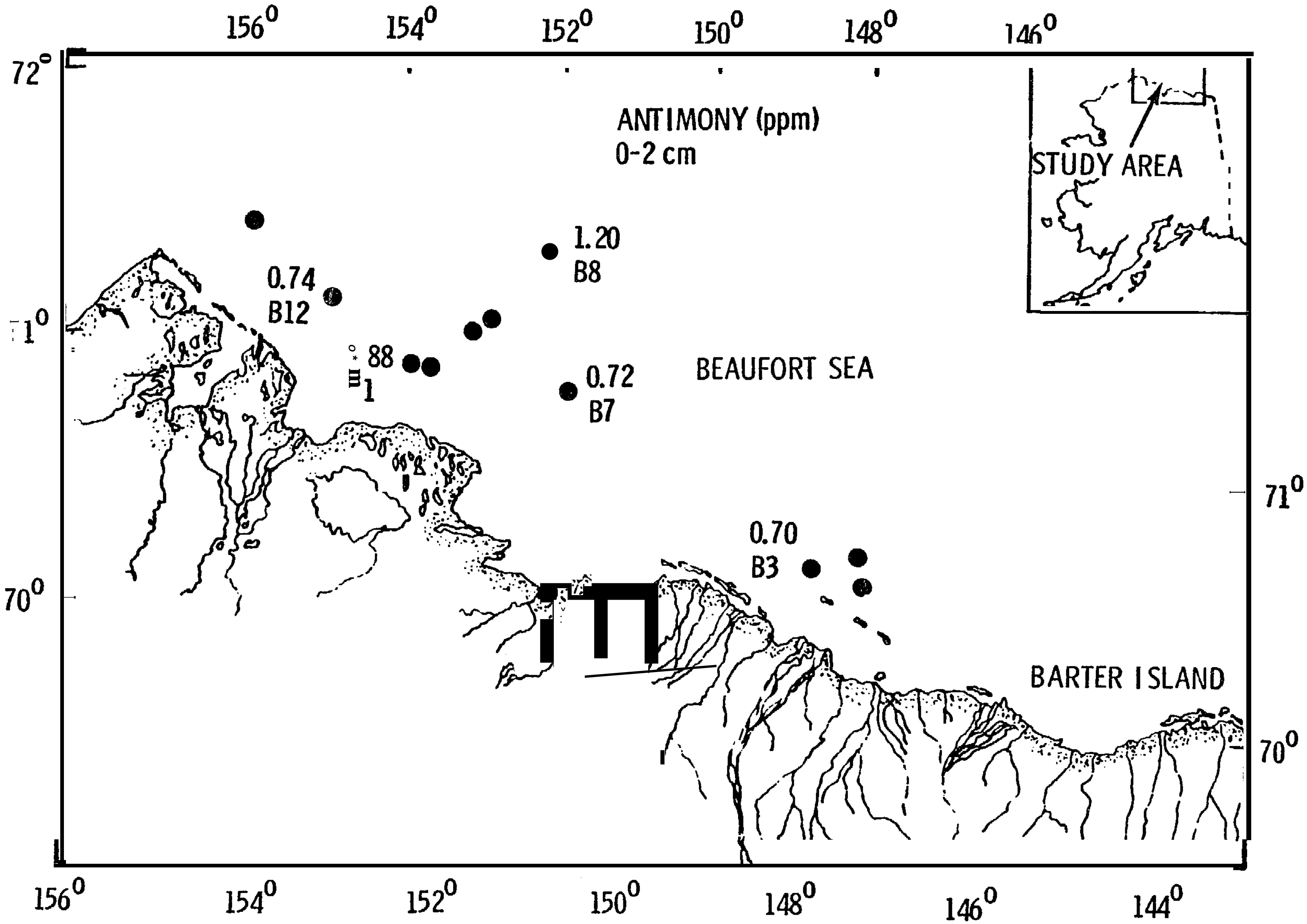


FIGURE D.75 Sb Concentrations in Beaufort Sea Sediments

APPENDIX E

"Available" Metals in Alaskan Shelf Sediments

TABLE E.1 "AVAILABLE" VANADIUM IN ALASKAN OCS SEDIMENTS (μg/g DRY WT SEDIMENT) DETERMINED BY A SEQUENTIAL HYDROGEN PEROXIDE AND 0.3 M HCl LEACHING TECHNIQUE*

	H_2O_2 Leachable	0.3M HC1 Leachable	Total "Available" Vanadium	(y)**
COOK INLET				
Station CB-1	4.52±0.17	23.4±1.9	27.9±1.9	(29%)
CB-3	1.17±0.06	10.0*1.1	11.2*1.1	(lo%)
CB-6	1.63?0.07	4.21±0.44	5.84?0.45	(lo%)
CB-7	2.77±0.11	11.4±1.0	14.2±1.0	(12%)
CB-8	11.8±0.4	26.8±1.9	38.6±1.9	(26%)
SHELIKOF STRAIT				
Station SS-2	4.68±0.17	16.2±1.2	20.9±1.2	(14%)
SS-5	1.17±0.05	12.6±1.3	13.8±1.2	(lo%)
SS-8	4.06±0.15	11.0±0.7	15.1±0.7	(lo%)
SS-10	2.14±0.08	9.3±0.6	11.4±0.6	(lo%)
BRISTOL BAY				
Station MB-8	6.84?0.26	28.3?2.2	35.1±2.2	(27%)
MB-12	4.17±0.16	16.1±1.4	20.3±1.4	(21%)
MB-41	5.91±0.23	24.8±2.0	30.7±2.0	(34%)
EASTERN GULF OF ALASKA				
Station EG-33	7.63?0.28	20.7±1.7	28.3±1.7	(24%)
EG-44	2.73±0.10	13.2±1.1	15.9±1.1	(12%)
EG- 58	2.53±0.10	26.1±2.0	28.6±2.0	(16%)
WESTERN GULF OF ALASKA				
Station WG-105	2.18±0.09	11.2±1.0	13.4±1.0	(15%)
WG-120	2.81±0.10	11.9±0.8	14.7±0.8	(11%)
WG-133	3.36±0.13	7.7±0.9	11.1±0.9	(5%)
BLANK	<0.055	0.063±0.011	----	
	<0.053	0.080±0.013	----	
	<0.024			

*Male, Environ, Sci. Technol.V.11, pp. 277, 1977.
**Percent of total vanadium in sediments

TABLE E.2

"AVAILABLE" MANGANESE IN ALASKAN OCS SEDIMENTS (µg/g DRY WT SEDIMENT) DETERMINED BY A SEQUENTIAL HYDROGEN PEROXIDE AND 0.3 M HCl LEACHING TECHNIQUE*

	H_2O_2 Leachable	0.3M HC1 Leachable.	Total "Available" Manganese	(%)**
COOK INLET				
Station CB-1	8.86±0.62	515k26	524±26	75%
CB-3	2.54?0.43	353±18	356±18	49%
CB-6	0.40±0.17	166±12	1 66*12	40%
CB-7	5.51±0.45	242±1 7	248±1 7	38%
CB-8	4.57?0.47	439*31	444±31	57%
SHELIKOF STRAIT				
Station SS-2	7.06±0.79	306±22	313±22	51%
SS-5	6.50±0.71	295±21	302±21	49%
SS-8	7.54*1.11	293±21	301±21	--
SS-10	13.0 ±1.3	241±17	254217	37%
EASTERN GULF OF ALASKA				
Station EG-33	3.29?0.47	464±24	467±24	82%
EG-44	2.80±0.31	374±19	377±19	49%
EG- 58	1.54±0.43	510i26	512±26	61%
WESTERN GULF OF ALASKA				
Station WG-105	--	71 4±37	714±37	106%
WG-120	6.03±0.31	350±18	356±18	40%
WG- 133	10.1 ±0.8	280±1 4	290±14	21%
BRISTOL BAY				
Station MB-8	12.1 ±1.0	385±20	397±20	57%
MB-12	5.72±0.61	123±6	129±6	22%
MB-41	6.39±0.51	185±9	191±9	43%
BLANK	----	----		

*Malo, Environ. Sci. Technol. V.11, p 277
**Percentage of total manganese in sediments

TABLE E.3

"AVAILABLE" Fe, Co, Sc IN ALASKAN OCS SURFICIAL SEDIMENTS DETERMINED BY SEQUENTIAL LEACHING WITH H_2O_2 AND 0.1 N HCl

	H_2O_2						0.1 N HCl					
	Fe		Co		Sc		Fe		Co		Sc	
STATION	µg /g	% AVAILABLE	Ng/g	% AVAILABLE	Ng/g	% AVAILABLE	µg /g	% AVAILABLE	Ng/g	% AVAILABLE	Ng /g	% AVAILABLE
EG-33	3.09 ± 0.30	0.01	16.0 ± 0.6	0.10	0.57 ± 0.03	0.004	3180 ± 10	6.1	1.80*0.01	11.3	" 0.283 ± 0.001	1.77
EG-44	6.72 ± 0.37	0.02	10.0 ± 0,6	0.07	0.87 ± 0.04	0.005	4510* 20	10.4	3.24 ± 0.28	21.6	0.553 * 0.002	3.07
EG-58	5.35 ± 0.61	0.01	7.8* 0.7	0.04	1.14 * 0.07	0.006	11870 ± 40	24.7	7.13*0.04	39.6	1.800 ± 0.004	9.00
MB-8	19.9 ± 0.6	0.05	23.6 ± 0.7	0.18	4.49 ± 0.71	0.03	3490* 10	9.0	1.75 ± 0.01	13.4	0.277 ± 0.002	2.15
MB-12	43.9 ± 1.0	0.13	1.03 ± 2	0.94	5.04 ± 0.08	0.04	1540 ± 10	4.5	1.17 * 0.01	10.6	0.212 ± 0.002	1.63
MB-41	24.2 ± 0.8	0.10	29.5 * 0.8	0.33	2.74 ± 0.06	0.03	3105 *10	15.1	1.83 ± 0.01	20.6	0.328 ± 0.003	3.28
WG-105	3.97 ± 0.31	0.01	12.8 ± 0.1	0.08	0.94 ± 0.05	0.008	1680 ± 10	---	1.87 * 0,02	---	0.178 ± 0.002	---
WG-120	4,98 ± 0.62	0.01	6.2* 1.4	0.03	0.69 ± 0.07	0.004	12180 ± 40	27.4	10.64 ± 0.03	59.1	0.687 ± 0.003	4.29
WG-133	6.27 ± 0.37	0.02	4.2 ± 0.7	0.03	3.24 ± 0.05	0.023	2581 ± 10	6.3	3.26 ± 0.03	20.4	0.366 * 0.003	2.61
CB-1	7.31 ± 0.59	0.02	19.3 ± 0.9	0.15	0.99 * 0.06	0.008	5870 ± 20	16.7	4.45 * 0.03	34.7	0.564 ± 0.003	4.26
CB-3	6.28 ± 0.43	0.03	12.9 ± 0.5	0.16	1.26 * 0.05	0.017	2850* 10	14.0	2.74 ± 0.03	33.3	0.328 ± 0.003	4.44
CB-6	5.93 ± 0.48	---	5.5 * 0.5	---	0.65 ± 0.05	---	1210 *10	---	2.45 ± 0.03	---	0.190 * 0.001	---
CB-7	3.08 ± 0.38	0.009	51 * 1	0.35	0.48 * 0.03	0.004	5310 ± 20	15.9	4.79 * 0.03	32.6	0.438 ± 0.003	3.43
CB-8	28.0 ± 0.8	0.054	44 * 1	0.21	7.6 ± 0.12	0.040	6910 *30	13.4	7.14 ± 0.04	34.3	0.942 ± 0.004	4.97
SS-2	9.24 ± 0.66	0.019	44 * 1	0.22	1.6 ± 0.1	0.009	7380 *30	15.3	5.99 * 0.04	30.5	0.701 ± 0.004	4.06
SS-5	5.52 * 0.39	0.011	27 ± 1	0.14	0.75 ± 0.03	0.004	8490*40	17.2	7.05 * 0.03	35.9	0.600 ± 0.003	3.42
SS-8	9.22 ± 0.50	0.018	44 ± 1	0.21	2.1 ± 0.4	0.0011	8810 ± 40	16.9	7.12 * 0.04	33.9	0,682 * 0.004	3.70
SS-10	3.25 ± 0.24	0.008	7.2 ± 0.3	0.045	0.43* 0.02	0.003	5800 ±30	13.5	4.66 ± 0.03	29.2	0.386 ± 0.003	2.38

APPENDIX F

Suspended Particulate Composition in Alaskan Shelf Waters

TABLE F:1

Elemental Concentrations*of Suspended Particulate Material (>0.4μ) from Alaska Outer Continental Shelf

	Station	Depth	Mn	Al	V
Western GOA	102	:1	0.22 ± 0.02	10.03 ± 0.15	.019 ± 0.011
		98	0.27 ± 0.02	9.56 ± 0.08	0.018 ± 0.009
	103		0.13 ± 0.04	3.79 ± 0.43	<0.020
		12;	0.26 ± 0.02	7.40 ± 0.19	0.021 ± 0.012
	104	1	0.061± 0.010	2.46 ± 0.08	<0.0056
		96	0.67 ± 0.03	27.38 ± 0.13	0.059 ± 0.014
	106				
		81	0.54 ± 0.12	26.3 ± 1.0	<0.057
	108	10	0.19 * 0.12	4.53 ± 0.86	<0.052
		226	0.33 ± 0.13	30.1 ± 0.8	<0.055
	110		0.17 ± 0.10	4.42 ± 0.82	<0.046
		1;:	0.27 ± 0.20	17.1 *1.5	<0.080
	1"19	1	0.68 *0.09	32.4 ± 1.0	0.070 ± 0.051
		204	6.48 ± 0.08	35.3 ± 0.8	0.094 ± 0.045
	120	1	0.38 ± 0.07	16.5 ± 0.6	<0.036
		281	7.10 * 0.09	103 ± 1	0.224 ± 0.063
	121	1	0.26 ± 0.04	15.0 ± 0.6	<0.025
		220	2.64 ± 0.08	69.9 ± 0.8	0.148 ± 0.051
	122	1	0.24 ± 0.04	15.1 ± 1.0	<0.036
		35	0.34 ± 0.04	28.3 ± 0.5	0.053 ± 0.024
	124	1	0.28 ± 0.03	14.6 ± 0.4	0.028 ± 0.020
		105	0.30 ± 0.04	25.5 ± 0.6	0.030 ± 0.029
	133	1	0.11 ± 0.04	5.00 ± 0.58	<0.025
		68	0.44 ± 0.04	18.3 ± 0.5	<0.026
	135	1	0.066± 0.043	2.04 ± 0.65	<0.028
		141	0.36 ± 0.06	24.8 ± 2.1	<0.066
	137	1	0.21 ± 0.05	3.73 ± 1.15	<0.040
		95	0.57 ± 0.06	20.6 ± 1.0	<0.044
	145	1	0.33 ± 0.12	7.68 ± 2.19	<0.090
		63	0.23 ± 0.05	4.88 ± 0.70	<0.029

* μg/l of seawater

TABLE F.1 (contd)

Elemental Concentrations* of Suspended Particulate Material (>0.4μ) from Alaska Outer Continental Shelf

	Station	Depth	Mn	Al	V
Western GOA	146	1	0.23 ± 0.04	3.63 ± 0.54	<0.023
		63	0.35 ± 0.07	6.79 ± 0.75	<0.036
	147	1	0.090± 0.064	<2.25	<0.069
		94	0.38 ± 0.04	11.0 *0.5	0.026 ± 0.023
	148	1	0.15 ± 0.04	4.30 ± 0.60	<0.028
		100	0.26 ± 0.04	15.5 ± 0.6	0.030 ± 0.026
	156	1	0.29 ± 0.05	11.0 ± 0.9	<0.036
		150	0.94 ± 0.15	56.4 ± 2.1	0.120 *0.099
	157	1	0.16 ± 0.01	5.65 ± 0.16	0.021 ± 0.008
		59	0.22 ± 0.04	17.1 ± 1.1	<0.040
	158	1	0.31 ± 0.11	4.95* 2.28	<0.093
		92	0.44 ± 0.11	12.2 ± 2.0	<0.081
	159	1			
		96	0.28 ± 0.06	9.25 ± 0.94	<0.038
	160	1	0.073± 0.034	1.30 ± 0,46	<0.020
		132	0.43 ± 0.03	10.3 ± 0.6	<0.024
	EGA- 2	10	0.59 ± 0.12	18.7 ± 0.8	<0.051
		178	0.82 ± 0.13	32.2 ± 1.0	0.063 ± 0.061
	EGA-5	10	0.47 ± 0.14	26.9 ± 1.2	<0.070
		162	0.72 ± 0.19	40.6 ± 1.8	<0.091
	EGA-8	10	0.27 ± 0.11	16.8 ± 0.9	0.080 ± 0.051
		274	0.79 ± 0.21	81.5 ± 1.4	0.16 ± 0.09
	EGA-1 1	10	<0.12	5.7 ± 1.2	<0.061
		1350	<0.11	7.0 ± 1.1	<0.056
Eastern GOA	EGA-t 5	10	<0.12	8.4 ± 1.1	<0.058
		1500	<0.11	3.9 ± 1.1	<0.055
	EGA-24	10	0.10 ± 0.10	1.3 ± 0.8	<0.044
		410	<0.11	5.4 ± 0.9	<0.047
	EGA-26	10	0.15 ± 0.12	8.9 ± 1.0	<0.057
		136	0.63 ± 0.09	34.9 ± 0.7	0.095 ± 0.045
	EGA-29				
		71	0.47 ± 0.11	43.9 ± 0.8	0.11 ± 0.(?5

TABLE F.1 (contd)

Elemental Concentrations* of Suspended Particu'ate Material (>0.4μ) from Alaska Outer Continental Shelf

	Station	Depth	Mn	Al	V
Eastern GOA	EGA-30				
		42	0.39 ± 0.35	395. ± 4	0.77 ± 0.23
	EGA-33	10	<0.084	0.91 ± 0.66	<0.035,
		205	0.24 ± 0.11	9.0 ± 1.1	<0.060
	EGA-44	10	1.02 ± 0.20	107 ± 1	0.20 ± 0.09
		165	0.63 ± 0.12	46.2 ± 1.2	0.11 ± 0.07
	EGA-48	10	0.11 ± 0.10	3.4 ± 1.1	<0.053
		447	0.33 ± 0.12	26.0 ± 1.1	0.067 ± 0.061
	EGA-49	10	1.59 ± 0.21	141 *2	0.29 ± 0.10
		120	0.97 ± 0.23	84.9 ± 1.7	0.16 ± 0.10
	EGA-50	10	0.81 ± 0.18	74.6 ± 1.7	0.12 ± 0.09
		161	0.60 ± 0.09	58.6 ± 0.5	0.14 ± 0.04
	EGA-51	10	0.59 ± 0.13	42.6 ± 1.1	0.090 ± 0.065
		133	1.21 ± 0.21	83.1 ± 1.1	0.15 ± 0.08
	EGA-52				
		74	0.62 ± 0.12	38.0 ± 0.9	<0.058
	EGA-53	10	0.78 ± 0.12	35.9 ± 1.2	0.067 ± 0.065
		284	3.79 ± 0.25	222 ± 3	0.42 ± 0.14
	EGA-54	10	0.96 ± 0.22	57.3 ± 1.6	0.11 ± 0.09
		212	1.03 *0.19	66.2 *1.5	0.11 ± 0.09
	EGA-55	10	0.97 ± 0.21	83.1 ± 1.1	0.19 ± 0.07
		110	1.13 ± 0.20	87.8 ± 1.9	0.15 ± 0.10
	EGA-56				
		58	0.86 ± 0.12	63.Y ± 1.0	0.16 ± 0.06
	EGA-57				
		67	0.56 ± 0.12	44.7 ± 1.8	0.13 ± 0.08
	EGA-58				
		82	0.74 ± 0.19	76.7 * 1.3	0.21 ± 0.08
	EGA-59A	10	1.02 ± 0.20	97.3 ± 1.3	0.18 ± 0.08
		370	<0.18	17.6 ± 1.5	<0.076
Bering Sea	MB-8	S	1.41 ± 0.02	64.4 *0.2	0.072 ± 0.016
		B	2.22 ± 0.60	68.0 ± 0.4	0.12 ± 0.03
	MB-2	S	0.56 ± 0.03	9.4 ± 0.2	0.019 ± 0.014
		B	0.50 ± 0.04	20.6 ± 0.2	0.051 ± 0.016

TABLE F.1 (contd)

Elemental Concentrations* of Suspended Particulate Material (>0.4μ) from Alaska Outer Continental Shelf

	Station	Depth	Mn	Al	Y
Bering Sea	MB-1 4	S	0.096 ± 0.064	10.7 ± 0.6	<0.017
		B	0.17 ± 0.02	24.1 ± 0.2	<0.007
	MB-17	B	0.51 ± 0.02	72.2 ± 0.2	0.085 ± 0.016
	MB-1 9	B	1.45 *0.13	114 ± 1	0.31 ± 0.06
	MB-24	a	2.80 ± 0.03	77.4 ± 0.6	0.12 ± 0.02
	MB-31	S	0.040 ± 0.014	6.3220.20	<0.007
		B	0.13 ± 0.01	18.3 ± 0.2	0.019 ± 0.008
	MB-30	B	0.89 ± 0.05	102 ± 1	0.18 ± 0.04
	MB-34	S	0.054'50.014	12.0 ± 0.2	<0.008
		B	0.12 *0.01	18.4 ± 0.1	0.016 ± 0.008
	MB-37	B	0.51 ± 0.02	28.8 ± 0.2	0.030 ± 0.010
	MB-41	B	0.93 ± 0.02	21.0 ± 0.2	0.034 ± 0.010
	MB-43	B	0.60 ± 0.02	23.0 ± 0.2	0.028 ± 0.010
	MB-48	S	0.082 ± 0.012	15.4 ± 0.1	0.014 ± 0.007
		B	0.14 ± 0.03	14.4 ± 0.1	0.019 ± 0.014
	MB-53	S	0.046 ± 0.028	7.34± 0.14	<0.012
		B	0.15 ± 0.03	14.0 ± 0.1	0.044 ± 0.014
	MB-56	B	1.48 ± 0.04	13.8 ± 0.1	0.044 ± 0.014
	MB-59	B	0.51 *0.04	17.2 ± 0.2	0.021 ± 0.019
	MB-64	8	1.00 ± 0.03	16.0 ± 0.1	0.049 ± 0.014

TABLE F.2

ELEMENTAL COMPOSITION OF SUSPENDED PARTICULATE MATERIAL (s-0.4 µ) IN ALASKAN SHELF WATERS
[rig/l EXCEPT WHERE NOTED]

STATION IDENTIFICATION			As	Ba (µg/l)	Co	Cs	Fe (µg/l)	Hg	Rb	Sb	Sc	Se	Sr
WESTERN GULF Of ALASKA	101	SURFACE	0.51 ± 0.11	<0.76	3.16: 0.08	0.42 ±0.06	5.31 ±0.14	2.8 ± 0.6	50 ± 30	0.26 ± 0.10	L74 ± 0.01	<0.38	60 ± 40
		BOTTOM	3.4 ± 0.5	<0.67	5.30 i am	0.73 ± 0.05	8.71 ± 0.09	2.6 ± 0.3	<20	0.49 ± 0.11	3.20 ± 0.01	0.5 ± 0.2	860 ± 40
	104	SURFACE	41* 0.5	<0.64	1.74 ± 0.03	0.12 ± 0.03	1.58 ± 0.05	5.5 ± 0.2	<10	<473	0.59 ± 0.002	LO* 0.1	400 ± 20
		BOTTOM	23* 0.4	<0.56	7.85 ± 0.09	1.1 ± 0.1	16.2 ± 0.1	7.4 ± 0.8	<40	0.48 ± 0.12	5.17: 0.01	1.5 ± 0.5	140 ± 50
	108	SURFACE	<1.8	<0.84	1.66 ± 0.13	0.23 ± 0.03	3.16 ± 0.04	1.9 ± 0.2	<20	0.19 ± 0.05	L20 ± 0.01	0.46 ± 0.12	540 ± 10
		BOTTOM	<1.5	<0.69	7.18 ± 0.06	1.3 ± 0.1	16.8 * 0.1	8.3 ± 0.7	70 ± 40	0.29 ± 0.11	6.30 ± 0.01	L2 ± 0.4	560 ± 50
	119	SURFACE	7.5 ± L3	2.4 ± L0	10.3 ± 0.1	2.2 ± 0.1	720 ± 0.1	18 ± 1	50 ± 10	L2 ± 0.1	8.77 * 0.01	0.91 ± 0.28	300 ± 30
		BOTTOM	13 ± 1	<L0	18.8 ± 0.1	2.6 ± 0.1	26.5 ± 0.2	16 ± 1	70 ± 40	0.94 ± 0.15	FL07 i 0.02	L4 ± 0.5	310 ± 60
	121	SURFACE	8.3 ± L3	<1.1	5.27 ± 0.01	1.0 ± 0.1	9.76 ± 0.06	14 ± 1	30 ± 10	4.7 ± 0.1	3.94 ± 0.01	1.4 ± 0.2	250 ± 20
	322	BOTTOM	<0.53	<0.69	6.31 ± 0.05	15* 0.1	168 ± 0.2	9.2 ± 0.8	80 ± 40	0.81 ± 0.13	6.18 ± 0.02	LO* 0.5	210 ± 50
	324	SURFACE	5.0 ± L4	<1.2	6.14 i 0.04	0.91 ± 0.05	9.17 ± 0.06	16 ± 1	30 ± 10	1.0 ± 0.1	3.91 ± 0.01	LO ± 0.2	200 ± 20
		BOTTOM	<0.52	<0.86	5.73 ± 0.07	1.2 ± 0.1	L33 ± 0.01	9.4 ± 0.7	<40	0.37 ± 0.12	4.82 ± 0.01	0.99 ± 41	280 ± 40
	333	SURFACE	<3.3	<L3	1.64 ± 0.03	0.21 * 0.03	253 ± 0.08	20 ± 1	<30	0.42 ± 0.09	0.82 i 0.06	L2 ± 0.2	150 ± 20
		BOTTOM	<L5	<L0	463 ± 0.05	1.1 ± 0.1	10.0 ± 0.1	11 ± 1	60 ± 20	LO ± 0.1	3.64 ± 0.01	<0.58	140 ± 30
	135	SURFACE	5.6* 3.3	<1.3	2.07 ± 0.03	<0.05	0.85 ± 0.07	17 ± 1	<20	0.56 ± 0.08	0.30 ± 0.05	1.7 ± 0.2	200 ± 20
		BOTTOM	<2.5	<1.1	6.03 ± 0.06	1.3 ± 0.1	15.1 ± 0.1	10 ± 1	50 ± 20	1.7 ± 0.2	5.34 i 0.01	<a52	360 ± 30
	331	SURFACE	<3.6	<1.4	355 * 0.03	0.14 ± 0.03	1.89 ± 0.07	15 ± 1	<20	0.57 ± am	0.66 ± 0.05	<a30	200 ± 20
		BOTTOM	<25	<1.1	6.13 ± 0.06	1.0 ± 0.1	11.7 ± 0.1	9.2 ± 0.5	50 ± 20	2.7 i 0.2	4.13 ± 0.01	0.85 ± 0.33	270 ± 30
	345	SURFACE	<45	<1.8	2.57 * 0.04	0.21 ± 0.04	3.63 ± 0.09	21 ± 1	<30	0.58 i 0.10	5.27 ± 0.01	0.73 ± 0.23	780 ± 20
		BOTTOM	<2.2	<0.95	3.44 ± 0.04	0.18 ± 0.04	2.90 ± 0.13	12 ± 1	<20	1.5 ± 0.1	1.05 ± 0.01	0.77 ± 0.21	230 ± 20
	343	SURFACE	<3.4	<L5	1.20 ± 0.03	0.12 ± 0.02	L40 ± 0.07	17 ± 1	<20	2.2 ± 0.1	0.48 ± 0.05	0.64 ± 0.10	170 ± 20
		BOTTOM	3.0 ± 3.5	<L2	5.33 ± 0.05	0.71 ± 0.05	8.00 ± 0.10	13 ± 1	<30	0.77 ± 0.14	286 ± 0.01	0.92 ± 0.28	380*30
	357	SURFACE	<3.2	<0.51	3.60 ± 0.04	0.18 ± 0.03	3.66 ± 0.09	14 ± 1	<30	0.98 ± 0.11	1.19 ± 0.01	<a46	100 ± 20
		BOTTOM	<L2	<1.1	4.27 ± 0.05	0.24 ± 0.05	6.59 i 0.09	14 ± 1	<30	1.3 ± 0.01	240 ± 0.01	0.59 ± a20	210*20
	160	SURFACE	<40	<3.4	1.79 ± 0.06	0.089 ± 0.049	1.49 ± 0.17	34 ± 1	<10	1.2 ± 0.1	---	L2 ± 0.3	350 ± 30
		BOTTOM	<28	<23	3.66 ± 0.04	0.44 ± 0.04	5.82 ± 0.12	14 ± 1	50 ± 40	0.52 ± 0.16	2.03 ± 0.01	0.73 ± 0.09	120 ± 30
BERING SEA	MB-2	SURFACE	1.4 ± 2.3	<L1	2.63 ± 0.06	0.13 ± 0.06	6.06 ± 0.17	2.6 ± 0.7	---	0.53 ± 0.16	1.82 ± 0.01	0.82 ± 0.35	<100
		BOTTOM	6.3 ± 1.6	<L2	3.27 ± 0.06	0.30 ± 0.07	10.1 ± 0.2	2.4 ± 0.9	90 ± 50	1.3 ± 0.2	3.81 ± 0.01	0.93 ± 0.45	180 ± 50
	MB-8	SURFACE	23 ± 2	1.9 ± 0.9	8.57 ± 0.09	1.29 ± 0.10	252 ± 0.03	<1.3	---	2461 * 0.26	8.46 i 0.02	25* 0.6	340 ± 70
		BOTTOM	16 ± 2	<L2	9.49 ± 0.09	L33 ± 0.11	27.3 ± 0.2	3.8 ± 1.4	<10	0.89 ± 0.35	10.2 ± 0.1	0.81 ± 0.68	330 ± 70
	MB-14	SURFACE	<7.5	<29	2.43 ± 0.10	0.40 ± 0.08	3,65 ± 0.27	6.9 ± 1.1	—	2.0 ± 0.2	1.22 ± 0.02	1.4 * 0.6	230 ± 60
		BOTTOM	2.7 ± 0.6	<1.4	1.06 * 0.04	0.27 ± 0.04	2.35 ± 0.12	1.4 ± 0.6	---	0.78 ± 0.17	1.06 ± 0.01	0.58 ± 0.30	--
	MB-17	BOTTOM	13 ± 2	<1.4	9.53 ± 0.10	L6 ± 0.1	32.21 * a33	2.3 ± 1.5	---	0.87 * 0.29	12.3 ± 0.1	2.1 ± 0.7	350 ± 80
	MO-24	BOTTOM	24 ± 2	<1.2	34.6 *al	1.8 ± 0.1	38.1 ± 0.3	<1.8	—	1.4 ± 0.4	13.2 ± 0.1	2.2 ± 0.8	250 ± 90
	MO-31	BOTTOM	13 ± 2	<0.77	3.78 ± 0.07	0.95 ± 0.08	12.9 ± 2	2.8 ± 1.0	---	0.64 ± 0.19	4.30 ± 0.01	1.7 * 0.5	160 ± 50
	MB-41	BOTTOM	8.7 ± L2	<0.80	3.52 ± 0.07	3.9 ± 0.1	9.86 ± 0.17	2.8 ± 0.9	70 ± 50	0.84 ± 0.26	3.17 * 0.01	1.2 * 0.4	90 ± 50
	MB-43	BOTTOM	11 ± 2	<1.1	3.3 ± 0.1	0.49 ± 0.06	8.1 ± 0.2	3.5 ± 0.9	<79	0.96 ± 431	2.9 ± 0.1	LO* 0.3	<430
	MB-53	SURFACE	6.4 ± 1.2	<1.1	1.2 ± 0.1	0.21 * 0.05	43* 0.2	3.4 ± 0.7	<57	1.6 ± 0.2	0.73 ± 0.03	1.9 ± 0.3	670 ± 350
		BOTTOM	11 ± 2	<1.8	2.2 ± 0.1	0.40 ± 0.07	12 ± 1	3.9 ± 0.8	<52	0.80 ± 0.24	2.3 ± 0.1	1.1 ± 0.4	<420
	MO-59	BOTTOM	13 ± 2	<1.1	3.0 ± 0.1	0.58 ± 0.07	9.0 ± 0.2	2.5 ± 0.8	<58	0.42 ± 0.28	2.9 ± 0.1	2.1 ± 0.4	150 ± 50

TABLE F.2 (contd)

ELEMENTAL COMPOSITION OF SUSPENDED PARTICULATE (>0.4 µ) IN ALASKAN SHELF WATERS
(rig/l EXCEPT WHERE NOTED) (CONTINUED)

EASTERN GULF OF ALASKA	Co	Cs	Fe (µg/l)	Hg	Rb	Sb	Sc	Se	Sr	Zn
EGA-2 SURFACE	8.1 ± 0.1	0.98 ± 0.09	13 ± 1	10*1	<170	42* 0.4	4.2 ± 0.1	<0.6	43(I * 70	0.09 ± 0.01
BOTTOM	10* I	L6 ± 0.1	24 ± 1	5.2 *Lo	<120	0.74 ± 0.28	6.0 ± 0.1	0.71 ± a42	270 ± 50	0.11 ± 0.01
EGA-5 SURFACE	8.8 ± 0.1	L3 * 0.1	20 ± 1	9.6 ± 0.9	<200	0.96 ± 0.25	6.2 ± 0.1	0.64 ± 0.39	610 ± 50	0.19 ± 0.01
BOTTOM	13 ± 1	1.8 * 0.1	12 ± 1	43* L0	620 * 120	0.82 * 0.28	7.4 ± Ill	a63 ± a45	630 ± 60	0.19 ± 0.01
EGA-B SURFACE	5.0 ± 0.1	0.71 ± 0.08	11 ± 1	<L3	<160	0.54 ± 0.35	3.6 ± 0.1	Lo* 0.5	390 ± 60	0.08 ± 0.01
BOTTOM	22 ± 1	2.8 ± 0.1	54 ± 1	32 ± 1	280 ± 140	0.73 ± 0.36	15 ± 1	<2.3	460 ± 80	0.17 ± 0.01
EGA-15 SURFACE	1.4 *al	0.33 * 0.09	62* 0.2	3.1 ± 1.1	<12a	3.6 * 0.2	2.0 ± 0.1	a93 ± a44	650 ± 50	4.74 ± am
BOTTOM	1.7 * 0.1	0.25 * 0.03	3.8 *al	7.9 * 0.5	<100	0.43 ± 0.13	a93 ± 0.01	a34 ± 0.21	460 ± 20	0.14 ± 0.01
EGA-26 SURFACE	3.8 * 0.1	0.12 ± 0.03	3.4 ± 0.1	2.0 ± 0.5	<64	0.49 * 0.12	0.95 ± 0.01	0.94 ± 0.20	340 * 20	0.10 ± 0.01
BOTTOM	7.1 ± 0.1	5.4 * 0.5	15 ± 1	<0.91	<100	a30 ± 0.25	4.9 ± 0.1	0.68 ± a40	230 ± 50	a22 ± am
EGA-29 BOTTOM	15 ± 1	L5 * 0.1	33 ± 1	8.5 ± L2	<15a	0.83 * 0.32	11 ± 1	L3 ± 0.5	570 ± 60	0.61 ± am
EGA-30 BOTTOM	93 ± 1	14 ± 1	220 *10	<3.0	<350	1.8 * 0.8	57 ± 1	2.1 ± L2	1380 ± 150	0.91 ± 0.01
EGA-33 SURFACE	1.1 ± 0.1	0.12 ± 0.04	0.9 ± 0.1	2.3 ± 0.2	<97	0.50 * 0.18	a3a ± 0.01	<0.3	300 ± 30	0.09 ± am
BOTTOM	3.2 ± 0.1	(126 ± 0.03	69* 0.1	<0.66	<80	0.26 * 0.16	23* 0.1	a63 ± a22	400 ± 30	0.12 ± am
EGA-44 SURFACE	36 ± 1	5.4 *al	86 ± 1	4.1 ± L9	<300	L6 ± 0.5	29 ± 1	<0.98	680 ± 100	0.34 ± 0.01
BOTTOM	13 ± 1	L2 ± 0.1	33 ± 1	<1.8	<26a	<0.49	11 ± 1	L6 ± 0.7	510 ± 100	0.20 ± 0.01
EGA-48 SURFACE	1.6 ± 0.1	0.16 ± 0.03	2.4 ± 0.1	2.4 ± 0.5	<72	0.60 ± 0.14	0.79 ± 0.01	0.86 * 0.18	330 ± 20	0.12 ± 0.01
BOTTOM	9.1 * 0.1	a83 * 0.03	21 ± 1	3.6 ± 0.5	<210	<0.44	7.5 ± 0.1	<0.62	440 * 30	0.15 ± 0.01
EGA-52 BOTTOM	11 ± 1	1.1 *al	25 ± 1	L3 ± 0.9	<130	<0.25	8.5 ± 0.1	a44 ± a37	200 ± 30	0.12 ± am
EGA-53 SURFACE	13 ± 1	2.1 ± 0.1	24 ± 1	<L1	<1243	<(W9	7.8 ± 0.1	LO* 0.4	320 ± 50	0.12 ± 0.01
BOTTOM	51 ± 1	5.3 ± 0.1	120 ± 10	<2.8	<450	L4 * 0.4	39 ± 1	2.9 ± 0.5	920 ± 70	0.44 * 0.01
EGA-55 SURFACE	32 ± 1	4.7 *al	69 ± 1	8.7 ± L6	<260	2.0 ± 0.4	23 ± 1	1.1 ± 0.6	75a ± 80	a37 * 0.01
BOTTOM	27*1	25 ± 0.1	63 ± 1	6.7 ± 1.4	<300	1.1 * 0.4	21 ± 1	a78 ± 0.57	540 ± 80	0.24 ± 0.01
EGA-58 BOTTOM	27 ± 1	2.6 ± 0.1	59 ± 1	45 ± L5	<250	L2 ± 0.4	20 ± 1	0.83 ± 0.59	490 ± 80	0.23 ± 0.01
10 ℓ BLANK (144 mm)	0.19	<0.013	a24	0.90	<2	0.20	0.04	<0.13	15	0.03
10 ℓ BLANK (144 mm)	0.23	<0.012	0.29	6.9	<2	0.53	0.02	<0.09	<10	0.007
10 ℓ BLANK (144 mm)	0.19	<0.017	0.21	L4	<2	0.29	0.03	<0.13	14	0.054
101 BLANK (144 mm)	0.14	<0.013	0.12	0.40	<2	0.13	0.005	<0.12	<10	a037
10 ℓ BLANK (144 mm)	0.17	<0.012	0.23		<2	0.39	0.003	---	24	0.03

TABLE F.3

ELEMENTAL CONCENTRATIONS (>0.4 μm) IN COOK INLET AND SHELIKOF STRAIT SUSPENDED PARTICULATES (μg/ℓ OF SEAMATER)

COOK INLET	Date	Depth	Al	Ti	Na	Mn	V
Station CB-1	5/78	Sfc.	235±9	10.3±6.0	440±30	3.05±0.13	0.56+0.12
CB-1	8/78	15M	13.534.9	8.8±5.6	650±40	0.39±0.06	<0.18
CB-2	5/78	Sfc.	192±5	11.4±4.5	380±30	2.10±0.10	0.25±0.07
CB-2	8/78	20M	185±5	9.5$4.8	570±40	2.39±0.11	0.40±0.09
CB-3	8/78	20M	16.7±2.0	<4.8	230±20	0.18±0.03	<0.08
CB-4	8/78	15M	41.6±1.6	4.6±2.1	210±10	0.52±0.03	<0.06
CB-5	8/78	30M	10.3±2.8	7.7±4.3	570±40	0.54±0.07	<0.14
CB-6	5/78	Sfc	19.2±1.7	5.753.3	260±20	0.4030.05	<0.09
CB-6	8/78	20M	9.0±2.2	<8.4	410330	0.34±0.06	<0.12
CB- 7	5/78	Sfc	29.6±3.5	<11.4	670±50	0.7330.07	<0.17
CB- 7	8/78	15M	23.2±3.4	10.4±5.1	660±70	0.69±0.07	<0.15
CB-8	5/78	Sfc	119±5	9.135.7	520±40	3.46±0.14	0.31±0.08
CB-8	8/78	15M	15325	10.7±4.2	280±20	3.85±0.15	0.36±0.07
SHELIKOF STRAIT							
Station SS-2	8/78	267M	411±11	24.2±9.0	680±50	14.6±0.5	0.66±0.14
SS-4	8/78	131M	37.7±1.7	<4.0	170±10	0.93±0.04	0.11±0.03
SS-6	8/78	203M	142±6	<12	51 0±30	11.430.4	0.27±0.09
SS-11	8/78	130M	21.2±1.5	3.3±1.6	150310	0.59±0.03	<0.06
SS-13	8/78	147M	74±3	<6.2	260±20	6.5±0.2	0.1530.05

TABLE F.4

COOK INLET -TIME SERIES-SUSPENDED PARTICULATE MATTER >0.4 µm. STATION CB-10

Discoverer, August 1978

	Al (%)	Ti (%)	Mn (ppm)	V (ppm)
t = 0 hr	8.57+0.29	0.73+0.13	1139:53	168:16
t = 0 hr	8.16+0.28	0.4930.11	1093~51	177+16
t = 0 hr	8.24+0.28	0.44+0.10	1081+50	151+15
t = 8 hr	9.79+0.33	0.32+0.11	1090+51	159:17
t = 8 hr	8.25+0.29	0.55+0.12	1133:54	154+18
t = 16 hr	8.08+0.29	0.48+0.11	1023+48	142+1 5
t = 24 hr	7.70+0.27	0.52+0.12	927+44	136+15
t = 32 hr	7.68+0.26	0.46+0.11	986+46	141+15
t = 40 hr	6.64+0.23	0.36+0.09	1 009+47	127+14
t = 40 hr	8.52+0.28	0.36+0.09	1064+49	151+16
t = 40 hr	8.31+0.29	0.52+0.09	1006+48	140+16
t = 48 hr	7.89+0.27	0.56+0.12	994+47	143+16

Station	Na(%)	K(%)	As(ppm)	La(ppm)	Sm(ppm)
t = 0 hr	3.43±0.01	2.86±0.36	26.1±1.4	27.9±0.8	5.1±0.1
t = 0 hr	3.27±0.01	2.60±0.32	21.9±1.3	25.6±0.7	4.6±0.1
t = 8 hr	3.61±0.01	2.97±0.39	22.4±1.5	26.630.8	5.1±0.1
t = 16 hr	3.20*0.01	2.68±0.39	19.1±1.4	23.3±0.7	4.2±0.1
t = 24 hr	4.57±0.01	2.52±0.44	19.321.6	26.3*0.8	4.920.1
t = 32 hr	3.50±0.01	2.51±0.41	20.5±1.4	25.1±0.8	4.620.1
t = 40 hr	2.70±0.01	1.48±0.20	17.8±1.0	23.520.6	4.4±0.1

TABLE F.4 (contd)

VARIATION **OF ELEMENTAL COMPOSITION IN SUSPENDED PARTICULATE (>0.4 μ) WITH TIME**

(ppm EXCEPT WHERE NOTED)

	Sc	Cr	Fe(%)	co	Sb	Cs	Eu	Tb	Ta	Th
COOK INLET										
TIME SERIES CB-10										
t = 0 hr	21.52 ± 0.07	122 ± 4	6.40 ± 0.03	25.92 ± 0.23	1.91* 0.08	7.04 ± 0.10	1.19 ± 0.02	0.67* 0.04	0.92* 0.07	8.92* 0.15
t = 0 hr	20.84 ± 0.06	120*4	6.14 ± 0.04	24.77* 0.25	1.75* 0.08	6.77* 0.10	1.20 ± 0.02	0.70 ± 0.04	0.91* 0.07	8.67* 0.15
t = 8 hr	19.17 ± 0.05	109*4	5.68* 0.02	23.17* 0.18	1.5410.07	6.47* 0.09	1.09 ± 0.01	0.59 ± 0.04	0.86 ± 0.07	7.66 ± 0.14
t = 16 hr	17.23 ± 0.06	98 ± 4	4.97* 0.04	19.55* 0.21	1.41* 0.09	5.29 ± 0.11	1.01* 0.02	0.54* 0.04	0.76* 0.05	6.81* 0.19
t = 24 hr	21.07 ± 0.03	123 ± 4	6.14 ± 0.03	24.44 ± 0.11	1.71* 0.11	6.75 ± 0.14	1,21* 0.02	0.75* 0,05	0.93* 0.09	8.55* 0.20
t = 32 hr	19.21 ± 0.02	114+4	5.68 ± 0.05	23.25* 0.31	1.56 ± 0.10	6.28 ± 0.12	1.10 ± 0.02	0.63 ± 0.04	0.93 ± 0.09	7.60 ± 0.21
t = 40 hr	16.08 ± 0.08	88* 2	4.65* 0.02	19.56* 0.10	1.43* 0.08	4.88 ± 0.09	O.% ± 0.02	0.4610.03	0.74* 0.07	6.77* 0.12

TABLE F.5

ELEMENTAL CONCENTRATION RANGES* IN SUSPENDED PARTICULATE MATERIAL (>0.4 urn) FROM THE ALASKA OUTER CONTINENTAL SHELF STUDY AREAS

	NUMBER OF SAMPLES	Mn	V	Al
WESTERN GULF OF ALASKA	44	0.061 -7.1	<0.006-0.224	1.3-103
EASTERN GULF OF ALASKA	40	<0.084- L59	<0.035-0.77	0.91-222
BERING SEA - BRISTOL BAY	24	0.040 -2.8	<0.(K)7 -031	6.3-114

*CONCENTRATION RANGES IN µg/ℓ OF SEAWATER

FIGURE F.1 ERTS Sattelite Photograph of N. E. Gulf of Alaska

APPENDIX G

Elemental Composition of Alaskan OCS Biological Materials

TABLE G.1

ELEMENTAL COMPOSITION OF BIOLOGICAL MATERIALS FROM ALASKA CONTINENTAL SHELF STUDY AREAS (ppm DRY WEIGHT EXCEPT WHERE NOTED)

	SPECIMEN	LOCATION	Ag	As	Br	Co	Cr	Cs	Fe	Hg	K(%)	Na(%)	Rb	Sb	Sc	Se	Sr	
1	ROC OLE	MF34	<0.038	14* I	31 ± 1	0.014 ± 0.002	2.0 ± 0.1	0.265 * 0.004	14*3	0.37 ± 0.10	1.86 i 0.09	0.53 ± 0.07	3.7 ± 0.1	<0.004	0.009 ± 0.001	1.5 ± 0.1	11 * 2	38
2		MF 5	<0.034	21 ± 1	47* I	0.018 ± 0.005	5.6 i 0.2	0.084 i 0.005	19*5	0.47 i 0.10	2.54 ± 0.13	0.65 ± 0.11	4.9 ± 0.2	0.010 ± 0.007	<0.005	3.4 ± 0.1	2(3*3	36
3		MF 13	<0.014	39*1	22* I	0.111 ± 0.002	1.2 ± 0.1	0.078 ± 0.002	14 ± 2	0,28 * 0,03	1.98 ± 0.08	0.52 ± 0.06	3.7 ± 0.1	0.008 * 0.001	<0.0002	L7 *al	5 ± 1	27
4		MF 27	<0.011	19*1	30 ± 1	0.021 ± 0.001	0.30 ± 0.05	0.068 ± 0.002	15 ± 2	0.27 ± 0.03	1.68 * 0.08	0.57 ± 0.07	2.9 * 0.3	0.030 ± 0.001	0.0021 ± 0.0003	1.7 ± 0.1	7 ± 1	30
5		MF 23	<0.061	18 ± 1	33*1	0.026 ± 0.003	0.75 ± 0.02	0.069 ± 0.004	43*3	0.19 ± 0.06	1.72 i 0.03	0.37 ± 0.07	3.4 * 0.1	0.011 ± 0.004	0.0110 ± 0.0002	1.8 ± 0.1	14 ± 2	30
6		MF 41	< 0.012	23 ± 1	30 ± 1	0.012 ± 0.001	0.15 ± 0.05	0.044 ± 0.002	6 ± 2	0.27 ± 0.03	L62 ± 0.09	0.54 ± 0.07	3.6*RI	<0.002	0.0004 ± 0.0002	2.7 ± 0.1	23* I	33
7		MF 43	<0.015	I0* I	27* I	0.033 * 0.002	0.12 ± 0.07	0.042 ± 0.002	13 ± 2	0.28 * 0.03	1.81 * 0.08	0.46 ± 0.07	3.9 ± 0.1	<0.003	0.0013 ± 0.0004	2.3 ± al	11*1	31
8		MF 44	<0.010	6.5 *a,	24*1	0.038 ± 0.001	0.13 ± 0.04	0.043 ± 0.001	10* I	0,13 ± am.	1.52 ± 0.07	0.43 ± 0.06	3.4 ± 0.1	<0.002	0.0004 ± 0.0002	1.4 ± 0.1	7 ± 1	27
9		MF 47	<0.030	8.6 * 0.	27*1	0.015 ± 0.034	<sol	0.046 ± 0.004	33*4	0.18 ± 0.02	L%* 0.09	0.43 ± 0.07	3.6*RI	0.011 * 0.004	0.0085 ± 0.0004	1.4 ± 0.1	U * 3	26
10	NEPTUNIA	MF 15	85	93*1	173 ± 1	4.9	1.8 ± 0.1	0.011 ± 0.009	1620 ± 10	3.4 ± 0.1	0.68 ± 0.10	L23 ± 0.10	5.4 ± 0.6	0.078 ± 0.008	0.018 * 0.001	119	150 ± 5	2260
11		rAF 19	40	98*1	363* I	4.4	Lo* 0.2	<0.013	2080 ± 30	0.19 ± 0.03	0.82 ± 0.16	1.89 ± 0.16	4.5*R6	0.110 ± 0.010	0.067 ± 0.002	13	250 ± 5	2520
12		MF 22	15	36 ± 1	83* I	4.0	1.8 ± 0.4	<0.(TJ5	M-43*3O	3.9 ± 0.2	0.34 * 0.04	0.43 ± 0.03	4.6 ± 1.8	0.088 * 0.022	0.104 ± 0.004	1 9	2600 ± 60	7890
13		MF 31	8.6	10*1	87 ± 1	L2	0.69 ± 0.06	<0.005	1130 ± 10	0.61 ± 0.03	0.40 ± 0.03	0.60 ± 0.03	2.8 ± 0.3	0.110 ± 0.005	0.052 ± 0.001	3.7 *0. 1	103 ± 2	870
14		MF 50A	3.4	140 ± 1	400 ± 10	1.3	0.62 ± 0.10	0.012 ± 0.006	950 ± 10	2.6 ± 0.1	<0.52	232 ± 0.27	5.9 ± 0.6	0.033 ± 0.006	0.036 ± 0.001	2.7 ± 0.1	43 ± 3	1243
15		MF 508	5A	49* I	91*1	1.6	o.% * 0.05	<0.020	1190 ± 10	1.2 ± 0.1	0.44 ± 0.06	0.50 ± 0.04	4.7* 0.8	0.034 ± 0.011	0.133 ± 0.001	8.4 ± 0.1	58 ± 5	2760
16	POI :K	MF 4	0.022 ± 0.009	3.4 ± 0.3	39 ± 1	0.016 * 0.001	0.34 ± 0.05	0.058 ± 0.001	11 ± 1	0.07 i am	1.72 ± 0.05	0.59 * 0.(M	4.6 ± 0.1	0.008 ± 0.001	<0.0002	0.87 ± 0.02	10 ± 1	22
17		MF 4	<0.012	3.5 ± 0.3	39 ± 1	0.015 ± 0.002	<0.4	0.091 ± 0.002	13 ± 1	0.6 * 0.03	1.84 ± 0.05	0.59 ± 0.05	4.1 ± 0.1	0.009 ± 0.002	0.0005 ± 0.0002	0.82 ± 0.03	5* I	22
18		MF 6	<0.011	2.0*0.3	29 ± 1	0.014 ± 0.003	0.46 ± 0. 10	0.107 ± 0.002	12 ± 3	0.10 ± 0.06	L63 ± 0.05	0.46 ± 0.04	4.8 ± 0.2	0.035 ± 0.004	0.0011 ± 0.0003	0.71 ± 0.05	6 ± 2	18
19		A5F 11	<0.027	3.1 ± 0.3	36 ± 1	0,010 * 0.002	0.40 ± 0.06	0.095 ± 0.002	10 ± 2	0.11 ± 0.03	1.91 * 0.03	0.52 ± 0.05	3.9 ± 0.1	0.010 i 0.001	0.0005 ± 0.0002	1.04 ± 0.03	19 ± 1	22
20		MF 17	<0.014	4.0 ± 0.3	34 ± 1	0.034 ± 0.001	0.15 ± 0.05	0.086 ± 0.001	30 ± 1	0,04 ± 0.02	L77 i 0.04	0.63 * 0.04	4.7 ± 0.1	0.009 * 0.002	0.0070 * 0.0002	0.78* 0.02	4 * 1	19
21		MF 21	<0.022	5,6*R3	37*1	0.017 ± 0.003	0.29 ± 0.11	0.111 ± 0.004	1 5 * 3	0.09 ± 0.06	2.00 ± 0.06	0.56 ± 0.04	4,3 ± 0.1	0.011 ± 0.006	0.0013 ± 0.0004	0.92 ± 0.06	5*2	23
22		MF 25	<0.015	11*1	30 ± 1	0.058 ± 0.021	0.24 ± 0.08	0.091 ± 0.002	b ± 2	0.15 ± 0.04	1.70 ± 0.04	0.43 ± 0.04	4.5 ± 0.1	0.019 ± 0.002	<0.0003	0.97 ± 0.01	6 ± 1	18
23		MF28	<0.035	5.3 ± 0.3	37 ± 1	0.017 * 0.032	0.22 ± 0.06	0.161 ± 0.002	20 ± 2	0.16 ± 0.01	1.84 ± 0.05	0.54 ± 0.03	4.5 ± 0.1	0.019 ± 0.002	0.0016 ± 0.0002	1.05 ± am	10 ± 1	29
24		MF 36	<0.009	2.4 ± 0.3	35* I	0.014 ± 0.001	0.17 i 0.10	0,075 ± 0.001	13 ± 2	0.34 ± 0.02	1.87 ± am	0.52 ± 0.05	43 ± 0.1	0.010 ± 0.002	0.0025 ± 0.0002	0.78 ± 0.02	8 ± 1	23
25		MF 39	0.032 ± RO1O	4.6 ± 0.2	38 ± 1	0.017 ± 0.001	<0.6	0. 105 ± 0.002	8 ± 2	0.04 ± 0.03	L65 ± 0.04	0.58 * 0.04	4.5 ± 0.1	0.012 * 0.002	<0.0003	1.15 ± 0.03	20 ± 1	31
26		MF 42	<0.015	6.9 ± 0.2	32*1	0.0097 ± 0.0018	0.22 ± 0.09	0.105 ± 0.002	14 ± 3	<0.02	1.86 ± 0.03	Q53 ± 0.03	5.7 ± 0.1	0.018 * 0.003	<0.0001	47* 0.2	9 ± 2	22
27		MF 43	<0.006	3.5 ± 0.1	31 ± 1	0.0075 ± 0.0008	0.21 ± 0.04	0.082 ± 0.001	5 ± 1	0.12 ± 0.01	1.45 ± 0.03	0.46 i 0.03	3.9 ± 0.1	0.051 ± 0.002	<0.0003	0.91 ± 0.02	5* I	17
28		MF 46	<0.011	2.5 ± 0.2	39 ± 1	0.018 ± 0.001	0.17 ± 0.03	0. 083 ± 0.001	39 ± 2	0.05 ± 0.01	L36 ± 0.04	0.68 ± 0.07	5.2 ± 0.1	0.020 * 0.002	0.0070 ± 0.0002	3.5 ± 0.1	8* I	23
29		MF49	<0.025	7.3 ± 0.2	41 ± 1	0.021 ± 0.002	<0.10	0.114 ± 0.003	14 ± 2	0.16 ± 0.04	L53 ± 0.04	0.66 * 0.07	4.5 ± 0.2	0.008 * 0.005	0.0007 ± 0.0003	1.5 ± 0.1	9*1	27
30	CRAB	3	0.82 * 0.03	.0.25	<0.34	1.32 * 0.01	<0.10	0.019 ± 0.004	17 ± 8	0.31 ± 0.02	<0.04		1,4 * Lo	0.028 * 0.006	0.0017 ± 0.0008	10.7 ± 0.2	48 ± 2	334
31		7	0.86 ± 0.01	23 ± 1	80 ± 1	0.40	<0.08	0.011 ± 0.002	7 * 2	0.21 ± 0.02	L54 * 0.19	1.54 ± 0.12	5,4 ± 0.2	0.010 ± 0.002	<0.0003	2.9 ± 0.1	18*1	127
32		MF 12	1.71 * 0,01	53* 1	120 * 10	0.74	<0.05	0.0080 ± 0.002	5 * 4	0.20 ± 0.01	1.64 ± 0.16	1.96 ± 0.12	6.6 ± 0.4	0.038 ± 0.003	<0.0007	41*1	46*1	129
33		MF 14	0.95 ± 0.02	4 1 * 1	130 * 10	0.42	<0.08	0.012 ± 0.004	8 ± 4	0.29 ± oar	1.25 ± 0.24	2.23 ± 0.12	4.5: 0.4	0.039 ± 0.004	0.0017 ± 0.0005	2.7 ± 0.1	38 ± 2	124
34		MF 20	1.52 ± 0.01	49 ± 1	130 ± 10	0.64	<0.06	0,012 ± 0.002	9 ± 3	0.17 ± 0.01	1.57 ± 0.26	2.14 ± 0.12	6.7 ± 0.4	0.025 * 0.002	0.0016 ± 0.0003	11 ± 1	44*2	119
35		MF 26	2.22 ± 0.01	45 ± 1	102 * 10	0.74	<0.05	O.O1O* 0.002	4 ± 3	0.43 ± 0.02	1.22 ± 0.23	L85 ± 0.12	6.2 ± 0.3	0.034 ± 0.003	<0.0006	7*1	58 ± 1	133
36	I	MF 29	0.93 ± 0.01	34 ± 1	106 * 10	0.57	0.44 ± 0.05	0.012 ± 0.002	26 ± 3	0.20 * 0.01	1.44 ± 0.16	1.87 ± 0.12	6.5 * 0.4	0.009 * 0.003	0.0041 ± 0.0004	13 ± 1	43* I	236

MF . MILLER FREEMAN STATION NUMBER

TABLE G.1 (contd)

ELEMENTAL **COMPOSITION OF BIOLOGICAL** MATERIALS FROM ALASKA CONTINENTAL SHELF **STUDY AREAS**
(ppm DRY WEIGHT EXCEPT WHERE NOTED)

			Ag	As	Br	Co	Cr	Cs	Fe	Hq	K(%)	Na(%)	Rb	Sb	Sc	34	Sr	Zn
37	CRAB LEG	MF 43	1.20 ± 0.02	57* I	80 ± 10	0.31 ± 0.01	<0.067	0.0099 ± am53	<7.5	0.39 ± 0.03	L49 ± 0.21	1.37 ± 0.01	5.8 ± 0.8	0.087 ± 0.004	0.0007 ± 0.001	4.45 ± 0.03	32 ± 2	83
33		MF 16	0.80 ± 0.02	43* I	140 ± 10	0.33 ± 0.01	<a 070	0.011 ± 0.004	32 ± 5	0.30 ± 0.04	1.69 ± 042	2.28: 0.01	3.6 ± 0.7	0.011 ± 0.004	0.007 ± 0.001	3.35 ± 0.02	32 ± 2	124
39		MF 40	a65 ± 0.01	38* I	79 ± 10	0.19 ± 0.01	<0.045	0.2027, 0.0018	6.0 ± 2.1	0.32 ± 0.02	1.32 ± 0.29	1.40 ± 0.01	7.1 * 0.4	0.042 ± 0.002	<0.0013	3.76 ± 0.01	19 ± 1	92
40		MF 33	0.81 ± 0.01	29 ± 1	140 ± 10	0.47 ± 0.01	0.010 ± 004	0.012 ± 0.002	35*3	0.24 ± 0.02	LC6 ± a38	1.92 ± 0.01	3.8 ± a4	0.009 ± 0.002	0.0033 ± 0.0008	2.53 ± 0.01	24 ± 1	106
41	I	MF 37	L53 ± 0.02	35X1	130 ± 10	0.32 ± 0.01	0.20 ± 0.07	0.011 ± 0C02	14 ± 5	0.49 ± 0.04	1.15 ± 0.41	233 ± 0.01	7.3 ± 0.9	0.046 ± 0.004	0.0020 ± 0.004	2.53 ± am	44*2	96
47	FUCUS	CAPE NUKSHAK	0.27 ± 0.01	20 ± 1	240 ± 10	1.35 ± 0.03	<a 074	0.023 ± 0.003	4355	<0.026	1.79 ± 0.38	2.43 ± 0.01	9.11 ± 0.7	0.035 ± 0.004	0.034 ± 0.023	0.069 ± 0.017	500 ± 10	19
43		PORT DICK	0.18 ± 0.01	9.0 ± 0.6	150 ± 10	1.11 ± 0.01	0.33 ± 0.03	0.021 ± 0.002	29*3	0.055 ± 0.014	2.04 ± a43	3.05 ± 0.01	16 ± 1	0.023 ± 0.003	0.013 ± 0.001	0.01720.011	370 ± 10	16
44		SUNDSTROM ISLAND	0.13 ± 0.01	28 ± 1	260 ± 10	0.76 ± 0.01	3.53 ± 0.04	0.025 ± 0.002	3613	<0.018	4.s5 ± am	3.72 ± 0.01	33* I	0.023 ± 0.003	0.010 ± 0.001	0.021 * 0.011	460 ± 10	16
4s		LaTOUCHE	0.15 ± 0.02	36*1	160 ± 10	2.05 ± 0.01	acm ± 0.055	0.019 ± 0.003	33*6	0.045 ± 0.03	1.70 ± 0.37	2.% * 0.01	16 ± 1	0.023 ± 0.005	ao3z ± 0.001	0.032 ± 0.018	470 ± 10	w
46		UNIMACK I SLAND - CAPE LUPIN	0.083 ± 0.015	22*1	190 ± 30	0.74 ± 0.01	0.38 ± 0.07	0.023 ± 0.003	48 ± 6	a655 ± 0.03	2.29 ± 0.55	3.26 ± 0.01	9.4 * 0.8	0.028 ± 0.005	0.025 ± 0.001	0.048 ± 0.020	420 ± 10	12
a		McLEOD HARBOR	0.17 ± 0.01	20$1	130 ± 10	1.18 ± 0.01	1.24 ± 0.04	ao23 ± 0.002	146 ± 4	0.030 ± 0.018	1.79 ± 0.47	2.80 ± 0.0	33*1	0.014 ± ao33	0.055 ± 0.001	0.025 ± 0.013	450 ± 10	25
44		OTTER ISLAND	0.068 ± 0.007	3.0 ± 1.0	320 ± 10	0.42 ± 0.01	0.84 ± 0.04	0.032 ± 0.001	26 ± 3	4036 ± 0.017	2.38 ± 0.S8	3.18 ± 0.01	10 ± 1	ao45 ± 0.003	0.0079 ± 0.003	0.043 ± 0.011	710 i 20	8
44		ANCHOR COVE	0.15 ± 0.01	W* I	200 ± 10	1.63 0.14	0.82 * 1101	0.021 ± 0.002	32 ± 4	0.054 ± 0.019	2.4a ± 0.38	4.40 ± 0.01	7.1 * a6	0.034 ± 0.003	0.027 ± 0.001	aoso * 0.01	480 ± 10	33
50	▼	UNALASKA ISLAND - EIDER POINT	7s027 ± 0.006	23*1	260 ± 10	0.30 ± 0.01	2.88 ± 0.04	0.032 ± 0.002	17 ± 2	0.032 ± 0.019	4.02 ± ass	3.19 ± 0.01	11* I	0.018 * 0.002	0.0082 ± 0.0001	0.074 ± 0.015	480 ± 30	23
51	SEAWEED	KAYAK I SLAND	0.080 ± 0.016	20 ± 1	140 ± 10	2.77 ± 0.16	1.87 ± ao2	aozz ± 0.002	89 ± 5	<0.022	1.80 ± 0.25	L94 * 0.01	5.6 ± 0.8	0.036 ± am4	0.050 * 0.001	0.051 ± 0.014	370 * 10	35
52	FUCUS	ZALKOF BAY	0.14 ± 0.01	14 ± 1	180 ± 10	1.41 ± 0.05	0.92 ± 0.07	0.021 ± 0.004	47* 7	<0.036	2.96 i a44	26? ± 0.01	6 ± 1	0.025 * 0.007	0.018 ± 0.001	<sow	450 ± 10	22
53		SAINTS BAY	0.13 ± 0.01	25 ± 1	230 ± 10	0.85 ± 0.04	5.37 ± 0.04	0.021 ± 0.002	32 ± 4	<0.022	3.26 * 0.49	475 ± 0.01	11 ± 1	0.025 ± 0.003	0.011 ± 0.001	0.063 ± 0,013	510 ± 10	35
3	58	SAINTS BAY	0.16 ± 0.01	14* I	270 ± 10	0.98 ± 0.04	0.78 ± 0.04	0.029 ± 0.002	33*3	0.095 ± 0.020	3.77 ± 0.47	2.69 * 0.01	10 ± 1	0.032 * 0.003	0.011 ± 0.001	aLB32 0,016	530 ± 10	35
55		LaCOON POINT	0.079 ± 0.015	23*1	170 ± 10	0.57 ± 0.03	5.25 * 0.07	0.027 ± 0.003	48 ± 6	<0.055	3.33 ± Q35	4%* 0.01	9 ± 1	0.026 ± 0.005	0.016 ± 0.001	<0.035	460 ± 10	11
56		CAPS PASSASHAK	0.11 ± 0.01	11 ± 1	210 ± 10	0.75 ± 0.03	0.35 ± 0.05	0.028 ± aao	42 ± 5	0.11 ± 0.03	3.03 ± 0.43	2.77 ± 0.01	8.1 ± 0.9	0.015 ± 0.005	0.0089 ± 0.0004	<0.25	5W*10	14
57		UNIMACK ISLAND - SONNETT POINT	0.11 * 0.01	21* I	190 :10	0.47 ± 0.02	3.332 0.04	0.023 i 0.002	42 ± 3	0.052 ± 0.020	3.13 ± 0.56	5.51 ± 0.01	9.8 ± 0.5	2L0192 0.003	0.020 ± 0.001	0.062 ± 0.012	350 ± 10	11
	SEAWEED	KATALLA	0.064 i 0.013	//* /	340 ± 10	2.71 ± 0.12	4.26 ± 0.06	0.041 ± ao33	W I * 6	0.056 ± 0.030	3.32 ± a48	232 * 0.01	10 ± 1	0.027 ± 0.005	0.076 ± 0.001	0.070 ± 0.021	820 ± 20	11
59		ANCHOR COVE	0.15 ± am	20 ± 1	510 ± 10	2.22* 011	2.55 ± 0.11	0.19 ± 0.01	780 ± 10	au ± am	2.96 ± 0.53	4.77 ± 0.01	11 ± 2	0.087 ± solo	az6 ± 0.01	0.22 ± 0.03	590 ± 10	17
60		SPECTACLE ISLAND	0.058 ± 0.006	6.1 ± 0.3	160 ± 10	0.64 ± 0.03	0.27 ± 0.04	0.039 ± o 002	52 ± 3	aa54 ± 0,018	2.9A * 0.36	1.60 ± 0.01	4.2 ± 0.5	aozo ± 0.003	scow ± ao34	<0.018	620 ± 20	8.0
61		PORT DICK	0.073 ± 0.07	12*1	220 ± 10	0.093 ± 0.02	1.51 ± a55	0,632 ± 0.002	149 ± 10	0.029 ± 0.025	1.72: 0.04	2.17 ± 0.01	8.1 ± 0.8	0.045 ± 0.001	0.0563 ± 0.003	0.086 ± 0.011	120 ± 10	7.2
62		MAKUSHIN BAY	0.019 ± 0.007	17 ± 1	170 ± 10	0.96 ± 0.04	0.30 ± 0.01	0.023 ± 0.001	63*3	0.020 * 0.014	1.39 ± 0.43	230 * 0.01	7.2 ± a5	0.019 ± 0.003	0.0263 ± 0.0002	ao35 ± 0.009	400 ± 10	5.7
63		CAPS NUKSHAK	0.070 ± 0.009	10* 1	290 ± 10	0.92 ± 0.02	0.38 ± 0.07	0.014 ± 0.002	21 ± 6	<0.022	4.90 ± 0,42	22s * 0.01	7.6 ± 1.1	0.024 ± 0.005	0.0169 ± 0.002	0.021 ± 0.01	150 * 10	6.4
04		SUNDSTROM ISLAND	0.046 ± 0.006	7.5 ± 0.7	230 ± 10	0.45 ± 0.01	1.3 ± 0.1	0.025 ± 0.001	36 ± 3	0.028 ± 0.013	1.46 ± 0.46	236 * 0.01	7.5 * 0.6	0.031 ± aooz	0.0097 ± 0.0002	0.038 ± 0.009	530 ± 10	6.4
63		LaTOUCHE	0.029 ± 0.006	7.9 * 0.4	130 ± 10	Loz ± 0.01	3.2 ± 0.1	0.018 ± 0.001	5s ± 4	<0.014	1.25 * 0.3	L95 ± 0.01	5.9* 0.8	0.028 ± 0.003	0.0131 ± 0.0003	0.032 ± 0.009	210 * 10	5.3
66	V	LaTOUCHE	0.033 * 0.012	11*1	130 ± 10	0.79 ± 0.01	1.5 ± 0.1	0.020 ± 0.002	42 ± 7	<0.025	3.33 * 0.46	237 * 0.01	6.5 ± 1.4	0.015 ± 0.006	0.0082 ± 0.0003	a04S ± 0.016	500 ± 10	5.7
47	MYTILUS	SAINTS BAY	0.11 ± 0.02	5.5 ± 0.6	190 ± 10	0.49 ± 0.01	1.3 ± 0.1	0.026 ± 0.004	310 ± 10	0.24 ± 0.04	0.56 ± a45	2.61 ± 0.01	5.4 ± L5	aoL32 0.007	0.106 ± 0.001	3.0* 0.1	21* I	73
03		KATALLA	<0.033	5.3 ± 0.9	290 ± 10	2.9 ± 0.1	9.9 ± 0.2	0.195 ± 0.006	4300 ± 10	0.23 ± 0.06	1.20 ± 0.55	3.07 ± aco	33*3	0.057 ± 0.013	1.60 ± 0.01	2.5 ± al	L3ZI*10	86
09		PORT ETCHES	0.029 ± 0.017	4.8 ± 0.6	200 ± 10	0.82 ± 0.01	2.2 ± 0.1	0.048 ± 0.003	970 ± 10	0.20 ± 0.02	<0.49	3.s6 ± 0.01	5.5 * 1.2	0.009 ± 0.006	0.335 ± 0.001	2.8 ± 0.1	27* I	51
10		OTTER I SLAND	0.12 ± 0.02	6.2 ± 0.7	300 ± 10	0.28 ± 0.01	1.6 ± 0.1	0.018 ± 0.003	230 ± 10	0.12 ± 0.03	Lz3 * 0.38	1.69 ± 0.01	5.4 * 1.3	0.008 ± 0.006	0.066 ± 0.001	2.3 ± o. I	43* I	n
71		MAKU SHIN BAY	0.075 ± 0.030	44*LO	320*30	0.38 ± 0.01	47 ± 0.2	0.015 ± 0.006	530 ± 10	0.31 ± 0.05	<0.72	3.98 * 0.01	7.0 * 2.2	0.084 ± 0.01	a305 * 0.001	2.5 ± 0.1	34* I	n
12	I	CAPE NUKSHAK	0.10 ± 0.02	7.4 ± 0.8	220 ± 10	0.66 ± 0.01	1.3 ± 0.1	0.041 * 0.003	560 ± 10	0.23 ± 0.03	1.52 ± 0.62	3.37 * 0.04	3.8* L2	0.015 ± 0.005	0.184 ± 0.001	3.9 ± 0.1	67 ± 3	W

MF = MILLER FREEMAN STATION NUMBER

TABLE G.1 (contd)

ELEMENTAL COMPOSITION OF BIOLOGICAL MATERIAL FROM ALASKA OCS STUDY AREAS ppm DRY WEIGHT [EXCEPT WHERE NOTED]

	SPECIMEN	LOCATION	As	Br	Co	Cr	Cs	Fe	Hg	Na (%)	K (%)	Rb	56	Sc	Se	Sr	Zn
73	MYTILUS	SUNDSTROM ISL.	11 ± 1	340 ± 10	0.97 ± 0.04	47*Q3	0.046 ± 0.009	1840 ± 130	0.32 ± 0.08	3.38 ± 0.15	2.10 ± 0.68	13 ± 3	0.034 *am	0.69 ± 0.01	27* 0.1	200 ± 10	110
14		SUNDSTROM 1S1.	13 ± 1	420 ± 10	0.65 ± 0.01	20 ± 0.1	0.031 ± 0.04	490 ± 50	0.46 ± 0.03	4.08 ± 0.23	1.73 ± 0.68	46*L3	0.045 ± 0.007	0.17 ± 0.01	2.9 ± 0.1	140 ± 10	100
73		CAPE NUKSHAK	64*Q2	310 ± 10	2.1 ± 0.1	3.6 ± 112	0.21 ± 0.01	2280 ± 50	0.22 ± 0.06	2.40 ± 0.11	<L27	22 ± 2	0.10 ± 0.02	0.97 ± am	2.9 ± 0.1	150 ± 10	72
?6		MY HARBOR	7.1 ± 0.4	160 ± 10	1.1 ± 0.1	1.2 ± 0.1	0.028 ± 0.002	240 ± 10	0.13 ± 0.02	1.66 ± 0.09	0.74 ± 0.33	2.8 ± 0.9	0.016 ± 0.004	0.070 ± 0.001	2.1 ± 0.1	100 ±10	50
n		BOSWELL BAY	8.0 ± as	140 ± 10	3.0 ± 0.1	11.6 ± 0.2	0.26 ± 0.01	6000 ± 140	0.12 ± am	1.22 ± 0.05	0.90 ± 0.31	32*2	0.12 ± 0.02	2.5 ± 0.1	L9 ± 0.1	160 ± 10	72
72		CAPE PASASHAK	8.7 ± 0.5	190 ± 10	1.2 ± 0.1	8.5 ± 0.2	0.095 ± 0.006	3960 ± 110	0.19 ± 0.05	2.42 ± 0.14	132 ± 0.50	8.7 ± 2.1	0.044 ± 0.015	14* 0.1	2.2 ± 0.1	51 ± 3	80
79		SENNETT POINT	10 ± 1	330 ± 10	0.55 ± 0.01	0.90 ± 0.13	0.027 ± 0.004	920 ± 40	0.37 ± 0.004	3.05 ± 0.15	<1.43	29* 1.4	<0.013	0.37 ± am	24* 0.1	61 ± 3	110
80		CAPE HUPIT	7.0 ± 0.6	230 ± 10	0.37 ± 0.01	1.5 ± 0.1	0.015 ± 0.003	540 ± 20	0.16 ± am	2.98 ± 0.17	1.88 ± 0.59	5.2 ± 1.1	0.018 ± 0.006	0.18 * 0.01	L9 * 0.1	49 ± 2	97
81		EIDER POINT	1.0 ± 1	290 ± 10	0.30 ± 0.01	1.2 ± 0.1	0.015 ± 0.004	150 ± 10	0.19 * 0.04	2.64 ± 0.12	<2.43	3..9 * 1.1	<0.009	0.051 ± 0.002	2.5 ± 0.1	47 ± 2	170
S?		LaTOUCHE POINT	8.6 ± 0.6	290 ± 10	1.3 ± 0.1	1.1 * 0.1	0.016 ± 0.003	280 ± 10	0.12 i 0.03	2.31 ± 0.13	< 1.09	<L5	0.021 ± 0.007	0.067 ± 0.001	26* 0.1	62 ± 2	63
23		PORT DICK	9.4 ± 0.7	290 ± 10	2.6 ± 0.1	12 ± 1	0.39 i 0.01	5740 ± 160	0.31 ± 0.04	291 i 0.13	<1.15	14 ± 2	0.22 ± 0.02	2.1 ± 0.1	3.2 ± 0.1	210 ± 10	130
24	1	LaCOON POINT	8.9 ± 0.5	220 ± 10	0.54 ± 0.01	1.2 ± 0.1	0.029 ± 0.003	380 ± 10	0.28 ± am	2.73 ± 0.15	1.28 ± 0.56	4.8 ± 1.1	0.013 ± 0.005	0.13 ± 0.01	2.7 ± 0.1	62 ± 2	93

TABLE G.2

VANADIUM CONCENTRATIONS IN SELECTED ALASKAN OCS BIOLOGICAL MATERIALS

ROCK SOLE	Ng V/g Tissue (Dry Weight)
Miller Freeman Station	
#34	55 ± 19
#13	<10
#27	20 ± 16
#43	29 ± 13
#44	69 ± 18
POLLOCK	
Miller Freeman Station	
#11	97 ± 20
#17	44 ± 16
#36	23 ± 13
#39	<16
#42	<14
#45	<19
CRAB	
Miller Freeman Station	
#12	<14
#26	<18
#48	23 ± 11
#40	24 ± 16
#37	44 ± 14
FUCUS	
Cape Nukshak	830 ± 24
Sundstrom 1s1.	483 ± 13
Otter 1s1.	945 ± 14
Anchor Cove	319 ± 16
Unalaska 1s1.	318 ± 48

TABLE G.2 (contd)

MYTILUS	Ng V/g Tissue (Dry Weight)
Otter 1s1.	783 ± 13
Cape Nukshak	226 ± 33
Sundstrom 1s1.	501 ± 20
Cape Nukshak	389 ± 18
Unalaska 1s1.	520 ± 53
NEPTUNIA	
Miller Freeman Station	
#15	2670 ± 110
#19	2470 ± 100

TABLE G.3

MEAN CONCENTRATIONS OF SELECTED ELEMENTS IN ALASKA OCS BIOTA
(ppm dry weight)

	Number of Samples	Ag	As	Cr	Hg	Se	Zn
Crab	12	1.17±0.48	41±10	< 0.50	0.33±0.14	5.6±4.2	117±18
Rock Sole	9	< 0.038	18±9	1.3±1.9	0.27±0.10	2.0±0.7	32±5
Pollock	14	< 0.035	4.7±2.4	0.26±0.10	0.12±0.08	1.4±1.2	23±4
Neptunia	5	35±32	71±48	1.130.6	2.0±1.5	33±48	3260±2690
Mytilus	18	0. 087±. 036	7.5±2.8	3.9±3.9	0.23±0.09	2.6±0.5	88±29
Fucus	15	0.1330.04	17±7	1.9±1.8	0. 056±0. 026	0.049±0.022	14±3
Seaweed	10	0. 062±0. 037	11±5	1.7±1.3	0. 046±0. 034	0.064±0.063	8.6±3.9

APPENDIX H

Dissolved Trace Element Concentrations in Alaskan Shelf Maters

TABLE H.1

Vanadium Concentration in Alaska Coastal Waters

Station	Vanadium (µg/l) Surface	Bottom
MB-17		1.0
24		1.3
34		1.3
37	1.3	
41	1.3	
43	1.5	
56	1.4	
59	1.3	
64	1.5	1.5, 1*4
EGA-2		1.6
5		1.7
8	1.3	1.6
15	1.4	1.6
26	1.6	1.6
29		1.5
30		1.3
33	1.1	1.6
44	1.2	1.4
48	1.3	1.6
52		1.3
53	1.3	1.4
55	1.3	1.2
58		1.4
GASW-101	1.2	1.4
104	1.6	1.4
108	1.5	1.6
119		1.5
121	1.3	1.7
124	1.6	1.7
133	1.3	1.3
135	1.4	1.3
137	1.3	1.6
145	1.4	1.5
148	1.3	1.3
157	1.4	1.2
160	1.5	1.6

TABLE H.2

DISSOLVED (<0.4 μm) VANADIUM CONCENTRATIONS (μg/ℓ) in
IN COOK INLET AND SHELIKOF STRAIT WATERS

Cook Inlet	May 1978 - (Depth)	August 1978- (Depth)
Station - CB-1	1.54±0.11 (sfc)	1.15 ±0.10 (15 M)
CB- 2	---	---
CB- 3	---	1.14±0.10
CB-4	1.49*O.1O (sfc)	1.19±0.10 (15 M)
CB-5	---	1.11±0.18 (30 M)
CB-6	1.53±0.11 (sfc)	1.36±0.09 (20 M)
CB- 7	1.99±0.13 (sfc)	1.26±0.09 (15 M)
CB-8	1.51±0.1o (sfc)	1.26±0.09 (15 M)
CB-9	1. 44±0.1o (sfc)	---

Time Series Station CB-10 - August 1978 Depth = 15M

t = 0 hr	1.12±0.08
t = 8 hr	1.25±0.09
t = 16 hr	1.22±0.09
t = 40 hr	1.17*0.09
t = 48 hr	1.07±0.08

Shelikof Strait	August 1978- (Depth)
Station - SS-2	1.28±0.14 (273 M)
SS-4	1.44±0.15 (131 M)
SS-6	1.41±0.15 (201 M)
Ss-11	1.42±0.12 (145 M)
SS-13	0.62±0.05 (147 M)

TABLE H.3

DISSOLVED (<0.4 μm) MANGANESE CONCENTRATIONS (μg/ℓ) IN
COOK INLET AND SHELIKOF STRAIT WATERS

	Cook Inlet	May 1978 -(Depth)		August 1978 -(Depth)	
Station -	CB-1	0.48±0.06	(sfc)	1.85±0.20	(15 M)
	CB-2			1.23±0.13	(20 M)
	CB-3			0.29±0.04	(20 M)
	CB-4	0.25±0.04	(sfc)	0.79±0.09	(15 M)
	CB-5	<0.2	(sfc)	0.34±0.04	(30 M)
	CB-6	0.29±0.04	(sfc)	0.31±0.04	(20 M)
	CB-7	0.11±0.02	(sfc)	0.95±0.11	(15 M)
	CB-8	0.16±0.03	(sfc)	0.82±0.09	(15 M)
	CB-9	0.64±0.07	(sfc)		

	Shelikof Strait	August 1978 - (Depth)	
Station -	SS-2	7.28?0.74	(273 M)
	SS-4	0.55±0.07	(131 M)
	SS-6	6.8±0.7	(201 M)
	SS-13	0.03±0.01	(147 M)

TABLE H.4

VANADIUM CONCENTRATIONS IN ALASKA SHELF WATERS (ug/l)

	SURFACE	BOTTOM	WATER COLUMN
BERING SEA	1.38 ± 0.09 (6)*	L34 * 0.23 (4)*	1.37* 0.15
EASTERN GULF OF ALASKA	1.33 * 0.14 (9)	L48 * 0.15 (14)	L42 ± 0.16
WESTERN GULF OF ALASKA	1.40 * 0.12 (12)	1.47* 0.17 (13)	1.43* 0.15
ALASKA SHELF AVERAGES	1.37 ± 0.12 (27)	1.46* 0.17 (31)	L42 * 0.15

*NUMBER OF SAMPLES

TABLE H.5

DISSOLVED TRACE ELEMENTS IN OCS SEA WATER, 1976

WESTERN GULF OF ALASKA

STATION IDENTIFY	STATION	DEPTH	u	Rb	Fe	Zn	co	Sb	Cs
			micrograms / liter						
4-30	WGA-101	SURFACE	3.21	105	9.75	26.6	L97	0.184	0.253
5-35	WGA-1OI	BOTTOM	3.40	116	5.95	3.37	0.0488	0.223	0.292
10-71	WGA-135	SURFACE	2.96	111	22.6	3.31	0.0469	0.277	0.281
10-72	WGA-135	BOTTOM	3.48	121	5.59	263	0.0226	0.195	0.291
4-25	WGA-148	SURFACE	3.09	115	5.90	1.09	0.0417	0.181	0.269
4-26	WGA-148	BOTTOM	3.26	114	2.84	0.521	0.0180	0.170	0.261
4-28	WGA-157	SURFACE	3.68	119	11.9	0.863	0.0234	0.211	Q267
4-27	WGA-157	BOTTOM	3.26	115	6012	1.58	0.0261	0.166	0.260
8-53	WGA-160	SURFACE	3.57	77	<4.83	0.968	0.0241	0.240	Q275
8-54	WGA-160	BOTTOM	3.84	113	5.07	0.596	0.0192	0.268	0.290

SOUTHWEST GULF OF ALASKA

STATION IDENTIFY	STATION	DEPTH	u	Rb	Fe	Zn	co	Sb	Cs
5-37	GASW-104	SURFACE	3.12	121	12.5	0.714	0.0189	0.156	0.273
5-31	GASW-104	BOTTOM	299	104	14.1	0.617	0.0277	0.200	0.287
9-63	GASW-119	SURFACE	3.18	105	3.54	0.736	0.0462	0.200	0.262
9-64	GASW-119	BOTTOM	3.75	119	9.87	0.551	0.0201	0.209	0.296
4-29	GASW-121	SURFACE	3.17	110	17.0	L07	0.0332	0.179	0.254
6-38	GASW-121	ZODIAC A SURF.	3.26	114	9.90	0.268	0.0472	Q 187	0.305
5-33	GASW-121	ZODIAC B SURF.	3.28	114	8.22	0.386	0.0417	0.170	0.282
5-34	GASW-121	BOTTOM	3.55	121	6.82	0.698	0.0154	0.245	0.308
10-66	GASW-124	SURFACE	3.32	104	8.47	4.60	0.0319	0.245	0.268
9-65	GASW-124	BOTTOM	3.99	124	5.91	0.770	0.0210	0.200	0.308
10-69	GASW-133	SURFACE	3.04	107	7.80	2.21	0.0333	0.171	0.275
10-70	GASW-133	BOTTOM	3,(KI	110	17.5	268	0.0300	0.261	0.286
11-78	GASW-137	SURFACE	299	106	5.80	8.56	0.0290	0.270	0.260
11-77	GASW-137	BOTTOM	3.56	122	3.58	0.671	0.0211	0.228	0.306
11-73	GASW-145	SURFACE	3.56	118	3.23	1.54	0.0304	0.205	0.300
11-74	GASW-145	BOTTOM	3.72	125	<2.90	53.5	0.0524	0.226	0.312

TABLE H.5 (contd)

DISSOLVED TRACE ELEMENTS IN OCS SEA WATER, 1976

B R NG A

SAMPLE IDENTIFY	STATION	DEPTH	micrograms /liter						
			u	Rb	Fe	Zn	co	Sb	Cs
2-16	MB 2	SURFACE	2.82	92	11.9	5.70	0.0569	0.164	0.250
3-18	MB 2	SURFACE	3.79	108	8.49	0.934	0.0268	0.148	0256
8-56	MB 8	SURFACE	2.96	102	6.11	2,93	0.0497	0.236	Q243
3-17	MB 8	BOTTOM	3.48	103	17.4	2.01	0.0451	0.155	0235
2-12	MB 14	SURFACE	2.92	102	9.87	10.5	0.0431	0.158	0.264
2-13	MB 14	BOTTOM	3.02	106	4.78	L76	0.0150	0.181	11299
1-6	MB 11	BOTTOM	3.37	104	9.61	1.08	0.0240	0.181	0.261
3-21	MB 19	BOTTOM	3.75	115	16.6	1.01	QO31O	0.176	0.268
1-5	MB 24	BOTTOM	3.49	111	11.0	5.36	0.0420	0.172	0.255
4-24	MB 30	BOTTOM	3*59	121	7.92	0.859	0.0259	0.176	0.273
3-19	MB 31	SURFACE	3.92	122	60.0	L36	0.0201	0.178	0.301
3-20	MB 31	BOTTOM	3.07	107	35.9	L42	0.0181	0.170	0.283
8-55	MB 34	SURFACE	2.88	118	5.66	1.18	0.0195	0.190	0.293
2-1o	MB 34	BOTTOM	2.36	109	16.4	0.959	0.0179	0.170	Q274
2-14	MB 37	BOTTOM	2,90	95	7.34	L24	0.0287	0.177	0.254
2-11	MB 41	BOTTOM	3.07	105	8.04	L39	0.0388	0.175	0.272
1-7	MB 43	BOTTOM	3.35	102	11.5	1.08	0.0294	0.152	Q264
3-22	MB 48	SURFACE	2.59	122	12.5	2.79	0.0247	0.188	0.281
3-23	MB 48	BOTTOM	3.50	122	12.7	L81	0.0256	0.187	0.281
1-4	MB 56	BOTTOM	3.30	112	12.9	L32	0.0364	0.171	0,272
2-8	MB 59	BOTTOM	2.98	104	15.2	L29	0.0390	0.170	0.271
1-3	MB 64	SURFACE	3.63	110	11.6	6.28	0.0214	0.172	0.247
1-1	MB 64	BOTTOM A	3.55	112	24.3	16.1	0.0259	0.163	0.238
1-2	MB 64	BOTTOM B	2.92	102	16.7	L21	0.0291	0.158	0.232

TAELE H.5 (contd)

DISSOLVED TRACE ELEMENTS IN OCS SEA WATER, 1976

EASTERN GULF OF ALASKA

SAMPLE IDENTIFY	STATION	DEPTH	micrograms/liter U	Rb	Fe	Zn	CO	Sb	Cs
8-52	EGA-2	BOTTOM	2.92	110	<5.30	0.752	0.0236	0.189	0.273
7-48	EGA-5	SURFACE	2.94	109	3.48	2.11	0.0401	0.171	0.248
7-49	EGA-5	BOTTOM	3.71	129	<250	0.684	0.0158	0.229	0280
7-47	EGA-8	SURFACE	3.52	120	7.74	0.672	0.0090	0235	0.264
7-51	EGA-8	BOTTOM	3.53	127	11.1	L10	0.0182	0.238	0.256
11-76	EGA-15	SURFACE	3.35	120	7.89	10.3	0.0152	Q 197	0.298
11-75	EGA-15	BOTTOM	3.13	111	5.49	L69	0.0372	0.212	0.272
9-61	EGA-26	SURFACE	3.40	119	5.09	3.80	0.0176	0.197	0.305
9-62	EGA-26	BOTTOM	3.43	120	5.08	0.814	0.0139	0.219	0.294
8-58	EGA-29	71 m	3.55	118	<3.90	L 18	0.0167	0.183	0.317
9-60	EGA-30	BOTTOM	3.29	112	5.07	L50	0.0272	0.205	Q283
8-57	EGA-33	SURFACE	3.56	114	2L7	0.815	0.0115	0.174	0.293
9-59	EGA-33	BOTTOM	3.66	116	10.5	L28	0.0347	0.236	0.306
6-39	EGA-44	SURFACE	3.15	114	8.67	L50	0.298	Q 100	0.0642
7-46	EGA-44	BOTTOM	2.95	105	4.24	0.985	0.0114	0.266	0.257
6-41	EGA-48	SURFACE	3.17	112	5.51	0.822	Q0103	0.196	0.275
7-45	EGA-48	BOTTOM	3.25	111	2.55	L34	0.0100	0.180	0.276
6-40	EGA-52	BOTTOM	3.31	114	<2.57	0.932	0.0827	0.262	0.294
6-44	EGA-53	SURFACE	2.81	102	5.01	21.4	Q276	0.301	0.244
5-36	EGA-53	BOTTOM	3.33	131	9.52	L10			
6-43	EGA-55	SURFACE	3.06	110	3.05	L 15	0.0300	0.184	0.255
5-32	EGA-55	BOTTOM	3.12	103	10.1	0.594	0.0285	0.173	0.293
6-42	EGA-58	BOTTOM	2.72	111	10.7	254	0.0281	Q 189	0.251
10-67	EGA-108	SURFACE	3.64	117	14.8	3.52	0.0181	0.194	(1274
10-68	EGA-108	BOTTOM	3.57	120	7.02	2.22	0.0226	0.263	0.310
11-79	EGA-110	SURFACE	3.39	117	12.4	L 18	0.0217	0.211	0.297