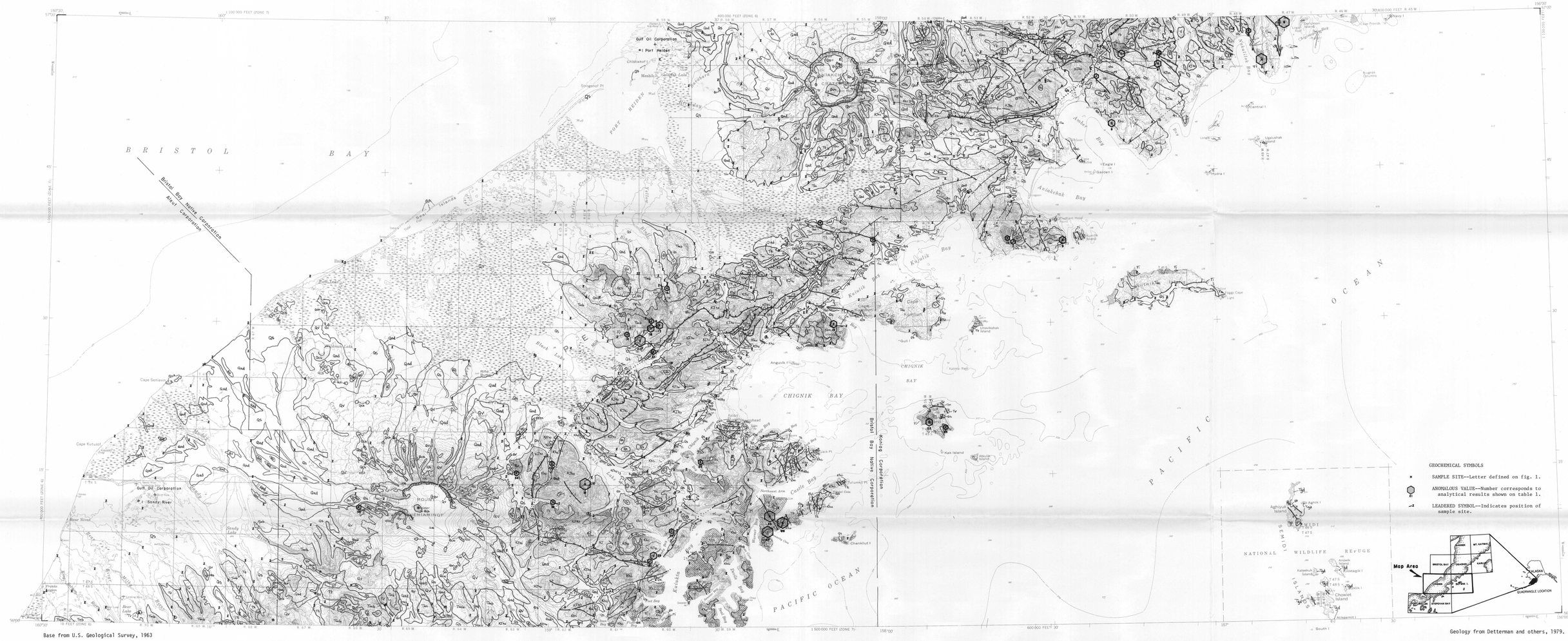
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1053E
FOLIO OF THE CHIGNIK AND SUTWIK ISLAND QUADRANGLES, ALASKA
GEOCHEMICAL MAP, Zn
SHEET 1 OF 2



Base from U.S. Geological Survey, 1963

Geology from Detterman and others, 1979.

ZINC IN NONMAGNETIC HEAVY-MINERAL-CONCENTRATE SAMPLES

SCALE 1:250 000

5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 KILOMETERS

DISCUSSION

Introduction

These geochemical maps show the distribution and abundance of zinc in the Chignik and Sutwik Island quadrangles, Alaska and are part of a folio of maps which were compiled under the auspices of the Alaska Mineral Resource Assessment Program. Background information pertaining to this folio is available in U.S. Geological Survey Circular 802 (Detterman and others, 1980).

The distribution and abundance of zinc in 637 minus-80-mesh stream-sediment samples and 623 nonmagnetic heavy-mineral-concentrate samples collected in 1977 and 1978 are shown on a subdued topographic and generalized geologic base. At each sample site a letter has been plotted on the map; letters represent analytical values of zinc expressed in ppm (parts per million) as defined on the histograms (figs. 1 and 2). Hexagons on the nonmagnetic heavy-mineral-concentrate map and squares on the stream-sediment map denote zinc concentrations which are considered to be anomalous; increasing symbol size represents increasing ranges of concentrations as defined on histograms (figs. 1 and 2). Anomalous concentrations of zinc and associated elements are tabulated by sample site in tables 1 and 2.

Sample media

The topography of the Chignik and Sutwik Island quadrangles is characteristically rugged with short, rapidly flowing mountain streams on the east and west flanks of the Aleutian Range. Where the west flank grades into tidal flats toward Bristol Bay the streams become slow and meandering. Because of earlier work, minus-80-mesh stream-sediment and nonmagnetic heavy-mineral-concentrate samples were considered to be the best sample media for the reconnaissance resource assessment of the area. In all cases the sediment samples were taken from the beds of active stream channels which were draining areas ranging from 6 to 12 km^2. The detrital material and clays composing the sediment are considered to be representative of the composition of the bedrock and colluvium within the confines of the drainage basin upstream from the sample site; analysis of this sediment may reflect the presence of mineralization. The heavy minerals were concentrated by panning the sediment to remove the dilutional effects produced by common rock-forming minerals and rock fragments, and minerals of economic importance were isolated. The concentration of heavy minerals enhances the contrast between background and anomalous values, thus making heavy-mineral-concentrate samples excellent indicators of mineral occurrences within the environment.

Sample preparation and analysis

Stream-sediment samples were air dried, sieved to minus 80 mesh, and pulverized to minus 150 mesh to produce a homogeneous sample for analysis. The heavy-mineral-concentrate samples were panned to remove a percentage of the light minerals and were then air dried. The samples were sieved to minus 20 mesh and separated using bromoform (specific gravity, 2.86) into light- and heavy-mineral fractions. The heavy-mineral fraction was passed through a Frantz Isodynamic Separator[1] to obtain a nonmagnetic fraction at a 0.6 ampere setting. The nonmagnetic fraction was then split; one fraction was used for mineralogical study and the other was pulverized with a mortar and pestle for spectrographic analysis.

Zinc in nonmagnetic heavy-mineral-concentrate samples was determined by semiquantitative emission spectroscopy (Grimes and Marranzino, 1968). The minus-80-mesh stream-sediment samples were analyzed by atomic absorption (Ward and others, 1969) for zinc. Detailed descriptions of sample preparation, analytical techniques, and tabulated results for the elements analyzed appear in Detra and others (1978).

Statistical data

The statistics presented on this map were compiled using U.S. Geological Survey STATPAC program (VanTrump and Miesch, 1977). The distribution of zinc for the entire sample set for each sample media is shown on the histograms where frequency is plotted against concentration in ppm (figs. 1 and 2). Summary statistics listed beneath each histogram were calculated using unqualified values. An unqualified value is a reported value which has not been coded with an N, L, or G, where: N indicates not detected; L indicates detected at a concentration below the lower limit of determination; G indicates detected concentration is above the upper limit of determination. Below is a listing of correlation coefficients of zinc to relevant associated elements. These coefficients (above diagonal) were computed from the number of unqualified pairs within the sample population (below diagonal). A coefficient of 1 indicates a perfect direct correlation and -1 an inverse relation); an asterisk indicates that the correlation coefficient was not computed. Correlation coefficients which are significant with a 5 percent or less chance of error are italicized.

[1]The use of commercial trade names is for descriptive purposes only and does not constitute endorsement of those products by the U.S. Geological Survey.

Correlation coefficients of zinc with associated elements

Sample media	Fe	Mn	Ag	Cu	Mo	Pb	Sn	W
Zn in stream sediments	.00/627	-.01/637	.07/5	.22/637	-.09/21	.40/614	*/1	*/0
Zn in heavy-mineral concentrates	.13/25	.22/33	.13/4	.28/33	.16/3	.21/28	-1.00/2	-1.00/2

A statistical summary of background zinc values in the major rock units of the Chignik and Sutwik Island quadrangles is presented in table 3. The background summary is based on rock samples which were considered to be compositionally representative of the rock unit from which they were taken. The method of analysis was identical to that used for the minus-80-mesh stream-sediment samples.

Distribution and nature of geochemical anomalies

The most notable anomaly patterns of zinc (best distinguished on the nonmagnetic heavy-mineral-concentrate map) occur in the areas of Cathedral Creek (T. 43 S., R. 60 W.) and north of Ship Mountain (T. 46 S., R. 58 W.). These anomalous concentrations are associated with plutons of varying composition shown as unit Ti on the generalized geologic map.

Two areas showing significant concentrations of zinc in both heavy-mineral concentrates and stream sediments are located on Nakchamik Island (T. 44 S., R. 54 W.) and Cape Kumlik (T. 41 S., R. 52 W.). These areas are probably associated with intrusive centers of diorite composition, denoted as unit Ti on the geologic map.

Characteristics of the better defined anomaly patterns of zinc suggest the possibility of porphyry-type mineralization where hydrothermal zoning has produced (1) a core enriched in copper, molybdenum, and locally, tungsten centered on the instrusive; (2) an adjacent halo of copper, lead, zinc, silver, arsenic, and (or) gold; and (3) a peripheral halo produced by tin and bismuth anomalies. The poorly patterned zinc anomalies in this area may be a response to similar porphyry-type mineralization which is weak or concealed.

Scattered anomalous zinc values in stream-sediment and heavy-mineral concentrate samples which are in the lower anomalous concentration ranges may reflect background values related to source rock (table 3) and are not necessarily an indication of significant mineralization.

Many of the geochemical patterns have a close spatial correlation with conspicuous aeromagnetic anomalies (U.S. Geological Survey, 1978); of special interest are correlations near Devil's Bay, Cathedral Creek Area, and near Cape Kumlik.

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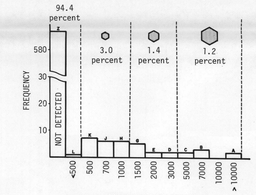

Figure 1.--Histogram for zinc in 623 nonmagnetic heavy-mineral-concentrate samples, Chignik and Sutwik Island quadrangle, Alaska, showing: symbols denoting anomalous concentrations, percentage of total number of samples represented by each range, and letters corresponding to concentrations in parts per million. Statistics are based on all unqualified values (33) within the sample population; arithmetic mean, 1884.8; standard deviation, 1997.7; geometric mean, 1261.9; geometric deviation, 2.3.

Table 1.--*Copper, lead, molybdenum, and silver associated with anomalous zinc values in nonmagnetic heavy-mineral-concentrate samples, Chignik and Sutwik Island quadrangles, Alaska*

[Values reported in parts per million; values shown were determined by semiquantitative emission spectroscopy; N, not detected; L, detected but below value shown; G, detected at a concentration above value shown; lower limits of detection for Pb, Mo, and Ag are 20, 10, and 1 ppm, respectively; *, anomalous concentrations of Cu, Pb, Mo, or Ag. Map number corresponds to sample site on heavy-mineral-concentrate map]

Map no.	Field no.	Zn	Cu	Pb	Mo	Ag
1	SW601	7,000	700*	70	70*	5*
2	008	500	50	N	N	N
3	006	G10,000	15	N	N	N
4	026	500	300	100	N	5*
5	021	1,500	100	70	N	N
6	020	1,500	15	N	N	N
7	035	700	100	50	N	N
8	033	1,500	200	300*	N	N
9	092	1,500	3,000*	5,000*	N	300*
10	097	500	2,000*	1,000*	N	5*
11	094	700	1,000*	1,000*	N	5*
12	CK027	700	500	20	N	N
13	088	1,000	15	N	N	N
14	372	1,000	100	70	N	N
15	159	2,000	7,000*	20	N	N
16	240	700	300	100	N	N
17	413	2,000	300	70	20*	7*
18	254	3,000	2,000*	70	N	N
19	237	1,000	150	150*	N	N
20	415	5,000	300	150*	N	5*
21	259	1,000	100	50	N	N
22	SW125	1,500	700*	100	N	N
23	131	500	150	70	N	7*
24	CK070	500	1,000*	70	N	N
25	139	G10,000	70	20	N	2*
26	138	7,000	1,000*	70	N	2*
27	560	5,000	100	2,000*	N	15*
28	044	700	70	70	N	N
29	040	3,000	1,500*	100	N	N
30	039	700	70	20	N	N
31	248	7,000	3,000*	500*	N	150*
32	265	1,000	2,000*	100	70*	N
33	241	500	300	70	N	N
34	170	1,000	15	N	N	N
35	281	500	500	20	N	N

DISTRIBUTION AND ABUNDANCE OF ZINC IN MINUS-80-MESH STREAM-SEDIMENT AND NONMAGNETIC HEAVY-MINERAL-CONCENTRATE SAMPLES, CHIGNIK AND SUTWIK ISLAND QUADRANGLES, ALASKA

By
D. E. Detra and R. M. O'Leary

1980

This map is one of a series, all bearing the number MF-1053. Background information relating to this map is published as U.S. Geological Survey Circular 802 available free from Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, VA 22202

INTERIOR--GEOLOGICAL SURVEY, RESTON, VIRGINIA--1980

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