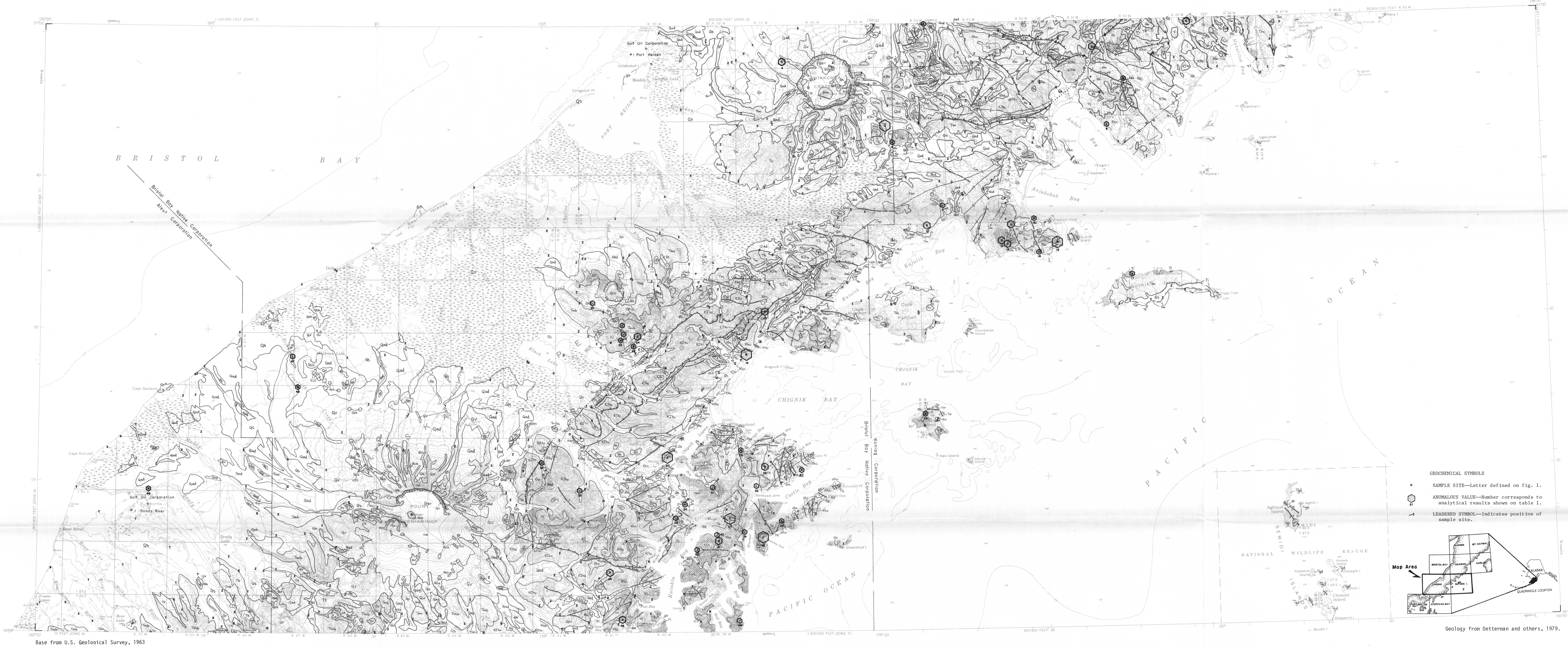

Base from U.S. Geological Survey, 1963

Geology from Detterman and others, 1979.

LEAD IN NONMAGNETIC HEAVY-MINERAL-CONCENTRATE SAMPLES

SCALE 1:250 000

5 0 5 10 MILES

5 0 5 10 KILOMETERS

DISCUSSION

Introduction

These geochemical maps show the distribution and abundance of lead 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 lead 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 lead 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 lead 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 lead 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 250 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.

Lead in minus-80-mesh stream-sediment samples and nonmagnetic heavy-mineral-concentrate samples was determined by semiquantitative emission spectroscopy (Grimes and Marranzino, 1968). 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 lead 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 lead to relevant associated elements. These coefficients (above diagonal) are 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 lead with associated elements

Sample media	Fe	Mn	Ag	Cu	Mo	Sn	W	Zn
Pb in stream sediments	*.12*/607	*.24*/614	.21/5	*.37*/614	-.04/21	*/1	*/0	*.40*/614
Pb in heavy-mineral concentrates	-.03/203	-*.22*/231	.27/23	*.32*/228	.20/19	-.04/14	-.26/13	.21/28

A statistical summary of background lead 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 lead in both minus-80-mesh stream-sediment and nonmagnetic heavy-mineral-concentrate samples occur in the area surrounding Warner Bay (T. 46 S., R. 58 W.) and Cape Kumlik (T. 41 S., R. 52 W.). A less significant pattern of lead anomalies occurring in heavy-mineral concentrates is located on Cathedral Creek (T. 43 S., R. 60 W.). These three locations of possible mineralization are all associated with plutons of quartz diorite or diorite which are shown as unit Ti on the generalized geologic map. One galena occurrence in the nonmagnetic heavy-mineral concentrates from a sample site on Cape Kumlik was reported by Tripp and Detra (1980).

Scattered anomalous lead concentrations in heavy-mineral-concentrate samples distributed over the quadrangles are probably related to small intrusive centers ranging in composition from quartz diorite, to diorite, to gabbro. The lack of any significant lead content in some of the stream-sediment samples at some sites suggests that the lead sources are small and that there are strong dilutional effects from the barren source rocks. It should be noted that, for the sample taken at map number 30 on the heavy-mineral-concentrate map, the anomalous lead value may have been derived from contamination.

Characteristics of the better defined anomaly patterns of lead 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 intrusive; (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 lead anomalies in this area may be a response to similar porphyry-type mineralization which is weak or concealed.

Scattered anomalous lead values in minus-80-mesh stream-sediment samples which are in the lower anomalous concentration ranges may reflect background values related to source rock (table 3) and not necssarily 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.

References

Burk, C. A., 1965, Geology of the Alaska Peninsula--Island arc and Continental margin: Geological Society of America Memoir 99, 250 p.

Detra, D. E., Cooley, E. F., Hopkins, R. T., Jr., O'Leary, R. M., and Jefferis, D. R., 1978, Final results and statistical summary from analyses of stream-sediment and heavy-mineral-concentrate samples, Chignik and Sutwik Island quadrangles, Alaska: U.S. Geological Survey Open-File Report 78-1090, 105 p.

Detterman, R. L., Case, J. E., Cox, D. P., Detra, D. E., Miller, T. P., and Wilson, F. H., 1980, The Alaskan Mineral Resource Assessment Program: Background information to accompany folio of geologic and mineral resource maps of the Chignik and Sutwik Island quadrangles, Alaska: U.S. Geological Survey Circular 802.

Detterman, R. L., Miller, T. P., Yount, M. E., and Wilson, F. H., 1979, Generalized geologic map of the Chignik and Sutwik Island quadrangles, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1053 A, 1 sheet, scale 1:250,000.

Galloway, W. E., 1974, Deposition and diagenetic alteration of sandstone in northeast Pacific arc-related basins: implications for graywacke genesis: Geological Society of America Bulletin, v. 85, no. 3, p. 379-390.

Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for the semiquantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.

Tripp, R. B., and Detra, D. E., 1980, Maps showing mineralogical data of selected minerals for the nonmagnetic heavy-mineral concentrates of stream sediments in the Chignik and Sutwik Island quadrangles, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1053 I, 2 sheets, scale 1:250,000.

U.S. Geological Survey, 1978, Aeromagnetic map of Chignik and Sutwik Island quadrangles, Alaska: U.S. Geological Survey Open-File Report 78-263, 11 plates, scale 1:63,360.

VanTrump, George, Jr., and Miesch, A. T., 1977, The U.S. Geological Survey RASS-STATPAC system for management and statistical reduction of geochemical data: Computers and Geosciences, v. 3, p. 475-488.

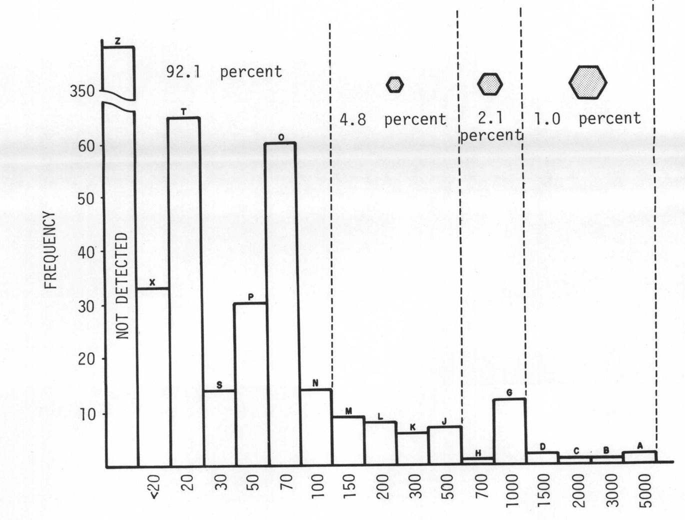

Figure 1.--Histogram for lead in 623 nonmagnetic heavy-mineral-concentrate samples, Chignik and Sutwik Island quadrangles, Alaska, showing: symbols denoting anomalous concentrations, percentage of total number of samples represented by each range, and letters corresponding to concentrations in parts per million. Statistics are based on all unqualified values (232) within the sample population; arithmetic mean, 205.9; standard deviation, 564.1; geometric mean, 68.6; and geometric deviation, 3.4.

Table 1.--*Copper, zinc, molybdenum, and silver associated with anomalous lead 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; lower limits of detection for Zn, Mo, and Ag are 500, 10, and 1 ppm, respectively; *, anomalous concentrations of Cu, Zn, Mo, or Ag. Map number corresponds to sample site on heavy-mineral-concentrate map]

Map no.	Field no.	Pb	Cu	Zn	Mo	Ag
1	SW016	1,000	200	N	N	N
2	039	1,000	150	N	20*	N
3	158	200	15	N	N	N
4	CG509	1,000	30	N	N	N
5	SW023	150	3,000*	N	20*	N
6	033	300	200	1,500*	N	N
7	145	1,500	15	N	N	N
8	144	500	500	N	200*	N
9	107	200	20	N	N	700*
10	113	1,000	100	N	N	7
11	088	1,000	500	N	N	10*
12	090	150	1,000*	N	N	N
13	097	1,000	2,000*	500*	N	5
14	094	1,000	1,000*	700*	N	5
15	092	5,000	3,000*	1,500*	N	300*
16	093	300	7,000*	N	N	5*
17	098	300	200	N	N	5
18	CG200	1,000	70	N	N	N
19	197	3,000	1,000*	N	N	10
20	420	200	100	N	N	N
21	236	300	5,000*	N	N	N
22	416	500	300	N	N	N
23	237	150	150	1,000*	N	N
24	414	1,000	500	N	N	7
25	415	150	300	5,000*	N	5
26	SW127	150	500	N	N	N
27	CG151	150	500	N	N	N
28	145	1,000	700*	N	N	10
29	166	150	1,000*	N	N	N
30	407	5,000	700*	N	N	15*
31	172	200	70	N	20*	N
32	243	300	1,000*	N	N	15
33	248	500	3,000*	7,000*	N	150*
34	174	300	200	N	N	N
35	144	200	300	N	150*	N
36	409	200	100	N	N	N
37	048	1,500	500	N	N	2
38	137	200	200	N	500*	N
39	061	500	70	N	700*	N
40	050	500	1,500*	N	N	N
41	051	1,000	150	N	N	N
42	060	2,000	100	5,000*	N	15
43	052	500	70	N	N	N
44	073	700	700*	N	N	N
45	076	1,000	1,500*	N	N	N
46	067	500	500	N	N	N
47	307	200	15	N	N	5
48	306	150	15	N	N	N
49	450	150	30	N	N	N

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

By
D. E. Detra and R. T. Hopkins, Jr.

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

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