CHAPTER 6

Rock, Stream Sediment, and Heavy-Mineral Concentrate Geochemical Data from Unga and Western Popof Islands, Alaska Peninsula, Alaska

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Geological and Geophysical Setting of the Gold-Silver Vein Systems of Unga Island, Southwestern Alaska

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INTRODUCTION

The data reported here was collected during the 1982-1988 mineral resource assessment of the Port Moller and adjacent quadrangles (see Wilson and others, 1996). Analytical data for virtually all of the samples reported here has been previously published in a series of U.S.G.S. Open-File reports, including Angeloni and others (1985), Arbogast and others (1987), and Wilson and others (1987). Induction-coupled plasma (ICP) data is reported here for the first time on stream sediment samples resulting from analyses conducted by S.E. Church in the early 1990's. We have selected a subset of the Port Moller assessment data for inclusion in this report.

SAMPLE DATA

Sampling of rocks for geochemical analysis was conducted in conjunction with geologic mapping (Angeloni and others, 1985; Wilson and others, 1987). Additional rock samples were also collected during stream-sediment sampling (Arbogast and others, 1987). In total, more than 2,700 rock samples were collected and analyzed for the Port Moller study and 321 of those are included here (Geochemistry folder). We attempted to obtain a detailed sampling of all rock types and geologic units; however, samples collected from areas of exposed rock alteration tend to be over-represented. The samples collected are primarily single grab samples though a few composite samples were collected. A large proportion of the rock samples collected during stream-sediment sampling (their sample id's are prefixed with the letters PM) were stream cobbles or float; however, these represent less than 10 percent of the total data set.

Stream sediment samples were collected at 787 sites for the Port Moller study (Arbogast and others, 1987) during the 1983 to 1985 field seasons. At 768 of those sites, heavy-mineral concentrate samples were also collected by panning at the site. In 1984, replicate heavy-mineral concentrate samples were collected at 161 sites; these replicates were used for gold analyses. Of these samples 87 stream-sediment (Geochemistry folder) and 86 heavy-mineral concentrate (Geochemistry folder) samples were from the Unga project area. Stream-sediment samples were collected from active alluvium in first- and second-order streams shown on 1:63,360-scale topographic maps. Arbogast and others (1987) indicated that "*** each sample was composited from several localities within an area ***" that may extend over as much as 60 m of stream length. Heavy-mineral concentrate samples, also composites, were screened through a 2-mm (10 mesh) screen and then panned until most lower density and clay-sized material were removed. Prior to analysis, stream-sediment samples were passed through a 0.17-mm (80-mesh) sieve and only the finer fraction was analyzed. Heavy-mineral concentrate samples were passed through a 0.6-mm (30-mesh) sieve, then separated in bromoform to remove all material of less than 2.85 g/cm^3 density. The resulting concentrate was separated into three magnetic fractions; the least magnetic of which was split for spectrographic and mineralogical analysis.

ANALYSIS OF GEOCHEMICAL SAMPLES

The rock, stream sediment, and heavy-mineral concentrate samples were analyzed for 31 elements using a semi-quantitative direct-current arc emission spectrographic method (Grimes and Marranzino, 1968) and for additional elements by atomic absorption or instrumental methods (see Arbogast and others, 1987; Angeloni and others, 1985; and Wilson and others, 1987). Frisken and Arbogast (1992a) showed the distribution of selected elements in stream-sediment samples. Frisken and Arbogast (1992b) examined the nonmagnetic heavy-mineral concentrate samples under a binocular microscope to determine mineralogies present; however, 19 samples were too small for a mineralogical split and were not examined.

STATISTICAL ANALYSIS

Statistical analysis of the rock, stream sediment, and heavy-mineral concentrate sample analytical data helped to determine thresholds for anomalous concentrations. Anomaly threshold levels for rock samples used in this report were determined based statistical analysis of a data set of more than 5,000 samples collected throughout the Alaska Peninsula. This larger data set represents samples collected during a series of mineral resource assessment studies on the Alaska Peninsula. Anomaly thresholds for the rocks were chosen approximating the 90th percentile for moderately anomalous samples and 98th percentile for highly anomalous samples. Anomaly thresholds for the stream sediment and heavy-mineral concentrate samples were determined by inspection of the data set included here. However, Frisken (1992) discusses an interpretation of the stream sediment and Heavy-mineral concentrate data for the Port Moller mineral resource assessment area. Not included here are data from samples on the Shumagin prospect reported by White and Queen (1989).

Table 1. Anomaly thresholds for rock, stream sediment, and heavy-mineral concentrate samples from Unga and western Popof Islands

[*Arsenic (As) threshold for stream sediment samples is based ICP analysis. No stream sediment samples had detectable gold (Au) at a 10 ppm threshold using emission spectrographic analysis. Molybdenum (Mo) threshold for stream sediment samples was 7 ppm based on emission spectrographic (S) analysis and 1.5 ppm based on ICP analysis. For lead (Pb) the respective thresholds were 100 based emission spectrographic analysis and 40 based on ICP analysis. Similarly, for zinc (Zn) the respective thresholds were 500 and 100 ppm.]

Element	**Rocks -- 90th percentile (ppm)**	**Rocks -- 98th percentile (ppm)**	**Stream sediments (ppm)**	**Heavy-mineral concentrates (ppm)**
Silver (Ag)	0.35	2.0	1	10
Arsenic (As)	20	140	40*	700
Gold (Au)	.0014	.02	--*	100
Copper (Cu)	150	300	100	100
Molybdenum (Mo)	5	20	7*	20
Lead (Pb)	30	70	100	100
Tin (Sn)	6	10	10	50
Zinc (Zn)	110	200	500*	700

The drainage basins that the stream sediment and heavy-mineral concentrate samples represent were outlined on a 1:63,360-scale topographic map. These drainage basins were color coded (Plate 2) based the order of the stream, defined generally as first-order here unless a drainage basin included basins that also had been sampled. These larger basins were considered second order basins. The locations of rock samples were also plotted on the same map. Then, using the thresholds of table 1, a series of anomaly maps were prepared, coloring basins having heavy-mineral concentrate samples anomalous in the chosen element in light blue and anomalous stream sediment samples in red. If a basin had anomalies in both types of samples, only the heavy-mineral concentrate color is shown. Anomalous rock sample localities were also plotted on the same series of maps.

Silver and gold anomaly maps (Plate 3) show anomalous values in basins draining areas of known mineralization such as the Suzy Adit and the Battle Mountain Gold Co. Centennial prospect on Popof Island and the Shumagin prospect on southeastern Unga Island. Neither the Apollo Mine nor the Apollo-trend contributed to the development of stream sediment or heavy-mineral concentrate anomalies in the basins that drain this area. However, rock samples show a wider distribution of anomalies, evenly distributed throughout the older volcanic and volcaniclastic rocks of the Meshik Volcanics (informally called the Popof volcanic rocks unit, see Wilson and others, 1995 and Riehle and others, Chapter 2). Anomalous copper, lead, and zinc stream sediment and heavy-mineral concentrate samples tend to match the distribution of silver and gold and in addition, with molybdenum, highlight the basins draining the inferred Zachary copper porphyry prospect southeast of Zachary Bay. Unexplained molybdenum anomalies in rock, stream sediment, and heavy-mineral concentrate also show up on the extreme southwestern part of Unga Island. Tin was not considered likely to have resource potential during the Port Moller resource assessment, nevertheless a series of tin anomalies in heavy-mineral concentrate samples are co-located with basins showing anomalous silver and gold near known mineralization. Tin also showed up in a few rock samples also near known mineralization.

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