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HISTOGRAMS AND CORRELATION TABLE FOR  
SELECTED ELEMENTS IN SAMPLES OF THE  
ASH OF BLACK SPRUCE NEEDLES FROM THE  
TANACROSS QUADRANGLE, ALASKA

By

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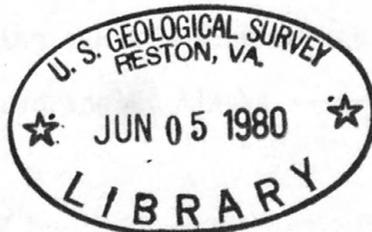
G. C. Curtin, G. W. Day, and R. B. Tripp

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## DISCUSSION

These histograms and correlation table show the distribution and abundance of, and correlations between, the populations of 21 elements in the ash of black spruce (Picea Mariana B.S.P.) needles collected throughout most of the Tanacross 1:250,000-scale quadrangle. The samples were collected during reconnaissance geochemical studies as part of the U.S. Geological Survey's Alaskan Mineral Resource Assessment Program. Related data for black spruce are presented in other reports (Day, Curtin, and Tripp, 1979 a,b,c), and background information on the mineral resource assessment of the Tanacross quadrangle is presented in a U.S. Geological Survey Circular (Foster and others, 1976).

## COLLECTION, PREPARATION, AND ANALYSIS OF SAMPLES

Samples of black spruce needles were collected along streams near sites where stream sediments, heavy-mineral concentrates and other samples were obtained.

Several branches from each of 2 or 3 trees were sampled at each site to produce a composite sample. The last 3 to 5 years' growth of needles and twigs were pruned from the branches, placed in cloth bags and allowed to dry. The needles were separated from the twigs and finely chopped in a blender. This composition was then ashed in a furnace at a peak temperature of approximately 500°C for 24 hours.

The ashed material was analyzed by an optical emission spectrographic method for plant materials (Mosier, 1972) for 29 elements including the 21 elements whose distributions are shown in the histograms. Elements not present in measurable amounts are: arsenic, gold, beryllium, bismuth, lanthanum, antimony, scandium, and yttrium.

The results were entered into the computerized Rock Analysis Storage System (RASS) of the U.S. Geological Survey (Van Trump and Miesch, 1977) and data sets were analyzed by statistical programs in the U.S. Geological Survey's STATPAC system to produce the tabular statistics for the histograms and the correlation table. Arithmetic means, standard deviations, geometric means, and geometric deviations are shown for those element distributions in which there are less than 5 percent censored values. The correlation coefficients in the correlation table (table 1) that are in bold type are statistically significant at the 5 percent error level.

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- Day, G. W., Curtin, G. C., and Tripp, R. B., 1979c, Spectrographic analyses of the ash of ground birch leaves and black spruce needles from the Tanacross quadrangle, Alaska: U.S. Geological Survey Open-File Report 79-1355.
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- Foster, H. L., Albert, N. R. D., Barnes, D. F., Curtin, G. C., Griscom, Andrew, Singer, D. A., and Smith, J. G., 1976, The Alaskan Mineral Resource Assessment Program: Background information to accompany folio of geologic and mineral resource maps of the Tanacross quadrangle, Alaska: U.S. Geological Survey Circular 734, 23 p.
- Mosier, E. L., 1972, A method for semiquantitative spectrographic analysis of plant ash for use in biogeochemical and environmental studies: *Applies Spectroscopy*, v. 26, no. 6, p. 636-640.
- Van Trump, 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.

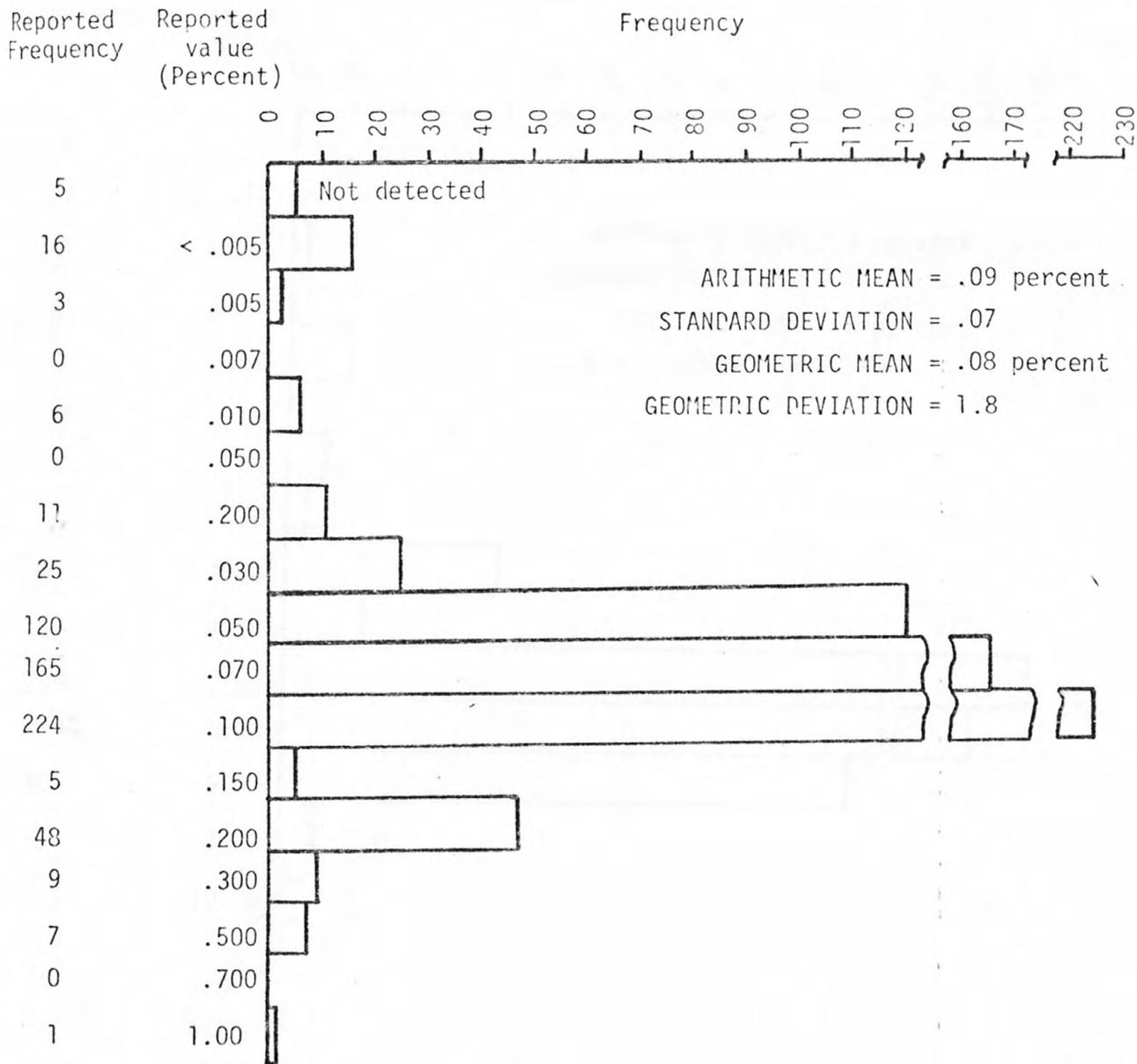


Figure 1.--Histogram showing iron, in percent, in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

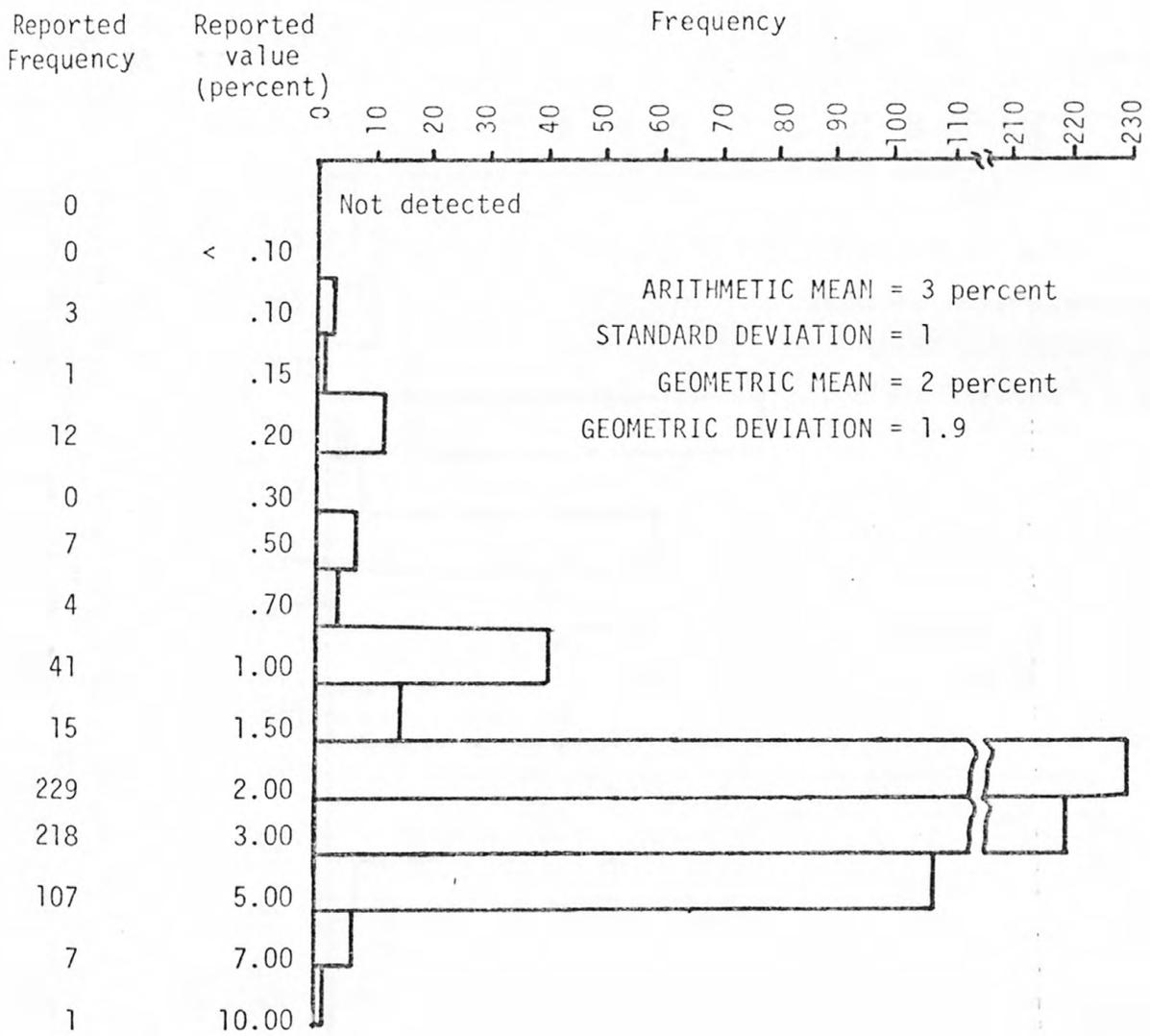


Figure 2.--Histogram showing magnesium, in percent, in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

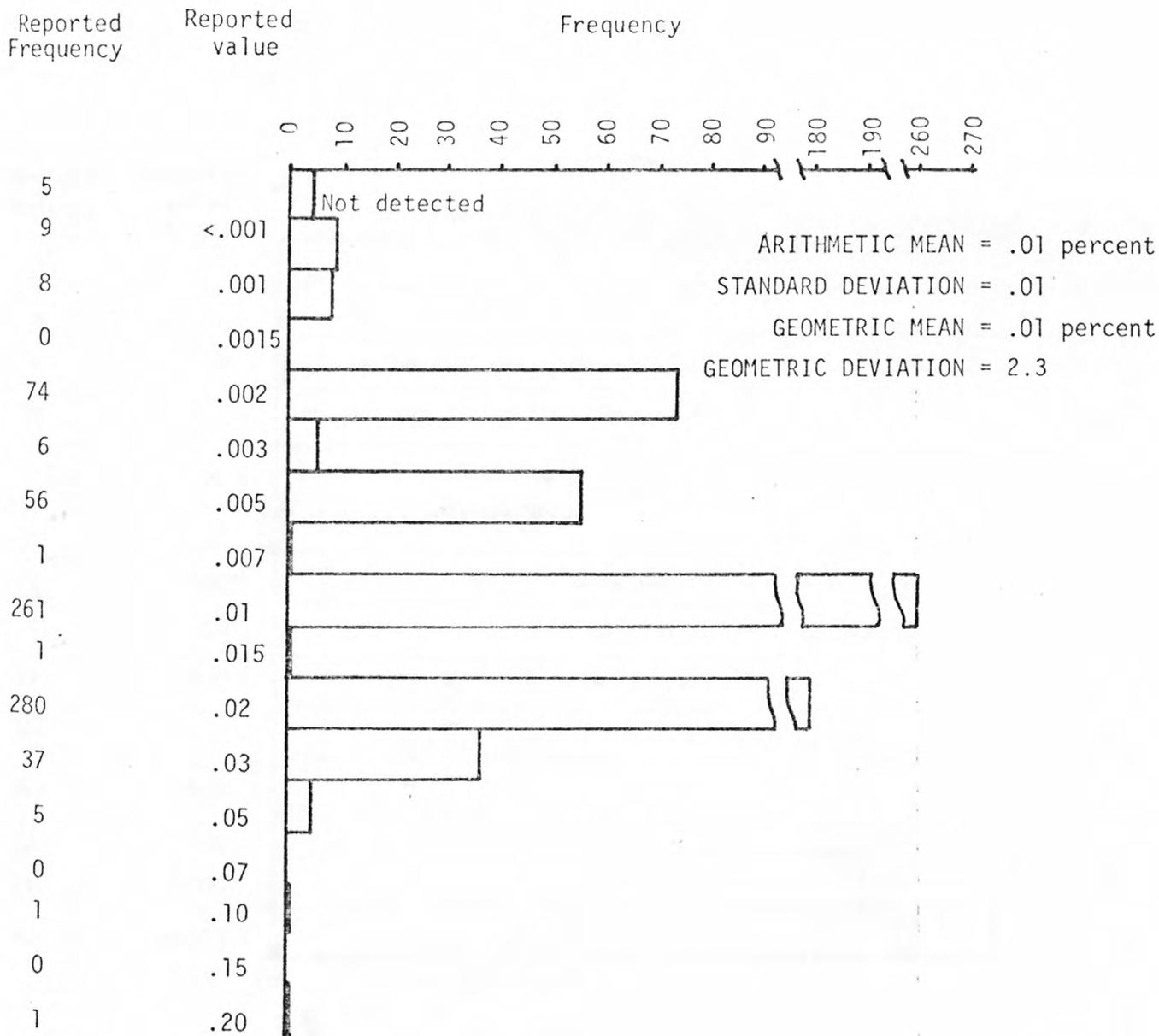


Figure 3.--Histogram showing titanium, in percent, in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

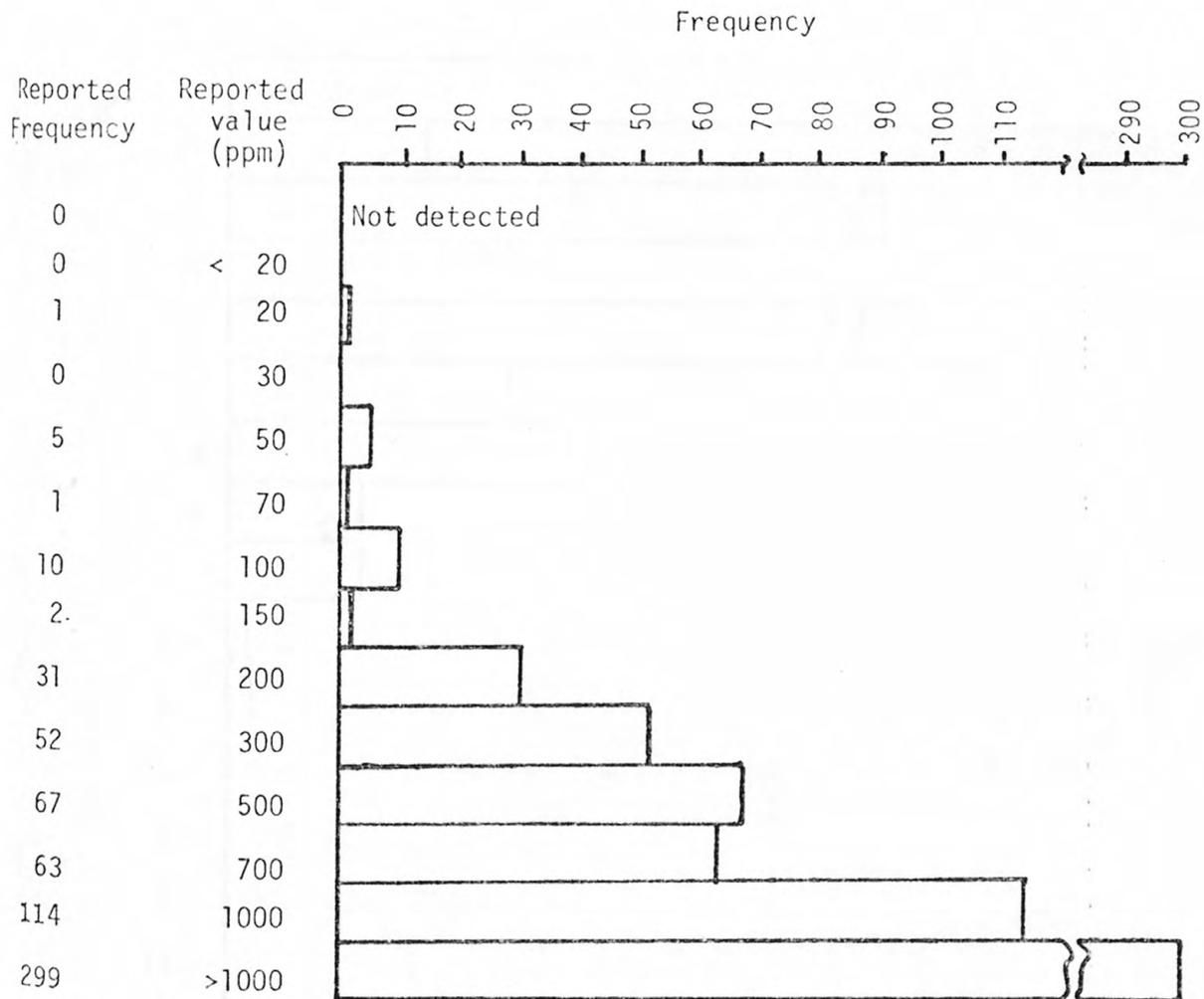


Figure 4.--Histogram showing manganese, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

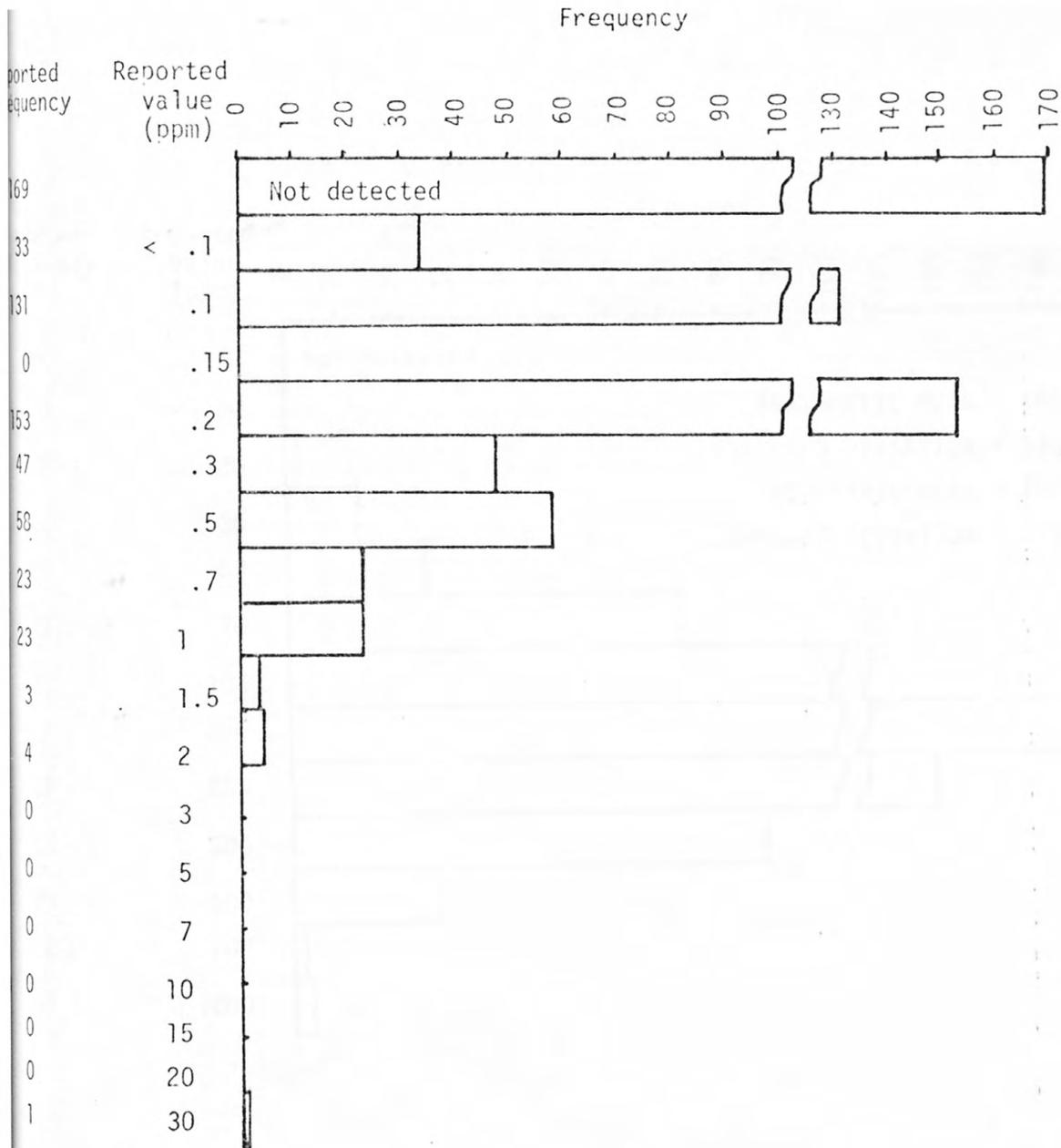


Figure 5.--Histogram showing silver, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

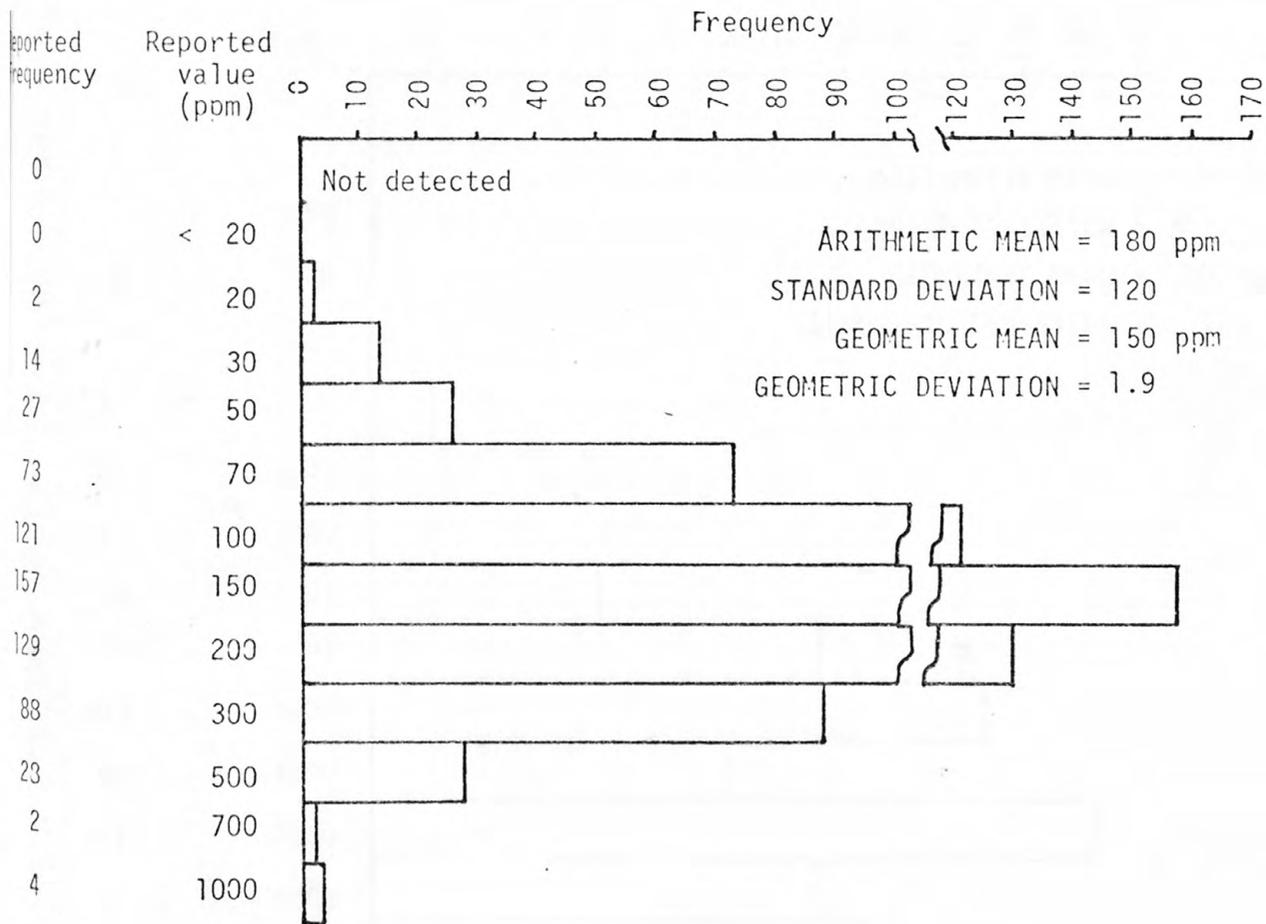


Figure 6.--Histogram showing boron, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

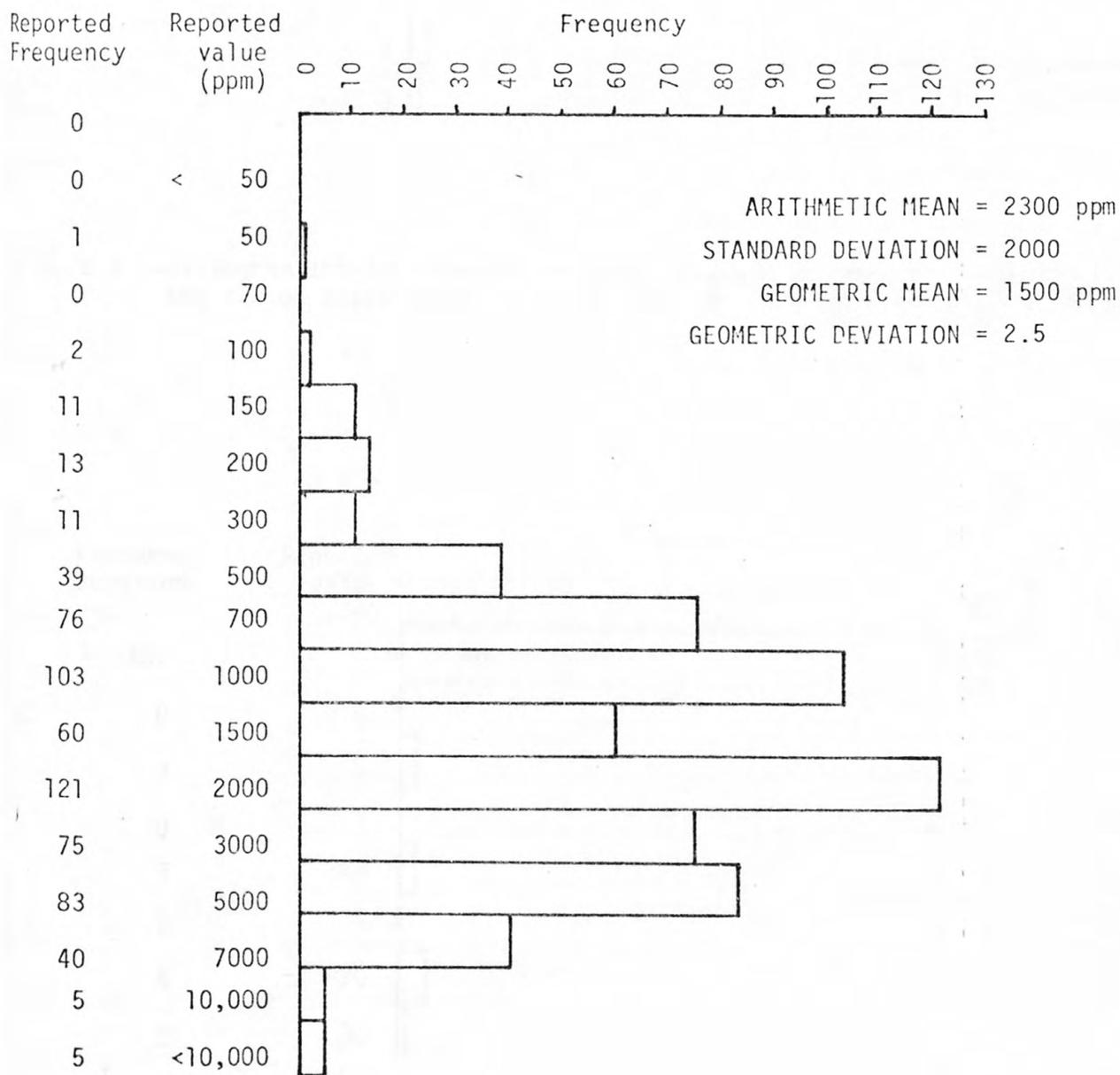


Figure 7.--Histogram showing barium, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

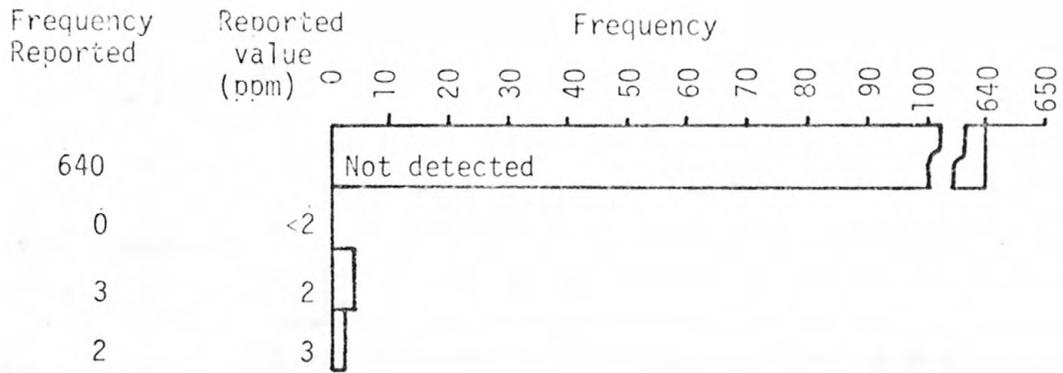


Figure 8.--Histogram showing cadmium, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

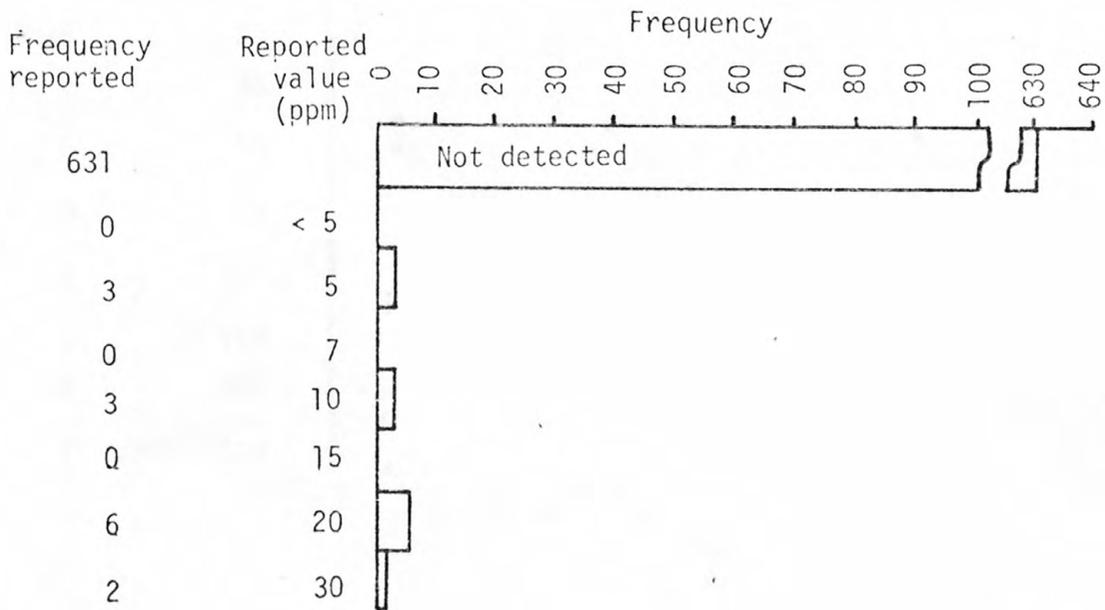


Figure 9.--Histogram showing cobalt, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

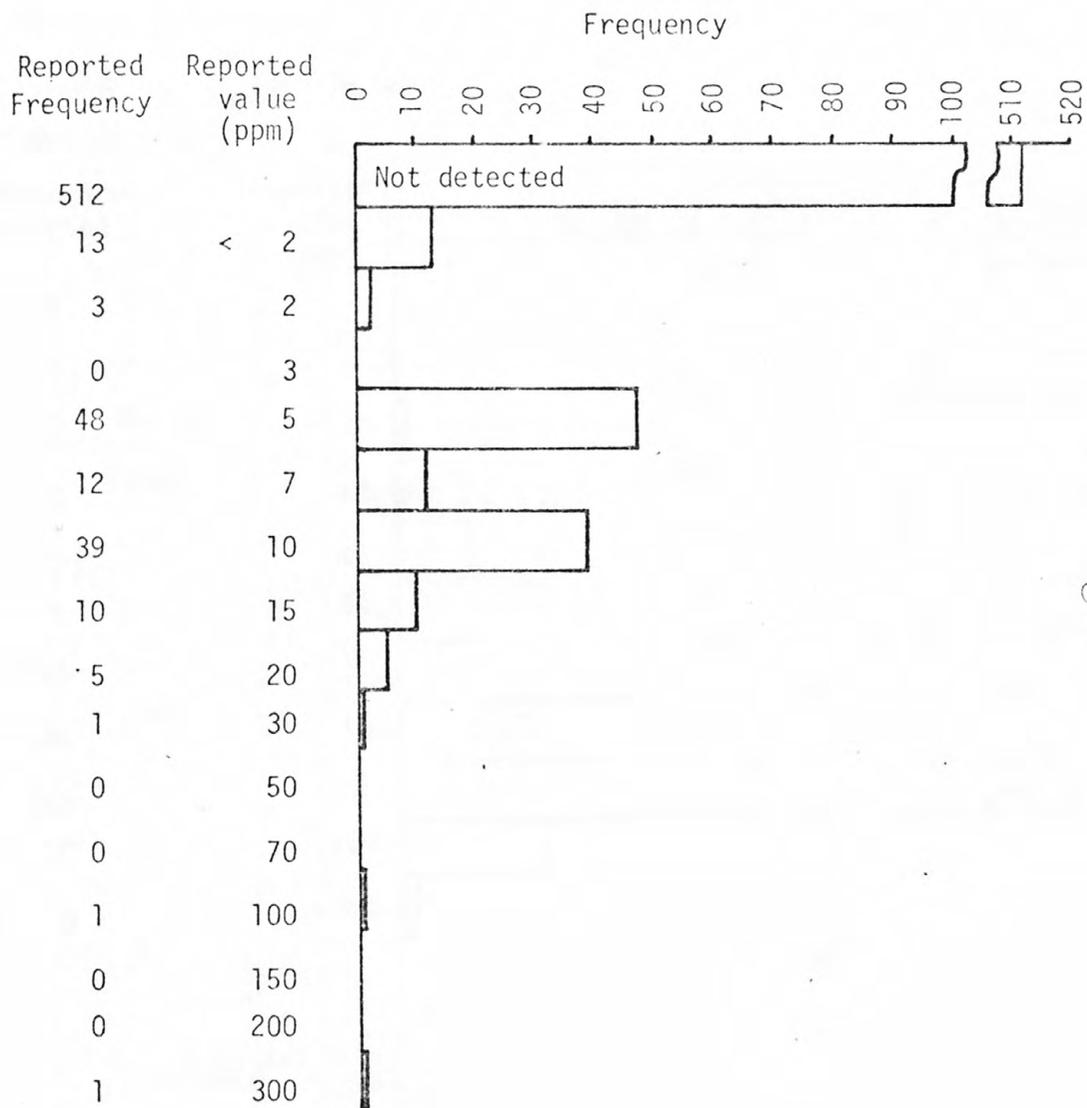


Figure 10.--Histogram showing chromium, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

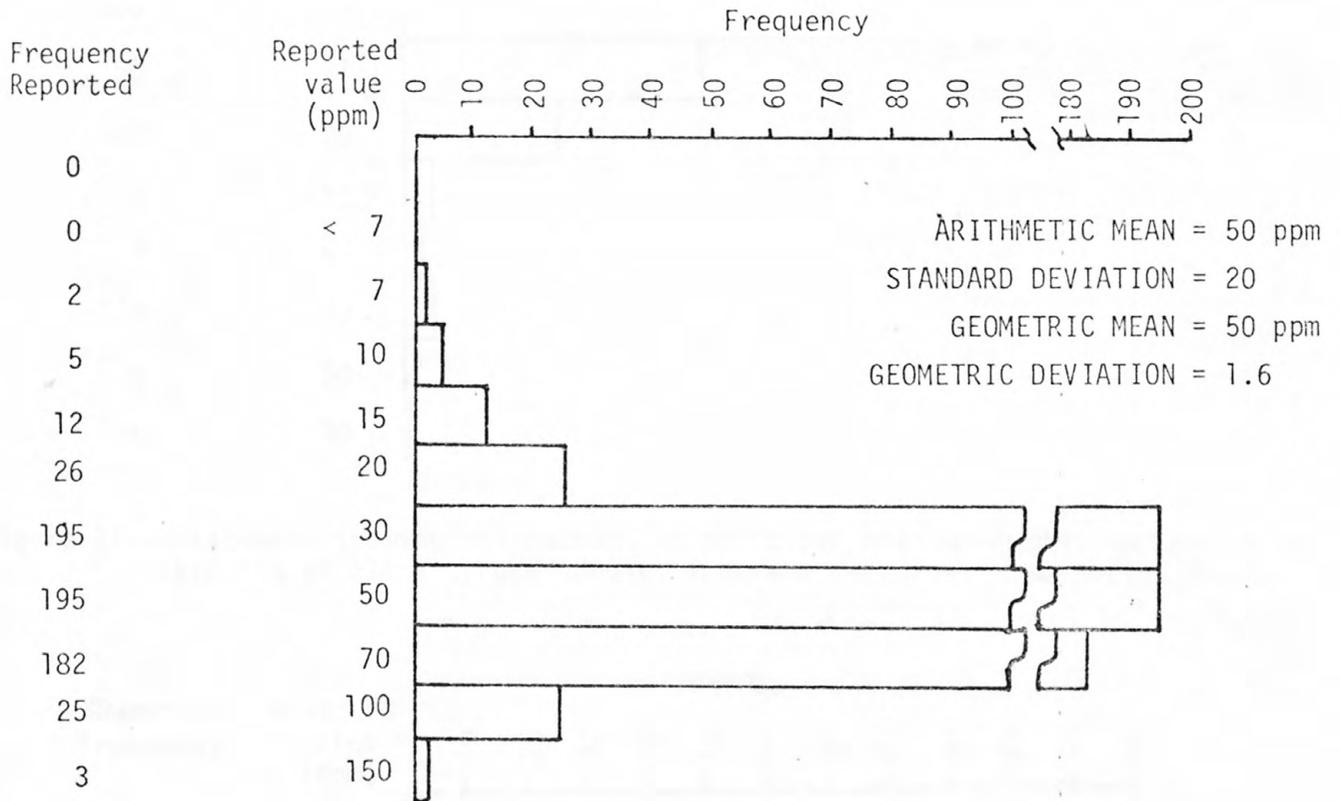


Figure 11.--Histogram showing copper, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

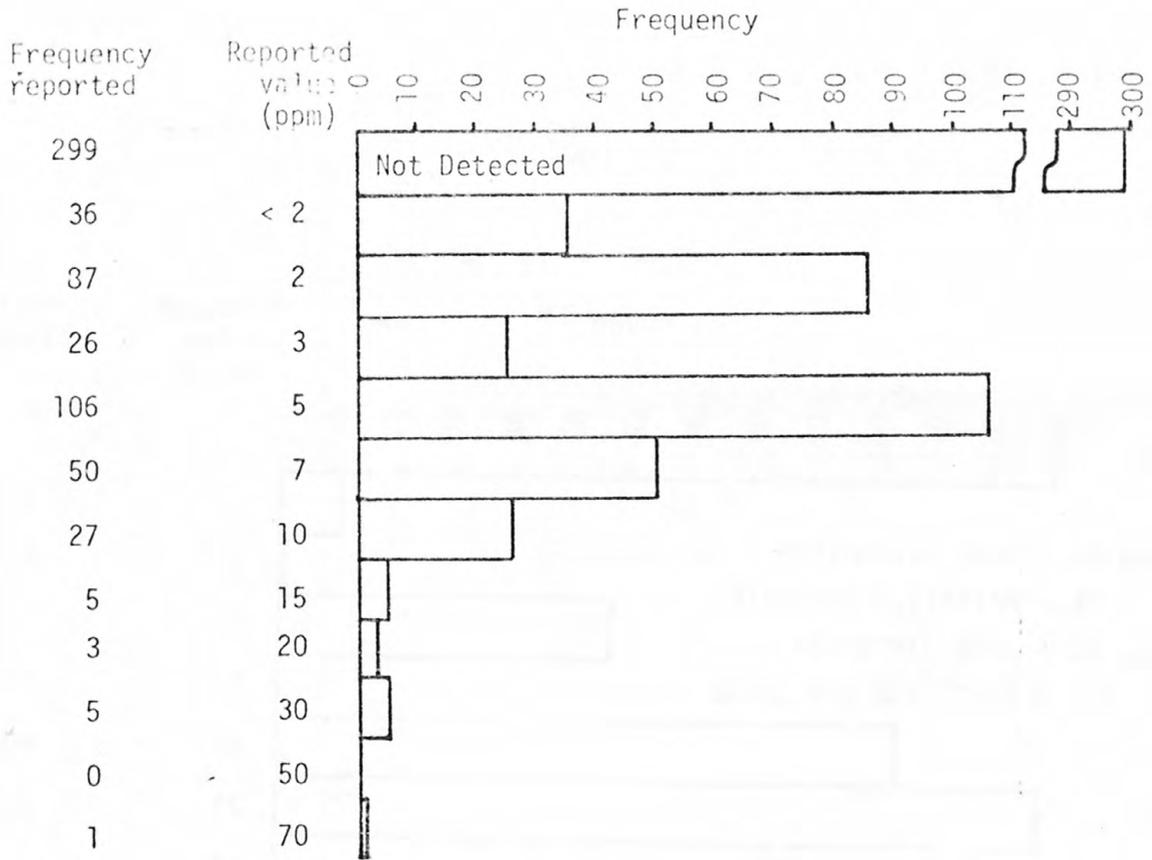


Figure 12.--Histogram showing molybdenum, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

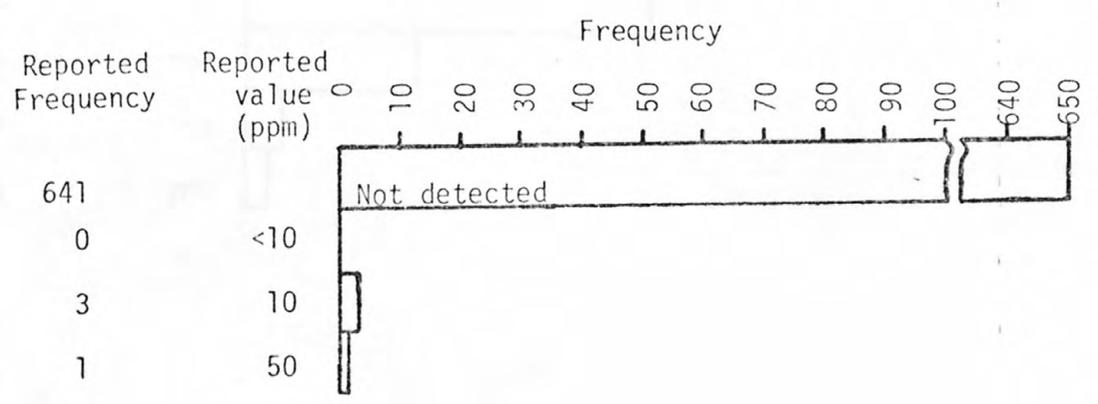


Figure 13.--Histogram showing niobium, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

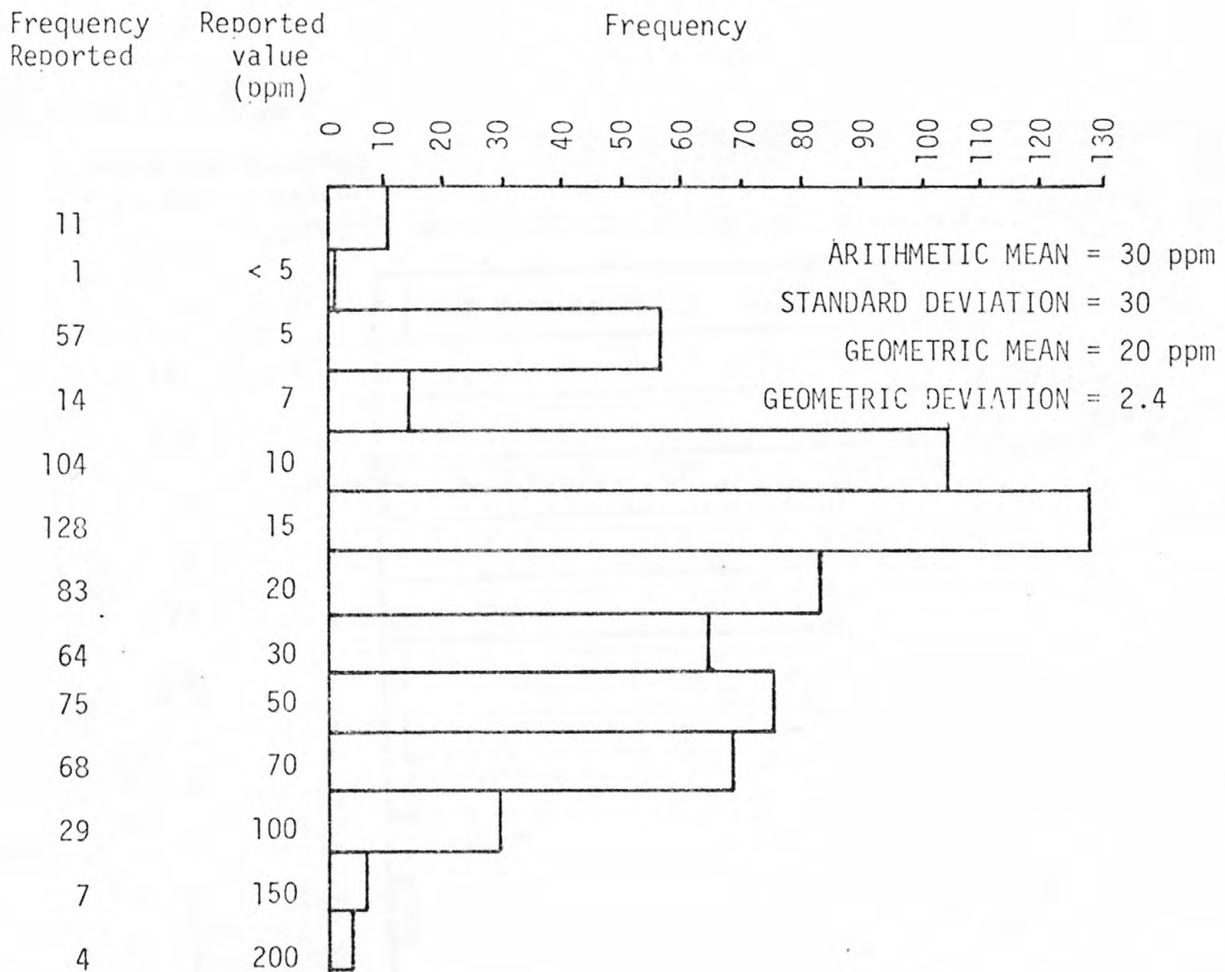


Figure 14. Histogram showing nickel, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

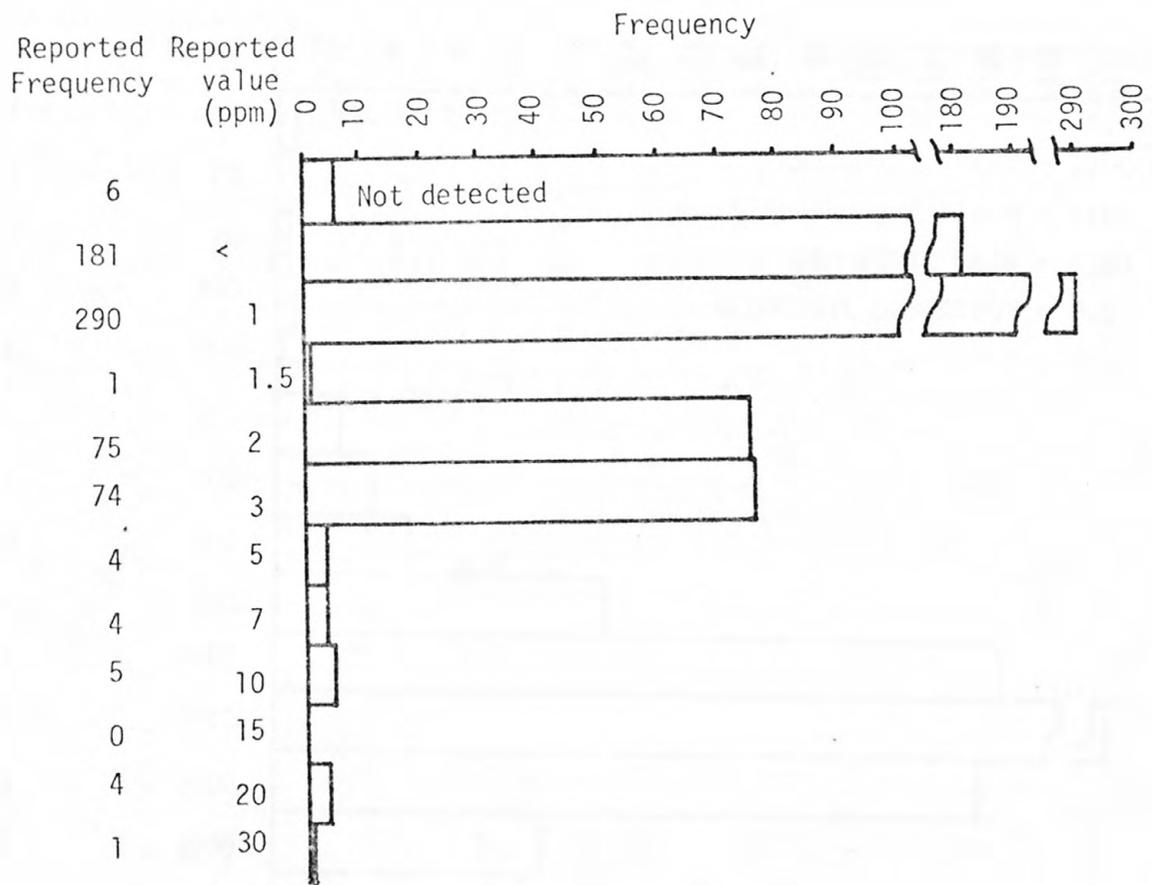


Figure 15.--Histogram showing lead, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

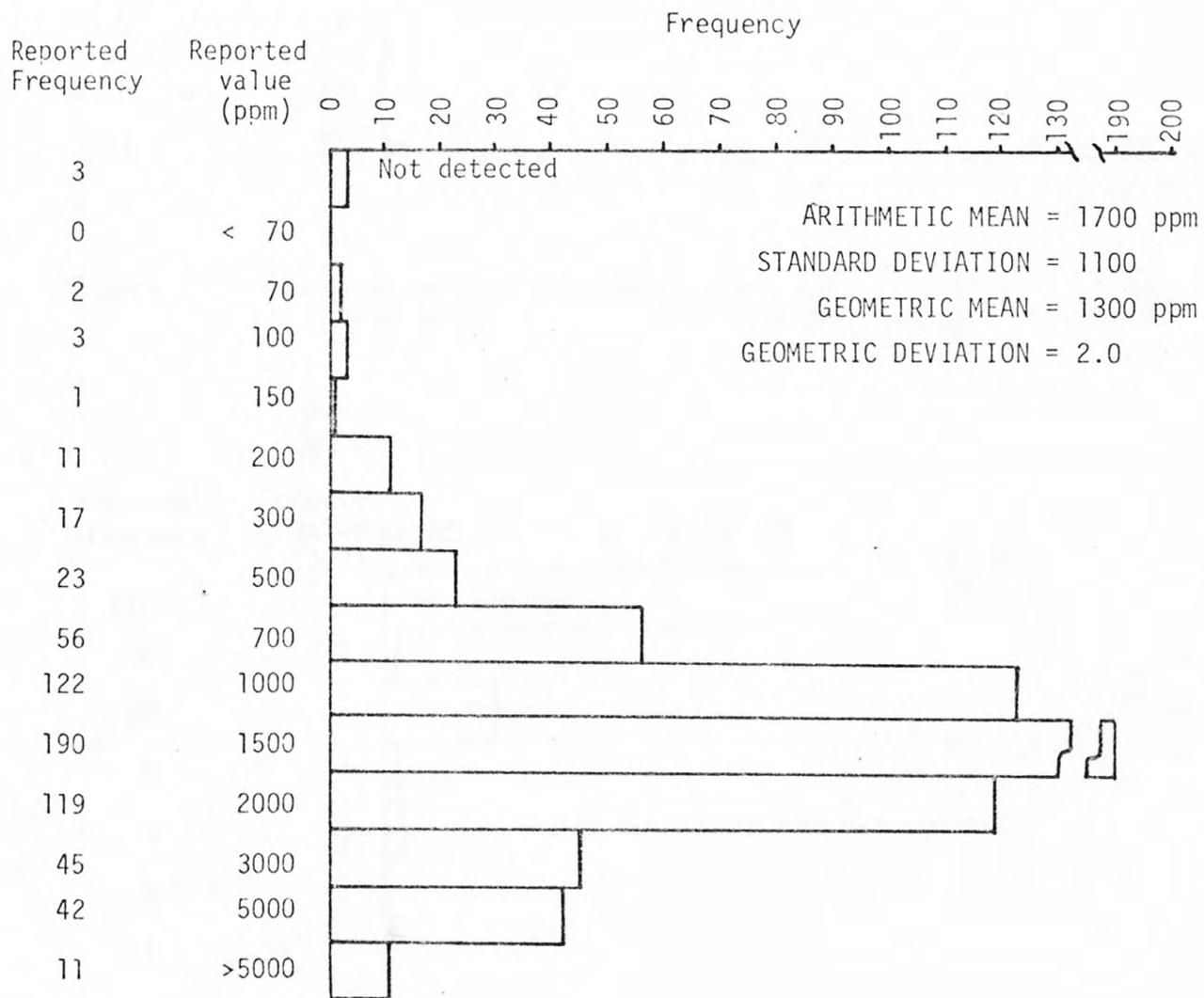


Figure 16.--Histogram showing strontium, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

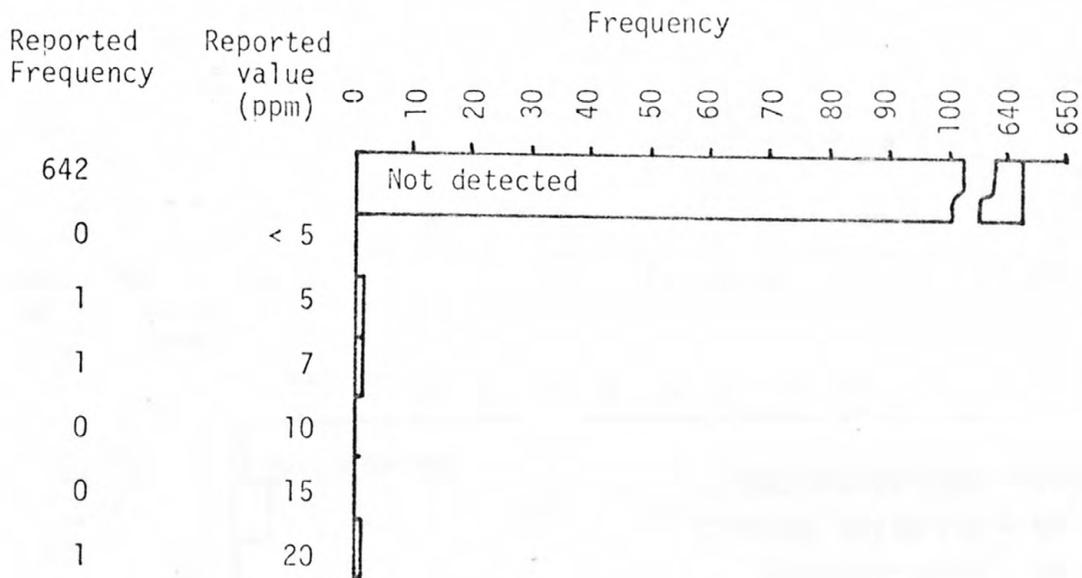


Figure 17.--Histogram showing tin, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

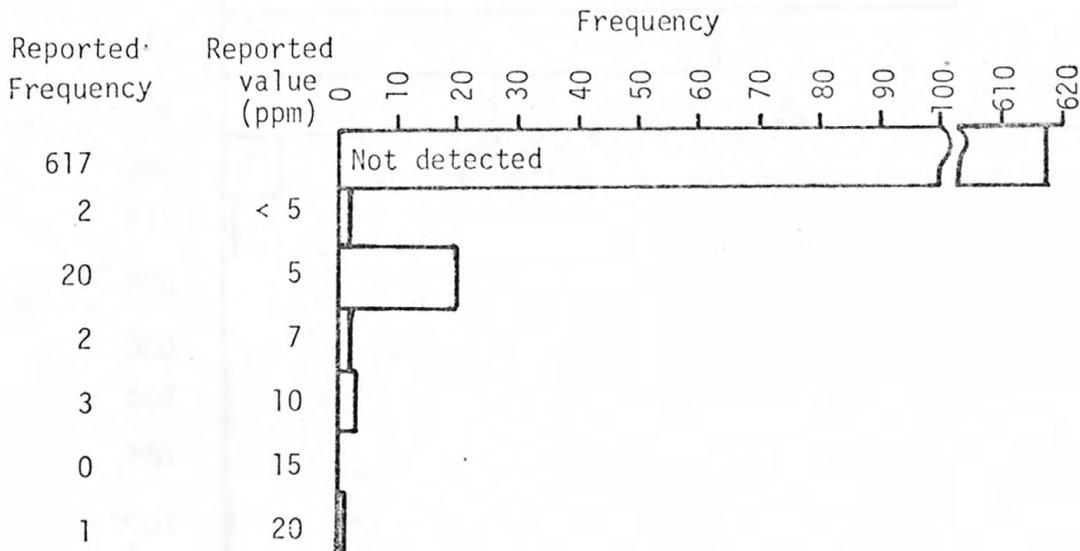


Figure 18.--Histogram showing tungsten, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

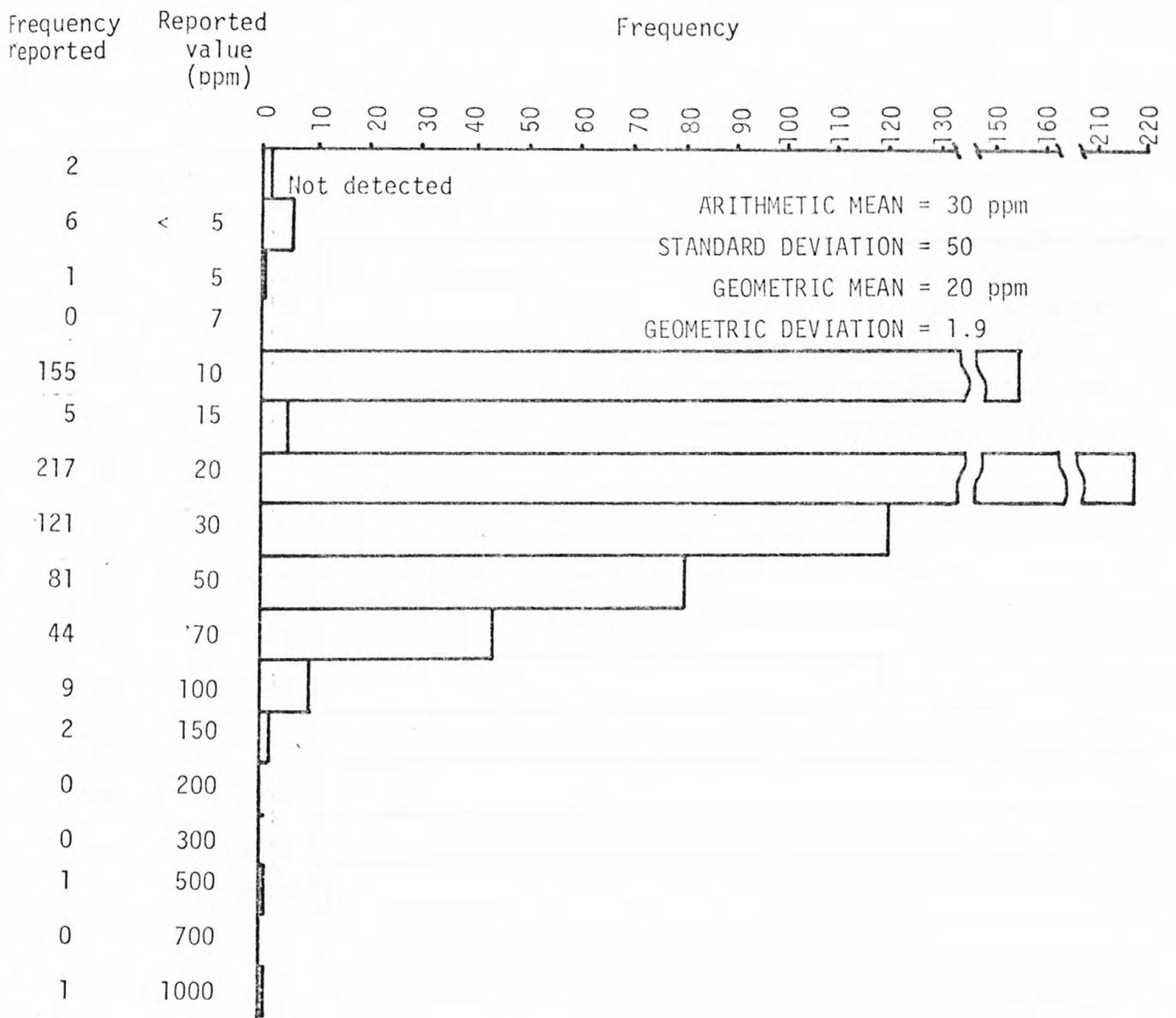


Figure 19.--Histogram showing vanadium, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

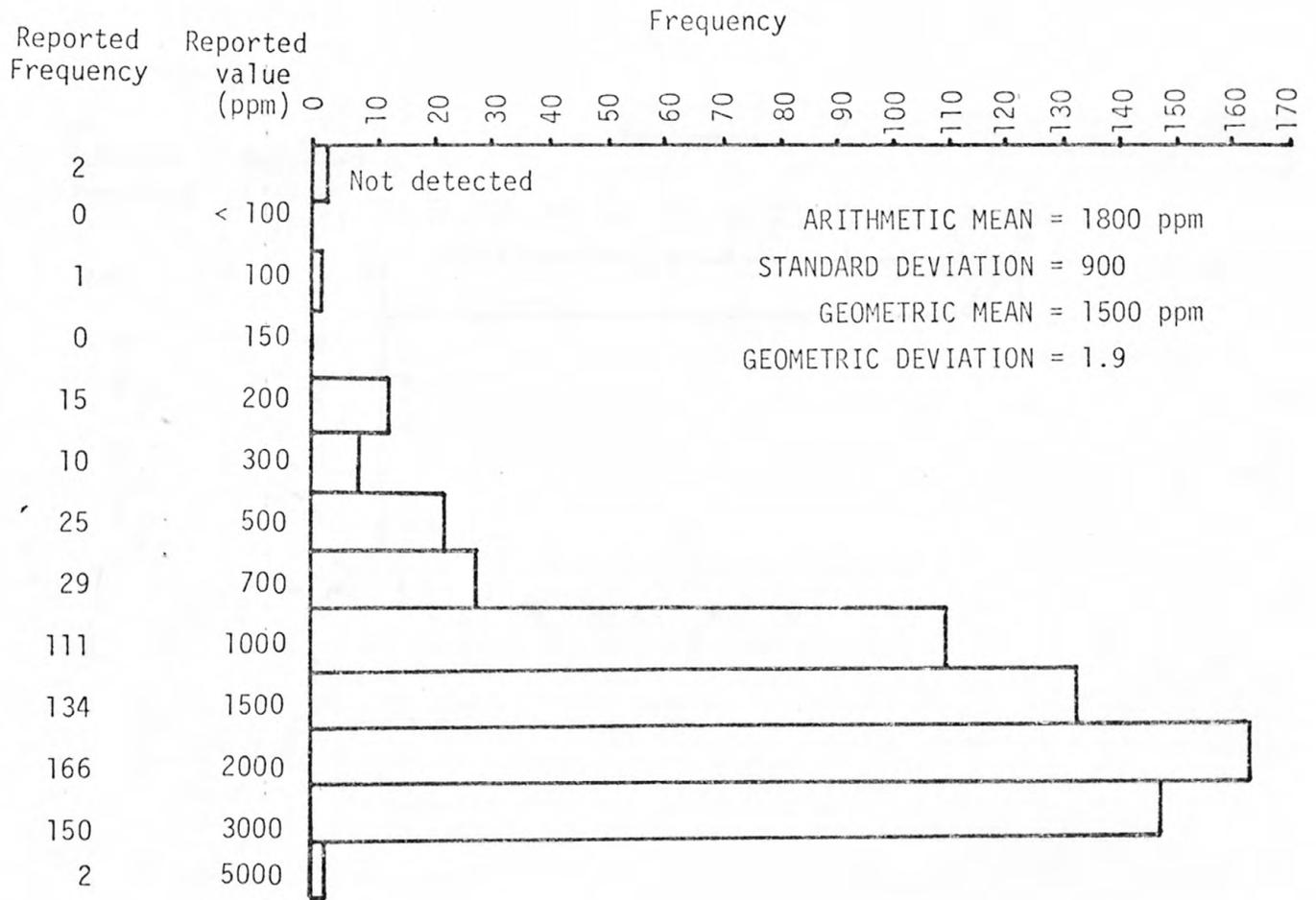


Figure 20.--Histogram showing zinc, in parts per million (ppm), in samples of the ash of black spruce needles from the Tanacross quadrangle, Alaska.

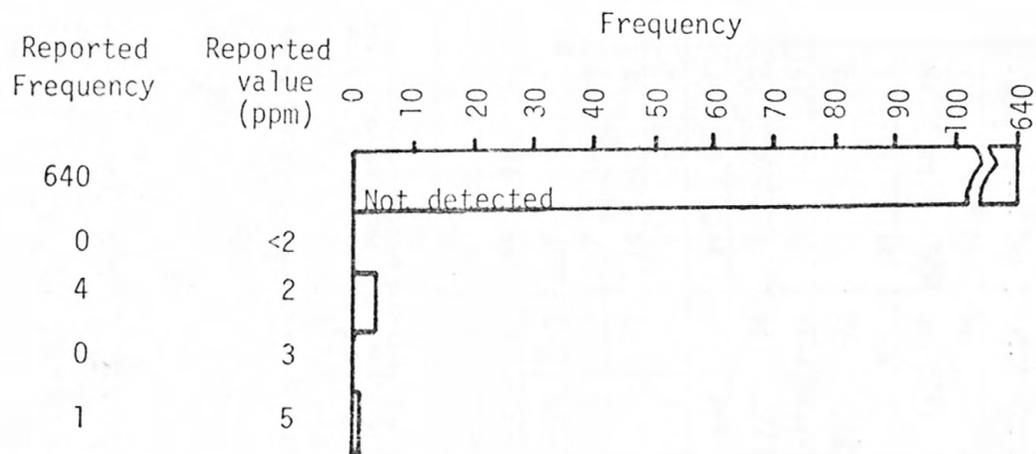


Figure 21.--Histogram showing zirconium, in parts per million (ppm), in samples of ash of black spruce needles from the Tanacross quadrangle, Alaska.

Table 1.--Simple linear correlation coefficients between logarithmic values of the element concentrations in the ash of 645 samples of black spruce needles collected in the Tanacross quadrangle, Alaska.

[Upper half of the table contains correlation coefficients, multiplied by 100; lower half is the number of pairs of values used to compute coefficients. \*\*\*\*indicates correlation coefficient was not computed. Method of analysis indicated in the row and column headings: S = Emission spectrography. Boldface figures indicate significant positive correlation.]

<del>**</del>	S-FE%	S-MG%	S-TI%	S-MN	S-AG	S-B	S-BA	S-CD	S-CD	S-CR	S-CU	S-MO	S-NI	S-PB	S-SR	S-V	S-W	S-ZN	S-ZR	
S-FE%	<del>**</del>	<b>46</b>	<b>56</b>	1	0	<b>27</b>	<b>23</b>	-40	-42	21	<b>39</b>	<b>24</b>	<b>27</b>	10	<b>22</b>	<b>13</b>	17	-7	<b>68</b>	S-FE%
S-MG%	623	<del>**</del>	<b>31</b>	<b>41</b>	1	<b>26</b>	<b>30</b>	57	-23	-6	<b>38</b>	0	<b>27</b>	0	<b>19</b>	<b>17</b>	20	<b>25</b>	<b>93</b>	S-MG%
S-TI%	618	630	<del>**</del>	4	-6	<b>21</b>	<b>26</b>	<b>-81</b>	<b>-71</b>	18	<b>17</b>	<b>16</b>	<b>25</b>	8	<b>46</b>	7	20	-5	22	S-TI%
S-MN	330	345	334	<del>**</del>	<b>-22</b>	3	<b>27</b>	<b>****</b>	0	-3	<b>16</b>	-10	<b>15</b>	0	3	9	-10	<b>29</b>	60	S-MN
S-AG	432	443	435	199	<del>**</del>	2	-1	<b>96</b>	7	-12	3	-2	9	9	-7	13	20	-2	<b>****</b>	S-AG
S-B	623	644	630	345	443	<del>**</del>	1	-75	-30	5	<b>21</b>	8	-1	13	9	4	<b>50</b>	6	<b>95</b>	S-B
S-BA	618	639	625	342	438	639	<del>**</del>	-1	-29	<b>38</b>	<b>19</b>	2	<b>30</b>	-12	<b>38</b>	-19	24	<b>22</b>	<b>87</b>	S-BA
S-CD	5	5	5	2	5	5	5	<del>**</del>	<b>****</b>	<b>****</b>	61	-22	19	<b>100</b>	16	57	<b>****</b>	<b>94</b>	<b>****</b>	S-CD
S-CD	14	14	14	4	14	14	14	0	<del>**</del>	-25	-17	12	-25	-72	25	57	<b>****</b>	-1	<b>****</b>	S-CD
S-CR	120	120	120	75	84	120	120	1	7	<del>**</del>	<b>21</b>	18	-3	6	-2	-12	-3	3	<b>****</b>	S-CR
S-CU	623	644	630	345	443	644	639	5	14	120	<del>**</del>	<b>23</b>	<b>36</b>	<b>25</b>	2	-9	30	<b>16</b>	<b>90</b>	S-CU
S-MO	306	310	308	118	227	310	308	4	10	66	310	<del>**</del>	-4	6	6	-4	10	3	<b>****</b>	S-MO
S-NI	615	632	623	336	433	632	627	5	14	120	632	308	<del>**</del>	-6	<b>17</b>	-1	2	<b>-17</b>	<b>-99</b>	S-NI
S-PB	452	458	454	238	297	458	455	2	7	74	458	235	455	<del>**</del>	-10	-1	-4	<b>15</b>	<b>****</b>	S-PB
S-SR	611	630	619	331	436	630	625	5	14	112	630	306	620	451	<del>**</del>	-20	10	-3	-6	S-SR
S-V	616	636	622	337	439	636	631	5	14	119	636	308	624	451	62	<del>**</del>	11	-11	-40	S-V
S-W	26	26	25	19	19	26	26	0	1	8	26	13	23	16	24	26	<del>**</del>	26	<b>****</b>	S-W
S-ZN	623	642	629	343	442	642	637	5	14	120	642	310	631	458	629	634	26	<del>**</del>	<b>69</b>	S-ZN
S-ZR	4	5	3	5	4	5	5	0	0	1	5	1	2	1	5	5	2	5	<del>**</del>	S-ZR
	S-FE%	S-MG%	S-TI%	S-MN	S-AG	S-B	S-BA	S-CD	S-CD	S-CR	S-CU	S-MO	S-NI	S-PB	S-SR	S-V	S-W	S-ZN	S-ZR	<del>**</del>

