Update on the gold and base metal potential of the Íngia area, central West Greenland

Bjørn Thomassen

Open File Series 93/7

December 1993

GRØNLANDS GEOLOGISKE UNDERSØGELSE
Ujarassiortut Kalaallit Nunaanni Misissuisoqarfiat
GEOLOGICAL SURVEY OF GREENLAND

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GEOLOGICAL SURVEY OF GREENLAND
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ISSN 0903-7322

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ABSTRACT

Geochemical reconnaissance of the Proterozoic Karrat Group in the Íngia area, Umanak district, was carried out by the Geological Survey of Greenland in 1989-92. A total of 133 stream sediment samples and 135 panned heavy mineral concentrates were collected over a 1300 km^2 area and analyzed for 36 elements.

The samples show relatively high values for gold (max. 19 ppm in pan samples), arsenic, tungsten and zinc. The gold is markedly associated with arsenic and is probably hosted mainly in arsenopyrite. A fairly good correlation exists between zinc, lead and copper. Correlation between the two sample types is poor, implying that they supplement each other.

The distribution of 13 selected elements are shown on 30 single element dot maps, where clusters of high values for both sample types define anomalous drainage areas. The most significant results for mineral exploration are summarized by two maps showing four gold-arsenic-tungsten anomalous areas, and four copper-zinc-lead-barium anomalous areas. These areas have potential for quartz vein or shear-zone hosted gold deposits, and for shale hosted base metal deposits, respectively.

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INTRODUCTION

A programme of geochemical reconnaissance in the Íngia area, Umanak district, was carried out from rubber dinghy by the Geological Survey of Greenland (GGU) in 1989-90 (Fig. 1). The work comprised sampling of stream sediments and rocks from the Proterozoic Karrat Group and resulted in a number of geochemical maps revealing three areas anomalous in gold and other elements (Thomassen, 1990, 1991). Two of these areas were open towards the hinterland. In 1992 when helicopter time became available in the area, it was possible to test the extent of these anomalies.

Field work in 1992 was a part of GGU's Disko Bugt Project which this year used Umanak as base camp (Christiansen, 1993). The work was carried out by the author assisted by E. Olsson from four fly camps in the period 1st-24th August. It comprised sediment sampling and general prospecting near the camps supplemented by helicopter supported sediment sampling in the surrounding area. The main purpose of the 1992 field work was to delineate the above mentioned geochemical anomalies.

The total amount of field time spent in the Íngia area in the period 1989-92 corresponds to 140 man days. A general assessment of the mineral potential of the area has already been presented (Thomassen, 1991, 1992). The present account is an updated supplement to this work containing raw data from the 1992 field work, a statistic analysis and geochemical maps, along with an elaboration of anomalous areas.

GEOLOGY AND MINERALISATION

The regional geology of the Umanak district has been reviewed by Henderson & Pulvertaft (1987) and Grocott & Pulvertaft (1990), and the mineralisation by Thomassen (1991, 1992). Presented below is a short summary.

The Umanak district is built up of Precambrian rocks, which to the west and north are covered by Cretaceous-Tertiary sediments and volcanics. The Precambrian comprises an Archaean basement (Umanak gneiss) and a Lower Proterozoic cover sequence (Karrat Group) which are transected by a mid Proterozoic dolerite dyke swarm.

These Precambrian rocks underwent deformation during the Middle Proterozoic Rinkian (Hudsonian) orogenesis. A major syn-tectonic granite/charnockite body (Prøven granite) occurs some 20 km north of the Íngia area, and microgranite veins associated with this intrusive event occur in the northwestern part of the area.

The bedrock geology of the Íngia area is shown in Fig. 2. Here the Karrat Group is represented by the Qeqertarssuaq Formation and the Nûkavsak Formation with tectonic thicknesses of up to 3 km and more than 5 km respectively.

The Qeqertarssuaq Formation consists of quartzite with intercalations of pelitic schists and rare marble. The formation hosts pods of ultramafic rocks and, at the very top, a mafic volcanic unit of hornblende schist and amphibolite. Thrust slices of these rocks occur in the overlying Nûkavsak Formation. Mineralisation hosted in the Qeqertarssuaq Formation comprises pyrrhotite and pyrite as disseminations and as stratiform horizons interbedded with chert in pelitic schist. Epigenetic copper mineralisation is known from chalcopyrite-bearing breccia and shear zones.

The Nûkavsak Formation consists of interbedded pelitic and semipelitic schists of turbiditic origin. Mineralisation comprises disseminations of pyrrhotite, pyrite and arsenopyrite, as well as cherty and graphitic iron-sulphide horizons. Epigenetic mineralisation in the form of quartz-calcite veins with traces of gold, arsenic and base metals is widespread.

The presumed economic potential in the Íngia area lies in turbidite hosted gold-bearing veins and shear zones, and shale hosted massive base metal sulphide deposits (Thomassen, 1991, 1992).

GEOCHEMICAL DATA

The geochemical data set comprises 133 stream sediment samples and 135 pan samples (heavy mineral concentrates) collected in pairs and analyzed for 36 elements (Table 1). Sampling methodology and raw data from 1989-90 were presented by Thomassen in 1991; the 1992 raw data are shown in Tables 2 & 3. All sample localities are shown on the enclosed Fig. 3.

The samples represent a combined drainage area of c. 1300 km^2 corresponding to an average sample density of c. 1 sample pair per 10 km^2. The source rocks are Nûkavsak Formation (77% of the samples), Qeqertarssuaq Formation (17%) and Umanak gneiss (6%).

MINERALOGICAL OBSERVATIONS

The pan samples, checked by hand lens in the field, revealed olivine, garnet, magnetite, ilmenite, pyrrhotite and pyrite as main minerals along with small amounts of chalcopyrite, arsenopyrite and scheelite. Twenty-four of the samples have been investigated microscopically at the Geological Survey of Latvia (Kalnina, 1993). This study confirmed and quantified the above mineral assemblage, but no free gold was detected.

STATISTICAL ANALYSIS

Statistical parameters for the 14 elements believed to be significant for exploration are summarized in Tables 4 & 5. As previously reported (Thomassen, 1991), relatively high levels occur for gold, arsenic, tungsten and zinc, whereas values for lead, barium and cerium are relatively low. A comparison between all samples and those originating from the Nûkavsak Formation shows higher level in the latter for all elements except chromium in pan samples, whereas in stream sediment samples only arsenic and to an lesser extent zinc and barium are higher in the Nûkavsak Formation.

The low values of the regression coefficients (Table 4) show that poor correlation exists between metal contents in a stream sediment sample and a pan sample collected at the same location. This observation is important as it implies that the two sample types supplement each other, i.e. neither can be omitted without loosing information. A possible explanation is, that fine-grained mineralisation is most efficiently registered in stream sediment samples (−0.1 mm fraction), and coarse-grained mineralisation is best detected in pan samples (−1.0 mm fraction).

In order to investigate the relationships between the individual elements in the Nûkavsak Formation samples, multi-element statistics have been applied. The correlation matrices are rather different for the two sample types (Tables 6 & 7). Of special interest is the good correlation of arsenic with gold and cobalt in pan samples. This indicates gold-cobalt-bearing grains of arsenopyrite as the main gold carrier. The same close relationship is not evident in the stream sediment samples, where there is a weaker correlation arsenic-gold and no arsenic-cobalt correlation, cobalt being strongly correlated with iron.

Factor analysis shows a grouping of the elements gold-arsenic-tungsten and zinc-lead-copper for both sample types (Fig. 8). Antimony, often a good pathfinder element for gold, seems to tilt more towards the base metals in this study. Cobalt, a possible tracer of arsenic and gold, is best correlated with the siderophilic elements chromium-nickel-iron in stream sediment samples, but with gold-arsenic-tungsten in pan samples. Barium, a classical tracer of base metal mineralisation, is only grouped with zinc-lead-copper in the stream sediment samples.

GEOCHEMICAL MAPS

The geochemical data for 13 elements are presented as 30 single element dot maps at scale 1:300 000 produced by the GGURAS program system (Figs 4-33). The minimum dot size corresponds to values below the 80% percentile and maximum size corresponds to values above the 95% percentile, cf. Tables 4 & 5. The maps thus show the distribution of "high" values, and all values above the 80% percentile are regarded as anomalous in this study. Furthermore, the frequency distribution is plotted on each figure both as a histogram and as a cumulative distribution on probability paper. On the histograms the 2-5 highest values have been excluded in order to get sensible class intervals. The probability plots only show the samples (n) with values above the detection limit. All investigated elements show at least two populations. Two distinct populations exist for arsenic, cobalt, chromium, zinc and antimony in stream sediment samples (Figs 8, 16, 20, 22, 26) and for cobalt and zinc in pan samples (Figs 17, 22). Theoretically, the two populations could represent background values and stratiform mineralisation, whereas three populations, as exemplified by copper in stream sediment samples (Fig. 20), could reflect an additional vein type mineralisation.

ANOMALOUS AREAS

Clusters of high values on the geochemical maps define geochemical anomalies. Their drainage areas are designated as anomalous areas. They have been demarcated manually, combining results from pan and stream sediment samples for each element, and attempting to weight factors such as uneven distribution of sample localities, dot size and sample type. As stated above the stream sediment and pan sample values from the same locality rarely confirm each other, but clusters of high values from the two sample types often coincide in the same general area.

Gold-arsenic-tungsten

As shown by the statistical analysis, gold correlates well with arsenic and tungsten; anomalous areas for these three elements are indicated on Fig. 34. The elements form four anomalous areas, the largest on eastern Svartenhuk Halvø with three smaller on Akuliarusinguaq. It is evident from a comparison between Figs 4, 5 and 6, 7 and between Figs 8, 9 and 10, 11, that most gold and all arsenic anomalies are associated the Nûkavsak Formation. It is believed that the gold anomalies are mainly caused by gold-bearing quartz veins or shear zones hosted in the metaturbidites of this formation (Thomassen, 1992).

Anomaly 1, on eastern Svartenhuk Halvø (Fig. 34) is mainly underlain by the Nûkavsak Formation. It has been demarcated as a 10 × 35 km^2 coherent gold anomaly partly overlapped by two smaller arsenic and tungsten anomalies. Prior to the 1992 season, these anomalies were only detected along Uvkusigssat Fjord, but the latest results indicate their extension to the southwest. Further to the west, the Nûkavsak Formation is mostly covered by Tertiary plateau basalts (Fig. 2). The highest pan sample values for gold, arsenic and tungsten in the Íngia area (18.8 ppm Au, 5.8% As and 0.63% W) as well as the highest gold values in stream sediment samples (33 ppb) and in rock samples (1.4 ppm Au in a boulder) stem from the U3 valley of this area, and arsenopyrite-bearing boulders are known from both this valley and from the Quingussâq area. Outcropping mineralisation, apart from iron sulphides, is not known.

Anomaly 2, the SW tip of Akuliarusinguaq, is well defined by gold and arsenic, but not tungsten (Fig. 34). The area is underlain by the Nûkavsak Formation. Most anomalous samples stem from streams draining a local glacier which has yielded values of up to 2.13 ppm Au and 1.8% As in pan samples. Arsenopyrite-bearing boulders are known from the front of the glacier, which has not yet been traversed.

Anomaly 3, Kugssinerssûp auvfâ, is characterized by gold and tungsten, but not arsenic (Fig. 34). The source rocks are mainly Qeqertarssuaq Formation and Umanak gneiss. The anomaly was originally defined by two pan samples with 616 and 338 ppb Au respectively. Field work in 1992 did not succeed in tracing the gold upstream in pan samples, whereas stream sediments returned anomalous gold (max. 16 ppb) and tungsten (max 10 ppm). Outcropping Qeqertarssuaq Formation quartzite with disseminated pyrite yields up to 304 ppb gold and possibly explains the anomaly.

Anomaly 4, Puatdlarsîvik, is a tungsten anomaly mainly defined by stream sediment samples (max. 22 ppm W) with a single enhanced gold value (12 ppb Au) (Fig. 34). The source rocks are mainly of the Qeqertarssuaq Formation and Umanak gneiss. A weak copper mineralised shear zone is known from the area.

Copper-zinc-lead-barium

Anomalous areas for copper, zinc, lead and barium are shown on Fig. 35. The base metals correlate in both sample types, whereas barium only correlates with these elements in stream sediment samples. Barium shows a good overlap with the base metals in three of the four anomalous areas. The anomalies are believed to originate from base metal enrichments in the stratiform iron sulphide rich horizons of the Nûkavsak and Qeqertarssuaq Formations, and subsidiary from quartz veins and shear zones (Thomassen, 1992).

Anomaly 1, on the west coast of Uvkusigssat Fjord, is over Nûkavsak Formation metasediments with stratiform iron sulphide rich horizons (Fig. 35). Only traces of base metals are known from the quartz veins of the area.

Anomaly 2, at the mouth of Íngia Fjord, consists of mainly Nûkavsak Formation (Fig. 35). In addition to stratiform iron sulphides, boulders of vein quartz with sphalerite, galena and chalcopyrite (max. 1.27% Zn, 0.35% Cu and 0.07% Pb) are known from both sides of the fjord. The area includes the gold-arsenic anomaly 2 (Fig. 34).

Anomaly 3, at inner Íngia Fjord, is underlain by Nûkavsak and Qeqertarssuaq Formations (Fig. 35). In addition to stratiform iron formations, chalcopyrite is known from quartz veins and as minor disseminations in mafic metavolcanics.

Anomaly 4, at Qingussâq, is mainly a barium anomaly (Fig. 35). It is over lower Nûkavsak Formation rocks with stratiform iron sulphides in conspicuous rust zones.

Other elements

The remaining investigated elements show no obvious association with the target elements gold and copper-zinc. Nickel and chromium are partly overlapping (Figs 14-15, 18-19). The most prominent anomalous area, in Kangiussap auvfâ, is probably due to Tertiary plateau basalts. Cobalt mainly overlaps with arsenic (Figs 16-17), whereas antimony shows overlap with both arsenic and base metals (Figs 26-27). Uranium and cerium overlap and form two anomalous arcs in SE Svartenhuk Halvø and on SW Akuliarusinguaq, respectively (Figs 30-33).

CONCLUDING REMARKS

It has been stated previously, that the Íngia area has a potential for gold and base metal mineralisation (Thomassen, 1990, 1991, 1992). This is confirmed by the present study. Furthermore, the 1992 data indicates that the gold anomalous area at Uvkusigssat Fjord with its potential for gold-bearing quartz veins or shear zones continues southwestwards. The existence of another type of gold mineralisation, possibly associated with pyritiferous quartzites, is indicated in the Kugssinerssûp auvfâ area.

Seen in the context of the entire Karrat Group basin (70°30′N-75°00′N), it appears from the regional geochemistry (Thomassen, 1992) that the Íngia area has the best potential for gold, whereas possibilities for base metal deposits are also to be found elsewhere.

ACKNOWLEDGEMENTS

I. Rytved and M. S. Jørgensen prepared the computer plots and H. F. Jepsen prepared that part of the topograpic map south of latitude 72°N.

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FIGURES & TABLES

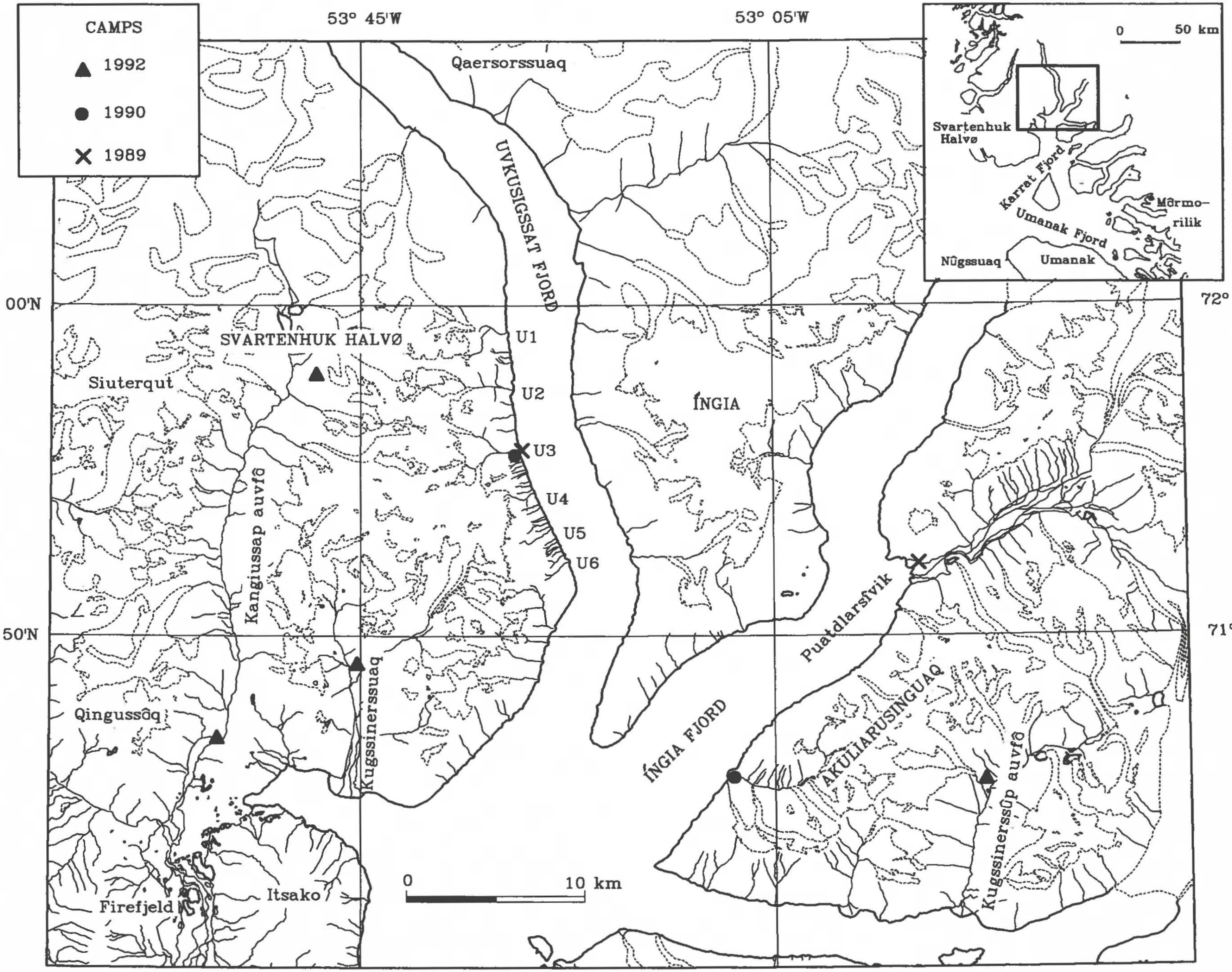


Fig. 1. Locality map of the Íngia area.

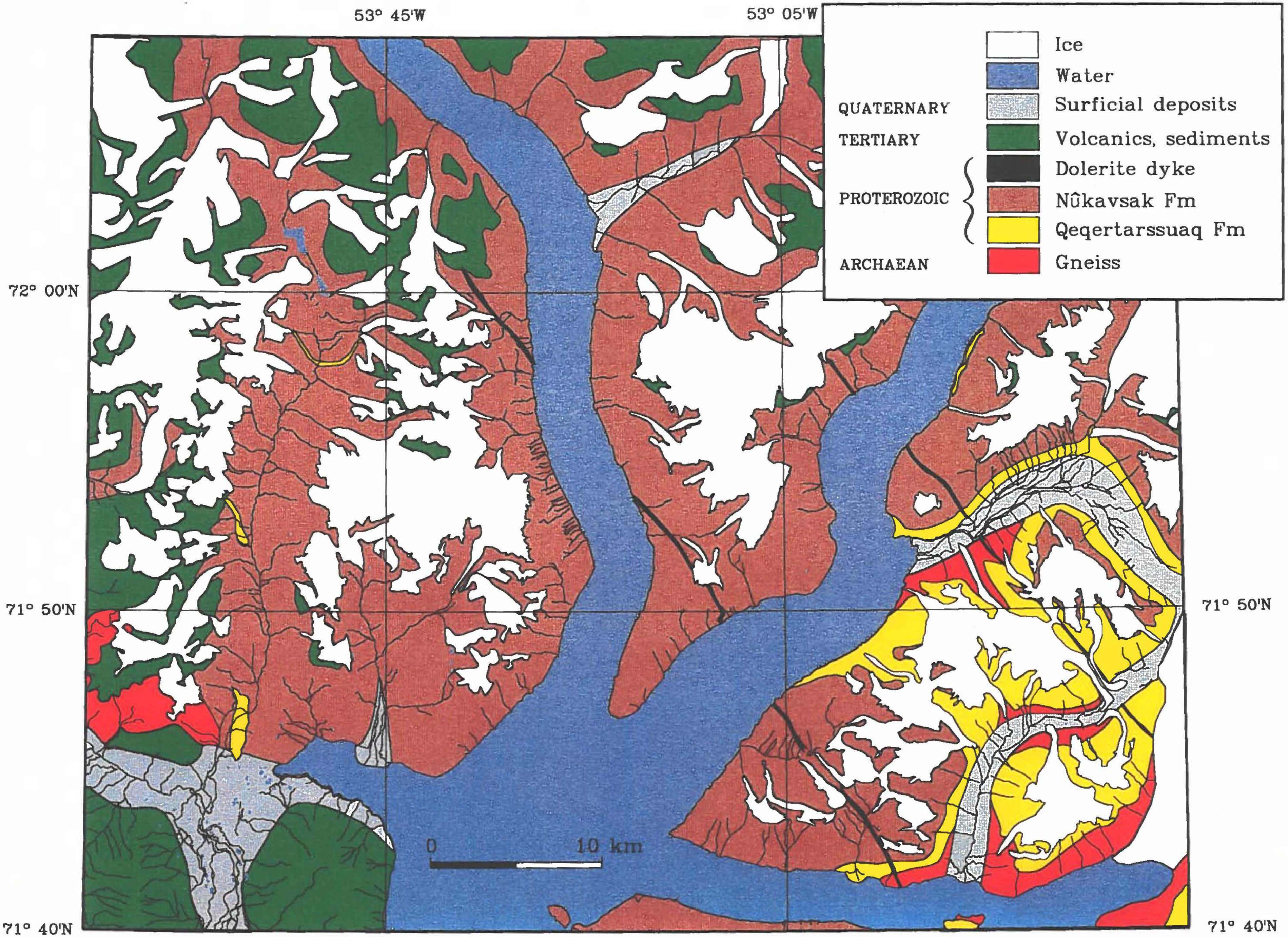
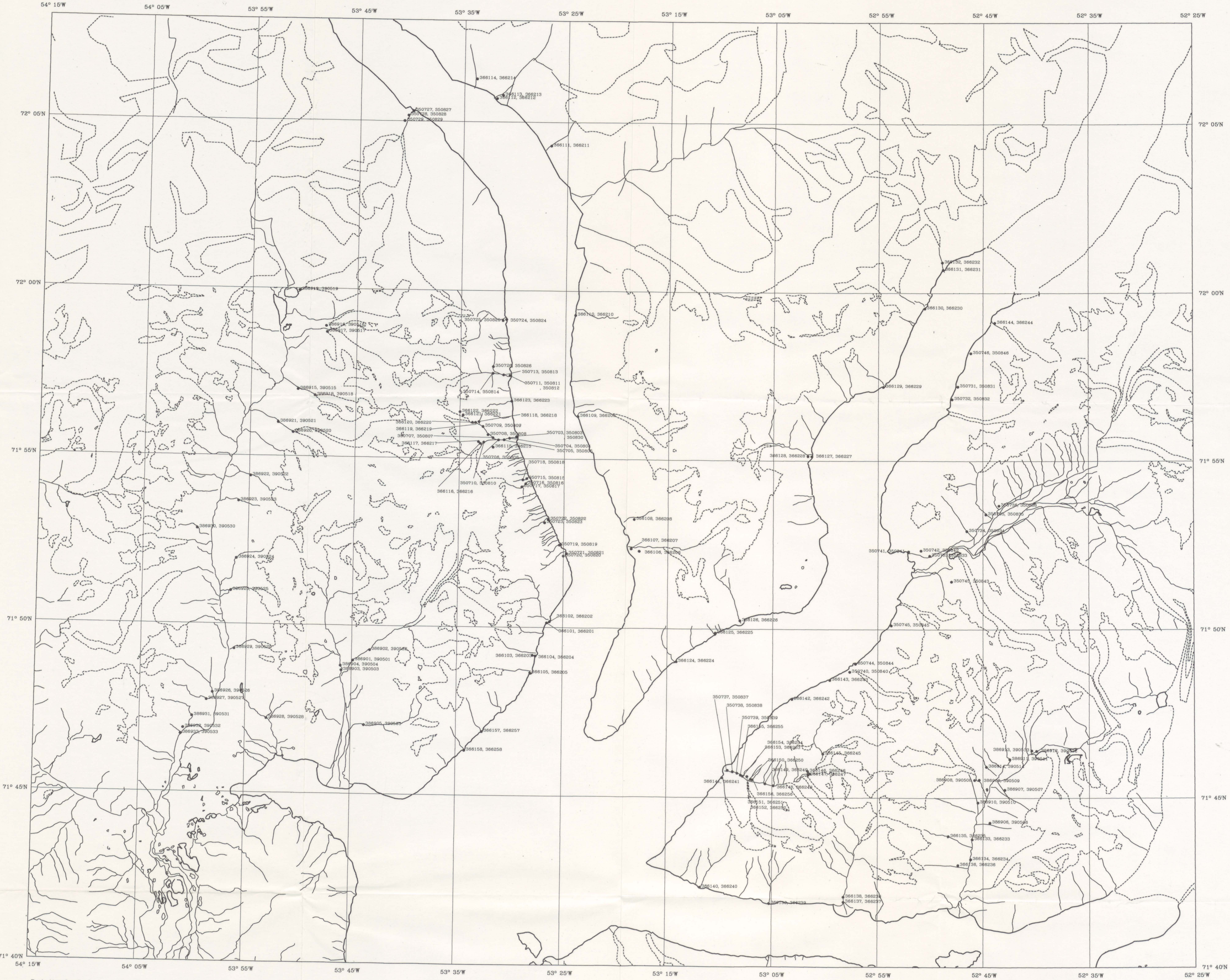


Fig. 2. Geological map of the Íngia area. Simplified from Henderson (1971) and Larsen & Grocott (1991).

Fig. 3

Sediment samples. Location map 1989 – 1992

1st number: stream sediment sample
2nd number: pan sample



Projection: Lambert conformal conic
Standard parallel: 71 30' N
Scale factor: 1.000
Ellipsoid: Hayford
Datum: Qornoq
Scale: 1:100000

0 10 km

Topographic base map south of 72 00 N by the Geological Survey of Greenland.
Aerial photographs and ground control points supplied by Kort- og matrikelstyrelsen. Denmark (A.200/87).
North of 72 00'N from KMS map sheet 72V1.

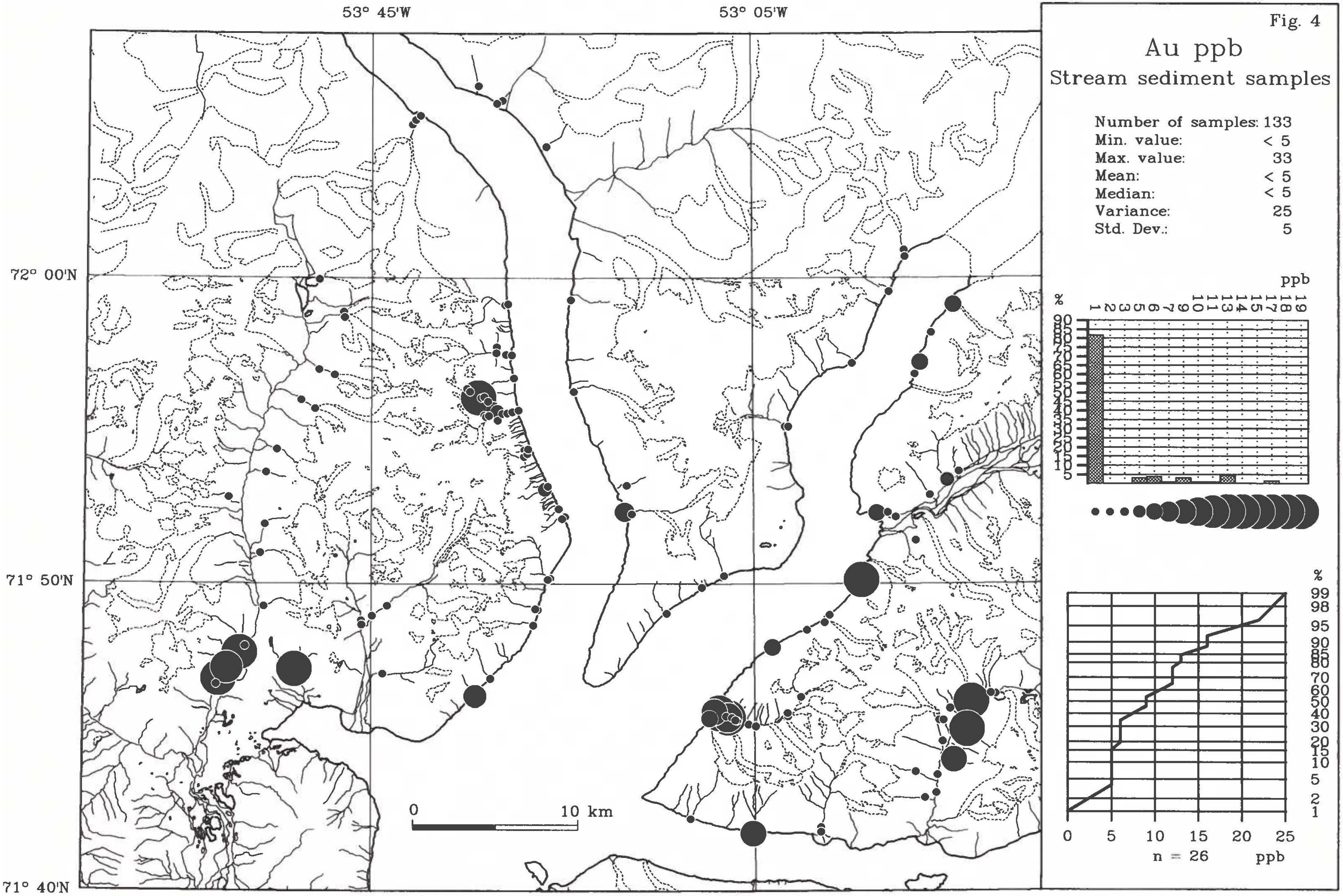
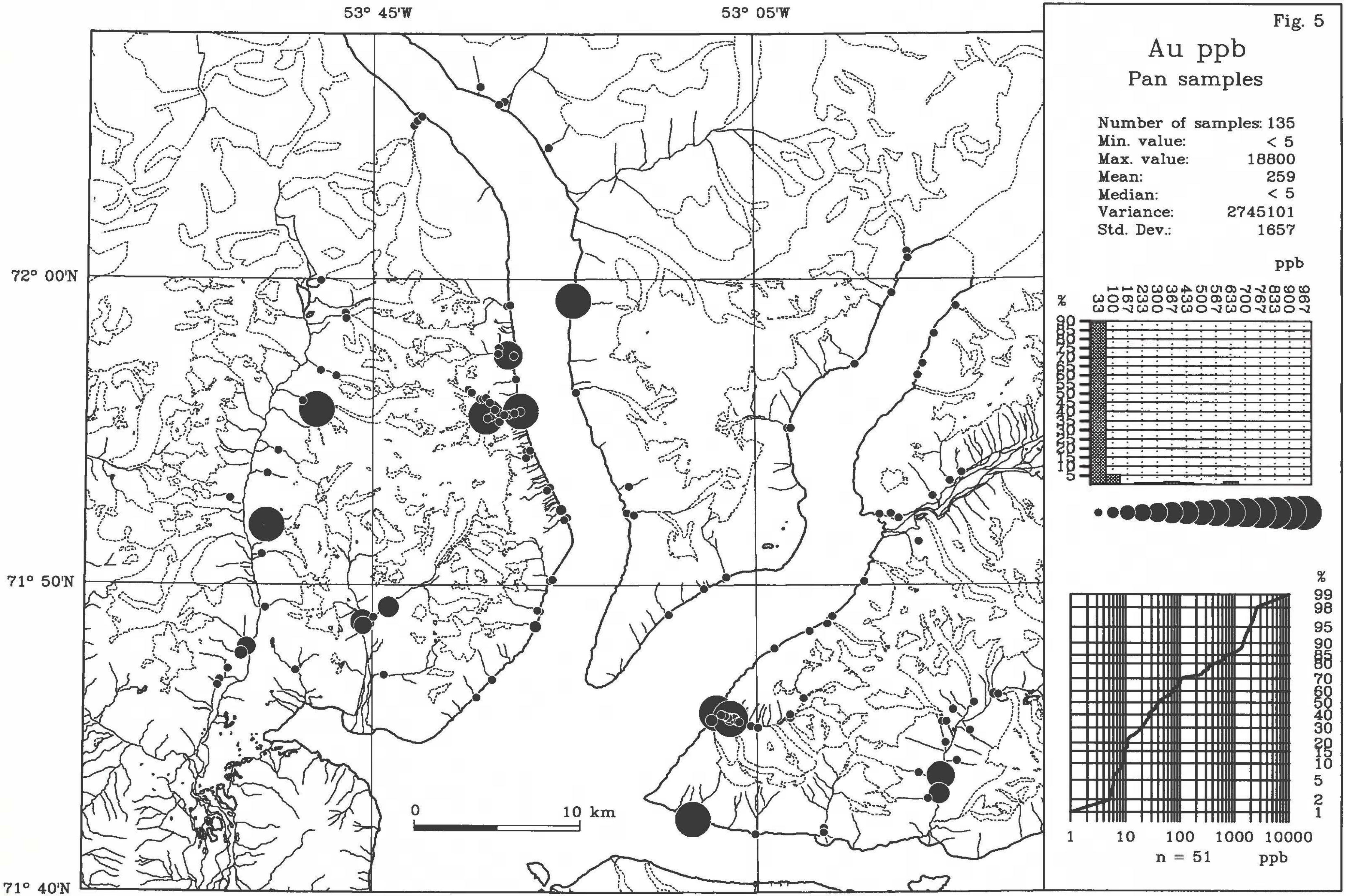


Fig. 4
Au ppb
Stream sediment samples
Number of samples: 133
Min. value: < 5
Max. value: 33
Mean: < 5
Median: < 5
Variance: 25
Std. Dev.: 5
ppb
%
n = 26
0 10 km
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N


53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 5
Au ppb
Pan samples
Number of samples: 135
Min. value: < 5
Max. value: 18800
Mean: 259
Median: < 5
Variance: 2745101
Std. Dev.: 1657
ppb
%
33 100 167 233 300 367 433 500 567 633 700 767 833 900 967
90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
1 10 100 1000 10000
n = 51
ppb

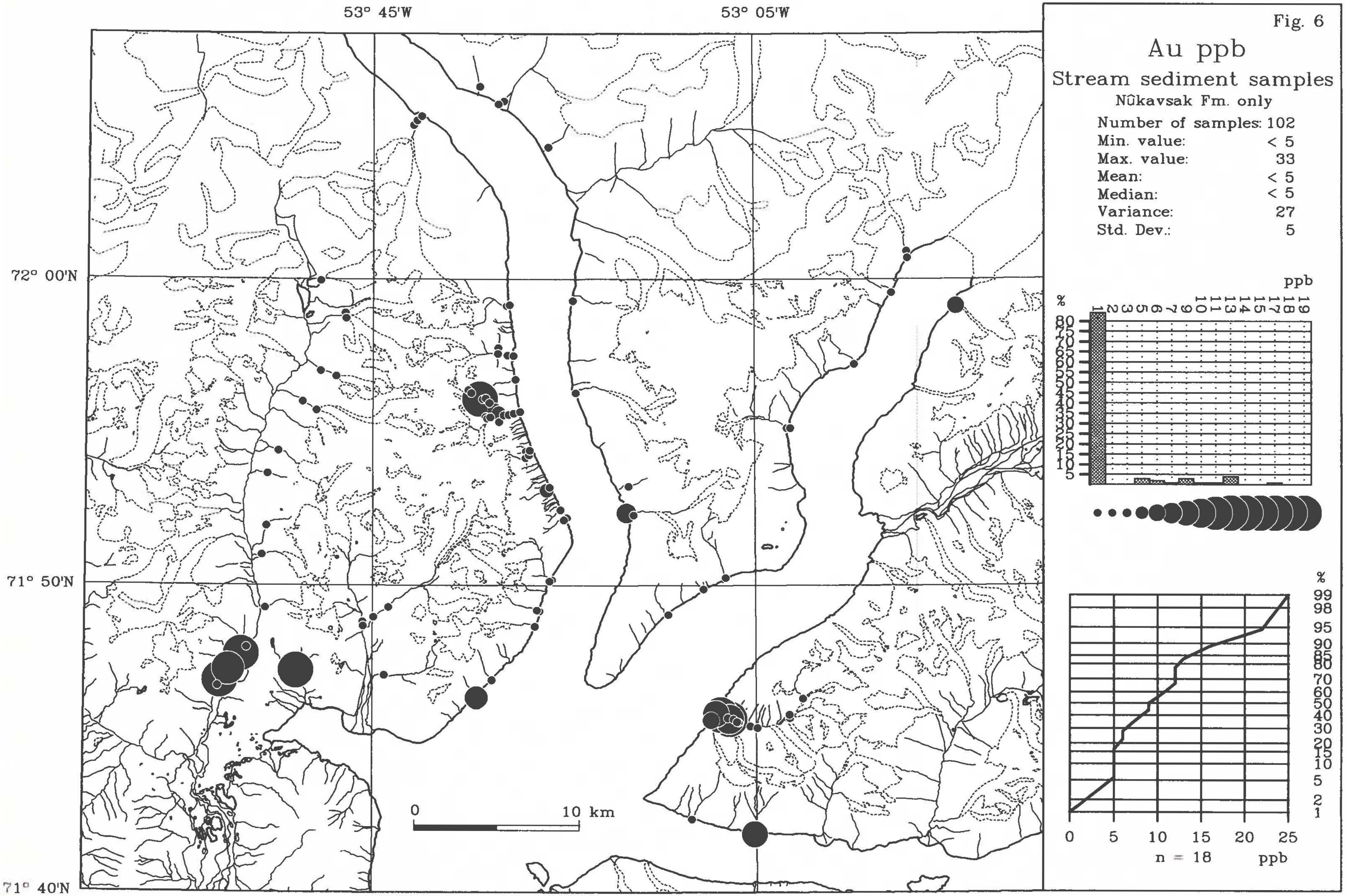


Fig. 6
Au ppb
Stream sediment samples
Nûkavsak Fm. only
Number of samples: 102
Min. value: < 5
Max. value: 33
Mean: < 5
Median: < 5
Variance: 27
Std. Dev.: 5
ppb
%
n = 18
ppb
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km

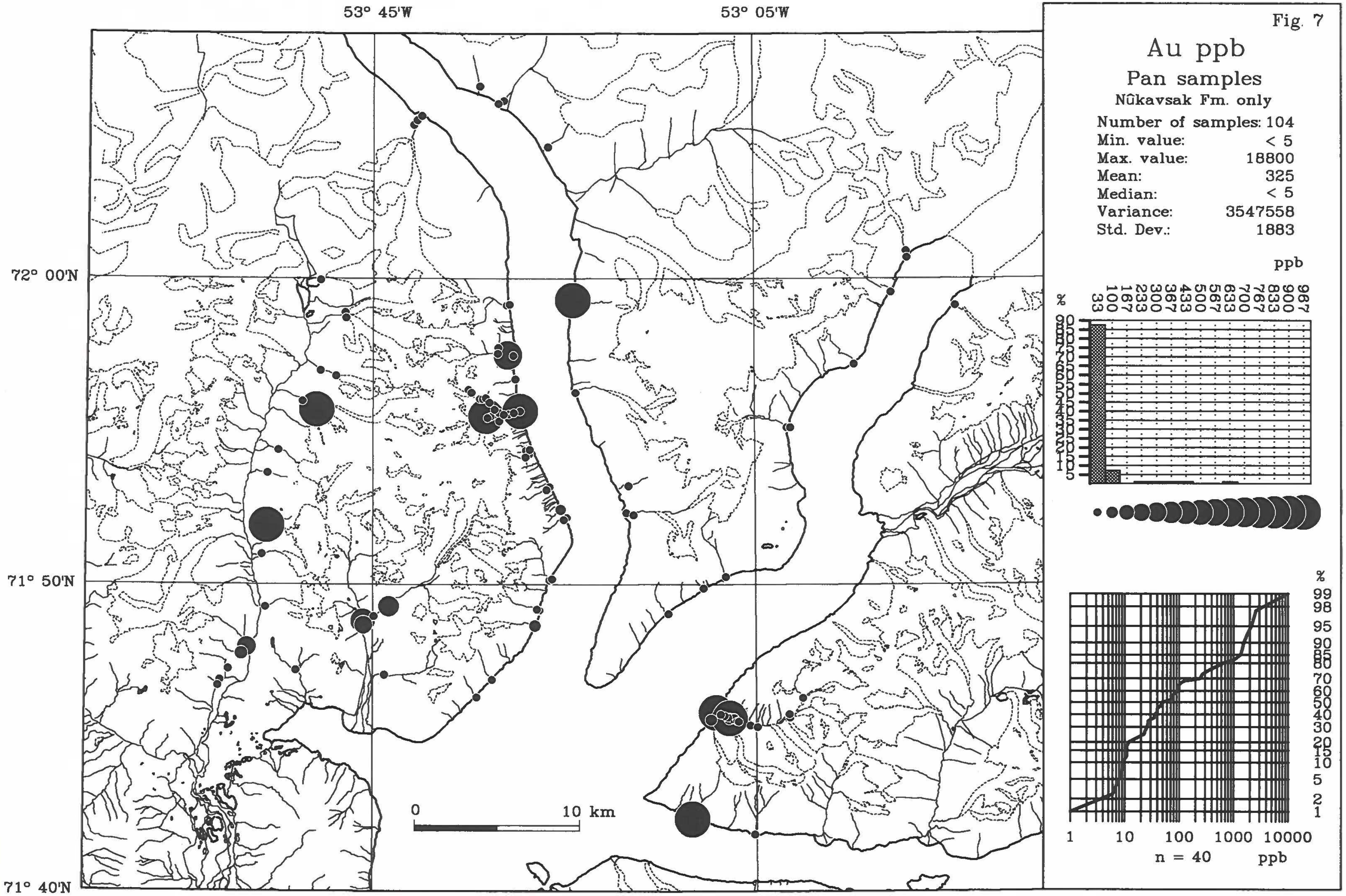


Fig. 7
Au ppb
Pan samples
Nûkavsak Fm. only
Number of samples: 104
Min. value: < 5
Max. value: 18800
Mean: 325
Median: < 5
Variance: 3547558
Std. Dev.: 1883
ppb
33 100 167 233 300 367 433 500 567 633 700 767 833 900 967
%
1 10 100 1000 10000
n = 40 ppb
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0 10 km

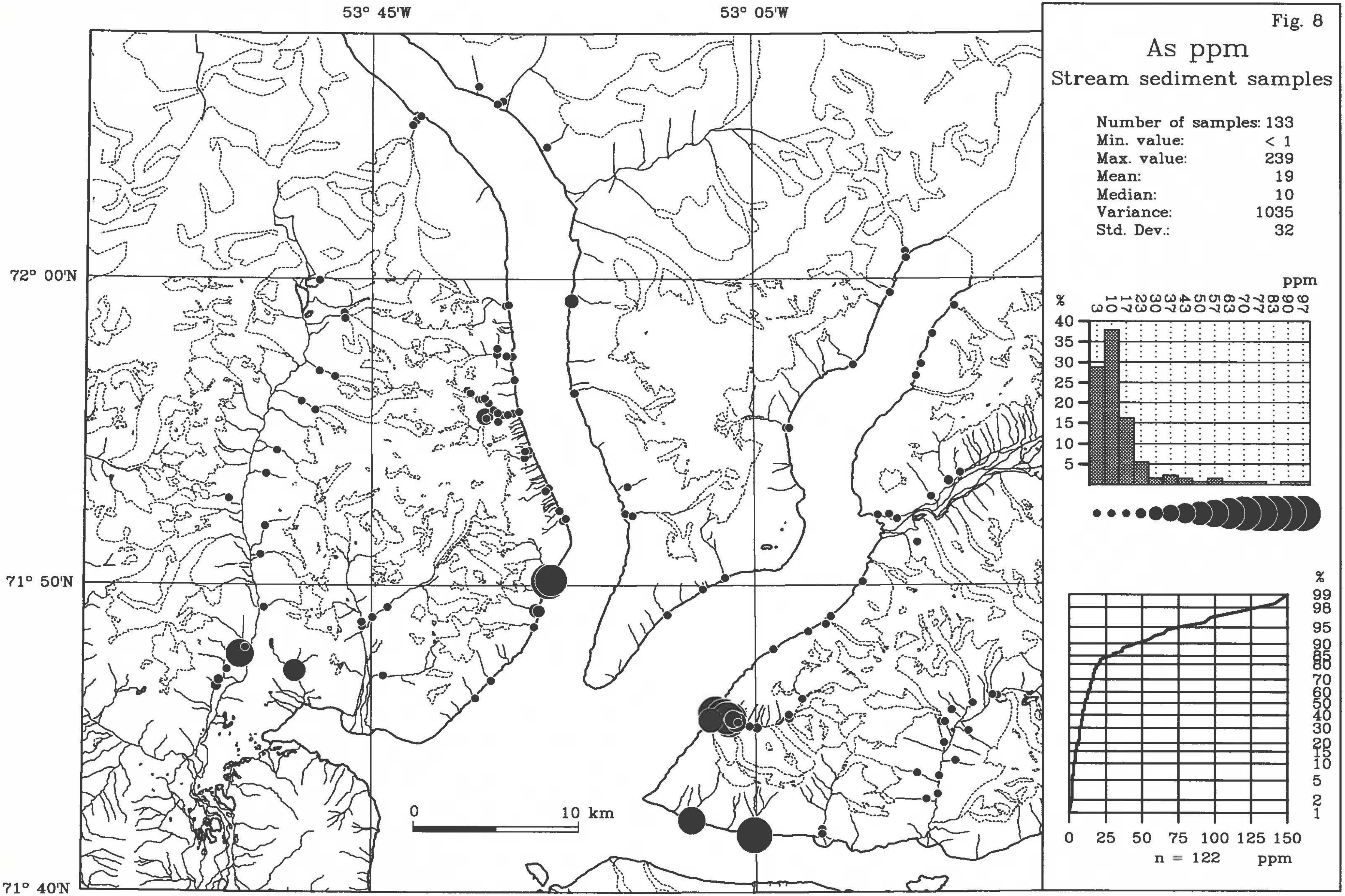
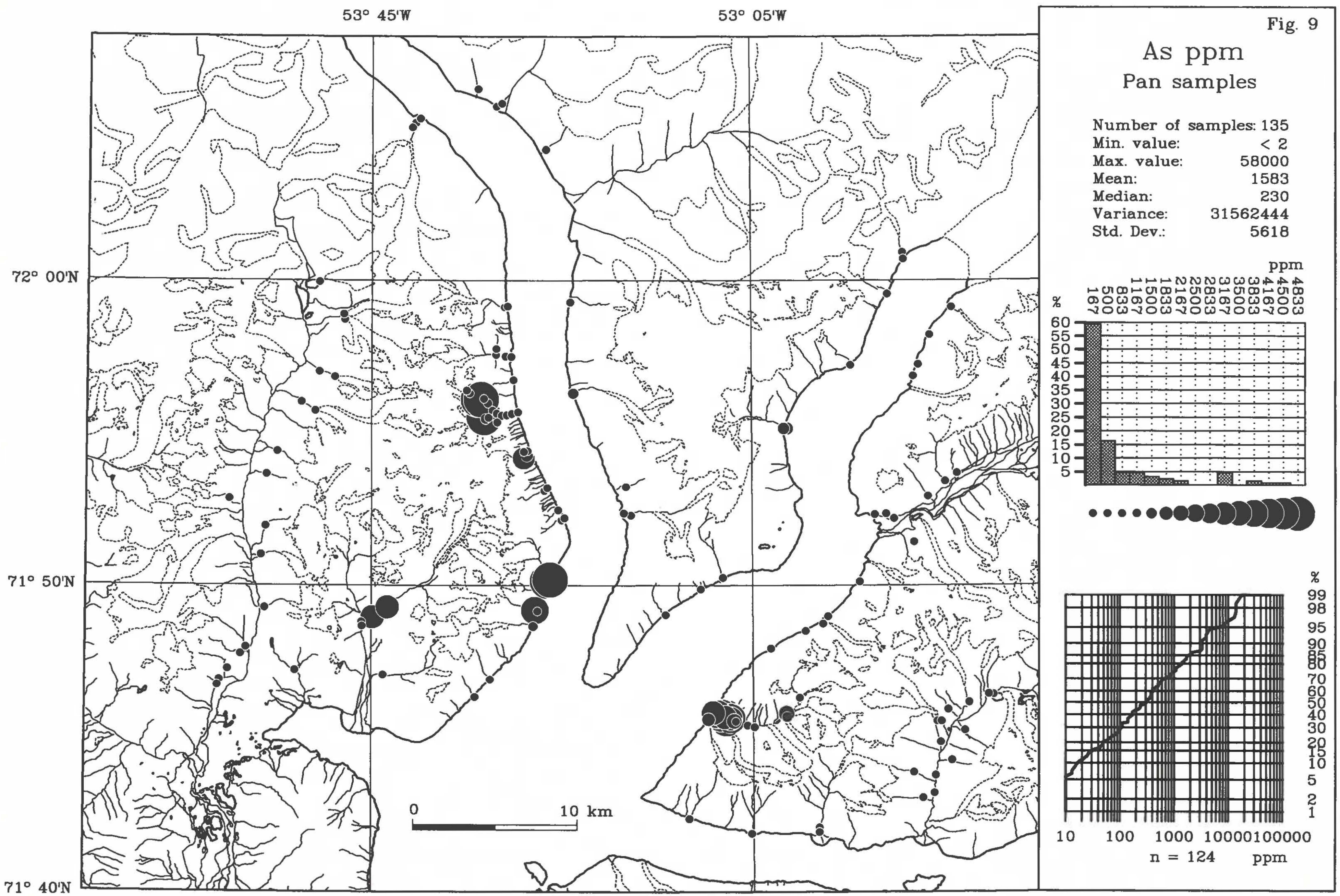
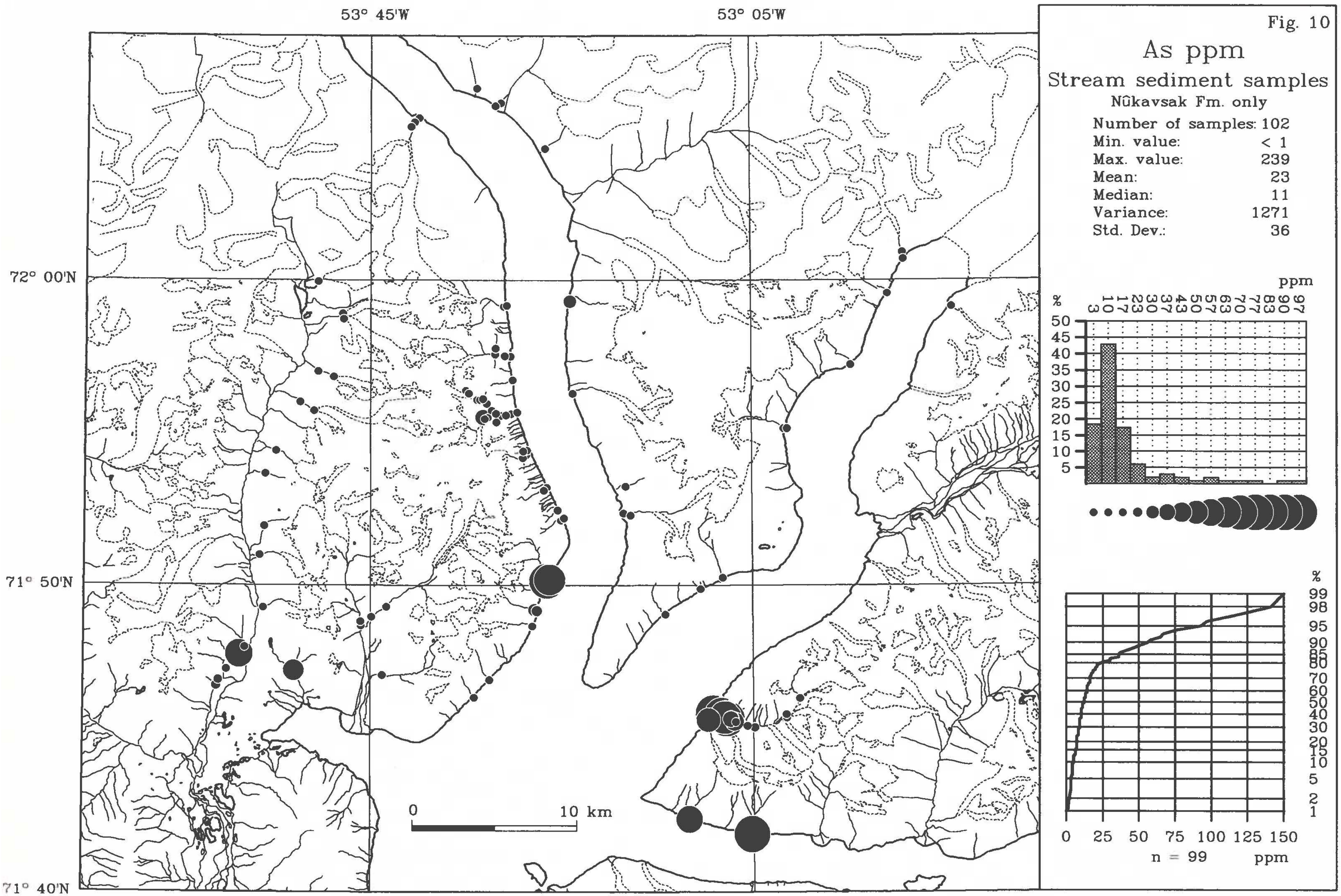


Fig. 8

As ppm

Stream sediment samples


53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 9
As ppm
Pan samples
Number of samples: 135
Min. value: < 2
Max. value: 58000
Mean: 1583
Median: 230
Variance: 31562444
Std. Dev.: 5618
ppm
167 500 833 1167 1500 1833 2167 2500 2833 3167 3500 3833 4167 4500 4833
%
60 55 50 45 40 35 30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
10 100 1000 10000100000
n = 124
ppm



53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 10
As ppm
Stream sediment samples
Nûkavsak Fm. only
Number of samples: 102
Min. value: < 1
Max. value: 239
Mean: 23
Median: 11
Variance: 1271
Std. Dev.: 36
ppm
%
3 10 17 23 30 37 43 50 57 63 70 77 83 90 97
50 45 40 35 30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
0 25 50 75 100 125 150
n = 99
ppm

22

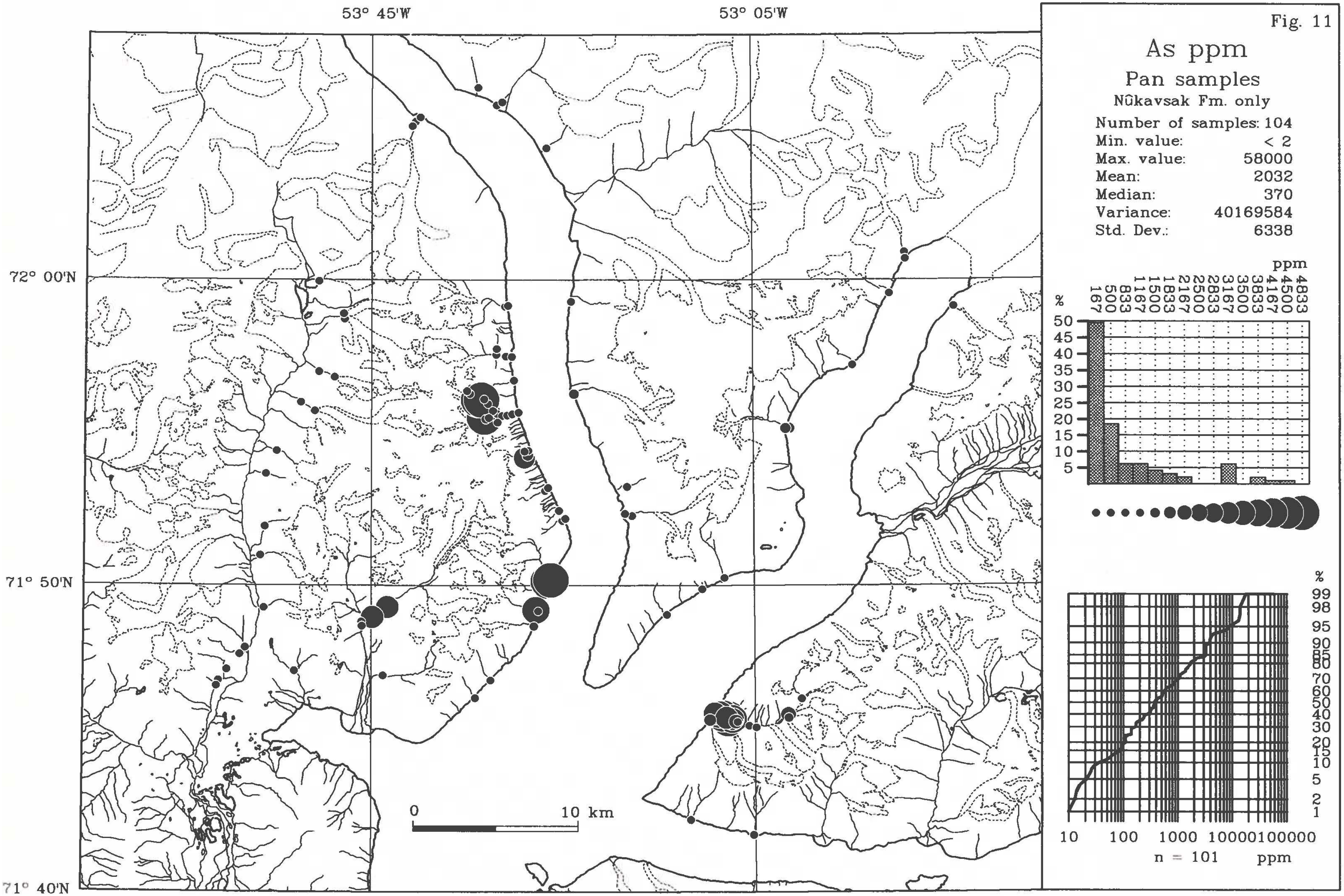
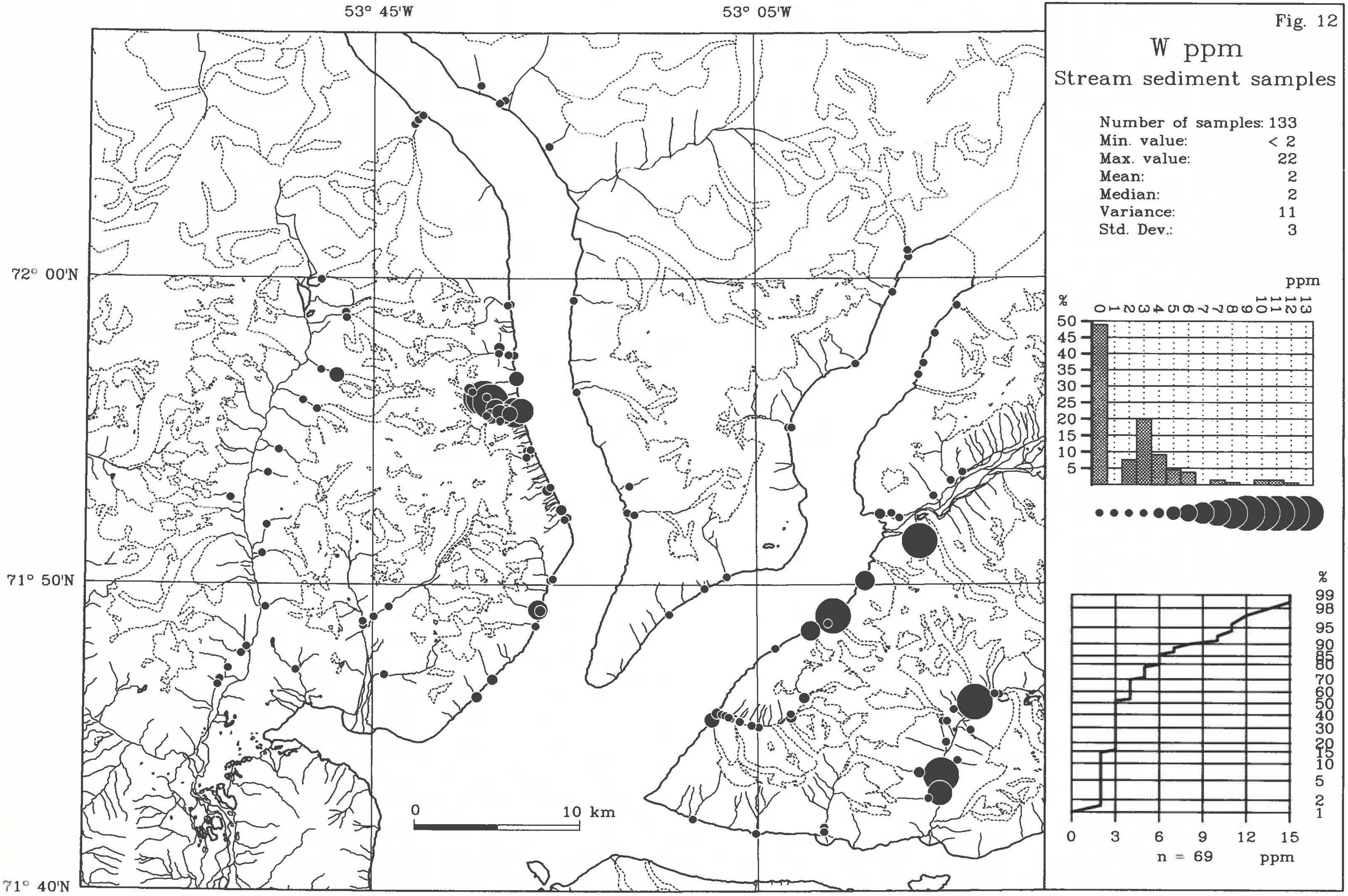


Fig. 11
As ppm
Pan samples
Nûkavsak Fm. only
Number of samples: 104
Min. value: < 2
Max. value: 58000
Mean: 2032
Median: 370
Variance: 40169584
Std. Dev.: 6338
ppm
167 500 833 1167 1500 1833 2167 2500 2833 3167 3500 3833 4167 4500 4833
%
50 45 40 35 30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
10 100 1000 10000100000
n = 101 ppm
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km


53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 12
W ppm
Stream sediment samples
Number of samples: 133
Min. value: < 2
Max. value: 22
Mean: 2
Median: 2
Variance: 11
Std. Dev.: 3
ppm
%
0 1 2 3 4 5 6 7 8 9 10 11 12 13
50 45 40 35 30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
0 3 6 9 12 15
n = 69
ppm

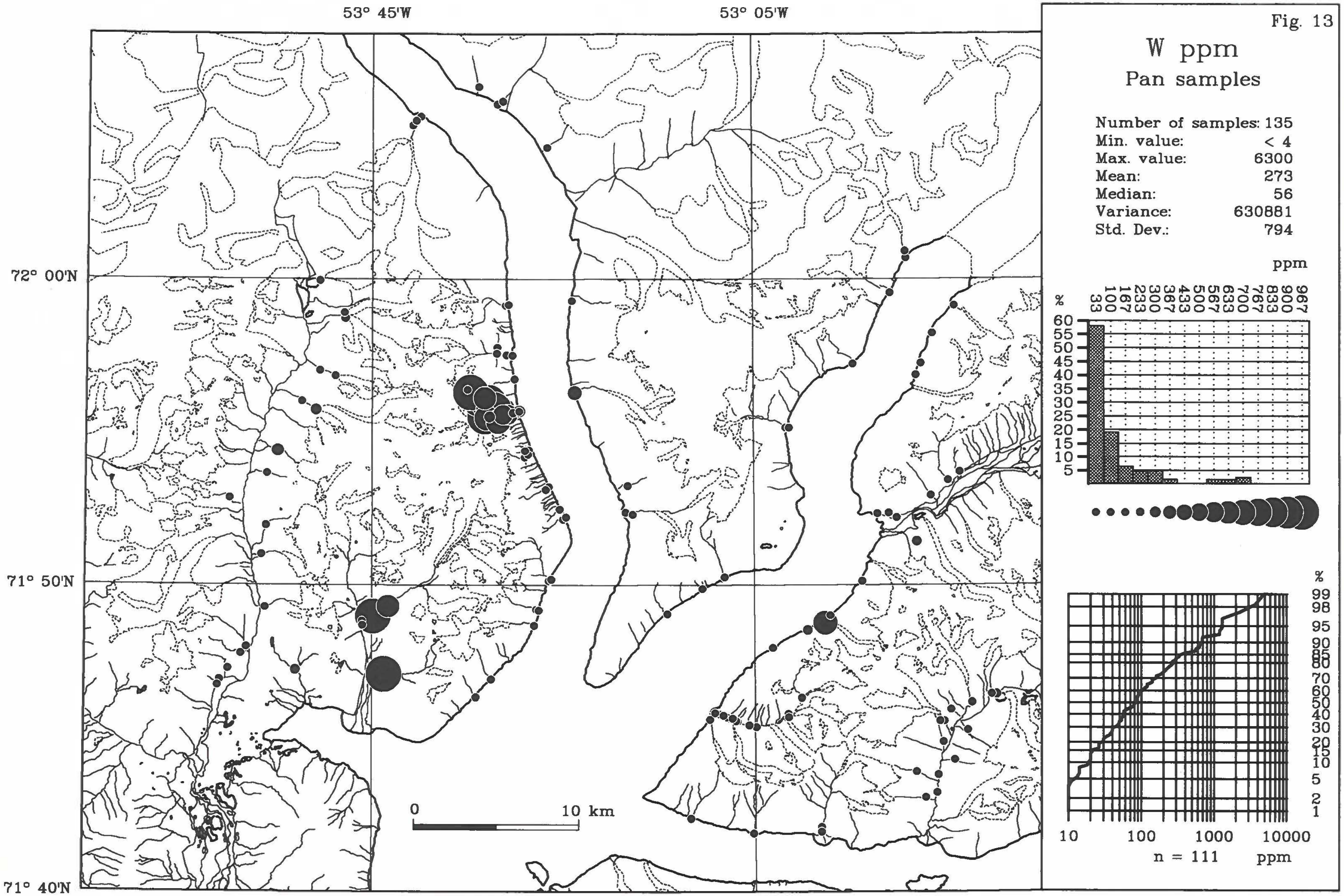


Fig. 13
W ppm
Pan samples
Number of samples: 135
Min. value: < 4
Max. value: 6300
Mean: 273
Median: 56
Variance: 630881
Std. Dev.: 794
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
n = 111
ppm

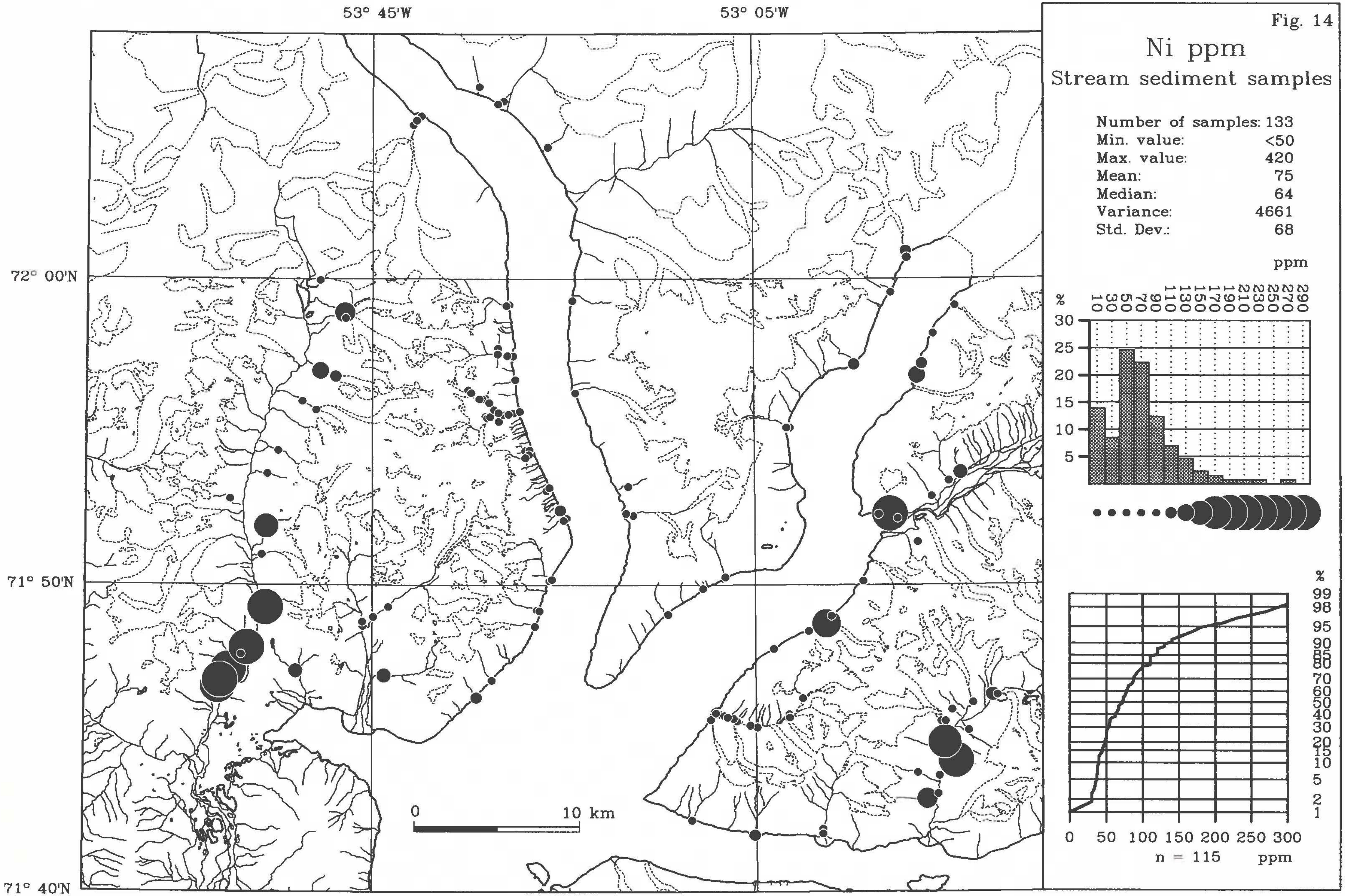


Fig. 14
Ni ppm
Stream sediment samples
Number of samples: 133
Min. value: <50
Max. value: 420
Mean: 75
Median: 64
Variance: 4661
Std. Dev.: 68
ppm
%
10 30 50 70 90 110 130 150 170 190 210 230 250 270 290
30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
0 50 100 150 200 250 300
n = 115 ppm
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0 10 km

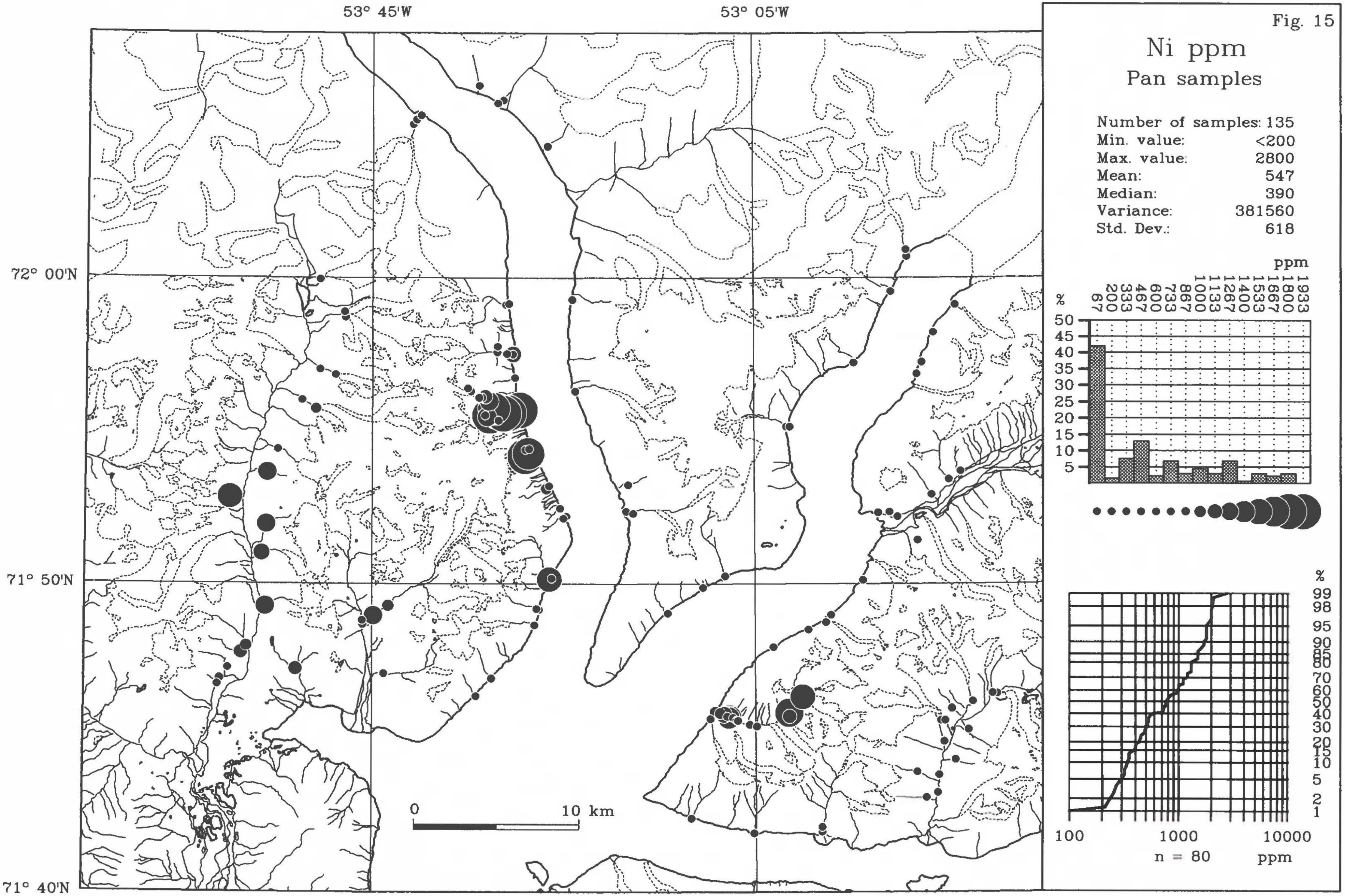
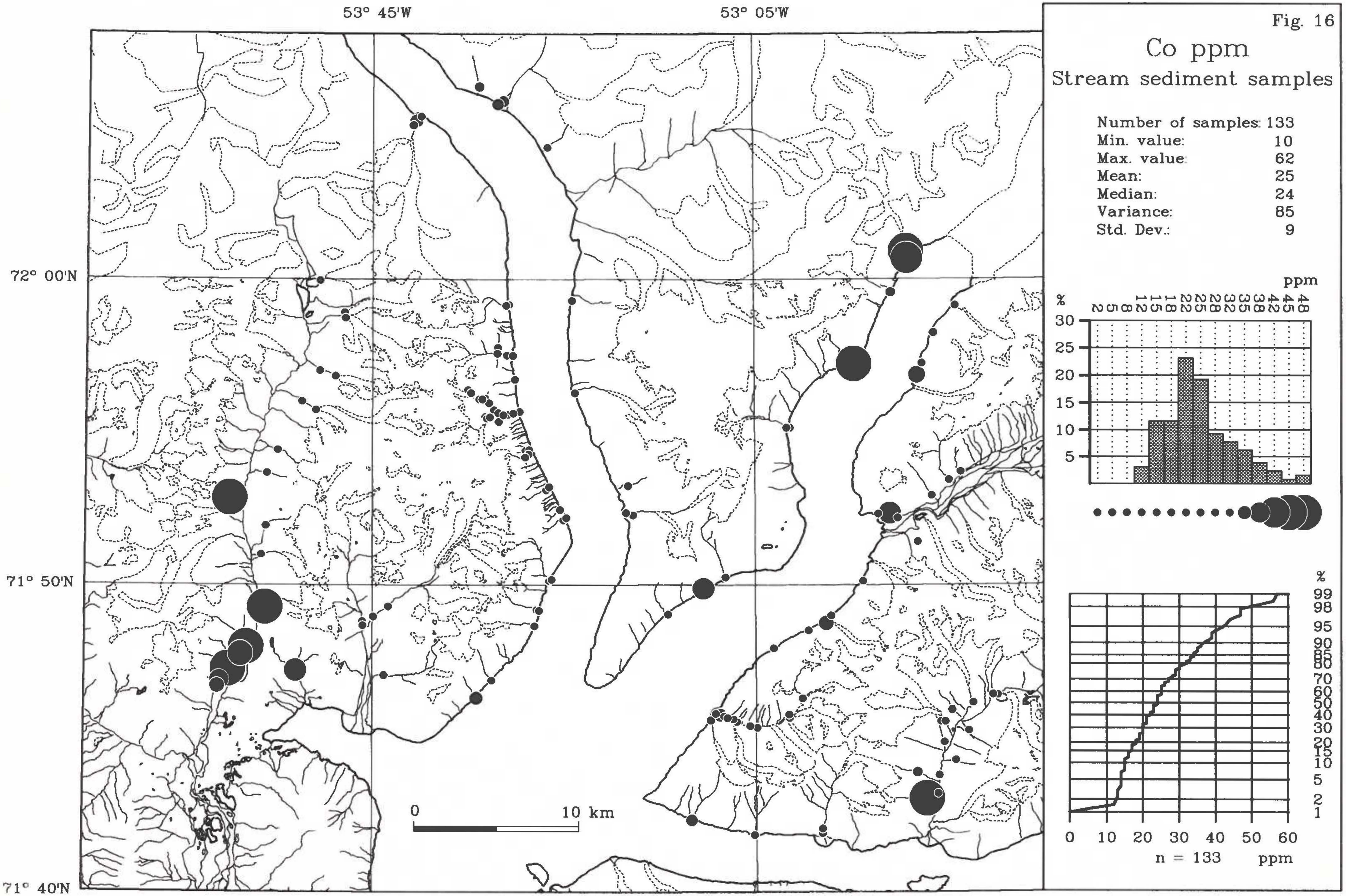
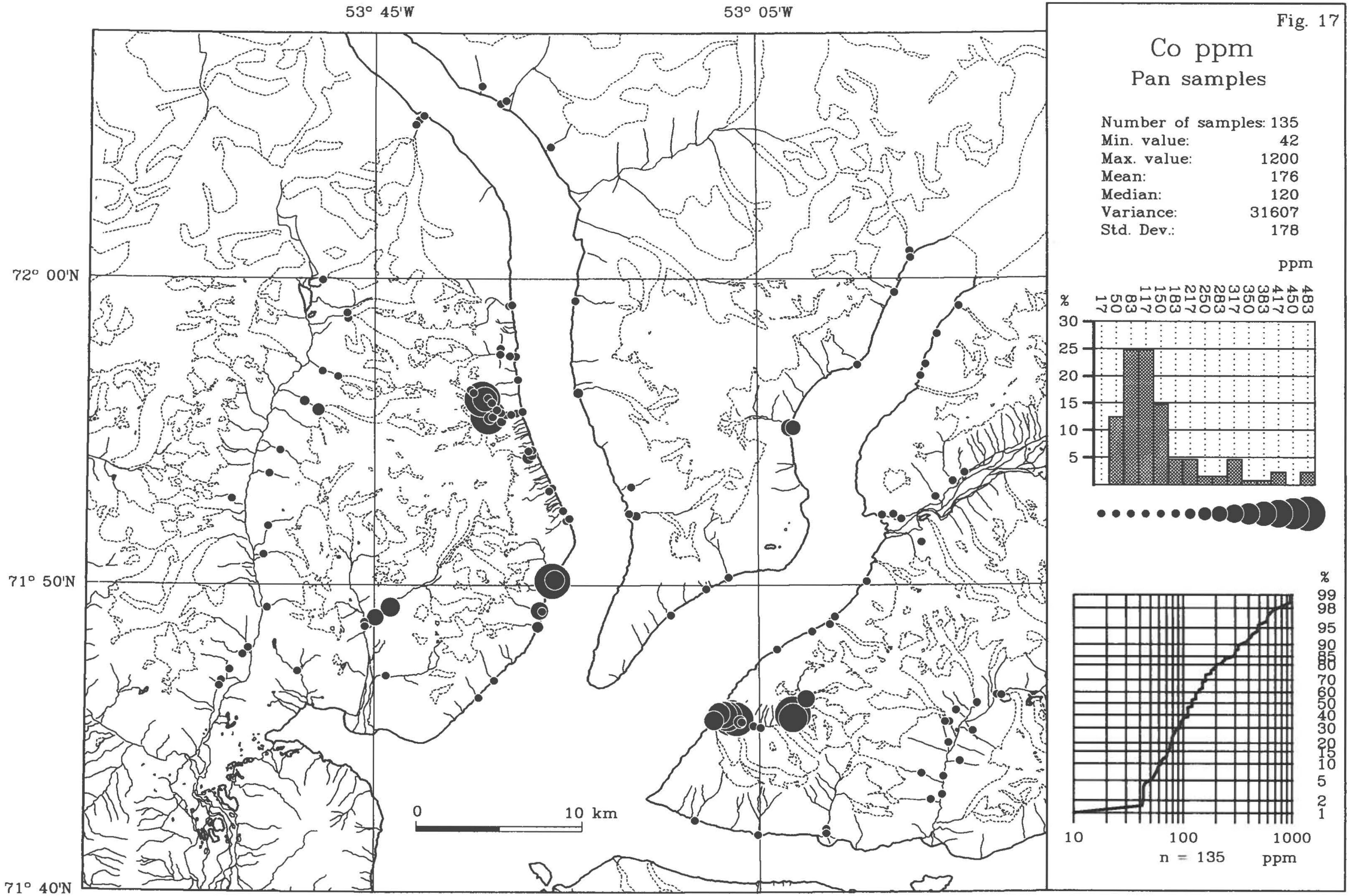


Fig. 15
Ni ppm
Pan samples
Number of samples: 135
Min. value: <200
Max. value: 2800
Mean: 547
Median: 390
Variance: 381560
Std. Dev.: 618
ppm
67 200 333 467 600 733 867 1000 1133 1267 1400 1533 1667 1800 1933
%
50 45 40 35 30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
100 1000 10000
n = 80
ppm
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km


53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 16
Co ppm
Stream sediment samples
Number of samples: 133
Min. value: 10
Max. value: 62
Mean: 25
Median: 24
Variance: 85
Std. Dev.: 9
ppm
%
2 5 8 12 15 18 22 25 28 32 35 38 42 45 48
30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
0 10 20 30 40 50 60
n = 133
ppm


53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 17
Co ppm
Pan samples
Number of samples: 135
Min. value: 42
Max. value: 1200
Mean: 176
Median: 120
Variance: 31607
Std. Dev.: 178
ppm
%
17 50 83 117 150 183 217 250 283 317 350 383 417 450 483
30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
10 100 1000
n = 135
ppm

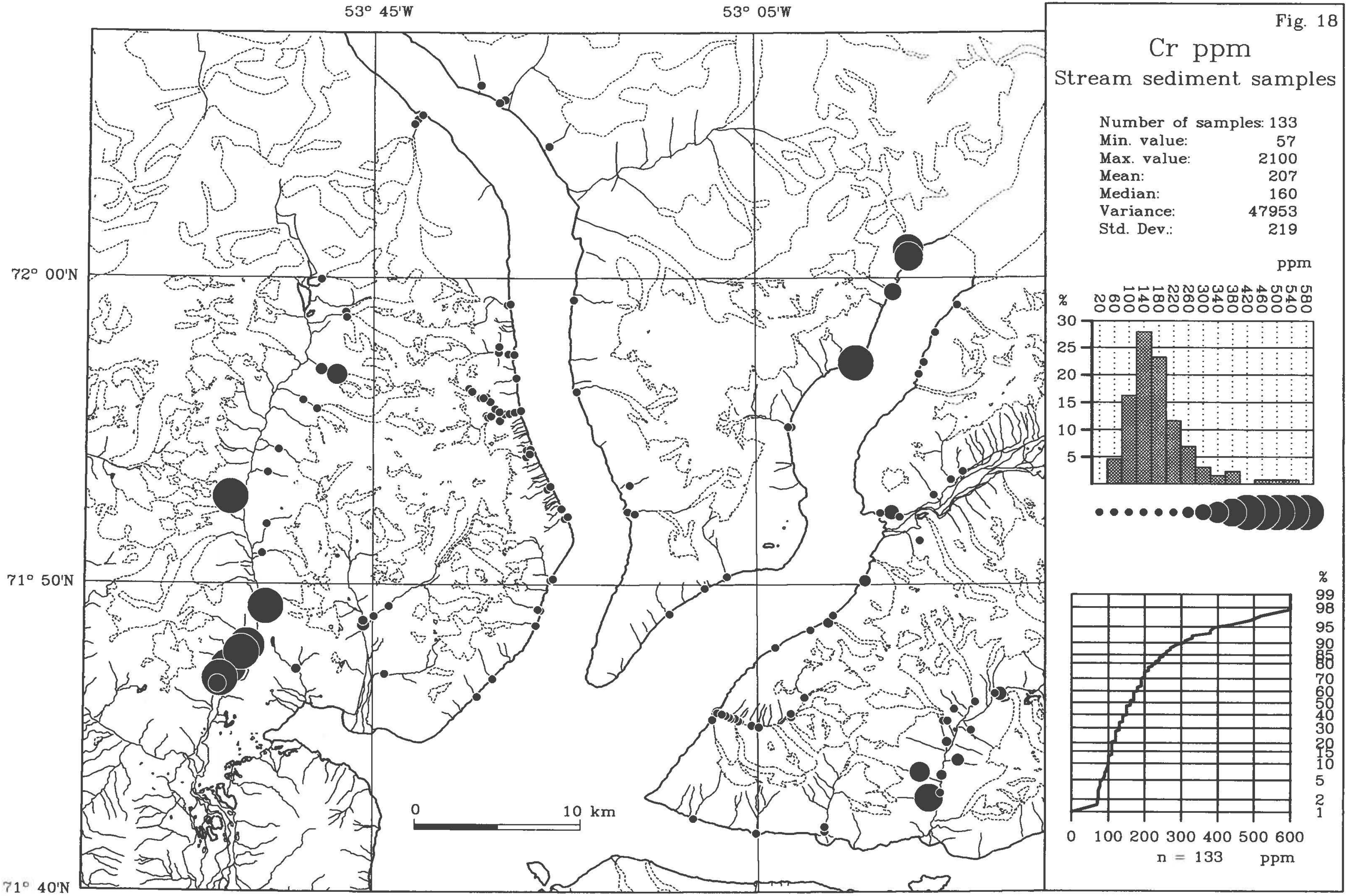
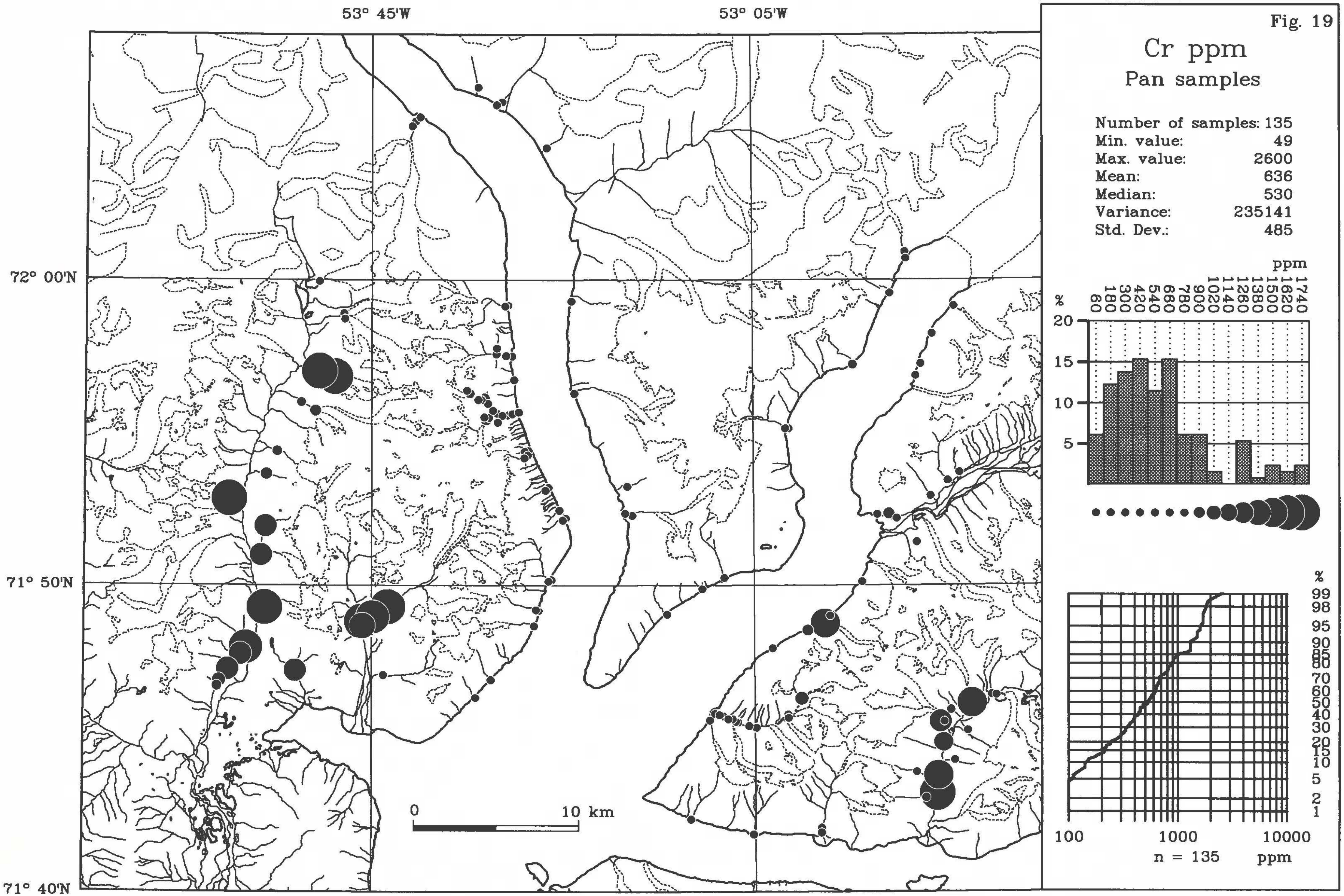


Fig. 18
Cr ppm
Stream sediment samples


53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 19
Cr ppm
Pan samples
Number of samples: 135
Min. value: 49
Max. value: 2600
Mean: 636
Median: 530
Variance: 235141
Std. Dev.: 485
ppm
%
60
180
300
420
540
660
780
900
1020
1140
1260
1380
1500
1620
1740
20
15
10
5
%
99
98
95
90
85
80
70
60
50
40
30
20
15
10
5
2
1
100
1000
10000
n = 135
ppm

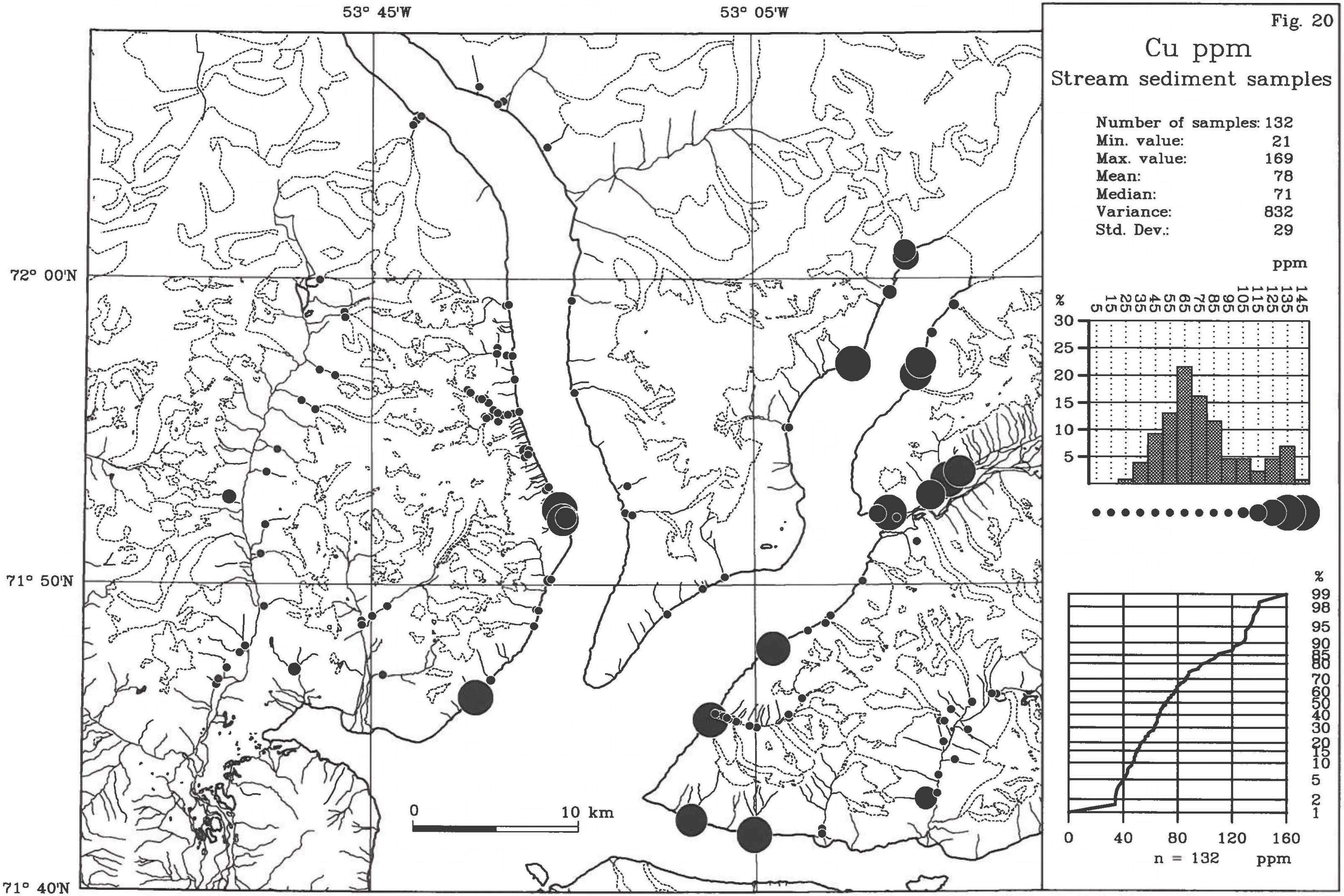
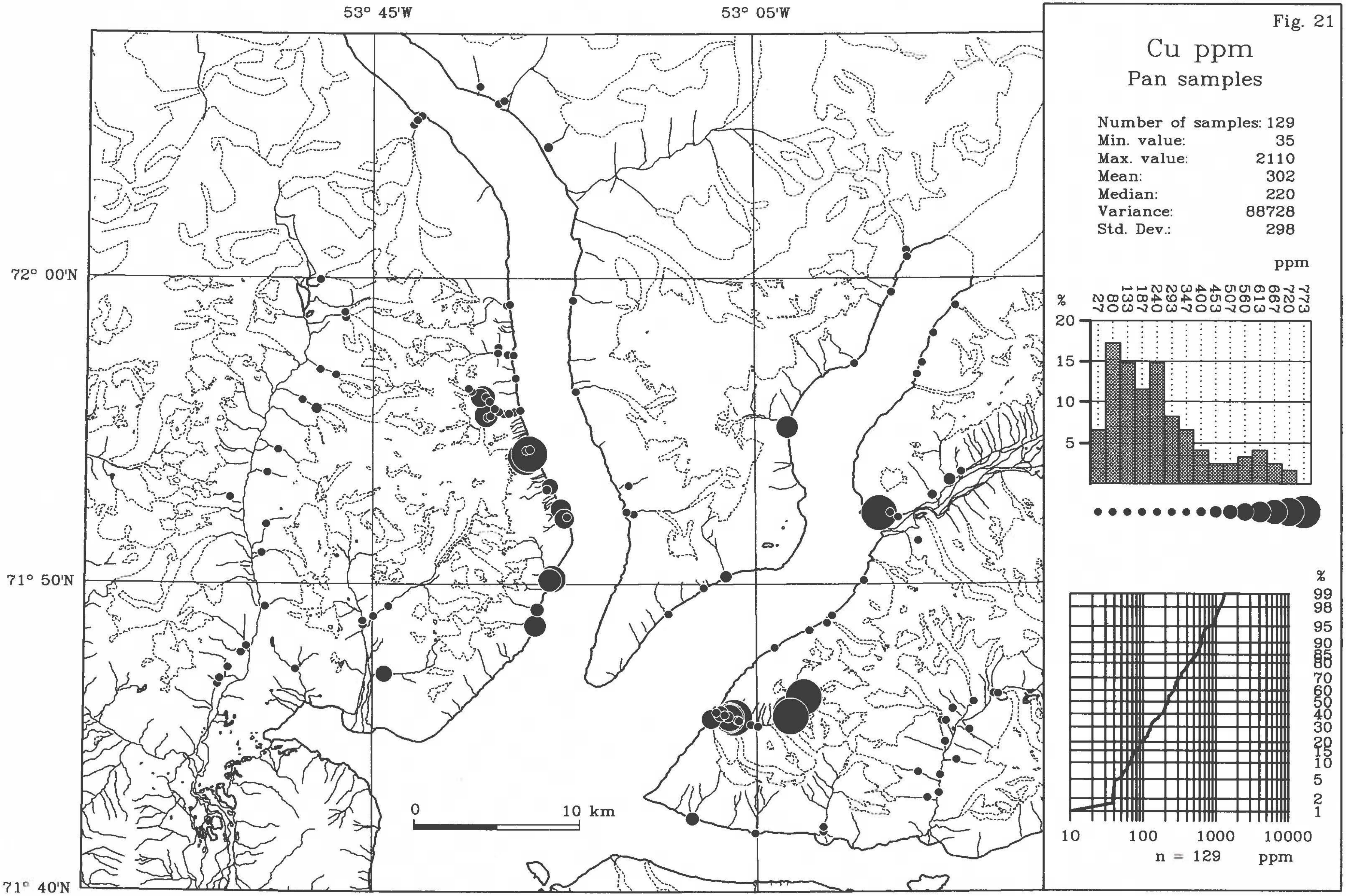


Fig. 20
Cu ppm
Stream sediment samples
Number of samples: 132
Min. value: 21
Max. value: 169
Mean: 78
Median: 71
Variance: 832
Std. Dev.: 29
ppm
%
5 15 25 35 45 55 65 75 85 95 105 115 125 135 145
30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
0 40 80 120 160
n = 132 ppm
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0 10 km



53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 21
Cu ppm
Pan samples
Number of samples: 129
Min. value: 35
Max. value: 2110
Mean: 302
Median: 220
Variance: 88728
Std. Dev.: 298
ppm
% 27 80 133 187 240 293 347 400 453 507 560 613 667 720 773
20
15
10
5
%
99
98
95
90
85
80
70
60
50
40
30
20
15
10
5
2
1
10 100 1000 10000
n = 129 ppm

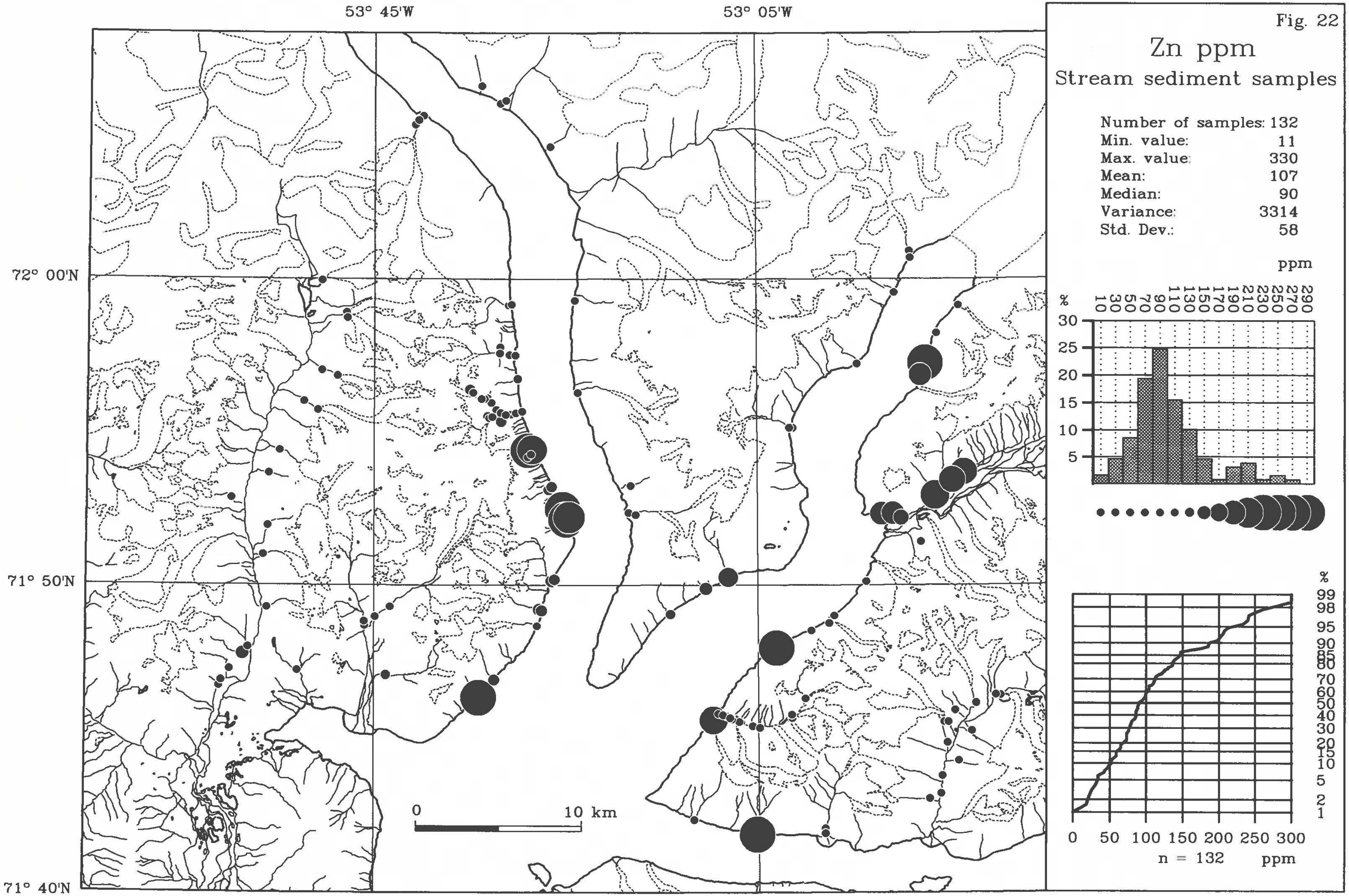
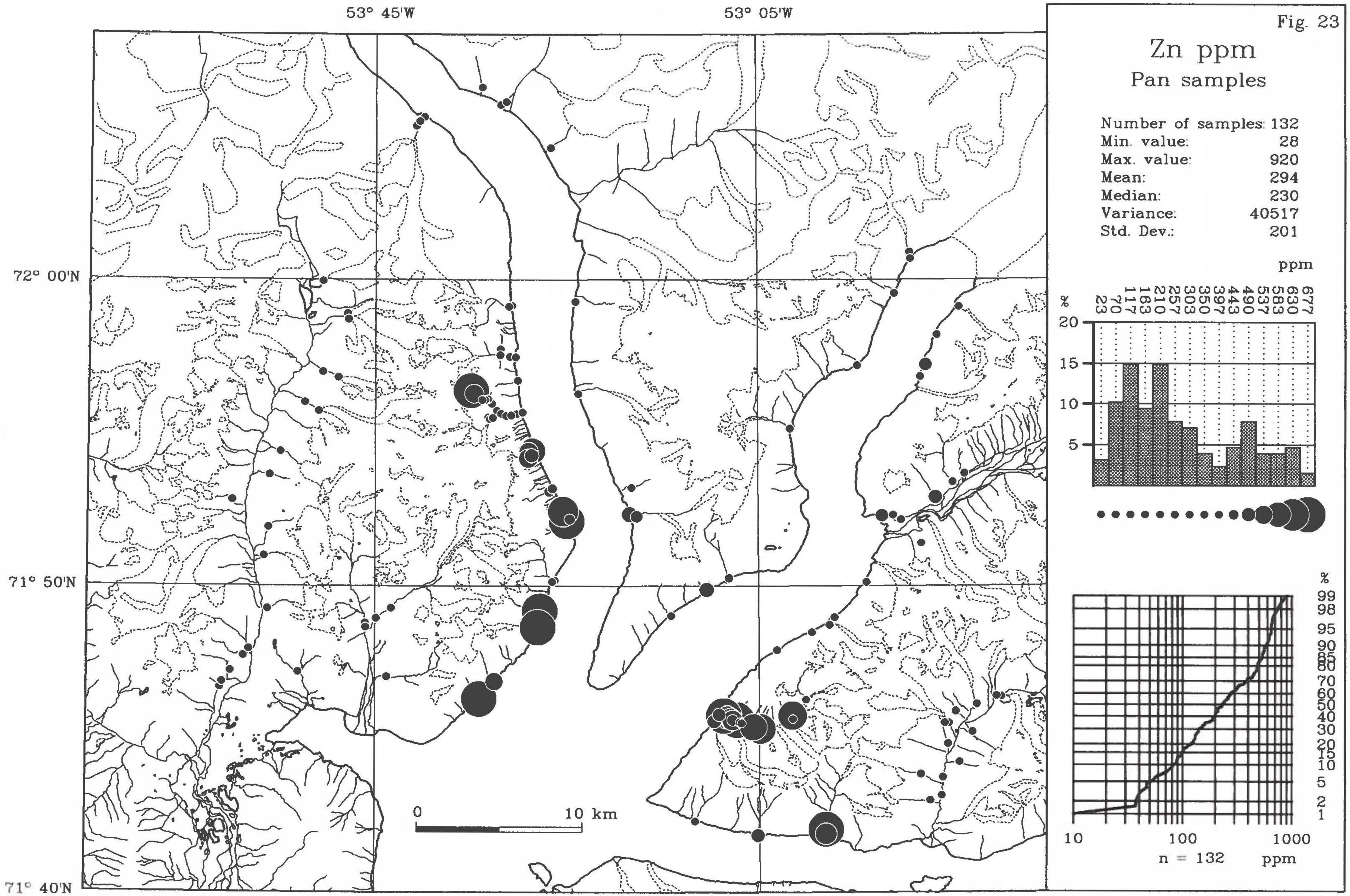
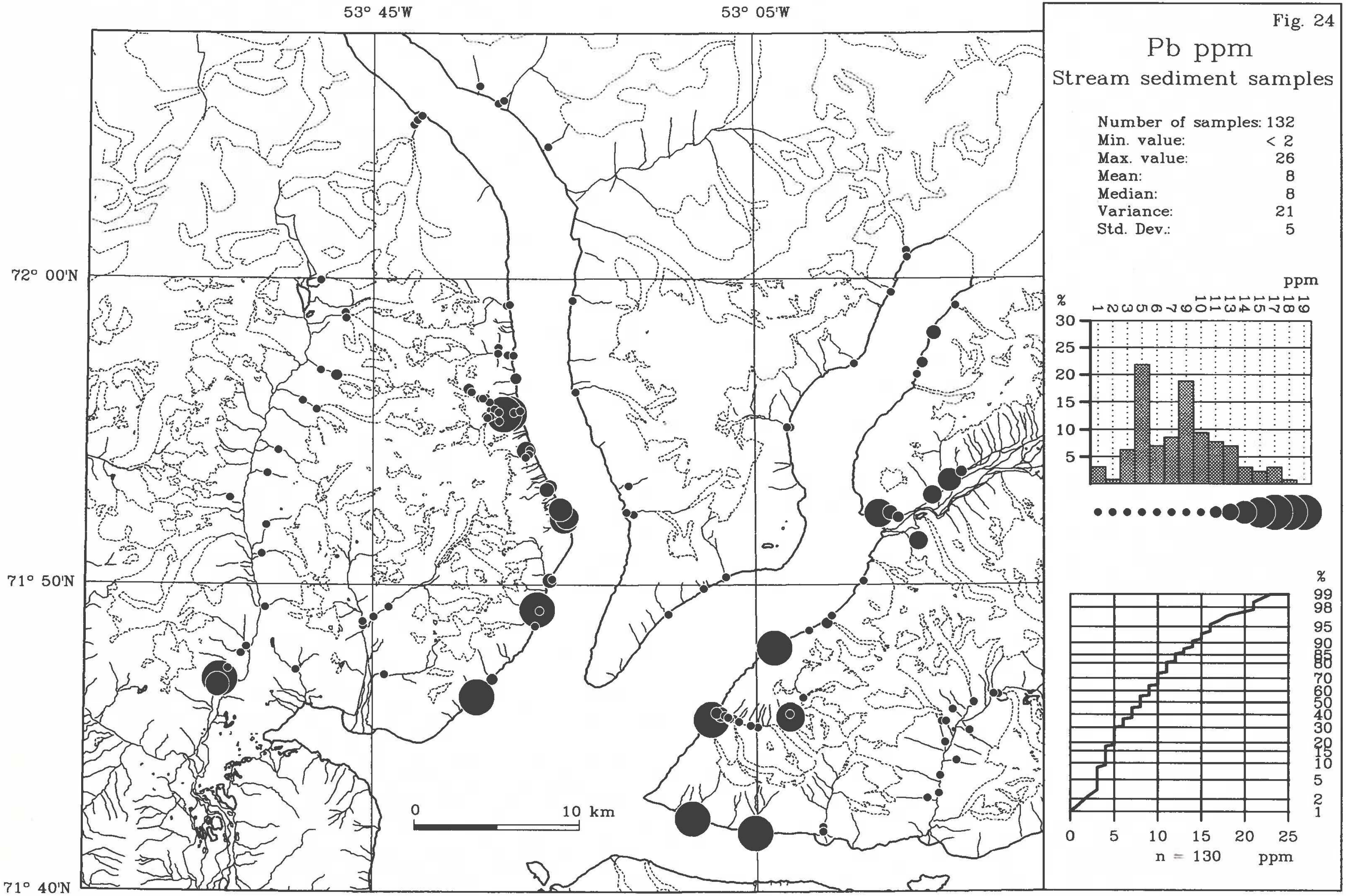
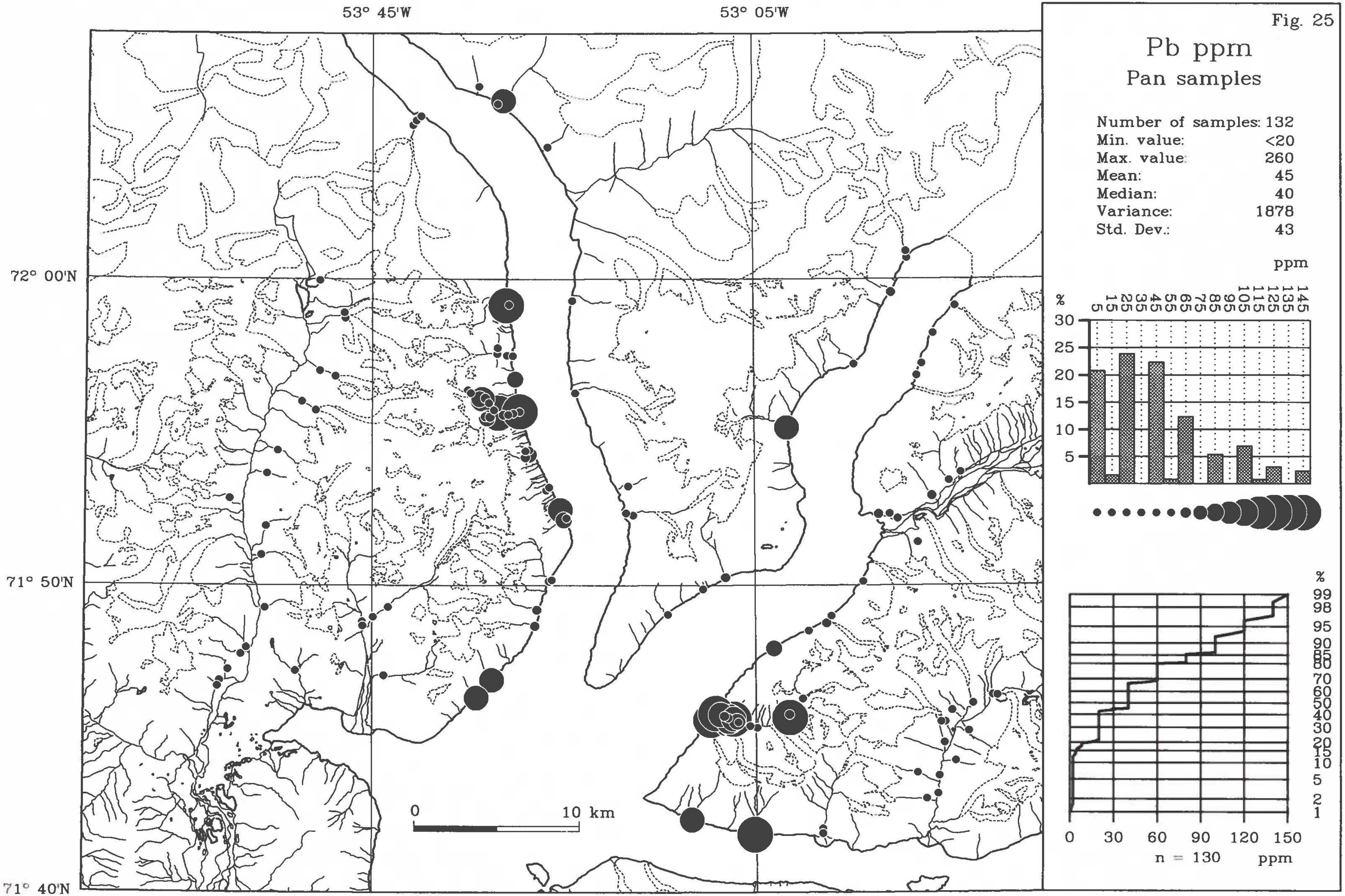


Fig. 22
Zn ppm
Stream sediment samples
Number of samples: 132
Min. value: 11
Max. value: 330
Mean: 107
Median: 90
Variance: 3314
Std. Dev.: 58
ppm
%
10 30 50 70 90 110 130 150 170 190 210 230 250 270 290
30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
0 50 100 150 200 250 300
n = 132 ppm
0 10 km
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N


53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 23
Zn ppm
Pan samples
Number of samples: 132
Min. value: 28
Max. value: 920
Mean: 294
Median: 230
Variance: 40517
Std. Dev.: 201
ppm
%
23 70 117 163 210 257 303 350 397 443 490 537 583 630 677
20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
10 100 1000
n = 132
ppm


53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 24
Pb ppm
Stream sediment samples
Number of samples: 132
Min. value: < 2
Max. value: 26
Mean: 8
Median: 8
Variance: 21
Std. Dev.: 5
ppm
%
1 2 3 5 6 7 9 10 11 13 14 15 17 18 19
30 25 20 15 10 5
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
0 5 10 15 20 25
n = 130
ppm


53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 25
Pb ppm
Pan samples
Number of samples: 132
Min. value: <20
Max. value: 260
Mean: 45
Median: 40
Variance: 1878
Std. Dev.: 43
ppm
%
5 15 25 35 45 55 65 75 85 95 105 115 125 135 145
30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
0 30 60 90 120 150
n = 130
ppm

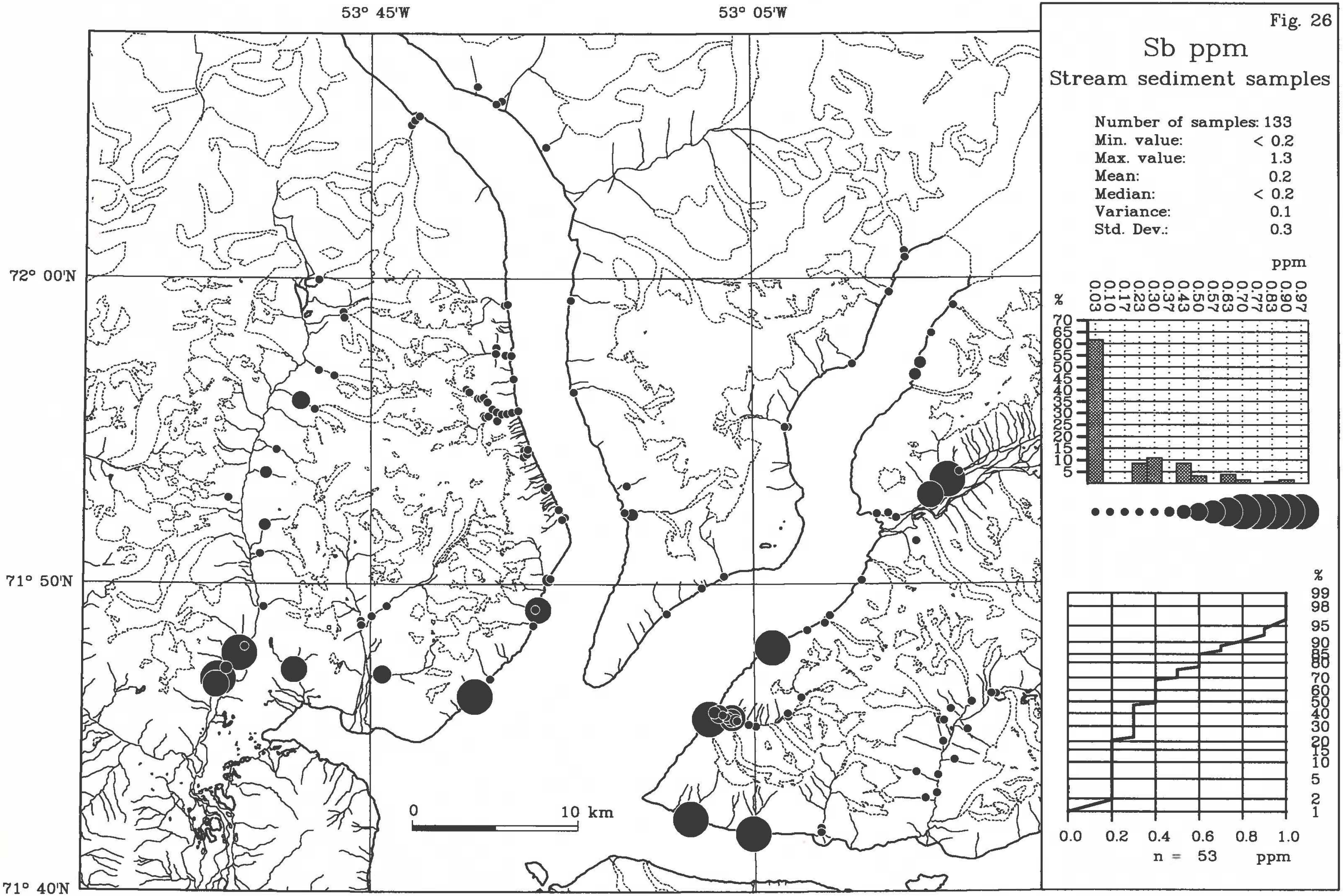


Fig. 26
Sb ppm
Stream sediment samples
Number of samples: 133
Min. value: < 0.2
Max. value: 1.3
Mean: 0.2
Median: < 0.2
Variance: 0.1
Std. Dev.: 0.3
ppm
%
0.03 0.10 0.17 0.23 0.30 0.37 0.43 0.50 0.57 0.63 0.70 0.77 0.83 0.90 0.97
70 65 60 55 50 45 40 35 30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
0.0 0.2 0.4 0.6 0.8 1.0
n = 53 ppm
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km

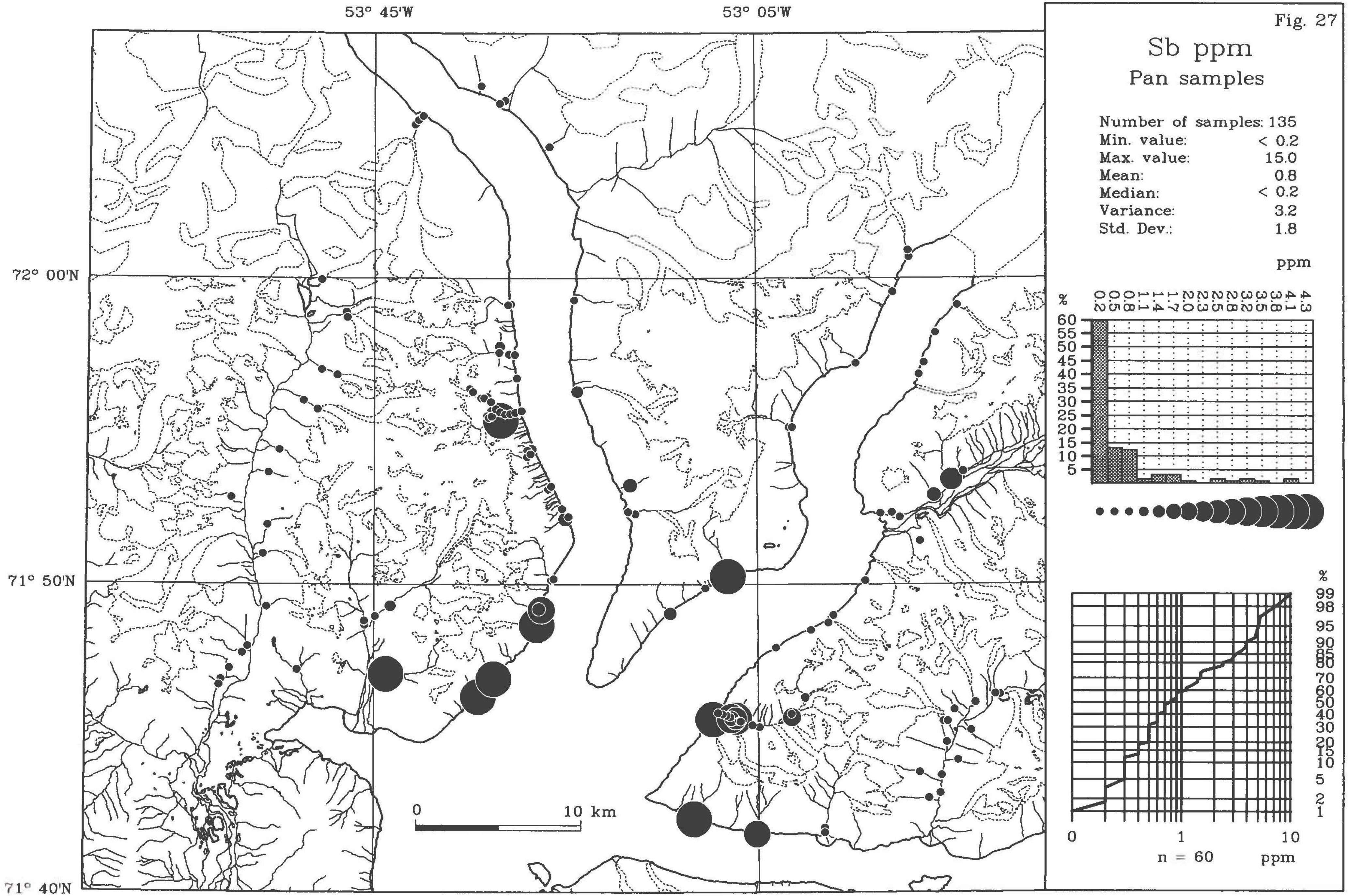


Fig. 27
Sb ppm
Pan samples
Number of samples: 135
Min. value: < 0.2
Max. value: 15.0
Mean: 0.8
Median: < 0.2
Variance: 3.2
Std. Dev.: 1.8
ppm
%
n = 60
ppm
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km

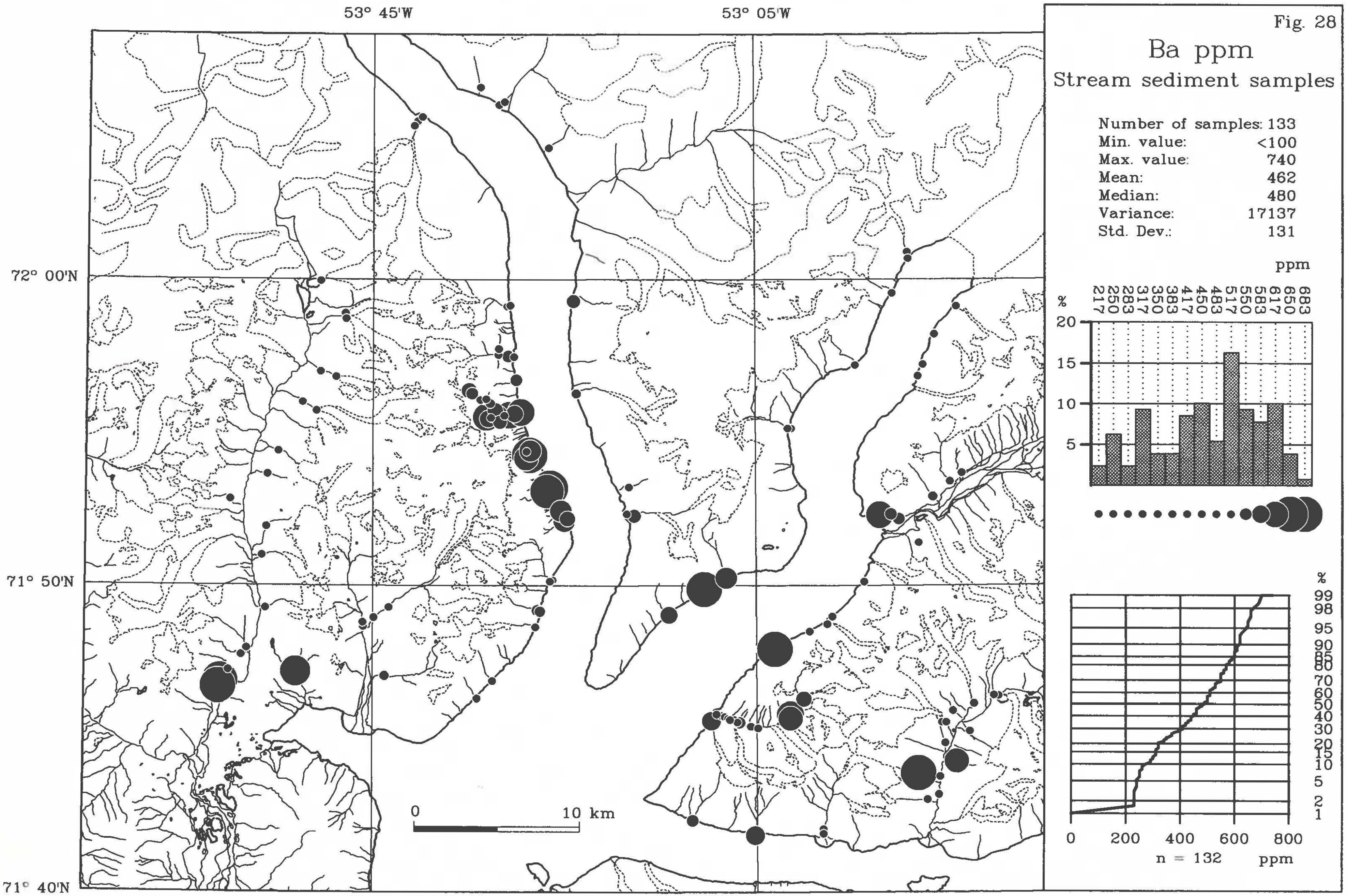
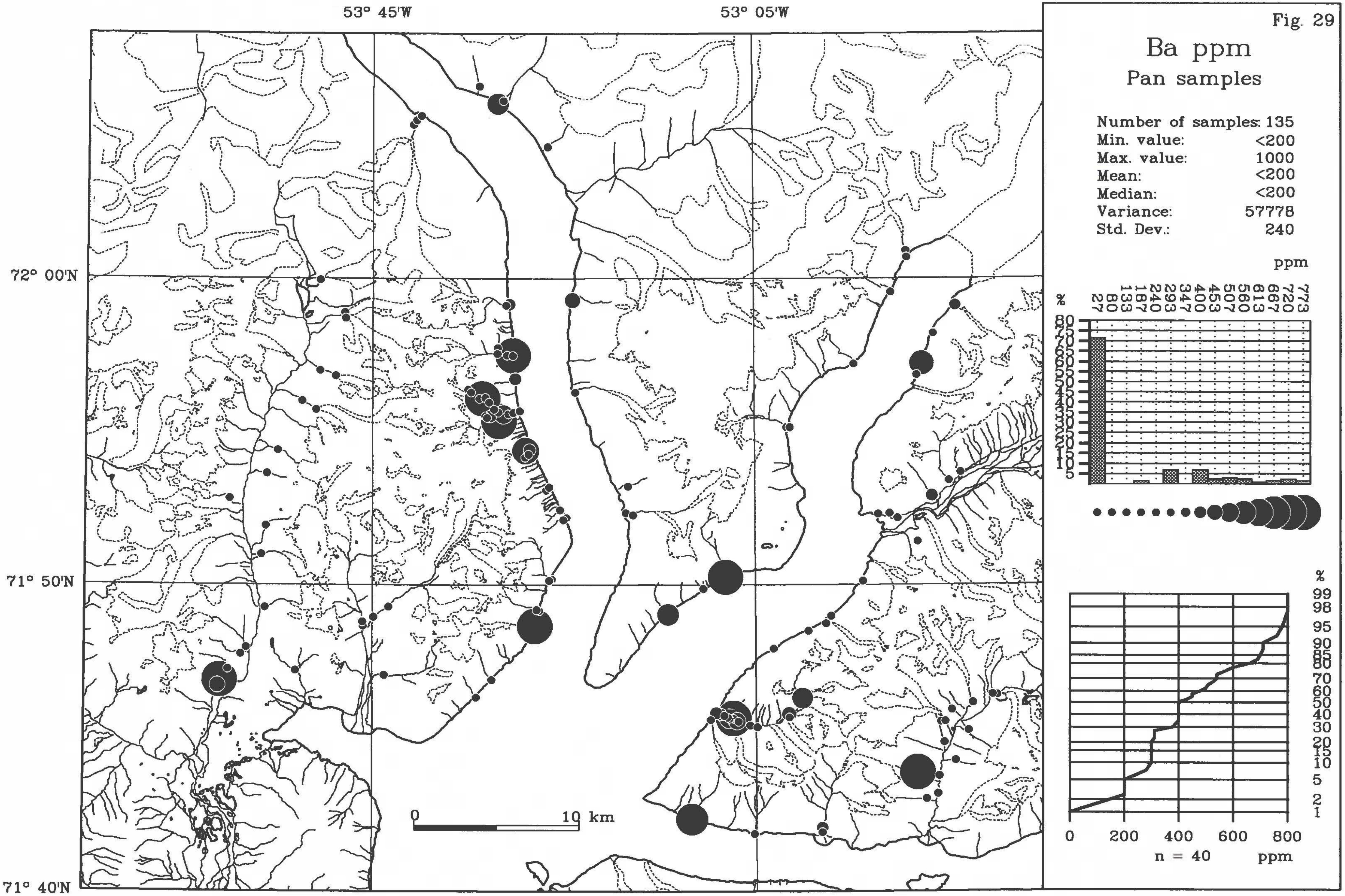


Fig. 28
Ba ppm
Stream sediment samples
Number of samples: 133
Min. value: <100
Max. value: 740
Mean: 462
Median: 480
Variance: 17137
Std. Dev.: 131
ppm
217 250 283 317 350 383 417 450 483 517 550 583 617 650 683
%
20
15
10
5
%
99
98
95
90
85
80
70
60
50
40
30
20
15
10
5
2
1
0 200 400 600 800
n = 132 ppm
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0 10 km


53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 29
Ba ppm
Pan samples
Number of samples: 135
Min. value: <200
Max. value: 1000
Mean: <200
Median: <200
Variance: 57778
Std. Dev.: 240
ppm
%
27 80 133 187 240 293 347 400 453 507 560 613 667 720 773
80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
0 200 400 600 800
n = 40
ppm

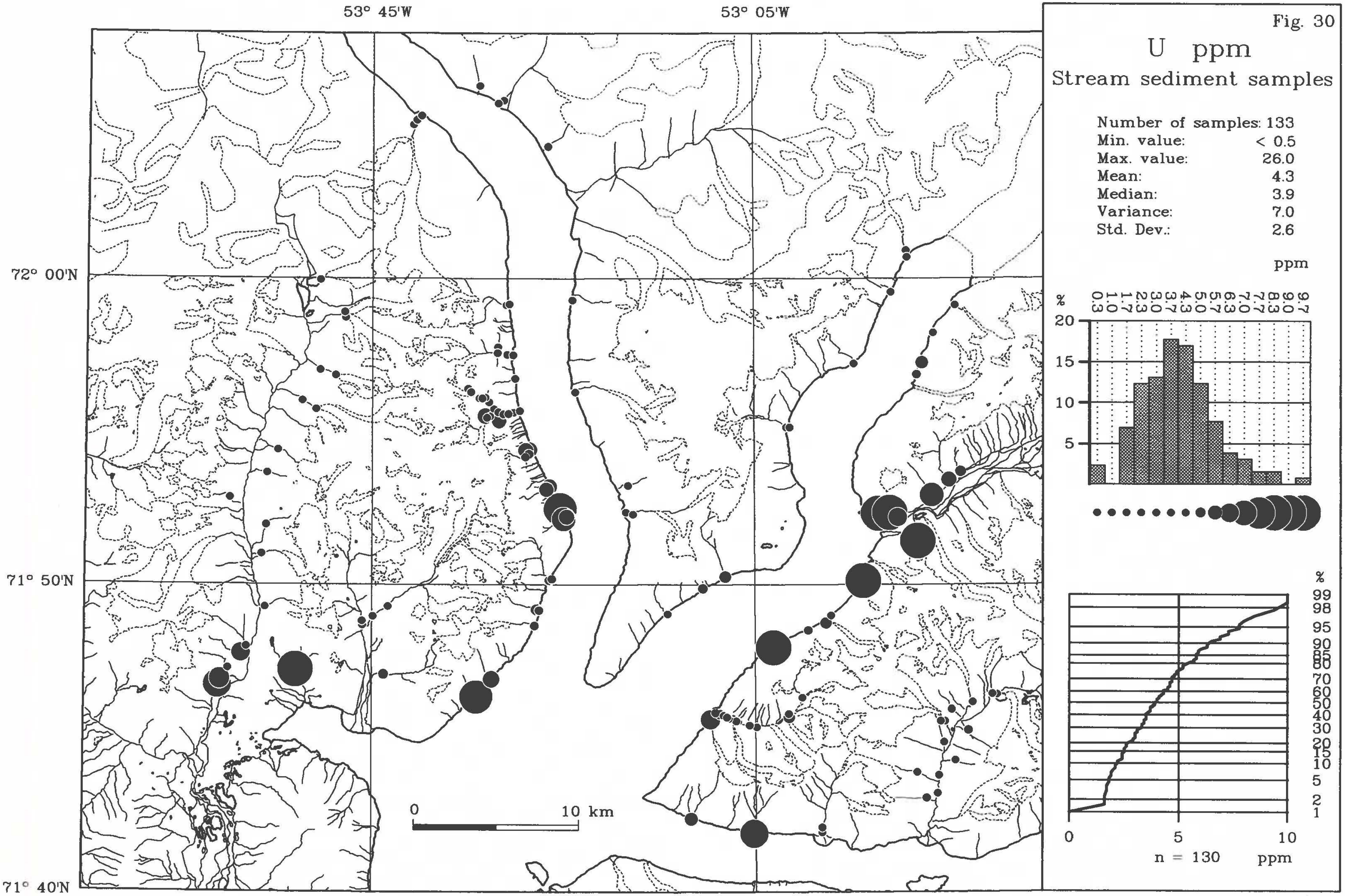
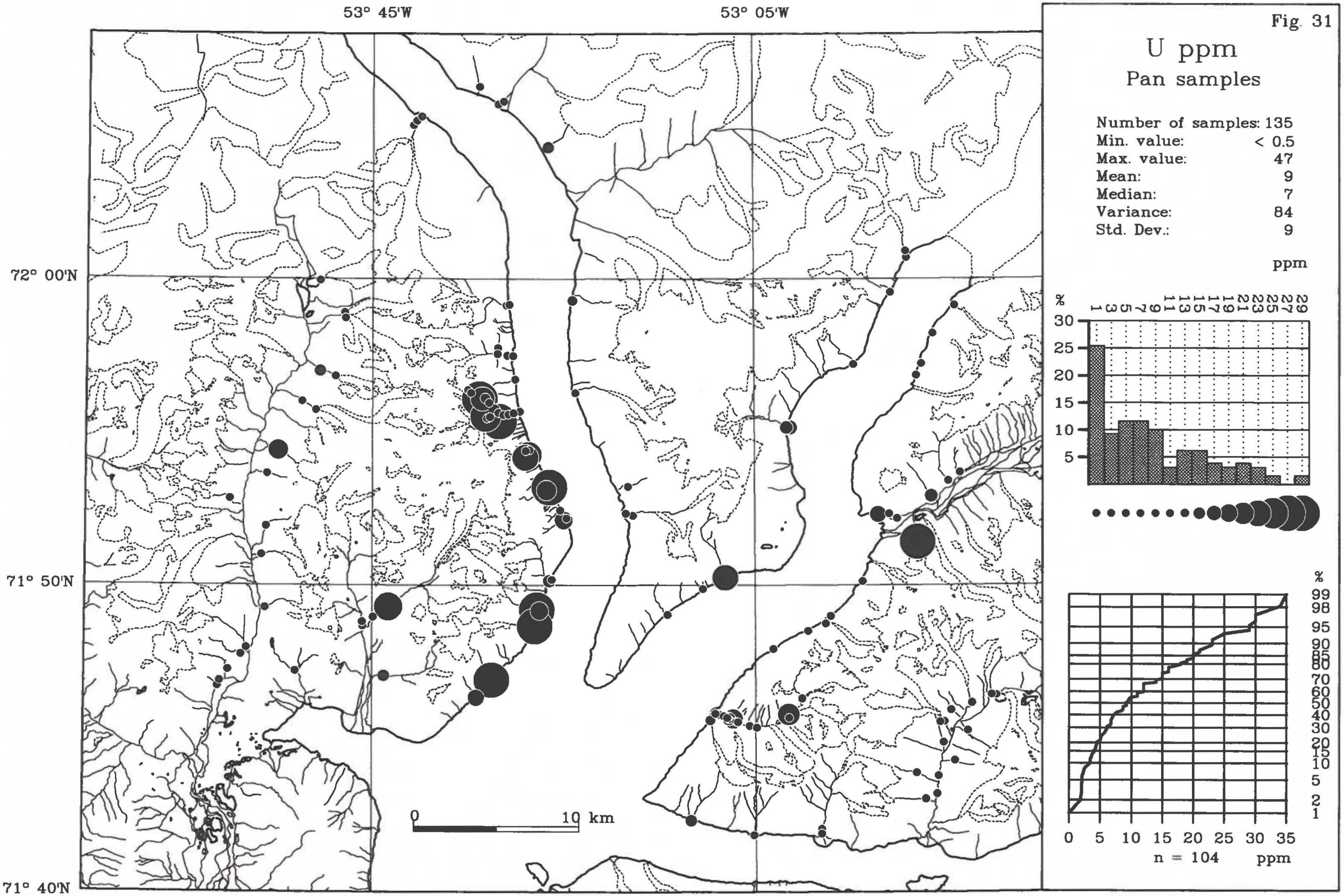


Fig. 30
U ppm
Stream sediment samples
Number of samples: 133
Min. value: < 0.5
Max. value: 26.0
Mean: 4.3
Median: 3.9
Variance: 7.0
Std. Dev.: 2.6
ppm
%
0.3 1.0 1.7 2.3 3.0 3.7 4.3 5.0 5.7 6.3 7.0 7.7 8.3 9.0 9.7
20
15
10
5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
0
5
10
n = 130 ppm
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km


53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 31
U ppm
Pan samples
Number of samples: 135
Min. value: < 0.5
Max. value: 47
Mean: 9
Median: 7
Variance: 84
Std. Dev.: 9
ppm
%
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
0 5 10 15 20 25 30 35
n = 104
ppm

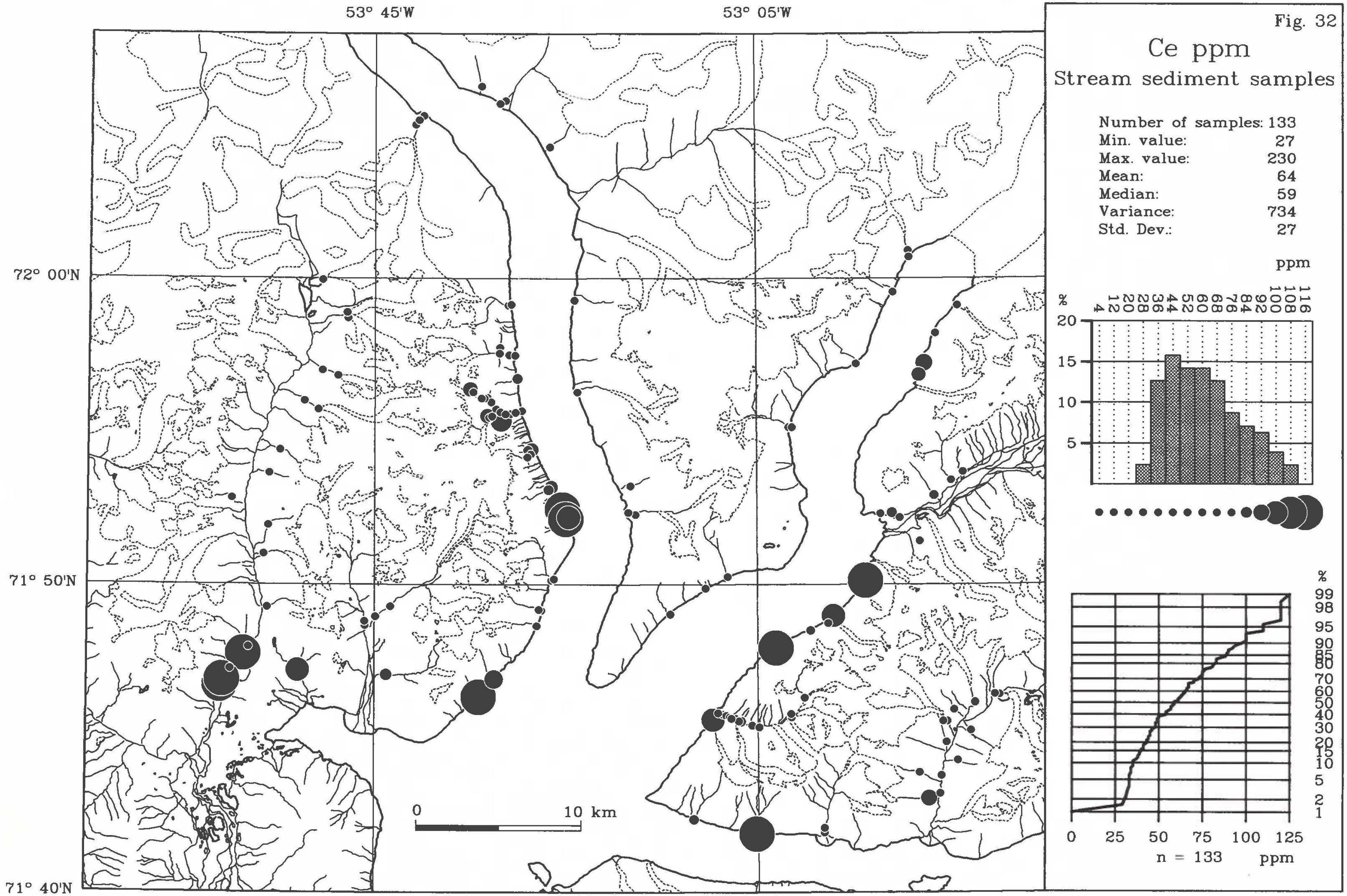
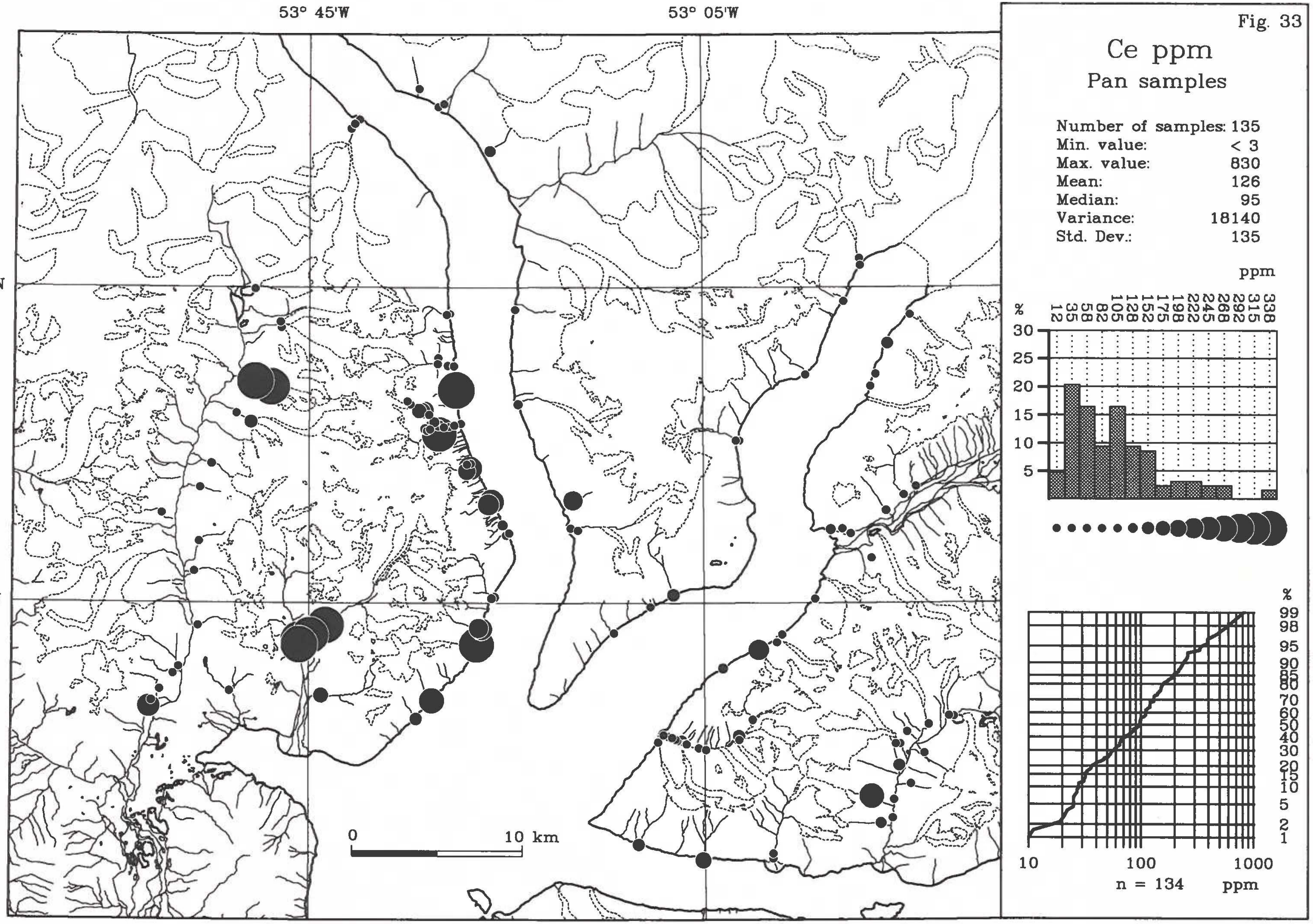


Fig. 32
Ce ppm
Stream sediment samples
Number of samples: 133
Min. value: 27
Max. value: 230
Mean: 64
Median: 59
Variance: 734
Std. Dev.: 27
53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
ppm
%
4 12 20 28 36 44 52 60 68 76 84 92 100 108 116
20 15 10 5
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
0 25 50 75 100 125
n = 133
ppm


53° 45'W
53° 05'W
72° 00'N
71° 50'N
71° 40'N
0
10 km
Fig. 33
Ce ppm
Pan samples
Number of samples: 135
Min. value: < 3
Max. value: 830
Mean: 126
Median: 95
Variance: 18140
Std. Dev.: 135
ppm
%
12 35 58 82 105 128 152 175 198 222 245 268 292 315 338
30 25 20 15 10 5
%
99 98 95 90 85 80 70 60 50 40 30 20 15 10 5 2 1
10 100 1000
n = 134
ppm

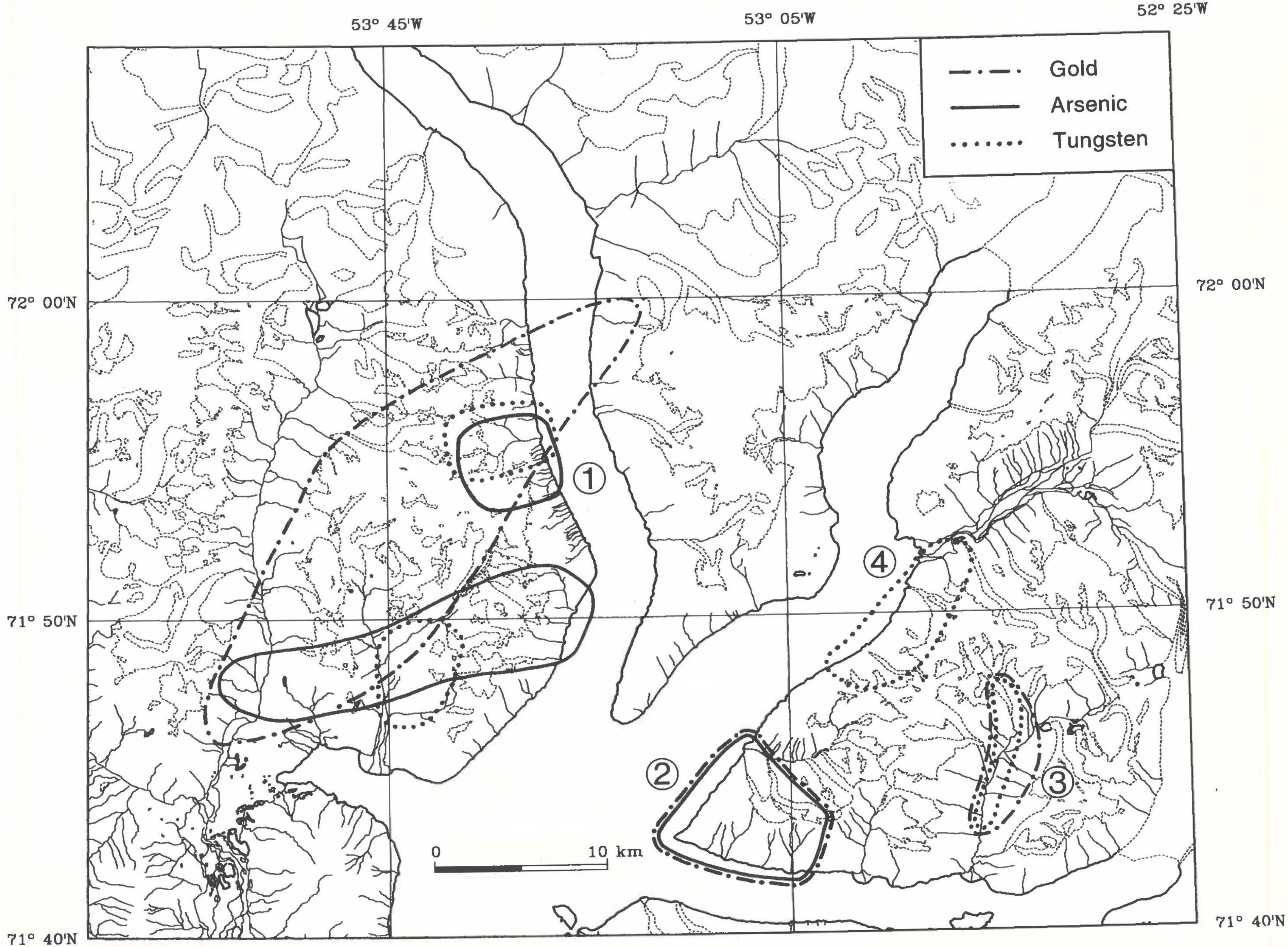


Fig. 34. Anomalous areas of gold - arsenic - tungsten

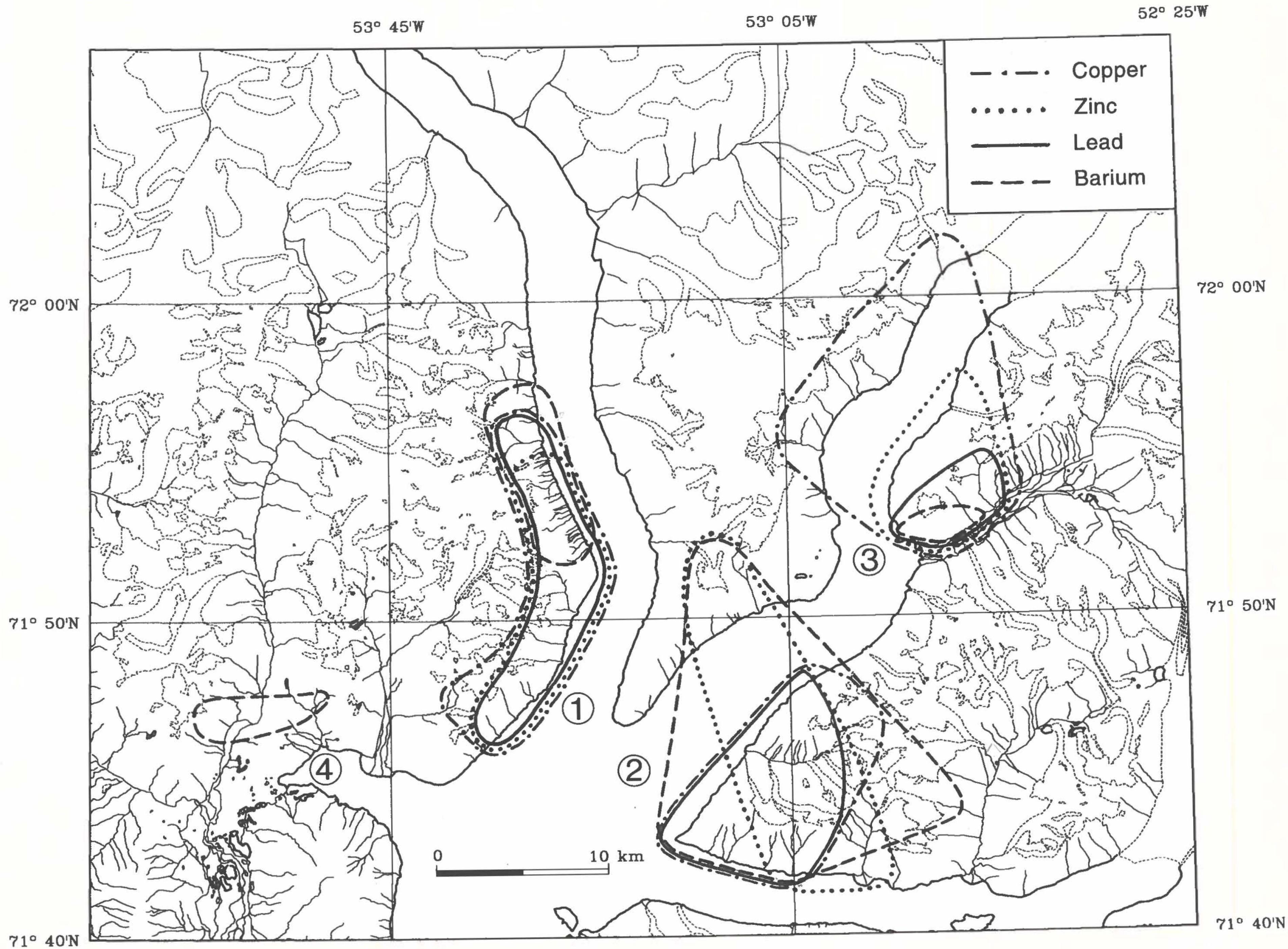


Fig. 35. Anomalous areas of copper - zinc - lead - barium

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Table 1. Analytical methods and detection limits.

(1) Neutron activation analysis by Activation Laboratories Ltd., Ontario.

Stream sediment samples.

Element	Detection limit	Element	Detection limit
Au	5 PPB	Na	500 PPM
Ag	5 PPM	Nd	5 PPM
As	2 PPM	Ni	50 PPM
Ba	100 PPM	Rb	30 PPM
Br	1 PPM	Sb	0.2 PPM
Ca	1 PCT	Sc	0.1 PPM
Co	5 PPM	Se	5 PPM
Cr	10 PPM	Sr	500 PPM
Cs	2 PPM	Sm	0.1 PPM
Eu	0.2 PPM	Sn	100 PPM
Fe	0.02 PCT	Ta	1 PPM
Hf	1 PPM	Tb	0.5 PPM
Hg	1 PPM	Th	0.5 PPM
Ir	5 PPB	U	0.5 PPM
La	1 PPM	W	4 PPM
Lu	0.05 PPM	Yb	0.05 PPM
Mo	5 PPM	Zn	50 PPM

(2) Neutron activation analysis by Activation Laboratories Ltd., Ontario.

Pan samples.

Element	Detection limit	Element	Detection limit
Au	5 PPB	Mo	20 PPM
Ag	5 PPM	Na	500 PPM
As	2 PPM	Nd	10 PPM
Ba	200 PPM	Ni	200 PPM
Br	5 PPM	Rb	50 PPM
Ca	1 PCT	Sb	0.2 PPM
Ce	3 PPM	Sc	0.1 PPM
Co	5 PPM	Se	20 PPM
Cr	10 PPM	Sm	0.1 PPM
Cs	2 PPM	Sr	2000 PPM
Eu	0.2 PPM	Ta	1 PPM
Fe	0.02 PCT	Tb	2 PPM
Hf	1 PPM	Th	0.5 PPM
Hg	5 PPM	U	0.5 PPM
Ir	50 PPB	W	4 PPM
La	1 PPM	Yb	0.2 PPM
Lu	0.1 PPM	Zn	200 PPM

Table 1. Analytical methods and detection limits.

(3) Fire assay/plasma analysis (f.a.) by Activation Laboratories Ltd., Ontario.

Pan samples.

Element	Detection limit
Pd	2 PPB
Pt	5 PPB
Au	1 PPB

(4) Aqua regia/atomic absorbtion by Activation Laboratories Ltd., Ontario.

Stream sediment samples.

Element	Detection limit
Cu	1 PPM
Pb	1 PPM
Zn	1 PPM

(5) Aqua regia/plasma analysis by Activation Laboratories Ltd., Ontario.

Pan samples.

Element	Detection limit
Cu	1 PPM
Pb	2 PPM
Zn	1 PPM

Note. 0 or 0.0 in the analytical results indicates a value below the detection limit.

Table 2. Stream sediment samples, 1992

GGU no	Source	Altitude metre	-0.1 mm fraction gramme
386901	N	210	69
386902	N	250	112
386903	N,P	200	98
386904	N,P	230	107
386905	N	200	41
386906	Q	350	130
386907	Q	350	78
386908	Q,D,V,N	350	115
386909	Q,D,V,N	350	76
386910	Q,V,N	230	203
386911	B,Q	300	137
386912	B,Q	300	99
386913	B,Q	300	99
386914	Q,D	430	36
386915	N,P	450	144
386916	N,G,P	720	155
386917	N,Q,P	730	195
386918	N,P	660	99
386919	N,G,P	470	140
386920	N,P	570	190
386921	N,P	430	178
386922	N	470	275
386923	N	330	379
386924	N	380	163
386925	N,P	250	177
386926	N,P	140	89
386927	N	150	128
386928	N,P	130	154
386929	N,P	160	57
386930	V,Q,N,P	420	26
386931	N,V,Q	100	19
386932	N	90	26
386933	N,B	80	24
Samples			33
Minimum			19
Maximum			379
Average			122

P = Plateau basalt
D = Dolerite dyke
G = Granitic sheet
N = Nûkavsak Formation (23)
V = Metavolcanic unit (1)
Q = Qeqertarssuaq Formation (6)
B = Gneissic basemant (3)

Table 2. Stream sediment samples, 1992

GGU no	Au ppb	As ppm	W ppm	Mo ppm	Sn ppm	Ni ppm	Co ppm	Ir ppb	Cr ppm	Fe %
386901	0	18	0	0	0	0	17	0	130	3.7
386902	0	17	0	0	0	0	15	0	120	3.1
386903	0	9	0	0	0	0	20	0	270	4.2
386904	0	8	0	0	0	0	21	0	240	4.1
386905	0	4	0	0	0	120	25	0	130	4.8
386906	9	0	0	0	0	270	30	0	270	4.9
386907	13	2	0	0	0	0	25	0	210	4.1
386908	0	4	0	0	0	0	20	0	170	4.1
386909	0	0	0	0	0	0	17	0	140	3.7
386910	0	3	0	0	0	170	27	0	240	4.9
386911	16	0	10	0	0	0	13	0	120	3.3
386912	0	3	0	0	0	0	25	0	280	4.5
386913	0	2	0	0	0	120	20	0	170	3.7
386914	0	0	0	0	0	0	25	0	190	4.7
386915	0	0	0	0	0	130	22	0	260	4.7
386916	0	5	0	0	0	140	24	0	200	5.0
386917	0	3	0	0	0	0	12	0	100	2.4
386918	0	3	5	0	0	110	29	0	330	5.6
386919	0	14	0	0	0	0	23	0	160	4.2
386920	0	0	0	0	0	77	14	0	110	2.8
386921	0	0	0	0	0	0	13	0	110	2.8
386922	0	14	0	0	0	0	26	0	200	4.7
386923	0	14	0	0	0	0	21	0	150	4.3
386924	0	14	0	0	0	150	25	0	220	4.9
386925	0	16	0	0	0	0	21	0	200	3.9
386926	0	9	0	0	0	230	44	0	1000	6.4
386927	13	58	0	0	0	0	40	0	520	7.2
386928	12	46	0	0	0	120	39	0	240	6.4
386929	0	4	0	0	0	210	47	0	600	6.8
386930	0	0	0	0	0	0	62	0	1200	8.5
386931	11	13	0	0	0	420	57	0	2100	7.9
386932	12	21	0	0	0	390	38	0	440	6.5
386933	0	23	0	0	0	400	36	0	310	6.1
Samples	33	33	33	33	33	33	33	33	33	33
Minimum	0	0	0	0	0	0	12	0	100	2.4
Maximum	16	58	10	0	0	420	62	0	2100	8.5

Table 2. Stream sediment samples, 1992

GGU no	Cu ppm	Zn ppm	Zn ppm (a.a.)	Pb ppm	Ag ppm	Sb ppm	Se ppm
386901	58	130	110	8	0	0.3	0
386902	53	120	86	5	0	0.0	0
386903	48	120	111	9	0	0.0	0
386904	50	130	88	3	0	0.3	0
386905	82	130	130	9	0	0.5	0
386906	60	87	42	4	0	0.0	0
386907	50	110	44	7	0	0.3	0
386908	68	110	52	3	0	0.0	0
386909	46	70	30	1	0	0.0	0
386910	71	110	53	5	0	0.0	0
386911	21	76	11	4	0	0.0	0
386912	42	110	47	7	0	0.0	0
386913	35	95	32	3	0	0.0	0
386914	52	78	34	5	0	0.0	0
386915	71	120	100	4	0	0.0	0
386916	75	96	68	8	0	0.0	0
386917	34	84	52	4	0	0.0	0
386918	72	110	97	11	0	0.2	0
386919	67	0	49	0	0	0.0	0
386920	49	63	70	1	0	0.3	0
386921	37	91	59	4	0	0.5	0
386922	73	170	113	5	0	0.3	0
386923	58	130	97	3	0	0.4	0
386924	59	130	81	8	0	0.4	0
386925	54	83	73	0	0	0.0	0
386926	73	81	73	9	0	0.0	0
386927	86	290	147	6	0	1.0	0
386928	108	210	118	10	0	0.6	0
386929	86	100	87	2	0	0.3	0
386930	110	170	86	4	0	0.0	0
386931	96	200	80	5	0	0.4	0
386932	78	200	104	16	0	0.9	0
386933	95	160	111	14	0	0.6	0
Samples	33	33	33	33	33	33	33
Minimum	21	0	11	0	0	0.0	0
Maximum	110	290	147	16	0	1.0	0

Table 2. Stream sediment samples, 1992

GGU no	Na %	Ba ppm	Br ppm	Sc ppm	Rb ppm	Cs ppm	Hf ppm	Ta ppm
386901	1.8	420	0	14.0	84	5	9	0
386902	1.7	410	0	12.0	74	5	8	0
386903	1.2	460	0	16.0	69	5	11	0
386904	1.2	460	0	17.0	76	5	12	0
386905	1.8	530	0	17.0	93	8	7	0
386906	1.5	610	0	23.0	100	4	7	0
386907	1.5	520	0	20.0	80	2	8	1
386908	1.8	320	0	15.0	51	3	7	0
386909	1.8	310	0	14.0	52	0	8	0
386910	1.8	360	3	18.0	64	3	6	1
386911	1.9	240	0	15.0	0	0	18	0
386912	1.5	410	0	19.0	76	5	9	0
386913	1.4	260	0	17.0	77	3	8	0
386914	1.6	300	0	23.0	59	3	6	0
386915	1.5	500	0	16.0	60	4	7	0
386916	1.6	250	0	24.0	41	2	6	0
386917	2.2	250	0	11.0	33	3	7	0
386918	1.5	490	0	19.0	82	5	8	0
386919	2.0	260	0	22.0	0	2	5	0
386920	1.8	310	0	11.0	54	4	7	0
386921	1.9	490	0	12.0	79	5	7	0
386922	1.4	510	3	20.0	78	6	6	0
386923	2.1	480	0	18.0	110	6	4	0
386924	1.5	400	2	21.0	92	5	6	0
386925	1.6	320	0	17.0	81	6	6	0
386926	1.3	250	0	31.0	62	3	5	0
386927	2.2	450	6	26.0	130	10	8	1
386928	1.8	630	19	25.0	130	9	6	0
386929	0.7	240	0	29.0	0	0	4	0
386930	1.0	0	0	37.0	32	0	4	0
386931	1.3	410	0	35.0	0	2	9	0
386932	1.7	660	9	25.0	120	9	10	0
386933	1.9	650	7	23.0	110	9	10	0
Samples	33	33	33	33	33	33	33	33
Minimum	0.7	0	0	11.0	0	0	4	0
Maximum	2.2	660	19	37.0	130	10	18	1

Table 2. Stream sediment samples, 1992

GGU no	U ppm	Th ppm	La ppm	Ce ppm	Sm ppm	Eu ppm	Tb ppm	Yb ppm	Lu ppm
386901	3.4	7.7	28	44	3.5	1	0	3	0
386902	2.4	6.6	24	38	3.0	1	0	2	0
386903	3.0	12.0	35	59	4.4	1	1	3	0
386904	3.0	12.0	34	57	4.5	1	0	3	0
386905	4.9	12.0	52	85	6.1	2	0	3	0
386906	3.3	12.0	41	65	4.9	1	0	3	0
386907	4.7	14.0	44	73	5.2	1	1	3	0
386908	2.4	7.0	27	44	3.7	1	0	2	0
386909	2.9	8.0	29	45	3.7	1	0	2	0
386910	2.1	6.9	31	49	4.3	1	0	2	0
386911	2.5	14.0	45	72	5.3	1	1	4	0
386912	4.5	10.0	34	57	4.2	1	0	3	0
386913	3.3	8.0	25	41	3.2	1	0	2	0
386914	2.5	7.2	26	41	3.4	1	0	2	0
386915	3.0	8.1	29	49	3.9	1	0	2	0
386916	1.8	5.1	18	33	3.1	1	1	2	0
386917	2.6	5.6	20	35	2.8	1	0	3	0
386918	2.8	9.1	32	56	4.5	1	1	3	0
386919	1.9	4.9	17	29	2.9	1	0	2	0
386920	1.6	7.0	20	34	2.7	1	0	2	0
386921	2.4	7.0	19	33	2.6	1	0	2	0
386922	3.0	9.5	37	59	4.5	1	0	3	0
386923	2.5	8.8	35	54	4.3	1	0	2	0
386924	2.2	8.4	33	52	4.2	1	1	3	0
386925	2.4	6.9	25	44	3.4	1	0	3	0
386926	1.8	4.8	19	32	3.3	1	0	2	0
386927	6.3	14.0	67	110	8.2	2	1	4	1
386928	11.0	14.0	75	100	9.2	2	1	3	0
386929	0.0	3.7	18	34	3.5	1	0	3	0
386930	0.0	2.8	13	27	3.4	1	0	2	0
386931	0.0	9.6	30	58	5.3	2	0	4	0
386932	6.5	23.0	65	110	7.8	1	1	4	1
386933	7.3	23.0	66	120	8.1	2	1	4	1
Samples	33	33	33	33	33	33	33	33	33
Minimum	0.0	2.8	13	27	2.6	1	0	2	0
Maximum	11.0	23.0	75	120	9.2	2	1	4	1

Table 2. Stream sediment samples, 1992

GGU no	Ca pct	Hg ppm	Sr ppm	Nd ppm
386901	3	0	0	20
386902	0	0	0	15
386903	2	0	0	23
386904	2	0	0	23
386905	2	0	0	35
386906	2	0	0	31
386907	3	0	0	28
386908	4	0	0	19
386909	3	0	0	20
386910	3	0	0	24
386911	3	0	0	30
386912	3	0	0	23
386913	2	0	0	17
386914	4	0	0	15
386915	2	0	0	22
386916	5	0	0	13
386917	3	0	0	14
386918	2	0	0	22
386919	4	0	0	12
386920	1	0	0	12
386921	2	0	0	15
386922	0	0	0	24
386923	2	0	0	23
386924	0	0	0	24
386925	2	0	0	19
386926	5	0	0	17
386927	2	0	0	51
386928	0	0	0	60
386929	5	0	0	20
386930	5	0	0	13
386931	7	0	0	25
386932	3	0	0	48
386933	3	0	0	54
Samples	33	33	33	33
Minimum	0	0	0	12
Maximum	7	0	0	60

Table 3. Pan samples, 1992

GGU no	Altitude metre	-1.0 mm fract. litre	Preconc. gramme	Conc. gramme	Analysis gramme
390501	210	2.50	41.8	7.6	4.96
390502	250	4.00	27.2	8.1	4.91
390503	200	2.50	97.6	49.0	39.21
390504	230	2.50	55.9	28.4	21.24
390505	200	1.50	24.7	1.4	1.02
390506	350	4.00	41.1	29.7	20.33
390507	350	2.00	47.7	30.1	20.51
390508	350	1.50	61.9	49.5	39.75
390509	350	3.00	51.9	31.7	19.67
390510	230	2.00	45.1	33.3	20.59
390511	300	3.00	61.9	30.3	19.94
390512	300	3.00	46.8	22.2	19.68
390513	300	3.00	37.9	18.0	14.48
390514	430	3.00	61.1	53.3	40.29
390515	450	1.50	36.3	18.8	14.73
390516	720	1.00	26.9	16.5	14.52
390517	730	1.00	35.9	12.9	9.74
390518	660	1.00	25.8	15.5	13.52
390519	470	1.00	38.7	19.9	14.91
390520	570	2.00	52.6	18.6	15.05
390521	430	2.00	39.0	9.9	8.05
390522	470	0.50	31.3	4.5	2.92
390523	330	1.00	19.9	5.5	4.13
390524	380	1.00	32.1	6.4	4.85
390525	250	1.00	41.6	13.9	10.45
390526	140	2.00	64.0	53.4	40.03
390527	150	2.00	48.6	22.3	19.43
390528	130	0.50	32.3	6.0	4.05
390529	160	3.00	40.9	18.0	15.16
390530	420	1.50	49.8	41.0	30.53
390531	100	2.00	56.7	41.4	30.96
390532	90	3.00	28.2	4.2	3.15
390533	80	3.00	34.1	11.2	8.02
Samples				33	
Minimum				1.4	
Maximum				53.4	
Average				22.2	

Table 3. Pan samples, 1992

GGU no	Au ppb	Au ppb (f.a.)	As ppm	W ppm	Mo ppm	Ni ppm	Co ppm	Ir ppb	Cr ppm	Fe %
390501	11		3300	1300	25	1300	290	0	1600	28.6
390502	336		3300	640	0	1000	320	0	1900	30.5
390503	248		330	85	0	300	94	0	1400	17.1
390504	452		370	88	0	0	110	0	1700	21.4
390505	0		16	2200	0	320	160	0	250	35.2
390506	0	4	0	85	0	0	43	0	370	14.7
390507	0	6	0	56	0	320	81	0	430	15.9
390508	0	3	43	11	0	210	77	0	1300	16.9
390509	0	4	32	26	0	0	92	0	670	18.9
390510	0	4	15	20	0	0	62	0	1200	18.8
390511	0	4	0	180	0	0	87	0	1500	24.1
390512	0	6	0	260	0	0	55	0	470	15.4
390513	65	73	0	190	0	0	58	0	630	14.2
390514	0	4	0	30	0	0	42	0	330	13.9
390515	0		36	72	0	760	110	0	1700	29.0
390516	0		410	64	0	440	110	0	770	21.4
390517	0		890	240	0	770	140	0	700	20.2
390518	0		0	0	0	550	110	0	1700	31.0
390519	0		1100	78	0	330	130	0	450	19.1
390520	1550		880	300	0	960	240	0	900	36.5
390521	0		180	82	0	780	200	0	820	27.3
390522	0		160	340	0	0	150	0	860	23.6
390523	0		530	140	0	1300	150	0	930	16.7
390524	1050		310	67	0	1300	180	0	1300	18.2
390525	0		380	41	0	1200	180	0	1300	15.2
390526	267		87	0	0	1000	110	0	1600	9.7
390527	120		520	92	0	1100	130	0	1300	14.5
390528	0		26	270	0	1100	160	0	1300	18.1
390529	0		25	0	0	1300	160	0	2600	13.8
390530	30		49	0	0	1500	150	0	2500	10.5
390531	0		74	0	0	730	96	0	1300	10.1
390532	0		110	100	0	870	120	0	1000	17.4
390533	0		110	56	0	730	96	0	860	14.1
Samples	33	9	33	33	33	33	33	33	33	33
Minimum	0	3	0	0	0	0	42	0	250	9.7
Maximum	1550	73	3300	2200	25	1500	320	0	2600	36.5

Table 3. Pan samples, 1992

GGU no	Cu ppm	Zn ppm	Zn ppm (a.a.)	Pb ppm	Ag ppm	Sb ppm	Se ppm	Hg ppm
390501	222	320	142	18	0	0.5	0	0
390502	232	390	192	6	0	1.2	0	0
390503	116	350	99	5	0	0.6	0	0
390504	91	305	104	9	0	0.5	0	0
390505	542	380	314	21	0	5.1	0	0
390506	38	674	38	2	0	0.0	0	0
390507	106	547	65	29	0	0.0	0	0
390508	132	313	41	5	0	0.3	0	0
390509	127	604	47	20	0	0.0	0	0
390510	121	352	47	2	0	0.4	0	0
390511	71	576	54	8	0	0.0	0	0
390512	52	429	37	2	0	0.0	0	0
390513	129	601	28	4	0	0.0	0	0
390514	39	358	56	8	0	0.0	0	0
390515	89	484	136	2	0	0.0	0	0
390516	83	393	126	2	0	0.3	0	0
390517	166	230	126	54	0	0.3	0	0
390518	114	404	153	4	0	0.0	0	0
390519	139	349	129	48	0	0.0	0	0
390520	418	319	134	29	0	0.2	0	0
390521	279	250	130	14	0	0.0	0	0
390522	278	470	153	2	0	0.0	0	0
390523	135	210	102	2	0	0.0	0	0
390524	147	290	114	2	0	0.0	0	0
390525	120	0	97	2	0	0.0	0	0
390526	69	226	88	2	0	0.0	0	0
390527	105	296	132	2	0	0.0	0	0
390528	83	260	101	2	0	0.0	0	0
390529	69	291	88	3	0	0.0	0	0
390530	38	0	75	2	0	0.0	0	0
390531	72	226	80	2	0	0.0	0	0
390532	50	430	72	2	0	0.0	0	0
390533	64	280	82	2	0	0.0	0	0
Samples	33	33	33	33	33	33	33	33
Minimum	38	0	28	2	0	0.0	0	0
Maximum	542	674	314	54	0	5.1	0	0

Table 3. Pan samples, 1992

GGU no	Na %	Ca %	Ba ppm	Sr %	Br ppm	Sc ppm	Rb ppm	Cs ppm	Hf ppm	Ta ppm
390501	0.683	0	0	0	290	46.0	0	0	45	11
390502	0.602	0	0	0	1200	48.0	0	0	67	11
390503	0.559	0	0	0	2100	43.0	0	0	21	14
390504	0.425	0	0	0	1800	53.0	0	0	29	14
390505	0.365	0	0	0	2900	22.0	64	3	11	5
390506	0.264	2	0	0	72	37.0	0	4	8	3
390507	0.377	0	0	0	180	29.0	0	0	12	3
390508	0.609	4	0	0	170	25.0	0	0	6	6
390509	0.385	0	0	0	160	24.0	0	0	10	5
390510	0.839	4	0	0	210	35.0	0	0	7	8
390511	0.372	4	0	0	83	30.0	0	0	12	2
390512	0.584	4	0	0	180	28.0	0	0	15	3
390513	0.520	0	0	0	110	28.0	67	0	12	2
390514	0.353	2	0	0	180	23.0	0	0	5	2
390515	0.421	0	0	0	720	58.0	0	0	44	15
390516	0.938	6	0	0	960	41.0	0	0	5	0
390517	0.988	4	0	0	610	31.0	0	0	8	0
390518	0.332	0	0	0	750	60.0	0	0	39	18
390519	1.440	7	0	0	720	45.0	0	0	5	1
390520	0.510	0	310	0	770	26.0	0	0	12	5
390521	0.844	3	0	0	1800	30.0	0	0	13	0
390522	1.710	0	0	0	1000	56.0	0	0	16	0
390523	1.370	0	0	0	700	43.0	0	0	14	0
390524	1.060	4	0	0	1500	40.0	0	0	9	0
390525	0.694	4	0	0	1400	25.0	0	0	6	0
390526	0.379	4	0	0	1500	26.0	0	0	2	0
390527	0.421	7	0	0	11000	24.0	0	0	4	2
390528	1.280	5	0	0	1100	40.0	0	0	14	0
390529	0.418	5	0	0	1100	24.0	0	0	3	2
390530	0.272	0	0	0	2200	17.0	0	0	0	0
390531	0.548	4	0	0	2600	37.0	0	0	3	0
390532	1.130	0	710	0	1100	68.0	0	0	13	0
390533	0.730	4	450	0	320	46.0	120	0	15	0
Samples	33	33	33	33	33	33	33	33	33	33
Minimum	0.264	0	0	0	72	17.0	0	0	0	0
Maximum	1.710	7	710	0	11000	68.0	120	4	67	18

Table 3. Pan samples, 1992

GGU no	U ppm	Th ppm	La ppm	Ce ppm	Sm ppm	Eu ppm	Tb ppm	Yb ppm	Lu ppm
390501	11.0	95.0	200	390	22.0	3.6	0	14.1	1.8
390502	24.0	150.0	300	570	29.0	4.2	0	18.3	2.8
390503	8.6	110.0	210	390	17.0	1.9	0	7.9	1.5
390504	6.9	130.0	240	470	22.0	2.2	0	10.2	2.0
390505	15.0	17.0	105	177	17.0	3.5	4	12.0	1.8
390506	5.0	12.0	36	82	4.9	1.0	0	11.7	1.6
390507	3.6	14.0	41	85	5.2	1.3	0	13.0	1.9
390508	3.2	9.3	53	98	6.1	1.8	0	5.4	0.9
390509	7.5	15.0	53	110	6.3	1.5	0	8.6	1.2
390510	0.0	11.0	71	150	9.0	3.0	0	8.4	1.3
390511	4.3	16.0	47	100	5.8	1.9	0	12.0	1.7
390512	5.4	17.0	44	98	6.4	1.9	0	7.8	1.1
390513	3.4	16.0	42	92	5.9	1.4	0	7.4	1.2
390514	4.0	6.3	21	43	2.7	0.9	0	5.1	0.7
390515	15.0	180.0	400	820	46.0	9.0	7	17.4	2.7
390516	0.0	2.9	12	32	3.4	1.5	0	3.5	0.5
390517	0.0	2.3	20	37	4.3	1.5	0	5.7	0.9
390518	11.0	180.0	420	830	48.0	8.5	8	14.2	2.5
390519	0.0	0.0	16	36	4.4	2.1	0	4.6	0.5
390520	5.1	34.0	73	160	9.8	2.2	2	8.9	1.4
390521	0.0	19.0	50	110	7.7	2.4	3	9.8	1.3
390522	20.0	15.0	48	120	8.1	2.7	0	15.0	1.8
390523	0.0	0.0	23	53	5.4	1.6	4	6.9	0.9
390524	0.0	7.6	27	65	5.2	1.5	0	7.4	1.0
390525	6.7	0.0	17	28	2.5	1.0	0	4.3	0.5
390526	0.0	0.0	4	11	1.0	0.7	0	3.7	0.8
390527	0.0	3.2	16	47	2.4	0.9	0	5.0	0.7
390528	0.0	4.9	26	57	4.6	1.6	0	8.3	1.4
390529	0.0	2.6	5	11	1.4	0.0	0	2.0	0.4
390530	0.0	0.0	2	0	0.6	0.0	0	0.8	0.0
390531	2.0	4.4	12	21	2.3	0.9	0	2.2	0.4
390532	0.0	31.0	74	120	13.0	1.9	0	23.2	3.2
390533	9.7	56.0	130	240	18.0	2.0	4	16.6	2.7
Samples	33	33	33	33	33	33	33	33	33
Minimum	0.0	0.0	2	0	0.6	0.0	0	0.8	0.0
Maximum	24.0	180.0	420	830	48.0	9.0	8	23.2	3.2

Table 4. Summary statistics for selected elements in stream sediment samples: ranges, percentiles and means. R is the std. regression coefficient for stream sediment samples versus pan samples.

	All samples (133)								Nûkavsak Fm. samples (102)							
	min.	50%	80%	90%	95%	max.	mean	R	min.	50%	80%	90%	95%	max.	mean	R
Au ppb	<5	<5	<5	9	12	33	<5	0.08	<5	<5	<5	9	12	33	<5	-0.05
As ppm	<1	10	18	40	72	239	19	0.28	<1	11	22	54	85	239	23	0.26
W ppm	<2	2	4	6	9	22	2	0.40	<2	<2	4	5	6	16	2	0.76
Ni ppm	<50	64	99	125	175	420	75	0.06	<50	56	87	110	145	420	73	0.06
Co ppm	10	24	32	37	43	62	25	-0.21	10	23	32	36	41	57	25	-0.23
Cr ppm	57	160	230	300	415	2100	207	0.46	57	150	210	290	415	2100	199	0.42
Fe pct	2.4	4.3	5.5	6.1	6.7	8.8	4.5	-0.36	2.4	4.2	5.5	6.1	6.7	8.8	4.4	-0.31
Cu ppm	21	71	99	127	133	169	78	0.13	34	71	93	110	130	169	77	0.05
Zn ppm	11	90	136	187	224	330	107	0.54	49	95	132	147	211	330	109	0.50
Pb ppm	<2	8	11	14	16	26	8	0.40	<2	8	11	14	16	26	8	0.43
Sb ppm	<0.2	<0.2	0.4	0.5	0.7	1.3	0.2	0.50	<0.2	<0.2	0.4	0.5	0.7	1.3	0.2	0.51
Ba ppm	<100	480	570	615	645	740	462	0.34	180	500	580	615	635	690	475	0.13
U ppm	<0.5	3.9	5.4	6.4	7.8	26.0	4.3	0.47	<0.5	3.7	5.1	5.9	6.7	11.0	3.9	0.30
Ce ppm	27	59	83	97	110	230	64	0.09	29	57	82	97	110	130	61	0.17

Table 5. Summary statistics for selected elements in pan samples: ranges, percentiles and means.

	All samples (135)							Nûkavsak Fm. samples (104)						
	min.	50%	80%	90%	95%	max.	mean	min.	50%	80%	90%	95%	max.	mean
Au ppb	<5	<5	36	258	1200	18800	259	<5	<5	49	302	1400	18800	325
As ppm	<2	230	1200	3300	6100	58000	1583	<2	370	1700	3600	8400	58000	2032
W ppm	<4	56	220	595	1250	6300	273	<4	57	255	660	1300	6300	323
Ni ppm	<200	390	1100	1500	1800	2800	547	<200	520	1250	1550	1800	2800	663
Co ppm	42	120	200	335	490	1200	176	70	140	280	410	540	1200	206
Cr ppm	49	530	900	1300	1650	2600	636	49	530	840	1300	1600	2600	596
Fe pct	10	24	35	39	43	51	26	10	25	36	40	44	51	27
Cu ppm	35	220	440	630	828	2110	302	35	225	525	645	958	2110	333
Zn ppm	28	230	490	580	650	920	294	72	250	505	605	650	920	321
Pb ppm	<20	40	60	100	120	260	45	<20	40	80	100	120	260	51
Sb ppm	<0.2	<0.2	0.9	2.2	3.9	15.0	0.8	<0.2	<0.2	1.2	3.0	4.3	15.0	0.9
Ba ppm	<200	<200	390	520	695	1000	<200	<200	<200	400	535	695	810	<200
U ppm	<0.5	7	15	21	27	47	9	<0.5	8	17	23	27	44	10
Ce ppm	<3	95	157	238	363	830	126	11	94	182	255	390	830	133

Table 6. Correlation matrix for 102 stream sediment samples from Nûkavsak Fm.

	Au	As	W	Ni	Co	Cr	Fe	Cu	Zn	Pb	Sb	Ba	U	Ce	
Au	1.00														Au
As	0.46	1.00													As
W	0.35	-0.04	1.00												W
Ni	0.13	-0.02	-0.16	1.00											Ni
Co	0.13	0.13	-0.32	0.61	1.00										Co
Cr	0.11	-0.11	-0.17	0.68	0.65	1.00									Cr
Fe	-0.02	-0.09	-0.34	0.57	0.94	0.59	1.00								Fe
Cu	0.04	0.16	-0.25	0.33	0.66	0.19	0.65	1.00							Cu
Zn	0.03	0.07	-0.00	0.11	0.14	-0.10	0.17	0.66	1.00						Zn
Pb	0.14	0.26	0.12	0.21	0.10	-0.13	0.08	0.49	0.66	1.00					Pb
Sb	0.31	0.38	-0.10	0.30	0.30	0.10	0.26	0.40	0.38	0.54	1.00				Sb
Ba	0.01	-0.02	0.26	0.01	-0.33	-0.25	-0.27	-0.03	0.45	0.52	0.15	1.00			Ba
U	0.19	0.22	0.09	0.08	-0.03	-0.30	-0.01	0.43	0.71	0.70	0.45	0.69	1.00		U
Ce	0.10	0.08	-0.04	0.29	0.17	-0.04	0.21	0.55	0.79	0.70	0.53	0.63	0.88	1.00	Ce
	Au	As	W	Ni	Co	Cr	Fe	Cu	Zn	Pb	Sb	Ba	U	Ce	

Table 7. Correlation matrix for 104 pan samples from Nûkavsak Fm.

	Au	As	W	Ni	Co	Cr	Fe	Cu	Zn	Pb	Sb	Ba	U	Ce	
Au	1.00														Au
As	0.87	1.00													As
W	0.48	0.59	1.00												W
Ni	0.01	0.08	0.04	1.00											Ni
Co	0.44	0.75	0.34	0.27	1.00										Co
Cr	-0.05	-0.12	0.04	0.17	-0.20	1.00									Cr
Fe	0.11	0.25	0.05	-0.12	0.48	-0.44	1.00								Fe
Cu	0.10	0.28	0.14	0.36	0.49	-0.44	0.48	1.00							Cu
Zn	-0.07	0.04	-0.14	-0.22	0.26	-0.64	0.76	0.43	1.00						Zn
Pb	0.04	0.18	0.08	0.08	0.40	-0.51	0.46	0.46	0.42	1.00					Pb
Sb	-0.03	0.01	-0.04	-0.14	0.17	-0.25	0.36	0.25	0.28	0.50	1.00				Sb
Ba	-0.04	-0.04	0.09	-0.03	0.01	-0.20	0.06	0.08	0.10	0.06	0.12	1.00			Ba
U	0.19	0.37	0.38	0.06	0.42	-0.26	0.48	0.61	0.34	0.28	0.29	0.13	1.00		U
Ce	-0.00	0.02	0.08	-0.04	0.01	0.33	0.23	0.06	-0.06	-0.08	0.05	0.02	0.47	1.00	Ce
	Au	As	W	Ni	Co	Cr	Fe	Cu	Zn	Pb	Sb	Ba	U	Ce	

Table 8. Varimax rotated factor loadings for Nûkavsak Fm. samples. Values below 0.25 excluded.

	Stream sediment samples (102) 79% variance explained					Pan samples (104) 76% variance explained				
	F1	F2	F3	F4		F1	F2	F3	F4	F5
Ce	0.94	-	-	-	Zn	0.87	-	-	-	-
U	0.91	-	-	-	Fe	0.81	-	0.31	-	-
Zn	0.86	-	-	-	Cr	-0.77	-	0.36	-	-
Pb	0.82	-	-	-	Pb	0.71	-	-	-	-
Ba	0.73	-	-	0.44	Cu	0.60	-	-	0.59	-
Cu	0.55	0.43	-	-0.53	Sb	0.55	-	-	-	-
Cr	-	0.88	-	-	As	-	0.96	-	-	-
Ni	-	0.85	-	-	Au	-	0.89	-	-	-
Co	-	0.84	-	-0.41	W	-	0.74	-	-	0.26
Fe	-	0.82	-	-0.43	Co	0.40	0.65	-	0.38	-
As	-	-	0.87	-	Ce	-	-	0.94	-	-
Au	-	-	0.75	0.46	U	0.46	0.33	0.64	-	-
Sb	0.50	-	0.53	-	Ni	-	-	-	0.93	-
W	-	-	-	0.79	Ba	-	-	-	-	0.92

ISSN 0903-7322