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Investigation of LANDSAT Imagery on Correlations  
between Ore Deposits and Major Shield Structures  
In Finland (x)

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Investigation number: 28600

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Quarterly Progress Report I

x) Secondary discipline: Ice Investigation in the Gulf of Bothnia

(E76-00061) INVESTIGATION OF LANDSAT  
IMAGERY ON CORRELATIONS BETWEEN ORE DEPOSITS  
AND MAJOR SHIELD STRUCTURES IN FINLAND  
Quarterly Progress Report (Helsinki Univ.)  
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## I Introduction

In the Baltic Shield several types of important ore deposits, and indications of ore, are distributed in line with major fracture zones. Owing to glacial drift cover, shallow topography and great width of the zones (up to 50 km) these zones are not easily detected in the field by ground or airborne methods. The purpose of the investigation is to estimate the expected advantages of LANDSAT-2 imagery in exploring these structures. The test area (fig 2) for the study represents the central parts of the Shield.

In March 1975 an ice investigation in the Gulf of Bothnia was included as a secondary discipline in the program. For this reason the LANDSAT-2 coverage was extended west across the Gulf of Bothnia. The ice study is a joint program between Sweden and Finland. A preliminary report of this study, made by professor Erkki Palosuo, is added as a supplement to the geological report.

The LANDSAT-2 imagery so far received for both disciplines is shown in Table 1, and its coverage in Fig. 1, 2 and 3. Formats of the images are 60 mm negatives and positives and 9,5 inch positives. 9,5 inch negatives would have been useful. A four tape set of the image 1039 - 09315 has also been received. Coverage of the NE-part of the test site (fig. 4) is not complete.

## II Techniques

B&W paper prints have been made of the 60 mm positives by the Finnish National Board of Survey, Photogrammetric division. Compilation of the images to mosaics is going on.

Optical transformation of the LANDSAT-2 data to so called Wiener-spectrum form was made by using laser light and a special lens system. In the Wiener-spectrum spatial information of images is arranged according to direction and frequency. By passing the Wiener-spectrum through an optical filter

direction and frequency information of the original image can be enhanced. The instrument used is the IFP optical filter FO-100.

Processing of various background data is going on. Optical filtering of bog and water maps and topographic maps has been made. Digital processing is used to prepare enhancement maps from the Bouguer-anomalies of Finland. The aeromagnetic map of Finland is being digitalized.

### III Accomplishments

The quality of the received images is fairly good and indications of geological structures and -units can be observed. The evaluation of structural units and fracture traces has been initiated. However, cloudcover (see table 1, . evaluated cloudcover in parenthesis) and inhomogenous humidity of snow (especially in band 7) hamper the interpretation.

Eskers and end moraines are clearly visible. An interesting detail (seen in scene 2137-08482) is an esker in Lake Saimaa. Furthermore, dune-formations near Lake Oulujärvi (scene 2084-08532) were detected due to their feather-like forms.

Certain features, such as differences in the amount of conifers are best seen in the winter images.

Soil and vegetation naturally reflect bedrock features. Schistbelts in Southern Finland are discerned because of their textural patterns. Circular granitic domes, dolerite dykes and gabbro massifs are also observable.

TABLE 1. List of received LANDSAT-2 images:

number in fig.	image ID	clouds %	date acquired	date received by P.I.	principal point of image	discipline
1	2051-C9101	0	75-03-14	75-04-28	N 65 33 E 025 50	ice study
2	2052-C9155	20	75-03-15	75-04-28	N 65 31 E 024 23	"
3	2053-C9214	40	75-03-16	75-04-28	N 65 34 E 023 01	"
4	2069-C9100	70	75-04-01	75-07-23	N 65 37 E 025 55	"
5	2070-C9155	30	75-04-02	75-06-18	N 65 37 E 024 18	"
6	2070-C9161	30	75-04-02	75-06-02	N 64 16 E 022 56	"
7	2070-C9332	10	75-04-05	75-06-16	N 64 13 E 018 36	"
8	2083-08483	30	74-04-15	75-07-23	N 61 10 E 027 27	geology
9	2084-08532	0	75-04-16	75-06-18	N 64 09 E 028 33	"
10	2084-08534	0	75-04-16	75-06-18	N 62 47 E 027 18	"
11	2084-08541	0	75-04-16	75-06-18	N 61 25 E 026 09	"
12	2085-08595	10	75-04-17	75-06-18	N 61 22 E 024 40	"
13	2086-09053	0	75-04-18	75-06-18	N 61 22 E 023 14	"
14	2136-08421	30	75-06-07	75-07-23	N 62 28 E 029 53	"
15	2136-08424	10	75-06-07	75-07-23	N 61 06 E 028 47	"

TABLE 1. continued

number in fig. 1	image ID	cld	date acquired	date received by P.I.	principal point of image	discipline
16	2137-08480	10 (0)	75-06-08	75-09-08	N 62 28 E 028 24	geology
17	2137-08482	0	75-06-08	75-09-08	N 61 05 E 027 17	"
18	2139-08595	C	75-06-10	75-09-08	N 61 02 E 024 19	"
19	2158-09040	30	75-06-29	75-09-08	N 66 40 E 028 12	"
20	2158-09042	20	75-06-29	75-09-08	N 65 20 E 026 45	"
21	2171-08365	(20)	75-07-12	75-09-08	N 61 26 E 030 22	"
22	2179-09214	40 (70)	75-07-20	75-09-08	N 64 15 E 021 25	"
23	2138-08541	20	75-06-09	75-09-15	N 61 02 E 025 49	"
24	2139-08590	30	75-06-10	75-09-15	N 63 45 E 026 37	"
25	2139-08593	40	75-06-10	75-09-15	N 62 25 E 025 25	"
26	2141-09110	(40)	75-06-12	75-09-15	N 62 33 E 022 42	"
27	2159-09103	20	75-06-30	75-09-15	N 64 00 E 024 01	"
28	2159-09110	30	75-06-30	75-09-15	N 62 38 E 022 47	"

TABLE 1. continued

number in fig.1	image ID	cld %	date acquired	date received by P.I.	principal point of image	discipline
29	2160-09153	20	75-07-01	75-09-15	N 65 40 E 025 20	geology
30	2160-09155	20	75-07-01	75-09-15	N 65 20 E 023 52	"
31	2160-09162	10	75-07-01	75-09-15	N 64 00 E 022 32	"
32	2160-09164	10 (20)	75-07-01	75-09-15	N 62 38 E 021 19	"
33	2178-09163	(10)	75-07-19	75-09-16	N 62 53 E 021 32	"

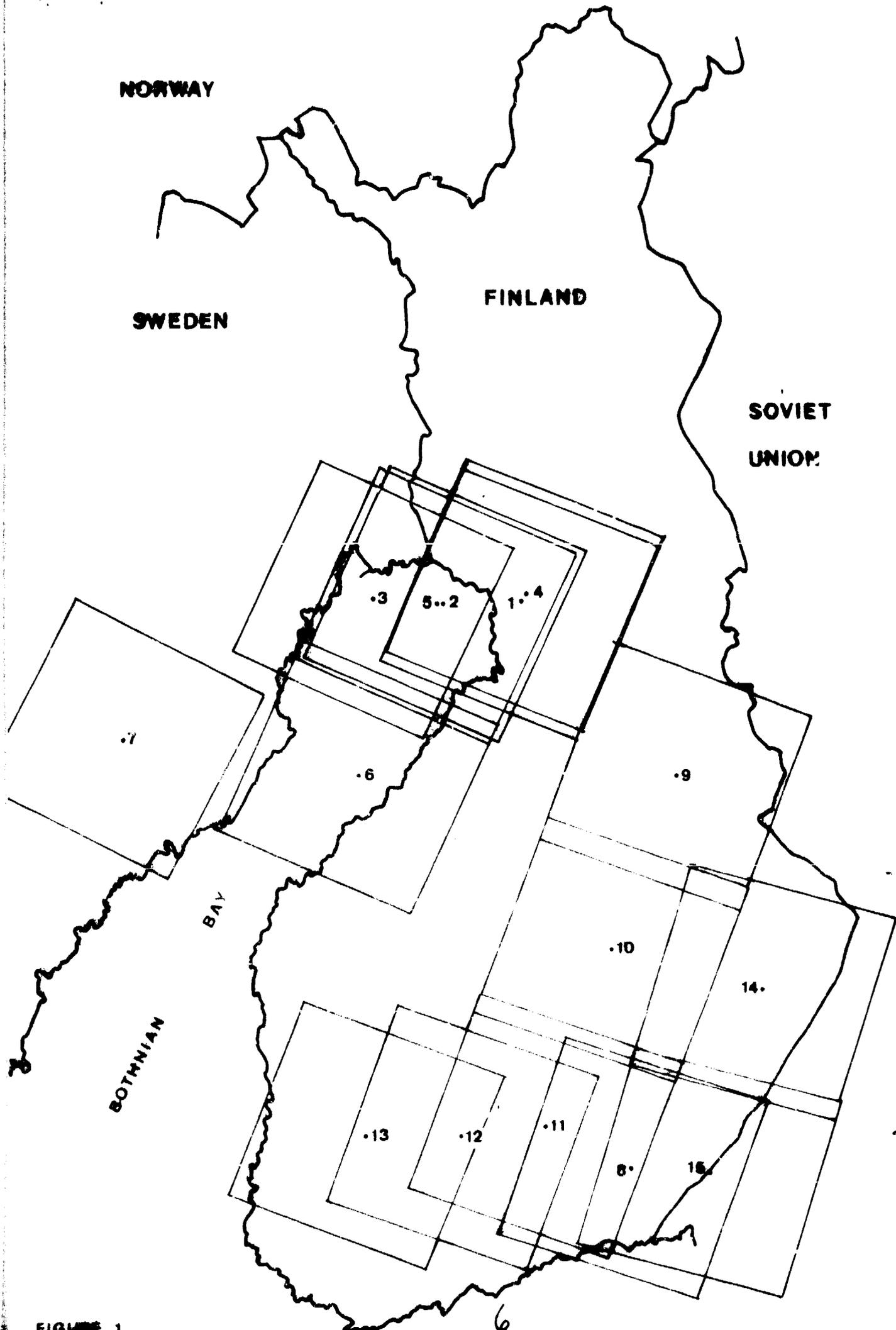


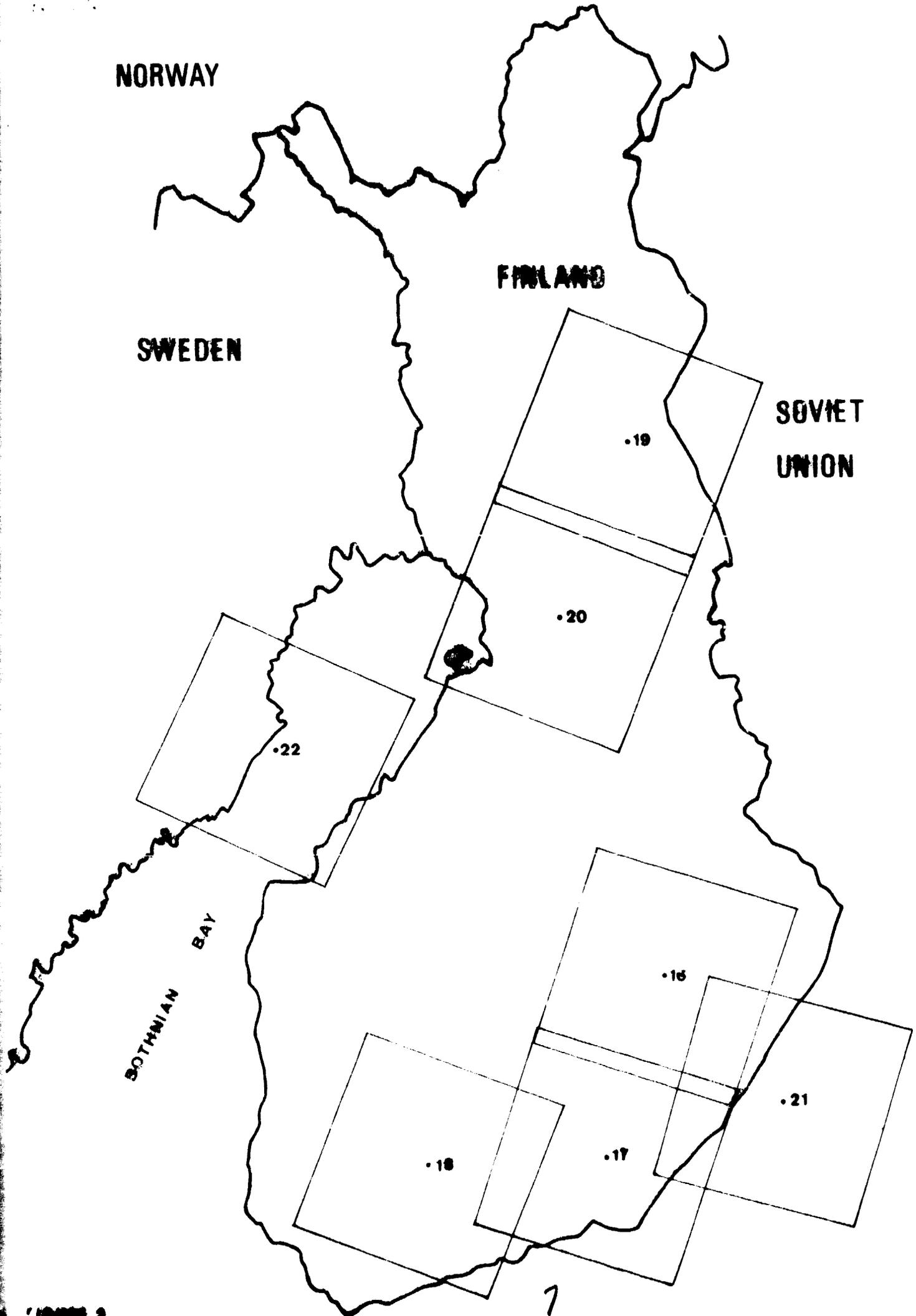
FIGURE 1.

NORWAY

FINLAND

SWEDEN

SOVIET  
UNION



NORWAY

FINLAND

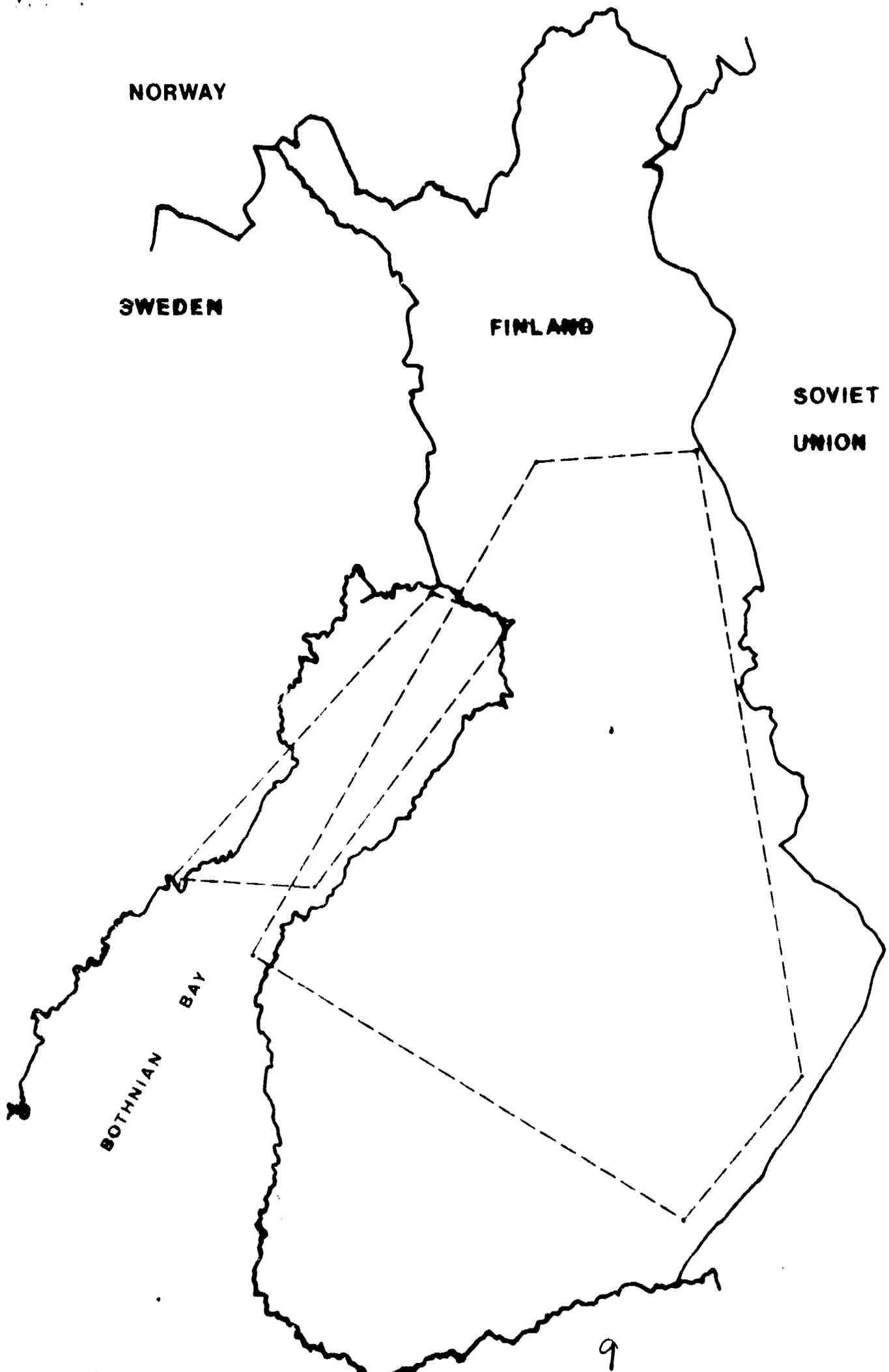
SWEDEN

SOVIET  
UNION



BOTHNIAN  
BAY

6



NORWAY

SWEDEN

FINLAND

SOVIET  
UNION

BOTHNIAN  
BAY