GREENLAND ENVIRONMENTAL RESEARCH INSTITUTE November 27, 1989

Environmental Observations in Relation to a Gold Project in the Skærgården Intrusion

Background

Corona Corporation and Platinova Resources hold an exploration concession in the Skærgård intrusion. The exploration has been going on since 1986 and in the spring of 1989 the Greenland Environmental Research Institute (GERI) felt that the project had reached a stage where planning of environmental work in relation to the project should be initiated. GERI had no previous experience from the area, and in order to get a basic knowledge necessary for the planning of detailed environmental work it was decided to perform a reconnaissance in 1989. The reconnaissance was carried out from August 26 to September 6 by Martin Munk Hansen. The study was supported by the concessionaire that provided travel between Iceland and Sødalen, internal transportation in the area and meals.

The area is shown in fig. 1.

Talks with Bob Gannicott from Platinova Resources and studies of maps had indicated that tailings disposal at a mine in the Skærgård intrusion might be a problem. The Uttental Sund and Vandfaldsdalen were identified as the most likely candidate areas for tailings disposal, and most of the effort in the reconnaissance was spent on depth soundings in Uttental Sund which has not been sounded in any detail previously. In addition temperature and salinity profiles were measured in Uttental Sund and in Kangerdlussuaq.

Other work included walking through and taking photographs of areas of interest including Vandfaldsdalen, and talks with inhabitants from the Skærgård village.

Depth measurements

Depth measurements in Uttental Sund were carried out with echo sounder operated from a rubber boat. The results were recorded on paper. The positions of the soundings were mostly determined by sailing with an constant speed on straight tracks between easily distinguishable landmarks. A map of the depths (fig. 2) was prepared afterwards from readings of the paper record. The positions

but this needs to be investigated.

Hydrography

Measurements of water temperature and salinity were performed with a Switchgear temperature-salinity bridge. This instrument is not very accurate, and the data should be evaluated accordingly.

Hydrographical profiles to a maximum depth of 99 m were recorded at three stations in the southern basin of Uttental Sund, one station at Strømstedet, one station in the northern basin, and at one station in Kangerdlussuaq off the southern entrance of Uttental Sund. Positions for the stations in the sound are indicated in fig. 2.

Results including the calculated densities of the water are shown i table 1-6 and graphically in fig. 4-9.

In Kangerdlussuaq (station HY 1, table 1, fig. 4) the temperature was negative in the entire water column. It had a maximum at 40-60 metres. The salinity increases from top to 99 metre depth. 50% of the increase takes place within the upper 10 metres.

In the southern basin of Uttental Sund 3 profiles were recorded. The southernmost (station HY 2) was placed in the deepest part of the basin (table 2, fig. 5). The temperature is positive in the top 2 metres, and decreases with depth. Salinity increases with depth and between 30 and 40 metres a marked increase occurs. Below 40 metres the increase is small and the water mass seems to be homogeneous.

In the middle part of the southern basin a short profile was recorded (table 3, fig. 6). The results resemble the profile from station HY 2.

Results from the northern part of the southern basin (station HY 4) are shown in table 4 and fig. 7. The salinity in the entire profile was found to be a little less than at station HY 2. However, the temperature was found to be very low, especially in the bottom layers. The density of the sea water at HY 4 is smaller than the density at HY 2 at each measuring depth.

At Strømstedet a profile was taken in what seems to be a small local basin (station HY 5). Results are shown in table 5 and fig. 8. The water in the top 4 metres are more homogeneous than at other stations (positive temperature and small salinity gradient). This probably is caused by vertical mixing occurring at this narrow part of the sound. At 10 metres the results resemble those from station HY 4 and the station from the outer basin, HY 6. At 20 metre depth the results correspond to HY 4. At 30 metres the salinity is different from HY 4 and HY 6, and thus reflects the presence of a local basin.

Station HY 6 is in the northern basin of Uttental Sund. Results are given in table 6 and fig. 9. The salinity at 0 and 2 metre depth is lower than in the southern basin which may be caused by inflow of less saline water from the densely ice packed Watkins Fjord. From 25 metres to the bottom the water is very uniform in temperature as well as salinity. From 40 metres to the bottom the salinity is comparable to station HY 4 in the northern part of the southern basin. However, the temperature is different at the two places.

A comparison between the hydrographic conditions in the southern and the northern basin of Uttental Sund shows a marked difference between the position of the top of the stable bottom water. In the southern basin it is situated at 30-40 metres while in the northern basin it is at 20-25 metres. The sill depth in the southern basin has been found not to exceed c. 18 metres, so below 18 metres the water in the basin is not in direct contact with the Kangerdlussuaq water. An explanation for the difference between the southern and the northern basin might be that fresh water is flowing into the sound at the bottom of Forbindelsesgletscher thereby introducing light water at depth.

Observation in Vandfaldsdalen

During the stay Vandfaldsdalen was walked through and photos were taken.

The general impression is that very little vegetation is found in the valley.

A stream is running in the valley. The water flow at the time of the walk (September 3) was rather limited. At some places the stream spreads out and becomes very wide.

Looking at a map of the area it can be seen that no streams are indicated at

the head of the valley. It was observed that this is due to the characteristics of the material in the valley which there consists of stones and boulders. Water could be heard flowing underneath the surface.

Biology of the Area

The terrestrial life in the area is very limited. Vegetation cover is absent most places and the richest vegetation was seen on the sides of Sødalen. Lichens do occur, but the lichen Cetraria nivalis, which is commonly used for monitoring deposition of pollutants from the air, was not seen.

Reindeer and muskox do not occur in the area. Foxes and hares are said to occur, but I did not see any.

In the sea marine mammals are very common. Seal, narhwal, and polar bear are hunted by people living in the village. Ulrik Sanimuinaq from the village informed me (via interpreter) that up to August 27 the hunt in 1989 had resulted in 9 polar bears, 19 narwhals, and around 1000 seals. The most common seal was ringed seal, but also hooded seal was important in the hunt. In the period I was there a further 9 narwhals were caught. Samples from 8 narwhals were obtained for Greenland Fisheries Research Institute that plans to use DNA finger printing techniques for determining the relationships between the stocks of narwhal.

Ulrik Sanimuinaq said that no fishing was carried out in the area (3 Greenland halibut had been caught in 1989). No streams holding Arctic char are known.

In the tidal zone of Uttental Sund the brown alga Fucus distichus, which is used for monitoring purposes at other mine sites in Greenland, is rather common. No sign of the blue mussel Mytilus edulis, which is commonly used as monitoring organism, was seen, and probably the species do not occur in the area.

Stat.	Date	Depth (m)	Temp. (deg. C)	Sal. (^{o}/oo)	Density (kg/m^{3})
HY 1	010989	0	-0.8	26.10	1020.94
		2	-0.8	26.60	1021.35
		5	-0.9	28.90	1023.21
		10	-0.9	29.80	1023.94
		20	-0.9	31.00	1024.91
		30	-0.4	31.40	1025.22
		40	-0.3	31.60	1025.37
		50	-0.3	32.00	1025.70
		60	-0.2	32.19	1025.85
		70	-0.9	32.42	1026.06
		80	-1.2	32.85	1026.42
		90	-1.2	33.09	1026.61
		99	-1.0	33.30	1026.78

Table 1: Hydrographic profile in Kangerdlussuaq south of Uttental Sund

Stat.	Date	Depth (m)	Temp. (deg. C)	Sal. (^{o}/oo)	Density (kg/m^{3})
HY 2	310889	0	0.6	27.30	1021.88
		2	0.3	28.20	1022.61
		5	-0.1	29.40	1023.59
		10	-0.5	30.40	1024.41
		20	-0.6	31.00	1024.90
		30	-0.6	31.60	1025.39
		40	-1.0	33.07	1026.59
		50	-1.05	33.42	1026.88
		60	-1.1	33.54	1026.97
		70	-1.1	33.56	1026.99
		80	-1.2	33.58	1027.01
		90	-1.2	33.61	1027.03
		99	-1.2	33.64	1027.06

Table 2: Hydrographic profile in southern part of south basin of Uttental Sund

Stat.	Date	Depth (m)	Temp. (deg. C)	Sal. (^{o}/oo)	Density (kg/m^{3})
HY 3	310889	0	0.6	27.50	1022.04
		2	0.35	27.80	1022.29
		5	-0.2	29.50	1023.68
		10	-0.6	30.70	1024.66
		20	-0.7	31.20	1025.07

Table 3: Hydrographic profile in middle part of southern basin of Uttental Sund

Stat.	Date	Depth (m)	Temp. (deg. C)	Sal. (^{o}/oo)	Density (kg/m^{3})
HY 4	310889	0	0.4	26.20	1021.00
		2	-0.2	27.60	1022.14
		5	-0.5	29.10	1023.36
		10	-0.8	30.00	1024.10
		20	-0.9	30.50	1024.51
		30	-1.0	31.20	1025.07
		40	-1.2	32.49	1026.13
		50	-1.3	32.75	1026.34
		60	-1.4	32.82	1026.40
		70	-1.4	32.86	1026.43
		80	-1.4	32.96	1026.51

Table 4: Hydrographic profile in northern part of southern basin of Uttental Sund

Stat.	Date	Depth (m)	Temp. (deg. C)	Sal. (^{o}/oo)	Density (kg/m^{3})
HY 5	310889	0	0.7	26.80	1021.47
		2	0.6	27.00	1021.63
		4	0.4	28.30	1022.69
		10	-0.7	30.10	1024.18
		20	-0.8	30.60	1024.58
		30	-0.9	30.90	1024.83

Table 5: Hydrographic profile at Strømstedet

Stat.	Date	Depth (m)	Temp. (deg. C)	Sal. (^{o}/oo)	Density (kg/m^{3})
HY 6	310889	0	0.5	24.90	1019.95
		2	0.5	26.70	1021.40
		5	-0.6	28.70	1023.04
		10	-0.9	30.30	1024.34
		20	-0.9	31.10	1024.99
		25	-1.0	32.72	1026.31
		30	-1.0	32.80	1026.37
		40	-1.1	32.86	1026.42
		50	-1.1	32.88	1026.44
		60	-1.1	32.96	1026.50
		70	-1.1	33.00	1026.54
		75	-1.1	33.12	1026.63

Table 6: Hydrographic profile in northern basin of Uttental Sund

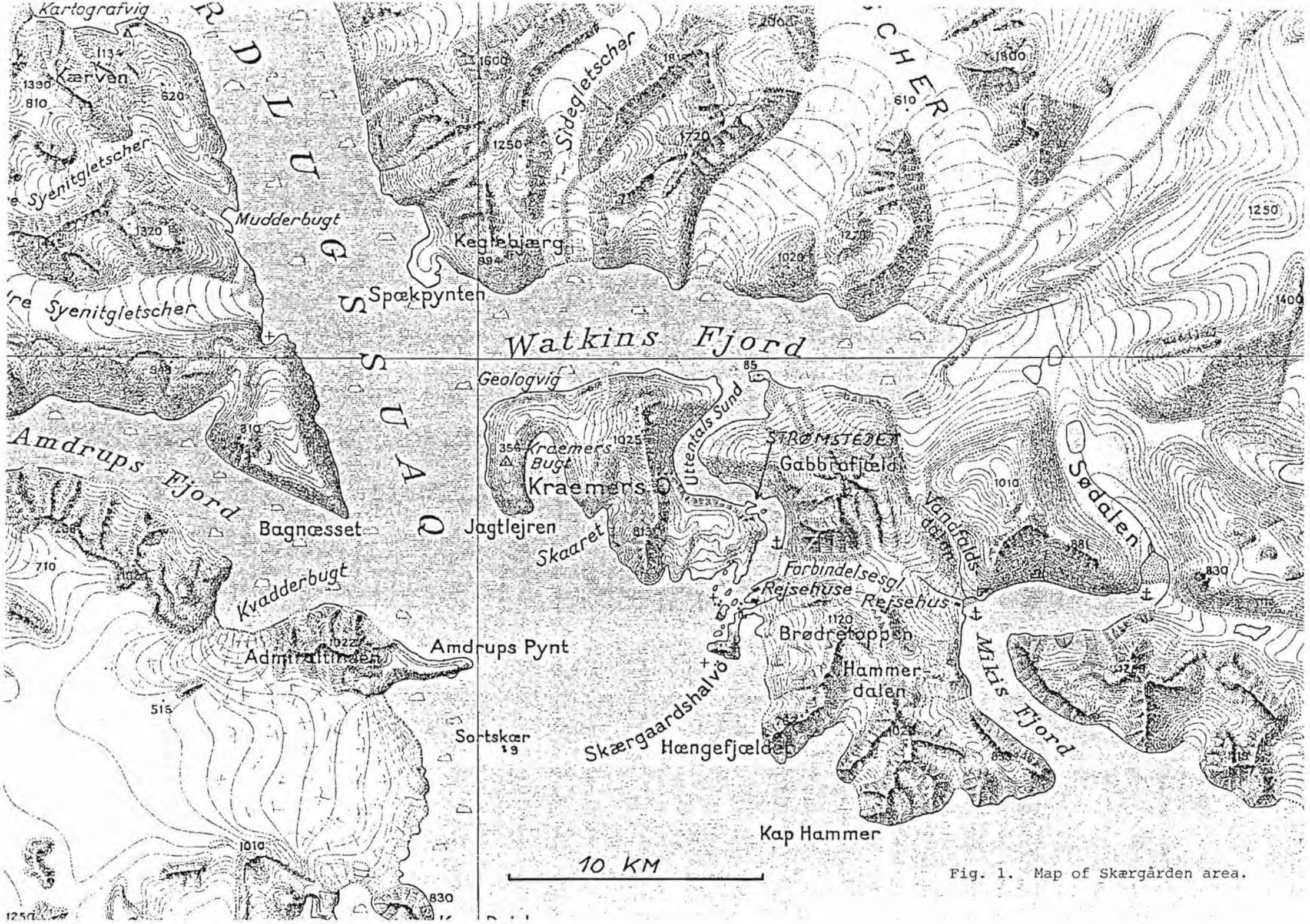


Fig. 1. Map of Skærgården area.

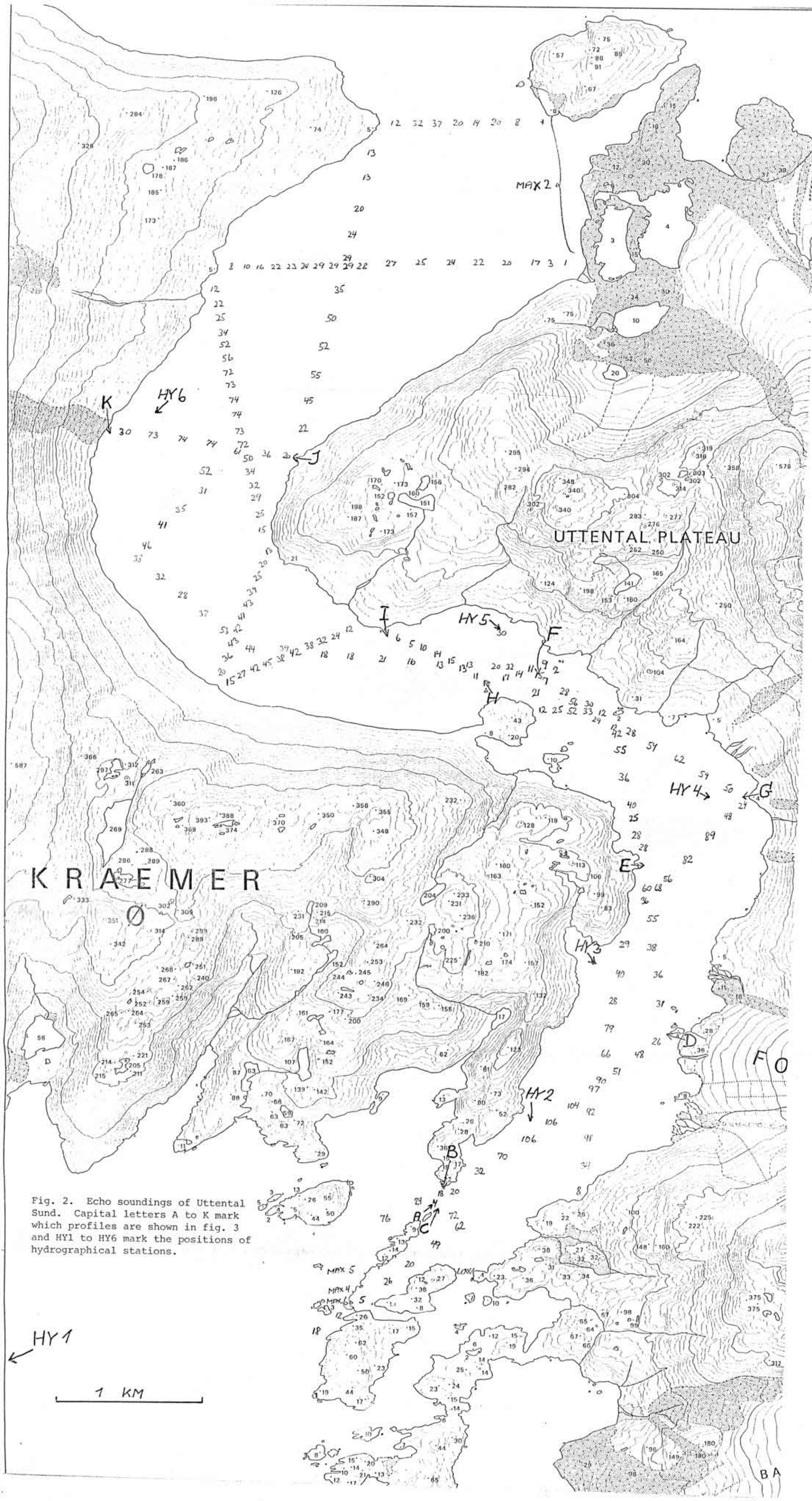


Fig. 2. Echo soundings of Uttental Sund. Capital letters A to K mark which profiles are shown in fig. 3 and HY1 to HY6 mark the positions of hydrographical stations.

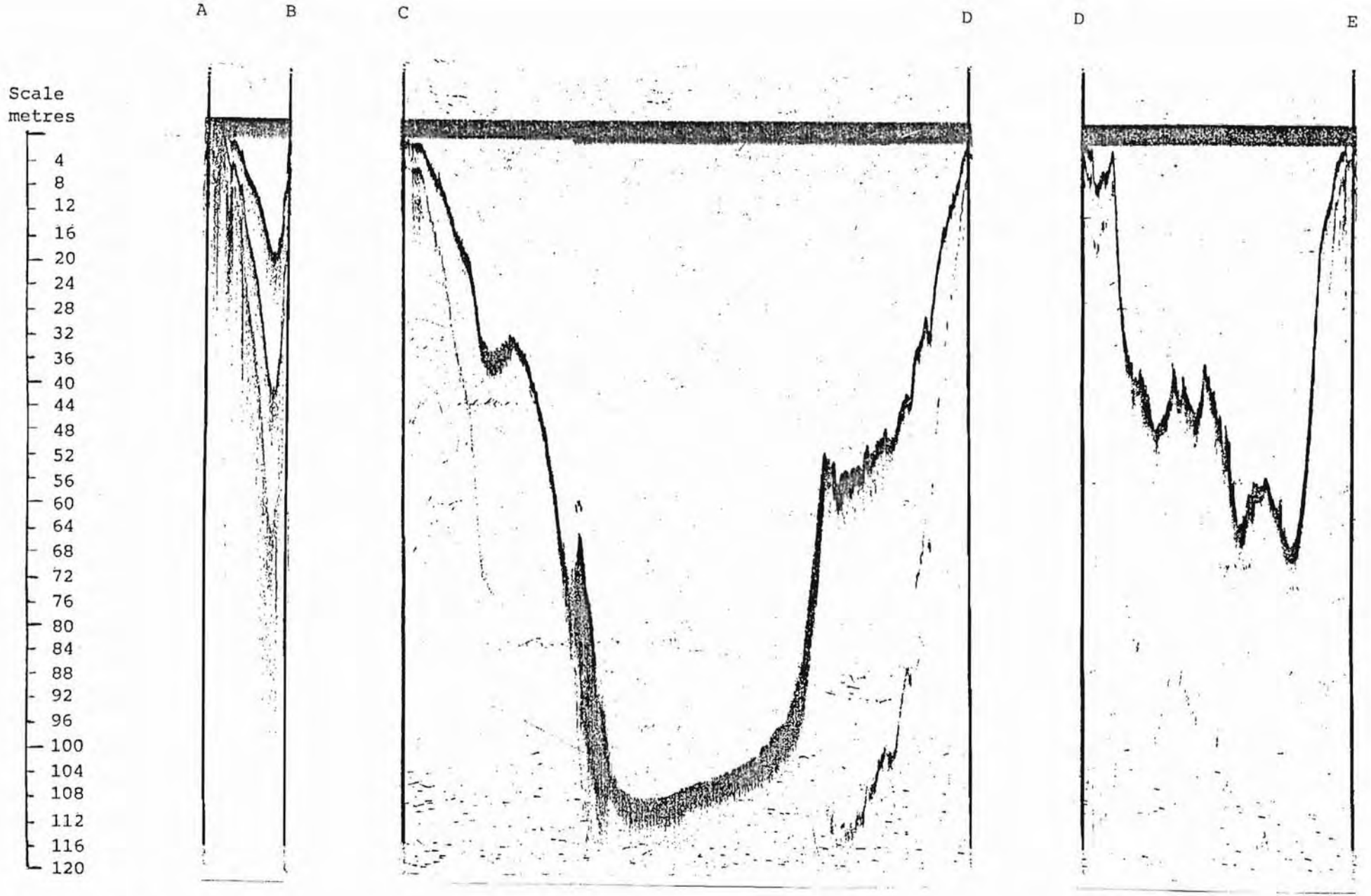


Figure 3. Selected depth profiles from Uttental Sund. The end points of the profiles are marked with capital letters in fig. 2. Note that the horizontal scale is not necessarily the same on all profiles due to differences in sailing speed.

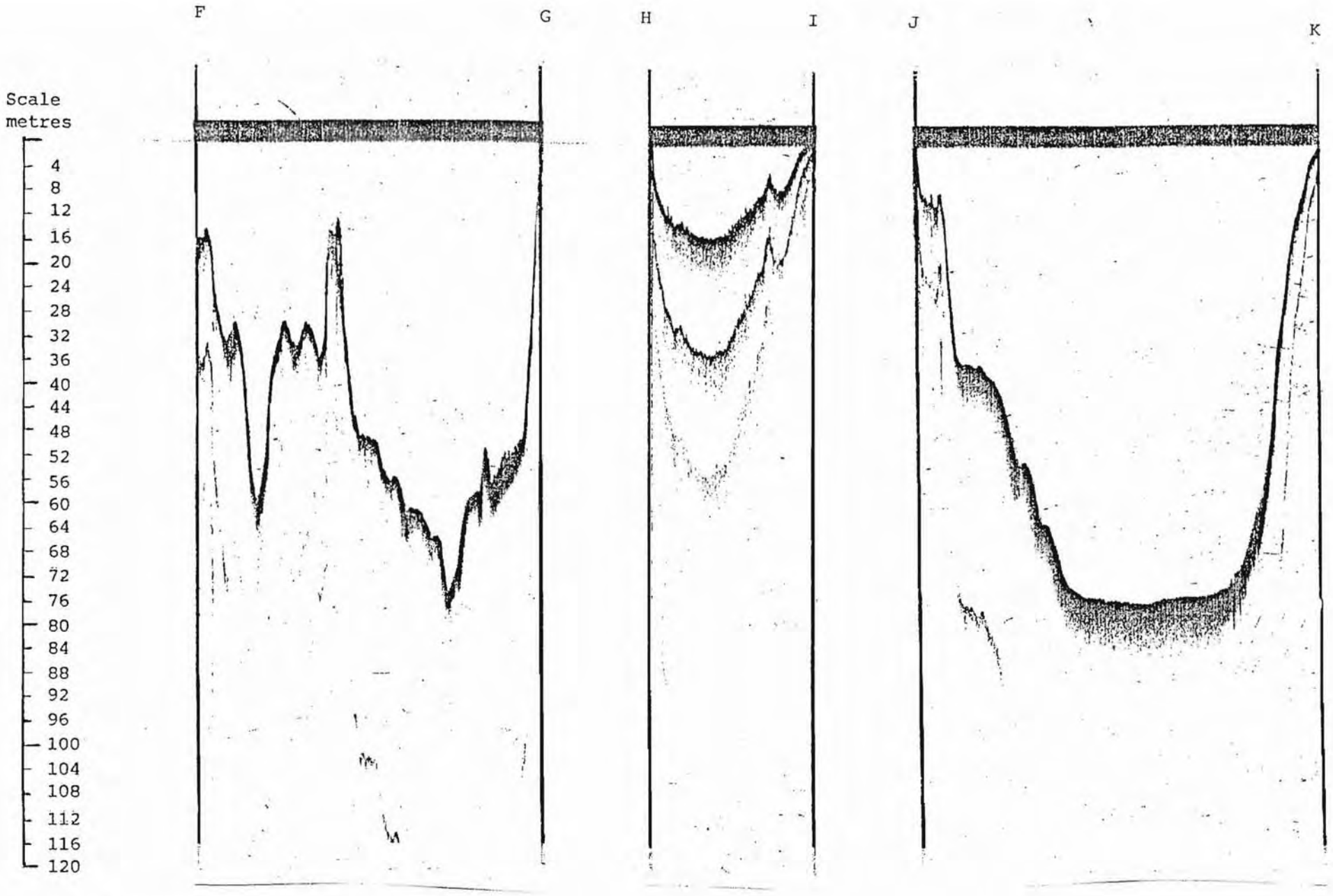
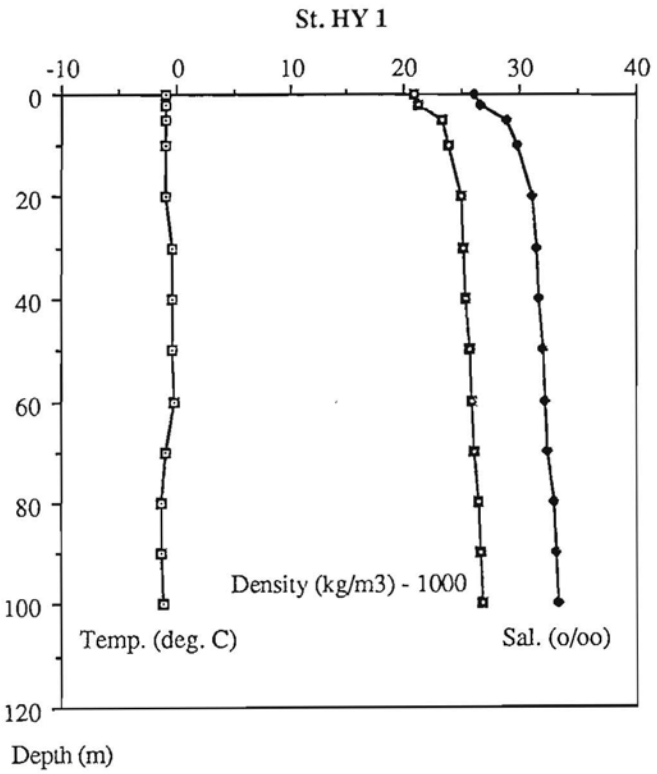
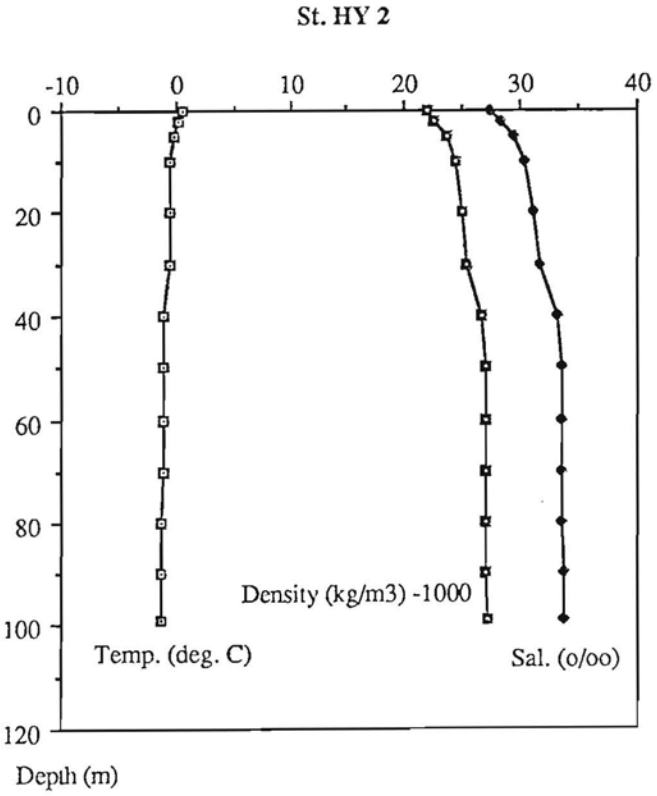


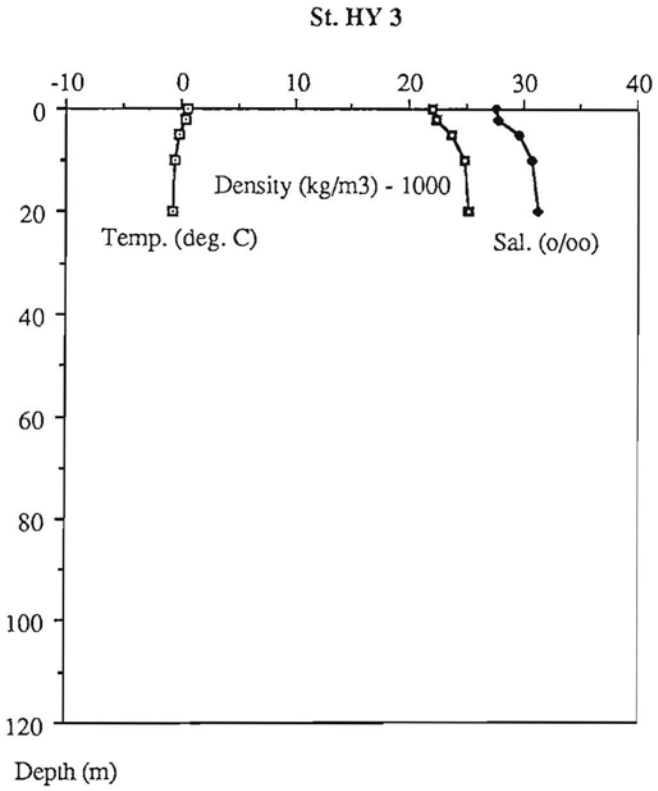
Figure 3 continued.



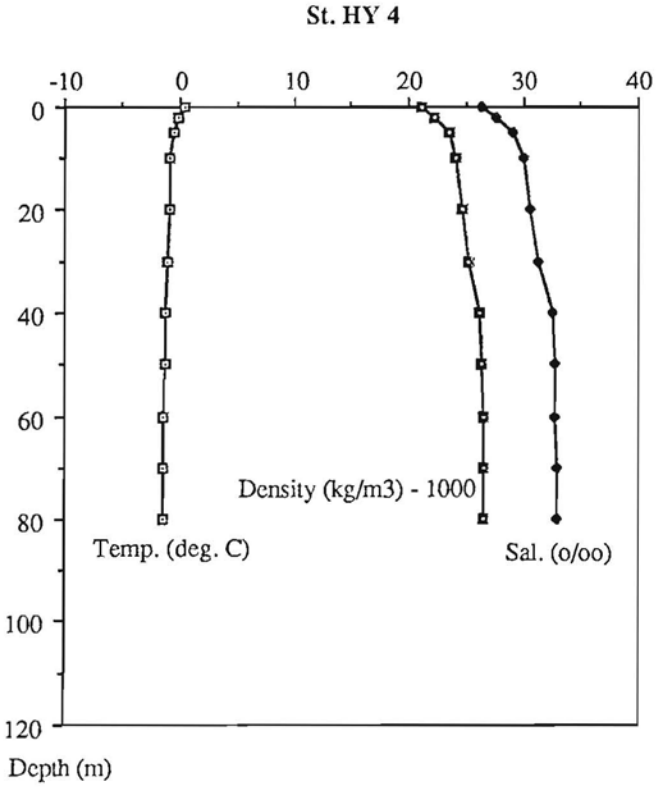
Figur 4. Hydrographic profile in Kangerdlugssuaq south of Uttental Sund.



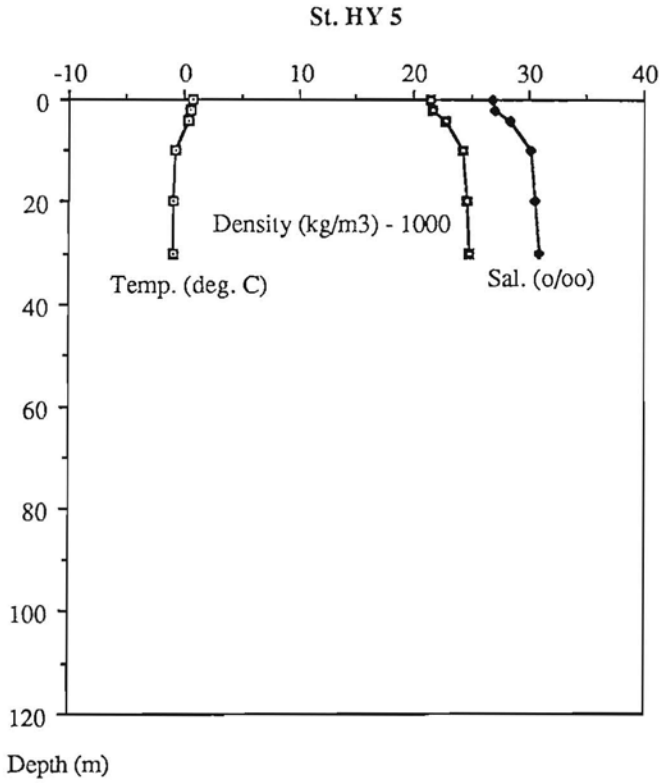
Figur 5. Hydrographic profile in southern part of the southern basin of Uttental Sund.



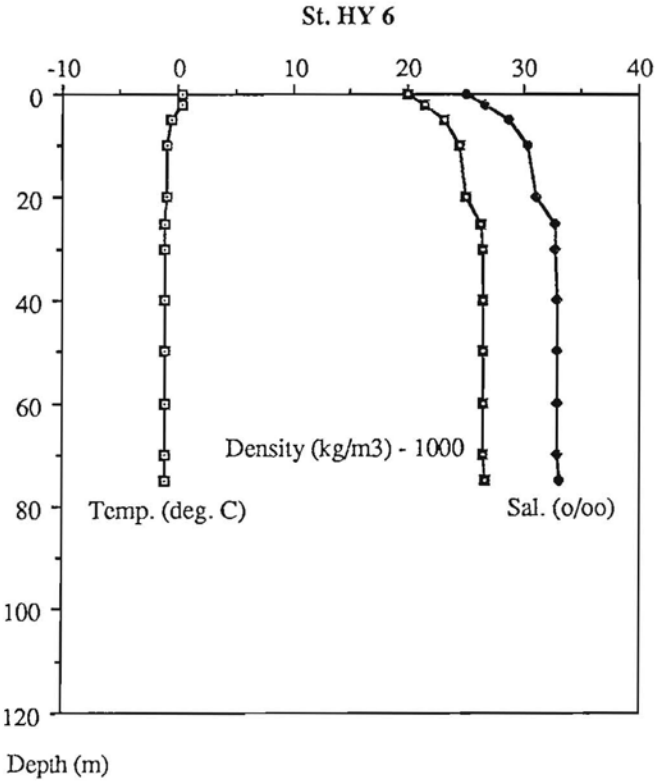
Figur 6. Hydrographic profile in middle part of southern basin of Uttental Sund.



Figur 7. Hydrographic profile in northern part of the southern basin of Uttental Sund.



Figur 8. Hydrographic profile at Strømstedet.



Figur 9. Hydrographic profile in northern basin of Uttental Sund.