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Ice-wedge casts in an early deglaciated area of southern Sweden

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In a locality in northwestern Scania, an area that was the first part of Sweden to emerge from the Weichselian ice sheet, three types of ice-wedge casts are observed. The wedges are discussed from a morphogenetic, morphostratigraphic and chronological point of view.

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Keywords: *Ice-wedge polygons, wedge-casts, segregated ice, fragipan, post-glacial transgression, Older Dryas, Younger Dryas.*

In a survey of relict ice-wedge polygons including reconnaissance flights and subsequent field check of crop marks in northwestern Scania (fig. 1), indications of polygon nets on the Bjäre peninsula were found to be rare (Svensson 1975). Only two small areas were registered as certain polygon sites (fig. 2), both located in cultivated fields at Vejby, at altitudes between 30 and 37 m a.s.l. This means they are situated below the Late Weichselian marine limit (55 m a.s.l.) but clearly above the maximum limit of the Post-glacial transgression of the area, 11-12 m a.s.l., (Daniel 1980).

In view of the wast areas of relict polygon patterns both to the northeast and southeast, the low frequency of polygon sites in the Bjäre peninsula is interesting in itself from a regional aspect. In addition, the Vejby area appeared to be important because of the possibilities for analysis ofsome types of ice-wedge pseudomorphs that were offered in a nearby gravel pit (Ljungby).

In this paper three types of ice-wedge casts will be discussed concerning morphogenesis, morphostratigraphy and chronology in relation to the deglaciation pattern of the area which probably was the first part of Sweden that was deglaciated.

ICE-WEDGE CASTS IN GLACIOFLUVIAL MATERIAL

In the eastern part of the gravel pit and in close connection to one of the polygon surfaces funnel-formed infillings of ice-wedge pseudomorphs showed up penetrating

Fig. 1. Index map. V indicates the area investigated.

Fig. 1. Index kort. V angiver det undersøgte område.

glaciofluvial beds from just below the ground surface (approx. 50 cm of the top soil had been removed).

During the fossilization of the wedges, the strata had bent down towards the fissure, strengthening the wedge form of the cast. Material from above and from adjacent strata made up the infilling, being a mixture af sand and gravel with a lower degree of sorting than the individual beds of the matrix.

This type of ice-wedge cast (fig. 3), type 1 of the locality, frequently occurs in gravel pits of glaciofluvial delta surfaces of the Ängelholm plain and the Laholm plain (Svensson 1964a and 1973). At the Vejby/Ljungby locality the casts are rather thin (5-10 cm) but can penetrate as deep as 6 m into the glaciofluvial deposits. In addition to their wedge shape, the contours of the casts are usually set off by precipitation of iron compounds in the infilled material. The wedges indicate a relatively short period of frost-fissuring in a permafrost environment during the deglaciation.

The Vejby/Ljungby locality became, however, of special interest because wedge casts were also found inside and in connection with till beds.

WEDGE CASTS IN TILL

Generally ice-wedge structures are less commonly found in till than in glaciofluvial deposits. This might be ex-

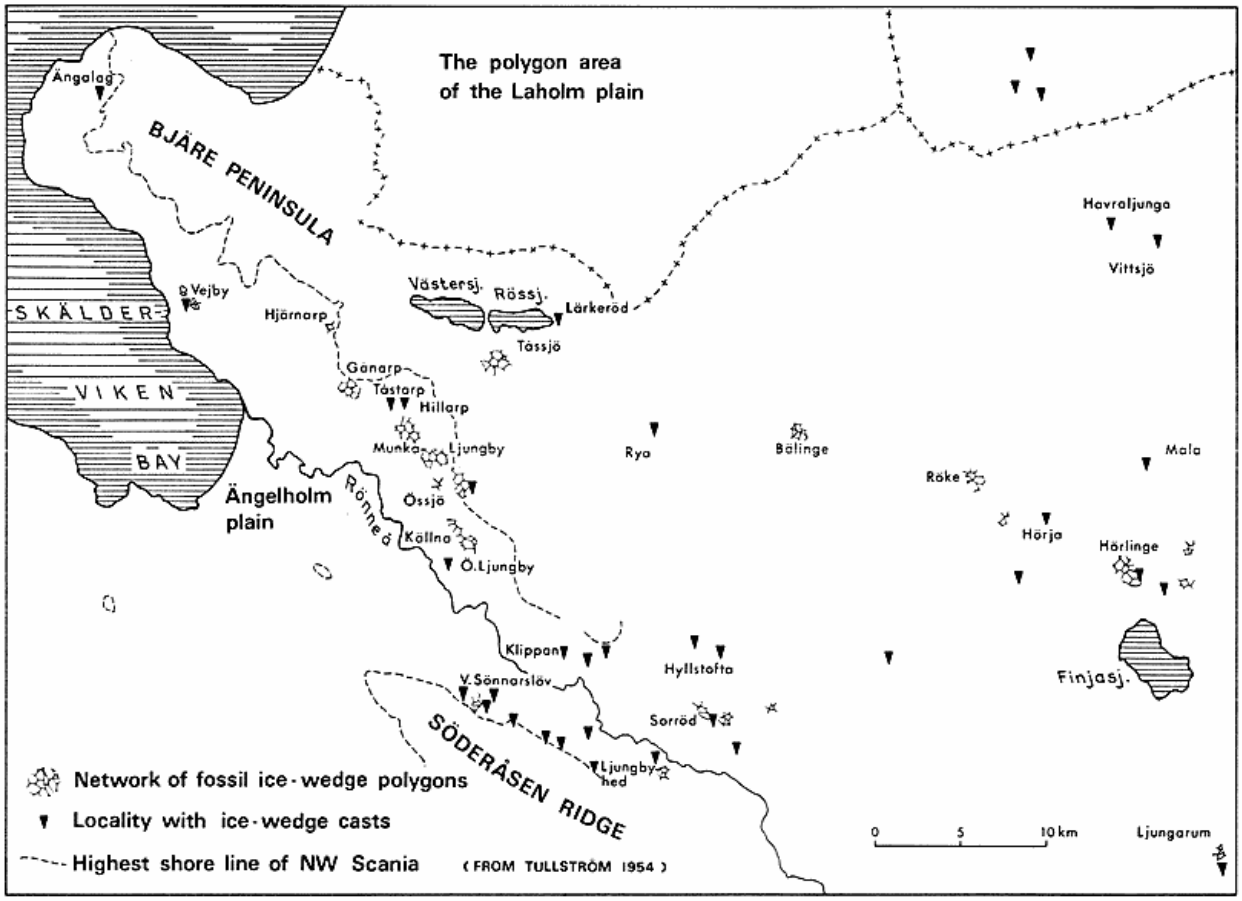

Fig. 2. Observations of polygon patterns (crop marks) and ice-wedge casts in northwestern Scania (from Svensson 1975).

Fig. 2. Observationer af polygonmønstre og iskileaftryk i det nordvestlige Skåne (efter Svensson 1975).

Fig. 3. Part of thin ice-wedge cast in glaciofluvial material. The section is 220 cm deep.

Fig. 3. Udsnit af tynd iskileafstøbning i smeltevandsaflejringer. Udgravningen er 220 cm dyb.

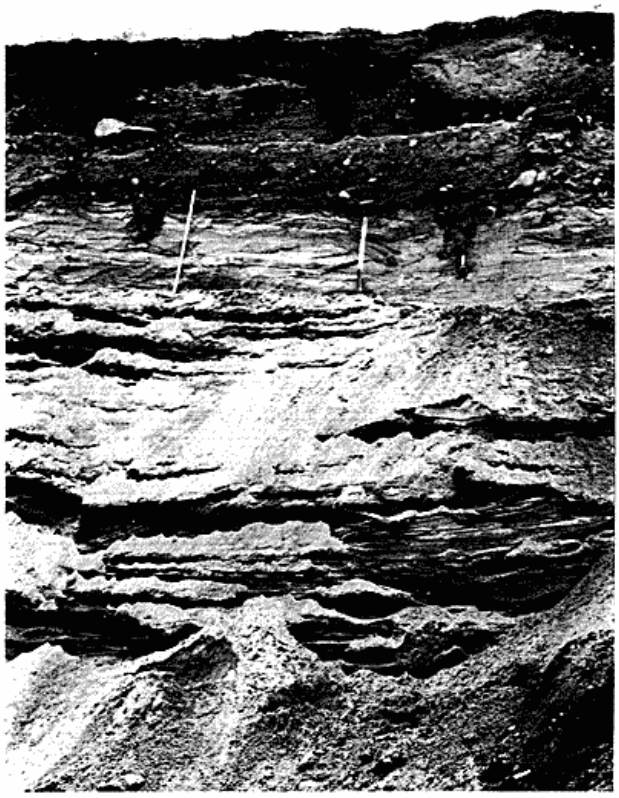

Fig. 4. Section through the southwestern part of the Ljungby gravel pit. 17/7 1981.

Fig. 4. Profil i den sydvestlige del af Ljungby grusgraven. 17/7 1981.

plained by the fact that there are fewer sections available in till than in glaciofluvial material, or by the difficulty to detect an infilling of till in the nonstratified mass of a till matrix. However, the divergence must be looked upon as a reality which can be ascribed to material qualities; till having less favourable properties for the development of frost fissure polygons than glaciofluvial material. Reasonably frozen till with its diamictic character, the stones and blocks being a reinforcing component, offers a greater strength resistance to thermal contraction than a frozen stratified glaciofluvial or eolian sediment under otherwise equal climatic conditions.

Not far from the Vejby/Ljungby locality Mörner (1972) identified and discussed a special wedge-form in till, and the same type has been observed by Humlum (1978) on Zealand, Denmark. These so-called till wedges with their strongly slanting, sometimes nearly horizontal direction, have, however, a quite different morphogenesis than ice-wedge casts. Their form and direction is due to mechanical squeezing of material in fractional craks of subglacial sediments caused by an overriding ice sheet.

The gravel pit under discussion is opened in the north-east-southeasterly hill area which can be followed between Vejby and Ljungby and makes part of a longer complex running further southeastwards. The pit, which has got an extension in the direction of the hill area shows quite different material composition in both of its elongated flanks. While the northeastern side is built up by well-stratified sand and gravel beds typical for glaciofluvial deposits, the southwestern flank shows a more complex picture (fig. 4). The superficial layers consist of beach sediments and are followed by a 80 cm thick bed of gravel, in its upper part clearly reworked by waves and probably of glaciofluvial origin. Below a bed of till appears, the top of which shows clear signs of erosion, indicated by an enrichment of smaller stones. Apparently, the till surface was exposed to erosion, before it was covered by the gravel bed, probably by wave activity, but wind abrasion is also possible. Indications of strong eolian erosion, as wind blasted stones, are, however not found. The till bank is underlain by an undisturbed laminated sand deposit which continues to the bottom of the pit, but its lower parts show dislocations that may be of glacialtectonic origin.

The intersedimentary till varies in thickness from 60 cm to 5 m within a distance of 60 m in the southwestern flank of the pit. During the excavation of the pit for some years, there has been observed a tendency that the till bank is getting thinner and probably will disappear in an

east-northeasterly direction. The till is built up of a sandy-silty matrix rich in stones and blocks of Archaen rocks (from the northeast), but also fragments of lime- and flint stones occur.

The whole exposed till bed is penetrated by a fissure-like net (fig. 5) without any preferred directions of a dynamic or compaction origin. The same type of struture is often found in silty sediments of permafrost areas, where the high water content of fine-grained material by freezing results in an enrichment of ice, segregated ice (fig. 6). The term ice lensing is sometimes used for this process because of the formation of lenses or nets of pure ice. When the ice melts, the material preserves a structure of aggregates with plain surfaces (Svensson 1964b). In soil science this structure in its fossil state is termed fragipan.

The operation of the pit has been followed for nine years, and it can be stated that there, besides the normal type of ice-wedge cast, type 1 (earlier mentioned), also exist two types of infilling with connection to the till:

type 2, wedges infilled with till in a matrix of sand, and
type 3, wedges infilled with till in a matrix of till.

Type 2. The wedge casts appear downwards from the bottom part of the till bank (fig. 7) and has an infilling that is mostly derived from the till, but also contains sand inclusions from the adjoining sand bed. In some cases layers bending towards the wedge can be observed in the laminated sand matrix, which is a characteristic feature for ice-wedge casts. A further excavation showed that the casts, 20 and 30 cm in width were obliquely cut. The real width of the right wedge was 12 cm. The casts were traced to depth of 45 and 65 cm respectively.

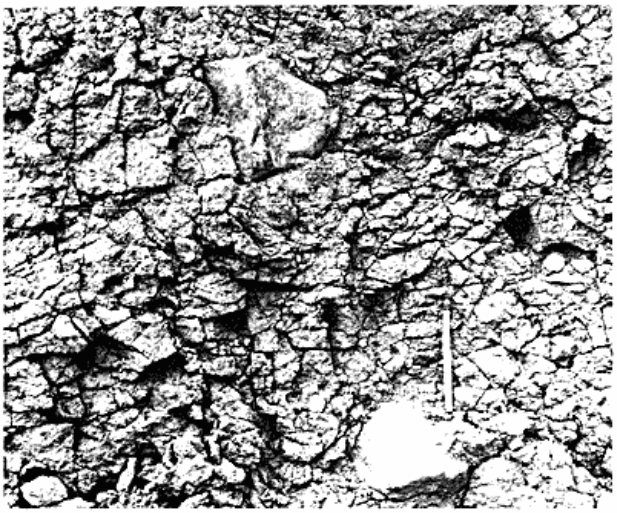

Fig. 5. Fissure-like net in a vertical section of the till bank (for scale a 5-cm match). 29/5 1985.

Fig. 5. Sprække-lignende net i et lodret profil gennem moræne-banken (størrelsesforholdet angives af en 5 cm lang tændstik). 29/5 1985.

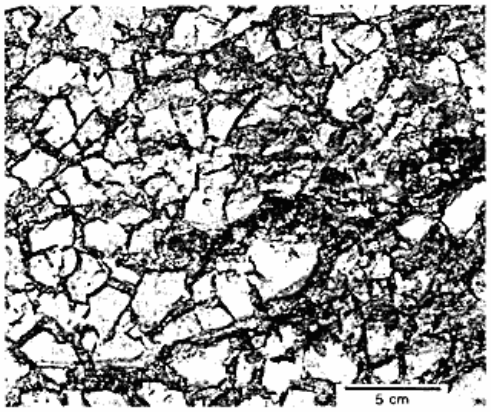

Fig. 6. Section of permafrost with segregated ice in a matrix of silt, Karlebotn, northeastern Norway.

Fig. 6. Profil gennem permafrost med segregeret is i en matrix af silt, Karlebotn, nordøstlige Norge.

The wedges cannot be traced by distinct contours upwards through the till bed, a fact that properly speaking is not astonishing because of the heterogeneous character of the till. More important is then that the wedges are not equivalated by structures in the top gravel. With the regular stratification that exists in this bed, a fossilization of ice wedges should have caused deformation of the strata and furthermore a subsidence of gravel material into the till bank.

Type 3. The infillings occur in the silty-sandy till matrix with clasts of gneiss and less frequent also granite and some flint stones. 4 m deep casts are observed, and other

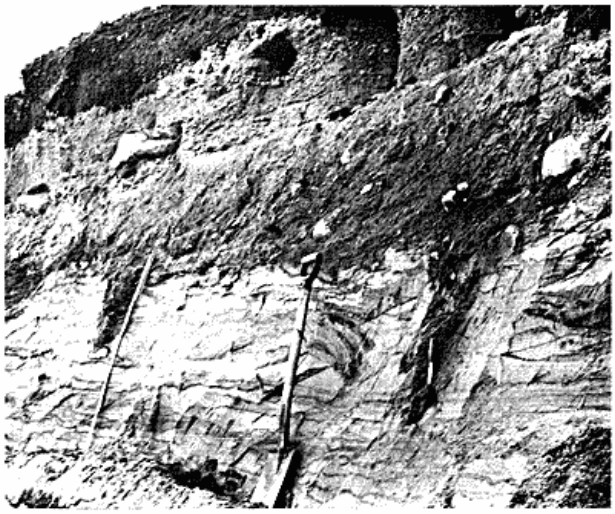

Fig. 7. Close-up view of a part of the southwestern wall of the Ljunby gravel pit. 17/7 1981.

Fig. 7. Nærbillede af en del af den sydvestlige væg i Ljungby grusgraven. 17/7 1981.

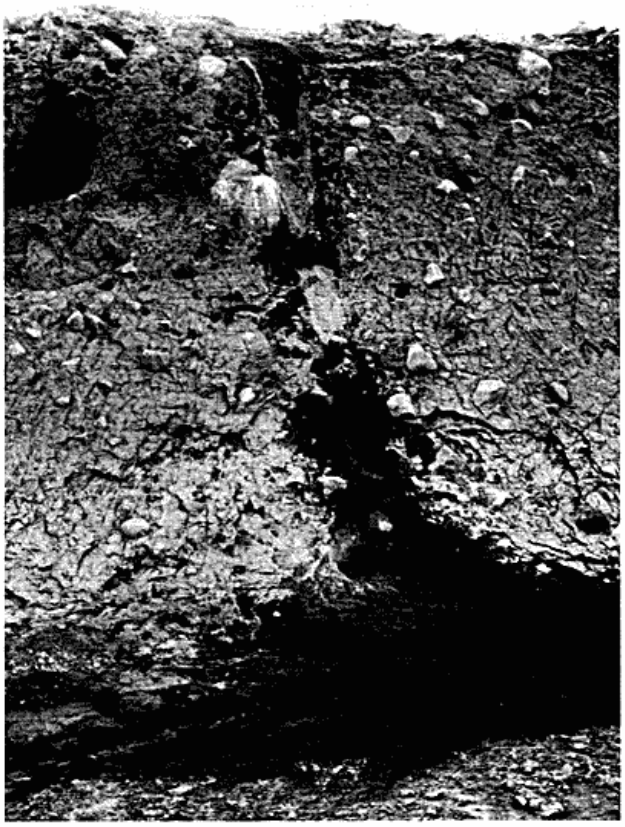

Fig. 8. Wedge-formed 4-m deep infiling in the till bank. The top soil is removed during the operation of the pit. 20/1 1976.

Fig. 8. Kileformet 4 m dyb udfyldning i morænebanken. Overjorden er fjernet ved gravning. 20/1 1976.

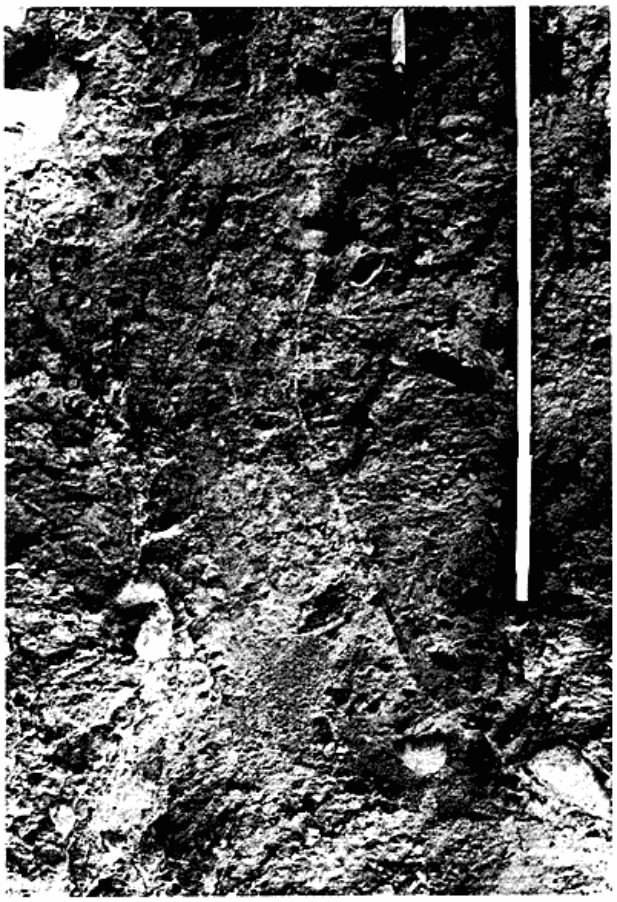

Fig. 9. The middle part of a wedge cast in the till bank (the knife is 20 cm). 8/9 1981.

Fig. 9. Den centrale del af et kileaftryk i morænebanken (kniven er 20 cm lang). 8/9 1981.

infillings could be followed to 2-3 m depth (fig. 8), before they disappeared in the talus material.

The casts are usually not wider than 10-40 cm in their upper part and some of them get only slowly thinner downwards and give the impression of some sort of clastic dike of unspecified origin. Where the lower parts could be excavated and analyzed, the casts, however, thin out and pass into fissures, which is characteristic for ice wedges. Also higher up in the cast, a branching or lateral fissuring occurs.

The wedges usually have well defined contours and often also stand out against the matrix because of the infilling. Mostly the wedges contain till material, but in addition also sand, so the infilling can generally be characterized as a mixture of till and sand. A sand film sometimes strengthens the contour between the wedge and the matrix (fig. 9) One of the thinner wedges was mainly filled with sand. As there are no beds or inclusions of sand in the till bed, the sand content of the casts must be supplied from above.

The study of the Vejby/Ljunby locality was started immediately after the polygon patterns were observed during a reconnaissance flight in 1975, but the working up of the material was let to rest for some time. Certainly, there was no doubt that the wedges were pseudomorphs of ice wedges, but for the types 2 and 3 their fossilization and stratigraphic position gave problems of interpretation. Among other things there were indications that the upper part of the intersedimentary till bank had been exposed to erosion.

In order to find the stratigraphical significane of the till bed with adherent erosional features and wedge casts, it was desirable to find other localities for analysis in the area. Unfortunately, new gravel pits are not opened; on the contrary, old ones are closed. However, in other parts of western Scania new facts on the deglaciation have come to hand by Lagerlund's comprehensive studies of the stratigraphy of Scanian tills, and a new deglaciation model, founded on bio- and litostratigraphical research, was presented by Berglund & Lagerlund (1981). A survey of the

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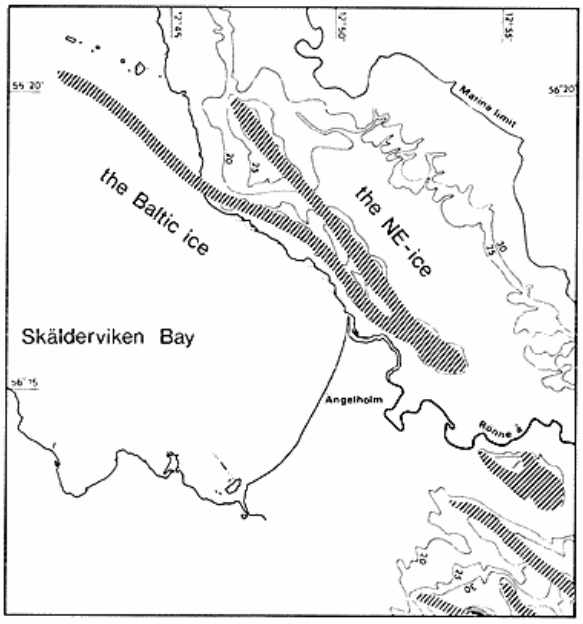


Fig. 10. A survey map of the Skälderviken Bay area, redrawn from Mörner (1979). L indicates the gravel pit investigated.

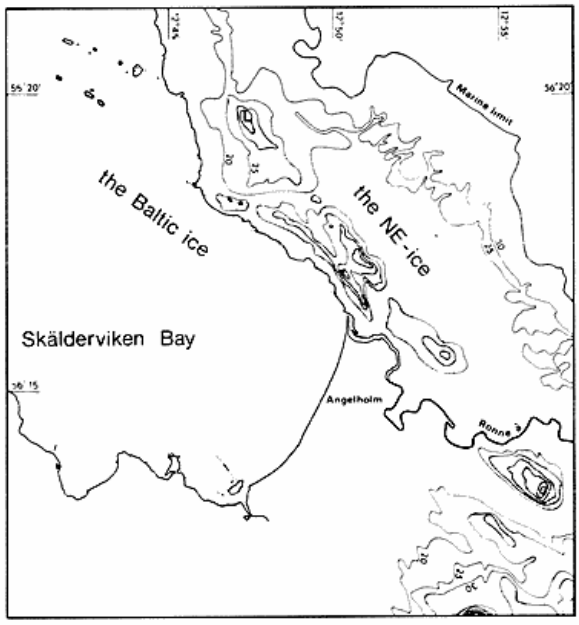
Fig. 10. Kort over området ved Skäldervik Bugt, omtegnet efter Mörner (1979). L angiver den undersøgte grusgrav.

Quaternary deposits in northwestern Scania has also been published (Daniel 1978). These works, together with parts of Mörner's (1969) thesis on the Quaternary deposits on the Swedish west coast may give a base to venture a morpho-chronological interpretation of the ice wedge pseudomorphs. Before going more in detail with the problems, the opinions of the deglaciation of the area and its periglacial nature will be delt with in brief.

THE POSITION OF THE VEJBY/LJUNGBY LOCALITY IN THE DEGLACIATION PATTERN

For the research on the recession of the Weichselian ice sheet from the Swedish west coast, northwestern Scania constitutes a most interesting area, especially because of the division of the ice sheet into different ice streams, which occurred in the area. For a period, the Skälderviken Bay area thus constituted a zone influenced by an ice sheet from the northeast and an ice stream moving up in the Öresund area from a south- or southeasterly direction (in the old terminology the Northeast ice and the Baltic ice, respectively). The corresponding directions of ice movements are indicated by striae and erratics.

In the farm land on the northern side of the Skälderviken Bay two ranges of hills occur. The relief is smoothed and the outlines partly diffuse when observed in the field, but their extension is clearly seen in a contour map (fig. 10). In the geological map (Daniel & Mohrén 1976) the ranges are indicated as connected zones of glaciofluvial material surrounded by silt, sand and wave-washed till.



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The morphogenesis of the hills has been discussed in geological works in which also information from to day closed gravel pits was included. Tullström (1954, p. 20) interpreted the area an an esker and proposed, with reference to Wennberg, the possibility that the glaciofluvial accumulation was built up in the contact zone between the Northeast ice and a Low Baltic ice. – Mörner found in the area »an old transportation of material from both SW and NE-E, combined with ice pressure from SW« (Mörner 1969, p. 73). He concludes that the formation is »an ice marginal fork« which corresponds with »the initial phase of the dividing of the ice into two masses which receded in different directions«. During the course of deglaciation the »fork« was then displaced further and further to the southeast and made room for the sea inundating the present Ängelholm plain. During this early phase of deglaciation the oldest raised shorelines in Sweden were formed. – In the description to the Quaternary map, Daniel (1978, p. 51) states that the ridges stratigraphically are complicated accumulations with both intersedimentary and covering till beds and interpretes the area as complex end moraines or marginal deposits accumulated by an ice sheet moving from the northeast. In Lagerlund's deglaciation model the ice margin of the »A-phase« of northwestern Scania is outlined by an acute angled contour in the Skälderviken Bay area, the angle being the result of an interaction of movements from a »main dome in the NE and the marginal dome in the SW« (Lagerlund 1980, Lagerlund et al. 1983).

The deglaciation chronology of northwestern Scania is still under discussion. Mörner includes the »fork« of the Skälderviken Bay area in his F5-line, which corresponds to 11.800 BC (Mörner 1969, p. 70 and p. 181). According to Lagerlund (oral communication) the northwestern – most part of Scania including the area of the acute angled ice margin may have emerged from the ice sheet about 14.000 B.P. (cf. also Lagerlund 1980 fig. 50).

GEOMORPHOLOGICAL AND CHRONOLOGICAL ASPECTS OF THE CASTS. DISCUSSION AND CONCLUSIONS

The type 1 cast gives no problems as to genesis and chronology. It has connection to the present ground surface and by contour and infilling shows the characteristics of the normal type of ice-wedge pseudomorphs in raised beach areas of southwestern Sweden, dating back to a high arctic climate during the Late Weichselian.

Though formed in till, the casts of type 3 seem to be of the same origin as type 1, formed during periglacial conditions from a Late Weichselian ground surface. When the permafrost disappeared, the wedges got their infilling from surficial sand and gravel together with material from the till matrix. Remarkable is only that they are devel-

oped in till. In the stratigraphical description attention was called to the fact that the till showed fossil textural (fragipan) characteristics of the existence of segreated ice. It can be taken for granted that in a periglacial coastal area, a former higher sea level with a corresponding high amount of ground water in fine-grained sediments caused the development of an extremely ice-rich permafrost. As the contraction of ground, a basic condition for ice-wedge formation, is highly facilitated by a high ground-ice content, there exists a plausible explanation that ice wedges could form also in till.

During the analysis of the infillings it could be stated that the fragipan texture of the till matrix does not exist in the wedge cast. This fact indicates that the process of ice segregation of the till was completed before the wedges were filled in. In other words, the wedges most probably belong to the period of permafrost, when the net of segregated ice was developed.

Unlike the two other wedge types, the cast type 2 has no connection with the present ground surface, but has an entirely intersedimentary position, connected to the till bed. When the till was laid down, the wedges existed as real ice wedges. It means that the ground surface was underlain with permafrost. Probably, the upper part of the ground (of the sand deposit) was removed in connection with the till accumulation, as there are no traces of structures of an active layer in the laminated sand. Thus the casts (fig. 7) represent only the lower parts of ice wedges.

The interface between the till bed and the top gravel is a surface of erosion. The till bed shows no surficial depressions corresponding to the casts below, and no gravel material has been supplied as infillings downwards; this indicates that the ice wedges had passed into a fossil state (wedge casts) before the till bed was covered by the gravel. The wedges type 2 are thus older than those of type 1 and 3. The surface layer of beach sediment corresponds to the activity of the Late Weichselian sea as does also the wave-washed part of the gravel bed, but the surface of erosion of the till bank is most probably older and indicates a phase of transgression.

In the material that recently has been presented by Lagerlund (1980) and Lagerlund et al. (1983), some localities in western Scania are decribed which stratigraphically show a transgression during a late phase of Weichselian time. Of special interest for the problems under discussion are the localities at Lund and Nyhamns läge. On the first locality, Lagerlund has observed and mapped a net of fossil ice-wedge polygons in till, »Dalby till«, which is covered by a later till, »Lund till«, representing the latest deposition of till on the locality. Between the two till beds sediment layers of transgressional origin occur. – On the other locality, Nyhamns läge, situated only 20 km west-southwest of the Vejby/Ljungby area, Lagerlund (1980) has found ice-wedge casts in a till bed, »Bräcke till«, which has a surface of erosion of the same kind as in the area of discussion. The till surface is covered by sediments indicating a transgression and on the top a younger till, the »Jonstorp till« occur.

Referring to these new stratigraphical facts the till bank of the Vejby/Ljungby locality hypothetically fits into a regional picture of a Late-Weichselian ground surface in western Scania which, with a pronounced periglacial position in an area between the »North east ice« (main ice) and the »Baltic ice«, was exposed to intense frost activity, before it was indundated by the sea. – Already in 1962 Johnsson demonstrated the presence of frost phenomena in an intervening area between the two ice masses in the Sound area. – On the southern localities, Lund and Nyhamns läge, the periglacial land surface was later on covered by marine clay and interbedded till material derived from drifting icebergs. The upper till-rich facies of this complex unit is the Lund till and the Jonstorp till, respectively (Lagerlund 1980). The deposits brought by icebergs did not reach – or were later eroded from – the Vejby/Ljungby locality. The transgression and deposition of the gravel bed, later followed by the accumulation of beach sediments, completed the evolution of the Weichselian stratigraphy of the area.

In the deglaciation pattern the wedge casts type 2 can be attributed to the »A/B interphase« (Lagerlund et al. 1983). So far, it is not possible to give a more precise chronology for the wedges, but using Lagerlund's glaciation curve for Scania and the southern part of the west coast (Lagerlund 1980), the time of formation seems to fall in the interval 14.000-13.000 BP. As far as the ice wedges type 1 and 3 are concerned, they can be connected with the arctic conditions of the Older Dryas period, or at the latest, the Younger Dryas period 11.000-10.500 BP.

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Resumé

Den nordvestlige del af Skåne var den del af Sverige, som først smeltede fri af isskjoldet (Weichsel). Under den tidligt isfrie periode havde Bjärehalvøen en periglacial beliggenhed såvel i for-

hold til den bortsmeltede ismasse i nord, Nordøstisen, som i forhold til den Baltiske is i syd. I dette periglaciale miljø eksisterede der permafrost i området, hvilket dels fremgår af nutidige polygonmønstre i dyrkede marker, dels af afstøbninger af iskiler i grusgrave.

På en lokalitet, Vejby/Ljungby, på nordsiden af Skälderviken er tre typer af iskiler iagttaget. Type 1 optræder i glaciofluvialt materiale; type 3 er dannet i moræne (till). Begge typer har direkte tilknytning til den nuværende terrænoverflade. Type 2 har en intersedimentar beliggenhed og er dækket af senere aflejringer. Kilerne er undersøgt ud fra et morfogenetisk, morfostratigrafisk og kronologisk synspunkt. Forekomsten af iskiler i till er mindre vanlig. I det aktuelle tilfælde er dannelsen af iskilerne begunstiget af et stort isindhold i morænematerialet, hvilket fremgår af bevarede strukturer efter segregationsis i materialet lateralt for kilerne.

Tidspunktet for dannelsen af iskilerne i intersedimentær position (type 2) falder i tidsrummet 14.000-13.000 år B.P. ifølge Lagerlunds glaciationskurve. De kiler, som har forbindelse med den nuværende terrænoverflade (type 1 og 3), er begyndt at dannes under Ældre Dryas eller senest i Yngre Dryas (11.000-10.500 år B.P.), da området henlå som tundra.

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A new map of the Mitdluagkat glacier – a preliminary report

Bent Hasholt

Hasholt, Bent: A new map of the Mitdluagkat glacier – a preliminary report. Geografisk Tidsskrift 87: 19-21, Copenhagen June 1987.

A new map covering the whole Mitdluagkat Glacier has been elaborated. The map is based on air photos from Geodetic Institute in scale 1:150,000 taken July 30, 1981. The scale of the new map is 1:20,000 with 10-m contour intervals. Preliminary field tests indicate that the map is so accurate that it might be used for comparative studies of long-term variations in mass balance of the glacier.

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Keywords: *Mapping, glaciology, air photos.*

The terminus of the Mitdluagkat Glacier has been observed since 1933. Maps from Geodetic Institute (1:250,000 and 1:50,000 surveyed 1932-33 and 1943, respectively) exist. A detailed map based on air photos from 1972 has been evaluated together with the maps from Geodetic Institute by Hasholt (1986).

The evaluation showed several differences between the maps with contradicting consequences for the computation of a mass balance of the glacier. It is most likely that some of the discrepancies are due to errors in the old maps from Geodetic Institute.

Another difficulty is that the map showing the 1972-situation is not covering the whole glacier, partly due to inadequate overlap between air photos and partly because of lack of photos of the southern part of the glacier.

There was therefore a need for a map covering the whole glacier so that a hypsographic curve could be drawn to facilitate studies of precipitation distribution and of mass balance. Part of the glacier was photographed by

hold til den bortsmeltede ismasse i nord, Nordøstisen, som i forhold til den Baltiske is i syd. I dette periglaciale miljø eksisterede der permafrost i området, hvilket dels fremgår af nutidige polygonmønstre i dyrkede marker, dels af afstøbninger af iskiler i grusgrave.

På en lokalitet, Vejby/Ljungby, på nordsiden af Skälderviken er tre typer af iskiler iagttaget. Type 1 optræder i glaciofluvialt materiale; type 3 er dannet i moræne (till). Begge typer har direkte tilknytning til den nuværende terrænoverflade. Type 2 har en intersedimentar beliggenhed og er dækket af senere aflejringer. Kilerne er undersøgt ud fra et morfogenetisk, morfostratigrafisk og kronologisk synspunkt. Forekomsten af iskiler i till er mindre vanlig. I det aktuelle tilfælde er dannelsen af iskilerne begunstiget af et stort isindhold i morænematerialet, hvilket fremgår af bevarede strukturer efter segregationsis i materialet lateralt for kilerne.

Tidspunktet for dannelsen af iskilerne i intersedimentær position (type 2) falder i tidsrummet 14.000-13.000 år B.P. ifølge Lagerlunds glaciationskurve. De kiler, som har forbindelse med den nuværende terrænoverflade (type 1 og 3), er begyndt at dannes under Ældre Dryas eller senest i Yngre Dryas (11.000-10.500 år B.P.), da området henlå som tundra.

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Another difficulty is that the map showing the 1972-situation is not covering the whole glacier, partly due to inadequate overlap between air photos and partly because of lack of photos of the southern part of the glacier.

There was therefore a need for a map covering the whole glacier so that a hypsographic curve could be drawn to facilitate studies of precipitation distribution and of mass balance. Part of the glacier was photographed by

oped in till. In the stratigraphical description attention was called to the fact that the till showed fossil textural (fragipan) characteristics of the existence of segreated ice. It can be taken for granted that in a periglacial coastal area, a former higher sea level with a corresponding high amount of ground water in fine-grained sediments caused the development of an extremely ice-rich permafrost. As the contraction of ground, a basic condition for ice-wedge formation, is highly facilitated by a high ground-ice content, there exists a plausible explanation that ice wedges could form also in till.

During the analysis of the infillings it could be stated that the fragipan texture of the till matrix does not exist in the wedge cast. This fact indicates that the process of ice segregation of the till was completed before the wedges were filled in. In other words, the wedges most probably belong to the period of permafrost, when the net of segregated ice was developed.

Unlike the two other wedge types, the cast type 2 has no connection with the present ground surface, but has an entirely intersedimentary position, connected to the till bed. When the till was laid down, the wedges existed as real ice wedges. It means that the ground surface was underlain with permafrost. Probably, the upper part of the ground (of the sand deposit) was removed in connection with the till accumulation, as there are no traces of structures of an active layer in the laminated sand. Thus the casts (fig. 7) represent only the lower parts of ice wedges.

The interface between the till bed and the top gravel is a surface of erosion. The till bed shows no surficial depressions corresponding to the casts below, and no gravel material has been supplied as infillings downwards; this indicates that the ice wedges had passed into a fossil state (wedge casts) before the till bed was covered by the gravel. The wedges type 2 are thus older than those of type 1 and 3. The surface layer of beach sediment corresponds to the activity of the Late Weichselian sea as does also the wave-washed part of the gravel bed, but the surface of erosion of the till bank is most probably older and indicates a phase of transgression.

In the material that recently has been presented by Lagerlund (1980) and Lagerlund et al. (1983), some localities in western Scania are decribed which stratigraphically show a transgression during a late phase of Weichselian time. Of special interest for the problems under discussion are the localities at Lund and Nyhamns läge. On the first locality, Lagerlund has observed and mapped a net of fossil ice-wedge polygons in till, »Dalby till«, which is covered by a later till, »Lund till«, representing the latest deposition of till on the locality. Between the two till beds sediment layers of transgressional origin occur. – On the other locality, Nyhamns läge, situated only 20 km west-southwest of the Vejby/Ljungby area, Lagerlund (1980) has found ice-wedge casts in a till bed, »Bräcke till«, which has a surface of erosion of the same kind as in the area of discussion. The till surface is covered by sediments indicating a transgression and on the top a younger till, the »Jonstorp till« occur.

Referring to these new stratigraphical facts the till bank of the Vejby/Ljungby locality hypothetically fits into a regional picture of a Late-Weichselian ground surface in western Scania which, with a pronounced periglacial position in an area between the »North east ice« (main ice) and the »Baltic ice«, was exposed to intense frost activity, before it was indundated by the sea. – Already in 1962 Johnsson demonstrated the presence of frost phenomena in an intervening area between the two ice masses in the Sound area. – On the southern localities, Lund and Nyhamns läge, the periglacial land surface was later on covered by marine clay and interbedded till material derived from drifting icebergs. The upper till-rich facies of this complex unit is the Lund till and the Jonstorp till, respectively (Lagerlund 1980). The deposits brought by icebergs did not reach – or were later eroded from – the Vejby/Ljungby locality. The transgression and deposition of the gravel bed, later followed by the accumulation of beach sediments, completed the evolution of the Weichselian stratigraphy of the area.

In the deglaciation pattern the wedge casts type 2 can be attributed to the »A/B interphase« (Lagerlund et al. 1983). So far, it is not possible to give a more precise chronology for the wedges, but using Lagerlund's glaciation curve for Scania and the southern part of the west coast (Lagerlund 1980), the time of formation seems to fall in the interval 14.000-13.000 BP. As far as the ice wedges type 1 and 3 are concerned, they can be connected with the arctic conditions of the Older Dryas period, or at the latest, the Younger Dryas period 11.000-10.500 BP.

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Resumé

Den nordvestlige del af Skåne var den del af Sverige, som først smeltede fri af isskjoldet (Weichsel). Under den tidligt isfrie periode havde Bjärehalvøen en periglacial beliggenhed såvel i for-