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A regional lithostratigraphy for the Sulitjelma region,Nordland,with reference to nappes at two levels. Lithostratigrafi.

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Sammendrag

En regional-stratigrafi er skildra for Sulitjelmafeltet. To tektoniske-grenser og fire deformasjonsfaser er pavist. Lithostratigrafisk korrelasjon mellom bergartsgrupper. Deformasjonsfase

A REGIONAL LITHOSTRATIGRAPHY FOR THE SULITJELMA REGION, NORDLAND, NORWAY WITH REFERENCE TO NAPPES AT TWO LEVELS

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Tectonic boundaries exist between the Lower Skaiti Group and the Furulund Group, and between the Pieske Marble and Lower Mica Schist Group.

Four phases of deformation are evident in the field, the regional geology of Sulitjelma being dominated by interference of F_2 and F_3. F_4 is a "brittle" deformation.

Metamorphism of the Groups up to the Lower Skaiti demonstrates garnet-oligoclase assemblages; the Skaiti Group shows kyanite-staurolite assemblages. Kyanite was found at one locality within the Muorki-Sjønsta, and may be associated with the F_4 deformation.

Introduction

The Sulitjelma area was visited by the author in 1970 and 1972, whilst working for A/S Sulitjelma Gruber. In 1970, working as field assistant to S. Kollung an area from Lomivatn to

Balvatn, and westward to Kragelva was mapped in detail. In 1972 I mapped in detail an area north of Kragelva to Knallerdalen, and south from Balvatn to Salefjell summit (Fig. 1, locality map).

A regional stratigraphy had been suggested by Nicolson and Rutland (1969) and formed the basis for the work. Much discussion had centred around the "Sulitjelma Nappes Hypothesis" presented by Kautsky in 1953, and various authors had since considered that the likelihood of nappes in the Sulitjelma region was low. Work in 1972 suggested that Kautsky's hypothesis had some justification andshould be accepted.

The regional geology is figured in Fig. 3, using the revised stratigraphy of this paper. The lack of availability of Norwegian maps means that the map is drawn from memory; the main divisions are placed accurately enough for future workers to follow up readily.

The region shows a basin and dome structure, attributed to interference of two fold axial trends. Sulitjelma itself lies in the core of an E-W trending antiform, with the Baldoive Basin immediately south, and to the north in the cliff above the town a tectonically disturbed zone between upper units of kyanite-staurolite schists and lower units of the Furulund garnet zone pelitic schists. This contact persists north of Lomivatn eastward into Sweden.

At the east end of Lomivatn, the conformable contact between the Furulund and underlying Muorki-Sjønsta schists can be seen. The Muorki-Sjønsta units are coarsely foliated green schists, whilst the Furulund at Lairotoppen although of green-schist grade, carries recognisable sedimentary beds with crinoid ossicles, bryozoan and coral fragments in one limestone horizon.

The Muorki-Sjønsta/Furulund contact swings southwest and then south to Balvatn. Grade of metamorphism increases westward in these units till garnet-zone is encountered just west of Kjelvatn in the Furulund pelites. South of Balvatn the Furulund group pelites are overlain by the Skaiti Group (Kollung, 1974) which can be divided on lithological grounds into two units, the Upper and Lower. These units show kyanite-staurolite-garnet assemblages; the Furulund solely garnet zone assemblages.

The lower part of the Skaiti Group is cut out at Skaitibukta, and the upper units rest on the Furulund Group with a tectonic disconformity. This contact can be traced eastward to halfway up the cliff of Storfjell I.

Due north of Storfjell I, in the region of Basshaugen an erosional window from the top of the Furulund to the Basement is found. This window is divided into the southern Kragelva window and the northern Knallerdalen window. Within the Kragelva window three units can be distinguished below the Muorki-Sjønsta Group; the Pieske Marble, the Lower Mica Schist, and the Basement Gneiss. In the northern Knallerdalen window the succession below the Muorki-Sjønsta is as follow: Pieske Marble, a grey-green garnet-two mica chlorite schist, a sparagmite of sometimes gneissose appearance, the Lower Mica Schist, and possibly Basement Gneiss in the region of Lake 416 m (not seen by author).

In the north part of the Knallerdalen window, the Furulund has a thrust relationship to units of the Muorki-Sjønsta group which is here considerably thinned and may itself be thrust over the Pieske Marble. North of the Knallerdalen window outcrops the southern end of the Baldoive Basin, the units of which develop kyanite.

Stratigraphy

The stratigraphy of Nicolson and Rutland (1969) provides a basis for discussion, and is outlined below

Fauske Marble Group
Sulitjelma Schist sequence and Sulitjelma Gabbro
Amphibolites
Furulund Group
Sjønsta Group
Pieske Marble
Juron Quartzite
Basement Gneiss

The Fauske Marble Group was not seen by the author and will take no part in the discussion; nor will the Sulitjelma Gabbro.

The Sulitjelma Schist sequence carries a lower group of schists (the Laphelleren schists) bearing kyanite (Badkar, pers. comm.) in discrete bands and also staurolite. Below the Sulitjelma schists an amphibolite-bearing tectonically disturbed zone is seen. A leucocratic gneiss may be found at several levels near this contact. Wilson (1968), and Mason (1966) have described a marble-psammite group above the kyanite-bearing (Laphelleren) schists, and Wilson (1968) also describes a "Rusty Psammite" and a "Duoldagop Banded Group ... extremely regularly banded grey rocks with a pelitic mineralogy".above the Laphelleren schists.

The units of the Baldoive Basin have been described as a lower rusty unit overlain by calcareous banded schists, both overlying a leucocratic gneiss zone and the Furulund pelite. The author has not seen these units.

At Skaitibukta at the southern end of Balvatn, Furulund pelites have been seen to be overlain by rusty weathering staurolite-garnet schists and amphibolites. The presence of kyanite is uncertain. These units form a wedge thickening eastward below Jouska, but thinning westward to be cut out a

Fig. 4 Furulund Group Stratigraphy

		North Lomivatn to Balvatn	South	East Balvatn to Basshaugen	West
GREATER FURULUND	UPPER	Brown fine-grained two-mica pelitic schist; also thin graphitic and phyllitic interbeds. Black garnets developed near Tjerfeldet. Fine-grained amphibolite bodies developed near Tjerfeldet.			
	MIDDLE	Variable, generally phyllitic schists showing biotite porphyroblasts. Meta-gabbro of variable grain size is found in the form of large boudins.		Grey-brown, generally phyllitic schists often carrying biotite porphyroblasts	
	LOWER	Calcareous pelitic schist with some phyllitic bands. Some meta-gabbro boudins may be developed. At Lairotoppen a thick graphitic schist is developed, and the calcareous pelitic schist appears to be absent.		Calcareous pelitic schist with meta-gabbro bodies and fine amphibolites.	
INFERIOR FURULUND		Acid effusives, amphibolites, with a sedimentary sequence of calc-pelites limestones (near Lomivatn), metaquartzites and metaconglomerates near the base.			

few hundred yards west of Skaitibukta by an orange-rusty weathering sequence of grey mica schist carrying kyanite pseudomorphs only, interbanded with grey-rusty units carrying biotite, garnet-chlorite, staurolite-garnet and possibly kyanite, in discrete bands that are tightly folded. Limestone lenses and an amphibolite are also found low down in this unit. Structurally above these rusty schists and separated by an intermittent thin, black quartzite is a calcareous banded pelite, developing diopside and green amphibole where tightly folded, and also near the lower contact with the rusty schists. Trondhjemite lenses are found at and below this contact.

The rusty kyanite schists and the "Diopside Rock" (Kollung, 1970) can be seen to overlie the staurolite-garnet schists and amphibolites in the region of Jouska; the staurolite-garnet schists and amphibolites form the lower, the rusty kyanite schists and Diopside Rock form the upper Skaiti Groups (Kollung, 1971).

The rusty kyanite schists immediately overlie the Furulund garnet-pelites west of Skaitibukta; further west the Diopside Rock, lying in a north facing syncline within the rusty kyanite schists of the north face of Salefjell, are found to overlie the Furulund. Between the southwestern corner of Balvatn and Tjerfeldet the rusty kyanite schists again overlie the Furulund.

The contact of the Furulund and Upper Skaiti Group is extremely tectonically disrupted and may best best described as a melange zone of the various units, including at times a leucocratic gneiss and an amphibolite, and is at least 20 to 30 feet thick.

It is proposed that this tectonically disturbed zone be equivalent to the tectonised zone in the cliff above Sulitjelma town, and that the Sulitjelma schists, Baldoive schist and Skaiti Group schists be equivalent. A correlation is set up below; the Diopside Rock, Baldoive calcareous pelites, and Sulitjelma marble-psammite group are taken provisionally as equivalent. The rusty kyanite schists of the Upper Skaiti would then be represented by the rusty schists of Baldoive and the rusty kyanite-bearing Laphelleren schist of Sulitjelma. In Baldoive and at Sulitjelma the Lower Skaiti Group is missing. It is also proposed that the name Skaiti Group be used as a regional term to include the Upper and Lower Units of the Skaiti Group, the Baldoive schists and the Sulitjelma schists (see Fig. 3).

Fig. 3 Skaiti Group Correlation

	Skaitibukta	Baldoive	Sulitjelma
UPPER	East West Diopside Rock (calcareous banded pelite) Thin lensoid quartzite Rusty Schists + Trondhjemites	Calcareous pebbles Rusty schists	Duoldagop banded Group Rusty schists Marble-psammite Group. Laphelleren.
LOWER	Rusty kyanite-staurolite schists + amphiboles		Rusty kyanite schists Leucocratic gneisses
	Furulund Group	Furulund Group	Furulund Group

The Furulund Group is seen continuously from Sulitjelma to Skaitibukta, and falls lithologically into two groups, a lower metavolcanic sequence, (The Inferior Furulund) and an upper sequence of grey pelites (The Greater Furulund). The contact of the Greater Furulund with the Skaiti Group has been discussed.

The Greater Furulund units are pelitic to semipelitic schists carrying two micas, garnet and poorly aligned dark amphibole, with metamorphic mineral grade decreasing eastward. Rusty graphitic schists are common; the lower units develop calcareous horizons and may also include large boudins of gabbro textured amphibolite with green amphibole set in a grey-green feldspathic background. Three lithostratigraphic groups with local variation define the Greater Furulund; these are outlined in Fig. 4.

The Inferior Furulund underlies the Greater Furulund conformably, the outcrop thickening and then thinning from Muorkivatn to Balvatn, and increasing in mineralogical metamorphic grade westward. In the Lairotoppen region, a low grade metamorphic sequence of thin limestones and phyllites is found close to the

boundary with the underlying Muorki-Sjønsta. In some limestones, corals, bryozoan and crinoid fragments of Ordovician (Vogt, 1929) are to be found. Greenschists and keratophyric rocks are also seen.

At the same level, in the Calmebelle region, a sequence of metamorphosed acid extrusives (Kollung, 1970) is developed, and a zone of limestones, quartzites and phyllites are seen before passage into the Muorki-Sjønsta quartz-chlorite schist.

Towards Balvatn, the meta-volcanics thin and lose the sedimentary units. These are next seen west of Balvatn, flanking the northern and eastern sides of the Basshaugen window. Thin keratophyres and amphibolites have been encountered further south around Tjerfeldet. Calcareous schists and metaconglomerates carrying acid and basic pebbles are to be seen locally in the Inferior Furulund of the Basshaugen window; these are isoclinally folded with amphibolites, a very white quartzofeldspathic schist (meta-rhyolite?) and meta-extrusives of probably andesitic bulk chemistry. The outcrop pattern is dominated by F_2 and F_3 axial directions creating interference folds on a scale of several hundred metres.

The contact with the underlying Muorki-Sjønsta Group is everywhere conformable, save to the north of the Basshaugen window where units of the Inferior Furulund are thrust onto the garnet two-mica schists of the Muorki-Sjønsta.

The Muorki-Sjønsta Group is so named as both names have been used individually to denote these schists to the west at Sjønsta, and to the east at Muorkivatn. From Muorkivatn to Balvatn the Muorki-Sjønsta Group is first recognised by a thick development of a coarsely foliated quartz-chlorite schist, with interbedded graphite schists, rare metaquartzite,

and metaconglomerate lenses.

Between Calatesjaure and Dorrovatn occur magnetite bearing greenschists (metavolcanic) and a "bluestone", sometimes magnetitiferous. The "bluestone" is fine-grained, schistose, massive in hand with development of chlorite-rich laminae bearing dark green amphibole. Immediately west of Calatesjaure an unnamed peak split by a gully shows flattened pillow-shaped structures about 18 inches long axis in the north wall of the gully. Just east of this belt a few ultrabasic pods were found, only several feet in diameter. A further investigation might be worthwhile.

These metavolcanic units lens out immediately south of Dorrovatn; their continuation north of Calatesjaure was not followed.by the author.

The Muorki-Sjønsta west of Balvatn lies in the Basshaugen window, and has increased in metamorphic grade from greenschist facies to a garnet two-mica schist. Chlorite is seen to coexist with garnet in some localities.

The Muorki-Sjønsta units of the Basshaugen window fall into three major divisions; Fig. 5 shows these, although the boundaries are not well defined in the field. The table shows the dominance of one or several rock types in their structural succession.

The Pieske Marble follows the Muorki-Sjønsta apparently conformably, the approach to the boundary being marked by the occurrence of amphibolites and graphite schists within the lower units of the Muorki-Sjønsta. This occurs right around the Knallerdalen window, and round the northern, eastern

Fig. 5 Generalised Muorki-Sjønsta Succession

	Lairotoppen Balvatn	Basshaugen window
UPPER	Chlorite quartz schist, with interbedded metaconglomerates, quartzite and graphite schists. Greenschists and "blue stone" just within the Muorki-Sjønsta upper boundary.	Grey garnet two-mica chlorite schist - sometimes garnet-poor, sometimes chlorite-poor. A chlorite-epidote-schist was seen in this close to the Furulund boundary in the eastern part of the window
MIDDLE		Brown schistose quartzites, with garnet two-mica schist interbeds. The quartzitic units may sometimes be feldspathic and sometimes calcareous. Graphitic schists also are found
LOWER		Grey to green chlorite two-mica schist. Coarse amphibole-bearing calcareous amphibolites, and fine-grained amphibolites are associated with graphite schists spatially in the lower parts of this subdivision.

and southern margins of the Kragelva window. The Pieske Marble was not visited in the eastern part of the region.

The Pieske Marble is a coarsely crystalline carbonate rock with two-mica quartz carbonate schists occurring high in the unit, and quartzites with coarse mica-schists occurring near the base. It is thought that the upper two-mica quartz carbonate schists represent an original sedimentary transition to the Muorki-Sjønsta schists, and that the quartzites represent a transitional facies to a lower group that may not be seen as a result of tectonism.

In the Kragelva window, the Pieske Marble rests apparently conformably on a rusty, coarsely-foliated garnetiferous two-mmica schist which is of several hundred feet thickness and of considerable uniformity throughout. This is the Lower Mica Schist of Kollung (1970), and it in turn rests on a six-inch thick quartzite overlying a leucocratic biotite-bearing gneiss that is accepted as "basement".

The Knallerdalen window has a different succession. Immediately west of Basshaugen a grey-green garnet two-mica chlorite schist is found to underlie the Piekse Marble. This unit can be traced north along the cliff face to where it can be seen to thin, before disappearing, to a greened rock of mylonitic appearance high in the southern wall of the Knallerdalen canyon. Near this point, inclusions in garnets show that the schistosity has been rotated about the garnet, and is taken as evidence of flattening. In the cliff just south of the Knallerdalen canyon entrance the quartz-rich bands of this schist can be seen to swing from a low angle dip west to vertical beds striking east-west. It is proposed that this schist is an infolded slice of the lowest Muorki-Sjønsta unit, and is a west-facing synform, the lower limb of which

is almost sheared out as evinced by the extremely thin (two to three feet thick) to missing underlying Pieske Marble.

Between the Lower Mica Schist and the base of the Pieske Marble a feldspathic quartzite of about 300 feet thickness is found in the northern cliff of Knallerdalen. This unit can be followed in the cliff south to the Knallerdalen canyon, and then in the cliff southward to below Basshaugen where it is about fifteen feet thick. It dies out completely further south and is not seen in the Kragelva window. This unit has been named the Sparagmite-Gneiss on account of the K-feldspar content and its gneissic appearance in the cliff just north of Basshaugen.

The Lower Mica Schist, a rusty weathering coarse garnet (up to 1 inch diameter) ?-mica quartz coarsely foliated schist underlies the Sparagmite-Gneiss in the Knallerdalen window and the Pieske Marble in the Kragelva window. Neither chlorite, nor amphibolite, nor graphite schists were seen in this unit; of note however, is the occurrence of several bands of a quartzose mica-schist showing a sparse development of green epidote and which weathered golden rusty. The name Lower Mica Schist (Kollung, 1971) is preferred to that of Needham (1967) who described this unit further west under the name "Liggefjell Complex". The confusion surrounding his lithostratigraphy and the Lower Mica Schist's lack of complexity render Kollung's nomenclature more appropriate.

Above the Lower Mica Schist, the Sparagmite-Gneiss thins and disappears southwards; it is not seen in the Kragelva window. This, and the shearing out of the lower limb of the Muorki-

Sjønsta synform in the Pieske Marble, is taken as evidence for the presence of a tectonic discontinuity below the Pieske Marble. No units were seen below the Lower Mica Schist in the Knallerdalen window, although it is possible that basement gneiss may be found in the region of Lake 416. In the Kragelva window, a 6 inch dark quartzite separated the Lower Mica Schist from a leucocratic gneiss with orientated biotite. This gneiss was visited only briefly in 1970, and was taken as "Basement".

The regional lithostratigraphy is summarised in Fig. 7.

Structure and metamorphism

Although this paper is concerned primarily with lithostratigraphic relations, some comments on the structural history of the region may be pertinent.

Four phases of deformation can be determined in the units below the Skaiti Group, designated F_1 to F_4 as follows:

F_1. Isoclinal folds from small to large scale with development of axial plane schistosity, axes having variable plunge and dip owing to refolding. These F_1 folds are best developed in the Knallerdalen window; the Muorki-Sjønsta synform is thought to be one such fold, and if so the rotation of schistosity about the garnets and their inclusions seen in the Muorki-Sjønsta outcrop in the Knallerdalen Canyon would suggest a flattening episode post-dating development of axial plane schistosity and the F_1 isoclinal episode.

F_2 and F_3. Open folds on a regional scale; on a small scale folds of various styles are developed ; chevron folds with development of a new schistosity in the southwest corner of Balvatn, isoclinal folds refolding axial plane schistosity in the Basshaugen window, and generally throughout, open similar folds that fold schistosity. Time relations between F_2 and F_3 are not known, although two axial trends are evident, ENE/WSW and N/S. As the F_2 and F_3 folds affect all lithostratigraphic contacts, formation of the tectonic discontinuities seen below the Skaiti and Pieske Groups must pre-date F_2 and F_3.

F_4. two to three inch wide quartz-feldspar filled tension gashes dipping between 40° to 80° towards 110° to130° are developed regionally. These may redirect schistosity parallel to the gashes close to their margins. Growth of garnet is associated spatially with the gashes, and in the Muorki-Sjønsta of the Basshaugen window, well formed 2 inch kyanite blades were seen in one gash. Well formed chlorite pseudomorphs of garnet are also seen near the gashes.

In the units of the Skaiti Group, Stoakes (1969) recognised four deformations; his D_2 was not recognized in the field, three phases being recognised by the author:

F_1 (Stoakes D). Isoclinal, with development of axial plane schistosity. The north-facing synform on the north face of Salefjell is attributed to this phase, as it has been refolded by F_2 and F_3.

F_2 and F_3. Large-scale open, small-scale isoclinal to similar folds of symmetrical to asymmetrical style, the axes trending NW/SE and N/S.

No F_4 tension gash phase is recognised.

No petrological studies were carried out. The present field work confirmed the previously described general increase in metamorphic grade of the units below the Skaiti Group, from greenschist facies in the east to a garnet-biotite-chlorite assemblage in the west. The only kyanite occurred in the F_4 tension gash described above.

The Skaiti Group throughout shows kyanite development. Schists within the rusty schists of the Skaiti Group at Staitibukta show separate development of tight to isoclinally folded garnet-chlorite-bearing, biotite-bearing, and staurolite-bearing bands sometimes only one or two feet wide. The finely fissile rusty schists themselves show quartz-muscovite pseudomorphs of kyanite. Diopside, green amphibole garnet and biotite coexist within the calcareous banded rock of the Upper Skaiti; within the lower Skaiti units staurolite, garnet and possibly kyanite coexist.

Conclusions

1. A regional lithostratigraphy for the Sulitjelma region has been derived, and is illustrated in Fig. 7.

2. Major tectonic discontinuities exist at two levels. The higher, between the Skaiti and Furulund Groups, may be correlatable with the base of the Gasak, Rodingsfjall and Beiarn Nappes. (Nicolson and Rutland, 1965; Kautsky, 1953) The lower, at the base of the Pieske Marble cannot yet be correlated with similar structures outside the region.

3. Three folding deformations are observable; an isoclinal early phase (F_1) predating the tectonic discontinuities, and two post-discontinuity phases (F_2 and F_3) the interference of which is responsible for regional structural pattern in the Sulitjelma-Balvatn region.

4. Brittle dislocation is evident in the melange at the level of the Skaiti discontinuity; no such evidence of brittle dislocation is seen at the level of the Pieske discontinuity. The discontinuities cut across lithostratigraphic boundaries and it is therefore unlikely that the proposed nappe(s) are conjunctive (Nicolson and Rutland, 1965) in this region.

Bibliography

Kautsky, (1953) Der Geologisches Bau des Sulitjelma - Salojauregebietes in den Norskandinavischen Kaledoniden. Sver.geol.Unders.Ser.C. No. 528, Vol. 46(4).

Nicolson and Rutland (1965) Caledonides of part of Nordland QJGS Vol. 121, 73-103.

Nicolson and Rutland (1969) in Årbok Norges Geologiske Undersøkelse.

Wilson, H.R. Ph.D Thesis (Oxford).

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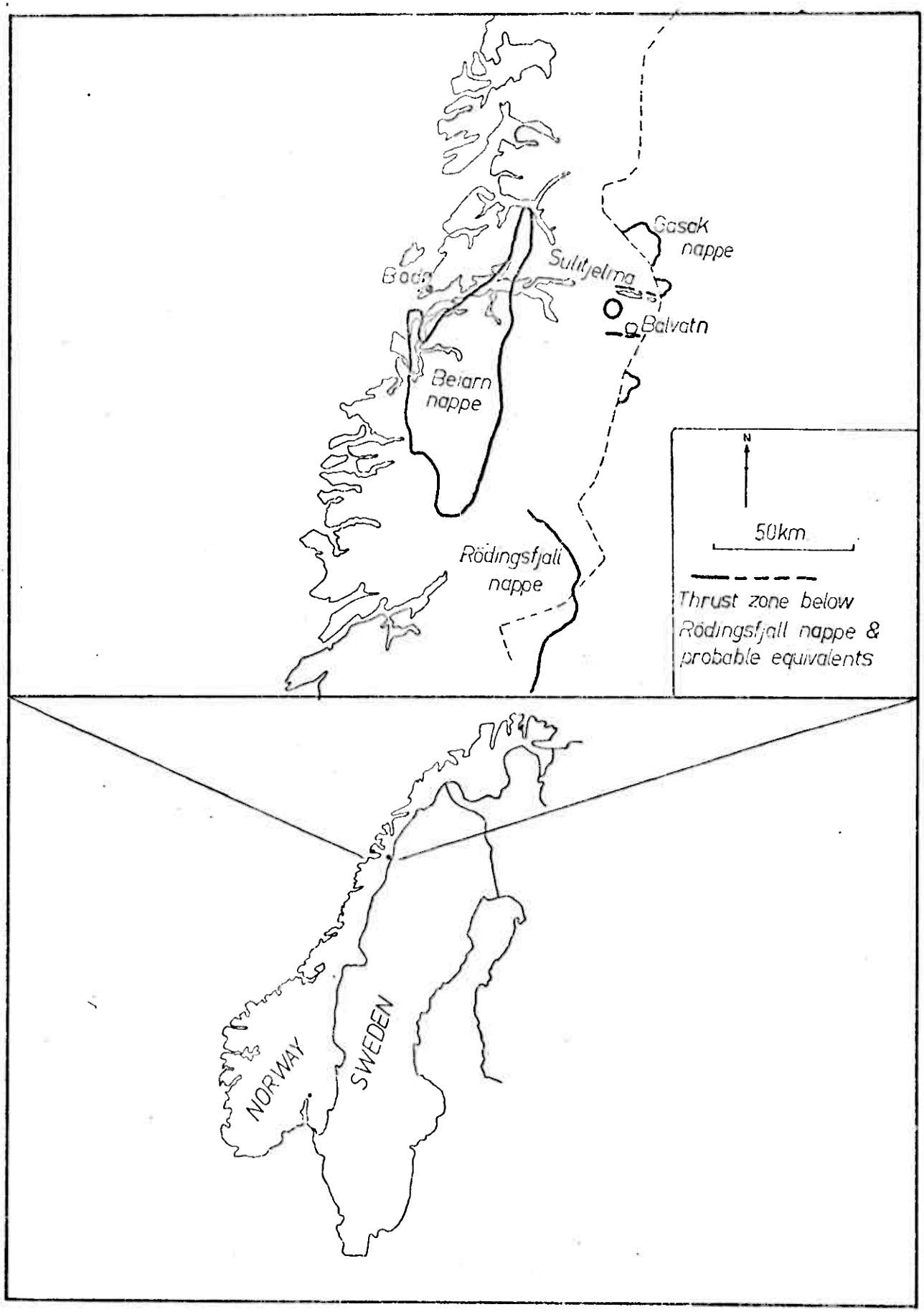
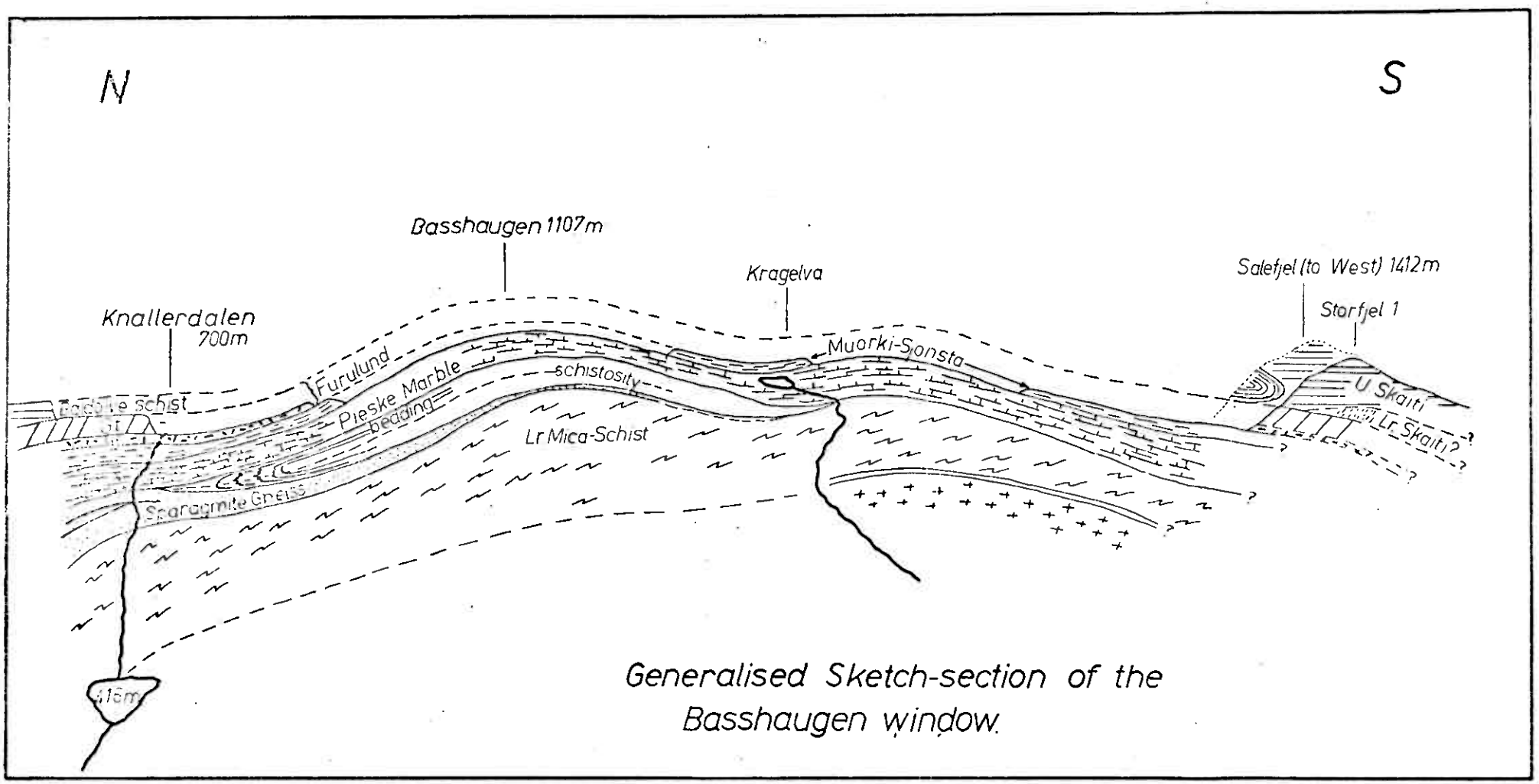

Gasak
nappe
Sulitjelma
Bodø
Balvatn
Beiarn
nappe
Rödingsfjäll
nappe
N
50km
Thrust zone below
Rödingsfjäll nappe &
probable equivalents
NORWAY
SWEDEN

Fig 1

Fig 6



Generalised Sketch-section of the Basshaugen window.

Fig. 7 Summary of lithostratigraphy of Sulitjelma - Balvatn Region

		Sulitjelma	Lomitvan-Balvatn	Skaitibukta & S.W. Balvatn	Basshaugen Window: Kragelva	Basshaugen Window: Knallerdalen	Baldoive-Sulitjelma
Fauske Marble		Not seen	Absent				
Skaiti	Upper	Duoldagop banded Group. Rusty psammite Marble Psammite Group Laphelleren kyanite schist	Absent	Banded calcareous pelites. Quartzite Kyanite, and staurolite, garnet and garnet chlorite, and biotite schists, limestones and amphibolite	Absent	Absent	Calcareous pelites Rusty kyanite schists
	Lower	Tectonic boundary Absent?	Absent	Rusty staurolite schist & amphibolite	Absent	Absent	Tectonic boundary? Absent?
Furulund	Greater	Grey pelites and calcareous pelites with graphite schists and amphibolite boudins, developed throughout region					
	Inferior	Not seen	Acid & basic effusives with limestones & quartzites near base. Limestones & Ordivician fossil fragments at Lairotoppen		Not well exposed. Keratophyres and greenschists seen	Meta-extrusives acid and basic in nature; calcareous schists near base. Occasional metaconglomerate	Not Seen
Muorki-Sjønsta	Upper		Quartz-chlorite schists with basic effusives near Furulund border. Graphite schists also		Grey garnet and 2 mica schists of a greenschist; possibly a basic metavolcanic	Note local development	
	Middle				Brown schistose quartzites with garnet 2-mica schist interbeds; quartzites are feldspathic. Graphite schists.		
	Lower			Not seen	Grey to green chlorite 2-mica schists. Coarse amphibole-bearing calcareous and fine-grained amphibolites spatially associated with graphite schists.		
Pieske Marble			Not seen		Coarsely crystalline limestone, with 2 mica quartz carbonate schists in upper part, micaceous quartzites in lower		
Sparagmite-Gneiss					Absent	qtz feldspar metaquartzite of gneissose texture	
Lower Mica Schist					Rusty orange coarse garnet 2 mica quartz schist. No amphibolites. No graphite schists.		
Turon Quartzite					6 inch dark quartzite		
Basement					leucocratic gneiss	Not seen; inferred	