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UNIVERSITY OF LEICESTER



ARCTIC NORWAY EXPEDITION 1969

LYNGEN PENINSULA
AND
TROMSØ



(*3) : 91(08)
[1969 Hayman]



UNIVERSITY OF LEICESTER

ARCTIC NORWAY EXPEDITION 1969

REPORT

No. 1

Organisation and Administration

PATRONS

The Lord Bishop of Leicester.

T. A. F. Noble, M.B.E., M.A., Vice-Chancellor of the
University of Leicester.

Professor N. Pye, Professor of Geography,
University of Leicester.

Professor W. Kirk, Professor of Geography, Queen's
University, Belfast.

Professor H. E. Street, Chairman of the School of Biology,
University of Leicester.

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INTRODUCTION

The Expedition was the first of its type to have been organised by students of the University of Leicester. It was conceived in the October of 1967 by Christopher Hayman and Brian Whalley. After a number of possible locations had been studied, it was decided that an expedition would visit the Lyngen and Tromsø area of North Norway during the summer vacation of 1969.

After consultation with the Norwegian Glaciologists, Olav Liestøl and Gunnar Østrem, the Strupbreen area of the northern part of the Lyngen peninsula was chosen as our area for investigation. The Strup Glacier offered a wealth of glaciological and geomorphological research opportunities, while the area to the west of the glacier provided a variety of habitats of interest to zoologists and botanists. The largest town of North Norway, Tromsø, about fifty miles to the west of the Lyngen Peninsula, was studied from several aspects by the human and economic geographers.

During the summer of 1968, a small recce party visited the peninsula to obtain a greater knowledge of the area.

Many of the problems which confronted us during the two years of organisation will be mentioned in this report, and we hope that some of our solutions will be of use to other expeditions.

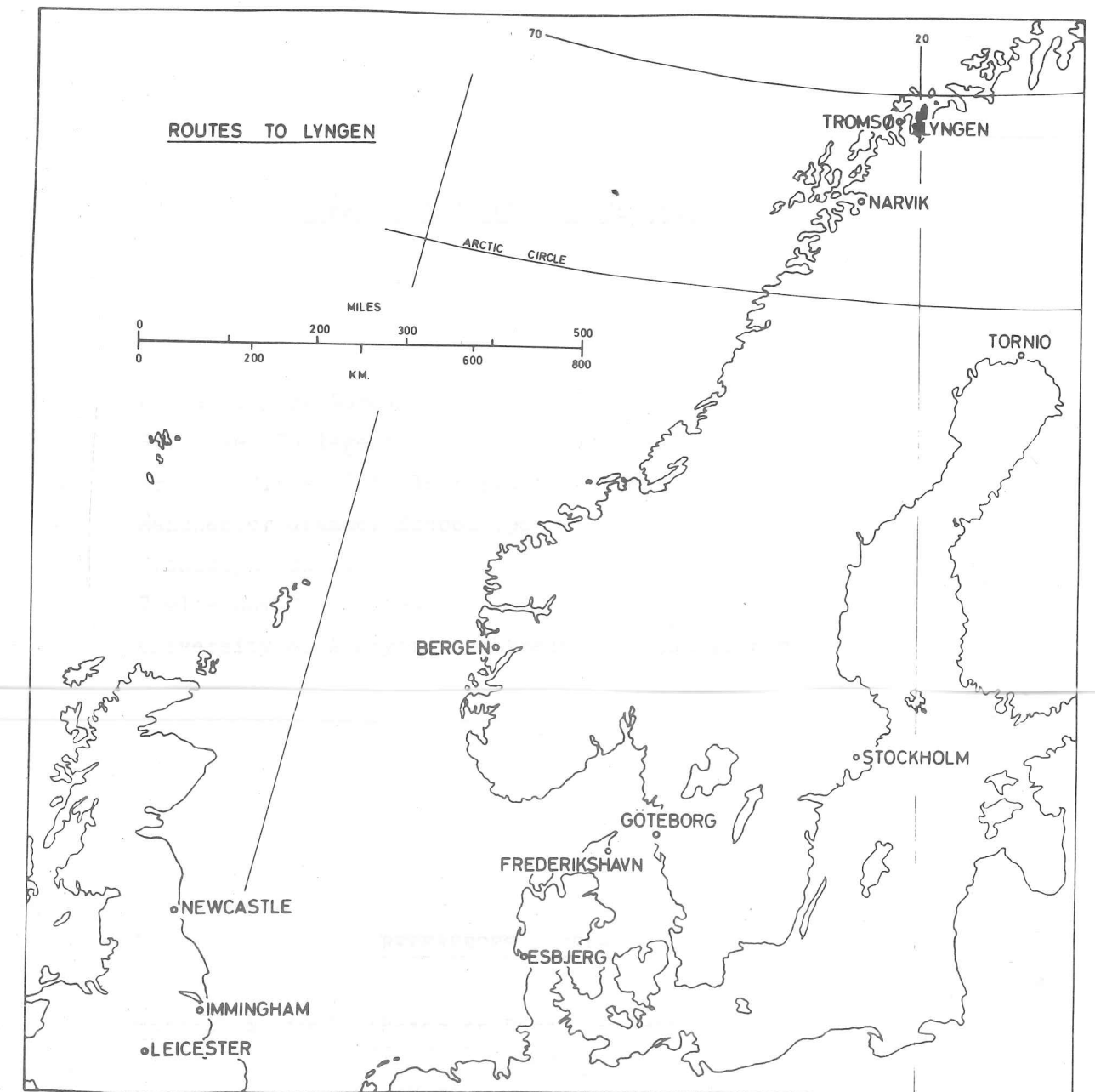
Christopher Hayman - Leader

Brian Whalley - Deputy Leader

MEMBERS

Christopher Hayman.	Third-year Geographer.	Leader.
Brian Whalley.	Third-year Geographyer.	Deputy Leader.
Glyn Collis.	Third-year Zoologist.	
Andrew Eavis.	Second-year Engineer.	
Alan Fowler.	Third-year Chemist.	
Robert Griffiths.	Third-year Engineer (University of Swansea).	
Ian Hepworth.	Third-year Zoologist.	
Allan Metcalfe.	Third-year Geographer.	
Peter Morgan.	Second-year Geographer.	
Nich Orson.	Dip.Ed. Student at Leicester (Leicester Zoology graduate).	
Peter Thompson.	Third-year Zoologist.	
John Douglas.	Second-year Zoologist.	
Don Goddard.	Second-year Zoologist.	
Alison Gibbins.	Third-year Zoologist.	
Caroline Young.	Third-year Zoologist.	
James Ormerod.	Second-year Zoologist.	
Tim Howick-Smith.	Second-year Economist.	
John Whittle.	Second-year Geographer.	
Karin Usher.	Third-year Geographer.	

Dennis Thurston, Jean Fallows, Anne Ward and Malcolm Cawley withdrew during the year.





OTHER EXPEDITIONS TO THE AREA

University of Durham 1956 and 1957
 St. Lukes College to the Steindalen Valley 1965
 British Girls' Schools Expedition 1966
 Manchester Grammar School 1969
 Cranleigh School 1969
 Cheltenham School 1969
 University of Aberystwyth Expedition 1969 (Lyngsdalen)

REFERENCES - GENERAL

Watson, A. 1957 'Notes on Birds in Arctic Norway'
 STERNA 2. 65-99.
 Negri, N. C. 1956 'Valley of Shadows'.

THE HISTORY OF THE EXPEDITION

The Expedition was conceived in the October of 1967 with the ultimate aim of establishing an Expedition Society at the University. Several expeditions from the Biology and Geology Departments had been organised by members of the staff in the past. The expedition was to be the first organised by students. Throughout the planning of the venture, the main aim - to give an opportunity for people to carry out original research in several aspects of Natural Science - has always been to the forefront.

Christopher Hayman and Brian Whalley were the main instigators of the Expedition and began to investigate the possibilities of visiting either Greenland, Baffin Land, Iceland or North Norway, originally with a party of eight, to carry out glaciological research. In the January of 1968 it was decided to visit the Lyngen peninsula, in Arctic Norway, and to concentrate studies on the ice-dammed lake and Strup glacier. Interest in the University grew, and many people from various departments became involved in the project. The party of twenty-one was chosen in June 1968, and although three of the original party did not come, twenty members took part. Since the beginning, much work had to be carried out to discover how to organise an expedition to achieve a good chance of success. Members, and many other people in and out of the University, spent much of their time investigating ideas, writing letters, and learning about the area as well as giving us much encouragement.

A small party was arranged to visit the area in the summer of 1968 as a recce, but as many of the proposed members had degree dissertations to complete, the number was only two - Christopher Hayman and Glyn Collis. Both of them spent over two weeks in the Tromsø and Lyngen peninsula area collecting much-needed data and making contact with local concerns and people. In future, much more use of a recce could be made, taking about six people to the area.

The Expedition applied for recognition by the University in October 1968, and was granted permission to call itself the 'University of Leicester Arctic Norway Expedition 1969'. The University, as well as the Students' Union, generously supported the Expedition. A Grand Draw was arranged, and with the help of many friends in collecting Green Shield Stamps and by small donations a large number of prizes was obtained. In all, over £76 was raised. A leaflet was published giving full details of the proposed projects, history, and members. The news of a very generous donation by an anonymous Trust, and the

purchase of the Land Rover finally decided the Expedition would definitely visit the Arctic in the following summer.

Many hours were spent in the organisation of the Expedition, and as June 1969 drew nearer, the eighteen months of planning began to pay as most aspects appeared under control. The room F64 in the Department of Geography became the headquarters, and the Expedition would like to thank Professor N. Pye and the Department for all their support and encouragement shown to them (see later).

Two weeks before the expedition was due to leave, all the food and scientific equipment had to be packed, and many last arrangements made, while some of the members were still taking examinations. The few 'free' members and many invaluable helpers worked 24 hours to pack, and to all these people the Expedition is indebted - Christopher Hayman, Brian Whalley, Alan Fowler, Allan Metcalfe, Karin Usher, Margaret Portsmore, Tim Howick-Smith, Andy Eavis and the other members who spent a few hours between revising and taking exams.

Jim Ormerod left on Thursday, June 19th, for the Lyngen peninsula. The crates had been transported by National Carriers Ltd., on the previous Monday, and a further smaller packing case and a dozen or so five-gallon paint tins left on Sunday in the Land Rover bound for Newcastle.

However, the Land Rover failed to arrive in Newcastle until the following Thursday, and ended up in Sheffield! South of the Woodall Service Centre on the M.1 a severe knocking noise began under the bonnet of the Land Rover. Fortunately, a Land Rover recovery vehicle was nearby and the driver/mechanic diagnosed it as possibly the 'big ends' being worn. The Land Rover with ten members was scheduled to leave Newcastle on the following Tuesday. After several unsuccessful attempts to contact the Expedition's engineer, Andy Eavis, in Leicester, the Land Rover was towed into a Sheffield garage.

First 'big end' and then main bearing failure was diagnosed though the Expedition mechanic believed strongly that it was a faulty injector. This was a matter of contention. If our mechanic was right, the Expedition would have saved itself a hundred pounds.

However, a van was hired on the Monday morning, while John Whittle and Don Goddard travelled to Newcastle by train to catch the 'Leda' in the afternoon. Christopher Hayman and Karin Usher managed to leave

Sheffield in the van, after that had broken down for an hour or so, and drove to the Tyne Commission Quay at Newcastle to put the rest of the equipment on board ship. They arrived about half an hour before the ship departed, but were unable to contact any of the members on board. Christopher returned to Sheffield that night, and waited for Andy Eavis and Tim Howick-Smith to arrive - seven o'clock the next morning!

The Geography Department were kind enough to lend us their van, and the remaining eight members were brought to Newcastle by Roger Richards and Terry Garfield. Christopher also arrived in Newcastle by train, and with the exception of Brian Whalley, saw the rest leave for Esbjerg. Alan Fowler and Peter Thomson were to continue to Tromsø as planned, and the others to camp in Esbjerg.

Meanwhile, Andy Eavis and Tim Howick-Smith had driven to Manchester to collect a new crankshaft as the only one available in Sheffield was wrongly machined. On the Wednesday, the engine was re-assembled, and started. But, the noise continued, and still our mechanic persisted that it was a faulty injector. Eventually, he persuaded the garage mechanic to change the No.4 injector, and the engine went, without trouble, for the next 10,000 miles in Norway.

The Land Rover, with Brian Whalley, Andy Eavis and Christopher Hayman left on the Thursday, and met the others in Esbjerg the following day. The Land Rover was loaded, and left for Frederikshaven just after two o'clock. They crossed the Kattegat to Goteborg during the night arriving at 2 a.m. They travelled to Stockholm, and then followed the east coast, only stopping to eat, and into Finland. After crossing the Arctic Circle, they continued north through Finland, and crossed into North Norway to arrive at the Lyngenfjord exactly forty-eight hours after leaving Goteborg. The midnight sun welcomed them.

The next few days were spent bringing the remainder of the equipment from Tromsø to Koppangen and J. C. camp in the Land Rover. As the sun never disappeared, very little sleep was obtained during the first week. A major problem was the transport of equipment and personal belongings to Strup Bay, and it soon became evident that the small rubber dinghy we had was not really adequate. Bob Munday, who was carrying out a geological survey of the peninsula for his Ph.D. at Newcastle University, had an inshore rescue dinghy and took three loads to the bay for us - some three miles. Finally, we hired a local

fishing boat which took the rest of the members and equipment round to Strup Bay. In fact, this latter move should have been done at the start. The small camp established at Koppangen was broken. The village of Koppangen had kindly loaned us a boathouse, where we stored some of our crates, equipment and food reserves.

J.C. camp was established, but it took much longer than we had anticipated, which tended to delay the scientific work by a few days. It is important to have one member solely responsible for the organisation and daily running of a camp of this size. Caroline Young, Alison Gibbins and Bob Griffiths arrived a week later, while Karin Usher and Tim Howick-Smith arrived in late July. Reports of the various camps are found elsewhere.

The Expedition spent from June 29th to September 2nd in the field. The return was less complex, but the weather did not help the removal of all the equipment back to Tromsø. However, by a non-stop three day purge this was completed in good time. The main party arrived back in England on Saturday, September 6th.

The members of the Expedition wish to express their gratitude to a tremendous number of people who gave them much encouragement, assistance and time during the two years of the Expedition. It is impossible to mention everyone, but a list of many of these appears below.

Vice-Chancellor of the University, T. A. F. Noble, Professor N. Pye, Professor W. Kirk, Dr. J. Rice, other members of the staff of the Geography Department, Professor H. E. Street, Professor Moon, Professor W. Sluckin, Dr. Halliday, Dr. Linn, Lord Bishop of Leicester, Students' Union, Terry Garfield, David Orme, Roger Richards and other technicians of the Geography Department, Jean Smith, Members' parents, Radio Leicester, the 'Brown Men' and very many students of the University.

Other lists appear in following sections.

TRAVEL

Most routes between Britain and Scandinavia were investigated with regard to price, convenience and time. It soon became evident that the Expedition would require some form of transport in the area of study. After much consideration, a twelve seater Diesel Land Rover was purchased in December 1968 in favour of a lorry. Investigations were made about the cheapest route for sending the equipment and food packed in large crates. Most of the planning was carried out during the summer of 1968.

The Expedition was split into four groups.

1. Land Rover Party

On investigation it was found that D.F.D.S. (agents - Nielsen, Andersen and Co. Ltd., 2 King Street, Newcastle-upon-Tyne) offered a single passage from Newcastle to Esbjerg (Denmark) for about five pounds for a group of at least ten people and the transport of the Land Rover free. As it was planned for the Land Rover to carry only eight people, with some equipment, two of the group had to travel by train through Denmark, across on the ferry to Goteborg (Gothenburg), and by train to Narvik.

The Land Rover party travelled from Esbjerg to Frederikshaven (180 miles approximately - good roads with garages for both diesel and petrol open all night in the main towns) and took the ferry (same agents as for D.F.D.S.) to Gothenburg (about three and a half hours). From Gothenburg the party drove to Lyngen peninsula via Jonkoping, Norrkoping, Stockholm, Gavle, Harnosand, Umea, Skelleftea, Haparanda, Tornio, Muonio, Kilpisjarvi and Lyngseidet. The roads were very good all the way until the latter part of the road in Finland - where improvements were being made. Fuel was available all day south of Harnosand, but further north night garages were fewer (specially at the end of the season).

This route was chosen because it proved to be the most economical with free transport of the Land Rover on both sea journeys, and cost about eight pounds from Newcastle to Gothenburg. The good condition of the roads favoured the east coast route rather than travelling north through Norway (some of the ferries south of Narvik are very crowded,

and often long queues exist).

The cost of diesel varied from country to country. Petrol was about the same per gallon as in Britain, except in Sweden where it is more expensive.

Cost of Diesel per gallon approximately:

Denmark	1/9d
Sweden	5/-d
Finland	4/-d
Norway	2/4d

Much work was carried out on the Land Rover before we left to lessen the chance of breakdowns. It is very important for the vehicle to be in excellent condition, and to carry a good selection of spares (your local dealer may hire them on a sale/return basis). A roof-rack was attached to the vehicle - there are several different types on the market.

2. Route - Newcastle to Bergen to Tromsø

Investigations were made into the transport of our crates. The Expedition was fortunate to obtain free transit across the North Sea, and a reduction on the coastal steamer. Several members accompanied the crates both ways. The coastal trip (second-class) from Bergen to Tromsø lasted three and a half days. Bergen Line are the agents for the coastal steamers as well as for their North Sea crossing.

3. Route - Immingham - Gothenburg - Narvik - Tromsø / Lyngen

This was found to be the most economical route in cost and time. Members travelled from Immingham to Gothenburg (twenty-six hours) on one of the Tor Line ferries. A train was taken to Narvik (thirty hours) and a bus to either Tromsø or Lyngen (six hours). It was attempted to minimise the waiting time en route, and one party travelled via Stockholm (spent one day there) before travelling north to Narvik. However, usually the boat arrived in Gothenburg to allow train departure same day. Agents for Tor Line and the Swedish trains are E. H. Mundy and Co. Ltd., Travel Department, Sething House, Walsingham Lane, London.

4. Air route

Owing to the unexpected change in an examination date, one of our members whose project depended on arriving in the area as soon as possible, flew to Bardufoss (south of Lyngen). It is also possible to fly to Tromsø from London (cost single £60).

Equipment

The transport of the crates from Leicester to Newcastle was by National Carriers Ltd. Other means were investigated, but this was found to be the most economical and convenient. It is very important to allow plenty of time for the crates to travel, as on the return journey, the crates arrived from Newcastle ten days later than expected.

The Expedition would like to express its gratitude to the following for their assistance in travelling matters:

D.F.D.S. (Danish Shipping Lines) Group rates
and free transport of Land Rover.

Nielsen, Andersen and Co. Ltd.

E. H. Mundy and Co. Ltd.

National Carriers Ltd.

Bergen Line

Nordenfjeldske's, Bergen

Tor Line

P. H. Matthiesen and Co. Ltd., Newcastle
(freight agents for Bergen Line).

FINANCE

One of the main problems facing all expeditions is that of raising money. The financial problem was exhaustively investigated, and the Expedition applied to as many Societies, Funds and Companies as possible. At Leicester, it was necessary to obtain the permission of Senate to call the Expedition the 'University of Leicester Arctic Norway Expedition'. This was duly obtained in October 1968. A leaflet was produced giving details of the scientific projects, history and financial demands of the Expedition, together with a map of the area we proposed to visit. This, with an accompanying letter, was sent to various concerns. It soon became evident that our financial position would not be fully known until the May before we intended to leave.

The Expedition was greatly boosted by substantial grants from the University and the Students' Union. Royal Geographical Society approval was gained in April. A Grand Draw was organised to raise funds during the latter part of the 1968 summer vacation. (Prizes were obtained by collecting Green Shield Stamps and writing to companies). In all, £76 was raised.

The Expedition is most grateful to N. B. Hayman, Esq., for his encouragement and advice on financial matters and by donating £125 personally.

The Expedition extends sincere thanks to all those who donated financial assistance to the venture:

The University of Leicester

Students' Union, University of Leicester

Royal Geographical Society

Scott Polar Research Institute (Gino Watkins
Memorial Trust)

John Spedan Lewis Trust for the Advancement
of Natural Science

Shipman Trust

Shell International Ltd.

British Petroleum

Gilchrist Educational Trust

Wolsey Ltd.

British United Shoe Machinery Co. Ltd.

Bostik Ltd.

Basford Dyers Co. Ltd.

Hills Biscuits Co. Ltd.

Rubery Owen Co. Ltd.

Mrs. G. Usher

N. B. Hayman, Esq.

Miss C. Young

Two anonymous gifts

University of Leicester Departmental
Staff Association

Mention must also be made of those who supported the Grand Draw by buying and selling tickets.

In order to buy the Land Rover, capital was needed. This was kindly provided by the Leader. However, for many other expeditions, it is a very difficult task to find capital if required. At Leicester no established Expedition Society exists, and as yet, little equipment is built up.

University of Leicester Arctic Norway Expedition 1969

RECEIPTS AND PAYMENTS ACCOUNT

22 June 1968 - 31 March 1970

RECEIPTS

Members' Contributions
Travelling Scholarships
Donations
Grand Draw
Sundries
Building Society Interest

979
130
1696
75
131
14

5
0
15
10
3
1

0
0
0
0
8
3

PAYMENTS

Travel
Land Rover Maintenance
Loss on Land Rover Sale
Insurance etc.
Equipment
Food
Rece Expenses
Freight
Expenses in Scandinavia:
Fuel
Ferries and Tolls
Food
Equipment and Transport
Travel
Miscellaneous
Film
Cash
Administration
Miscellaneous

736
336
50
108
286
419
69
89

15
18
0
10
7
9
0
6

7
1
0
0
9
11
0
1

95
33
35
64
50
84

7
0
0
0
0
0
0
0

361
56
92
22
33

9
8
0
0
8

7
0
0
0
10

Debtors
Members' Debts
Cash at Building Soc.
Cash at Bank

26
53
114
171

0
13
1
4

6
7
3
6

2661
364
£3025

15
19
14

1
10
11

£3025 14 11

RECCE

During the summer of 1968, a recce party of Christopher Hayman and Glyn Collis visited the area. Although of great use in planning, more benefit could have been obtained.

Ideally, a party of six people should have visited the area, preferably with some form of transport. A thorough investigation of the Strup glacier would have been possible, as well as more of the area. A good use of photographs and cine films was made.

A recce has an added value in that it is useful in attempting to seek financial help. Greater detail is known, and the probability of the success of the scientific projects is increased.

Both of us went individually, due to our dissertation difficulties, and so 'exploration' of the mountains was limited. A survey of the Strupskardelva was made, as well as around Jaegervatnet. The Expedition gained much from information obtained and saved it a considerable amount of time on arrival in the summer of 1969.

FOOD

It was decided from the outset that the Expedition would be self-sufficient during its stay. Further, food would be packed in boxes sufficient for one man to survive ten days. With about ten weeks in the field, it was vital to have a good variety in the diet boosted by several luxury items.

Food can be a very high item in cost, but by seeking assistance from food manufacturers, economies can be achieved. In all, about four hundred letters were written, and a list of the companies that helped us by donating food or by offering reduced prices appears at the end of this section. The Expedition would like to express its gratitude to all those companies that helped it so generously.

The organisation of food is an enormous problem. Forms were designed in order to plan the exact types and quantities of food in each box, subsequently easing ordering and packing.

A questionnaire about the amount and type of food was put in each box. The information gathered will, it is hoped, be of use to future expeditions.

Each 10 man-day pack contained, as standard:

- 20 oz. Porridge (Quaker and Morning Foods)
- 25 oz. Dried Milk
- 40 ozs. Sugar
- 1 lb. St. Ivel tinned butter or Kraft margarine
- 1 lb. Jam/marmalade
- 10 Teabags
- 4 oz. Coffee
- 4 oz. Drinking chocolate
- 10 packets of soups (Knorr, Batchelor and Maggi)
- 1 packet Yeoman potato powder
- 10 Evening meals - usually packed in meals for two
- 3 packets Ryvita or Ry-King
- 10 small packets of sweet biscuits (Nabisco-Freear)
- 1 packet sweet biscuits

1 packet of chocolate biscuits
Sweets
2 Mars bars
Packet of toilet paper
1 box of matches

Additional: curry powder, herbs, salt, pepper, tinned fruit, dried egg, tin of Primula cheese, Bovril, Marmite, chocolate spread, custard, instant puddings, jellies, and extra rations.

Breakfast

Porridge tends to become 'boring' over a period of ten weeks, and Force Flakes and Mapleton's Fru-grains were taken as alternatives. Some members preferred semolina. Dried egg (S. Behr and Mathew) was made into omelettes but individual taste was important here.

The amount of tea was inadequate, and should be double. Although teabags are cleaner to handle, loose tea was preferred by several members. The quantity of drinking chocolate seemed too high, but this was strongly determined by a member's taste. It was found that Complan/drinking chocolate was a pleasant drink, especially before going to bed. Coffee was taken in units of 4 oz. but needed careful handling under Arctic conditions.

A special investigation was carried out on several dried milks. All members preferred the most expensive manufactured by the Bernese Alps Milk Co. It was found to dissolve well in coffee and tea. Millac (L. E. Pritchard and Co.) and Bibby's dried milk were also very successful, but not quite so good. Others were unsatisfactory.

Orange juice was taken in gallon containers, but due to the exceptional hot weather, this was inadequate. Lemonade and orange powder were very popular (Symington's and Pearce Duff).

Jam and marmalade was taken in 5 lb. poly-containers unless already purchased in tins. Marmite, Bovril, chocolate spread, Primula cheese (Kavli), and various pastes (Shippams and Sutherlands) were taken. A good variety is essential, but it is important to discover

personal tastes before departure.

Biscuits are bulky and break very easily. The Expedition took Ryvita and Ry-King for every day (1½ packets for ten days). A small packet of sweet biscuits was provided as well as a packet of ship's biscuits (A. Lusk and Co.). In addition, packets of chocolate biscuits (United Biscuits) and sweet biscuits were taken. Fruit cakes in tins proved very popular, and are well worth taking especially if laced with whisky!

A pound of St. Ivel tinned butter was included in man-day-box, and also, in addition, Kraft Margarine. It was found that the butter went rancid thirty-six hours after being opened in all types of weather. Kraft Margarine is good and keeps a long time with little deterioration, in any weather.

Lunches

Lunches were pre-packed in polybags before leaving Britain. Details of the various types:

1 oz. Raisins	1 oz. Raisins
2 oz. Sultanas	2 oz. Sultanas
2 oz. Dried Peaches/Pears	2 oz. Dried Peaches/Apples/Pears
1 Bar of Chocolate	1 Penguin Biscuit
	1 Liga 3-way Biscuit
	4 oz. Peanuts
	2 oz. Sultanas
	1 Bar of Chocolate

Members became tired of sultanas, and the dried peaches went a little 'off'. Peanuts were very welcome, and the daily chocolate ration could be increased. Liga 3-way biscuits were good, and highly recommended. Another suggestion is to pack up small polybags of lemon or orange crystals for inclusion.

The main problem on deciding type and quantity of products is determined by the proposed kind of work. J. C. camp did not require these lunches as they worked in the immediate area of the camp, while up on the glacier they were eaten more regularly except for the profusion of sultanas.

It was found that the purchase of chocolate was cheaper

in supermarkets than by buying from the manufacturers. Instead of buying the small bars, a pound bar was broken up into equivalent pieces (costs less but beware of climatic condition).

Lunches indeed still need a good deal of consideration and experiment if staying in the field for a long period.

Evening Meals

As much variety as possible was the theme of these meals. Meals were packed for two, five to a box, consisting of:

Batchelor Vestas : all varieties. Found only to be sufficient for one person in the field. Rice portion was also too small, and usually had to be supplemented.

Cerola Meals : contents in bags already for cooking. Again, (Cerebos) the portions are small.

Horlicks HF88, HF5 : All were good, and added to the diet, although and Meals-in-one they tend to be expensive. Some members said they all tasted the same.

Batchelors Beef, : Very tasty, but expensive.
Pork, Steak and
Kidney concentrated
meat bars (7½ oz.
for 2).

Wall's Stewing : were all very popular amongst the members.
Steak, Beef Curry, Steak was taken as a luxury, and was often a
Chicken Curry and Sunday night special. Sausages were cooked
Sausages for lunch on occasions.

Dana Sausages : well worth taking.

Cold meats by Keynote, Dana and Fray Bentos. Large tins of ham were purchased from Winterbotham, Darby and Co. Ltd.

F.M.S. (Templeton Patents) Meat Balls - a good variety available, and good for making stews. These were bought in bulk, and pre-packed into polybags as meals for two (2 oz.).

Vegetables

Yeoman Dried Potato - should have taken double the quantity per day. Good for thickening stews.

Surprise Peas, Beans, and Carrots - all very popular, and the best available on the market. It was found best to soak the carrots for a day otherwise they took a long time to cook. Again, these were purchased in bulk, and packed into 4 oz. units.

Rice, spaghetti and macaroni were also taken. The amount required depended on the individual. Usually 8 oz. was sufficient for two people, but in some cases only one! Chiltern Herb Farm tomato flavoured rice was a pleasant alternative. Rice was also used to boost the Vesta quantities.

Additionally, dried onions, 5lb. polythene jars of tomato sauce and H.P. sauce were taken (as much as possible). Curry powder and other herbs were included.

Tinned fruit was taken as a luxury (Libby, McNeil and Libby, Keynote) and proved a good idea. Instant puddings were also consumed. A few tins of sponge were purchased, but we could have taken more.

Canned beer added life to a meal, although it disappeared very rapidly.

The organisation of food needs much thought, and consideration of people's tastes. The packing is also important, and must be seen in the light of the type of work to be carried out.

GENERAL TOPOGRAPHY OF THE STRUPBREEN - STRUPSKARDET AREA

The Lyngen Peninsula lies at a latitude of about $69^{\circ} 30'$ N some 50km. due east of Tromsø. Though the county of Tromsø is well north of the Arctic Circle it has a surprisingly low glacierized area, about 234 km^2 or 0.90%. Of this the Lyngen district has 41.5 km^2 or 7.48%, the highest area in the county. The peninsula is very mountainous with only the narrow coastal strip providing any farm land. This long finger of mountains separated from the 'mainlands' by Ullsfjord on the west and Lyngenfjord on the east is itself split. About half way along its length the gash of Kjosenfjord penetrates from the west. Thus the northern part of the peninsula is very nearly an island, there being only $3\frac{1}{2} \text{ km}$ from Kjosen to Lyngseidet, the major town in the region. The area of glaciers is roughly equally divided between the northern and southern sectors of the peninsula. The highest mountain in the region is in the southern part - Jiekkevarri (1833 m) the first ascent was made by the English climber, George Hastings, in 1897. This part has been visited quite frequently by British climbers. Further details are in the booklet 'Mountain Holidays in Norway' published by the Norwegian Travel Association, Oslo, obtainable from the Norwegian National Tourist Office.

The largest glacier in the district is that known as Strupbreen. This flows east from a high group of mountains in the centre of the northern part of the peninsula. The glacier was chosen for study with the advice from the Norwegian Polar Institute (Norsk Polarinstitut), Oslo. In addition the large lake of Jaegervatnet provided a good range of environments for the biologists of the Expedition.

All the central part of the peninsula consists of gabbroic rocks in a long north to south band. As a consequence the area is precipitous, rather like the Cuillin in Skye though rather higher and with glaciers. The geology of the area is complex; details of this for the Strupskardet area are given in the reports of the Durham University Expedition to the area in 1956 and 7. These reports are available for consultation in the Scott Polar Research Institute Library, Lensfield Road, Cambridge.

Strupskardet is the 'through Valley' which leads from the north-east side of Jaegervatnet to Strupvatnet and the snout of Strupbreen. The watershed is displaced well to the east in Strupskardet. This valley has been described as the stoniest valley in the world. This is not

unlikely but though the ascent is tedious there are magnificent views if the weather is good. South of this pass is the mountain complex with which we had prime contact. For climbing purposes this can also be reached easily (again up long valleys) from either the east or west.

The mountains of the district fall into a number of groups. The Lenangstindane overlook the lower part of Strupskardet to which there descend large faces. On its southern side the group overlooks the head of Strupbreen, again with impressive faces. The Struptindane separate the glacier from Strupskardet. Faces here are not as impressive being generally scree covered.

On the southern side of the glacier there are the isolated peaks of Koppangsfjellet, the culmination of which is Store Koppangstind.

Directly to the west and across the glacier again is Tafeltind. This is really the southern part of the ridge from Store Lenangstind and the Jaegervasstindane which lie to the west across the watershed. There are two small glaciers flowing from this western group; Lenangsbreen to the north and Stortindalsbreen to the south. The latter glacier is unmarked on the map (1:50,000).

Fine climbing is to be had in all of these groups, further mention is made in the climbing report.

Vegetation is mainly restricted to low altitudes round the coast though it is possible to find grasses growing in surprising places. Lichens, of course, are to be found on all rocks but those most recently revealed by the glaciers' retreat.

The prime interest in the area from the point of view of the glaciologists was Strupbreen. This is the largest valley glacier in north Norway. Further details are to be found in the scientific report.

In this region the western side of the peninsula has much more vegetated ground than the east coast. Here too there are marshes and moss wamps, especially near to Jaegervatnet.

MAPS AND AERIAL PHOTOGRAPHS

Maps

It is only quite recently that there have been good maps of the Lyngen peninsula. The present coverage is due to the combined work of Norges Geografiske Oppmåling and the U.S. Army Map Service. These maps are at the scale of 1:50,000 compiled from aerial photographs taken variously in 1953 and 1954. Further details are on the maps themselves. The general date of publication is 1956. The maps are very clear and well printed though with no hillshading. The contour interval is 20m. and these are everywhere printed, there being no crag symbol. This gives the maps an odd appearance at first sight and until photographs of the area are seen, gives no immediate impression of the precipitous, craggy terrain.

The map series is M711 Edition 1-AMS. A number of sheets cover the peninsula. Almost all the working area of the Expedition is on sheet 1634 III. This covers all except the extreme northwest of Strupskardet though not as far as Reindalen; in the south it extends some 8km. beyond Kjosenfjord.

Sheet 1634 IV extends to the northern tip of the peninsula and sheets 1533 I and 1633 IV to the south cover the Jeikkevarri area. The accompanying key shows the main positions of these:

1534 I	1634 IV	1634 I
1534 II	1634 III	1634 II
1533 I	1633 IV	1633 I

The maps can be obtained from:

Norwegian National Tourist Office
Messrs. E. Stanford, London.

For some reason we were charged variously 5/- to 8/- per sheet between the two and at different times. The maps are on paper only.

As mentioned elsewhere there seems to be confusion over some of the names of mountains.

Aerial Photographs

Vertical

The set which the Expedition obtained was to about 1:40,000 scale taken on a Wild RC5 camera (11.5 cm.) at 4500m. There is good coverage over almost

all the peninsula except for a strip which includes Jaegervatnet and runs north and south from it. This set is flight coverage 491, July to October 1952. A key can be sent on request to the address below.

Recently, two further photographs were obtained of the Strupvatnet area, taken in 1953. These are on an approximate scale of about 1:50,000; from 5000m. This is coverage 563.

The prints are 11 x 17 cm. and cost N.kr.7 in 1968. This does not include any reproduction fee. They can be obtained from:

Widerøe's Flyveselskap A/S Kr. Augusts Gt.19 Oslo.

Oblique Photographs

These can be obtained as for the verticals. Give a map reference of the area required. The number varies for each particular area; they are of good quality and very useful for planning.

GLACIOLOGICAL GROUP - CAMPS AND ROUTE DETAILS

The study of Strupbreen necessitated a base camp conveniently placed, both to supply it and for access to the lower part of the glacier's ablation area. As one of the projects was to observe the behaviour of the ice-dammed lake - Strupvatnet - the camp also had to be close to this. Further details of the camp itself are given below.

The First Reconnaissance

This was made soon after our arrival at Koppangen, the roadhead on the eastern side of the peninsula. The equipment boxes were stored in a boatshed kindly made available by the villagers. Koppangen Camp was set up on a grassy area to the northwest of the village, overlooking the sea and a tributary of the river draining Koppangsdalen.

We had a small inflatable rubber dinghy in which three members set off for the bay of Strupen. Some comments on the trip might be of value. The craft we used was an Avon Goldcrest, powered by a Villiers two-stroke motor that was only just powerful enough for the negotiation of heavy seas. We had trouble with this motor at various times but it is thought that this was due to the fact that it was not properly overhauled beforehand. Fishing lines are often put out from Koppangen to the headland of Storklubben (and occasionally beyond). The outer limits of the lines are marked by orange buoys; if these are passed inland then great care must be taken to ensure that the lines running to the shore are not fouled. Near to the Strupen headland itself there are occasionally "standing" waves if the wind blows from a northerly or easterly quarter. It was found that these could be more easily negotiated if the craft was headed out towards the centre of the bay before turning to the shore at Strupen. Though the coast is very steep in this section it should be possible to land at almost any place in case of an emergency; the carrying of a flare pack is a sensible idea. The bays of Strupen and Koppangen are, themselves, sheltered but the intervening waters can become quite rough. For a brief time we used an inshore rescue craft, this was superior in every way to the Goldcrest (nicknamed 'Slug'). It could progress in seas that would have swamped, though not sunk, the smaller craft. Most of the equipment was taken round to the bay in a hired fishing vessel (N.kr. 60/80 return). Unless the party and its gear is very small this is the best method.

Landing at Strupen was made about 100m. north along the coast from the southern river mouth. The camp here was set up near to the trees well above high water.

From the bay, two of the members set off to find the best route to the glacier. The route followed then was taken in load carrying trips subsequently except in its upper part. This route and its variations are now described.

Routes to the Glacier

Points on the route were marked in places with orange paint, some of which might last a long time.

The route described is a general line and each individual had his own ideas as to which was the 'easiest'. The edge of a river terrace was followed from the camp to the junction of two streams in an area of small rapids. This river is not marked on the 1:50,000 map but is marked on the accompanying map. The river was crossed and followed up through the woods on its (true) right bank. The way goes steadily upwards, first in the woods then on large boulders which are relatively stable but should be treated with care. Near the woods they can be slippery when wet. At a height of about 230m. asl. the stream is very small and can easily be crossed above the rocky waterfall step. The route then goes to the right (north) aiming just to the right of a black waterfall. This last section is steep but leads directly to the small pool at the 'Col'. In the later stages of the Expedition it was possible, even loaded, to gain the Col from the camp in Strupen Bay in 30 minutes. No camp was pitched at the Col, though there is plenty of flat ground if this is thought desirable. The Col was used as a transit and supply depot only.

From the Col two routes must be described, one to the glacier and the other to the Waterfall Camp. The way to the glacier lies quite simply up the blunt ridge above the Col. If this is followed, leaving a small valley to the left and the glacier right, some scree and scrambling leads to the top of this section of ridge where the surface is flat solid rock. The descent from this place (named Transit 'Camp') was very quick, especially when there was snow in the early part of the season. The little valley mentioned above provides this. It can be gained by going about 20m. to the south of the flat area overlooking the glacier and comes out near to the ridge about 40m. above the Col. The glissades had safe run-outs. If there is very little snow the route is still possible though some care

is needed in routefinding but the line is almost the same as for the snowed-up descent.

The route to the waterfall does not head directly to the river but initially to the west towards a big cliff, threading its way along a defile. At the end of this gap the route is fairly obvious as the way follows a small stream towards the river. After some searching a small tent site was found here. Below the large waterfall is a flat gravel bank region where the river is braided before becoming entrained in a narrow and spectacular gorge. The barrier through which this gorge is cut consists of bare gabbro with some deep (4m.) notches, especially on its waterfall facing side. Into one of these drains the small stream mentioned above forming a long narrow pool the inflow and exit of which are at the southern end. The camp site was on a small shelf at the northern extremity of the pool. Even when the lake burst the tent was well protected from the driven spray though if the water in the enlarged waterfall plunge pool had risen very much further the level of the water in the camp pool would have been reached. The fortunate choice of site was only realised after the lake had burst.

Waterfall Camp could also be reached from Strupen by following the slabs next to the main river direct to the top. This way is not recommended with loads. The camp could be reached from Transit by way of a gully leading down to the small stream which filled the tent-side pool. Early in the season this has snow banks which may be quite hard frozen. The apex of this gully is near to the bottom of the snow descent from Transit to the ridge.

Early in the season it was possible to ascend from the snout of the glacier to the true left bank of Strupbreen. Difficulty was encountered crossing over some of the crevasses at the top of the small icefall and also gaining the rock to avoid a badly crevassed section. This route was only used once.

One further route to Lake Camp directly from the Col by way of the glacier snout should be mentioned. This involved crossing the river at the snout and then climbing the scree and snowbanks high up the hillside and then traversing to the west towards the camp.. This was tried once but not found to be very satisfactory.

Crossing the Glacier and Lake Camp

Stores were left at Transit covered by polythene sheet, not in the small trough just below the highest point of the flat area (cairn) - this

filled with water - but in a recess 10m. nearer the glacier. Beyond this recess and the small pools is a small gully leading down to the glacier surface a few metres below. This was used as the point of departure for the glacier. In all the time we were there it was possible to get onto and off the snow or ice either here or very close by.

The direction of travel once on the glacier was at first almost northwest, i.e. directly across. However, as more snow melted off the glacier and crevasses had to be crossed still higher up, the direction became nearer to due west - heading for the bottom of the lower icefall. There were relatively few crevasses near to the Transit Gully but some 50m. in from the edge they became increasingly greater in size and number. Though they could be bridged or zig-zagged through the best method was to avoid them by taking the westerly line to the flatter part of the glacier near the centre. Continuing down the left hand side the junction of rock, glacier and the lake should be aimed for. The last part of the descent could be quite tricky though was managed at various times without axe, crampons or both. As the character of this side of the glacier changed (more so than the right bank) so the last part of the route off the ice varied. This was especially true when the lake emptied as the edge of the ice was prone to cracking off in large and spectacular blocks.

The last section, to the site of the Lake Camp, leads directly up the hillside above the glacier for about 20m; then cutting westwards at about the same height till a small gap is reached. This leads, by way of a flatter area, to a wide gully which is descended to the camp area.

Times for sections of the route

These are average times for a reasonably loaded male who is fairly fit. They make no allowance for someone either grossly unfit at the start of an Expedition or one trying to 'burn off' everyone else!

Strupen	-	Col	45 minutes
Col	-	Waterfall	10 "
Waterfall	-	Transit	20 "
Col	-	Transit	20 "
Transit	-	Lake Camp	25 "

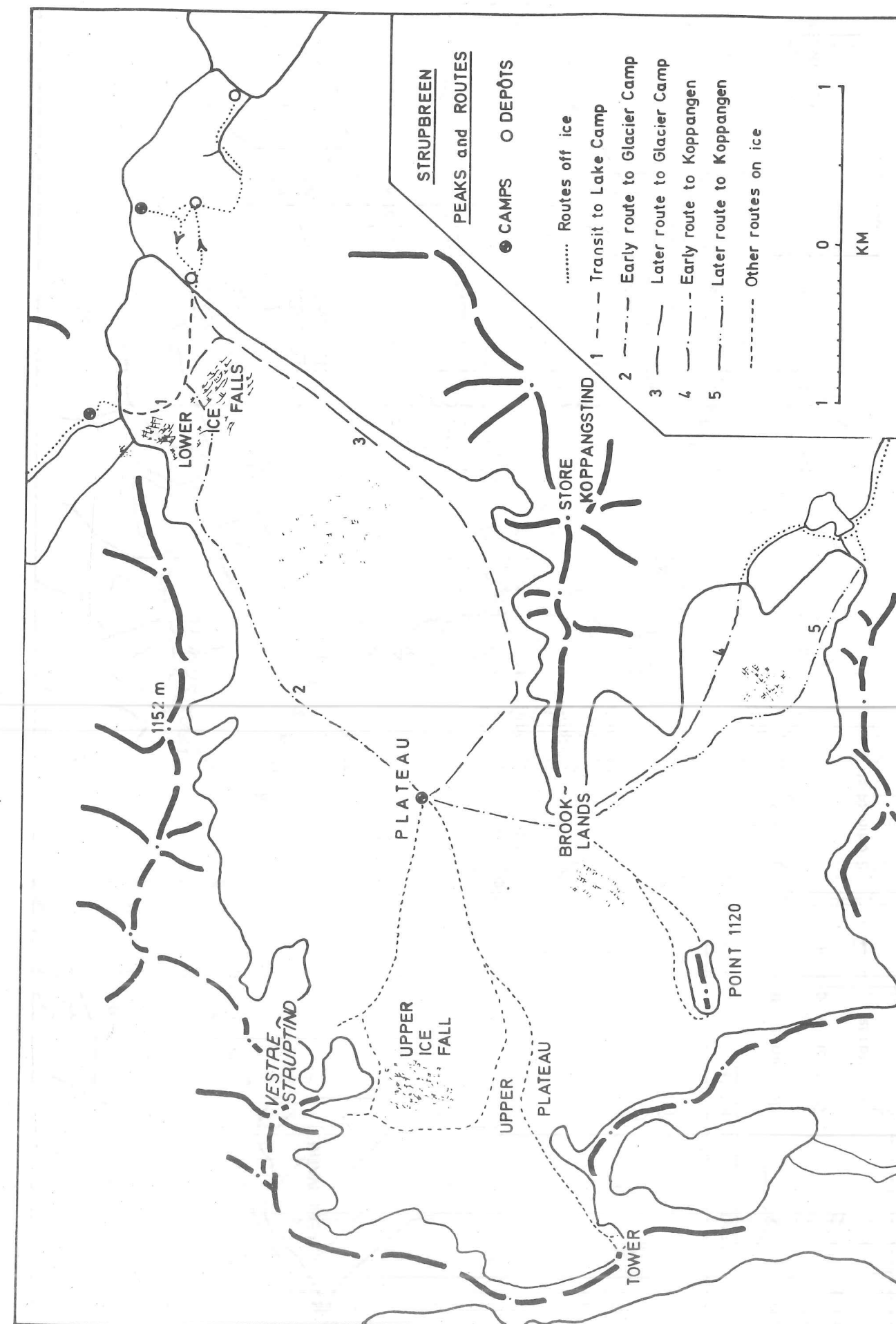
(This last time is for completely snow-free conditions, otherwise it may be longer).

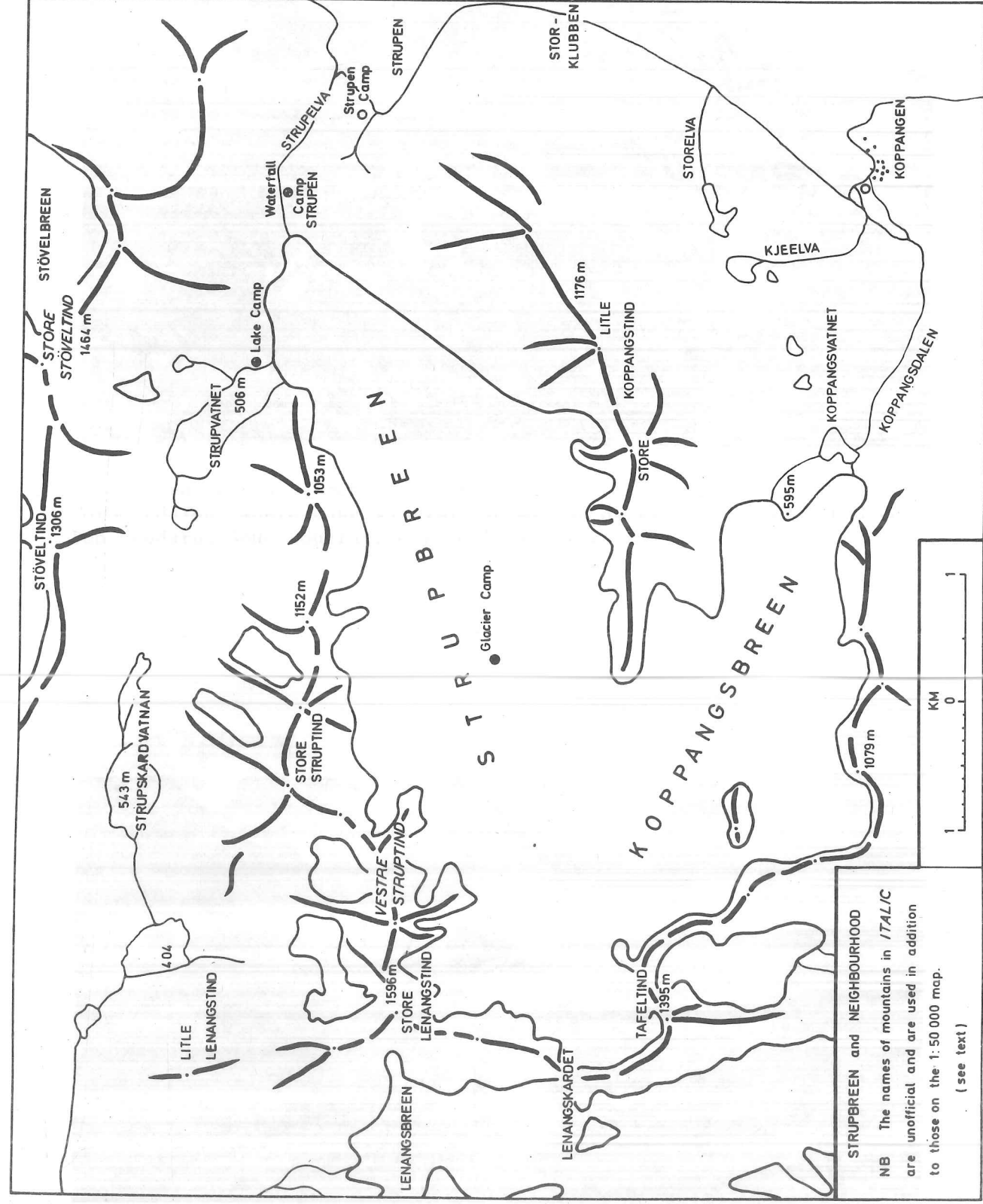
At Lake Camp a number of raised tent platforms were built. Obviously, in time they will vanish but they may be of value to anyone in the area in the not-too-distant future. The spot was aptly described as 'inorganic' by one of the members (a chemist!). This indeed it was, but as time went on and spring eventually arrived, there was a little grass to be seen about the place. We were fortunate in having good weather for most of the time. Late afternoon sun shining on the snow and icefloes of the lake even dispelled memories of drizzle and cloud for several days on end. This latter situation can be the norm, however, and it is advisable to prepare for it. All the platforms made were above the flood level in the area. The stream that can run down the gully was entrained and straightened so that it did not disrupt life too much. The site is not very well protected from the winds that blow up Strupskardet. Almost invariably all the bad weather came from that direction. Skewer pegs were of little use to hold down even the groundsheets of tents, "Bulldogs" were not that much use either when the ground was sodden. String to tie round boulders, as is often the case, proved to be the best answer though in the midst of the gale we experienced one member who cut up the insulated wire from a piece of geophysical equipment! This did not help the functioning of the instrument but was perhaps the best solution of all for guying the tents.

Further comments about the camp are to be found in the Equipment notes and in the scientific part of the report.

Glacier Camp and routes to it

It has been mentioned elsewhere that the work on the glacier involved areas that could not be easily reached from the Lake Camp. The approximate position that was required was known before we went; however, actually the site was determined by the fact that the two people who took the tent up to inhabit the camp were too tired to go any further. As it happened the place chosen could not have been better, or put another way, could have been much worse. To say the least the camp was exposed, being 1.5km. from the nearest rock. The place chosen is shown on the accompanying map. There are no crevasses at all in the area except for some very minor cracks and one crevasse that acted as a sink for one of the supra-glacial streams. This cravasse was relatively short in length and situated about 200m. west of the Camp. Some 300m. to the east there is the beginning of a crevassed zone. Otherwise the area is relatively







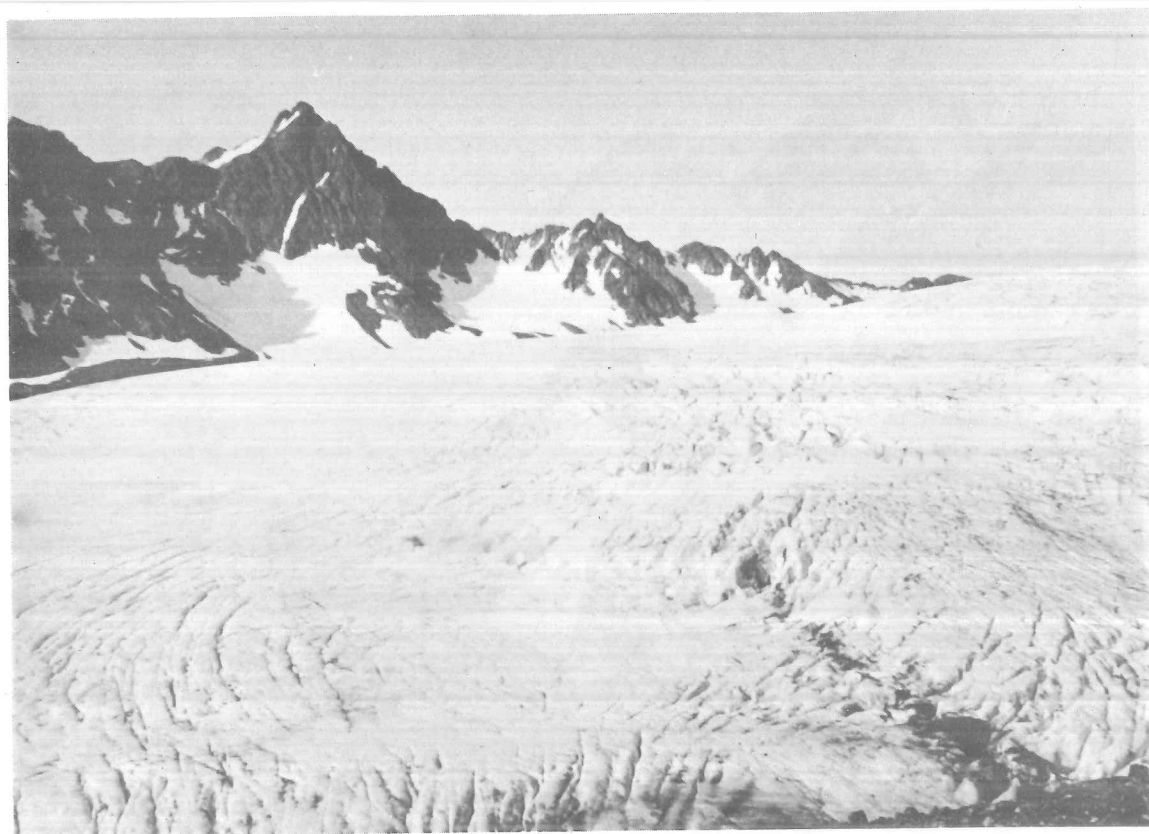
Halt to collect specimens in Tverredalen on the route from J.C. to Forholtdalen, where post-glacial succession of vegetation was studied. Don Goddard, John Douglas, Glyn Collis, Nick Orson.



Photography from Forholtaksla towards Lynsdalen (Alison Gibbins)



Strup Bay. The route from the Bay Camp follows the stream diagonally left from the centre, then goes right to the 'Col' behind the rock knoll.



The lower part of Strupbreen in mid-July, from above the Lake Base Camp. The peak is Store Koppangstind. The route from Transit Camp crossed the nearly crevasse-free zone below the two lower ice falls.



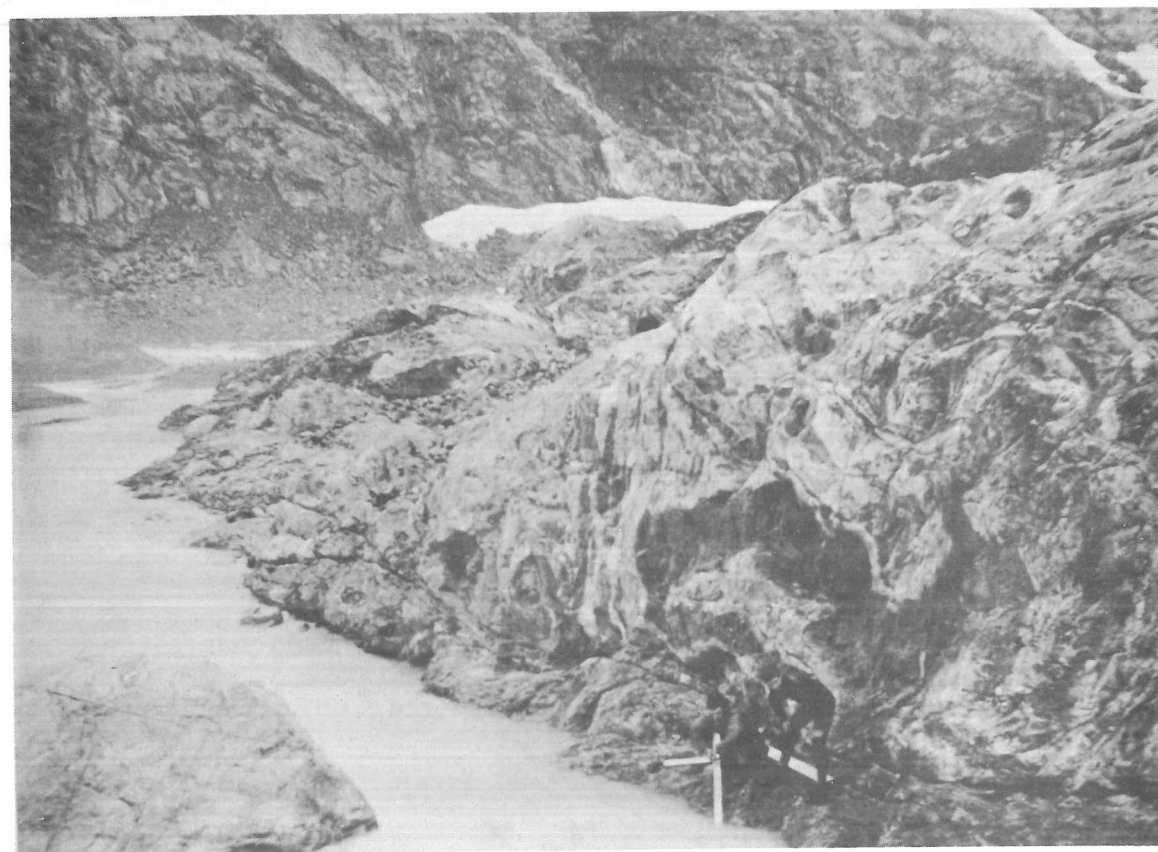
The Expedition Landrover



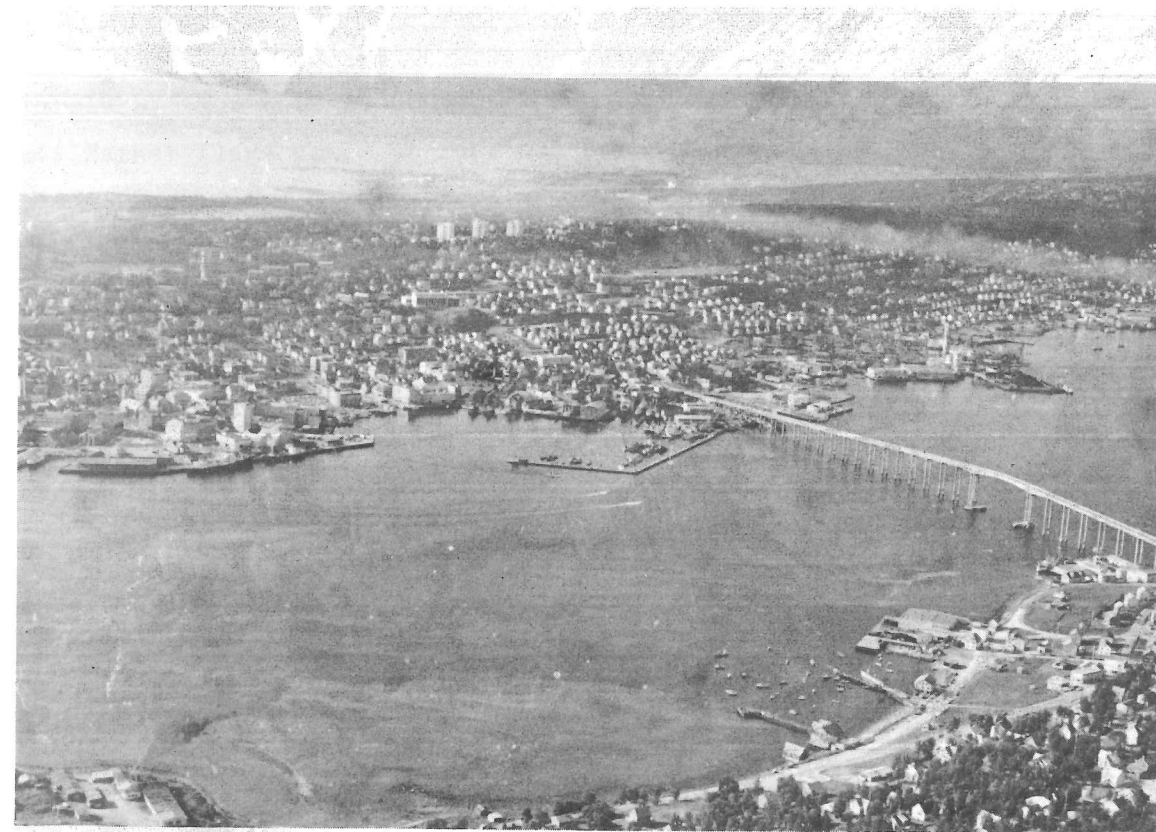
Jaegervatnet Camp



Strupvatnet before it drained.
Looking to the west from above Lake Camp.



Fixing the river guaging point at Waterfall Camp.



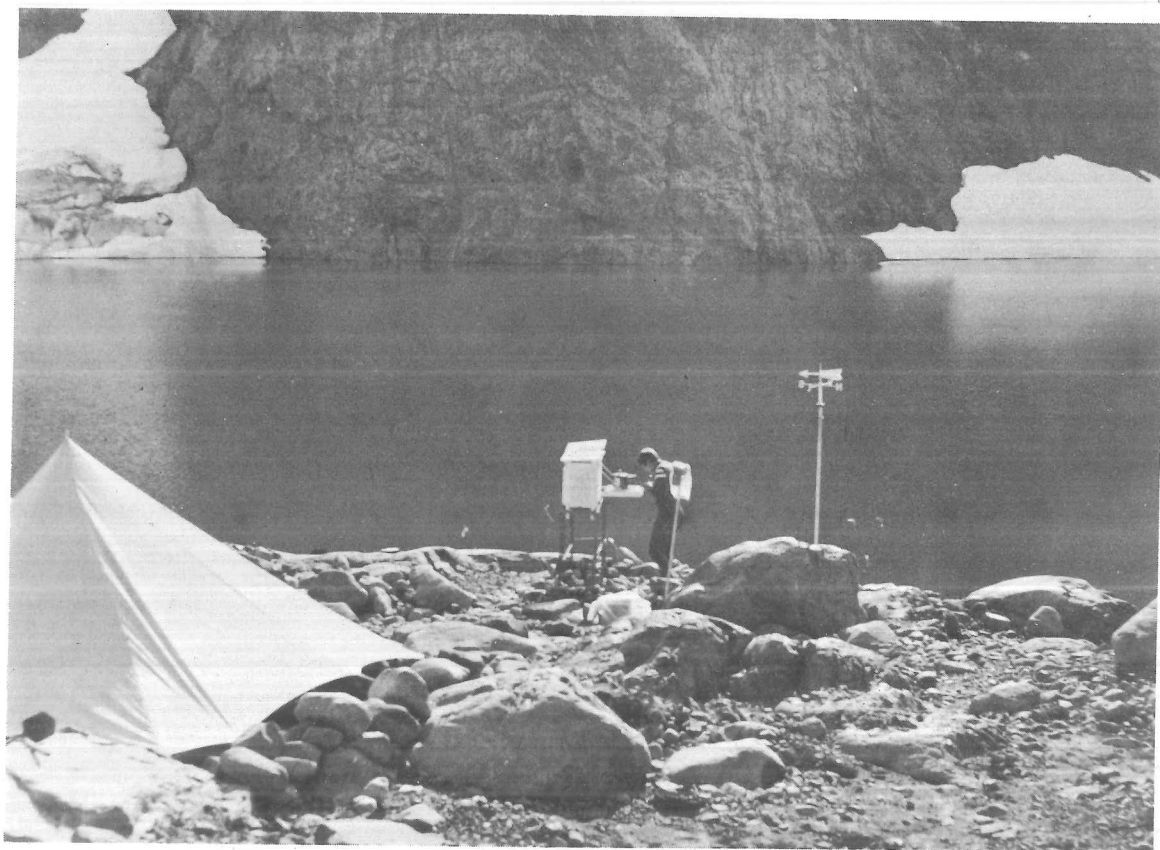
The town of Troms



Koppangen on Lyngenfjord



The "Mess Tent" at Lake Camp



Andrew Eavis and the Meteorological Station at Lake Camp

featureless. For this reason it is possible to be lost if the cloud is down. Marker flags could be left out but this was not done. Notwithstanding, the tents were found at night and in the cloud by two members at the end of the Expedition without too much trouble.

Further details regarding this Camp are given in the notes about camping on ice.

It was thought that it might well be possible to supply Glacier Camp directly from Koppangen and in the early stages this was tried but abandoned as being too difficult without the aid of supporting camps as the other route had. The route was used to bring people up to the camp when there was no transport by sea and also at the end of the Expedition to take loads down. In ascent from Koppangen, the river is followed up along its right bank. In the lower section there is a variety of possible routes. The rock step is taken by a gully almost directly above the moraine crest. Part of this is very awkward with unwieldy loads especially skis, stakes, etc. The long stony valley is followed to another step which is taken on the left. The lake is skirted again, on the left (south). When first negotiated early in the season the glacier was gained not by the lowest part of the snout but by crossing the stream below it and ascending the valley to the north to the upper snout. Subsequently, in descent, the lower snout was used when the snow cover had melted, though steep, heavy loads were carried down and it was also used for ascent. If used when snow-covered there are a few deep crevasses very close to the right bank to steer clear of. The best route avoiding some complicated crevasses in the centre is shown on the accompanying map. After the snow had gone from the lower part of the glacier the time for ascent unladen from Koppangen to Glacier Camp was about three hours.

A route of less value takes the long dry valley which is the continuation of the usual route from Strupen to the Col. It goes straight on from where the route to the Col turns off to the right (north). In its upper section there are enormous blocks, often unstable. It is neither easier nor quicker than the route via the Col and Transit and up the glacier.

There now remain the routes to Glacier Camp from Lake Camp to describe. Early in the season it should be possible to go onto the glacier as if crossing to Transit but turning off up the steepening slope at about the middle. The small second icefall near the right bank is best turned to the north. The main factor preventing the use of the direct routes is the collapse of snow bridges over crevasses on the Ramp.

This is the first rise just above the line of crossing. If time is being wasted here it is better to retreat and go to the extreme true right hand side. Here there are very few crevasses, though care must be taken as snow lingers in some sections and there are some crevasses around. Once snow-free the route presents no problems and can be followed directly along the side of the glacier and the moraine. When the lower part of the Koppangstind ridge is directly above most of the side chevron crevasses have been passed and it is possible to cross diagonally towards the centre of the glacier with very little hindrance. Except for some steep slopes, where a slip would be nasty, this last route is very safe and has been done solo and laden, moreover, it is easy to follow in bad conditions. In good conditions the time taken may not be much above an hour and a quarter for the ascent.

Emergency routes

It may be possible to traverse round from near the Col under the Koppangsfjellet to the lakes above Koppangent and descend near the Kjeelva. This was not tried but does not appear to be very good, certainly as a normal access route.

The other is the approach up the through-valley from the west - Strupskardet. As we had a party near Jaegervatnet this was done several times. It is somewhat laborious though quite an experience (probably never to be repeated). Time from Jaegervatnet is about 5 hours.

FUTURE POSSIBILITIES FOR TRANSPORTING EQUIPMENT TO LAKE AND GLACIER CAMPS

We experienced considerable difficulties in the transportation of all the scientific and camping gear to these respective camps. The sooner the equipment is moved the sooner the recordings can be started. This obviously increases both the value of the work (when time is already short) and frees time for additional projects. Three aids to this objective are given below.

1) The use of Koppangsdalen as an access route

If Koppangsdalen is treated as the major route for approach to both Glacier Camp and Lake Camp there are several benefits. There is no need to use a fishing boat for transport. Important meteorological readings at the firm line can be started much earlier than was possible in 1969.

It need take only a day longer from the pitching of a Glacier Camp to the occupation of Lake Camp. Disadvantages are the lower rock step in the valley and the steep part of the Koppangsbreen snout or the awkward river crossing to the upper snout. A pulley system would solve the first of these and fixed ropes the second. The snout, though steep, is not badly crevassed. A camp could be set up near to the lake below the snout. All the loads would thus be taken onto the glacier and the requisites for Lake Camp taken down as required.

2) The use of PULKA sledges

These sledges are of Swedish manufacture and were used with some success in North Peary Land in 1969. They are one man sledges and seem suitable for either snow or ice. They can be used with about 70kg. as a normal maximum load. As much of Strupbreen and Koppangsbreen are relatively flat they could be used at least in the relay of equipment. If they were to be used in conjunction with the Koppangsdalen route then full use of the snow conditions on the glacier could be taken.

3) The use of Helicopters

Helicopters provide the fastest means of occupying camps in the area. Naturally, it is much more expensive than human labour but it could be budgeted for. A helicopter could be chartered from Bardufoss; this would then call at Koppangen and pick up the loads in a sling below it. As there is no difficulty in finding a suitable place to land on the upper plateau there need be no prior reconnaissance. Subsequent loads need not even require the landing of the craft. It would not be much in the way of extra time to fly to Lake Camp. It is not considered that the route up Koppangsdalen is difficult to fly. Photographs taken on an initial flight could provide useful information.

TROMSØ

Tromsø is the largest urban municipality in North Norway, and the town itself is situated on an island, connected to the mainland by a toll bridge built in the early sixties. (Land Rover toll 7 N.Kr.)

There are two official camp sites on the island. One of them is situated in the southern part of the island near the museum, about two miles from the centre of the town. The other site is in the centre of the island found to the south of Prestvannet. Heavy rains tend to waterlog this site very quickly. Cost is 2 N.Kr. per tent, and in addition, a fee for extra people. Both are accessible by bus from the town centre. Food is on sale, and cooking and washing facilities are available. (Showers at site near museum - cost extra).

We also used to camp in the north-western part of the island, near the airport. A road branches off the road leading to the airport, and continue along it for a mile or so, and then sites on the right hand side of the road are easily seen. Wood was available for making fires. Buses do operate in this part of the island, but not very regularly.

Tromsø has a variety of shops including several departmental stores and supermarkets. There are several coffee bars (most large shops also have bars), the most northern brewery in the world (a kind of public house open during the day until 4.00 p.m., but cost is high), and a cinema.

Tromsø Museum has exhibits on many aspects of Arctic life, in particular Lapp culture. There is a separate marine museum nearby. There is an English graduate, Richard Binns, at the University working in the Geology Department. The Expedition would like to express its gratitude to him for all his assistance in the last two years. There is a good library open to the public during the day.

Captain Crawford is the British Consul in Tromsø until he retires in the summer of 1970. Again, the Expedition would like to thank his wife and him for the assistance and hospitality given to us, and for the lending of one of his offices for those working in the town.

Buses provide a good service throughout the island, and to the mainland. A ferry runs regularly across Sandnessundet to Kvaløy, and another ferry from Kvaløy to Ringvassøy. A bridge is being built to replace the former ferry. Long distance buses go to Alta and Narvik passing through several places of importance. The Expedition used buses to travel to Lynseidet, and Jaegervatnet from Tromsø. Details of the

timetable obtainable from A/S Troms Innland Rutebil, Finnsses and Tromsø of Omegn Bussruter A/S, Tromsø.

The post office was used as an address for the Expedition members. It is necessary to contact the postmaster.

A map of the island is available from the main bookshops:

Centrum Bok og Papirhandel, Tromsø.

Other information from the local Tourist Office.

Transport - Tromsø to Lyngen

Buses run daily to Breivikeidet from Tromsø, and cross Ullsfjord on the ferry to Svensby. The buses continue to Lynseidet. Local buses make regular trips to Jaegervatnet and Lenangen, and also to Koppangen.

A ferry operates from Lyngseidet to Olderdalen across the Lyngenfjord. It is proposed to replace this ferry with a road in time.

Lynseidet is a small town with a post office, several coffee bars, two supermarkets and garages. (Sell diesel, petrol and paraffin. Note that fuel is only sold in official containers). A photographic shop is also present. The post office was used as a postal address for the glacier party.

EQUIPMENT REPORT

The notes presented here are intended to show what items we took with us and to give some general indication as to their performance. This must be subjective, especially as environments other than the one we experienced will affect items in different ways. It is hoped that this might be of general use despite these possible shortcomings. The notes also provide the opportunity for comment on conditions experienced and what improvements and modifications might be considered by other expeditions. Because of the diverse range of clothing and equipment used on the Expedition, both personal and in general, it is not proposed to comment on all items.

Tents

Arctic Guinea - Blacks:

Three of these were used and all, at some time or another, were on the glacier. Two were in 'Ventile' the other in Egyptian cotton. Until the storm on the glacier one of each was in use, both having cotton flysheets. Though this is not necessary on the Ventile tent it was found to be very useful. It makes life more pleasant in bad weather and gives some measure of darkness for sleeping as well as being cooler than the tent alone; this was important if surveying had been done and sleep during the day was required. In the storm both flysheets were ripped, one was past its prime, that on the Ventile tent was brand new. It was blown off the apex piece, not having been sufficiently well secured by the tie cord. Life was unpleasant under these conditions as there was next to no room inside in the strong gusts. The two tents were pitched facing each other about $\frac{1}{2}$ m. apart. This makes for much better use of the tents especially when there were three or four members at the camp. The main disadvantage is the lack of space for entering rather than any instability. The site of the camp was very exposed and the storm blew straight at the tents which had no storm wall. Unfortunately, the design of the tent seems to have stagnated. It could be improved in a number of ways, e.g. poles in sleeves. The Mountain tent from the same firm was considered too small for continued habitation though it may have withstood the storm better, having fewer guys. The new improved design of the Mountain tent may make this a better proposition. However, the workmanship is quite good and the tents were probably the best used on the Expedition.

Tinker Blacks:

This tent stayed, for most of its time, at Lake Camp though it spent some time on the glacier. It was not very well suited for this latter job as it is too dependent on numerous guys. A flysheet and A-poles were used though

even so only one person normally used it. For this reason it is not very suitable for sedentary camps, especially if there is any pressure on tent space.

Good Companion - Blacks':

There were three of these tents on the Expedition, one Standard with fly at Lake Camp the other two (one a Major) with flys at J.C. They are so well-known that there seems little point in saying very much about them. The only thing that lets them down is the very great increase in surface area that the flysheet makes. This often results in snapped guys rather than tearing of the cloth. Being surprisingly tough they make good base camp tents. The zipped entrance is considered a retrograde step over the tie tapes used previously. Useful additions are to extend the hood on the tent and/or fly. Similarly, extensions to the bottom of the doors and the groundsheet make a welcome increase to the floor space.

Force Ten - Vango:

One of these tents was purchased new before the Expedition. It was only taken to Lake Camp. The basic design of this tent seems very good, the wrap-around door makes cooking and gear storage much better than in many mountain tents. Unfortunately, there are rather a lot of drawbacks to the tent itself rather than the design. The quality of the material is poor, certainly not up to the standard of Blacks' Egyptian cotton. The tent is too close to the flysheet, this resulted in them touching in a strong wind and letting water in. The guy sliders are very poor and the zips are of the wrong type and are exposed to rain and snow which could well jam them when frozen. These drawbacks should not be present in a serious mountain tent. It should be said in fairness that other users have reported these tents to be very good.

P. and S. Mountain Tent:

This tent was only used at Lake Camp but proved to be very good, though a little small. There are several good design features and the quality is of a high standard all round.

As a general comment on tent design it might profitably be pointed out that recent developments in this field should make life both simpler and more comfortable, especially in bad conditions. Nylon cloth and double layered tents seem to be the most promising. There are very good reports of a new

design by Brighams incorporating these principles. Such tents will obviously be more expensive than those in general use today but should be well worth the extra cost.

Boots

The boots used by members varied very widely in their sophistication and, therefore, cost. For the most part the members of the Glaciological group were experienced climbers and thus had good climbing boots, viz. Kastinger, Bonatti, Nordica, Terray, Scarpa. Other members had fell boots, mainly FEB 911 and Scafell. Some slight trouble was experienced by some of the members with the latter two boots in that they were not completely water-proof. However, this is perhaps not to be wondered at, at times. There were no major complaints though some people had to resort to a second pair as their first started to fall to pieces. The disintegration of some boots was more rapid than others as they had been used for some time previous to the Expedition. The main factor contributing to the disintegration was the scree of the area. Except on the coastal areas it was impossible to get away from the very sharp rocks. As the scree is often unstable leather soon becomes chewed-up and stitching pulled. Therefore, it is highly recommended that each person who will be in the upper regions should have a pair of 'hack' boots for general use. There was some difficulty experienced in changing from one pair of boots to another because crampons did not fit the other type. The best remedy for this is the use of instep crampons for all but major travel on the glaciers. This also saves the crampons (see below). Wellingtons are considered to be of value under all conditions. A short wellington rather larger than usual so that thick socks could be worn would have been ideal for the Glacier Camp. The sole pattern could be cut extra deep and they would thus be ideal especially when the snow is in the last stages of melting.

Crampons

These were of three types. Several members had their own which were Salewa 12 point adjustables. These suffered heavily. Sets which had been in use for several years only suffered breakages of the junction strip. The newer ones (which were almost certainly from the same batch) both had breakages of this junction and also of the points themselves. Point breakages were of front cow-catchers and side points. Crampons from this batch and used by people not on the Expedition evidently also had failures. Complaints have been made to Salewa and replacements supplied. Remedial measures were taken for the linkages and this usually consisted of Bulldog or skewer pegs bent with pliers.

Salewa walking crampons were also used but were not very effective. The front boot supports were too flimsy and did not support the boot effectively.

Instep crampons were used a good deal. They were quite effective for most of the ferrying and are virtually indestructible.

Vacuum Flasks

When surveying and taken out with the party or left in camp with hot water to provide an instant hot drink on return, these flasks were excellent. With several groups in operation either climbing, surveying or load carrying they provided the ideal solution to the problem of different living habits among the members. Surprisingly none were damaged.

Skis

Skis were used on occasion on the plateaux. There was nothing elaborate about them. They were not new but with the limitations of our equipment (we did not have ski boots) and skill proved to be very useful especially when there was snow on the plateau and then slush on the upper portion of it.

Polythene sheet

A great deal of this was taken and all of it was used. 'Transgrips' are the only effective way of guying the polythene down. Much use was made of polythene in the way of bags for food and equipment at all stages in the Expedition.

Lighting

Candles were bought in Norway but should have been taken with us. This may sound odd in the Land of the Midnight Sun. However, it was very dark at times towards the end of the time. At each camp there was a Camping Gaz lantern (using the 200 cartridge). These were very good and provided useful heat for warming the tent.

Stoves and cooking

Most of the cooking was done on primus stoves of 1 and $\frac{1}{2}$ pint capacity. All were very good if a little messy. In addition Camping Gaz 200 (or Super) was used, these were fine for small heating jobs and warming food. A gas stove

utilizing propane instead of the more usual butane would have been very useful. It is only a little more expensive than butane to fill and has the advantages of burning hotter and having a lower freezing point and, therefore, could be used on the glacier. There was no difficulty over filling the propane used on the ice drill at Lyngseidet. Here also paraffin and two stroke fuel could be bought. This was from the filling station where it was also necessary to buy a special container. However, once bought this could then be used to fill the larger containers used. Several members suffered bad rashes from the spilling of paraffin on the back when carrying. The containers should, therefore, be placed in polythene bags. At J.C. a wood fire was normally used with supplementary stoves.

Foam Rubber

A lot of this was taken. Most of it in the form of larger sheets in the packing of equipment and instruments. It was very successful in this, there being no breakages in any of the delicate instruments and rough handling of crates. Polythene bags filled with scraps were useful seats and larger pieces were used on tent floors and for protecting the back when carrying loads.

Sleeping bags

A wide variety was used most proving to be adequate. A pied d'Elephant was taken and this was used in the odd cases where people had been left without bags for any reason. The Nevis bag from Hutchinson was excellent.

Duvets

A number of people had duvets, mostly Ellesmere. As no really extreme conditions were encountered these were rather a luxury but often appreciated early in the morning and when surveying.

Cigarette lighters

Less than half the members smoked. However, it was thought that lighters would have been a very good thing. If kept on the person gas lighters will not freeze up and provide a useful substitute for a box of matches. This was especially so as all the matches we had were of the safety kind. These are fine until the outer box gets wet when it is not then possible to light them without the proper surface. Some windproof matches were taken but not often used.

Clothing

Clothing taken was very variable and not standardized. Perhaps it should be mentioned that Blacks' anoraks are not nearly as good value as they once were. Not only do they seem to be tightly cut, but the size of pockets is too small. Peter Storm and P. & O. were also used and are good value. A number of kinds of cagoule were used and possibly make the ventaile (or Ventile) type of cloth unnecessary for most purposes.

Nylon leggings rather than stop tout were used in the soft snow on the glacier and found to be excellent. However, in slush (which could be up to $\frac{1}{2}$ m. deep) they are, of course, ineffective.

Climbing Equipment

A wide variety of equipment was taken, this was supplied by the individuals concerned. There was great diversity and some duplication. As the climbing was never of a very high technical standard it was not often necessary to have some of the items.

Ropes

Kernmantel types made by Edelrid and Kisslig were used as well as a laid rope by Viking. The low water absorption of the Kisslig was a good feature.

Pegs and chocks

A wide variety was taken. Chocks of one form or another seemed to be as useful as pegs. Where there are cracks they are good but they can be scanty.

MEDICAL REPORT

It is not proposed to say much about the medical equipment used as this was of the normal comprehensive first aid kit type. Because of the large number on the Expedition the kits were divided up into three large units; for the Glaciological, Biological and Tromsø groups. Individuals had their own kits.

Plenty of tablets for the treatment of headaches and digestive tract ailments were taken of various types. These seemed to be the most often used (as might be expected). Occasionally there was the odd illness that was suffered by an individual for no apparent reason. Fortunately, recovery was rapid. Glucose tablets for recovering strength were very useful.

A variety of fly repellents (mostly ineffective) were tried.

Injuries were almost entirely restricted to superficial cuts and grazes. No morphia was carried. However, it could be a life-saver even when there is some transport relatively close. It was for this reason of close proximity to transport, especially helicopters, that there was nothing very sophisticated taken in the way of medicines. There was no medical person on the Expedition.

It was ensured that each member had a dental check before leaving. Apart from serious injury, it is this sort of thing that can have the most debilitating effect on the functioning of an expedition. Barrier cream was taken as was lip salve but even though we had many long periods of bright sun on the glacier it was rarely necessary to use it. A cheap Boots lip salve was found to be very useful at times when there were strong winds as well as the sun.

NOTE ON CAMPING ON SNOW AND GLACIER ICE

Camping on snow in fact presents few problems, especially on a flat glacier. However, as the tent cannot be dug into a slope it means that all the guys must go to ground level. Aluminium 'T' and 'angle' snow stakes 24" (61cm.) and 36" (92cm.) were used and found to be good. 'Dead men' were not tried but it is thought that under these conditions they would have pulled out due to the angle of the guy. As the snow is not very deep they are not easily buried. Normal tent pegs are not much use though the plastic pegs from PTC were surprisingly good. They can be hammered, even in bouldery ground and are highly recommended. When first pitched, Glacier Camp was on about $\frac{1}{2}$ m. of snow. At that time the ablation rate was relatively low and the camp stood for about ten days on the same spot before being moved. When the snow had almost ablated a space was cleared on the ice itself. As we had no experience of camping on ice a number of fixing methods were tried. Ice crews were very little use especially if windy. Ice pegs held for a time (perhaps a day if not subjected to strong winds) but they too suffered from pressure melting causing them to heel over. By far the best method was to drill a hole with the mechanical ice drill to a depth of about a metre and then insert part of a wooden stake. The guys were then tied off on the stakes. For details of the stakes and drill see the scientific report. With a tent such as the Arctic Guinea having a number of guys at the side, one solution is to drill the corner stakes well, then to secure a horizontal stake to these and the guys are then tied to this as usual.

Another great problem encountered was that of the differential ablation rates of bare glacier ice and ice protected by a tent. At the height of summer it became necessary to move the tents to a new spot perhaps every four days though this time increased to about a week near the end of August. The mound of ice under the tent not only restricted the amount of room and height in the tent but imposed a great strain on the snow valence of the Arctic Guinea. This is not helped by the A-pole construction not being in sleeves. The press-studded front flap in the tent is more a hindrance than a help in that it can rarely be fastened and cold draughts penetrate. It also means that the tent is not waterproof (even by keeping the door off the ground which is the normal procedure). Twice we were nearly caught by a rising water level as the small cracks and crevasses failed to take all the meltwater or rain. Extensive drainage ditches had to be dug to save the situation. It was purely luck that we camped on the highest part (by $\frac{1}{4}$ m.) in the area. The most awkward time is when the snowline is retreating from below and before the supraglacial drainage system has time to become

established. If the drainage can be assisted in its paths before disaster strikes it is as well to do so.

Keeping warm when camping directly on ice was also a problem. Generally air beds were used though one member had a foam rubber mattress. This was quite effective though suffered from condensation; they are also not much use if they become saturated. A new type of mattress uses cellular ethyl vinyl acetate. This is flexible and being composed of non-connecting air spaces will not get soggy. They are thinner than the conventional foam and are nearly as comfortable. Such mattresses can be obtained from Graham Tiso. However, both mattresses suffer the disadvantages of bulk. None of this type was used on the Expedition though praise for them has come from a Greenland Expedition.

An air pillow was very useful for kneeling or sitting on, especially when first getting back to camp and lighting the stove for a brew.

One member had his home-made pair of duvet boots. These were in great demand especially by the cook of the day. Though not completely waterproof they can be used on snow for just popping out of the tent. Their greatest value is in giving freedom of movement without getting the feet too cold.

Finally, some recent details of advances in tent design and construction material. Nylon would seem to have a lot of advantages over even Ventile as it is both strong and light. The condensation problem can be avoided by the use of an inner tent, giving an integral construction. Brighams of Manchester are experimenting with this idea and the initial problems have largely been overcome; they hope to have such a tent commercially available soon. We hoped to have one of their experimental designs but in the event this was not possible. It could be that the use of glass fibre poles, 'Velcro' fastening material (which is in fact already used) and plastic 'Bulldog' type pegs will become common practice in the near future. Unfortunately, this is likely to be at a higher price compared with those of today but will undoubtedly be worth it, giving the strength and resilience of high altitude tents with low weight and bulk at relatively lower cost.

The Expedition would like to thank the following for their assistance:

A B C Polythene Ltd.	Izal Ltd.
Arnold Packaging Ltd.	Kimberly-Clark Ltd.
Atlantic Metal Co. Ltd.	Lacrinoid Products Ltd.
Bahco Condруп Ltd.	Mander Paints Ltd.
Biro Bic Ltd.	Mentmore Manufacturing Co. Ltd.
Brillo Manufacturing Co. Ltd.	Packall
British Tissues (Dixcel) Ltd.	Pneumatic Tent Co.
British Vacuum Flask Co. Ltd.	Prestige Ltd.
British Visqueen Ltd.	Proctor and Gamble Ltd.
Bryant and May Ltd.	S O M Plastics Ltd.
Carr, Davy and Martin Ltd.	Sellotape Products Ltd.
Casey's Camping Ltd.	Supreme Plastics Ltd.
Ellis Brigham	Transatlantic Plastics Ltd.
Goodyear Type and Rubber Co.	Tupperware
H J B Plastics Ltd.	Turner Whitehead Industries Ltd.

INSURANCE

Insurance of the members and all the equipment was obtained through the National Union of Students.

REPORT ON GLACIOLOGICAL AND GEOMORPHOLOGICAL WORK CARRIED OUT ON THE EXPEDITION

Most of the items proposed for study in the pre-Expedition report were carried out successfully. Further details will be given in the Scientific Report of the Expedition to be published in 1970.

The items covered in this report are given below:

Glaciology

Introduction: Choice of glacier, Glaciers of Lyngen, Summary of work.
Topography: Strupbreen and Koppangsbreen, General remarks.
Morphology and Classification: Area/altitude relations, Glacierized limits.
History of study and areal variation: Early observations, University of Durham 1956/7.
Retreat of snout, Downwasting and volume loss, Evidence for past extent.
Velocity: Velocity vectors etc. Ice flow, Crevasse systems, Ice volume.
Surface features: Cryoconite holes, Algal pits, Moulins, Drainage and subglacial drainage.

Glaciometeorology

Aims etc.: Station descriptions, Equipment, Techniques.
Results: General summary of observations.
River Discharge: General comments, Discharge measurements, River cross-profile, Discharge variations, Sediment transport.
Other phenomena: Firnline variation, Differential snowlines, 'Fohn' winds, 'Ice bankings'.
Strupvatnet: Past history, History inferred from maps etc., Present size and position, Water leakage, the 1969 Jokulhlaup, Lake levels and water discharge measurements, Conclusions.

Surveying

Plan of survey: Basic control points, Base line.
Instruments: Equipment used and comments.
Velocity Studies: Resection programme, Practicalities.
Surveying conditions: Refraction, Shimmer, Accuracy, Use of radios.

Geomorphology

Past work in the area: Durham Expeditions.
Moraines: Ice cores, Chronology.
Other phenomena: Rock knolls, Screes.

Further work in the Strupbreen/Strupskardet area

Glaciology

Glaciometeorology

Geomorphology

Appendices

Details of survey control stations.
Notes on useful equipment for the area.

Acknowledgements

References

CLIMBING REPORT

Though the main aims of the Expedition were wholly scientific some climbing was done by members of the glaciological group. Of these, three had experience of climbing in the Alps and a further two had wide British experience. As mentioned elsewhere, though Strupbreen is a large glacier it is relatively safe to travel on. The area of longitudinal crevasses near to the lake requires a little care at the beginning of the ablation season and certainly the crevasses of the icefalls above the plateau demand respect but should not prove very difficult to someone with a bit of Alpine experience. Knowledge and experience of crevasse rescue techniques is, of course, essential. Route-finding ability is valuable as most of the difficulties can be avoided. The accompanying map shows the best routes for some of the climbs as in 1969. Because the amount of ablation that year may have been abnormally high other routes may be equally safe but follow a different line. It is hoped that they do give some indication as to the best ways of approach.

The rock is gabbro and, like that in Skye, gives magnificent peaks linked by knife-sharp ridges. These ridges give very fine traverses. Unlike Skye, however, the rock (though firm in itself) is more shattered and inclined to be loose. This is due to two factors; the climate is less equable and therefore more prone to freeze-thaw wedging off of fragments and the routes themselves are either new or very rarely done. Sometimes the dangers are obvious but all holds should be well tested. Pegs are sometimes useful and a number of 'Clogs' and 'Moacs' are valuable. Crash-hats are desirable even on the easiest ridges.

It might be pointed out that there are vast possibilities still untouched for the keen boulder trundler. There are many fine situations for this, one of the best is at 'Brooklands'. There are unsolved problems in this activity too, probably the most outstanding overlooks the glacier and the lake just to the east of the Lake Camp. Even the efforts of the whole Trundlers Convention 1969 failed to shift it. A hydraulic jack may succeed though purists will frown at this.

The snow and ice possibilities are poor in comparison with those on rock. The long hours of sunlight turn many slopes into snow plods. Perhaps excitement may be had in some of the higher gullies late in the season. There are no obvious problems existing here.

Most of the routes were free from objective dangers, other than that of

bringing down stones whilst climbing. Natural stone falls were few. No snow avalanches were seen in the summer period.

There are several possibilities for new rock routes in the area, some of a fairly high standard though it would probably not be worthwhile going solely to do hard routes. The area does give ample opportunities for relatively easy rock climbs and magnificent 'alpine' ridges. The standard guide book to the area is "Mountain Holidays in Norway", (referred to below as MHN), published by the Norway Travel Association, Oslo; obtainable from the Norwegian National Tourist Office 8/- (1968) paperback. This has been completely revised though will again be a little out of date now. Other than this there is little written about the area. There have been several expeditions to the area in the past and in 1969, as has been recorded elsewhere, the Manchester Grammar School group as well as a party of German climbers. The latter party put up a new route (said to be about Grade III) on the North East face of Store Lenangstind. No further details are available. Mention is made in "Mountain Holidays in Norway" of the confusion in names of some of the peaks with the use of the 1956 1:50,000 series maps. Indeed, we found it rather confusing from the map, for example, the name Store Struptind is given to what is, in effect, a rather insignificant peak. It is hoped that the route descriptions with the aid of the map and the route book mentioned above will not be too confusing.

Notes which try to clarify the peak nomenclature are included in this report.

Routes Climbed: 1969

STORE KOPPANGSTIND

Two routes were climbed on this mountain. From the upper part of the Strupbreen there is a very large diedre. Under certain lighting conditions this face in fact looks like one slab though it is composed of two walls.

West Face: Route One

On the first ascent the groove could not be started direct because of the condition of the snow which forms a ramp up to the corner. (Later in the season this slope had reduced very considerably in size). The route was started some 20m. to the right of the groove at a ledge just to the right of a corner. Climb up left and mount a short stubborn wall (one peg-VS), then straight up to a ledge overlooking the main groove. Traverse into the groove

and either climb the chimney in the back over an overhang or go up a steep slab on the right. These alternatives merge below the second overhang. Layback round this (VS) to a good stance above.

Continue up the groove which is now easier, until it steepens again. Above this the groove was set, smooth and very steep and was quitted in favour of an ascending traverse to the right. After this the edge of the slab was followed as closely as possible. Interesting but not very difficult. About $2\frac{1}{2}$ hours from the snow to the ridge.

First Ascent: R. Griffiths, A. G. Fowler.

Route Two

The route takes some challenging cracks on the left wall of the big diedre.

Start up the diedre and after about 15m. traverse 15m. left. The height that this traverse begins depends on the snow at the bottom. The traverse leads to the main crack line up the face. After about 20m. the rock deteriorates badly and care is needed. Once a small overhang has been passed the quality of the rock improves and the main difficulties are over. The rock becomes rougher higher up and gives pleasant climbing with very good friction. The crack finishes on the ridge of the Durham North Face route and this may be followed (scrambling with some short pitches up to Severe) to the summit of Store Koppangstind.

4 hours.

The best descent route seems to be down the W. ridge and down the snow-slope which comes close to the ridge. Then continue to the glacier.

First Ascent: R. Griffiths and I. L. Hepworth.

Point 1120m. (661 315)

Opposite Koppangstind on the other side of Strupbreen a point (1120m.) sends a spur into Koppangsbreen. This is very prominent from the upper part of Strupbreen. The ridge gives an interesting climb of reasonable standard. Grade 3.

Start at the lowest rocks. A few pleasant pitches to the left of the crest lead to the first gap. The steep wall beyond was avoided by a traverse to the left and some steep grooves (V. Diff.) lead to the crest. The line of the ridge is followed past a few tricky pitches (Severe - which can be avoided in part) to a prominent tower. Abseil into the gap and climb the slab opposite

over some loose flakes to a crack on the right (awkward start). Continue up this to the next tower (S). Higher up is another good slab.

A gap in the ridge where it levels was avoided on the right and the crest followed to the highest point.

Descent was by continuing west past a short knife-edged ridge to a snow col. About three hours for the traverse.

First Ascent: I. L. Hepworth, A. G. Fowler.
For the most part the route was soloed with alternate leads otherwise.

Tafeltind was ascended direct from the upper part of the glacier up a broken loose wall. This was mainly for a reconnaissance of a prominent tower on the west ridge.

Contrary to the guide book it is no longer possible to glissade down the north side. Descent was by the north ridge avoiding the final steep section by a glissade to the south.

Unnamed Tower: North Face: 130m. Grade 4

This is the tower mentioned above, G.R. 644 321 which can be seen from the upper part of Strupbreen.

Roughly in the centre of the north face is a steep groove. The route starts in a small corner about 30m. right of this and follows the weakest line upwards until an overhang is encountered, at about 80m. A traverse left over loose rock is made to a series of mantelshelves up to a corner. The groove above is then followed to the top.

The descent was made by scrambling down to the ridge in the direction of Tafeltind followed by a short abseil to the col and a longer abseil to the bergschrund which was easily crossed without axes.

First Ascent: R. Griffiths, I. L. Hepworth.

Time: 4 hours.

Vestre Struptind (653 341)

The ascent was made by the south east couloir which is broad in most of its length. The bergschrund was crossed directly and a steep wall ascended. Above it the snow slopes were quite easy and lead to a rock buttress to the right of the upper part of the slope. Easy (II-III) climbing and scrambling lead to the summit.

First Ascent: W. B. Whalley, R. Griffiths.

Time: 4 hours.

The descent was in mist and first went to the west to the top of a snow slope. This was descended but is not recommended. This south couloir is about as steep as the ascent route in fact! It probably had not been previously ascended.

Care was required through the crevasses of the ice fall and, though it does not look feasible from above, it should be possible to by-pass them to the north near the rock buttresses.

Store Struptind (669 348)

The route climbed was up the ridge running south from the summit. Grade 3.

This is an interesting climb on good rock. The first half is easy until the first steep step. This was climbed direct up the edge (S). The next step can be avoided by a traverse right over some flakes to the corner. All pitches can then be taken direct including the loose looking red wall high up the ridge. This then leads to the summit.

First Ascent: A. G. Fowler, A. M. Metcalfe (varied leads).

Names and positions of some of the peaks in the Strupen area:

As is mentioned in the booklet "Mountain Holidays in Norway" (MHN) there is some confusion over the names of some of the peaks in the area. Information from the Norsk Geografiske Oppmåling has helped to solve the problem in part. They point out that as in many other mountainous parts of the world the same peaks are known by different names according to which side of the mountain one is looking. The names on sheet 1634 III are correct as seen from Lyngen (i.e. Lyngseidet) area. Thus the names as given on this map should stand. This in fact only partly solves the problem as there are several peaks which are not named and which are the dominant ones rather than those easily seen from the fjord.

Such peaks have been given names in this report to make differentiation clear. The map names are not changed and only magnitude or directional adjectives have been added. On the maps in this report they are given in italics. In addition there is a list below with the positions and heights of these additionally defined peaks. It should be stressed that they are in fact not official names. Justification for some of these changes is given below.

The name store Struptind on the map covers a group of three summits in the west of Struptindane. Presumably the actual store Struptind is at 669 348 (approx. 1245m.). However, the most dominant peak is at 654 341

(approx. 1565m.). This peak is probably hidden from the fjord and also from the Ullsfjord side by store Lengangstind (1596m.). In MHN it is referred to as Strupentind and mentions that it was climbed by Guy Barlow. We found this in fact to be so. To avoid confusion it has been termed vestre Struptind here.

The peaks to the north of the glacier dammed lake are distinctly named on the map though there is some confusion here too according to the descriptions in MHN. This seems to have been the result of descriptions from the 1956 and 1957 Durham Expeditions. Firstly, it is proposed to give additional names to those which are prominent but are unnamed on the map.

Of the Stovelfjellet the most westerly peak is called Støveltind (1306m.). However, the most dominant is in fact the higher summit to the east (1464m.) at 693 367. This peak is here called store Støveltind as it is still part of the Støvelfjellet and overlooks Støvelbreen. In addition it is higher than that at 682 367.

Store Reindalstind (1334m.) to the north east has no counterpart called litle. Perhaps the point at 702 372 should be given this name.

Secondly, using this nomenclature it is hoped that the following will makes the notes in MHN clearer. On page 165 Reindalstind is correctly named as north of Støvelbreen and of 1334m. It has not been checked whether this was the mountain climbed by Hastings and Hogrenning from Lyngenfjord (presumably and not Strupenfjord; sic). However, the mountain climbed by Aitkenhead and Sharrat was store Støveltind (1464m.). This is confirmed from the Expedition report where store Støveltind is named as Reindalstind. Thus on page 166 the three paragraphs headed by the word Reindalstind should read store Støveltind. In the fourth paragraph mention is made of 'Reindalstind's E ridge' and this is again presumed to be the east ridge of store Støveltind, which indeed has many pinnacles. But the next sentence states that Austre Reindalstind lies at the head of this ridge. The height given after this peak (not named on the map 1634 III) is "0930m?" even though this spot height occurs on the end of the ridge of store Reindalstind as marked. The party consisting of Aitkenhead, Burrough and Tarney climbed a mountain of this name according to the guidebook but it is thought that this was on the eastern ridge of store Støveltind. The same party also climbed the minor peaks of Sybilstind and nodre Sybilstind "...which lie on the ridge running NNE from near the main summit of Reindalstind." By this it is thought that they are on the ridge running from store Støveltind to store Reindalstind as marked on the map. If the name litle Reindalstind is given to the point at 702 372 then perhaps this is the same as nodre Sybilstind. It may be that the peak called austre Reindalstind in MHN is the same as store Reindalstind because the point

930m. is both very low and insignificant.

The last point to clear up is in the same paragraph on page 166. This refers to Støveltind (1306m.), which is correct but it is there given the name of Oxaltind too. This name is not given on the map. The Durham Expedition report gives a new route on the north face of Axeltind and the height of the mountain as c.1368m. In MHN the Durham route is described as being on Støveltind, this is not so. The only peak which in fact fits the description of being the second highest peak on the ridge and opposite Lenangstind (Lenangenstind) is that at 654 382 at about 1280m. This also fits the fact that the party were able to return to Sør Lenangen along the ridge.

It is hoped that these notes will help clear up some of the identification problems in the area.

List of additionally defined names for peaks in the Strupbreen area.
Grid references are from the AMS 1:50,000 map:

Vestre Struptind	c.1565m.	654 341
Store Støveltind	1464m.	693 367
(Little Reindalstind		702 372)

PHOTOGRAPHIC REPORT

It is an important part of an expedition's work to record the area and type of work carried out as much as possible. The photographs will be of great use for future expeditions, and for exhibiting the results in reports and lectures. In addition to still work, a cine film of the Expedition was made.

The Expedition was fortunate to obtain assistance with the supply of film from Kodak. The film was collected at the port of departure, and consequently no purchase tax was payable.

Several types of camera were used. Both Ilford FP4 and Kodak Plus-X black and white film were tried, and were satisfactory. Black and white was used mainly for taking photographs of habitats, the area and aspects of town and village life. A 360° pan of the area around the Biological Camp was taken from Forhåltakså. It is important to consider the position of the sun when taking these shots.

Throughout the Expedition, many good photographs were taken between 3 and 6 o'clock in the morning while the midnight sun was present.

Colourwise, Kodachrome X and Agfacolour were preferable to Kodachrome II because of the faster speeds, but Kodachrome II was sufficient at the beginning of the Expedition when the light intensity was greater, particularly at night, than in the later stages.

A U.V. filter proved to be of value in shots of the glaciers around the Biological Camps. One photo taken of a glacier with a filter, and immediately after, with same settings, a second photo taken with another lens without filter. No contrast on the second photograph; the structure of the glacier and the surrounding rock not visible as in the first photograph.

Colour transparencies were taken covering every aspect of the Expedition - work, camp-life, travel, scenery, members, animals, etc.

A collection of both black and white, and colour photographs will be deposited with the Expedition Society at the University of Leicester.

In addition, a cine film of the Expedition was made. One camera recorded the life at the Glacier Camps, while two covered the happenings at the Biological Camps. A fourth camera wandered around the area with the Leader. Over 2000 feet of film was shot with some very interesting results. Kodachrome II was used exclusively. Film taken at midnight with sun out

proved very successful, but in the actual film must not be over done. The film has been split up into sections recording the packing up before departure, travelling to Lyngen, setting up camps, camp life and domestic duties, and the major part concentrated on the scientific work. Some slow motion filming of birds in flight was particularly successful. A commentary and background music has been added to the film.

UNIVERSITY OF LEICESTER EXPEDITION SOCIETY

One of the aims of the Expedition was to establish an Expedition Society at the University on return. The Society has been established to encourage, promote and organise scientific expeditions.

An encouraging start to the Society is a small expedition organised by Glyn Collis to the Monach Islands in West Scotland.

However, for 1971, greater plans are in mind.

BRATHAY FIELD STUDIES CENTRE

Christopher Hayman attended a course organised by the above during the summer of 1968 (about seven days). During the day, aspects of surveying were learnt and put into practice. A tarn was surveyed as well as a set of sand dunes. In the evening, discussions on the organisation of expeditions took place. Much useful information was gained, and the course is very highly recommended.

The Expedition would like to express its gratitude to both Brian Ware and Michael Mortimer of the Centre for their assistance and encouragement.

JAEGERVATNET CAMP

Position and characteristics of site

Full map reference: 34 WDC 594393; Map Series M711 Sheet 1634 IV Edition 1AMS

The camp was situated on an 'island' of moraine or raised beach well overgrown with heath, near the edge of the bog that lies between the southern end of the Sor Lenangen Fjord and the northern shore of the Jaegervatnet Lake, near to the river Strupskardelva.

The site was as well drained as could possibly be expected, never developing into a quagmire normally expected after camping for ten weeks in one place. The bog surrounding the camp did, however, become much wetter after rain.

Water was obtained from the nearby river which throughout our stay never became so laden with glacial silt as to make it undrinkable. There was a fair amount of dead wood within gathering distance of the camp, though it was scattered. The nearby lake, Aspevatnet, was found to be excellent for bathing. Cloud-berries grew abundantly on the bog, and when well cooked made an excellent addition to our diet. Apart from vehicles passing fairly frequently along the road, and cars often stopping to look at us, the local people were often seen picking cloudberries on the bog or walking up the river to fish for sport, especially at weekends. (We caught no sizable fish in the river or Aspevatnet). Once or twice we had visits from local people coming into the camp for a chat.

Access by road

The site was about 200m. south of the road from Jaegervatnet to Sor Lenangen. This road is not marked on the map quoted above. It joins the track following the east shore of Sor Lenangen, and the road between Jaegervatnet and Lenangsoyra. The whole of this latter road has also been made up, as has the Jaegervatnet to Sor Lenangen road which continues as a made up road along the east side of Sor Lenangen and northward all the way to Nord Lenangen.

Nearest villages

Jaegervatnet is a village on the east shore of Ullsfjord where the lake Jaegervatnet flows out into the Fjord. Here there was a post office, telegraph station, and a shop. The steamer stop marked on the map is now discontinued.

Sor Lenangen is a village on the east shore of the Sor Lenangen Fjord, at the bottom of the Reindalen valley. It has post office-cum-shop, and a telegraph station. Again the steamer no longer calls.

Lenangsoyra is on the west shore of the Sor Lenangen Fjord, nearly opposite the village of Sor Lenangen. It has a post office, telegraph station and two shops. There is a jetty used by local fishing boats.

The shops in these villages provided a fair range of foodstuffs. Although virtually all the food for the Expedition was taken from England, fresh eggs, milk and bread were occasionally purchased as treats. Mail for the camp was sent Poste Restante to the post office at Jaegervatnet. Buses ran daily past the camp site, to and from Svensby, from where it was possible to get to Lyngseidet, or via the ferry across Ullsfjord to Tromsø.

Surrounding Area

The camp site was ideally placed for access to Strupskardet and adjacent areas, the shores of Sor Lenangen, the bog of Stormyra and the shores of Jaegervatnet.

Sor Lenangen Fjord is shallow and a large area of mud is uncovered at low tide. The mud proved safe to walk on. The bog of Stormyra could also be traversed fairly easily with reasonable care. The fastest route south from the camp was along the side of the drainage ditch marked on the map. Alternatively, the bog could be skirted using the higher ground on its east side. Otherwise, the road could be followed.

Most of the rivers in the area could easily be crossed in many places, although crossing places were slightly hard to find on Strupskardelva below Blavatnet; and on the lower parts of Stortindelva, at the southern end of Jaegervatnet lake.

The shores of Jaegervatnet and the west side of Stormyra bog were fairly well wooded, mainly by birch with some willow. Trees are more scattered at the bottom of Strupskardet and the east side of the bog. Conifers are protected by law.

Some form of water transport, preferably a rubber dinghy, would have been extremely useful on Sor Lenangen Fjord and Jaegervatnet. An extremely light, one-man craft, capable of being carried inflated, would have been useful on some of the bog pools.

The floor of Strupskardet was almost entirely boulders. Tverreldalen on the other hand is more overgrown. The north-west side of Strupskardet is

probably the easier route up that valley. A route through Tverreldalen or along the ridge of Forholtaksla is a better approach to the valley of Forholtdalen than along the east shore of Jaegervatnet. From the top of Forholtaksla a very good view of the area can be obtained. Photographs of the bog from here are useful to pinpoint the position of bog pools relative to the whole bog. After a period of rain, the picture of the bog from here changes markedly.

Other Areas Visited

Veidalen is the valley running parallel with and to the south of Reindalen which is behind Sor Lenangen. The river Veidalselva flows through it into Sor Lenangen. The valley is virtually continuous with that of the river Olderselva running parallel with Veidalselva. The two valleys are separated only by a moraine. The upper parts of the two valleys between the lakes of Veidalsvatnet and Oldervatnet form a basin, the floor of which is covered with large boulders. The Olderselva side of the two valleys is noticeably more covered with vegetation than the northern Veidalselva side. The twin valleys can be reached either from the road (Veidal is about two kilometres south of Sor Lenangen, or over the col between Stortuva and Botnfjellet GR 623410.

The Lenangsoyra peninsula is more or less completely covered with vegetation, much of it wooded. It is possible to walk right round the shoreline. The roads are as marked on the map except that the track between Ravik and Lattervika on the west side of the peninsula is now made up.

Forholtdalen is the valley down which the river Forholtelva flows into the east side of Jaegervatnet. The Forholtelva is fed by the glacier Forholtbreen. There are crevasses in the glacier which indicate that it is still moving. The glacier carries a large amount of debris. About 50m. below the glacier is a lake (map altitude 480-500m.). The south side of the lake was covered with boulders, and the north side was a sheer rock face. The only vegetation around the area was lichens, mosses and the occasional vascular plant. The lake reached westward right to the top of a 250m. high rock wall down which the outflow from the lake passed as a waterfall. Either side of the rock wall was steep, unstable scree. At the bottom of the rock wall the river flows across a silt deposit thickly vegetated with saxifrage and into another lake (map altitude 239m.). The southern side of this lake is more vegetated than the northern side. The lake is dammed by a moraine, through which it flows out over boulders. To the west is a smaller subsidiary

lake, slightly lower in altitude. Below the moraine, trees appear, getting thicker lower down. On the northern side and running parallel to Forholtdalen is another valley at a higher level. At its head is the glacier Trollbreen which is little more than a corrie ice patch with no crevasses and probably static. Water flows out from under Trollbreen, down under scree to the north of the rock wall and into the 239m. lake near its outflow, where the higher valley drops into Forholtdalen.

As mentioned earlier, the road to Nord Lenangen is now made up. As well as that marked on the map, there is a road to the post office-cum-telegraph station at GR 679561. Adjacent to the shop is a jetty. From timetables in Tromsø it appears that a steamer service still serves Nord Lenangen. There is another shop and a petrol station at Straumen, about two miles south of the jetty, where Nord Lenangen is bridged. The track to here from the jetty is now made up but the track across the peninsula to Eidstranda is not. The road from the bridge on the east side of the Fjord is also made up, but not beyond a position approximately opposite the jetty. North of this only the track continues.

Access to Nord Lenangsbøtn at the southern end of the fjord is more difficult. It can be reached from Sor Lenangen up Bjorndalen over Vassdalsskardet and down Vassdalen. Alternatively, one can follow the shore of the fjord south from Nord Lenangen. Probably the best approach is by boat along the fjord.

The west side of the valley above the fjord is more wooded than the eastern side. The wood is most dense lower down, the trees thinning out higher. On the east side the screes are steeper and reach lower. At the southern end of the fjord, the valley floor is well covered with vegetation, though trees are only scattered. There are areas of bog here, and old abandoned fields. It seems that now, however, the locals only visit the area to fish for sport and pick cloudberries. They come from Nord Lenangen down the fjord by boat.

Camp sites abounded on the west side of the fjord between the trees and shoreline. Driftwood on the shore was abundant and there was some dead wood amongst the trees. Water was available from innumerable small streams running down to the fjord. Cloudberries were particularly abundant at the southern end of the fjord.

LYNGSDALEN

An Expedition from the University of Aberystwyth was camped in Lyngsdalen valley. Six of us visited the camp and studied the valley from 1st to 4th August.

Lyngsdalen is a steep sided U-shaped valley running east-west in the southern half of the Lyngen Peninsula, approximately ten miles south of Lyngseidet. At the western end of the valley are mountains rising to 1400ft., principal among these being Jiekkevarri. Glaciers feed a large fast flowing river, which drains into Lyngen fjord at the eastern side of the Lyngen Peninsula. The rock of the area is typically gabbro and garnetiferous schist.

At the western end of the valley is the village of Furufalten. It has a post office, a shop, and is on the bus route that passes along the coast road. There is a wire-netting factory in the village and associated with this is a large concrete jetty. A number of small fishing boats are anchored and cod and coalfish are plentiful in the fjord to supplement Expedition food! Farming appears to be the main summer occupation of the villagers, but there is a scarcity of land flat enough for grazing cattle and making hay. The farmers take advantage of the steep valley sides by sending the hay directly from the high fields to the barns, on long wires stretched between the two.

The Aberystwyth Expedition was camped very close to the village, in a small wood beside a hay field, and were able to drive their lorry right to the camp. They had at first obtained drinking water from the river, which flowed some way below the camp, but at least during July and August this was very 'milky' with rock flour and they obtained water from a small stream about ten to fifteen minutes walk to the west of camp. A track led past the camp and all the way up the valley beside the river. It was frequented by locals; and overall the situation led to far more contact with the Norwegians than we encountered at our camp.

The land was also far more influenced by human habitation than that around Jaegervatnet camp, consisting of tracks, areas of small woodland and grass meadows with areas of dwarf juniper full of vole runs and in which a pair of meadow pipits was found nesting, and occasional small rocky outcrops from which grey-sided voles were caught. This was flanked by the steep valley sides, which were grass covered with a few trees, small scree slopes, streams and occasional waterfalls. Higher up the valley the land became wilder and at one point the river split up to create a boggy area on the valley floor.

The flora and fauna were very varied and considerably different from that around J.C. It was particularly rich in Coleoptera. The bird life was more typical of an inhabited area. The village itself was inhabited by a very large number of magpies. A number of the bird species seen were also seen in the area around J.C., although dominant species differed. The following species were seen only at Lyngsdalen: Black Throated Diver, Common Terns, Razor Bill, Chiffchaff (which was very common, though at the limit of its range), Redstart and Yellow Hammer.

On the whole the valley offered a convenient and interesting area for study, being very rich in life, with easy access and extremely easy walking as compared with the boggy, rocky terrain around J.C. It contained a rapid transition from farm land to glaciers and bare rock, and considerable variation in altitude within a small area. However, we felt it was too influenced by human habitation to be suitable as the sole site of an Expedition.

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