REPORT OF THE SCIENTIFIC RESULTS OF THE NORWEGIAN EXPEDITION TO NOVAYA ZEMLYA 1921. No. 43.

B. LYNGE

LICHENS FROM NOVAYA ZEMLYA

(EXCL. OF ACAROSPORA AND LECANORA)

WITH XIII PLATES

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DET NORSKE VIDENSKAPS-AKADEMI I OSLO
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OSLO (KRISTIANIA)
A. W. BRØGGERS BOKTRYKKERI A/s
1928

A. W. BRØGGERS BOKTRYKKERI A/S

Introduction.

Some lichens have been mentioned more occasionally from Novaya Zemlya by several authors, who have written on other subjects, e. g. by VON BAER, the father of botanical exploration in Novaya Zemlya.

The first authors, who published special papers on the lichen flora of Novaya Zemlya, were TH. FRIES (1872) and STIZENBERGER (1872). TH. FRIES determined the lichens collected by the Norwegian student Aagaard, who had been a member of the ROSENTHAL-HEUGLIN expedition of 1871 in the steamer Germania (equipped by ROSENTHAL, under the command of HEUGLIN). TH. FRIES enumerates 56 different species, of which 11 species had not been collected in Novaya Zemlya, but in Waigatsch or in Russia at Jugor Shar.

STIZENBERGER determined the lichens collected by TH. VON HEUGLIN during the same expedition, in all 52 species, of which 36 were collected in Novaya Zemlya.

A compilation of these results is found in HEUGLIN's book of 1874 (see bibliography), where he enumerates in all 79 species, several of them obtained from Waigatsch or Russia and not from Novaya Zemlya.

During the WILCZEK expedition HÖFER collected some lichens that were determined by KOERBER in 1875. KOERBER enumerates in all 51 different species, of which 5 species are described as new.

During the Voyage in the "Isbjörn" to Novaya Zemlya in 1879 MARKHAM collected 13 lichens, determined by J. G. Baker (1881).

During the Danish Dijmphna Expedition in 1882—83 S. BORCH and TH. HOLM collected a number of lichens that were determined by DEICHMANN BRANTH (1887). This author enumerates 62 different species, but as it is a well known fact that his limitation of the species is very wide, this important collection contains a considerably larger number of species. Unfortunately no special localities have been recorded.

During the Russian expedition of 1882—83 KRIVASCHEJA collected 73 different species at Möller Bay, determined by KUSNETZOFF (1886—87). KUSNETZOFF also gives an enumeration of all the different species then recorded from Novaya Zemlya, a total number of 116. He compares this flora with the lichen floras of Ural, Lapponia, Scandinavia, Iceland, Spitsbergen, Northern America, Greenland, Northern Asia and Waigatsch. KUSNETZOFF is of the opinion that the lichen flora of Novaya Zemlya has arrived from Scandinavia. It is unnecessary to say that a bibliographical compilation, based on floras, which are in many cases very insufficiently investigated, must be of a limited value.

During the PEARSON Expedition in 1897 FEILDEN collected some lichens that were determined by VAINIO in 1898. The collection contains 27 lichens, of which 2 species are described as new.

V. P. SAVICZ determined 29 lichens collected in Novaya Zemlya by R. NIEMAN in 1903 and in 1908—09 (SAVICZ 1911).

The next year SAVICZ published a list of the lichens collected by R. R. POHLE in the northern regions of the European Russian empire. This list includes a total of 106 species, of which 40 species are from Novaya Zemlya (SAVICZ 1912).

In the same year (1912) A. A. ELENKIN and V. P. SAVICZ published a paper on the lichens collected by J. V. PALIBIN in 1901 in the Arctic regions. The Novaya Zemlya collection comprises 30 species.

In these 3 works the two authors have given many valuable systematic notes.

In a small, but important publication of 1927 A. H. MAGNUSSON records 104 different species of lichens from Novaya Zemlya (and from other parts of Northern Russia) collected in 1901 at Kristovii Bay (J. V. PALIBIN), 1904 at Belushii Bay (R. R. POHLE), 1906 along the Shores of the Arctic Sea (B. L. ISSATSCHENKO) and in 1908 at Malyje Karmakuli (N. A. SSIMANOVSKY). Of these species 38 (3 nov. sp.) were collected in Novaya Zemlya.

Larger collections than the ones enumerated above have been made by several Swedish botanists, KJELLMAN and LUNDSTRÖM during the NORDENSKIÖLD Expedition of 1875 and OTTO EKSTAM during several trips to Novaya Zemlya. Unfortunately these collections have not yet been worked up. They have been entrusted to me for determination and it was my intention to include them in my own report.

But it was found necessary to bring the "Reports" of our expedition to a final conclusion as soon as possible. I was therefore obliged to reserve this highly valuable Swedish material for a special publication. The work will be started as soon as possible. This publication will also comprise a certain part of my own material that has so far been inaccessible to me. Dr. ZAHLBRUCKNER kindly undertook the determination of the genus *Lecanora* and every stone containing a *Lecanora* was sent to him. This material also contains some other lichens than the *Lecanorae* and when it has been returned they will be determined, as far as possible.

A full history of our expedition and its route has been given by Dr. O. HOLTEDAHL, the leader of our expedition (Brief Account of the

Expedition. Norw. Nov. Zemlya Exp. 1921, No. 1). I have given some data on the more botanical side of our work in my book Vascular Plants from Novaya Zemlya (Norw. Nov. Zemlya Exp. 1921, No. 13).

We have worked at the following localities:

I. *The Southern Fjords:*

Goose Bay, July 3—6th.

Bessimyanni Fjord, Aug. 31st.

Gribovii Fjord: South coast Aug. 28th and 30th, Veselago Island Aug. 29th, North coast Sept. 2nd.

II. *The Matotchkin Shar district:*

Matotchkin Shar: Pomorskaya July 7—8th and Aug. 27th, At the foot of Mt. Wilczek with a visit to Mt. Lasareff on the south coast of the Shar July 10—11th, Near Tretyakoff Glacier 12th, Chalhonik Valley 13th, East of Cape Jouravlev 14th, At the foot of Mt. Syernaia 15th, Belushii Bay 16—19th, South side of the Kara Sea entrance 20th, Matotchkin Shar westbound (ice-difficulties, short visits ashore at Mt. Syedlho and at Vasnetsoff Glacier) 21—22nd.

Serebryanka Fjord July 23—25th and Sukhoi Noss 26th.

III. *Kristovii Fjord:* July 27th.

IV. *Mashigin Fjord:*

Point Basis July 28th, Moraines in front of Junior Glacier 29th, Mt. Dietrichson July 30th, Glacier trip to a nunatak east of Blaafjell Basin (Lacroix Glacier, on our map Norway Glacier) July 31st and Aug. 1st, Blaafjell River Delta Aug. 2nd, Blomster Bay and Mt. Tveten, 3—4th, Rækved Bay 5th, Dal Bay 6th, Strömsnes Bay and Mt. Golovin 8th, Fram Bay 10th, Sol Bay and Dal Bay Aug. 23—25th.

V. *Admiralty Peninsula:* Aug. 21st.

VI. *Farthest north:*

Rookery south of Arkhangel Bay Aug. 12—13th, Northern Kristovii Island 14th, Eastern Kristovii Island 15th, Lichutin Island 16th, Mainland east of Lichutin Island 17th, Berkh Island 18th and Pankratyeff Peninsula 19th.

Practically all the lichens have been collected in the lowlands and in the talus slopes. An investigation of the precipices and the mountains would have been very interesting, but unfortunately I am no alpinist.

These localities have been arranged in the same 6 main sections as in my work on the Vascular Plants of Novaya Zemlya (pag. 11). — We only spent a few hours at Kristovii Fjord (section III) and very few lichens were collected there.

At the time when the maps of our expedition were prepared (see HOLTEDAHL Brief Account, Norw. Nov. Zemlya Exp. No. 1) we had not been able to consult SOSNOWSKIJ: Матеріалы по изслѣдованію Новой Земли. Выпускъ I и II.

This work contains maps of Mashigin Fjord (l. c. vol. I, facing pag. VIII and vol. II, facing pag. 94), and we find that some of our names must be replaced by SOSNOWSKIJ's older, valid names. There is only one name of interest for my work: our "Norway Glacier" is identical with his "Lacroix Glacier". On his first mentioned map there is a (5) at our locality Rækved Bay (Drift-wood Bay) and a (6) at our Mt. Tveten and Strömsnes Bay. But as far as I can see SOSNOWSKIJ has not named these localities.

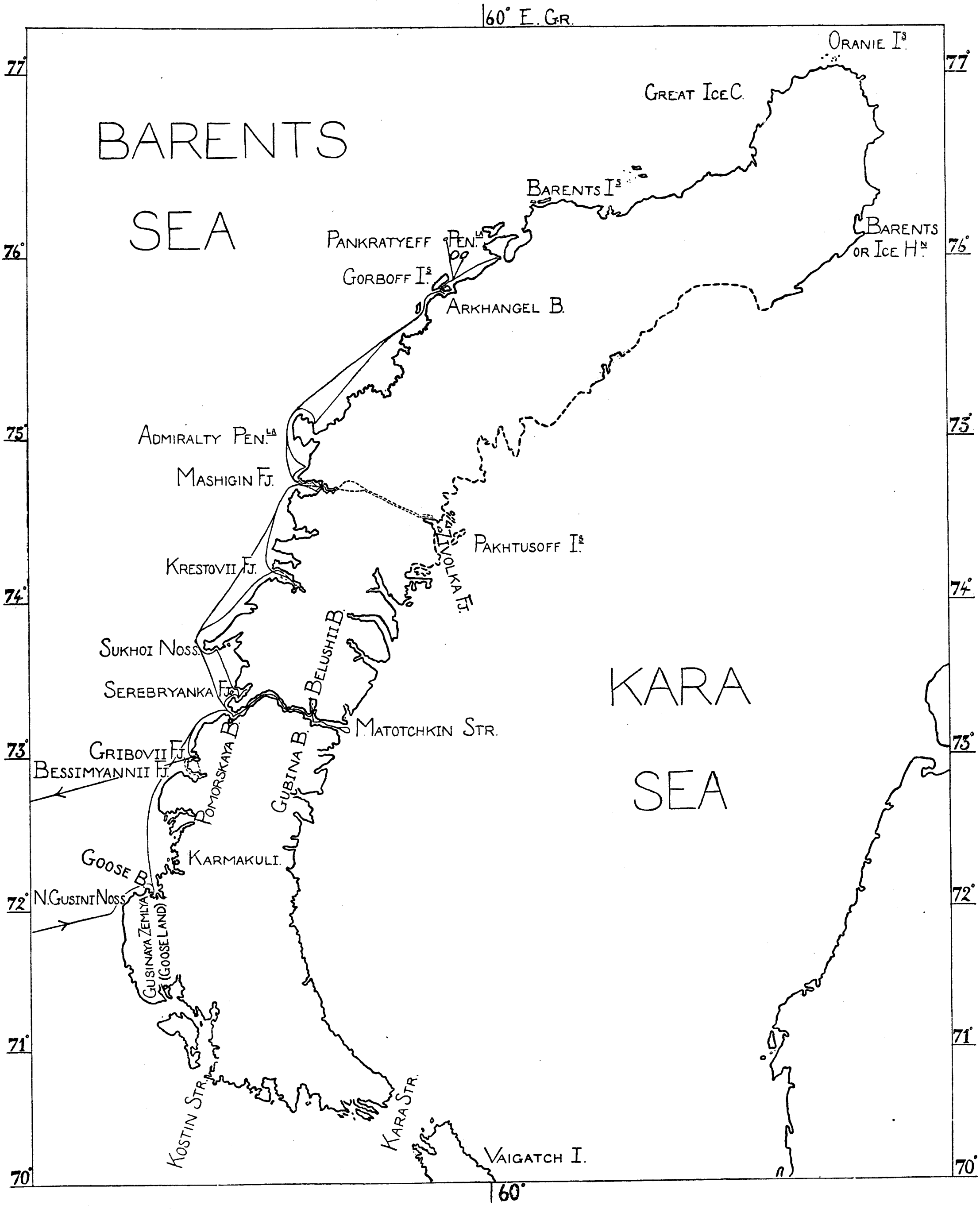
My lichens were prepared in the manner, which I have learnt from Dr. ZAHLBRUCKNER. Each plant and each stone or piece of soil with their lichens, were carefully packed into porous paper (newspapers are very suitable) and these parcels were put into bags of porous linen. The lichens must be moistened if they are dry and brittle, but in the Arctis this is hardly ever the case. The bags were dried over a stove or over a petroleum apparatus. This was absolutely necessary, for the air was never dry enough. The dried linen bags were stowed away in ordinary wooden boxes (empty provision boxes). I only lost the contents of one bag (from mould). That bag contained some peculiarly difficult earth lichens that had not been sufficiently dried. Otherwise my lichens are just as fine as if they had been collected at home.

The method was tested under still more difficult conditions. During a visit to Spitsbergen (Bell Sound) in July—August 1926 I only had a tent and an open boat at my disposal, and the weather was very rough, much rain, snow and fog. Yet the lichens came home in a perfect condition.

It is absolutely necessary to put each lichen (or very few plants together) in the porous paper. I have seen Arctic lichens simply filled into bags of different kinds or — still worse — into tin-cans or even in formaline or alcool, by which means they are generally effectively destroyed.

On my return the saxicolous lichens were directly mounted on our museum carton. The other lichens were moistened, pressed and dried before mounting, in the usual manner.

Owing to the favourable weather and the good organization of our expedition large collections were obtained. They have not been actually counted, but my estimate is about 7000 lichens and 3000 vascular plants. Considering the enormous amount of microscopical work and the many


60° E. Gr.
Oranie Is.
77°
Great Ice C.
BARENTS
SEA
Barents Is.
Pankratyeff Pen.la
Gorboff Is.
Barents or Ice Hn.
76°
Arkhangel B.
Admiralty Pen.la
75°
Mashigin Fj.
Pakhtusoff Is.
Krestovii Fj.
Volka Fj.
74°
Belushii B.
Sukhoi Noss
Serebryanka Fj.
KARA
SEA
Matotchkin Str.
Gribovii Fj.
73°
Bessimyannii Fj.
Pomorskaya B.
Gubina B.
Goose B.
Karmakuli.
N. Gusinii Noss
72°
Gusinaya Zemlya (Goose Land)
71°
Kostin Str.
Kara Str.
Vaigatch I.
70°
60°

difficult and critical genera it was found almost impossible to work up the collection alone. Fortunately I obtained the cooperation of two friends: Mr. A. H. MAGNUSSON, Göteborg (Gothenburg), who worked up my *Acarosporae*, and Dr. A. ZAHLBRUCKNER, who will determine my *Lecanorae*. Mr. MAGNUSSON's work has been printed in our "Reports", No. 34, and Dr. ZAHLBRUCKNER's work will be printed there as soon as we shall have received his manuscript. I am very happy to express my profound feeling of gratitude to these learned colleagues.

During my own work I have obtained generous assistance from many lichenological friends. If this work has any value it is largely due to their help and I wish to thank them most heartily for it.

My Swedish friends are from their own country familiar with alpine Scandinavian lichens and it is unnecessary to say how valuable their assistance has been. I have repeatedly visited Dr. G. O. MALME in Stockholm and discussed many difficult plants over and over with him. For the same purpose I have also visited Dr. G. EINAR DU RIETZ in Upsala and Mr. A. H. MAGNUSSON in Göteborg. I am greatly indebted to Miss A. L. SMITH in London (British Museum), Mr. HEINRICH SANDSTEDE in Zwischenahn, Dr. HERMANN ZSCHACKE in Bernburg and Dr. BOULY DE LESDAIN in Dunkerque, who have determined several critical plants and given much valuable information. I am also much indebted to my old teacher and friend Dr. A. ZAHLBRUCKNER for all the interest which he has always bestowed on my work.

Though our own herbarium in Oslo is rich in Arctic lichens it soon became necessary to visit other museums in order to obtain material for comparison. I have repeatedly visited Upsala, the old centre of lichenological research. A contribution from the Nansen fund enabled me to spend three months abroad in 1927, during which time the rest of my critical plants were discussed with colleagues in Germany, Finland and Sweden. This journey was especially valuable, for it gave me the opportunity of studying in the herb. NYLANDER in Helsingfors and of visiting Professor E. A. VAINIO, our grand old man of lichenology, in Åbo, Finland. Dr. VAINIO generously placed his enormous knowledge and much time at my disposal and his assistance with the difficult last rest of my collection was quite inestimable.

I am also much indebted to the directors of several museums who have been kind enough to lend me their types for comparison (Upsala, Copenhagen, Berlin, Wien, Leningrad).

Considering also the fortunate circumstance that an excellent library is at my disposal at home, I have had every facility of work. But yet I have often felt that the difficulties were great and that I was unable to solve many questions in a satisfactory manner. A lot of interesting plants were obtained in small numbers only, which gave me a quite insufficient information of their range of variation. Their relationship or eventual identity with other species, formerly described, could not always be determined with certainty.

If critical plants were simply referred to their nearest relations, the risk for positive errors would be diminished, but the scientific value of my work would be diminished still more. For this reason I have described several doubtful new species that may prove valid or perhaps not. When more material is available, we can judge better, and I am fully prepared for a reduction in the number of new species.

I have felt it important to distinguish carefully between such cases where I have felt certain and such cases where I could not fully convince myself of the best interpretation, and to express my doubts.

Arctic lichens are not always so well developed as the same species is in Norway or in other relatively southern regions (cfr. LYNGE Lich. Bear Isl. pag. 7). This necessitates much microscopical investigation. The spores, the colours of the hymenium, hypothecium and excipulum and to some degree the height of the hymenium are characters of high systematical importance, preserved even if the thallus is reduced beyond recognition.

It is therefore not always sufficient to mention the name of a lichen, even if the determination is supposed to be quite certain. It is desirable to know someting about its habitus in this region of the world, with its peculiar conditions of life. I have therefore added some observations on several species, as far as possible in a work of this kind, which is no flora.

My colleagues will perhaps criticize my limitation of the species for the reason that it should be too narrow (e. g. in *Caloplaca*). In this work I have found it natural to operate with "small" species. But I will reserve the right of a revision on that point for a later work of more comprehensive nature, which is in preparation.

Large Spitsbergen collections await determination. First the enormous collections of TH. M. FRIES (1868), next my own from Bell Sound (1926), and also some smaller, though important collections by my friends, JOHS. LID (Botanical Museum, Oslo) and OVE ARBO HÖEG (Videnskabernes Selskap, Trondhjem).

When these collections have been determined I hope that I shall be able to write an Arctic lichen flora of our own sector of the Arctis. For that purpose it would be highly desirable to obtain really representative collections from Eastern Greenland. We would then be able to discuss the important question of Western and Eastern Arctic lichens in the Scandinavian flora.

At present it is not possible to compare the lichen flora of Novaya Zemlya with that of other Arctic regions, as Spitsbergen and Greenland. Their lichen flora has as yet been too insufficiently worked up and the larger publications on the subject are old, with a wider limitation of their species. A comparision can only be based on comparable things.

During the preparation of this book I have obtained the highly appreciated assistance of

Mrs. JOHANNE KRAFFT LYNGE, who has drawn all the figures of my first 5 plates after the microscope,

Miss LILY MONSEN, who has done all the photographical work with the other 8 plates,

The director of the Geological Museum of Oslo, who has allowed us to use its excellent photographical equipment and

The leader of our expedition, Professor OLAF HOLTEDAHL, who has allowed me to reproduce drawings and photographs to an extent, that is not usual, but which has largely contributed to the good get-up of my book.

I wish to thank all of them most heartily.

Botanical Museum, Oslo.

17. 5. 1928.

Verrucaria (WIGG.) TH. FR.

1. (1). *Verrucaria aethiobola* WBG.

Verrucaria aethiobola WBG., sensu VAINIO Lich. Fenn. I (1921) pag. 27—37, ubi syn.

II. Matotchkin Shar: Chalhonik Valley, east of Cape Jouravlev, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.

IV. Mashigin Fjord: North side of Blaafjell Basin, Blomster Bay and Strömsnes Bay. North of the Mashigin Fjord entrance.

V. Admiralty Peninsula.

VI. Berkh Island. Eastern Kristovii Island.

Verrucaria aethiobola, as limited by VAINIO, is by far the commonest of all pyrenocarpous lichens in Novaya Zemlya. It is found in great abundance on hard rocks, slates and the like (not on chalk) that are at times irrigated by cold water. Such localities are ubiquitous in the Arctis.

WAHLENBERG created two species of this section, *Verrucaria aethiobola* and *margacea*, and NYLANDER added some species and varieties. The plants of this section have been very differently judged of by modern authors. ZSCHACKE has raised several types to specific rank (Mitteleur. Verruc. V. c. Süßwasserverrucarien, Hedwigia 1927). VAINIO on the contrary unites all of them into one species, which he divides into numerous varieties after the thalline development, the structure of the perithecia and the size of the spores (Lich. Fenn. I (1921) pag. 27—37).

Most probably my material contains some undescribed types. I have shown it to ZSCHACKE as well as to VAINIO, and either of them suggested novelties. But my experience on these difficult and critical pyrenocarpous lichens is not yet so great, that I feel inclined to attack this question. I have therefore thought it the most prudent to include my material under the wide name *Verrucaria aethiobola* and to reserve a sufficient material in our herbarium for future study.

The thallus of my plants is generally very thin, as usual in the Arctis; in several plants so thin that VAINIO suggested a new variety, perhaps even a new species, based on this character. Few plants only have a relatively thick thallus, it is then always cracked and aerolate. The size of the spores is very variable, or more correctly very different in different plants, e. g. 16—18×11—12, 20—25×9—12, 22—25×14—15, 27—33×13, 27—38×11—17 μ. Plants with the shorter types of spores (e. g. 22—28 μ) are by far the commonest in my collection.

VAINIO was kind enough to determine three variteties in my collection:

var. *primaria* VAIN.

Verrucaria aethiobola var. *primaria* VAINIO Lich. Fenn. I (1921) pag. 27 (ubi syn.).

IV. Mashigin Fjord: in a brooklet on the north side of Blaafjell Basin.

The thallus is thick (for the Arctis), rimoso-areolate, areoles 0.2—0.3 mm. Perithecia 0.25—0.35 mm. large, half immersed, with prominent apices, not depressed at the ostioles. Spores about 20×10 μ.

There is a parasite on this thallus: spores dark, 1-septated, not constricted at the septum, 10—12×5.5—7.5 μ. Dr. KEISSLER, Wien, has been kind enough to determine the lichen-parasites in my collection, but his work has already been printed. I have tried to determine this parasite myself: *Tichothecium gemmiferum*.

var. *griseocinerascens* VAIN.

Verrucaria aethiobola var. *griseocinerascens* VAIN. l. c. p. 32 (ubi syn.).

V. Admiralty Peninsula.

Habitually distinguished from the preceding variety chiefly by its paler, more greyish-brown colour, as suggested by its name. Spores in my plants 19—22.5×7.5—8.5 μ. Several other plants in my collection resemble this variety.

var. *verruculifera* VAIN.

Verrucaria aethiobola var. *verruculifera* VAIN. l. c. pag. 30.

VI. Berkh Island.

Thallus very thin, hardly visible to the naked eye, consisting of scattered, minute brown verrucose areolae. Perithecia considerably smaller than in the preceding formae: 0.2 mm. Spores 18—19×8—10.5 μ. — VAINIO said: most probably *verruculifera*, but miserably developed.

Aberrant plants:

1. f. *subumbrinula* LYNGE n. f.

VI. Northern Kristovii Island.

Thallus nigrescens, tenuis, areolato-rimosus, minute scabridus. Perithecia rotundata, parva, diam. 0.2—0.25 mm, excipulum integrum, fuligineum. Sporae 21—31 × 8—12 μ.

VAINIO suggested *Verrucaria umbrinula*, after its scabridous thallus. But that species has considerably smaller spores: 12—20 (9—26) × 5—8 (—11) μ. (VAINIO Lich. Fenn. I (1921) pag. 39).

Verrucaria aractina has more prominent, larger perithecia (0.3 —0.5 mm.), and much smaller spores: 14—17 × 6—9 μ. (VAIN. l. c. pag. 60).

I cannot find characters of specific value separating my plant from *Verrucaria aethiobola* in the wide limitation of VAINIO. He has also described a scabridous form of this species: var. *scabrida* VAIN. Lich. Fenn. I (1921) pag. 30. I have not VAINIO's type before me, and I do not venture to identify my plant with his after the description.

2. f. *oblongata* LYNGE n. f.

IV. North of the Mashigin fjord entrance, on a granitic, often irrigated rock, with *Lecanora flavida* a. o.

Thallus cinereo-fuscescens, opacus, circum perithecia ± verrucosus, varie rimosus, praeterea tenuissimus. Hypothallus ater inter verrucas saepe dispersas distincte visus.

Perithecia parva: diam. 0.2—0.3 mm, ad basin verrucis thallinis immersa vel semiimmersa, late protuberantia, nitida. Sporae parvae: 11—21 × (5—) 6.5—10 μ, saepe oblongatae.

Nucleus J rubescens.

Praeterea ut in *Verrucaria aethiobola* (sensu latiore).

It must belong to the *aethiobola*-section, but I do not venture to distinguish it specifically from this polymorphous species. ZSCHACKE and VAINIO, who have seen my plant, were more inclined to do so. To judge from VAINIO's diagnoses in Lich. Fen. I (1921) my plant resembles his var. *verruculifera* (l. c. pag. 30 and 242), but VAINIO expressly states that this variety has opaque perithecia. I have named it f. *oblongata* after its spores.

Former investigations. *Verrucaria aethiobola* (+ *margacea*) have been recorded from Novaya Zemlya (DEICHM. BRANTH pag. 77) and from Tolyenii Bay in Matotchkin Shar (TH. FRIES pag. 16, HEUGL. pag. 316).

2. (2). *Verrucaria arctica* LYNGE n. sp.

II. Matotchkin Shar: Chalhonik Valley, east of Cape Jouravlev and Belushii Bay. Serebryanka Fjord.
IV. Mashigin Fjord: south side of Blaafjell Basin and Sol Bay.
VI. Eastern Kristovii Island. Pankratyeff Peninsula.

Found on chalky rocks, often with *Protoblastenia rupestris*, occasionally on slates. There are not so many plants in my collection, but the enumeration of its localities shows that it must be a common and widespread plant.

Thallus tenuis vel mediocris, badius vel cinereo-nigrescens, opacus. Areolae laevigatae, parvae, convexae vel verrucosae, discretae vel ± confluentes, crustam formantes areolato-verrucosam.

Perithecia crebra, in areolis thallinis sita, tertia vel dimidia parte superiori prominentia, in vertice nitida, circum ostiolum non vel leviter solum impressa. Perithecia globosa, diam. 0.25—0.4 mm. Excipulum integrum, atrum, dimidia vel $^{2}/_{3}$ parte superiori amphithecio crasso carbonaceo tectum. Paraphyses evanescentes. Asci angusti, 12—14 μ crassi, saepe subcylindrici, sporas tum uniseriales continentes. Sporae simplices, incoloratae, breves, late ellipsoideae vel subglobosae, 8—12 (—14) × (6—) 8—10 μ.

Nucleus J rubescens.

Distinguished by its brown verrucose areolae and especially by its broad, often almost globose spores. If the thallus is very miserably developed, as it sometimes is, it is only seen as small brown verrucae, surrounding the perithecia. In other plants it is better developed.

Verrucaria arctica belongs to the *Verrucaria aethiobola* section.

3. (3). *Verrucaria devergens* NYL.

Verrucaria devergens NYL. VAINIO Lich. Fenn. I (1921) pag. 45 (ubi syn.) et 243.

II. Serebryanka Fjord.
IV. Mashigin Fjord: Nunatak on Norway Glacier (?).

Two plants, found on chalky rocks.

Thallus endolitheus.

Perithecia parva, diam. 0.2—0.3 mm, ca. tertia parte superiori supra substratum prominentia. Excipulum integre fuligineum. Sporae (24—) 26—33 (—37) × 10—16 μ.

Nucleus J e caeruleo vinosum.

The perithecia leave pits in the chalk, a litte larger than themselves (0.3—0.4 mm. in diam.), when they are shed.

A far as I can see the first mentioned plant is quite typical and VAINIO has acknowledged the determination. In the other plant there are but a few perithecia. The pits are larger, the spores 24—36×10.5—12 μ. *Verrucaria integra* has considerably larger perithecia: 0.2—0.5 mm, which are immersed in the substratum.

I referred some Bear Island plants to *Verrucaria deversa* VAIN. Lich. Fenn. I (1921) pag. 49, on the reason that their spores were supposed to be too small for *Verrucaria devergens*. I measured 21—24(—30) ×12—15 μ. In his clavis VAINIO has distinguished these two species by their spore size: in the former: 15—20 (—24)×7—10, in the latter 30—36×11—18 μ. It seems to me that the above measures combined with my measures in Lich. Bear Island pag. 9 (21—24 (—29)×12—15) bridge over these differences. We might refer the *deversa* to *Verrucaria devergens* as *Verrucaria devergens* var. *deversa* (VAIN.) LYNGE as a forma with smaller spores.

4. (4). *Verrucaria acrotella* ACH.

ZAHLBRUCKNER Cat. Lich. I (1922) pag. 10, ubi syn. VAINIO Lich. Fenn. I (1921) pag. 40 (ubi syn.) et 243.

IV. Mashigin Fjord: south side of Blaafjell Basin.

Characterized by its minute perithecia, hardly surpassing 0.1 mm. In my plants the spores are 10—13×5—6 μ.

5. (5). *Verrucaria ossiseda* LYNGE n. sp.

I. Goose Bay, on a bird's bone.

Thallus tenuissimus, sed distinctus, fuscescens, subcontinuus, rugulosus.

Perithecia dispersa, dimidia parte inferiori thallo v. substrato immersa, minutissima, diam. 0.1—0.13 mm, globosa, ad ostiolum non impressa, atra, leviter nitidula. Perithecia amphithecio crasso, excipulo adpresso et inferne divergenti, instructa, excipulum pallide cinereo-fuscescens. Sporae octonae, distichae, minutae, anguste cylindrico-oblongae, rectae vel subrectae, 8—9×2.5—3 (—3.5) μ.

Nucleus J rubescens.

Its thin thallus and very small perithecia suggest a relationship to *Verrucaria acrotella*, but it is sufficiently distinct by its very small oblong spores. Its excipulum is so pale brown that it is quite as probable that it should be referred to the section *leucobasis* of VAINIO.

6. (6). *Verrucaria obsoleta* LYNGE n. sp.

II. Matotchkin Shar: Chalhonik Valley and at the Kara Sea entrance.
IV. Mashigin Fjord: North and south side of Blaafjell Basin.

The plants were found on a hard slate that gave no CO_2 with HCl, often with *Lecidea rhaetica* f. *dispersa*.

Thallus obsoletus vel tenuissimus, cinereo-albescens vel cinereo-flavescens.

Perithecia minuta vel minutissima, globosa diam. 0.15—0.25 mm, epilithea, substrato adpressa, numerosa, regulariter dispersa, atra, opaca, ad ostiolum non depressa. Amphithecium crassum, dimidiatum, carbonaceum. Excipulum integrum, atrum. Sporae incolores, simplices, magnae: 21—28 (—30)×(10—) 13—15 μ.

Nucleus J rubescens.

Its minute perithecia and its obsolete thallus suggest *Verrucaria acrotella*, but its spores are much too large, especially too broad. VAINIO, who has had free access too ACHARIUS' type, records 11—21 ×7—9 μ for that species, I measured 10—13×5—6 μ in my plant. — The amphithecium is not distinctly limited from the excipulum in *Verrucaria obsoleta*. Unfortunately the perithecia were so firmly attached to their substratum that I did not succeed in detaching a quite intact excipulum. I cannot quite exclude the possibility of a species of the *leucobasis* section, but what I saw was black.

7. (7). *Verrucaria maura* WBG.

Verrucaria maura ZAHLBRUCKNER Cat. Lich. I (1922) pag. 64, ubi syn.

I. Gribovii Fjord: Veselago Island.
VI. Northern Kristovii Island.

Tolerably plentiful on "hard" slates (hard: not containing carbonates, no CO_2 with HCl). The maritime *Verrucariae* are rare in Novaya Zemlya, I was especially astonished to find so little of *Verrucaria ceuthocarpa*, otherwise so common in Arctic countries, abundant e. g. in Bell Sound, Spitzbergen. I can see no other reason for this than the substratum, they are limited to "hard" rocks, which are very rare on the west coast of Novaya Zemlya.

The distinction between *Verrucaria maura* and *aractina* is sometimes difficult and I am not convinced of their specific difference. In some Northern *aractina*-plants, e. g. in some of WAHLENBERG's own type plants the thallus is so scabrosus that the term "excavato-scabrosus" might be appropriate. In others it is more "punctato-scabrosus". —

On the other hand *Verrucaria maura* is not always quite "laevigata". If studied under a lense of high power (microscope objective No. 3) the surface is generally seen to be more or less "minute rugulosus".

The typical *aractina* as seen in WAHLENBERG'S herb. is in our country a Subarctic plant. It might deserve a renewed consideration whether the "*Verrucaria aractina*" of French and British authors is not a *Verrucaria maura* that is more rugulose than usual; but the diagnosis by WEDDELL, the eminent observer, certainly suggests the true *Verrucaria aractina*: "Thallus . . . . minute punctato-scabridus" (Lich. de l'Ile d'Yeu pag. 300).

In my Novaya Zemlya plants the thallus is not quite "laevigatus", but the more I have compared them with *Verrucaria aractina* the more I have been convinced that they must be referred to *Verrucaria maura.*

8. (8). *Verrucaria convexa* LYNGE n. sp. ad. int.

VI. Berkh Island.

Only one plant, collected on a hard maritime rock (no CO_2 with HCl).

Differt a *Verrucaria maura* thallo opaco, effuso, minus distincte limitato, a r e o l i s c o n v e x i s, s a e p e ± d i s c r e t i s, hypothallo impositis distincto, atro, secundum marginem thalli dendritice ramoso.

Perithecia opaca, quam in *Verrucaria maura* magis prominentia. Sporae 16—19×7—11 μ.

Nucleus J rubescens.

It is nearly related to *Verrucaria maura* and the specific distinction can be contested, so much the more as only one plant was collected and nothing can be known of its range of variation. *Verrucaria maura* has a very characteristic thallus. It is reticulato-rimose with regular, minute (0.15—0.2 mm.), angular, strictly contiguous, plane areolae, often somewhat shining. In my species the areolae are convex, more effuse, arranged into reticulate formations with the stone visible in the meshes. This discontinuous thallus might be explained as a reduction, due to the hard Arctic climate. But there are several quite typical plants of *Verrucaria maura* in my collection.

9. (9). *Verrucaria bullata* LYNGE n. sp.

I. Goose Bay, on a granitic rock.

Thallus mollis, parvus, maculus rotundatas 5—10 mm. latas format. A r e o l a e parvae, 0.2—0.3 mm, contiguae vel subcontiguae, c r a s s a e, o b s c u r e f u s c e s c e n t e s, b u l l a t a e, hypothallo atro distincto impositae.

Perithecia haud numerosa, in verrucis thallinis immersa, tertia vel quarta parte superiori atro, opaco, epruinoso, prominentia. Perithecia globosa, diam. 0.3 mm. Amphithecium crassum, carbonaceum, excipulum late tegens, ad basin divaricatum. Excipulum ad basin perithecii anguste cinereo-fuscescens vel p. p. obscurius coloratum. Sporae anguste ellipsoideae, $16—18 \times 5.5—8$ μ.

Nucleus J flavo-rubescens.

Its soft bullate thallus is very characteristic; it is easily detached from its substratum. The amphithecium covers the excipulum far down, it is divergent at its lower part, leaving only the basis of the perithecia free. In my sections I found carbonized as well as rather pale parts at the basis of the perithecia in one section, in another (was it quite central?) a quite carbonized ring surrounding the nucleus. I cannot place it with certainty in any of the *Verrucaria* sections (*Melanothecium* or *Leucobasis*).

10. (10). *Verrucaria ceuthocarpa* WBG.

Verrucaria ceuthocarpa ZAHLBRUCKNER Cat. Lich. I (1922) pag. 25, ubi syn. VAINIO Lich. Fenn. I (1921) pag. 72, ubi syn. LYNGE Lich. Bear Island (1926) pag. 9.

II. Matotchkin Shar: Mt. Wilczek, Chalhonik Valley, east of Cape Jouravlev and Mt. Syernaia.
VI. Northern Kristovii Island.

In Novaya Zemlya, as in the other Arctic European Islands, this species is the commonest one of the maritime *Verrucariae*. It was quite plentiful where I found it. But it is strictly limited to hard rocks and stones which are not common on the west coast of Novaya Zemlya.

I detected a pycnide with straight, narrowly elliptical, almost cylindrical pycnoconidia, 4—5 μ long.

11. (11). *Verrucaria striatula* WBG.

Verrucaria striatula ZAHLBRUCKNER Cat. Lich. I (1922) pag. 95, ubi syn. ZSCHACKE Mitteleur. Verruc. (1924) pag. 48 et 59. LYNGE Lich. Spitsb. I (1924) pag. 21.

VI. Northern Kristovii Island.

Found on maritime rocks, only seen from this island. It is not restricted to hard rocks, like the other maritime Arctic *Verrucariae*, for these plants were found on chalk.

Recognized by its very prominent perithecia. The ostiolum is at last distinctly crateriform, the spores 7—9×5—6 μ. — The thallus is generally poorly developed, like black spots on the rock, but here and there it develops the characteristic dendritic figures at the circumference.

My plants correspond entirely to WAHLENBERG's type plants, which I have seen in Upsala.

12. (12). *Verrucaria rupestris* SCHRAD.

Verrucaria rupestris ZAHLBRUCKNER Cat. Lich. I (1922) pag. 84, ubi syn. VAINIO Lich. Fenn. I (1921) pag. 73.

IV. Mashigin Fjord: Rækved Bay.

I detected some plants on a chalky rock.

The thallus is quite embedded in the rock. The perithecia are globose, not angular, small, diam. 0.2—0.3 mm, with a thick, black, dimidiate amphithecium; the excipulum is quite uncoloured at the lower half part (VAINIO's section *Leucobasis*). The young perithecia are quite immersed, later the vertex becomes more prominent. No pits are seen after the shed perithecia, but the rock is a soft chalk. The spores are generally 21—26×10—13 μ, but I have also seen some larger spores, up to 34 μ long, (34×13), and 17 μ broad (20×17). The spores are often pear-shaped.

Former investigations. Recorded from Russia, on the Jugor Shar (TH. FRIES pag. 16, HEUGL. pag. 316), but not from Novaya Zemlya.

Thelidium MASS.

13. (1). *Thelidium decipiens* (HEPP) KRPLH.

Thelidium decipiens ZAHLBRUCKNER Cat. Lich. I (1922) pag. 118, ubi syn.

Thelidium crassum MASS. ZSCHACKE Die mitteleur. Verruc. III (1921) pag. 95 and 98.

Exsic. HEPP Flechten von Europa XII, No. 699.

II. Matotchkin Shar: Near Vasnetsoff Gl.

There is only one plant in my collection, from a chalky rock.

Thallus in specimine omnino endoliteus.

Perithecia parva, diam. 0.2—0.4 mm, semiimmersa. Sporae dyblastae, incolores, (21—) 24—30×10—13 μ, vulgo 27—29 μ longae.

Dehiscent apothecia leave semiglobular alveolae, about 0.5 mm in diameter. — *Thelidium immersum* has its perithecia much deeper immersed, their ostiolum does not reach the surface of the thallus.

In Serebryanka Fjord I collected a *Thelidium* (on a chalky rock), that resembles this species, but the perithecia are perhaps too prominent. Spores uncoloured, one-septated, 30—34×15—16 μ.

14. (2). *Thelidium pyrenophorum* (Ach.) Mudd.

Thelidium pyrenophorum Zahlbruckner Cat. Lich. I (1922) pag. 128, ubi syn. Zschacke Die mitteleur. Verruc. III (1920) pag. 122 et 126. Vainio Lich. Fenn. I (1921) pag. 125 et 251. Lynge Lich. Bear Isl. (1926) pag. 11.

Plate I, fig. 3—6.

II. Matotchkin Shar: Chalhonik Valley, east of Cape Jouravlev and Mt. Syernaia.
IV. Mashigin Fjord: Blomster Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. Pankratyeff Peninsula.

If my determinations are correct they suggest a widespread species, but I do not venture to say much of its frequency. Most probably it is common. Some of my plants were collected on hard rocks, others on chalk.

The species is here limited in a "sensu latiore", and even then a considerable number of possibilities must be considered.

With the exception of a few plants the thallus is very thin or practically lacking in all my plants. The colour of these poor rudiments of a thallus is greyish-brown, often darker than it should be in *Thelidium pyrenophorum*, to judge from the descriptions, and from plants in our herb. I have examined the thalline anatomy of all my plants, without finding any plectenchymatous tissues (as in *Thelidium aeneovinosum*). An apparently plechtenchymatous tissue in some plants was due to dead decolorated clustered gonidia (stain with zinkchloriodide).

Thelidium papulare has three-septated longer spores, this species one-septated. They are evidently nearly related, the spores often remain one-septated for a long time, and it is necessary to examine many perithecia if the possibility of three-septated spores shall be excluded.

Thelidium pyrenophorum has large perithecia, according to Vainio l. c. 0.4—0.8 mm. In my Bear Island plant I found 0.6—0.65 mm. All the Novaya Zemlya plants have smaller perithecia: 0.3—0.4 mm, a serious objection to the determinations. They might be compared with var. *incincta* VAIN. Adjum. Lich. Lapp. II pag. 170. But VAINIO's type has more immersed perithecia with an excipulum which is "integre nigrum".

I have measured rather large spores, e. g. 24—28 × 13—14, 28—30 × 14—16, 28—32 × 13—15, 30—34 × 14—16 and 30—37 × 14—20 μ, in all: 24—37 × 13—16 (—20).

Most probably my Novaya Zemlya plants should be distinguished from the southern, Central European types by a proper name. But I will reserve a sufficient material for a more definite study, when I have gained more experience on the pyrenocarpous lichens.

15. (3). *Thelidium microsporum* LYNGE n. sp.

Plate I, fig. 7—9.

IV. Mashigin Fjord: south side of Blaafjell Basin.

There is only one plant, detected on a rock, containing carbonates. But it is very inconspicuous and easily overlooked.

Thallus obsoletus vel tenuissimus, maculas inconspicuas pallidas (flavo-cinerascentes?) circum perithecia formans.

Perithecia parva, globosa, diam. 0.2—0.3 mm, supra substratum adnata. Excipulum involucrello crasso atro 1/2 vel 2/3 parte superiori tectum, ad basin incolor. Paraphyses evanescentes; asci octospori, saccati, 27—32 × 13—14 μ. Sporae optime evolutae, incolores, dyblastae, late ellipsoideae, parvae: 8—11 × 5—6 μ. Episporium tenuissimum. Nucleus J rubescens.

If there is any thallus at all it is so thin and inconspicuous that it is difficult to describe its colour.

It is difficult to distinguish between involucrellum and excipulum in these small brittle perithecia. But my observation is that there is an involucrellum, covering the excipulum far down, and divergent at the base. The spores are remarkably well developed, for a *Thelidium*.

There is no species in ZSCHACKE's *acrotellum*-section with so small spores. — In my opinion this species belongs to the *pyrenophorum* section. In that section there are only two species with so small spores that they approach my species, viz. *Thelidium minimum* and *impressum*. The former has much smaller perithecia (0.1 mm) and very narrow spores (10—15 × 3—6 μ, according to ZSCHACKE Mitteleur. Verruc. III. Thelidium pag. 122, cfr. also the figures in Krypt. Exsic. Vind. No. 65). I have not seen the latter species. It is found in the Jura mountains; it has half-immersed perithecia, and a thin continuous thallus. To judge from the descriptions it must be the nearest relation of my species.

16. (4). *Thelidium aeneovinosum* (ANZI) ARN.

Thelidium aeneovinosum ARNOLD. ZAHLBRUCKNER Cat. Lich. I (1922) pag. 113, ubi syn.

Thelidium methorium (NYL.), vide ZSCHACKE Die mitteleur. Verr. III. Thelidium pag. 123 et 139.

II. Matotchkin Shar: Chalhonik Valley, east of Cape Jouravlev and Belushii Bay.

VI. Berkh Island.

Collected on hard, irrigated rocks, not on chalk; probably not rare on such substratum.

Characterized by a distinct, brown or greyish-brown thallus of plectenchymatous structure. Some of my plants are more cracked than the Norwegian plants in our herb. The thallus is so thin in these Arctic plants that it was impossible for me to obtain a section. But it is sufficient to detatch a thin piece with a scalpel and heat it in lactic acid, that removes the air from the hyphae and clears up the tissues. The plectenchymatous tissue is distinct in the stratum corticale and gonidiale, lower down in the thallus the hyphae often degenerate, forming an amorphous substance. I found the cells larger in Norwegian plants.

The perithecia measure 0.3—0.5 mm in diam. The excipulum is paler at the basis, brown, not uncoloured. It is covered with a thick involucrellum at the upper $^1/_2$ or $^2/_3$ part. The spores are always uncoloured, sometimes not well developed. In one plant I detected a few 3-septated spores, but they were so few compared with the normal 1-septated that they were considered a variation. — I have measured (21—) 26—37 $\times$ 11—16 (—20) μ, the spore size is quite variable.

17. (5). *Thelidium cataractarum* (HEPP) LÖNNR.

Sagedia cataractarum HEPP Flecht. Eur. No. 442.

Thelidium cataractarum LÖNNR.; cfr. ZAHLBRUCKNER Cat. Lich. I (1922) pag. 117, ubi syn. ZSCHACKE Mitteleur. Verr. III. Thelidium, (1921) pag. 141 et 142.

IV. Mashigin Fjord: south side of Blaafjell Basin, on a chalky clay slate.

Thallus fere evanescens, circum perithecia melius evolutus, pallide albo- vel cinereo-flavescens.

Perithecia prominentia, non immersa, ad basin thallo annulata, diam. ca. 0.3 mm. Amphithecium crassum, dimidiam vel tertiam partem excipuli obtegens, inferne divaricatum; excipulum basin versus pallidius. Sporae incolores, triseptatae, magnae, septis non vel levissime solum constrictae, 30—44 $\times$ 13—16 μ.

Nucleus J rubescens.

Its perithecia are too small for *Thelidium papulare.* Their size corresponds to HEPP's Flechten Europas No. 442 within the probable limits of variation; the perithecia of this plant are slightly smaller than mine (0.2—0.3 mm). In ARNOLD Lich. Mon. Nos. 66 and 419 they are considerably smaller, but in herb. NYLANDER there are plants with perithecia of about 0.3 mm, sent by ARNOLD.

HEPP's plant has a considerably thicker thallus than mine and its perithecia are more immersed. This is the most serious objection to my determination. But in Arctic lichens we must generally expect a thinner thallus.

I can find no other *Thelidium* that agrees better with my plant. If the above mentioned differences should justify a specific distinction, it would suggest a new species.

The perithecia are very brittle. But sufficiently good sections can be obtained if a small drop of gummi arabicum is applied over the perithecium. I prefer to cut them with a thin scalpel under a good lens ("Präparier-Mikroskop"), before the gum has quite dried up. The perithecia are then cut in situ, which method facilitates the orientation.

18. (6). *Thelidium papulare* (E. FR.) ARN.

Thelidium papulare ZAHLBRUCKNER Cat. Lich. I (1922) pag. 125, ubi syn. VAINIO Lich. Fenn. I (1921) pag. 121, 250. ZSCHACKE Die mitteleur. Verruc. III (1921) pag. 141 and 145.

Exsic. (vide VAIN. et ZSCHACKE l. c.) MALME Lich. suec. 550, 800.

Plate I, fig. 1—2.

II. Matotchkin Shar: Chalhonik Valley.
IV. Mashigin Fjord: South side of Blaafjell Basin and Rækved Bay.

On chalky (dolomitic) rocks or on schistose chalky rocks.

Thallus vulgo distinctus, minute areolato-verrucosus, areolis 0.1—0.2 mm, vel granulosus, cinereus vel cinereo-albidus, interdum membranam tenuem cinereo-fuscescentem supra rupem format, rarius subendoliteus.

Perithecia numerosa, globosa vel interdum conoidea, diam. 0.3—0.5 mm, dimidia vel tertia parte supra thallum prominentia, atra, saepe nitida. Porus distinctus, ± depressus. Asci subglobosi, e. g. 60×50 μ, sporae incolores, triseptatae, magnae: (28—) 34—43×13—18 μ.

Nucleus Jodo rubescens.

The spores often remain 1-septated for a considerable time; such plants should be distinguished from *Thelidium pyrenophorum* with some attention.

Thelidium umbrosum MASS. has been recorded from dolomite on the south coast of Matotchkin Shar (KBR. pag. 7).

Polyblastia LÖNNR.

Sect. a. *Coccospora* KBR.

19. (1.) *Polyblastia quartzina* LYNGE n. sp.

Plate I, fig. 13, 18—20.

II. Matotchkin Shar: Chalhonik Valley, on quartzite.

Crusta maculas parvas effusas, mediocres vel satis tenues, sed distincte evolutas format, cinereo-fuscescens, irregulariter rimosa.

Perithecia thallo immersa, vertice tertia parte peritheciorum supra thallum prominentia. Perithecia haud numerosa, globosa, diam. 0.4—0.45 mm. Amphithecium crassum, carbonaceum, dimidiatum, excipulo arcte adpressum; excipulum integrum, tenue, etiam ad basin fusconigrescens. Asci angusti, subcylindrici, 60—65×12—14 μ. Sporae incolores, pauciloculatae, septa transversalia 1—3, longitudin. 1, septa saepe obliqua, sporaetum oblique cruciatim divisae. Sporae late ellipsoideae, parvae: 11—16×8—9, vulgo 13×8 μ.

Nucleus J rubescens.

Its small pauciloculated spores refer it to the section *Coccospora* KBR. In this section we only know 2 species with colourless spores, viz. *Polyblastia singularis* and *plicata*. These species are found on chalk. The former has much smaller perithecia than my species, diam. 0.1—0.2 mm. The latter has very numerous small perithecia, diam. 0.2—0.25 mm, immersed in a thick white crusta. The spore size does not differ much in these 3 species, but the two above mentioned species have broader asci than my species, resp. 70×30 and 55×26 μ.

Sect. b. *Thelidioides* ZSCHACKE.

20. (2). *Polyblastia verrucosa* (ACH.) LÖNNR.

Polyblastia verrucosa ZAHLBRUCKNER Cat. Lich. I (1922) pag. 159, ubi syn.

II. Matotchkin Shar: Chalhonik Valley.

There is only one plant in my collection, found on a hard (not chalky) rock.

Thallus albidus, crassitudine mediocri, areolae subdispersae, convexae. Perithecia magna, diam. 0.5—0.6 mm, excipulum integrum, fuligineum, sporae incoloratae, guttulis oleosis repletae, septa transv. 3—5, vulgo 3, sept. long. 0—1. Sporae magnae: 34—53×17—19 μ. Nucleus J e caeruleo (pr. ostiolum) sordide vinosum.

ZSCHACKE suggested this determination and a comparison with ACHARII type of *Pyrenula verrucosa* in herb. Ach. in Helsingfors fully confirmed this suggestion. The type has a thicker thallus, but otherwise I can see no habitual difference.

21. (3). *Polyblastia Friesii* LYNGE n. sp.

Plate I, fig. 15—16.

II. Matotchkin Shar: Chalhonik Valley, one plant on a hard slate (no CO_2 with HCl).

Thallus indeterminatus, cinereus, bene evolutus, rugosus, irregulariter rimosus.

Perithecia globosa, diam. 0.5 mm, in verrucis thallinis immersa, ostiolum solum visum vel etiam pars superior parva circum ostiolum. Excipulum dimidia pars superior amphithecio crasso carbonaceo tectum, excipulum parte inferiore fuscescens vel fusco-nigrescens. Amphithecium cum excipulo concrescens. Sporae incolores, transversim tri-septatae, rarius tetra-septatae, cellulae mediae vulgo vel interdum septo singulo longitudinali divisae. Sporae magnae: 35—45×16—21 μ.

Nucleus J aurantiacus.

It must be referred to the section *Thelidioides* ZSCHACKE Mitteleur. Verruc. II. Polyblastia pag. 290. — *Polyblastia verrucosa* has a purely white, thicker, more verrucose thallus and much more prominent perithecia. Old perithecia are so prominent that they may resemble a *Lecidea* with very convex apothecia. In *Polyblastia Friesii* the perithecia are so immersed in the thalline verrucae that only a black point is visible. The *Sporodictyons* have multiseptate spores.

My material for comparison is insufficient. There is no *Polyblastia Sprucei* and no *rivalis* in our herb. But to judge from ZSCHACKE's descriptions (l. c. pag. 292—293) these species have still larger and more multiseptate spores: 50—63×18—24 and 48—60—76×18—20—30 μ. I have cut several perithecia in my plant and found no spore larger than 45 μ.

I understand ZSCHACKE's expression "Perithezien eingesenkt" (l. c. pag. 290) as "immersed in the stone", leaving pits, when they are shed, not as "immersed in the thallus".

Named in honour of TH. M. FRIES, monographer of the genus and famous explorer of the Arctic lichen flora.

Sect. c. *Polyblastidea* ZSCHACKE.

22. (4). *Polyblastia Sendtneri* KRPLH.

Polyblastia Sendtneri ZAHLBRUCKNER Cat. Lich. vol. I (1922) pag. 153, ubi syn. VAINIO Lich. Fenn. I (1921) pag. 101 et 248. LYNGE Lich. Bear Isl. (1926) pag. 14.

II. Matotchkin Shar: Mt. Lasareff, Mt. Wilczek, East of Cape Jouravlev, Mt. Syedlho and Mt. Syernaia.
III. Kristovii Fjord.
IV. Mashigin Fjord: Mt. Tveten.
VI. East of Lichutin Island.

On earth. There are few plants in my collection, but I detected some of them quite incidentally, on pieces of earth collected for the sake of other lichens. It is supposed to be common.

The spore measures agree with those given by TH. FRIES and ZSCHACKE, I have measured 16—28×11—13 μ in my Novaya Zemlya material. Two plants (Mt. Wilczek and east of Lichutin Island) differ by their considerably-broader spores: (21—) 24—30 (—32) ×13—18. That is the length of *Polyblastia Sendtneri*, the thickness of *Polyblastia bryophila*. These spores have a considerable number of loculi: septa transversalia 6—8, septa longitudinalia 2—3.

These two species are nearly related, if specifically distinct.

23. (5). *Polyblastia bryophila* (NYL.) LÖNNR.

Polyblastia bryophila ZAHLBRUCKNER Cat. Lich. I (1922) pag. 140, ubi syn. LYNGE Lich. Bear Isl. (1926) pag. 12.

II. Matotchkin Shar: Mt. Wilczek. Serebryanka Fjord: in the rookery.
VI. Berkh Island.

On the earth, as usual. It is not common, at least not so common as *Polyblastia Sendtneri*.

It is nearly related to that species, the only distinction is the spore size (larger in *Polyblastia bryophila*), but the dimensions overlap to some degree: 30—42×14—26 against 15—30×9—14 (TH. FRIES Polybl. Scand. pag. 18—20), 25—46×14—28 against 15—30×9—14 (ZSCHACKE Mitteleur. Verr. II pag. 302). — The two last mentioned plants are typically *Polyblastia bryophila*, I have measured 35—42×18—25 μ.

24. (6). *Polyblastia gelatinosa* (ACH.) TH. FR.

Polyblastia gelatinosa TH. M. FRIES Lich. Arctoi (1860) pag. 262, Polyblastiae Scandinavicae (1877) pag. 17, ZSCHACKE Die mitteleur. Verruc. I (1914) pag. 296 et 303, ZAHLBRUCKNER Cat. Lich. I (1922) pag. 145, ubi syn.

Polyblastia nigrata (NYL.) LÖNNR. VAINIO Lich. Fenn. I (1921) pag. 103 et 248, ubi syn.

It is impossible to find out the correct name for this species without an examination of the types.

II. Matotchkin Shar: Mt. Syernaia.
VI. Berkh Island.

On mosses and on the earth in calcareous regions.

It is hardly possible to mention a lichen that is more inconspicuous than this species, at least not in the Arctis. It is not my merit that these two plants were collected, for I was not aware of them during my field work. They were detected at home during the determination of my lichens. Accordingly these two plants cannot tell us much of the frequency and distribution of this species in Novaya Zemlya.

The thallus, hardly visible, is black and extremely thin, gelatinous; the spores are muriform, entirely colourless, 30—47×16—22 μ; in the Bear Island plants I found 35—42×21—26 μ, somewhat broader than in the Novaya Zemlya plants.

25. (7). *Polyblastia* cfr. *forana* (ANZI) KBR.

ZAHLBRUCKNER Cat. Lich. I (1922) pag. 144, ZSCHACKE Mitteleur. Verruc. II (1914) pag. 304—305, pl. IX, fig. 8 a—c.

Polyblastia intermedia TH. FR.; vide ZAHLBRUCKNER Cat. Lich. I (1922) pag. 149, ubi syn. VAINIO Lich. Fenn. I (1921) pag. 106.

var. *latispora* LYNGE nov. var. ad int.

II. Matotchkin Shar: Mt. Wilczek, Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Sol Bay.
V. Admiralty Peninsula.
VI. Berkh Island (?). Eastern Kristovii Island. Northern Kristovii Island.

Differt a typo sporis latioribus: (13—) 16—26×11—18 μ; in *Polyblastia forana*: 21—27×10—14 (sec. ZSCHACKE l. c. pag. 305), in *Polyblastia intermedia*: 15—21×7—10 μ (TH. FRIES Polybl. Scand. pag. 24).

Found chiefly on hard rocks, widespread and most probably common on such substratum.

The determination is doubtful. Vide *Polyblastia hyperborea* TH. FR.

26. (8). *Polyblastia septentrionalis* LYNGE n. sp. ad int.

VI. Northern Kristovii Island, on a rock, containing no carbonates (no CO_2 with HCl).

Thallus fere obsoletus, vestigia thalli circum apothecia evoluta. Thallus granulis subcontiguis minutis, cinereis, formatus.

Apothecia parva, diam. 0.2—0.3 mm., adnata, basi solum thallo immersa, globosa, atra, opaca, epruinosa, ad ostiolum leviter impressa. Amphithecium dimidiatum, crassum, carbonaceum; excipulum superne nigrescens, basin versus dilutius coloratum: in peritheciis junioribus pallide fuscescens, deinde fusconigrescens. Sporae (saepe male evolutae) octonae, incolores, pauciloculatae: septa longitudinalia 1—2, septa transversalia 3—5. Sporae 22—26×13—17 μ.

Nucleus J rubescens.

The above data approach this species to *Polyblastia intermedia* TH. FR. and especially to *Polyblastia obscurata* VAIN. The former has still smaller spores, TH. M. FRIES Polybl. Scand. pag. 24: 15—21×7—10 μ; I have measured 17×11 μ. It has a thin, but very distinct, granular or more effuse, quite white crusta (our plant from the cementum of the citadel Kristianssten). Its perithecia are somewhat larger than in my plant (0.3—0.5 mm. against 0.2—0.3 mm.), but in this case that character is evidently not important. TH. FRIES himself states the perithecia of his species to be 0.2—0.3 mm., and ZSCHACKE unites this species with the southern *Polyblastia forana* (ANZI) KBR. which has still smaller perithecia: 0.15—0.2 mm.

All these species, *Polyblastia forana, intermedia* and *obscurata* are typically chalk plants. Generally a different substratum (chalk or not chalk) is recogniced to suggest a specific distinction in this genus, but our knowledge of lichen physiology is more than limited.

Apart from the substratum the chief distinction from *Polyblastia obscurata* is the colour, grey against brown (fuscescenti-obscuratus). VAINIO, who has seen my plant, was more convinced of its specific distinction from his *obscurata* than I am.

27. (9). *Polyblastia hyperborea* TH. FR.

Polyblastia hyperborea VAINIO Lich. Fenn. I (1921) pag. 105, ubi syn.

P. p. syn. *Polyblastia intercedens* NYL. Vide TH. FRIES Polybl. Scand. (1877) pag. 20—21, ZSCHACKE Mitteleur. Verruc. II (1914) pag. 306, pl. XI fig. 18, a—c.

I. Gribovii Fjord: south side.

II. Matotchkin Shar: Vasnetsoff Glacier, Mt. Lasareff, Mt. Wilczek, Chalhonik Valley, Mt. Syedlho, Mt. Syernaia and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.

IV. Mashigin Fjord: South and north side of Blaafjell Basin and Blomster Bay.

VI. Berkh Island. Lichutin Island. Mainland east of Lichutin Island. Eastern and Northern Kristovii Islands.

var. *integrascens* (NYL.) LYNGE.

Polyblastia integrascens (NYL.) VAIN. Lich. Fenn. I (1921) pag. 104, ubi syn.

An syn. *Polyblastia intercedens* var. *pallescens* ANZI, vide ZSCHACKE Die Mitteleur. Verruc. II. Polyblastia, pag. 307.

II. Matotschkin Shar: East of Cape Jouravlev, Mt. Syernaia and south side of the Shar at the Kara Sea entrance.
III. Kristovii Fjord.
VI. Eastern Kristovii Island.

Polyblastia hyperborea is one of the commonest and most wide-spread lichens in Novaya Zemlya, evidently plentiful everywhere on chalky, (always?) irrigated ground. Var. *integrascens* is more scarce.

In my Novaya Zemlya collection there are about 60 plants of the *Polyblastia intercedens* tribus, saxicolous plants, growing chiefly on chalky substratum, with a greyish thallus of very variable development, rather small perithecia (rarely more than 0.5 mm in diam.) and colourless spores of medium size.

These plants have a varying development of the thallus, the size of the spores and the septation of the spores. Lichenologists, who have studied the question, have attributed a different value to these characters; some authors recognize several species, others reduce the number.

By far the greater part of my plants have either a very thin thallus or no visible thallus at all ("Thallus evanescens", vide VAINIO Lich. Fenn. I pag. 248). If there is a thallus it is white or generally greyish. A "thin" thallus is here defined as a thallus that is so poorly developed that it is only just visible under a common lens (×8), a thallus where a needle can draw a pale line, but where no structure (verrucosus vel laevigatus, areolatus vel continuus) is distinctly visible.

But there are also a few plants with a considerably better developed thallus. It is ash-grey (cinereus) and irregularly cracked (irregulariter rimoso-areolatus).

In Polybl. Scand. pag. 20 TH. FRIES has wisely warned us against attributing too much importance to the development of the thallus. My plants give me the same admonition, at least I was unable to find any specific difference between the athalline plants, plants with a very thin thallus and plants with a better developed thallus, I think that I saw intermediate stages.

VAINIO has called attention to the colour of the excipulum (Lich. Fenn. I pag. 248). A thin central longitudinal section of a perithecium of a plant with well developed thallus (East of Cape Jouravlev) really showed a thin entire excipulum, dark, though not quite black (fusco-fuligineum). Several sections were cut of athalline plants. I always found a thick amphithecium covering the excipulum generally half-way (±) down, it is divergent at its lower part. The excipulum is much thinner than the involucrellum and always dark at its upper part, under the involucrellum. This dark colour is developed more or less far downwards. My result is that the excipulum is colourless in the lower part of young perithecia but thicker and darker, in some plants as black as coal in old perithecia. I have seen a colourless and a carbonized lower part of the excipulum in perithecia of the same plant. — The study of the young perithecia is not always easy, for the colourless lower part is soft and firmly connected with the underlying stratum, and it is easily detached from the coloured upper part of the excipulum. A section is then incomplete, it shows the amphithecium, the upper part of the excipulum and at the base a colourless nucleus without the lower part of the excipulum.

It is accordingly impossible for me to accept NYLANDER'S *integrascens* as a proper species (*Polyblastia integrascens* (NYL.) VAIN. Lich. Fenn. I (1921) pag. 104). This is in accordance with NYLANDER'S own opinion (*Verrucaria intercedens **integrascens* NYL. Lich. Freti Behr. pag. 42).

I have compared my var. *integrascens* from Mt. Syernaia with NYLANDER'S plant from Lapponia Ponojensis in Stockholm (Riksmuseum) and I can see no difference. The thallus is equally developed and the perithecia are of the same size. ZSCHACKE refers my plant to his *intercedens* f. *pallescens* (ANZI), see Die mitteleur. Verruc. II. Polyblastia, pag. 307. These names are evidently synonymous, cfr. ANZI Lang. No. 243 B and HEPP Flechten Europas No. 445.

TH. FRIES, ZSCHACKE and VAINIO agree in attributing specific importance to the septation of the spores: sporae murales, cellulis numerosis (*P. hyperborea* TH. FR. = *P. intercedens* (NYL.), saltem p. p., of other authors), against sporae submurales, septis longitudinalibus paucis (*P. intermedia* TH. FR. = *P. forana* (ANZI), according to ZSCHACKE), as expressed by VAINIO (Lich. Fenn. I pag. 247—248).

I have carefully measured the spores of all my 60 plants. By far the greater part of them had the polyblastous spores, with 2—3 (—4) longitudinal, often oblique, septa and 6—10 transversal septa. The septation agrees entirely with ZSCHACKE'S illustration of the spores of *Polyblastia intercedens* (l. c. p. XI fig. 18 c). The size of these spores is quite variable (see my Lich. Bear Island pag. 13), I have measured 25—40 (—45) $\times$ 14—21 μ, spores longer than 40 μ are rare. These plants are found on chalky rocks. If the chalk is soft, the perithecia are more profoundly immersed in the rock than usual.

In the other smaller part of my plants the spores were oligoblastous. This might be due to the fact that the perithecia examined only contained young spores, and the material was examined again. Several plants were then found to contain polyblastous spores. The rest, the oligoblastous spores have 1, rarely 2 longitudinal septa and generally 4 transversal septa. These spores are smaller (13—) 16—26 × 11—18 μ, they are shorter, but often very broad. In two plants (Belushii Bay and Admiralty Peninsula the spores are narrower than in the other plants, resp. 18—21 × 9—10 and 13—16 × 11—12 μ. The septation of these spores agrees exactly with ZSCHACKE's illustration (l. c. pl. IX, fig. 8 b).

In either species the spores are often corrugated, shrunken, with indistinct septa. To make them distinct add KOH, wash with water and add Zinc chloriodide. As stated by ZSCHACKE the blastidiae (cell-rooms) are often isolated, do they germinate separately? (cfr. TH. FRIES Polybl. Scand. pag. 21).

I am quite convinced that my plants with large polyblastous spores must be identified with TH. FRIES's *Polyblastia hyperborea* (TH. FRIES Lich. Arct. (1860) pag. 266); they correspond entirely to TH. FRIES's own plants from Mortensnes in Finmark, Norway, in our herb. Later on TH. FRIES identified his species with NYLANDER's *Verrucaria intercedens* (= *Polyblastia intercedens* (NYL.) LÖNNR.) from 1858, though well aware that this name covered several species in NYLANDER's herbarium. (Polyblastiae Scand. pag. 20—21). As far as I understand ZSCHACKE he has done the same (Mitteleur. Verruc. II pag. 306—307). VAINIO on the contrary has retained TH. FRIES's name *Polyblastia hyperborea* (Lich. Fenn. I pag. 105); he writes: "haud *Verrucaria intercedens* NYL." This suggests that he has examined NYLANDER's type plant in Helsingfors.

It seems justified then to use TH. FRIES's name for this species, and NYLANDER's name for the whole section.

The determination of the other species, with smaller oligoblastous spores, is not so certain. I can find no specific difference between my plants and TH. FRIES's *Polyblastia intermedia* which ZSCHACKE unites with ANZI's *Polyblastia forana*, I think with right. But all records agree that this species is a chalk plant, and my plants were chiefly, though not exclusively, found on hard rocks.

As stated above my plants have generally considerably broader spores than *Polyblastia intermedia — forana* (in TH. FRIES's *Polyblastia intermedia* from Kristianssten, Trondhjem, I found 17 × 11 μ, one longitudinal septum and 4—5 transversal ones). A more monographical study must determine the eventual importance of these broad spores; I consider them to be within the limits of variation, but to avoid confusion I have attributed the name var. *latispora* to my plants.

The spore-dimensions correspond better to *Polyblastia fusco-argillacea* ANZI. But as stated by ZSCHACKE this species has multicellular spores, vide ZSCHACKE l. c. pl. X fig. 15. I have examined ANZI's type plant (*Verrucaria fusco-argillacea* ANZI Lang. No. 368), only a few spores were seen, almost globose, 18×16 μ, with 3 longitudinal septa.

Polyblastia intermedia TH. FR. from Goose Fjord, Ellesmereland (leg. SIMMONS, det. DARBISHIRE: Rep. Sec. Arct. Exp. Fram, pag. 48, has polyblastous spores (septa long. 2—3, septa transv. 7—8). I would refer it to *P. hyperborea.*

Former investigations. "*Polyblastia (Verrucaria) intercedens*" has been recorded from Novaya Zemlya (DEICHM. BRANTH pag. 77). Also from Waigatsch (STIZ. pag. 421, HEUGL. pag. 316) and from Russia at Jugor Shar (TH. FRIES pag. 16).

28. (10). *Polyblastia scotinospora* (NYL.) HELLB.

Polyblastia scotinospora ZSCHACKE Die mitteleur. Verr. I (1914) pag. 297 et 313. VAINIO Lich. Fenn. I (1921) pag. 98 et 247, ubi syn. A. L. SMITH Brit. Lich. II (1926) pag. 333. LYNGE Lich. Bear. Isl. (1926) pag. 14.

Polyblastia melaspora (TAYL.) ZAHLBR. Cat. Lich. I (1922) pag. 150, ubi syn.

f. *monstrum* KBR.

II. Matotchkin Shar: Near Vasnetsoff Glacier and in Chalhonik Valley.

On hard (not chalky) slates, at the former station collected in some abundance.

Perithecium basin versus pallidius coloratum, circa ostiolum solum amphithecio crasso divergenti tectum vel dimidia parte superiori amphithecio tectum. Sporae primum incoloratae, deinde mox obscuratae, murales (sept. long. 1—2, septa transv. 6—10), (25—) 30—40×16—25 μ. Nucleus J rubescens.

Plantae thallo visibili vulgo fere destitutae.

Sect. a. *Sporodictyon* MASS.

29. (11). *Polyblastia theleodes* (SOMRFT.) TH. FR.

Polyblastia theleodes ZAHLBRUCKNER Cat. Lich. vol. I (1922) pag. 157, ubi syn. LYNGE Lich. Bear Isl. (1926) pag. 14.

Plate I, fig. 14, 17.

II. Matotchkin Shar: Chalhonik Valley.
IV. Mashigin Fjord: south side of Blaafjell Basin and Blomster Bay.
VI. Mainland east of Lichutin Island.

I found it on chalky rocks that are often irrigated by cold water. Such stations are frequent enough in Novaya Zemlya, but I only detected a few plants. — In Bell Sound, Spitsbergen, I collected a large number of plants in 1926, which I referred to this species, after their habitus (they are not yet determined).

I have measured the spores of several plants. They are always dark, but their size is very variable: in one plant 65—83×33—40 μ, in another 65—95×28—32, in a third plant 72—88×42—52, in a fourth plant: 55—65×35, in all: 55—95×28—52 μ. TH. FRIES writes 60—84 ×24—45 (Polyblastiae Scandinaviae pag. 11), ZSCHACKE 63—84×35—45 μ (Mitteleur. Verruc. II pag. 317), in the Bear Island plants I measured 68—80×37—45 μ.

The perithecia are immersed into the thallus, but only with their lower half part, the vertex is largely free. This is also the case in the type plants of SOMMERFELT in our herbarium.

Former investigations. Recorded from Tolyenii Bay in Matotchkin Shar (STIZ. pag. 421).

30. (12). *Polyblastia Sommerfeltii* LYNGE n. sp.

II. Matotchkin Shar: Chalhonik Valley and east of Cape Jouravlev. Serebryanka Fjord.
IV. Mashigin Fjord: Moraines on the south side of Blaafjell Basin and Blomster Bay.

Thallus tenuis vel tenuissimus, cinereo-fuscescens vel cinereo-albidus, irregulariter rimosus.

Perithecia verrucis thallinis immersa, primum ostiolum solum, deinde pars superior tertia peritheciorum supra verrucos visibilis. Verrucae thallo concolores vel eo leviter pallidiores. Perithecia atra, magna, diam. usque 0.75 mm.; ostiolum non impressum, poro tenui formatum. Excipulum superne incolucrello arcte tectum vel eo concrescens, basi solum ab involucrellum liber, fuscum vel deinde nigrescens. Involucrellum crassum, atrum, excipulum fere usque ad basin obtegens, in parte inferiori ab excipulum divergens. Periphyses gracilentae, copiosae, elongatae. Asci saccati vel saccato-pyriformes, magnae, e. g. 100—120×45×50 μ, octospori, membrana primo in apice valde incrassata, deinde extensa, tenuis, fere aequaliter incrassata. Sporae persistenter incolores, murales, loculis numerosissimis, angulatis vel vulgo ± rotundatis, compositae, (septa long. 5—8, septa transv. 15—20), ellipsoideae, apice obtuse rotundatae, magnae (37—) 45—65×20—28 (—30) μ.

Nucleus J vinose rubescit.

The habitus agrees so well with *Polyblastia theleodes* that at first I simply referred it to that species, supposing the colourless spores to be young and colourless from that reason only. But I have examined many perithecia and I have not seen a single coloured spore. That excludes *Polyblastia theleodes*.

The perithecia are more profoundly immersed in the thalline warts than they are in *Polyblastia theleodes*, at least there is no perithecium in my collection where the surrounding thalline "ring" disappears so much, that the term "sessile perithecia" can be applied.

But on the whole it is nearly related to *Polyblastia theleodes*, the only specific difference of importance is the colourless spores.

Amongst the other species of the section *Sporodictyon* MASS. with colourless spores, described by ZSCHACKE (Mitteleur. Verr. II pag. 315) only *Polyblastia Tarvesedis* (ANZI) BAGL. et CAREST. can come into consideration. But as stated by ZSCHACKE this species has another involucrellum, covering the excipulum only half way down. I have examined ANZI Lich. Lang. No. 237 ("*Thelotrema Tarvesedis*") and I can only confirm ZSCHACKE's statement, its involucrellum only covered the upper third part of the excipulum. It is also very improbable that a lichen from the Alps on the frontier between Italy and Switzerland, and detected nowhere else, should be found in Novaya Zemlya.

31. (13). *Polyblastia terrestris* TH. FR.

Polyblastia terrestris ZAHLBRUCKNER Cat. Lich. I (1922) pag. 157, ubi syn. VAINIO Lich. Fenn. I (1921) pag. 100 et 248. LYNGE Lich. Bear Isl. (1926) pag. 14.

II. Matotchkin Shar: Mt. Wilczek.
IV. Mashigin Fjord: Mt. Dietrichson.

I only detected one poor plant at each locality.

Sporae incolores, murales, polyblastae, 55—60×23—25 μ (Mt. Dietr.), vel majores: 60—100×30—40 μ (Mt. Wilczek).

The spores in the Mt. Wilczek plant are extraordinarily large. There was only one miserable plant, the few perithecia are old and more prominent. The spore size is evidently very variable in this species; a better material must decide, whether these large spores suggest a proper species.

Staurothele NORM.

32. (1). *Staurothele clopima* (WBG.) TH. FR.

Staurothele clopima ZAHLBRUCKNER Cat. Lich. I (1922) pag. 164, ubi syn. MALME Svenska . . . Staurothele (1919) pag. 198 et 200. LYNGE Lich. Spitsb. I (1924) pag. 20.

II. Matotchkin Shar: South side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: North side of Blaafjell Basin, Strömsnes Bay and Sol Bay.

My collections do not suggest a common plant, but anyhow it is the commonest *Staurothele* in Novaya Zemlya. — Often associated with *Lecanora flavida* and another *Lecanora* of the section *Aspicilia*.

The thallus is very thin, of a brownish colour. The perithecia are quite typical, the spores brown, only the very young, immature spores are colourless; there are two (or one) spores in each ascus, I have measured 34—52×16—22 μ. The hymenial gonidia are straight or slightly arcuate, ellipsoid or cylindrical, 6—13×4 μ.

33. (2). *Staurothele septentrionalis* LYNGE n. sp.

Plate XIII, fig. 5.

II. Matotchkin Shar: Belushii Bay, on slates.

Thallus orbicularis, 3—15 mm., obscure fuscescens, tenuis vel tenuissimus, rugulosus, deinde crebre irregulariter ruptus, areolae minutae, diam. 0.1—0.2 mm.

Perithecia globosa, diam. 0.3—0.4 mm., thallo ad basin solum immersa, praeterea prominentia, thallo non vestita, atra, epruinosa, ad ostiolum vulgo non impressa. Amphithecium crassum, carbonaceum, dimidiatum, parte inferiore divergens. Nucleus dimidia parte inferiori excipulo incolorato tectum. Nucleus gonidiis hymenialibus omnino repletus, gonidia elongata, oblongo-cylindrica, subrecta, 5—9, interdum usque ad 14×2—2.5 μ. Asci subcylindrici videntur, praematuri deliquescentes. Sporae persistenter incolores, binae, murales, septa longitudinalia 1—3, transversalia 5—9. Sporae apicibus obtuse rotundatae, 24—32×11—15 μ, crassitudine variantes, e. g. 26×14, 28×11.

Nucleus J sordide rubescens.

Habitually it resembles *Staurothele fuscocuprea*. It has a thinner crusta than that species, which may be due to the Arctic conditions of life. *Staurothele fuscocuprea* has a more continuous thallus, more immersed perithecia, largely covered by the thallus, its spores are at first colourless, then brown, and considerably larger than in my species: 35—48×14—21 μ, sec. ZSCHACKE Mitteleur. Verruc. (1913) pag. 188; in a Norwegian plant (det. ZSCHACKE) I measured 38—47×16—24 μ.

MAGNUSSON collected a *Staurothele* in Kopparåsen, Torne Lappmark, Sweden, which has the same thin, cracked thallus as my Novaya Zemlya plants and the same prominent perithecia. In a plant which MAGNUSSON sent to our herb. I have measured the same small spores (e. g. 26×13 μ). But MAGNUSSON informs me that his own plant has larger spores, e. g. 33×17, 42×12, 50×22.

There are evidently two different species, differing in the above mentioned characters. My material of *Staurothele fuscocuprea* is from Norway, det. ZSCHACKE. I have not seen NYLANDER's type plant, nor has ZSCHACKE.

34. (3). *Staurothele Hazslinskyi* (KBR.) FORSS. et BLOMB.

Staurothele Hazslinskyi ZAHLBRUCKNER Cat. Lich. I (1922) pag. 171, ubi syn. MALME Svenska . . . Staurothele (1919) pag. 199 et 201.

II. Matotchkin Shar: Chalhonik Valley.

I only found one plant, on a slaty (not chalky) rock, with *Verrucaria aethiobola* and *Rhizocarpon albidum*, in part overgrown by the latter species.

I could not with absolute certainty decide whether there are 2 spores in each ascus, or more, for the asci are rapidly evanescent. But what I saw is strongly in favour of the former alternative. The spores which I found were colourless, muriform, $32—55 \times 13—18$ μ. The hymenial gonidia are cubiform or ± globose, diam. 2.5—3 μ. The thallus is very miserably developed, some thin areolae, visible only under a lens.

MALME is of opinion that this species is only a "forma v. status *St. fissae*, cujus speciei sporae saepe diu hyalinae remanent" (l. c. pag. 201).

FORSSELL and BLOMBERG referred this species to the genus *Staurothele* in 1880 (Enum. plant. scand. 4 (1880) pag. 97), STEINER in 1905 (Erg. einer naturw. Reise zum Erdschias-Dagh (1905) pag. 384).

35. (4). *Staurothele guestphalica* (LAHM) TH. FR.

Staurothele guestphalica ZAHLBRUCKNER Cat. Lich. I (1922) pag. 170, ubi syn. MALME Svenska . . . Staurothele (1919) pag. 199 et 202.

IV. Mashigin Fjord: South side of Blaafjell Basin.
VI. Lichutin Island.

I detected a few plants only, on chalky rocks.

The perithecia are immersed in the rock, leaving rounded holes when they are shed. The spores are one or generally two in each ascus, colourless or slightly yellowish, (35—) $45—68 \times 21—24$ μ (the largest spore, 68×21 μ, was single). — The black lines are not so distinct in my plants as they are in some plants from Central Europa in our herbarium.

TH. FRIES referred this species to the genus *Staurothele* in 1877 (Polybl. Scand. pag. 6), earlier than ARNOLD (1885).

36. (5). *Staurothele hymenogonia* (NYL.) TH. FR.

Staurothele hymenogonia ZAHLBRUCKNER Cat. Lich. I (1922) pag. 171, ubi syn.

II. Serebryanka Fjord: in the rookery.
VI. Lichutin Island.

There are but a few plants in my collection, growing on chalky rocks.

Perithecia not immersed, diam. about 0.5 mm. (generally they are larger), resting on a very thin, hardly visible thallus. Spores 4—8 in the ascus, colourless, muriform: longit. septa ca. 3, transversal septa ca. 8, their size: 26—36×13—17 μ (often badly developed). Hymenial gonidia elongated: 4—6×2.5 μ in one plant or still more elongated in others: 8—12×1.5—2.5 μ.

DERMATOCARPACEAE

Dermatocarpon (ESCHW.) TH. FR.

37. (1). *Dermatocarpon miniatum* (L.) MANN.

I. North side of Gribovii Fjord.

It must be very rare, for I only found one plant.

38. (2). *Dermatocarpon cinereum* (PERS.) TH. FR.

II. Matotchkin Shar: Mt. Lasareff, Vasnetsoff Glacier, Chalhonik Valley and Mt. Syernaia.
IV. Mashigin Fjord: Junior Gl., Mt. Dietrichson and Mt. Tveten. North of the Mashigin Fjord entrance.
VI. Mainland east of Lichutin Island.

These stations are sufficient to show its wide distribution in Novaya Zemlya. But I was astonished to find it so little common; there are only a few plants in my collection. Have I overlooked it?

39. (3). *Dermatocarpon* cfr. *lachneum* (ACH.) A. L. SM.

An *D. hepaticum*? vel p. p. *D. lachneum*, p. p. *D. hepaticum*?
Dermatocarpon lachneum syn. *D. rufescens* (ACH.) TH. FR.

II. Matotchkin Shar: Chalhonik Valley (*) and Mt. Syernaia (*).
IV. Mashigin Fjord: Mt. Dietrichson, Dal Bay, Sol Bay and Rækved Bay.
VI. Mainland east of Lichutin Island (*).

Brown-squamuled *Dermatocarpons* are quite common on the earth, especially in chalky regions; but they are far from plentiful.

In southern countries where lichens develop good ("typical") thalli the two species *Dermatocarpon lachneum* and *hepaticum* are best distinguished by their squamules: In the former "squamae margine leviter angusteque adscendentes", in the latter "squamae totae adnatae" (VAIN. Lich. Fenn. I pag. 241). TH. M. FRIES calls attention to the same difference (Lich. Arct. pag. 254—255). The thalline anatomy and the structure of the apothecia are, so far as I can see, quite identical, only with the insignificant exception that in *Dermatocarpon hepaticum* the spores are very slightly smaller. In VAINIO's Lich. Fenn. the descriptions of the said characters run so parallel that they might have been exchanged.

But it is a well known fact that in the Arctis the thalli of the lichens are generally not so well developed as in Scandinavia, and the distinction between these two species becomes extremely difficult, if possible. TH. M. FRIES himself writes (Lich. Arct. pag. 255): (*Dermatocarpon hepaticum*) "a praecedente (i. e. his *Dermatocarpon rufescens*) forte non satis distinctum".

As was to be expected my Novaya Zemlya plants were of the Arctic type: Small, rigid, often quite discrete squamules, with a thickish margin, all of them brownish-red (castaneus). Generally they are appressed to the substratum with their whole surface, but some of them (three plants, marked above with an asterisc) have less appressed, slightly ascending margins. I had first referred the 3 latter plants to *Dermatocarpon lachneum*, and the other greater part to *Dermatocarpon hepaticum*. Finding these determinations very uncertain I submitted my material to my Swedish friends A. H. MAGNUSSON in Göteborg and G. O. MALME in Stockholm. My whole material was referred to *Dermatocarpon lachneum* by the former, and to *Dermatocarpon hepaticum* by the latter.

The solution of the question depends on the interpretation of the squamules. The appressed squamules may be due to a reduced development (size) on account of the severe Arctic conditions of life, in that case *Dermatocarpon lachneum* would be the more probable determination. Our Norwegian herbarium material of the two species is not rich enough to be representative, but MAGNUSSON says that in Swedish Lapland *Dermatocarpon hepaticum* is quite rare and according to VAINIO the same is the case in Finland. These well established facts are in favour of *Dermatocarpon lachneum*.

As suggested my own opinion is that either species is represented in my collection, but that I cannot with certainty distinguish between them in this material. I have, accordingly, referred all my plants to

Dermatocarpon lachneum (= *Dermatocarpon rufescens*) in this work, but only on the reason that it is the oldest name.

A. L. SMITH has reintroduced the specific name *lachneum* ACH. Lich. Suec. Prodr. 1798, pag. 140, that name being older than *rufescens* ACH. Lichen. Univ. 1810, pag. 304. VAINIO who has an easy access to the ACHARIAN herb. in Helsingfors has followed her. It seems to me that we must accept this nomenclature. In his Catalogus Lichenum vol. I, pag. 217, ZAHLBRUCKNER has referred the *lachneum* as a variety to *Dermatocarpon hepaticum*, this necessitates the use of the name *Dermatocarpon rufescens* for the plant with ascending margins.

PYRENULACEAE

Belonia KBR.

40. (1). *Belonia arctica* LYNGE n. sp.

Plate I, fig. 10—12; XIII, fig. 6.

II. Matotchkin Shar: Chalhonik Valley.

I only brought home a single plant, but it is perfectly developed; it was found on drift-wood.

Thallus tenuis, crustaceus, cinereo-albidus, membranaceus, laevigatus vel sub lente ± farinosus.

Gonidia etiam in amphithecio numerosa, flavo-virescentia, globosa, diam. 20—40 μ, vel ellipsoidea, usque ad 40 μ longa, interdum solitaria, saepe binae vel ternae, catenata, membrana crassiuscula instructa: *Trentepohlia.*

Perithecia globosa, in verrucas subglobosas thallinas (amphitecium), magnas: diam. 0.7—1 mm vel etiam majora, profunde immersa, ostiolum solum visum. Verrucae thallo concolores, in superficie inaequales: sub lente farinosae videntur. Ostiola atra, leviter impressa, rotundata, rarius subastroidea vel varie elongata, in verrucis singula, rarius binae usque quaternae. Perithecia diam. usque 0.8—1 mm. Excipulum circum ostiolum solum atrum, praeterea incolor. Paraphyses persistentes, numerosissimae, arcte cohaerentes, gelatinam firmam percurrentes, tenuissimae, saepe undulatae, vulgo indivisae, rarius ramosae, sed paraphyses ramoso-connexas nondum vidimus. Asci angusti, 10—12 μ crassi, mox dissoluti, membrana tenuis. Sporae rectae vel arcuatae, aciculares, valde elongatae, altero apice acutatae, interdum subflagelliformiter protractae, fragiles, multiseptatae, septa 10—20, cellulae cubicae vel breviter ellipsoideae. Episporium tenue. Sporae 50—95, vulgo 60—70 μ longae, 3 μ crassae.

Nucleus J e caeruleo mox fusco-flavescens vel pallide vinosum.

It seems to me that there are 4 spores in each ascus. The paraphyses are generally simple, but I have also seen distinctly ramose paraphyses (clear up with KOH, remove KOH with water and stain with zinkchloriodide. Undivided paraphyses are recorded as a generic character, cfr. ZAHLBRUCKNER Lichenes, in Engl. Prantl (1926) pag. 74 and 79. I have compared my plant with a section of SUZA Lich. Boh. No. 2 (*Belonia herculana*). This plant only gave me undivided paraphyses, but its spores and whole structure agreed so well with my plant that it must be unnecessary to create a new genus based on the few ramose paraphyses of the latter.

Belonia herculana and *Belonia russula* have much smaller perithecia. But possibly my plant is a lignicolous forma of the otherwise saxicolous *Belonia fennica* VAINIO Adjum. Lich. Lapp. II (1883) pag. 196, Lich. Fenn. I (1921) pag. 171, which I have not seen. To establish an unobjectionable specific difference it is necessary to compare the plants themselves. To judge from VAINIO's descriptions my plant has larger verrucae, larger perithecia and more cubical cellulae of the spores; the number of septa is 8—11 in VAINIO's plant.

Coriscium viride has been recorded from Kolgueff (SAV. 1912 pag. 59—62), but not from Novaya Zemlya.

SPAEROPHORACEAE

Sphaerophorus PERS.

41. (1). *Sphaerophorus globosus* (HUDS.) VAIN.

I. Goose Bay c. fr. Möller Bay (KJELLM. et LUNDSTR.).
II. Matotchkin Shar: Pomorskaya, Belushii Bay and south side of the Shar near the Kara Sea entrance.
IV. Mashigin Fjord: Mt. Dietrichson, Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay.

Widespread and in places abundant. Supposed to be more common than than these few stations suggest. It is somewhat nitrophilous; in the rookeries it is often quite embedded into the mosses. Generally sterile, but a few apothecia were also found. The material shows the usual variation: from large branched plants to the f. *congesta*, the latter is common in windy places, it is also found immersed in the mosses in the rookeries.

Former investigations. Novaya Zemlya (DEICHM. BRANTH pag. 74), Karmakuli (SAV. 1912, pag. 59), Möller Bay (KUSNETZOFF No. 86), Matotchkin Shar (TH. FRIES pag. 16, HEUGL. pag. 311), Belushii Bay (SAV. 1912, pag. 59). Also from Kolgueff (SAV. 1912, pag. 59) and from Franz Joseph Land (ELENK. et SAV. pag. 93).

Sphaerophorus fragilis was not found. Arctic "*Sphaerophorus fragilis*" in the herbaria should be reconsidered. I have seen many Arctic *Sphaerophorus globosus*, determined as *fragilis*; I am not quite convinced that the latter species is found on the European Arctic islands.

"*Sphaerophorus fragilis*" has been recorded from Möller Bay (KUSNETZOFF No. 87 and from Matotchkin Shar (SAV. 1911, pag. 51).

Arthonia fusca (= Allarthonia) has been recorded from Tolyenii Bay in Matotchkin Shar (TH. FRIES pag. 16, HEUGL. pag. 316), and from Rogatscheff Bay (KBR. pag. 7).

LECANACTIDACEAE

Catinaria VAIN.

Catinaria VAIN. Lich. Fenn. II (1922) pag. 143.

42. (1). *Catinaria* cfr. *athallina* (HEPP) LYNGE comb. nov.

Catillaria athallina (HEPP) HELLB., vide ZAHLBRUCKNER Cat. Lich. IV (1927) pag. 11, ubi syn.

II. Matotchkin Shar: Belushii Bay.

Gonidia *Trentepohlia.*

Apothecia parva: 0.3—0.5 mm.

Hypothecium fusco-nigrescens, hymenium angustum: 30—40 μ, superne hypothecio concolor, paraphyses cohaerentes, apice capitatae. Sporae incoloratae, medio septatae, cylindrico-ellipsoideae, saepe altero apice acutatae, vel medio constrictae, $11—13 \times 4$ μ.

Hymenium J rubescens.

A very inconspicuous, almost athalline plant, with small apothecia, in my plant not exceeding 0.5 mm. in diam. Accordingly we cannot conclude from this single locality, that it should be so rare.

VAINIO has told me that the gonidia of this plant are a *Trentepohlia.* I have examined them, and I can only confirm this interesting observation.

This plant differs so much from HEPP's *Biatora athallina*, Flechten von Europa No. 499, that the determination is problematical. HEPP's plant has larger apothecia, diam. 0.5—0.8 mm. and their paraphyses are easily discrete and bluish towards their tips. If the colour of the hypothecium is less valuable as specific character in this genus than in *Lecidea*, my Belushii Bay plant should be transferred from *athallina* to *Catinaria atomaria.*

43. (2). *Catinaria atomaria* LYNGE n. sp.

Plate II, fig. 1—3.

VI. Northern Kristovii Island.

There is only one plant in my collection, from a chalky rock, but it is most probably the most inconspicuous plant in my collection, and easily overlooked.

Thallus endoliteus. Gonidia: *Trentepohlia* sp.

Apothecia minutissima, diam. 0.2—0.3 mm, dispersa, sessilia, convexa, immarginata, atra, epruinosa. Hypothecium incolor vel subincolor. Hymenium angustum, 40—45 (—50) μ altum. Paraphyses arcte cohaerentes, graciles, apicem versus clavato-incrassatae, constricte septatae, furcatae, obscuratae: fuscescentes, interdum leviter in violascentem vergentes. Asci pyriformes vel saccati, octospori. Sporae incolores, dyblastae, medio constrictae, articuli saepe inaequales; sporae $10—11 \times 3—5$ μ.

Medulla J÷, KOH÷, hymenium J mox intense vinosum.

The gonidia are 12—16 μ in diam., they have a thick cell-wall, often a yellowish content and they are arranged in chains of a few links (2—3). Their content is often divided into numerous small rounded balls (sporulation?). I would refer these gonidia to *Trentepohlia*, not to *Cystococcus*; if that is correct, the plant is a *Catinaria* and not a *Catillaria.*

The dark apical articuli of the paraphyses are often seen detached. The paraphyses are so coherent that it is necessary to stain them: clear up with KOH, remove the KOH with water, stain with zinkchloriodide.

DIPLOSCHISTACEAE

Diploschistes NORM.

44. (1). *Diploschistes scruposus* (L.) NORM.

II. Matotchkin Shar: Mt. Lasareff.

It must be very rare, for I only detected a few plants. They are well fertile.

GYALECTACEAE

Sagiolechia MASS.

45. (1). *Sagiolechia rhexoblephara* (NYL.) A. ZAHLBR.

II. Matotchkin Shar: south side of the Shar at the Kara Sea entrance. I only detected a few plants at this very rich locality.

Ionaspis TH. FR.

46. (1). *Ionaspis arctica* LYNGE n. sp. ad int.

Plate IV, fig. 30—35.

II. Matotchkin Shar: Mt. Wilczek. Serebryanka Fjord.
IV. Mashigin Fjord: South side of Blaafjell Basin, Strömsnes Bay and Sol Bay.
V. Admiralty Peninsula.
VI. Pankratyeff Peninsula.

Thallus marginem versus effusus, tenuissimus, subverniceus, protothallo indistincto impositus, centrum versus crassior, sed tenuis, crebre irregulariter ruptus, areolis planis. Color cinerascens, cinereo-ochraceus vel pallide ochraceus. Gonidia *Trentepohlia*, flavescentia, pachydermatica, concatenata, diam. usque ad 40 μ.

Apothecia arcte adpressa, sed non immersa, diam. (incl. marg.) 0.3—0.5 mm. Discus primo carneus, deinde nigrescens, urceolatus vel concavus, margine crasso, thallino, fere tumidulo circumdatus. Hypothecium incolor. Hymenium superne (primo?) incolor, vel (deinde?) pulchre smaragdulum, 70—80 μ altum. Paraphyses indistinctae, tenuissimae, in apice haud incrassatae. Sporae late ellipsoideae vel subglobosae: 10—13×7—10 (—11) μ.

Medulla J÷, KOH÷; hymenium J e caeruleo pulchre vinosum (asci obscurius colorantur), KOH ÷.

Small as it is this genus has caused me more difficulties than many larger genera. It was often difficult to find good ripe spores; are they rapidly dispersed? — I have compared this species with those mentioned in ZAHLBRUCKNER's Catalogus, as far as my available material enabled me to do it, but I could not convince myself that it was identical with any of them.

My species is characterized by its thin effuse thallus, much resembling *Lecanora flavida*, and its broadly elliptical spores. The colour is not a little variable, as described above, but it was impossible for me to find a specific distinction between the greyish and the more ochraceous colours. A. H. MAGNUSSON, who is especially interested in this genus, is of opinion that the differences mentioned above suggest different species. It is quite probable that he is right.

Habitually my species resembles *Ionaspis odora* (ACH.) STEIN. I have no type of this plant before me and I do not know the spore measures of ACHARIUS' plant. But *Ionaspis odora* as understood by STEIN in Fl. Schles. (1878) pag. 151 and by MASSALONGO in Ricerche Lich. (1852) pag. 38, has much narrower spores, resp. 8—10×3—4 and 6.1×3.7 μ.

The apothecia of *Ionaspis arctica* agree entirely with those of "*Lecanora schismatopis*" NYL. Lich. Freti Behr. pag. 31 (226). The thick, white, cracked thallus of the *schismatopis* should distinguish it specifically, but the thallus is evidently very variable in this genus. Having now seen this plant in herb. NYLANDER, I find my determination of the Bear Island plant doubtful.

The type plant of "*Lecanora ochromicra*" NYL. l. c. pag. 69 (264) has hardly any thallus, evidently the chief difference against the *schismatopis*.

These three species are nearly related, I am not quite convinced that they are specifically distinct.

STEIN writes that the thallus of *Ionaspis odora* is "firniss-artig ergossen", whereas *Ionaspis suaveolens* is "meist abgegrenzt" (l. c. pag. 151). Are these species distinct? In my material there is an analogous variation: Three plants (from Matotchkin Shar: Chalhonik Valley and Cape Jouravlev, and Mashigin Fjord: North side of Blaafjell Basin) differ from the above mentioned plants of *Ionaspis arctica* by a considerably thicker, more markedly cracked and better limited thallus. But their spores are just as in the *arctica* and it cannot be necessary to distinguish them by a special name. In one of them (Chalhonik Valley) I detected fertile pycnides, with conidia straight, oblongato-cylindrical, 4—5 μ.

var. *macrospora* LYNGE nov. var.

An = *Ionaspis epulotica* (ACH.) KBR.?

II. Matotchkin Shar: East of Cape Jouravlev.
IV. Mashigin Fjord: South side of Blaafjell Basin.
VI. Eastern Kristovii Island.

Differt a specie sporis majoribus, ellipsoideis: 14—20×8—12 μ.

The large elliptical spores suggest a proper species. But my material is not satisfactory and on the final revision I found the apothecia examined either sterile or containing unripe spores. I will therefore leave the final decision untill a better material can be procured.

47. (2). *Ionaspis melanocarpa* (KRPLH.) ARN.

Ionaspis cyrtaspis (WBG.) ARN. ZAHLBRUCKNER Cat. Lich. II (1924) pag. 687.

Exsic. ARNOLD Lich. Exsic. 405 et 1115.

VI. Arkhangel Bay, chalky rocks in the rookery.

There are only two plants in my collection.

Thallus endolitheus. Gonidia *Trentepohlia*, diam. 21—24 μ.

Apothecia in areolis immersa. Discus diam. ca. 0.5 mm, ater, epruinosus, planus, margine thallino distincto circumdatus. Hypothecium incolor. Hymenium superne pulchre smaragdulum, praeterea incolor, altum vel altissimum: 110—130 vel usque ad 160 μ altum. Paraphyses indistinctae, tenues, in apice non vel leviter solum incrassatae, indivisae, septatae. Asci octospori, angusti, 85—95, usque ad 120 μ longi, 12—18 μ crassi. Sporae simplices, satis pachydermaticae, 14—19×(8—) 11—12 μ.

Medulla J÷, KOH÷; hymenium KOH÷, J intense fusco-rubescens.

My material for comparison is ARNOLD's Lich. Exsic. 405 and 1115. In the former I measured large spores: 19—24×10.5—13 μ, in the latter smaller ones: 16—19×9—10 μ. The hymenium is high, in No. 1115 130—160 μ. In either of them the hymenium was uncoloured.

Ionaspis heteromorpha has a thick, distinct thallus, an intensely smaragdine hymenium and smaller spores: 13—15×7—8 μ (ARNOLD Lich. exsic. No. 1386).

ZAHLBRUCKNER has called this species *Ionaspis cyrtaspis*. It is quite probable that this is correct, but I have seen no type of *Ionaspis cyrtaspis*.

Gyalecta ACH.

48. (1). *Gyalecta foveolaris* (ACH.) SCHAER.

I. Gribovii Fjord, south side.
II. Matotchkin Shar: Mt. Lasareff, Mt. Syernaia and Belushii Bay.
IV. Mashigin Fjord: Mt. Dietrichson and Rækved Bay.
VI. South of Arkhangel Bay. Mainland east of Lichutin Island. Northern Kristovii Island.

Scattered, but widespread and in places plentiful, e. g. in the Rækved Bay. It grows on naked earth. Some plants were fine with the typical thick pale yellowish-grey thallus (Rækved Bay), but generally the crusta is much thinner, and a confusion with *Gyalecta geoica* is then possible. I examined the spores of all such plants and only found the spores of *Gyalecta foveolaris*: 16—21×5—7 μ.

EPHEBACEAE

Polychidium (MASS.) A. ZAHLBR.

49. (1). *Polychidium muscicola* (SM.) S. GRAY.

II. Matotchkin Schar: Mt. Lasareff.
IV. Mashigin Fjord: Dal Bay.

I only detected a few plants, growing on decayed mosses and in part overgrown by other lichens (*Caloplaca stillicidiorum*, *Lecidea neglecta*, *Cladonia pyxidata* var. *neglecta* and *Cladonia coccifera* var. *stemmatina*). The latter plant (Dal Bay) is well fertile and quite typical, its apothecia are biatorine, with a plechtenchymatous excipulum and septate, uncoloured spores, 25—32×6—7 μ.

PYRENOPSIDACEAE

Pyrenopsis NYL.

50. (1). *Pyrenopsis macrospora* n. sp.

II. Matotchkin Shar: Belushii Bay.

Thallus indeterminatus, inconspicuus, crustaceus, obscure rubescens, indistincte areolatus, rugosus.

Apothecia arcte adpressa, fere innata. Discus deinde ± convexus et tum immarginatus; nitidus, rufo-rubescens, epruinosus, ± rugulosus. Hypothecium omnino incolor. Hymenium 60—65 μ altum, superne dilute olivaceo-flavescens, praeterea incolor. Paraphyses conglutinatae, indistinctae, KOH addito distinctae, validae, orbiculatae, indivisae vel furcatae. Sporae maturae magnae: 24—34×12—13 μ, simplices, incolores, guttulis oleosis repletae, tenuiter limbatae, sed in utroque apice papilliformiter limbatae.

Asci J pulchre persistenterque caerulescentes, hymenium praeterea mox decoloratur. Papillae sporarum J intensius coloratae et KOH valde turgescentes.

This species is habitually quite corresponding to *Pyrenopsis pulvinata* and I was much astonished to find its very large spores. They originate 8 in each ascus, but it is impossible that 8 spores of this size can ripen in one ascus when the hymenium is so low. I have made several sections of my few apothecia; in each preparate I found a lot of free large spores, but I was unable to find a single ascus containing ripe spores. Immature asci contained up to 8 small young spores, which were easily removed from their asci if KOH was applied. I conclude from this that only a reduced number of spores (1?, 2?) ripen in each ascus, that they exercise a considerable pressure on the ascus wall according to their size, and that they are easily ejaculated owing to this pressure — an unusual thing with lichens.

The apical articuli of the paraphyses are easily detached and look like small spores.

I cannot quite exclude the possibility that this is a *Pyrenopsis pulvinata* where only a reduced number of spores develop in each ascus, and where they accordingly attain this extraordinary size. But the difference in the spore size is very great and I have not seen the apical papillae on the spores of *Pyrenopsis pulvinata*. The maturation of the spores should be studied cytologically, if sufficient material could be procured.

51. (2). *Pyrenopsis pulvinata* (SCHAER.) HELLB.

Pyrenopsis pulvinata, vide ZAHLBR. Cat. Lich. II (1924) pag. 774, ubi syn.

I. Goose Bay.
II. Matotchkin Shar: Mt. Lasareff (?, sterile).

Only a few plants, on mosses. The fertile plant is small and the thallus is poorly developed. But there are a few apothecia; the simple spores measure 14—16×7—8 μ.

Pyrenopsis granatina has been recorded from Belushii Bay (VAIN. pag. 86). In our publications it has been included under the genus *Lecanora*.

COLLEMACEAE

Leciophysma TH. FR.

52. (1). *Leciophysma finmarkicum* TH. FR.

Leciophysma Finmarkicum TH. FR. n. gen. et sp. Nya Skandinaviska Lafarter 2. Botaniska Notiser Lund 1865, p. 102. ZAHLBRUCKNER Catalogus III (1925) pag. 12. LYNGE Lich. Bear Island (1926) pag. 44. Plate III, fig. 23.

I. Gribovii Fjord: North side.
II. Matotchkin Schar: Mt. Lasareff, Vasnetsoff Gl., Mt. Wilczek, Chalhonik Valley, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, Blaafjell Basin (south side), Mt. Dietrichson and Sol Bay. North of the Mashigin Fjord entrance.

V. Admiralty Peninsula.
VI. Mainland east of Lichutin Island. Northern Kristovii Island.

Leciophysma finmarkicum is widely distributed in Novaya Zemlya and quite common everywhere. It grows on mosses and on dead plants (*Saxifraga oppositifolia*, *Dryas octopetala* and the like), with *Blastenia tetraspora*, *Buellia disciformis* var. *muscorum*, *Caloplaca cinnamomea* and *subolivacea*, *Lecanora epibrya* and *verrucosa*, *Lecidea glomerulosa* var. *Wulfenii* and *Rinodina roscida*, very faithful companions.

Thallus parvus, caespites nigricantes vel olivaceo-nigricantes, parvas (diam. 5—15 mm.) formans. Laciniae erectae vel adscendentes, confertae, breves, angustae, 0.2—0.4 mm. latae, depresso-cylindricae vel papillatae, ramosae. Laciniae ecorticatae, gonidia (*Nostoc*) moniliformia, superficiem versus densius, centrum versus sparsius disposita.

Apothecia lecideina, numerosa, sessilia vel laciniis thallinis ± immersa, immarginata, mox convexa, discus epruinosus, minute rugulosus. Excipulum plectenchymaticum, incolor, hyphis (cellis) leptodermaticis, magnis, diam. 13—18 μ formatum. Hypothecium dilute fuscidulum, hyphis intricatis vel subplectenchymaticis, quam hyphis receptaculi multo minoribus contextum. Hymenium 100—130 μ altum, superne fusco- vel olivaceo-nigrescens, ceterum incolor vel dilutissime roseum, non inspersum. Paraphyses indistinctae, apice saltem conglutinatae et nigro- vel fusco-capitatae, indivisae vel saepe furcatae vel ramosae, (haud constricte) septatae. Asci anguste clavati vel subcylindrici, octospori, 100—110 μ longi, 17—20 μ crassi, membrana tenui, in apice leviter incrassata cincti. Sporae uniserialiter dispositae, indivisae, incoloratae, immaturae subquadraticae, maturae late ellipsoideae vel ovoideae vel globosae, dupliciter limbatae (1—1.5 μ), diam. 10.5—16 μ.

Pycnides frustra quaesivimus (ignotae).

React. Gelatina hymenii J mox vinosum, asci persistenter caerulescentes vel caeruleo-nigrescentes. Thallus J non rubescens.

Collema (HILL) A. ZAHLBR.

53. (1). *Collema rupestre* (SW.) RABH.

VI. Berkh Island.

There was only one plant of this species in my collection. It is surprising that this station should be so far north.

54. (2). *Collema arcticum* LYNGE.

Plate III, fig. 19–20, XI, fig. 2.

Collema arcticum LYNGE Lich. Bear Island (1926) pag. 45.

I. Gribovii Fjord: North side.
II. Matotchkin Shar: Mt. Wilczek, Mt. Lasareff, Chalhonik Valley, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Blaafjell Basin, south side, Mt. Dietrichson, Mt. Tveten and Sol Bay. North of the Fjord entrance.
VI. South of Arkhangel Bay. Berkh Island.

Generally found with *Leciophysma Finmarkicum*. It has the same distribution as that species in Novaya Zemlya, but it is probably not so common.

55. (3). *Collema multifidum* (SCOP.) RABENH.

I. Goose Bay. Inland end of Gribovii Fjord.
II. Matotchkin Shar: Chalhonik Valley and Mt. Syernaia. Rookery in Serebryanka Fjord.
IV. Mashigin Fjord: Mt. Dietrichson.
VI. Berkh Island. Mainland east of Lichutin Island.

Collema multifidum is quite common on chalk in Arctic Norway and the plants are often fine and well fertile. In Novaya Zemlya I had expected to find more of it. But there is only one (very sparingly) fertile plant in my collection with small and undeveloped apothecia, curiously enough from the northernmost station (Berkh Island), and the sterile plants are generally small and poorly developed.

The plants that were collected directly on chalky rocks, are typical enough, though small. But the plants that were growing among mosses are often so stunted in their growth that they approach *Collema pulposum*. In the Arctis these species are not always easy of distinction if they are sterile, especially the well-fed plants from the rookeries. *Collema multifidum* has a thinner, often plicate thallus, which is more lacerate at the margin, the best character of the other species, if sterile, is expressed by its name "pulposum".

LID found *Collema polycarpum* near Sörkapp (Spitsbergen) and I saw it in Bell Sound (1926). I had expected to find it in Novaya Zemlya where chalky rocks are so abundant, but I searched it in vain. — Though *Nostocs* are plentiful on irrigated soil, *Collemas* are, on the whole, not common in Novaya Zemlya.

56. (4). *Collema pulposum* ACH.

II. Matotchkin Shar: Mt. Syernaia. Rookery in Serebryanka Fjord.
IV. Mashigin Fjord: Moraines on the south side of Blaafjell Basin, Nunatak on Lacroix (Norway) Gl. North of the Mashigin Fjord entrance.

On naked clayey soil. Unfortunately all my plants are sterile, with one exception (Serebryanka Fjord), and this plant contains no spores. Some of the determinations are uncertain, cfr. *Collema multifidum*.

Arctomia TH. FR.

57. (1). *Arctomia delicatula* TH. FR.

Plate III, fig. 24—26.

I. Goose Bay.
II. Matotchkin Shar: Mt. Lasareff, Belushii Bay and south side of the Shar, at the Kara Sea entrance.
IV. Mashigin Fjord: Mt. Tveten and Sol Bay.

Very scarce, I only found a few plants. But I do not venture to say that it is really so rare, for it is so inconspicuous. I did not observe it in situ, but I detected these few plants at home, with some other muscicolous lichens, e. g. *Blastenia tetraspora*, *Lecidea glomerulosa* var. *Wulfenii* and *Buellia disciformis* var. *muscorum*.

Its spores are multiseptate, generally 7-septate, more or less curved, and larger than in the following species: 35—75×(4.5) 5—6 μ. The third species of this genus, *Arctomia acutior* (NYL.) VAIN. has multiseptate, long and very narrow spores: 52—69×3.5—4.5 μ.

58. (2). *Arctomia interfixa* (NYL.) VAIN.

Arctomia interfixa ZAHLBRUCKNER Cat. Lich. III (1925) pag. 109, No. 5489.

II. Matotchkin Shar: Mt. Lasareff.

It is still more inconspicuous than the former species. I have found its spores to be straight, triseptate, 28—34×4.5—5 μ.

First collected at Lawrence Bay by E. ALMQUIST during the Vega Expedition 1879. I have seen no other record of it, and it is one of the rarest plants in my collection.

Leptogium S. GRAY.

59. (1). *Leptogium lichenoides* (L.) A. ZAHLBR.

II. Matotchkin Shar: Mt. Lasareff.
Evidently very rare. I only found one plant.

60. (2). *Leptogium pulvinatum* (HOFFM.) CROMB.

Syn. *Leptogium atrocaeruleum* var. *pulvinatum* BELTRAM. *Leptogium lichenoides* var. *pulvinatum* A. ZAHLBR. *Leptogium lacerum* var. *pulvinatum* (ACH.).

I. Goose Bay.
II. Matotchkin Shar: Vasnetsoff Gl., Chalhonik Valley, Mt. Syernaia and Belushii Bay. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Mt. Dietrichson, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
VI. Mainland east of Lichutin Isl. Berkh Isl. Eastern and Northern Kristovii Isl. Pankratyeff Peninsula.

Widespread all over the region investigated by us and plentiful almost everywhere. Apothecia are very rare, as usual. I only detected one fertile plant, at Belushii Bay. The spores were generally immature, one mature spore was ellipsoid, not truncate, murali-locular, 30×16 μ.

It is, on the whole, the commonest *Leptogium* of the Arctis. *Leptogium lacerum* from Ellesmereland (2nd Norw. Exp. Fram) in our herb. is this species.

Its laciniae vary considerably. Some of them are quite terete, others more flattened. Possibly the former type is identical with *Leptogium lacerum β. tenuissimum* (DICKS.) TH. FR. in Th. Fries Lich. Arct. pag. 283. But it is very different from *Leptogium tenuissimum* (DICKS.) KBR. in MALME Lich. suec. No. 885 and from *Lept. tenuissimum* in NORRL. et NYL. Herb. Lich. Fenn. No. 356.

I have no good material for comparison of the *lichenoides-scotinum* tribus of *Leptogium*, which is sorely in need of a monographical treatment.

It seems to me that this very characteristic plant must be specifically distinct from *Leptogium lichenoides*. Excellent descriptions are found in TH. FRIES Lich. Arct. pag. 283, and in CROMBIE Brit. Lich. (1894) pag. 70.

61. (3). *Leptogium* cfr. *scotinum* (ACH.) FR.

VI. Mainland east of Lichutin Island.

Only one plant, small and microphyllinous, with rotundated lobes, growing on a dead *Dryas*, together with *Leciophysma finmarkicum*. It has a thin cortex, formed of uniseriated cells; its apothecia are young, almost urceolated, with 8 muriform, apiculated spores, $35—50 \times 14—18$ μ, in each ascus.

62. (4). *Leptogium saturninum* (DICKS.) NYL.

I. Gribovii Fjord.
II. Matotchkin Shar: Belushii Bay.

Supposed to be rare, I only found a few plants. The thallus is distinctly corticate, but not plectenchymatous. It is polyphyllous with very crisp margins. The tomentum of the under surface is distinct, but not so dense as it usually is in our country. The upper surface is slightly furfuraceous. The plants agree quite well with CLAUD. et HARM. Lich. Gall. praecip. No. 154 or with SCHAER. Lich. Helv. No. 424 ("*Parmelia myochroa γ. imbricata* SCHAER."). As was to be expected all my plants are sterile.

PANNARIACEAE

Placynthium S. GRAY.

63. (1). *Placynthium asperellum* (ACH.) TREV.

Vide *Pterygium asperellum* NYL. ZAHLBRUCKNER Cat. Lich. III (1925) pag. 1, ubi syn.

Placynthium asperellum, LYNGE Lich. Bear Isl. (1926) pag. 49.

I. Goose Bay. Gribovii Fjord: south side.
II. Matotchkin Shar: Near Vasnetsoff Gl., Mt. Lasareff, Mt. Wilczek, Chalhonik Valley, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay. Nunatak on Lacroix (Norway) Gl., Mt. Dietrichson, Mt. Tveten, Strömsnes Bay and Sol Bay.
VI. Lichutin Island.

Placynthium asperellum is one of the really common lichens of Novaya Zemlya. It is especially found on the flat stones of the rock-falls. It prefers chalky slates, but it is not strictly calcicolous, as *Placynthium nigrum* is. Fertile plants are quite common.

In Arctic literature it has evidently often been confused with *Placynthium nigrum*.

Apart of the "typical" plants ("thallo ambitu ramulis decumbentibus, angustis, torulosis, teretiusculis, ramosis stellato") there are some other plants which I have referred to this species, although with some doubt. Other botanists might have judged otherwise of them. The branches are more condensed so as to form almost pulvinate areolae, the thallus may be almost "areolato-rimosus". But here and there more typical marginal branches are seen. The plants look damaged (irrigation with ice-water?)

I found a remarkable sterile *Placynthium* on a hard granitic rock (no CO_2 with HCl) south of Arkhangel Bay. Its black thallus is cracked (areolato-rimosus) with rosulate areolae. It has not the decumbent radiating marginal branches of *Placynthinm asperellum*, but I cannot refer it to the strictly calcicolous *Placynthium nigrum*.

It is probably a damaged (irrigation?) *Placynthium asperellum*, which is so common in Novaya Zemlya, but I cannot quite exclude *Placynthium rosulans* (TH. FR.) ZAHLBR. (*Lecothecium rosulans* TH. FR. Nya lafarter, Bot. Not. (1863) pag. 12). It differs from that species by its black colour, the *rosulans* is brown (TH. FRIES: cervino-fuscescens), and its distinct hypothallus. *Placynthium rosulans* is a species suspecta, several plants collected at the locus classicus and distributed by BLOMBERG, are *Pterygium pannariellum*, according to DU RIETZ (in littere).

64. (2). *Placynthium nigrum* (HUDS.) S. GRAY.

VI. Lichutin Island. Berkh Island.

Only a few plants, growing on chalky substratum, but as they were found "farthest north", we may expect the species to be widely distributed, though it must be rare.

Placynthium nigrum is distinguished from *Pl. asperellum* by characters which TH. M. FRIES has excellently described in Lich. Arct. pag. 285—286. The morphological distinctions are:

Pl. nigrum:	*Pl. asperellum:*
Thallus microphyllino-squamulosus, squamulae inciso-laciniatae, in crustam corallinam diffracto-areolatam confertae.	Thallus ramulosus et granulato-verrucosus, crusta rimoso-areolatus, ambitu ramulis decumbentibus, angustis, torulosis, teretiusculis ramosis stellata.
Thallus cervino- l. fusco-ater. Thallus hypothallo caeruleo-atro, byssino, primitus saltem evidente et limitante.	Thallus niger v. olivaceo-nigricans. Hypothallus indistinctus vel nullus.

Young *asperellum*-plants are very easy of distinction, on account of their spreading adpressed torulose laciniae. But in old plants the crustose habitus becomes more prevailing, in that case the hypothallus is the distinctive character.

When I have examined Arctic herbarium plants, named *Placynthium nigrum* or *Lecothecium corallinoides* I generally found them to be *Placynthium asperellum* and at last I doubted of *Placynthium nigrum* as an Arctic plant. I was therefore glad to find, in my collection, these few plants with a very distinct hypothallus, which I was unable to distinguish from *Placynthium nigrum.*

The distinction between the genera *Pterygium* and *Placynthium* is very uncertain and deserves a monographical investigation.

Parmeliella MÜLL. ARG.

65. (1). *Parmeliella arctophila* (TH. FR.) MALME.

Vide LYNGE Lich. Bear Island p. 48, ubi syn.

II. Matotchkin Shar: Mt. Syernaia and south side of the Shar, at the Kara Sea entrance.
IV. Mashigin Fjord: Blomster Bay.
V. Admiralty Peninsula.

I only found a few and very poorly developed plants of this species, which was so plentiful in TH. FRIES's Bear Island collection. Though the plants are so small and not quite typical I have ventured the determination owing to the conformable texture of the apothecia: biatorina, excipulum plectenchymaticum, sporae simplices, 16—21 × 10 —12 μ, episporium rugulosum. Thallus corticatus, gonodia: *Nostoc.*

Former investigations. Recorded from Matotchkin Shar (TH. FRIES pag. 16, HEUGL. pag. 312).

66. (2). *Parmeliella furfurascens* (NYL.) LYNGE comb. nova.

Pannaria furfurascens NYLANDER Addenda Nova, Flora, vol. LVI, 1873 pag. 17. ZAHLBRUCKNER Cat. Lich. No. 5797, vol. III (1925) pag. 242.

II. Matotchkin Shar: South side at the foot of Mt. Lasareff.

Supposed to be rare — or overlooked —, for I only collected a few plants. Formerly only recorded in literature from Karelia Onegensis: Waalkiamäki, leg. J. P. NORRLIN 1870, NYLANDER's type plant. But it has a wider distribution, for in the Upsala herb. I detected plants from Dovre, (ZETTERSTEDT and TH. M. FRIES) and from Varanger: Mortensnes (TH. M. FRIES), s. n. *Pannaria triptophylla.*

Parmeliella furfurascens differs considerably from *Pannaria triptophylla* = *Parmeliella corallinoides* (vide ZAHLBR. Cat. Lich. No. 5717) by its much darker thalline colour, its furfuraceous or granular thallus and its quite black apothecia. Its paraphyses are stoutish and septate, as usual in the genus, its spores simple, 14—18 × 7—9 μ (NYLANDER measured 15—20 × 8—11 μ).

67. (3). *Parmeliella lepidiota* (SOMRFT.) VAIN.

ZAHLBRUCKNER Cat. Lich. III (1925) pag. 210, ubi syn.

II. Matotchkin Shar: Mt. Lasareff.
IV. Mashigin Fjord: From Bay and Dal Bay.
VI. Berkh Island (?).

Only a few plants were obtained, but it is quite possible that I have overlooked it. The Berkh Island plant is very dark, with coarse imbricate verrucae. Otherwise the plants are typical, generally sterile, one of them has a few apothecia, immersed among the thalline verrucae.

Pannaria DEL.

68. (1). *Pannaria elaeina* (WBG.) NYL.

II. Matotchkin Shar: Mt. Lasareff.
IV. Mashigin Fjord: Nunatak on Lacroix Gl. (Norske bræen), Mt. Tveten, Strömsnes Bay and Sol Bay.

Most probably *Pannaria elaeina* is a widespread plant in Novaya Zemlya. I found a fine plant on the nunatak, suggestive of its distribution much farther north than Mashigin Fjord. The plants are generally fine and often fertile.

Pannaria elaeina prefers large stones in the rock-falls, where there is some moisture, often together with *Lecanora gelida*, *Pannaria Hookeri* a. o. At such places it can be quite plentiful.

69. (2). *Pannaria Hookeri* (BORR.) NYL.

Plate VII, fig. 2.

II. Matotchkin Shar: Mt. Lasareff and Mt. Wilczek.
IV. Mashigin Fjord: Fram Bay, Nunatak on Lacroix Gl. (Norske bræen), Mt. Dietrichson, Mt. Tveten and Sol Bay.
V. Admiralty Peninsula.

Like the former species it is a plant from the rock-falls, but it is by far the commoner of the two.

Pannaria Hookeri is a conspicuous and fine plant, always well fertile.

70. (3). *Pannaria pezizoides* (WEB.) LIGHTF.

I. Goose Bay.
II. Matotchkin Shar: Mt. Syernaia, Belushii Bay and south side of the Shar, at the Kara Sea entrance.

IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson, Mt. Tveten, Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. South of Arkhangel Bay.

As was to be expected *Pannaria pezizoides* is the commonest *Pannaria* in Novaya Zemlya. I found it on the earth in the lowlands. In Mashigin Fjord it is very common, but I do not venture to suggest anything about its frequency farther north.

The plants are well fertile, as usual. But the colour is much darker than in Norwegian plants. The same is the case with *Psoroma hypnorum*, and in the Arctis attention (ev. microscopical examination of the gonidia) is sometimes necessary to prevent confusion between these two species, which are so easy of distinction under more favourable conditions of life.

Former investigations. Recorded from Matotchkin Shar (TH. FRIES pag. 16, HEUGL. pag. 312).

Psoroma (ACH.) NYL.

71. (1). *Psoroma hypnorum* (DICKS.) HOFFM.

I. Goose Bay.
II. Matotchkin Shar: Mt. Lasareff, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson, Mt. Tveten, Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.

Widespread and common; there is no reason to suppose that it should be lacking farthest north. The thalline granules are often poorly developed; the whole plant is frequently seen only as apothecia, immersed in the mosses. Microfungi are not rare in the thallus.

Former investigations. Recorded from Novaya Zemlya (DEICHM. BRANTH pag. 75). Matotchkin Shar (SAV. 1911, pag. 52). Also from Kolgueff (SAV. 1912, pag. 58) and Franz Joseph Land (ELENK. and SAV. pag. 93).

STICTACEAE

Lobaria (SCHREB.) A. ZAHLBR.

72. (1). *Lobaria linita* (ACH.) RABH.

I. Gribovii Fjord: North side.
II. Matotchkin Shar: Pomorskaia, Belushii Bay and south side of the Shar, at the Kara Sea entrance.
IV. Mashigin Fjord: Mt. Dietrichson, Mt. Tveten and Dal Bay.
V. Admiralty Peninsula.

It is widespread in Novaya Zemlya, but far from common. On grassy and mossy slopes, often with *Nephroma expallidum*, which is much more common.

Former investigations. Recorded from Matotchkin Shar (SAV. 1911, pag. 52). Also from Kolgueff (SAV. 1912, pag. 58).

PELTIGERACEAE

Solorina ACH.

73. (1). *Solorina bispora* NYL.

I. Bessimyannii Fjord. Gribovii Fjord: South side.
II. Matotchkin Shar: Mt. Lasareff, Mt. Wilczek, Chalhonik Valley, east of Cape Jouravlev, Vasnetsoff Glacier, Mt. Syernaia, Belushii Bay, south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Mt. Dietrichson, Mt. Tveten, Strømsnes Bay, Dal Bay, Sol Bay and Rækved Bay. North of the fjord entrance.
VI. Rookery south of Arkhangel Bay, Lichutin Island, mainland east of Lichutin Island, Berkh Island, Eastern and Northern Kristovii Islands and Pankratyeff Peninsula.

Solorina bispora is by far the commonest *Solorina* in Novaya Zemlya, as in other Arctic countries. It is widespread, common and abundant almost everywhere, I think that I could have found it every day. It ascends high on the mountains and it is found on the very moraines.

74. (2). *Solorina octospora* ARN.

HUE Monographia generis Solorinae Ach. (1911) pag. 19, ubi syn.

II. Matotchkin Shar: Belushii Bay.
IV. North of the Mashigin Fjord entrance.

The asci are octosporous, long and very narrow: about 250 μ long and 15—16 μ broad. The spores are smaller than in *Solorina saccata*: 29—35×13—14 μ, and more acute, with a smooth episporium. The hymenium is very high: 300, up to 500 μ. Only these two plants were detected. Vide *Solorina saccata.*

75. (3). *Solorina spongiosa* (SM.) ANZI.

Syn. *Solorina limbata* (SOMRFT.) MUDD.

I. Bessimyanni Fjord.
II. Matotchkin Shar: Mt. Wilczek. Sukhoi Noss.
IV. Mashigin Fjord: Mt. Dietrichson. North of the Fjord entrance.

Scattered, rare and very scarce.

76. (4). *Solorina saccata* (L.) ACH.

II. Matotchkin Shar: Near Vasnetsoff Glacier.
VI. South of Arkhangel Bay. Berkh Island.

In Novaya Zemlya as in other Arctic regions *Solorina saccata* is a rare plant, it is most probably very rare in Novaya Zemlya. It is there considerably smaller than our Norwegian plants and easily confused with *Solorina bispora*, the common *Solorina* in the Arctis. It was therefore necessary to examine the spores of every plant where *Solorina saccata* might be suspected. The result was poor: only these three plants were vindicated for *Solorina saccata*; but *Solorina octospora* was detected. One plant from Ellesmereland, (leg. SIMMONS) is also the *Solorina octospora*. This suggests a wide distribution.

Former investigations. "*Solorina saccata*" has been recorded from Kristovii Fjord (ELENK. et SAV. pag. 81). It is not *Solorina bispora*?

77. (5). *Solorina crocea* (L.) ACH.

I. Goose Bay. Möller Bay (KJELLM. et LUNDSTR.)
II. Matotchkin Shar: Pomorskaya, Belushii Bay and south side of the Shar at the Kara Sea entrance.

IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson, Strömsnes Bay, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. South of Arkhangel Bay.

It is widespread and abundant in suitable stations: moist soil irrigated by the water from melting snow (Norwegian: "sneleier"). But it is almost limited to such places.

Former investigations. Novaya Zemlya (MARKH. p. 332). Möller Bay (KUSNETZOFF No. 85), Karmakuli (SAV. 1912, pag. 57), Matotchkin Shar: Belushii Bay (VAIN. pag. 86). Also from Franz Josef Land (JACKSON pag. 417).

Nephroma ACH.

78. (1). *Nephroma arcticum* (L.) TORSSELL.

I. Cape Gusinnoi (KJELLM. et LUNDSTR.). Goose Bay.
II. Matotchkin Shar: South side at the Kara Sea entrance. Serebryanka Fjord. Sukhoi Noss.

I only detected a few sterile plants of the Arctic type (f. *complicata* NYL.), and not north of the Matotchkin Shar district. It has generally been supposed that it should be so common in the Arctis, but that must be a mistake. To judge from literature it must be widely distributed, but it is evidently rare. — In Spitsbergen (Bell Sound) I only detected it at one place (1926).

Former investigations. Möller Bay (KUSNETZOFF No. 80) and Matotchkin Shar (SAV. 1911, pag. 51). Also from Kolgueff (SAV. 1912, pag. 55).

79. (2). *Nephroma expallidum* NYL.

I. Goose Bay. North side of Gribovii Fjord.
II. Matotchkin Shar: Pomorskaya, Belushii Bay (pluribi) and south side at the Kara Sea entrance. Sukhoi Noss.
IV. Mashigin Fjord: Blomster Bay, Strömsnes Bay and Rækved Bay. North of the Fjord entrance.
V. Admiralty Peninsula.
VI. Berkh Island. Eastern Kristovii Island.

Widespread and common, in places quite plentiful. It is much more common than *Nephroma arcticum*. All my plants are sterile. They are generally of the f. *complicata* type, but often well developed, at the Kara Sea entrance I found quite magnificent plants.

Former investigations. Möller Bay (KUSNETZOFF No. 81) and Matotchkin Shar (SAV. 1911, pag. 51). Also in Kolgueff (SAV. 1912, pag. 55).

Nephroma resupinatum has been recorded from Möller Bay by KUSNETZOFF, No. 82.

Peltigera WILLD.

Sect. I. *Phlebia* WALLR.

80. (1). *Peltigera aphthosa* (L.) HOFFM.

0. Waigatsch: Cape Grebenij (KJELLM. et LUNDSTR.).
I. Goose Bay. North side of Gribovii Fjord.
II. Matotchkin Shar: Pomorskaya, at the foot of Mt. Lasareff, Belushii Bay, South side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, in the scree at the foot of the Mts. Dietrichson and Tveten, Strömsnes Bay, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Mainland east of Lichutin Island. Berkh Island.

Common and widespread all over the country, but only seen sterile. The plants are small, more crisp and often more brownish than in Norway.

Former investigations. Novaya Zemlya (MARKH. pag. 332). Recorded from Karmakuli (SAV. 1912, pag. 53), Möller Bay (KUSNETZOFF No. 83), Matotchkin Shar (SAV. 1911, pag. 51, 1912, pag. 53), and Belushii Bay (SAV. 1912, pag. 53). Also from Waigatsch (STIZ. pag. 420, HEUGL. pag. 311) and from Franz Joseph Land (C. R. MARKHAM pag. 134, JACKSON pag. 417 and ELENK. et SAV. pag. 92).

81. (2). *Peltigera venosa* (L.) HOFFM.

II. Matotchkin Shar: South side, at the Kara Sea entrance.

Certainly rare; I only found it at this station, so rich in rare and interesting lichens. The plants were not large, but perfectly developed.

Sect. II. *Emprostea* VAIN.

82. (3). *Peltigera malacea* (ACH.) FR.

I. Goose Bay.
II. Matotchkin Shar: Belushii Bay.
IV. Mashigin Fjord: Mt. Dietrichson and Mt. Tveten.

It is not common and I did not find it farthest north. At the Mashigin Fjord stations it was quite plentiful and well developed, otherwise the Novaya Zemlya plants are often small, with crisp margins. Always sterile.

83. (4). *Peltigera canina* (L.) HOFFM.

I. Goose Bay.
II. Matotchkin Shar: At the foot of Mt. Lasareff, c. fr., Belushii Bay, and at the Kara Sea entrance on the south side. Serebryanka Fjord. Sukhoi Noss.
IV. Mashigin Fjord: Fram Bay, at the foot of the Mts. Dietrichson and Tveten, Strömsnes Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Berkh Island.

var. *rufescens* (NECK.) MUDD.

I. Goose Bay.
II. Matotchkin Shar: Pomorskaya, Mt. Lasareff, east of Cape Jouravlev, Mt. Syernaia, Belushii Bay, and the Kara Sea entrance on the south side. Serebryanka Fjord.
III. Kristovii Fjord.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Mt. Tveten, Dal Bay and Rækved Bay. North of the Mashigin Fjord entrance.
VI. Rookery south of Arkhangel Bay. Berkh Island. Mainland east of Lichutin Island. Northern Kristovii Island. Pankratyeff Peninsula.

Peltigera canina sensu latiore is one of the commonest and most widespread lichens of Novaya Zemlya, abundant all over the region investigated by us. Most probably I have seen it every day. Fertile plants are very rare, in the whole large collection there is only one apothecium.

The difference between *Peltigera canina* and *rufescens* is well known: The latter has darker brown, coarser, more crisp and accordingly less expanded thalli with darker veins on the underside. The most important difference is the crisp margin, resulting in more ascending lobes, but this is a variable character and the colour is still more variable. My investigation of the Novaya Zemlya material has only confirmed my former opinion that there is no specific difference between these plants, at least not in the Arctis.

In Novaya Zemlya var. *rufescens* is much more common than the type. A few plants approach the expanded, thin, quite pale f. *membranacea.*

Former investigations. Novaya Zemlya (MARKH. pag. 332). "*Peltigera canina*" has been recorded from Matotchkin Shar (SAV. 1911, pag. 51, 1912, pag. 54), Belushii Bay (SAV. 1911, pag. 51) and Kristovii Fjord (ELENK. et SAV. pag. 81). Also from Franz Joseph Land (ABRUZZI pag. 670 — var. *carnea* DELISE — and ELENK. et SAV. pag. 92).

"*Peltigera rufescens*" from Möller Bay (KUSNETZOFF No. 84). Also from Kolgueff (SAV. 1912, pag. 55) and Franz Joseph Land (ELENK. et SAV. pag. 93).

84. (5). *Peltigera erumpens* (TAYL.) VAIN.

Plate VI, fig. 1.

I. North side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Wilczek, east of Cape Jouravlev, Mt. Syernaia, Belushii Bay, south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Mt. Dietrichson, Mt. Tveten, Strömsnes Bay, Sol Bay. North of the Mashigin Fjord entrance.
VI. Northern Kristovii Fjord.

On grassy and mossy slopes, with *Peltigera aphthosa* and *Peltigera canina*. It is common and widespread, but not so plentiful as the other two species. The plants are small, and always sterile, as in Norway.

85. (6). *Peltigera lepidophora* (NYL.) BITTER.

Vide DU RIETZ Lich. Fragm. Svensk Bot. Tidsskr. 1915, p. 421.

Plate VI, fig. 2.

II. Matotchkin Shar: Mt. Lasareff and on the south side at the Kara Sea entrance.
IV. Mashigin Fjord: Mt. Dietrichson, Mt. Tveten and Dal Bay.
VI. South of Arkhangel Bay.

Widespread and perhaps common, but nowhere plentiful. The plants are small, often miserable and always sterile.

86. (7). *Peltigera scabrosa* TH. FR.

I. Goose Bay.
II. Matotchkin Shar: Pomorskaya, Belushii Bay and south side at the Kara Sea entrance.
IV. Mashigin Fjord: Strömsnes Bay.
V. Admiralty Peninsula.

Distribution and frequency about the same as for *Peltigera polydactyla.* Often well developed, but always sterile.

87. (8). *Peltigera polydactyla* (NECK.) HOFFM.

I. Goose Bay. South side of Gribovii Fjord.
IV. Mashigin Fjord: Mt. Tveten, Strömsnes Bay, Dal Bay and Sol Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Lichutin Island.

Widely distributed and more common than *Peltigera malacea.* The plants are often small and compressed, but fine plants are not rare and a few fertile ones were also detected. *Peltigera horizontalis* is a southern plant, even in Norway, and hardly to be expected from Novaya Zemlya. Poorly developed plants might be confused with *Peltigera canina* var. *rufescens* or with *Peltigera malacea,* but its shining overside and its dark veins are very characteristic.

Lecidea (ACH.) A. ZAHLBR.

A. *Eulecidea* STIZ.

a. Sect. *atrobrunnea* Th. FR.

88. (1). *Lecidea atrobrunnea* (RAM.) SCHAER.

Plate IX, fig. 3.

II. Matotchkin Shar: East of Cape Jouravlev, Mt. Syernaia and Belushii Bay. Rookery in Serebryanka Fjord.
IV. Mashigin Fjord: South side of Blaafjell Basin, Strömsnes Bay and Dal Bay.
VI. Rookery south of Arkhangel Bay. Berkh Island. Northern Kristovii Island.

Common and widespread and very plentiful in the rookeries. — In Bell Sound, Spitsbergen, I found it still more plentiful, quite a type plant of the bird-stones.

Lecidea atrobrunnea is highly coprophilous and my finest plants were obtained in the large rookeries, where they evidently found the conditions of life very attractive. South of Arkhangel Bay I found quite magnificent plants in a rookery, which is most probably the largest on the Arctic coasts. The areolae were so thick that the plant could be detached with a knife. But generally its development is of a more Arctic type. Som of my plants have a thallus so thin that I had to consider the possibility of *Lecidea paupercula*, otherwise so distinct from this species.

The normal cupreous colour sometimes changes into a much paler, greyish or even greyish-white, if the cortex is damaged or destroyed. Some of my plants are so pale that *Lecidea speirea* had to be considered. The hypothecium is paler than in *Lecidea paupercula*, but it is not always quite uncoloured. Its spores are (6—) 8—10×(3.5—) 4.5—6 μ.

Former investigations. Möller Bay (KUSNETZOFF No. 60).

89. (2). *Lecidea paupercula* TH. FR.

Lecidea paupercula TH. FR. Lich. Scand. II (1874) pag. 482.

Psora atrobrunnea var. *subfumosa* ARNOLD Lich. Ausfl. XX (1879) pag. 23 (373). ARNOLD Lich. Exsic. No. 551 (s. n. *Psora atrobrunnea*).

Lecidea fuscoatrata NYLANDER Flora 1875, pag. 301.

Lecidea aeneola VAIN. in ZAHLBR. Cat. Lich. III (1925) pag. 501, ubi syn. Non *Lecidella aeneola* ARNOLD Lich. Ausfl. X pag. 96.

II. Matotchkin Shar: Near Vasnetsoff Gl., Mt. Wilczek, East of Cape Jouravlev, Mt. Syernaia and Belushii Bay.
IV. Mashigin Fjord: North side of Blaafjell Basin and Strömsnes Bay.
VI. Lichutin Island.

It is quite common in Matotchkin Shar, but my material is insufficient to determine its distribution farther north. My observations do not suggest it to be a nitrophilous plant more than most other *Lecideae* are.

I have carefully examined the apothecia of almost every plant in my collection in order to measure the spores, but I was unable to find the two species of this section that have large spores: *Lecidea athroocarpa* ACH. and *Lecidea atroocarpoides* VAIN. The spores are often badly developed or quite lacking in *Lecidea paupercula*.

At Belushii Bay I found a plant with an abnormal colour, greyish-yellow, of this section. Happily there were some marginal (young) areolae with the typical brownish colour, I have determined this plant to *Lecidea paupercula*. — Its areolae are contiguous.

Considerable difficulties are connected with this species: first its systematical limitation, secondly its synonymy.

TH. FRIES described *Lecidea paupercula* in Lich. Scand. pag. 482 with wonted accuracy, but there is no single type plant, for he recorded it from 6 named localities. We have two of them in our herb., viz. from Tromsö and Algasvarre (leg. NORMAN). TH. FRIES writes that *Lecidea paupercula* has "areolis . . . vulgo dispersis". The Algasvarre plant really has dispersed discrete areolae, but in the other plant the areolae are quite contiguous, the thallus is "reticulato-rimosus" more than "disperse areolatus".

ARNOLD has given much inferior descriptions of his *Lecidea (Psora) subfumosa.* He first suggested its differences from *Lecidea (Psora) atrobrunnea*: "sit forma *Ps. atrobrunneae*, a quae squamis planis, ambitu thalli saepe discretis differt" (Lich. Ausfl. XXIII, 1887, pag. 32). This is correct enough, with the exception that *Lecidea atrobrunnea* often has quite discrete marginal areolae, at least in the Arctis. The distinction between these two species (in the Arctis) lies firstly in the thicker, often quite tumidous areolae of *Lecidea atrobrunnea*, secondly in its paler hypothecium.

ARNOLD has not cleared up the difference between his *Lecidea (Psora) subfumosa* and *Lecidea paupercula*, and it is hardly possible to find a specific difference of value. In Adjum. Lich. Lapp. pag. 51 VAINIO writes: (f. *subfumosa*) "areolis magis contiguis (thallo fere rimoso-areolata) saepe minus distincte albido- vel cinereo-marginatis" (than in *Lecidea paupercula*). In Lich. Pitlek. pag. 138 he attributes specific rank to *Lecidea subfumosa.* If that is correct, TH. FRIES's plant from Tromsö is typically *Lecidea subfumosa*, his plant from Algasvarre quite as typically *Lecidea paupercula.* — But I have found it difficult to attribute specific importance to this difference, and I will refer *Lecidea subfumosa* to *Lecidea paupercula* by the name *Lecidea paupercula* var. *subfumosa* (ARN.) VAIN.

ARNOLD has repeatedly stated that his *Lecidea (Psora) subfumosa* is identical with NYLANDER's *Lecidea fuscoatrata.* (e. g. Lich. Ausfl. XXIII pag. 32), but he has not drawn the consequence of this observation, for NYLANDER's name is older than ARNOLD's.

All my Novaya Zemlya plants have a thallus with very discrete areolae, the thallus is thin, in some plants almost lacking, the white edge of the areolae is not always distinct. As stated by TH. FRIES old areolae are sometimes "dealbatae". The spores are 9×4—$4.5\ \mu$ (often lacking). This indicates *Lecidea paupercula* typica, not var. *subfumosa.*

I am indebted to the courtesy of Dr. KARL KEISSLER, Botanisches Staatsmuseum, Wien, for the loan of ARNOLD Lich. Exsic. No. 551.

In his Cat. Lich. vol. III, pag. 501, ZAHLBRUCKNER has united the *subfumosa* of ARNOLD and the type of *Lecidea paupercula* under the name of *Lecidea aeneola* (ARN.) VAIN. But VAINIO does not use the combination *Lecidea aeneola*, he only writes: "*Lecidella aeneola* . . .

cum hac specie (i. e. *Lecidea paupercula*) conferenda est, sed reactione medullae J÷ differt" (Adjum. pag. 51). And in his first diagnosis ARNOLD clearly writes (of his *Lecidella aeneola*): "medulla jodo fulvescens", and he calls attention to this reaction: . . . "steht der *Lec. atrobrunnea* . . . am nächsten . . . unterscheidet sich aber durch die Jodfärbung der Markschicht" (Lich. Ausfl. X pag. 96).

This reaction is, as far as I can see, the only distinctive character between the two "stirpes *Lecideae*" of TH. FRIES: stirps *Lecidea atrobrunneae* and stirps *Lecidea fuscoatrae*, which are otherwise nearly related. Though I have not seen *Lecidella aeneola*, I conclude from this that it is a plant of the *Lecidea fuscoatra*-section, not identical with *Lecidea paupercula* TH. FR.

In his work on the lichens of the 2nd Arct. Exp. Fram DARBISHIRE records *Lecidea paupercula* from King Oscar Land: Goose Fjord. I could find no *Lecidea paupercula* on that stone, but there are several other interesting lichens on it, e. g. *Rhizocarpon expallescens*, not recorded by DARBISHIRE from Ellesmereland.

b. Sect. *confluens* TH. FR.

90. (3). *Lecidea confluens* ACH.

var. *connectens* VAIN.

Lecidea confluens ACH. var. *connectens* VAIN. Adjum. Lich. Lapp. II (1883) pag. 53.

I. Goose Bay.
II. Matotchkin Shar: Near Vasnetsoff Gl., east of Cape Jouravlev, Mt. Syernaia and Belushii Bay.
IV. Mashigin Fjord: South and north side of Blaafjell Basin and Strömsnes Bay.
VI. Eastern Kristovii Island. Pankratyeff Peninsula.

It can hardly be called plentiful, but it is common and widespread on hard rocks all over the region, investigated by us.

Its rounded convex areolae are discrete, resting on a black conspicuous hypothallus. Its spores are generally badly developed or lacking, I have measured 7—11 (—13)×(4.5—) 6—8 μ.

var. *albida* n. var. ad int.

My material of *Lecidea confluens* is very monotypic, with the exception of one plant from the sandstone of Pankratyeff Peninsula:

Thallus cretaceus, subalbidus, areolae in centro contiguae, peripheriam versus magis discretae. Thallus hypothallo radianti quam in typo multo pallidiori impositus.

It is doubtful whether this variety ought to be referred to *Lecidea confluens* or not. ZAHLBRUCKNER enumerates 12 formae of *Lecidea confluens* in his Catalogus. It is impossible to say with absolute certainty from the diagnoses whether this variety might be identical with any of them, or not; anyhow it deserves a name.

Lecidea confluens in DARBISHIRE Lich. Sec. Arct. Exp. Fram pag. 16, can hardly be referred to that species. The habitus is different, more like *Lecidea cyanea*. I have sectioned the apothecia in two of these plants; the hypothecium was entirely uncoloured.

Former investigations. Recorded from Kristovii Fjord (ELENK. et SAV. pag. 79).

91. (4). *Lecidea speirea* ACH.

II. Matotchkin Shar: Near Vasnetsoff Glacier, Mt. Lasareff, east of Cape Jouravlev, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Rookery in Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, south and north side of Blaafjell Basin and north of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Eastern Kristovii Island.

Though hardly plentiful *Lecidea speirea* is common and widespread in the regions investigated by us. It prefers hard rocks, but it is also found on slates and (sometimes) on chalky rocks.

The thallus is highly variable and a monographer would perhaps be able to distinguish more species in my material. The colour varies from almost purely white — cretaceous — to a yellowish-grey.

Perfectly developed plants have a rimose thallus with the hypothallus visible at the circumference of the thallus and here and there between the areolae. Such plants are not common in the Arctis. Some plants have quite discrete, well limited areolae. Other plants have soft areolae of a more diffuse limitation, the colour of the areolae is prevailing at their centre and the colour of the hypothallus becomes more and more visible towards their circumference.

In *Lecidea speirea* the apothecia are more innate than in *Lecidea confluens*, and they are plane or only slightly convex. *Lecidea speirea* has longer spores than *Lecidea confluens*, I have measured 10—12 μ., in *Lecidea confluens* (according to TH. FRIES Lich. Scand. pag. 485: 7—9 μ. This difference is not great and unfortunately the spores are generally miserably developed, especially in *Lecidea speirea*. The pseudolecanorine margin of the apothecia of *Lecidea speirea* is a good character.

var. *verrucosa* nov. var.

VI. Eastern Kristovii Island, on chalky sandstone.

Thallus cinereo-albescens, crassus, areolis valde verrucosis, laevigatis, contiguis. Apothecia magna, diam. usque ad 2.5—3 mm., primo innata, thallum subaequantia, dein elevata vel etiam protuberantia et tum emarginata. Hymenium altum: 100 μ, superne olivaceo-fuligineum, sporae 11—12×6—6.5 μ.

Medulla J intense caerulescens, KOH immutata. Hymenium J intense persistenterque caerulescens.

Owing to its large apothecia and verrucosa areolae I had first placed it with my *L. macrocarpa*-plants when I started my work of determination. Its reaction with J and its small spores removed it from that section.

Habitually it differs considerably from *Lecidea speirea*, but its opulent habitus is perhaps a reaction on its substratum; in Eastern Kristovii Island birds are very abundant.

var. *elevata* nov. var.

IV. Mashigin Fjord: south side of Blaafjell Basin.

Differt a typo apotheciis magis elevatis, parvis, diam. 0.5—0.7 mm., planis, bene marginatis. Discus epruinosus. Thallus pallide ochraceus, interdum scabrosus.

Structura apotheciorum cum typo congruit.

Habitually it differs considerably from the type by the characters given, but there is hardly any reason to distinguish it specifically.

Former investigations. *Lecidea speirea* has been recorded from Novaya Zemlya (DEICHMANN BRANTH pag. 76) and from Belushii Bay (SAV. 1912, pag. 39). Also from Jugor Shar (STIZ. pag. 421, HEUGL. pag. 315).

92. (5). *Lecidea symphycarpea* n. sp.

Plate XII, fig. 4.

VI. Eastern Kristovii Island.

Thallus diam. usque ad 8 cm., tenuis, centrum versus crassior; crustaceus, mollis, laevigatus, opacus, cretaceus, glauco- vel fumoso-cinereus. Thallus oculo nudo continuus videtur, sed sub lente minutissime reticulato-rimosus, centrum versus subcontinuus vel magis irregulariter ruptus; secundum peripheriam anguste albidus. Thallus zona hypothallina cinereo-nigrescenti, ± radianti, 1 mm. lata, circumdatus.

Apothecia subzeorina, numerosissima, saepe confluentia, tum mutua pressione compressa vel angulosa, thallo adpressa vel subimmersa, margine elevato thallum superantia, mediocria, diam. 0.5—1 mm. Discus persistenter planus, epruinosus, margine persistenti satis crasso, crenato vel magis irregulari, saepe subpruinoso circumdatus. Excipulum fusco-nigrum, lentiforme; hypothecio concolor. Hymenium altum, usque 120 μ, dilutissime roseum, superne fuliginascens. Paraphyses cohaerentes (haud arcte), graciles, in apice obscure capitatae (2—2.5 μ). Asci angusti (15 μ), octospori, sporae satis late ellipsoideae, 9—11 $\times$ 5.5—7 μ.

Pycnides non visae.

Medulla J+, KOH÷, hymenium J persistenter caerulescens vel atro-caerulescens.

It grows on a hard (non calcareous) rock with *Lecidea confluens*, which it invades, and a *Lecanora* sp.

On the inside of the dark hypothallus there is a narrow (2—3 mm.), more or less radiant white zone without apothecia, divided into minute areolae by very inconspicuous cracks. The greater part of the thallus has a more glaucous colour, it is either quite continuous or divided into larger compartments by very irregular cracks. The thicker central part of the thallus is again more white.

It is nearly allied to *Lecidea speirea*, many authors might unite them. It differs chiefly by its dark hypothallus and its thin almost continuous thallus.

93. (6). *Lecidea Syernaiae* n. sp.

Plate XI, fig. 3.

II. Matotchkin Shar: Mt. Syernaia.

I found some plants on a schistose rock, containing much chalk.

Thallus diam. 5—6 cm., obscure cinereus, mollis, crassitudine mediocri, crustaceus, hypothallo atro (1—2 mm.), indistincte radianti, circumdatus. Thallus areolatus, areolae marginem thallinem versus subdiscretae, convexae, crenatae, hypothallo impositae, praeterea confluentes, angulatae, lineis obscuratis hypothallinis separatae. Thallus omnino opacus, rugulosus, marginibus areolarum elevatis plicato-inaequalis.

Apothecia fere elevata, majuscula, diam. 1—2 mm. Discus ater, epruinosus, subnitidus, ab initio planus, margine tenui integro circumdatus, dein convexus margine excluso. Excipulum nigrescens vel violaceo-nigrescens, hypothecium fusco-nigrescens. Hymenium 100—120 μ altum, non inspersum, superne aeruginoso fuligineum, praeterea incolor vel dilute in aeruginascentem vergens. Paraphyses arcte cohaerentes, indivisae, apice clavatae. Sporae octonae, ellipsoideae, 8—13 $\times$ 6—7 μ.

Pycnides frustra quaesitae.

Medulla J intense caerulescens, KOH et $CaCl_2O_2$ immutata. Hymenium J persistenter caerulescens vel caerulescenti-nigrum.

It differs from *Lecidea speirea* by its elevated apothecia and dark hypothallus and from *Lecidea confluens* by its thalline colour. It is considerably darker than wood-ashes, but there is no tinge of the bluish or fumous colour which is so characteristic of *Lecidea confluens.*

c. Sect. *silacea* TH. FR.

94. (7). *Lecidea cyanea* (ACH). RÖHL.

II. Matotchkin Shar: Mt. Lasareff, east of Cape Jouravlev, Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: South side of Blaafjell Basin, Nunatak on Lacroix (Norway) Glacier, Strömsnes Bay, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Berkh Island. Northern Kristovii Island.

Widespread and quite common, especially on hard slates. It often encroaches upon other lichens, it is a very dangerous neighbour to *Lecidea Dicksonii* and several other lichens.

Generally the thallus is well developed, very thin plants were collected in the nunataks, very thick plants in the rookeries. The thallus is white (cretaceous) or greyish-white. By far the greater part of my plants have the tesselate plane areolae of "*Lecidea tesselata*" FLK. Deutsche Lichenen No. 64, verrucose areolae were found in some more nitrophilous localities: Sol Bay and — less typically — from the rookery south of Arkhangel Bay.

The apothecia are generally epruinose, the hypothecium is quite uncoloured, the paraphyses have incrassated, capitate, very dark apices (caeruleo-nigrescentes). Spores are rarely developed: 8—13$\times$5—5.5 μ.

Former investigations. Recorded from Novaya Zemlya (DEICHMANN BRANTH pag. 76), Möller Bay, var. *polaris* (KUSNETZOFF No. 61) and Tolyenii Bay in Matotchkin Shar, var. *tesselata* (STIZ. pag. 421, HEUGL. pag. 315).

95. (8). *Lecidea lapicida* ACH.

var. *ecrustacea* ANZI.

ZAHLBRUCKNER Cat. Lich. III (1925) pag. 605 et 607, ubi syn.

I. Goose Bay.
II. Matotchkin Shar: Mt. Lasareff, Mt. Wilczek, Vasnetsoff Glacier, east of Cape Jouravlev, Belushii Bay and south side of the Shar at the Kara Sea entrance.

IV. Mashigin Fjord: Fram Bay, moraines on the south side of Blaafjell Basin, nunatak on Lacroix (Norway) Glacier, Mt. Dietrichson, Blomster Bay, Mt. Tveten, Strömsnes Bay and Rækved Bay. North of the Mashigin Fjord entrance.

VI. Mainlaind east of Lichutin Island.

Lecidea lapicida is common, in places plentiful, at least so far north as Mashigin Fjord. Have I overlooked it farther north?

Almost my entire material is developed as var. *ecrustacea*, either quite acrustose or with a very thin film of a crusta. There is only one plant, from a moraine before Reidar Glacier, on the south side of Blaafjell Basin in Mashigin Fjord, that has a well developed thallus, discrete areolae resting on a conspicuous black hypothecium. — Another plant from the same locality, which I have referred to *Lecidea lapicida*, although with much doubt, has an ochraceous thallus, quite well developed.

The colour of the hypothecium is very variable, from almost uncoloured to dark brownish-black, generally pale-brownish. The paraphyses are stoutish, not coherent, with incrassated (clavate or capitate), often almost black apices. The spores are always scarce, their size is variable: (6—) 8—10 (—12)×4—5 (—7) μ.

Former investigation. Novaya Zemlya (DEICHMANN BRANTH pag. 76). Karmakuli, also its f. *declinascens* and f. *seriata* (MAGN. pag. 8), Möller Bay (KUSNETZOFF No. 63). Also from Waigatsch (STIZ. pag. 421), HEUGL. pag. 315). All records: var. *declinans*, DEICHMANN BRANTH also records var. *ochromela*).

96. (9). *Lecidea pantherina* ACH.

I. Goose Bay.

II. Matotchkin Shar: East of Cape Jouravlev, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.

IV. Mashigin Fjord: Fram Bay, south and north side of Blaafjell Basin, nunatak on Lacroix (Norway) Glacier, Mt. Dietrichson, Dal Bay, Sol Bayand Rækved Bay. North of the Mashigin Fjord entrance.

V. Admiralty Peninsula.

VI. Berkh Island, mainlaind east of Lichutin Island, Northern Kristovii Island and Pankratyeff Peninsula.

I did not find it on the chalks and dolomites, which are so widespread in Novaya Zemlya. But on hard rocks, sandstones and on hard slates it is as common as a lichen can be. Hundreds of plants have passed before my eyes.

A plant of this frequency is, of course, variable; but yet it preserves its habitus quite well in the Arctis. Its colour is there generally paler than in more southern countries, either white or greyish-white. One plant, from Fram Bay, has an ochraceous thallus. The hypothallus is darker: in some plants like a thick, black zone surrounding the thallus, but usually not so dark, plumbeous- ± dark grey. If the areolae are thin and effuse, they may be so translucent that their colour is influenced by the hypothallus.

The thallus is reticulato-rimose, with small plane angular areolae. The thallus is either ± orbicular or — quick growing thalli? — with flabelliform or dendritical figures at their circumference, with transverse rimae on the "branches". At the circumference the rimae are generally radiating in well developed orbicular plants.

There are no pruinose apothecia in my collection.

Almost my entire material must be referred to var. *Achariana* VAIN. Adjum. Lich. Lapp. II (1883) pag. 56. There are only a few plants where the thallus is so obsolete that the plants belong to:

f. *pseudopilati* VAIN. l. c. pag. 57.

II. Matotchkin Shar: Mt. Lasareff.
IV. Mashigin Fjord: Mt. Dietrichson and Sol Bay.

In one plant, from Sol Bay, I first found astroid 6-radiate uncoloured crystals, with KOH. When I tested it again some time afterwards I was much astonished to find only the common crystals of *Lecidea pantherina*. The plant has a thick areolate thallus, much resembling *Lecidea cyanea*.

Former investigations. Novaya Zemlya (DEICHMANN BRANTH pag. 76), Karmakuly (MAGN. pag. 9), Möller Bay (KUSNETZOFF No. 62), Tolyenii Bay in Matotchkin Shar (STIZ. pag. 421, TH. FRIES pag. 15).

97. (10). *Lecidea Swartzioidea* NYL.

ZAHLBRUCKNER Cat. Lich. III (1925) pag. 705, ubi syn.
Lecidea peralbida TH. FR. Lich. Scand. II (1874) pag. 494.
II. Matotchkin Shar: Belushii Bay.

There is only one plant in my collection, it agrees quite well with TH. FRIES's *Lecidea peralbida* in herb. Ups.

It has a white thallus with verrucose areolae. Hypothecium black; spores poorly developed, as is frequently the case with the species of this section. Medulla J blue, KOH precipitates red crystals, as in *Lecidea pantherina*.

TH. M. FRIES has rejected NYLANDER'S name and introduced a new name *Lecidea peralbida*, on the reason that the former name should be a "nomen barbarum". There is evidently no plausible reason for that, and ZAHLBRUCKNER (l. c.) has reintroduced NYLANDER'S name.

Former investigations. Möller Bay (KUSNETZOFF No. 64) and Kristovii Fjord (ELENK. et SAV. 1912, pag. 78—79).

98. (11). *Lecidea theiodes* SOMRFT.

Lecidea theiodes SOMRFT. Suppl. Flor. Lapp. (1826) pag. 145. TH. M. FRIES Lich. Scand. II (1874) pag. 495. ZAHLBRUCKNER Cat. Lich. III (1925) pag. 709, ubi syn.

II. Matotchkin Shar: Belushii Bay.

I only detected two plants, one on slaty rocks, the other on hard rocks.

The colours and the reaction agree perfectly with SOMMERFELT'S (single) type plant in our herbarium. The apothecia are not pruinose in my plants; in the type plant the pruina is so thin that the disc is practically black. In the type plant the areolae are thick, verrucose and coarsely rugose, in the Novaya Zemlya plant they are almost flat, only some low "plicae" are left. But that cannot influence the determination, for it is just a typical feature in Arctic lichens, which are covered with snow during the greater part of the year and much exposed to frequent irrigations with ice-water during the short season, that might — in favourable years — be called summer.

The hymenium is inspersed with uncoloured grains, about 80 μ high. The paraphyses are cohaerent at their capitate apices, which are very dark, almost black or with a tinge of smaragdine. The spores are badly developed, but I found some mature spores in one of my Novaya Zemlya plants: 9—13$\times$5—5.5 μ. — Otherwise I have nothing to add to SOMMERFELT'S and TH. M. FRIES'S excellent descriptions.

It must be very rare. Since the days of SOMMERFELT no well determined plant has been detected in Norway. VAINIO gives the name var. *Sommerfeltiana* to the typus of SOMMERFELT, and another new name var. *referta* VAIN. (Adjum. Flor. Lapp. pag. 58) to ARNOLD'S *Lecidea lactea* f. *theiodes*. I have not seen ARNOLD'S plant, but I find VAINIO'S opinion quite probable, for I regard the records of several Arctic lichens in Central Europe with some distrust (and vice versa).

Former investigations. Recorded from Möller Bay (KUSNETZOFF No. 65).

a. Sect. *lithophila* TH. FR.

99. (12). *Lecidea plana* LAHM.

var. *incommoda* VAIN.

VI. Pankratyeff Peninsula.

There is only one plant in my collection.

The paraphyses are almost black at their apices and clavate or even capitate. The plant is well fertile, the spores are small: 9—9.2×4.5—5 μ. The hypothecium is entirely uncoloured. Medulla J÷, KOH÷.

VAINIO suggested this determination. The colour of my plant is yellowish-grey, generally *Lecidea plana* is "cinerea vel glaucescenti-albida" (TH. FRIES Lich. Scand. pag. 497).

Former investigations. Recorded from Kolgueff (SAV. 1912, pag. 37), but not from Novaya Zemlya.

100. (13). *Lecidea auriculata* TH. FR.

var. *diducens* TH. FR.

II. Matotchkin Shar: Near Vasnetsoff Glacier. Serebryanka Fjord in the rookery.

IV. Mashigin Fjord: Fram Bay. Moraines before Junior Glacier and Mt. Dietrichson. North of the Fjord entrance.

This species is really common in Northern Norway. And I have seen a lot of plants from Bear Island as well as from Spitsbergen. NYLANDER recorded it from Lawrence Bay and from Behring Island, and VAINIO from Pitlekai. There are several plants from Ellesmere-land in our herb. (leg. SIMMONS, det. DARBISHIRE), named *Lecidea auriculata*; they are however much in need of a revision. It is widely distributed in the Arctis and evidently quite common. I was therefore much astonished to find only relatively few plants in my collection. Most probably I have overlooked it, though its large apothecia are conspicuous enough. — In some of my plants the apothecia are smaller than usual in Norwegian plants.

101. (14). *Lecidea reducens* VAIN.

Lecidea reducens VAINIO Lich. Pitlek. (1909) pag. 144.

II. Matotchkin Shar: South side near the Kara Sea entrance, on a quarzitic rock.

Unfortunately difficult ice conditions obliged us to leave this very interesting locality after a few hour's work. But my harvest suggests a much richer flora on the east coast of Novaya Zemlya than we might expect from its hard climate, a flora not a little different from that of the west coast.

Thallus albidus, opacus, areolae bene evolutae, praecipue circa apothecia, satis crassae, planae vel leviter convexae, usque ad 1 mm. latae, discretae et rotundatae vel ± contiguae et angulosae.

Apothecia (ut in *Lecidea auriculata*) numerosissima, aggregata, adnata, rotundata vel mutua pressione saepe angulosa, magna, diam. usque 2 mm. Discus persistenter planus, ater, epruinosus, margine tenui, concolori, persistenti, circumdatus. Excipulum marginem versus fuligineum, non violaceum, praeterea incolor; hypothecium ± obscure fuscescens, usque nigricans. Hymenium 80—90 μ altum, superne fuligineum. Paraphyses articulatae, haud cohaerentes. Sporae male evolutae, paucas solum invenimus, anguste oblongae, 9—10×3—4 μ.

Medulla J intense caerulescit, KOH÷; hymenium J e caeruleo nigrescit.

Habitually the apothecia are very like those of *Lecidea auriculata*, but this species has a beautiful smaragdine epithecium, and a violet excipulum. A quite white thallus is rarely seen in *auriculata*.

I have seen VAINIO's type plant. Its thallus is not so well developed as in my plant, but I can see no other real difference between them than the spores: the very few spores detected in my plant were narrower than in *Lecidea reducens*: 9—10×3—4 against 9—13×5—7. The narrowly oblong spores are very characteristic of *Lecidea auriculata*.

All the Novaya Zemlya *Lecideae*, here referred to *auriculata*, had a negative medullary reaction with J. TH. FRIES writes "hyphae parce amyloideae" (Lich. Scand. II pag. 499). Some lichenologists refer to this species plants with positive as well as with negative reaction. This reaction is generally excellent for specific, but not always for sectional distinction; that will easily refer nearly related species to different sections. The colour and the form of the areolae are characters that have not always been sufficiently considered.

Lecidea plana differs from *reducens* by its negative medullary reaction with J.

e. Sect. *panaeola* TH. FR.

102. (15). *Lecidea panaeola* ACH.

I. Gribovii Fjord: north side.
II. Matotchkin Shar: Mt. Matotchka.
IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson and Sol Bay.
V. Admiralty Peninsula.

Widespread and common, but not plentiful. Often found together with *Lecidea flavocaerulescens*.

My plants are developed as in Norway, some of them are quite luxuriant. I also detected a few apothecia.

103. (16). *Lecidea macrocarpa* (DC.) STEUD. var. *superba* TH. FR.

II. Matotchkin Shar: Mt. Lasareff, Mt Wilczek, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, Blomster Bay and Strömsnes Bay.
V. Admiralty Peninsula.

Curiously enough the pachythalline formae of *Lecidea macrocarpa* are by far the commonest in Novaya Zemlya. Though not ubiquitous *Lecidea macrocarpa* (sensu latiore) must be one of the commonest *Lecideae* of Novaya Zemlya.

KOERBER's Lich. sel. Germ. No. 48 (*Lecidea superba*) is unfortunately lacking in our herb., but my plants agree well with ANZI Lich. Lang. No. 571 and with TH. FRIES's description in Lich. Scand. pag. 505. They are considerably more pachythalline than VAINIO's *Lecidea macrocarpa* f. *contigua* in Norrl. et Nyl. Herb. Lich. Fenn. cont. No. 756 and 757.

I have referred to var. *superba* plants with thick, verrucose, white or pale ash-grey, generally contiguous areolae, sometimes $\pm$ discrete towards the circumference of the thallus, rarely the areolae are more discrete all over the thallus. The apothecia are large, diam. up to 1.5 or 2 mm., at last very convex and then with disappearing margin. The hymenium is high: 100—130, sometimes 140 or even 160 μ, dark olive-coloured or $\pm$ intensely brownish (fuscus) at its upper part, almost uncoloured lower down. The spores are but rarely developed, I have measured a few ones: 16—19$\times$8—9 μ.

The areolae are often so thick that the thallus resembles *Lecidea panaeola*.

var. *praetoria* TH. FR. (ex descr.)

IV. Mashigin Fjord: Strömsnes Bay.

The thallus is thick, white or very pale greyish-white, with plane, quite contiguous areolae (thallus reticulato-rimosus), the apothecia are persistantly plane, black, epruinose, with a persistant, distinct margin. Hymenium 130 μ high, upper part almost fuliginose, lower part uncoloured. Ripe spores about 16$\times$8 μ (well developed spores are very rare).

I have seen no plant, determined by TH. FRIES himself, but his description (Lich. Scand. pag. 506) suggests this variety.

var. *platycarpa* (ACH.) TH. FR.

IV. Mashigin Fjord: Stömsnes Bay.

Thallus evanescent, apothecia large, plane, black, epruinose, with a persistant, distinct margin.

I found only one plant in my collection that could be referred to this variety.

var. *subconvexa* VAIN. (ex descr.)

III. Kristovii Fjord.
IV. Mashigin Fjord: Rækved Bay.
V. Admiralty Peninsula.

I have referred to this variety plants with a thin greyish or greyish-white thallus, subdiscrete areolae, apothecia of 1—1.5 mm. in diam., with a blackish, epruinose disc and a distinct black margin; finally the apothecia are slightly convex. The upper part of the hymenium is more greenish-blue than olive-coloured, almost smaragdine. Otherwise the hymenium of *Lecidea macrocarpa* is either brownish or olive to dark olive, sometimes almost black at its upper part.

I have not seen VAINIO's plants and the determination is approximate.

Innumerable formae and varieties have been described of this very variable species. It seems to me that many of these names only express its variation in a more precise manner. I am not convinced that it is expedient to give a systematical name to every possible individual variation.

There are a number of plants in our herb. from the 2nd Arct. Exp. in the Fram, collected by SIMMONS in North Kent and in Ellesmereland: Bedford Pim Island, Goose Fjord and Lands End, in all 7 plants, all of them determined *Lecidea macrocarpa* or *Lecidea platycarpa* by DARBISHIRE, Lichens, in Rep. of the 2nd Arct Exp. Fram, pag. 17.

One of them, from Borgdalen in the Goose Fjord, belongs to the *Lecidea macrocarpa* section. Its hymenium is intensely smaragdine, more intensely so at its lower part and smaragdine-fuliginose at its upper part. The hymenium is 85—90 μ high. The hypothecium is black, the excipulum paler, with a distinct, though faint tinge of violet. The spores are small, oblong, quite narrow: $9—11 \times 3—4$ μ. These data suggest *Lecidea vorticosa* var. *Ivalensis*, DARBISHIRE referred it to *Lecidea platycarpa*.

In all the other plants, called *Lecidea macrocarpa*, there is a thick white thallus, where the reaction is "medulla J intense caerulescens". The hypothecium is black. All these plants belong to the *Lecidea confluens* section. One plant (Bedford Pim Island) resembles *Lecidea confluens*, all the others *Lecidea speirea,* but I have not yet studied the West-Arctic *Lecideae* so much that I can exclude the possibility of some related American species.

var. *Crucis* nov. var.

VI. Eastern Kristovii Island, on stones of hard rocks.

Thallus 2.5 cm. latus, satis crassus, albido-cinerascens, rimoso-areolatus vel verrucoso-areolatus, areolae angulosae, diam. 0.5—1 mm., subplanae vel convexae, usque verrucosae.

Apothecia numerosa, saepe contigua, adnata vel subimmersa et tum thallum aequantia, mediocria vel magna, diam. 1—1.5 (—2) mm., discus ater, epruinosus, persistenter planus vel dein subconvexus; margine nitidulo circumdatus. Excipulum hypotheciumque atra, epithecium granulosum, hymenium superne fuligineum vel olivaceo-fuligineum, altum, 130—160 μ. Paraphyses arcte cohaerentes, in apice obscure capitatae vel clavatae. Sporae parvae: 10—14 (—16)× 6—8 μ.

Medulla J et KOH immutata; hymenium J persistenter caerulescens vel caeruleo-nigrescens, epithecium KOH magis in olivascentem coloratum.

The relatively thick, rimose thallus and the plane apothecia suggest *Lecidea albocaerulescens*, but the spores are much too small. Is is related to *Lecidea meiospora* NYL. on account of the small spores. VAINIO has not acknowledged this species, but placed it with some formae of *Lecidea macrocarpa*: f. *subinnata* VAIN. and var. *cinereoatra* (ACH.) VAIN. Adjum. Lich. Lapp. II (1883) pag. 70—71. In either of these the thallus is thinner than in my plant. SANDSTEDE remarks: "Lager . . dicker und rissig oder geglättet bis fest fehlend" (Flecht. des n. w. deut. Tieflandes (1912) pag. 78. He also remarks "Sporen manchmal von einem Schleimhof umgeben", I have made the same observation.

Var. *meiosporella* VAIN. (Adjum. Lich. Lapp. II (1883) pag. 69) also has a thinner thallus with small areolae: 0.2—0.4 mm., smaller apothecia ("1 mm. vel paullo minora") and a lower hymenium (110 μ).

I have called this variety var. *Crucis*, from the locality (Kristovii Island). There are two plants: one with plane areolae (typus) and one with more convex, verrucose areolae.

Former investigations. *Lecidea macrocarpa* has been recorded from Karmakuly, with its f. *subflavicunda* (MAGN. pag. 8) and from Matotchkin Shar: Tolyenii Bay in Belushii Bay (STIZ. pag. 421, SAV. 1912 pag. 37, var. *oxydata* KBR.). Also from Kolgueff (var. *superba*) (Kbr.) Th. Fr., SAV. 1912 pag. 37).

104. (17). *Lecidea albocoerulescens* ACH.

var. *flavocoerulescens* SCHAER.

II. Matotchkin Shar: Belushii Bay. Serebryanka Fjord, in the rookery.
IV. Mashigin Fjord: Sol Bay.

I was astonished to find onle a few plants in my collection. The plant from Belushii Bay is well fertile, the others are sterile.

ARNOLD and TH. FRIES are of opinion that there is no specific difference between the "oxydated" and the whitish plants of the *Lecidea macrocarpa*-section, (TH. FRIES Lich. Scand. II pag. 509), and they are evidently right. My plant from Belushii Bay is only slightly yellowish, it is more like the type of *Lecidea albocoerulescens.*

Former investigations. *Lecidea contigua* var. *flavicunda* from Tolyenii Bay, Matotchkin Shar (STIZ. pag. 421) is perhaps this species.

105. (18). *Lecidea albosuffusa* TH. FR.

var. *petrosa* (ARN.) VAIN.

ZAHLBRUCKNER Cat. Lich. III (1925) pag. 509, ubi syn.

Lecidea petrosa α. nuda TH. FR. Lich. Scand. II (1874) pag. 511. LYNGE Lich. Bear Isl. (1926) pag. 27.

II. Matotchkin Shar: Near Vasnetsoff Gl., Chalhonik Valley, Mt. Syernaia and Belushii Bay.
IV. Mashigin Fjord: Nunatak on Lacroix (Norway) Glacier. Mt. Tveten, Strömsnes Bay and Rækved Bay.

var. *typica* LYNGE.

Lecidea petrosa β. albosuffusa TH. FR. Lich. Scand. II (1874) pag. 512.

IV. Mashigin Fjord: North of Blaafjell Basin.

I found my plants on chalky rocks. If I have correctly limited this species, it cannot be rare. But it is difficult of distinction from *Lecidea rhaetica*, which see.

Quite athalline plants, as in ARNOLD Lich. Exsic. No. 1179, are evidently rare. Generally there is a thin thallus, consisting of small, depressed areolae. Plants with pruinose apothecia are rare. There is only one plant of this type in my collection, and its disc is less pruinose than in Norwegian plants.

Thallus tenuis, mollis, areolae albidae vel cinereae, medio saepe dilutius coloratae, parvae, diam. 0.2—0.3 mm., dispersae vel subcontinuae, crustam granulato-areolatam formantes, hypothallo pallido, ± distincto, impositae.

Apothecia numerosa, dispersa, adpressa, parva, diam. 0.5—0.7 mm. Discus vulgo epruinosus, primum diuque planus, tenuiter marginatus, deinde leviter convexus. Excipulum atrum, etiam cum hypothecio. Hymenium altum, 100—120 vel usque ad 140 μ altum, superne smaragdulum vel olivaceo-nigricans. Paraphyses coharentes, septatae, superne ± clavatae. Asci pachydermaticae, asci evacuati interdum transverse rugosi vel saepe (vulgo?) laevigati. Sporae octonae, saepe male evolutae, 13—26 (—30) × (6—) 8—12 μ.

React. Medulla J÷, KOH÷, hymenium J caerulescens, asci persistenter, gelatina deinde magis in flavofuscescentem decoloratur.

In some plants I was unable to find the spores. Generally they have the normal size: 18—30 × 10—13 μ. Occasionally smaller spores are found mixed with the larger ones, in one apothecium 14 × 9 μ, mixed with spores of 19—24 × 10—11. In two plants I only found these small spores: 13—18 × 6—10 and 13—16 × 8 μ. As no morphological difference could be found between these plants and plants with "typical" spores, and as intermediate spores were also found, it cannot be necessary to give special names to these plants with small spores.

Habitually it resembles *Lecidea crustulata* very much. But *Lecidea macrocarpa* (sensu latiore) typically consists of plants growing on hard, granitic (not chalky) rocks. The spores of *Lecidea crustulata* are smaller than the typical *albosuffusa* spores, but they agree with the smaller types of the latter species.

106. (19). *Lecidea rhaetica* HEPP.

Lecidea rhaetica HEPP, in ARNOLD Lich. Exsic. No. 117. TH. M. FRIES Lich. Arct. (1860) pag. 209. ZAHLBRUCKNER Cat. Lich. III (1925) pag. 682, ubi syn. LYNGE Lich. Bear Isl. (1926) pag. 30.

f. *dispersa* LYNGE n. f.

I. Goose Bay.
II. Matotchkin Shar: south side of the Shar at the Kara Sea entrance.
V. Admiralty Peninsula.

I collected only these three plants, on hard rocks (no CO_2 with HCl).

Thallus late expansus, cinereo-albidus, tenuis, non cretaceus, granulis formatus rotundatis vel angulosis, parvis, 0.3—0.5, rarius usque 1.0 mm., vulgo dispersis, interdum ± contiguis, crustam formantibus rimoso-areolatam. Hypothallus tenuis pallidus interdum visus.

Apothecia numerosa, adpressa, dispersa, rotundata, parva, diam. 0.7—1.0 mm. Discus ater, epruinosus, primo planus, marginatus, deinde saepe magis convexus, immarginatus. Excipulum omnino carbonaceum, etiam cum hypothecio. Hymenium altum, usque ad 140—150 μ, superne smaragdulo-nigricans. Paraphyses arcte cohaerentes, hydrate kalico addito capitatae vel clavatae. Asci pachydermatici, evacuati saepe $\pm$ distincte transverse striati. Sporae male evolutae vel omnino deficientes, (18—) 21—26$\times$10—12 μ.

Medulla J$\div$, hymenium J persistenter caeruleo-nigricans.

The asci are thick-walled. The number of transversely striped asci is very variable, in some sections such asci are numerous and conspicuous, in others it is necessary to search after them.

Distinguished from *Lecidea rhaetica*, as distributed in ARNOLD Lich. Exsic. No. 359 c (No. 117 is lacking in our herb.) by its large greyish-white thallus, consisting of thin, often scattered, small, convex areolae (granulae). Habitually it differs so much from *Lecidea rhaetica* that it might with advantage be regarded a proper species.

Lecidea rhaetica HEPP in ARNOLD Lich. Exsic. No. 359 c, with its thick, cretaceous areolato-diffract thallus habitually differs much from *Lecidea petrosa* in ARNOLD Lich. Exsic. No. 1179 with its almost acrustaceous thallus. Yet I have found it difficult, if possible, to distinguish between these two species in the Arctis.

The plants which TH. M. FRIES collected in Bear Island (LYNGE Lich. Bear Isl. (1926) pag. 30) agree well with ARNOLD No. 359 c. The plant from Sörhamna agrees entirely, in the other plant the thallus is a little more granular. They are typically *Lecidea rhaetica*, easily distinguished from *Lecidea albosuffusa* (= *Lecidea petrosa*). These two plants were collected on pure chalk.

TH. M. FRIES's *Lecidea rhaetica* from Mortensnes in Finmark has a white, thick, granular or even verrucose thallus with discrete or subdiscrete areolae; its substratum is sandstone.

In my Novaya Zemlya collection there is no typical *Lecidea rhaetica*. But there are three plants, growing on hard rocks, which I cannot distinguish specifically from TH. M. FRIES's Mortensnes plants. They have a thinner, more greyish-white thallus, formed of low, often small and dispersed granules, sometimes more confluent granules, resting on an almost invisible pale hypothallus. They approach *Lecidea albosuffusa* very much.

107. (20). *Lecidea emergens* Fw.

Lecidea emergens, TH. M. FRIES Lich. Scand. II pag. 513, ubi syn.
Lecidea lithospersa A. ZAHLBR. Cat. Lich. III pag. 624.

I. Gribovii Fjord: North side, on chalk.

It is one of the numerous lichens which I only obtained once. There are only a few plants in my collection.

Crusta omnino obsoleta. Apothecia primitus plana, discus margine crasso circumdatus; dein subglobosa, rugosa, margine evanescente. Excipulum rubricosum, hypothecium obscure fuscum, hymenium smaragdulum, sporae 11—15×7—8.5 μ (e. g. 13×7, 11×8.5, 15×8).

The synonymy of this species is very intricate. According to TH. M. FRIES l. c. *Lecidea lithyrga* of ACHARIUS is a mixtum, at least not this species. He also rejects his father's name *Lecidea lithyrga* FR. Summa Veget. Scand. pag. 117, which he never did without very valid reason. We may therefore conclude that E. FRIES's *Lecidea lithyrga* is another species. ZAHLBRUCKNER has rejected FLOTOW's name and introduced a quite new name, *Lecidea lithospersa*.

My plants agree entirely with HEPP Die Flechten Europas No. 266 (*Lecidea jurana*) and with a plant in our herb. collected at Kandersteg, Switzerland, by METZLER. MALME's plant (Lich. suec. No. 668) has a better developed thallus and more conglomerate apothecia.

108. (21). *Lecidea vorticosa* (FLK.) KBR.

var. *Ivalensis* (VAIN.) LYNGE comb. nov.

Lecidea vorticosa (FLK.) KBR., vide ZAHLBRUCKNER Cat. Lich. III (1925) pag. 717, ubi syn.

Lecidea Ivalensis VAINIO Adjum. Lich. Lapp. II (1883) pag. 65.

I. Gribovii Fjord: Veselago Island.
IV. Mashigin Fjord: Moraines on the south side of Blaafjell Basin.

Only a few plants on slaty rocks. The former locality is highly ornithocoprophilous, but at the latter birds are quite rare, they do not breed there. I have only a few plants.

Thallus cinerascens, tenuissimus, vulgo obsoletus.

Apothecia parva: diam. ca. 0.5 mm., rarius usque ad 1.0 mm., dispersa vel in fissuris petri liniformiter congesta. Discus niger, nitidus, epruinosus, distincte umbonatus, diu vel persistenter planus, deinde interdum leviter convexiusculus, margine concolori nitido circumdatus. Excipulum fere nigricans, KOH addito olivaceum vel ± in violascentem vergens, plectenchymaticum. Hypothecium fusconigricans, dilutissime in violascentem vergens. Hymenium angustum: (40—) 50—55 μ altum, totum smaragdulum, superne intensius coloratum, subnigrescens. Paraphyses arcte conglutinatae, ad apicem haud incrassatae, tenues, ramosae. Sporae ellipsoideae vel oblongo-ellipsoideae, 9—13×4—5 μ.

Medulla J ÷, KOH ÷, hymenium J persistenter intenseque caerulescens, praecipue asci.

In all the diagnoses of *Lecidea vorticosa* it is said that the hymenium is intensely emerald-green to almost black at its upper part only (TH. M. FRIES Lich. Scand. II pag. 515, VAINIO Adjum. pag. 66). This also agrees with the plants in KBR. Lich. sel. Germ. No. 168 and MALME Lich. suec. No. 967, which I have examined. In the former plant the lower part of the hymenium is practically uncoloured, in the latter it has a faint tinge of blue. In my plants the whole hymenium is distinctly emerald-blue, though not equally intensely so in all the examined apothecia. I have found it difficult to attribute specific value to this difference.

109. (22). *Lecidea Dicksonii* ACH.

I. Goose Bay. Karmakuli (EKSTAM). Gribovii Fjord: Veselágo Island.
II. Matotchkin Shar: Mt. Wilczek, moraine at Vasnetsoff Glacier, Mt. Syernaia, and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord in the rookery.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Nunatak on Lacroix (Norway) Gl., Mt. Dietrichson, Mt. Tveten, Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
VI. Mountains south of Arkhangel Bay. Lichutin Island.

Lecidea Dicksonii is one of the commonest lichens of Novaya Zemlya and the above mentioned stations give no adequate idea of its frequency; for it was so common that I did not care much to collect it. It is especially characteristic of the flat, rounded stones of the strandwall (is it a quick grower?), but it is also found elsewhere as a common plant, even on the moraine-stones and in the nunataks.

Its thallus is sometimes very thin, hardly perceptible, more rarely thick, up to very thick. But its concave almost immersed apothecia are always developed and prevent it from being confused with *Rhizocarpon Oederi*, even if its spores are badly developed, as they often are. — I gave much attention to *Rhizocarpon Oederi*, but I could not find it.

Former investigations. Recorded from Novaya Zemlya (DEICHMANN BRANTH pag. 76), Karmakuly (MAGN. pag. 8), Möller Bay (KUSNETZOFF No. 67), Matotchkin Shar: Tolyenii Bay in Belushii Bay (STIZ. pag. 421, TH. FRIES pag. 16, HEUGL. pag. 314, VAIN. pag. 87, SAV. 1912 pag. 38).

f. Sect. *xanthococca* TH. FR.

110. (23). *Lecidea Sommerfeltii* LYNGE n. sp.

Veris. syn. *Lecidea xanthococca* SOMRFT. f. *immutata* VAIN. Adjum. Lich. Lapp. II (1883) pag. 103.

II. Matotchkin Shar: Chalhonik Valley.
IV. Mashigin Fjord: Sol Bay, on drift wood.

Crusta (in specimine) tenuissima, fere hypophloeodes, rimoso-diffracta, cinerea.

Apothecia numerosa vel numerosissima, parva, diam. 0.2—0.3—(0.5) mm., adpressa, rotundata vel mutua pressione angulata. Discus diu vel persistenter planus, ater, opacus, epruinosus, margine atro, nitido, prominenti, persistenti, integro vel flexuoso, circumdatus. Excipulum nigricans, etiam cum hypothecio. Hymenium 65—80 μ altum, superne caerulescenti-nigricans, deinde pulchre smaragdulum, inferne interdum subincolor. Paraphyses cohaerentes, KOH addito tamen discretae, validae, superne clavatae. Asci late pyriformes, octospori, sporae satis variantes: anguste oblongae, 10—13×3—4.5 μ vel late ellipsoideae: 7—9×5—5.5 μ.

React. Medulla J non caerulescens, KOH immutata. Hymenium J persistenter caerulescens, KOH pulchre smaragdulum, non violascens, deinde saepe decoloratur, sed non violascit.

The crusta is only a thin film over the wood, hardly visible. The "rimoso-diffract" surface belongs more to the decayed wood than to the lichen. There is no habitual difference from *Lecidea xanthococca*, and the structure of the apothecia agrees well. The only difference of importance is the beautiful smaragdine colour of the hymenium (as in *Lecidea vorticosa*). The spores are a little narrower in the Sol Bay plant, they are broader in the other plant, and the paraphyses more concrete, but the difference is within the probable limit of variation.

Though I have not seen VAINIO's f. *immutata* I think it probable that it is identical with my plant. As *Lecidea immutata* is no appropriate specific name, I have called my plant *Lecidea Sommerfeltii*, in honour of the author of Supplementum Florae Lapponicae and of *Lecidea xanthococca*.

TH. M. FRIES is of opinion that *Lecidea plebeia* NYL., which he had not seen, is an acrustaceous *Lecidea xanthococca*. I have examined that species in Herb. Lich. Fenn. No. 173. It is really acrustaceous (i. e. crusta hypophloeodes), its young apothecia are plane and marginated, but they soon become convex with excluded margin. More important are the characters of its hymenium and hypothecium. Its hypothecium is reddish-brown, not black, as is also the upper part of its hymenium. Its paraphyses are clavated or even capitated at their tips. KOH does not change the colour of the hymenium, it only dilutes the brown colour. I found no spores, but NYLANDER has found narrowly elliptical spores ($7-11 \times 3-4$ μ, cfr. HUE Addenda pag. 144, No. 942), as usual in the lichens of the *Lecidea xanthococca* section. *Lecidea plebeia* must be specifically distinct from *Lecidea xanthococca*.

g. Sect. *crassipes* TH. FR.

111. (24). *Lecidea crassipes* (TH. FR.) NYL.

Lecidea crassipes, vide ZAHLBRUCKNER Cat. Lich. III (1925) pag. 548, ubi syn.

Exsic. ARNOLD 1121, MALME 362, NORRL. 194 a, b.

II. Matotchkin Shar: Mt. Lasareff.

Only one plant was collected.

The spores ($14-16 \times 5-6$ μ) are often septated. For that reason I had hunted for it in the genus *Catillaria*, so intimately related with *Lecidea*. But MAGNUSSON suggested the correct determination.

The verniceous thallus is very thin. Otherwise my plant agrees perfectly with MALME's and NORRLIN's exsiccata.

112. (25). *Lecidea ramulosa* TH. FR.

Lecidea ramulosa. ZAHLBRUCKNER Cat. Lich. vol. III (1925) pag. 682. LYNGE Lich. Bear Isl. (1926) pag. 28.

var. *evoluta* TH. FR.

Plate X, fig. 3.

I. Goose Bay.

II. Matotchkin Shar: Near Vasnetsoff Gl., Mt. Lasareff, Mt. Wilczek, Belushii Bay and south side of the Shar near the Kara Sea entrance. Serebryanka Fjord, in the rookery.

IV. Mashigin Fjord: South and north side of Blaafjell Basin.

V. Admiralty Peninsula.

VI. Berkh Island. Mainland east of Lichutin Island. Northern and Eastern Kristovii Islands.

var. *depressa* TH. FR.

Vide LYNGE Lich. Bear Isl. (1926), ubi syn.

II. Matotchkin Shar: Belushii Bay.
IV. Mashigin Fjord: Rækved Bay.
V. Admiralty Peninsula.

In Novaya Zemlya *Lecidea ramulosa* is one of the most widespread lichens, common and plentiful everywhere. It grows in low depressions in the soil, which are for a long time covered with snow or irrigated with water from the eternal snow (Norwegian: "sneleieplante") with *Cetraria Delisei* a. o. In Spitsbergen I found it still more plentiful (Bell Sound 1926).

It is often well fertile, but even sterile plants can be determined with certainty after their habitus and bluish colour. Botanists who are not well acquainted with the Arctis, might confuse it with an *Ochrolechia*.

Plants from Goose Bay approach var. *depressa*.

My plant from Rækved Bay (var. *depressa*) agrees perfectly with NYLANDER's type plant of *Lecidea ementiens* from Konyam Bay. On the label there is a herbarium note by NYLANDER himself: "*L. ramulosa* FR. jun".

113. (26). *Lecidea assimilata* NYL.

p. m. p. var. *infuscata* TH. FR.

Lecidea assimilata NYL. ZAHLBRUCKNER Cat. Lich. III (1925) pag. 520, ubi syn. LYNGE Lich. Bear Isl. (1926) pag. 17.

I. Goose Bay. South side of Gribovii Fjord.
II. Matotchkin Shar: Pomorskaya, Mt. Lasareff near Vasnetsoff Glacier, Mt. Wilczek, Mt. Syernaia and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, Mt. Tveten, Strömsnes Bay, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.

Common and widespread on naked earth and on decayed mosses. I did not, however, find it north of Mashigin Fjord. But that does not even suggest that it should be lacking there.

Almost my entire material must be referred to var. *infuscata*, which is a more northern type than var. *irrubata*. Only a few plants, from Goose Bay, Mt. Lasareff, Vasnetsoff Gl. and Matotchkin Shar at the Kara Sea have the whitish thallus of var. *irrubata*.

The characters of thallus and apotheci agree entirely with our plants from Bear Island.

Lecidea assimilata should be distinguished with some care from *Lecidea Berengeriana*. The latter species is a *Biatora*, but its apothecia are often dark, at times almost black; if moistened their brownish colour is more visible. The best distinctive character is the colour of the hymenium which is smaragdine to smaragdine-black (upper part) in *Lecidea assimilata*, yellowish-brown in *L. Berengeriana*. The apothecia of *Lecidea assimilata* are very convex from their start, in the other species they are first plane or almost plane, then convex. In *Lecidea Berengeriana* the thallus is more effuse, it is more granular in *Lecidea assimilata*. But I would not venture a determination after their habitus.

114. (27). *Lecidea neglecta* NYL.

I. Goose Bay.
II. Matotchkin Shar: Pomorskaya, Mt. Lasareff, Mt. Syernaia and Belushii Bay.
IV. Mashigin Fjord: Nunatak on Lacroix (Norway) Glacier, Blomster Bay, Strömsnes Bay, Dal Bay and Sol Bay.
VI. Rookery south of Arkhangel Bay.

Widespread, common and plentiful in Novaya Zemlya as in other Arctic regions. — I have never seen fertile plants. I do not know whether this plant really is a *Lecidea*, and of this section.

h. Sect. *fuscoatra* TH. FR.

115. (28). *Lecidea impavida* TH. FR.

Lecidea impavida TH. FR. Lich. Spitsb. (1867) pag. 42. TH. FR. Lich. Scand. II (1874) pag. 529. ZAHLBRUCKNER Cat. Lich. IV (1925) pag. 598, ubi syn. LYNGE Lich. Bear Isl. (1926) pag. 23.

Non *Lecidea impavida* TH. FR. LYNGE Lich. Spitsb. I (1924) pag. 14.

I. Goose Bay.
II. Matotchkin Shar: south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Mt. Tveten.

It is difficult to say whether it is common or not. My material suggests a widespread, but not a common species. I have only found it on hard rocks, never on chalk. It is not directly parasitic, but it is a dangerous neighbour that often invades other crustaceous lichens, especially the yellow species of *Rhizocarpon*.

Even if *Lecidea impavida* is fertile, its spores are miserably developed in my Arctic plants. I have only seen a few spores, 12—13×5 μ, in the Bear Island plant I found 9—11×5—6 μ.

TH. FRIES writes (1867 l. c.) that it is a "Tam externis quam internis notis facillime distincta species". Its internal characters (the dark hypothecium and relatively small spores), as well as its chemical reaction are indeed characteristic, and if these characters are examined it is impossible to confuse it with other species.

But its habitus is more deceptive, for it resembles *Lecanora mastrucata*. In *Lecidea impavida* the disc of the apothecia is more plane and the prominent margin thinner than in *Lecanora mastrucata* and a little shining; if the plant is sterile, as *Lecidea impavida* often is (or the apothecia morbid), the positive reaction of *Lecanora mastrucata* with KOH will distinguish it.

It will be seen from the data given in my Bear Island work that *Lecidea impavida* has there been correctly determined. But misled by the habitus I failed with the Spitsbergen plants (LYNGE Lich. Spitsb. l. c.): The plant from Sörkappöya is *Lecanora mastrucata* (K+), the plant from Olsokbreen is another *Aspicilia*, very like *mastrucata*, but it is K÷, its spores are large and broad, e. g. 16×13 μ.

Former investigations. Recorded from Karmakuly (MAGN. pag. 8).

i. Sect. *armeniaca* TH. FR.

116. (29). *Lecidea armeniaca* (DC.) FR.

I. Goose Bay. Gribovii Fjord: North side.
II. Matotchkin Shar: Mt. Matotchka, Mt. Wilczek, east of Cape Jouravlev and Belushii Bay. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, nunatak on Lacroix (Norway) Glacier, Mt. Dietrichson, Mt. Tveten, Strömsnes Bay and Sol Bay.
VI. In the large rookery south of Arkhangel Bay.

It is evident from this considerable number of localities that *Lecidea armeniaca* as understood here is a very widespread lichen in Novaya Zemlya. It is also a common plant, but it is restricted to hard rocks. In the rookeries it develops very luxuriant thalli, but it is common also in places where birds are not abundant.

I have been much interested in finding *Lecidea aglaea* SOMRFT., recorded from Spitsbergen and Greenland, (TH. FRIES Lich. Arct. pag. 219) and from Novaya Zemlya (VAIN. pag. 87), but I cannot find it in my collections. It differs from *Lecidea armeniaca* by its thicker thallus, very convex areolae, convex and more prominent apothecia and a yellowish or yellowish-brown reaction with KOH. To judge from the type plants of SOMMERFELT in our herb. the hypothallus of *Lecidea aglaea* is almost lacking, in the Arctic *Lecidea armeniaca* the areolae are always more or less discrete, resting on a very conspicuous black hypothallus, sometimes almost immersed in it. The ochroleucous areolae are then only just visible here and there (the nunatak plants). In *Lecidea armeniaca* the hypothallus is distinctly radiating at the circumference of the thallus. In Arctic plants I have never seen the reddish-brown colour which is so common in the areolae of southern plants (at least in the herbaria). The areolae are ochroleucous, varying to a more yellowish tinge or — more rarely — to a somewhat greenish one, resembling the colour of a very pale *Rhizocarpon geographicum.*

Lecidea aglaea from Ellesmereland: Goosefjord, det. DARBISHIRE, Rep. Arct. Exp. Fram, pag. 15, has nothing to do with that species.

I am not quite convinced that the Arctic *Lecidea armeniaca* with its thin ochroleucous thallus and its often scattered, ± plane areolae is identical with the *Lecidea armeniaca* of Central Europe, which has a much thicker thallus with contiguous, more nitidous areolae and a more brownish or ochraceous colour.

I have not seen *Lecidea subbullata* VAIN. (Adjum. Lich. Lapp. pag. 81), its reaction is "areolis ... hydrate kalico lutescentibus-flavolutescentibus".

f. *diffracta* nov. forma.

Thallus valde incrassatus, areolato-diffractus, pallide ochroleucus, fere dealbatus. Areolae magnae, diam. 2—5 mm., leviter convexae, minute rimosae vel scabridae. Apothecia subplana, in thallo crasso immersa.

Praeterea ut in specie.

VI. Rookery south of Arkhangel Bay.

In my opinion this opulent habitus is due to the extraordinary supply of food from the birds' excrements in the rookery.

The thallus with its immersed apothecia somewhat resemble a thick *Lecanora sulphurea*. *Lecidea bullata* has another colour ("thallus candidus vel stramineo-albus", TH. FR. Lich. Scand. pag. 534) and very convex apothecia, and this species, as well as *Lecidea aglaea*, has much more convex areolae.

117. (30). *Lecidea arctogena* TH. FR.

Lecidea arctogena TH. M. FRIES Lich. Scand. II (1874) pag. 533, ubi syn.

I. Goose Bay. Gribovii Fjord: South side in the rock-fall (not collected).
II. Matotchkin Shar: East of Cape Jouravlev.

IV. Mashigin Fjord: Fram Bay, Nunatak on Lacroix (Norway) Glacier and north side of Blaafjell Basin (Mt. Dietrichson).

Found on hard rocks in the rock-falls, on large stones and the like. Considering the wide extension of its "impedimenta" — chalky and slaty rocks — it must be considered common. In Norway it is typically a summit lichen.

According to TH. M. FRIES Lich. Scand. II pag. 533 *Lecidea melaleuca* SOMRFT. is only a pale *Lecidea armeniaca.* It must accordingly have a positive reaction with KOH. The type of SOMMERFELT is unfortunately lacking in our herbarium and I cannot control this observation. We only have one plant, called *Lecidea melaleuca nobilitata* (leg. SOMMERFELT) on the label, but SOMMERFELT himself corrected this to *Lecidea melaleuca β. picta* SOMRFT. and it is evident from the description that this plant corresponds to his *Lecidea nobilis*, SOMMERFELT Suppl. Fl. Lapp. pag. 149.

Former investigations. Möller Bay (KUSNETZOFF No. 68). Matotchkin Shar: Belushii Bay (VAIN. pag. 86).

k. Sect. *alpestris* TH. FR.

118. (31). *Lecidea limosa* ACH.

I. Goose Bay.
II. Matotchkin Shar: Belushii Bay.
IV. Mashigin Fjord: Sol Bay.
V. Admiralty Peninsula.

The whole *Lecidea alpestris* section is poorly represented in Novaya Zemlya. *Lecidea arctica* is quite rare, there were only a few plants of *Lecidea limosa*, and *Lecidea alpestris*, which is common in Arctic Norway, could not be identified in my collection.

In Norway *Lecidea alpestris* has a much better developed thallus than *Lecidea limosa.* In the Arctis we cannot always expect that to be so. We must look after differences in the aposthecia, which are to be found in the spores. *Lecidea alpestris* has long and narrow, generally cylindrical-ellipsoidical spores, which are not always quite straight. TH. M. FRIES has measured 14—25×3—4 μ (Lich. Scand. II pag. 537), I have found 18—24×3—3.5 μ (MALME Lich. suec. No. 491).

In *Lecidea limosa* the spores are simply elliptical, not cylindrically elliptical, and considerably shorter. In MALME Lich. suec. No. 363 I have measured 10—11×3—4 μ, in my Novaya Zemlya plants from the first mentioned locality 10—12×4—4.5 μ, in my Belushii Bay plants 10—13×3 μ, and at Sol Bay 11—14×4.5—5 μ, in my Admiralty

Peninsula plant: 12—17×4—4.5 μ. TH. M. FRIES writes (l. c. pag. 538) 9—18×4—6 μ.

KUSNETZOFF'S *Lecidea alpestris* should perhaps be compared with *Lecidea limosa.*

119. (32). *Lecidea sublimosa* NYL.

Lecidea sublimosa NYL. Vide VAINIO Lich. Pitlek. (1909) pag. 130, ubi syn.

I. Goose Bay.
II. Matotchkin Shar: Belushii Bay.
IV. Mashigin Fjord: Sol Bay.
V. Admiralty Peninsula.

Only a few plants were obtained.

Thallus indistinctus, tenuis, minute granulatus vel subverniceus, cinereus vel impure albidus.

Apothecia parva, diam. 0.3—0.4 mm., arcte adpressa, diu plana et indistincte marginata, deinde subconvexa, sed non globosa. Discus margine atro concolor, omnino epruinosus, rugosus. Excipulum hypotheciumque omnino incoloria, hymenium inferne dilute aeruginosum, superne intensius smaragdulum, strato interrupto incolori tectum. Hymenium 70—80 (—100) μ altum, paraphyses arcte conglutinatae, indistinctae, KOH addito capitatae vel clavato-incrassatae videntur. Sporae octonae, simplices, incolores, majusculae vel oblongo-elongatae, in apice rotundatae, magnae: (15—) 18—31×7—9 (—10) μ.

Asci J persistenter caerulescentes, praecipue in apice, hymenium praeterea mox decoloratur (flavescens).

Its characters refer it to the "stirps *Lecidea alpestris*" of TH. FRIES Lich. Scand. II pag. 536. Its spores are too large, especially too broad, for *Lecidea alpestris* and *Lecidea limosa.* The two other species *Lecidea pallida* and *Lecidea arctica* have large spores, though not so large as in this species, but they differ by their thallus, which is much thicker and distinctly granular, and by their almost globose apothecia with a characteristic pruina.

In some of my plants I had first thought to see a few uni-septated spores, suggesting a *Catillaria* (near *jemtlandica*), but this observation was hardly correct, for on the final revision I saw numerous simple spores in several apothecia, but not a single septated. VAINIO has observed thick-walled gonidia: "gonidia . . . forsan pleurococcacea, membrana sat tenui, at in nonnullis speciminibus membrana bene incrassata" (l. c. pag. 131). I have also seen gonidia, up to 20—22 μ in diam., that were so thick-walled that it suggested a *Trentepohlia.*

120. (33). *Lecidea arctica* SOMRFT.

I. Goose Bay.
II. Matotchkin Shar: Pomorskaya.

I was very astonished to find that there were only a few plants in my collection of this conspicuous species, which is so common in Norway and also in Bear Island. Also recorded by NYLANDER in his Lich. Freti Behr. from Konyam Bay and from Behring Island.

It is quite possible that I have overseen it in Lütke Land, the greater northern Island of Novaya Zemlya.

121. (34). *Lecidea terricola* LYNGE n. sp.

V. Admiralty Peninsula, on naked earth.

Crusta effusa, pallide cinereo-fuscescens, granulata, granulis confluentibus, mollibus, diam. 0.2—0.4 mm., convexis, crenatis, rugulosis.

Apothecia mox convexa, immarginata, diam. 0.4—0.7 mm., atra, epruinosa, scabrosa. Excipulum stipitem versus fusco-nigrescens, in parte superiore subincolor vel dilutissime fuscescens vel levissime in aeruginosum vergens. Hypothecium incolor vel dilutissime aeruginosum. Hymenium 80—90 μ altum, superne anguste smaragdulo-fuligineum, praeterea dilute aeruginosum, guttulis oleosis (ob semper?) $\pm$ inspersum. Paraphyses arctissime conglutinatae. Sporae majusculae: $18—24 \times 5—8\ \mu$ (apothecia interdum sporis carentia).

Medulla J÷, hymenium J vinosum, asci J$\pm$ caerulescentes. Medulla et apothecia KOH et $CaCl_2O_2$ immutata.

Its characters refer it to the sect. *alpestris* TH. FR. near *Lecidea arctica* and especially *Lecidea pallida*. *Lecidea arctica* is always found on mosses. It has much smaller (0.1 mm.), firmer, almost papillato-coralloid granules and slightly smaller spores: $13—18 \times 6—8\ \mu$. *Lecidea pallida* has a characteristic yellowish-white colour ("stramineus vel pallide ochroleucus", TH. FR. Lich. Scand. pag. 539) and firmer granules. Either of these species generally has caesio-pruinose apothecia, but the pruina is occasionally lacking.

122. (35). *Lecidea macrospora* LYNGE n. sp. ad int.

VI. Northern Kristovii Island, on a rock, containing some chalk.

Planta inconspicua, parva, granulis albidis, dispersis, minutis (0.1 —0.3 mm.) formatus.

Apothecia crebra, diam. 0.5—0.8 mm., plana, nitida, marginata. Excipulum incolor, etiam cum hypothecio. Hymenium altum, 90—100 μ, strato incolorato, amorpho tectum, superne olivaceo-fuligineum, praeterea incolor. Paraphyses arcte cohaerentes, indistinctae, septatae, superne leviter clavatae. Asci ventricosi, octospori. Sporae majusculae: 16—21×9—11 μ.

Medulla J÷, KOH÷. Hymenium J e caeruleo persistenter nigrescens; excipulum KOH immutatum (non violaceum).

Its habitus calls to mind *Lecidea pungens*, its spore size also agrees quite well with that species. But its paraphyses are very coherent.

There are very few *Lecideae* with uncoloured hypothecium, coherent paraphyses and spores of this relatively great size. *Lecidea superlata* VAIN. Adjum. Lich. Lapp. II pag. 79 has a different structure of its grey (or greyish-brown) thallus. — It is hardly possible to find a place for *Lecidea macrospora* in any of TH. M. FRIES's sections. Its characters rather suggest the *Lecidea alpestris* section, but as yet only muscicolous or terricolous species have been placed in that section. The species of the *Lecidea lithophila* section have much smaller spores.

I have described it as a n. sp. ad int., but I cannot reject the possibility that it might be a *Lecidea pungens* with abnormally coherent paraphyses.

l. Sect. *tenebrosa* TH. FR.

123. (36). *Lecidea somphotera* VAIN.

Lecidea somphotera VAINIO Adjum. Lich. Lapp. II (1883) pag. 88.

IV. North of the Mashigin Fjord entrance.

Hymenium superne granulis violaceis ± inspersum; medulla $CaCl_2O_2$ non rubescens.

var. *lygaeoides* (VAIN.) LYNGE comb. nova.

Lecidea tenebrosa var. *lygaeoides* VAINIO Adjum. Lich. Lapp. II (1883) pag. 88.

II. Matotchkin Shar: Belushii Bay. Serebryanka Fjord in the rookery.

Hymenium superne granulis violaceis destitutum, medulla $CaCl_2O_2$ non rubescens.

I only detected these 3 small and inconspicuous plants in my collection.

The spores are not always well developed, but their size is remarkably constant: 10—13×5—6 (—7) μ. The difference against *Lecidea* *tenebrosa* is not great, but I have found it constant. TH. M. FRIES writes (of *Lecidea tenebrosa*) 11—17×6—7 μ (Lich. Scand. pag. 541), VAINIO (l. c. pag. 88) 14—16×6—8 μ. It is quite probable that TH. M. FRIES's data also cover some plants of *Lecidea somphotera*.

I am not so convinced of the specific value of the violet grains in the upper part of the hymenium. Accordingly I have united the *somphotera* and the *lygaeoides* into one species, distinguished from *Lecidea tenebrosa* by its shorter spores and from *Lecidea epiioidiza* by its negative reaction with $CaCl_2O_2$. Unfortunately VAINIO did not state the reaction of his *somphotera* with $CaCl_2O_2$. If it is positive I do not know how to separate these two species. — But I have given sufficient data to determine my plants if a monographical study of the section should rearrange these species, which it quite probably will.

In all my plants the uppermost part of the hymenium is almost fuliginose and the eventual violet colour is observed under the epithecium. The lower part of the hymenium is uncoloured, as is also the hypothecium.

A. L. SMITH (Brit. Lich. II, 1911, pag. 91) and A. ZAHLBRUCKNER (Catal. Lich. III, 1925, pag. 776) have given preference to the older name *Lecidea griseoatra* (*Verrucaria griseoatra* HOFFM. Deutschl. Flora, 1795, pag. 182) instead of *Lecidea tenebrosa*. To judge from HOFFMANN's description, l. c., and from his figure 2 in Plantae Lichenosae III pl. LX, this is quite probable, but I have not seen HOFFMANN's plant. — ZAHLBRUCKNER has referred *Lecidea griseoatra* to the *Biatorae* and the nearly allied *Lecidea somphotera* to the *Eulecideae*.

Former investigations. DEICHMANN BRANTH records a "*Lecidea tenebrosa*" from Novaya Zemlya (D. B. pag. 77).

124. (37). *Lecidea epiioidiza* NYL.

Lecidea epiioidiza NYLANDER Enum. Lich. Freti Behr. (1888) pag. 37. (1887?).

Lecidea somphotera f. *epiioidiza* (NYL.) VAIN. Lich. Pitlek. (1909) pag. 138.

II. Matotchkin Shar: Mt. Lasareff and east of Cape Jouravlev. Serebryanka Bay.

IV. Mashigin Fjord: Mt. Tveten.

Lecidea epiioidiza is an inconspicuous lichen, and these few stations do not tell us much about its distribution in Novaya Zemlya.

Thallus pallide vel obscure cinereus, opacus, satis crassus, areolis contiguis (thallus rimoso-areolatus) et leviter convexis vel interdum discretis et tum verrucosis. Thallus hypothallo atro impositus.

Apothecia arcte adpressa, fere aspicilioidea, minuta vel parva: diam. 0.2—0.4 (—0.7) mm. Discus planus, ater, epruinosus, margine crasso integro persistenti circumdatus. Hypothecium incolor. Paraphyses facillime liberae, asci subcylindrici. Sporae interdum sparse evolutae, ellipsoideae, 10—13×5—6 μ.

Medulla J÷, $CaCl_2O_2$ rubescens, hymenium J e caeruleo mox decoloratur, asci interdum subpersistenter caerulescentes, hymenium KOH intensius smaragdulum.

It differs from *Lecidea tenebrosa* by its smaller spores and the positive reaction with $CaCl_2O_2$, from *Lecidea somphotera* by this reaction. The spore size is remarkably constant, but the spores are generally scarce and in many sections they are not found at all.

NYLANDER writes (l. c.): "epithecium violaceum". I have always found an almost fuliginose upper part of the hymenium (epithecium). Under this thin stratum there is a pale violet colour, caused by minute grains, in two of my plants (from Serebryanka and Mt. Tveten); in the two other plants I could not detect any violet colour. In this case we can hardly attribute too much importance to this difference of colour.

Young immersed apothecia are quite punctiform and habitually they are easily mistaken for pycnides. I have done my best to find pycnides, but it was in vain.

Habitually my plant from Cape Jouravlev agrees entirely with NYLANDER's type plant.

125. (38). *Lecidea endolithea* n. sp.

VI. Mainland east of Lichutin Island.

Thallus endolitheus.

Apothecia dispersa, sparsa, adpressa (non immersa), diam. usque 2.5 mm. Discus ater, epruinosus, primo planus, indistincte marginatus, deinde convexus, margine excluso. Excipulum in parte exteriore smaragdulum, hypothecium incolor, hymenium inspersum, altum: 110—120 μ, superne smaragdulo-fuligineum. Paraphyses facile discretae, apicem versus ramosae. Sporae late ellipsoideae, mediocres vel majusculae: 15—18×10—12 μ.

Pycnides non visae.

Medulla J non caerulea, KOH immutata. Hymenium J e caeruleo obscure vinosum, cortex excipuli J intense vinosum.

Only one plant was obtained, growing on a chalky rock, with *Protoblastenia rupestris*, *Caloplaca elegans* a. o.

Its paraphyses which are so easily discrete, its uncoloured hypothecium and its chemical reaction refer it either to the *Lecidea tenebrosa* or to the *L. elaeochroma* section (TH. M. FR. Lich. Scand. pag. 540

and 542). But as no pycnides were found, its section cannot be determined with certainty.

Its athalline habitus might suggest *Lecidea pungens*, but that species is calciphobous and it has numerous small, plane apothecia.

m. Sect. *elaeochroma* TH. FR.

126. (39). *Lecidea glomerulosa* (DC.) STEUD.

Vide VAINIO Adjum. Lich. Lapp. II (1883) pag. 92, ubi syn.

A. *Muscicolous plants.*

var. *muscorum* (WULF.) VAIN.

ZAHLBRUCKNER Cat. Lich. III (1925) pag. 590, ubi syn.

Lecidea glomerulosa var. *Wulfenii* (HEPP) VAIN. Lich. Caucas. (1889) pag. 326. VAIN. Lich. Pitlek. (1909) pag. 131. LYNGE Lich. Bear Isl. (1926) pag. 22.

I. Goose Bay. Gribovii Fjord: south and north side.
II. Matotchkin Shar: Mt. Lasareff, Vasnetsoff Glacier, Chalhonik Valley, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord in the rookery.
IV. Mashigin Fjord: Fram Bay, Mt. Tveten and Sol Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Northern Kristovii Island.

On naked earth and on decayed plants. It is, perhaps, not one of the most ubiquitous lichens in Novaya Zemlya, but nevertheless it is widespread all over the region investigated by us and plentiful almost everywhere. It has a distinct predilection for nitrophilous localities, (I found it on the dry excrements of a *Rangifer tarandus*), but it cannot be listed among the specially coprophilous lichens.

Some of my plants (Belushii Bay, Kara Sea entrance, Mt. Tveten, Admiralty Peninsula and Northern Kristovii Isl.) have plane or (later) only slightly convex apothecia, with a nitidous disc and a nitidous, almost persistant margin. Their hymenium is remarkably low: 50—60, rarely 65 μ. I have compared them with *Lecidea sublimosa* NYL., which I have been able to investigate, thanks to professor G. SAMUELSSON, Stockholm. But all my plants have the loosely coherent paraphyses and the broad and relatively short spores of *Lecidea glomerulosa*, they hardly exceed 13—14 μ. In *Lecidea sublimosa* the paraphyses are coherent and the spores much larger and more elongated: 13—32×5—13 μ (VAINIO Lich. Pitlek. pag. 130—131) cfr. this work pag. 91.

B. *Lignicolous plants.*

I have tested all the "*Lecidea elaeochroma*"-plants, which I found on drift-wood, with K+C, and in all my plants I found an entirely negative reaction, never a red colour. The same reaction was found in some plants growing on old dead twigs of Salices and in a plant from a whale-bone. This excludes the species which VAINIO has called *Lecidea parasema* (Adjum. Lich. Lapp. pag. 94) or *Lecidea olivacea* (Lich. Pitlek. pag. 132): "K+C aurantiacus vel aurantiaco-rubescens".

The hypothecium of these lignicolous plants is either quite uncoloured or it is yellowish-brown, but I have seen no hypothecium that could be called dark. The uppermost part of the hymenium is bluish-black.

The apothecia vary considerably in size. The plants on the twigs of *Salices* have small apothecia, about 1 mm. in diam., the same is the case with a lignicolous plant from Berkh Island; still smaller apothecia are found in a lignicolous plant from Sol Bay, about 0.5 mm. or less in diam. We may refer these plants to var. *euphorea* FLK. as defined by VAINIO in Adjum. pag. 94. In my collection these plants have a very thin thallus.

In the other plants the apothecia are larger, 1.0—1.5 mm. in diam. By far the greater part of them have a thin thallus, a "thallus evanescens" is, however, rarely seen in these lignicolous plants. The thallus is granular and on the flat wood the granules are often so large that they may be compared with small, flat, crenate squamules. SOMMERFELT's *Lecidea elaeochroma β. achrista* in SOMRFT. Pl. crypt. Norv. No. 46 is a corticolous plant (*Populus*), it agrees so well with my lignicolous plants that I do not hesitate to identify them.

ZAHLBRUCKNER has called this plant *Lecidea elaeochroma* var. *hyalina* (Cat. Lich. III pag. 571). MARTIUS's "*Lecidea hyalina*" from 1817 is older than SOMMERFELT's name. But before we accept MARTIUS's name a comparison between the actual plants must be necessary.

Lecidea glomerulosa f. *Laureri* has a thick, granular thallus with middle-sized (0.7—0.8 mm.) convex apothecia, cfr. HEPP Flechten Europas No. 4.

But all these formae are quite confluent. There is (Chalhonik Valley) one plant with a thick granular thallus, as in f. *Laureri* and small plane, clustered apothecia.

A definite arrangement can only be obtained by a careful comparison with all the type plants, if such plants really exist.

f. *euphorea* FLK.

I. Goose Bay.
IV. Mashigin Fjord: Sol Bay.
VI. Berkh Island.

f. *achrista* (SOMRFT.) VAIN.

II. Matotchkin Shar: Chalhonik Valley.
IV. Mashigin Fjord: Blomster Bay and Rækved Bay.
VI. Berkh Island. Mainland east of Lichutin Island (on whale-bones). Eastern Kristovii Island.

f. *Laureri* (HEPP.) VAIN.

II. Matotchkin Shar: Mt. Wilczek and Chalhonik Valley.
VI. Berkh Island. Northern Kristovii Island.

Lecidea glomerulosa is a common plant on drift-wood all over the region investigated by us.

127. (40). *Lecidea latypea* ACH.

Lecidea latypea ZAHLBRUCKNER Cat. Lich. III (1925) pag. 608, ubi syn.

I. Goose Bay.

I collected several plants at Goose Bay, on hard rocks. I have examined the apothecia of all my saxicolous plants of the "*Lecidea elaeochroma*"-section, but I obtained *Lecidea latypea* from this locality alone. This does not suggest a common plant.

I have referred to *Lecidea latypea* plants with easily discrete paraphyses, dark (brownish) hypothecium and positive reaction (red colour) with hypochlorite of lime. Some plants that differed from *Lecidea latypea* only by their negative reaction (K+C÷) were referred to *Lecidea latypiza* NYL. In the Goose Bay plants the positive reaction is distinct.

The thallus is purely white (osseo-albidus) and typically granular, the granules are small and scattered, or in some plants ± contiguous, better developed, but never thick.

Former investigations. Novaya Zemlya (DEICHMANN BRANTH pag. 76). Matotchkin Shar: Tolyenii Bay (STIZ. pag. 421, TH. FRIES pag. 16, HEUGL. pag. 314). Also from Russia: Jugor Shar (TH. FRIES pag. 16 and HEUGL. pag. 314).

128. (41). *Lecidea latypiza* NYL.

Lecidea latypiza ZAHLBRUCKNER Cat. Lich. III (1925) pag. 612, ubi syn.

II. Matotchkin Shar: Belushii Bay and south side of the Shar at the Kara Sea entrance.

Only two plants, one from either station.

The thallus is very thin, granular, white (osseo-albidus) in the former plant and more greyish in the latter. They were first identified with *L. latypea*, but removed to this species on account of their negative reaction with hypochlorite of lime (C÷, K+C÷). I can find no other difference between these two species (pétites éspèces) than the chemical reaction.

The epithecium of the type plant (NYLANDER Pyr. Orient. No. 64) is smaragdine — not violet —, almost black at the upper part, and its hypothecium is pale brownish.

I have tested the reaction of *Lecidea latypea* from Mt. Misery, Bear Island, in our herb. (leg. TH. M. FRIES 1868, det. B. LYNGE Lich. Bear Isl. (1926) pag. 23). I could not find any certain positive reaction with hypochlorite of lime, only a faint yellow colour. This plant may quite as well be *Lecidea latypiza* as *Lecidea latypea*, we cannot always trust the C-reaction in so old plants.

129. (42). *Lecidea goniophila* FLK. var. *granulosa* (ARN.) VAIN.

Lecidella goniophila var. *granulosa* ARNOLD Lich. Ausflüge IV (1869) pag. 644. ARNOLD Lich. Exsic. 411 ab.

Lecidea elaeochroma var. *pilularis* (DAV?) TH. M. FRIES Lich. Scand. II (1874) pag. 543.

Lecidea goniophila var. *granulosa* VAIN. Adjum. Lich. Lapp. II (1883) pag. 92. LYNGE Lich. Bear Isl. (1926) pag. 23.

I. Goose Bay.

II. Matotchkin Shar: Near Vasnetsoff Glacier, Mt. Wilczek, Chalhonik Valley, east of Cape Jouravlev, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.

IV. Mashigin Fjord: Fram Bay, south and north side of Blaafjell Basin, nunatak on Lacroix (Norway) Glacier, Mt. Tveten and Strömsnes Bay. North of the Fjord entrance.

VI. Berkh Island. Lichutin Island. Mainland east of Lichutin Island. Eastern and Northern Kristovii Islands. Pankratyeff Peninsula.

The number of localities and still more the large number of plants in my collection are sufficient proofs that this species is very common in the region investigated by us. Found on rocks, slaty, chalky as well as on hard rocks.

I have referred to *Lecidea goniophila* plants with a tolerably well developed grey or whitish-grey, granular thallus, discrete or often contiguous granules and apothecia soon convex with disappearing margin. Hypothecium uncoloured, apices of the paraphyses dark bluish-black, hymenium otherwise either uncoloured or (often) ± distinctly reddish-violet.

An aberrant plant, collected at Vasnetsoff Glacier, Matotchkin Shar, was submitted to A. H. MAGNUSSON, Göteborg. He suggested var. *subsequens* NYL.; vide VAINIO Adjum. Lich. Lapp. II pag. 91. It agrees perfectly with VAINIO's description, but neither of us has a type plant for comparison.

Cfr. *Lecidea pungens* and *latypea.*

Former investigations. "*Lecidea pilularis*" and *Lecidea elaeochroma* have been recorded from Novaya Zemlya (DEICHMANN BRANTH pag. 76), *Lecidea goniophila* from Karmakuli (MAGN. pag. 8). Also from Franz Joseph Land (*Lecidea goniophila* KBR. ABRUZZI pag. 674).

130. (43). *Lecidea pungens* (KBR.) NYL.

Lecidea pungens ZAHLBRUCKNER Cat. Lich. III (1925) pag. 679, ubi syn.

I. Gribovii Fjord: south side.

II. Matotchkin Shar: Near Vasnetsoff Glacier and south side of the Shar at the Kara Sea entrance.

IV. Mashigin Fjord: Fram Bay and south side of Blaafjell Basin.

Conclusions on the frequency of a plant in a region must be very cautious if they are based only on the number of plants in a special collection. But I collected largely and paid much attention to the common plants also, which are so often neglected. A comparison between the very considerable number of *Lecidea goniophila* and the few plants of *Lecidea pungens* or *Lecidea latypea* must suggest the two latter species to be rather rare in Novaya Zemlya and the first mentioned species to be the commonest saxicolous species of the *Lecidea elaeochroma* section.

I have referred to *Lecidea pungens* plants that have no visible thallus or only inconspicuous traces of a thallus surrounding the apothecia, and small plane apothecia with a distinct margin. The hypothecium is uncoloured, the hymenium emerald-green (not violet) and the paraphyses, of course, easily discrete.

This corresponds entirely to KOERBER Lich. sel. Germ. No. 13 (in our herb.); this plant was quoted by KOERBER in his first diagnosis of "*Biatora pungens* KBR. nov. sp." in Parerga Lichen. (1865) pag. 161, and we must consider it the type plant.

TH. M. FRIES writes of *α. pungens*: partes internes var. *β.* subsimiles" and of his var. *β. pilularis*: "paraphyses apice fusco-vel caeruleo-nigricantes vel (vulgo) in violaceum vergentes" (Lich. Scand. II pag. 543).

In the plant which I have named *Lecidea goniophila* var. *granulosa* the upper part of the hymenium (i. e. the apices of the paraphyses) is very dark greenish-black, but otherwise the hymenium is either quite uncoloured or ± distinctly reddish-violet. In ARNOLD Lich. Exsic. No. 411 a. the apices of the paraphyses are "atrovirides" (cfr. ARNOLD Lich. Ausfl. IV pag. 644), the rest of the hymenium quite uncoloured and the hypothecium uncoloured.

If constant this different colour of the hymenium will strengthen the supposition that *Lecidea pungens* is specifically distinct from the plant which I have called *Lecidea goniophila* var. *granulosa*, supposed to be a synonym of *Lecidea elaeochroma* var. *pilularis* in TH. M. FRIES Lich. Scand. pag. 543. The true synonymy of this plant is almost inextricable, that would necessitate an examination of a large number of types, inaccessible to me.

Former investigations. Recorded from Novaya Zemlya (DEICHMANN BRANTH pag. 76). "*Lecidea parasema* var. *enteroleuca* NYL." from Franz Joseph Land (ABRUZZI pag. 675) is perhaps this species.

n. Sect. *elabens* TH. FR.

131. (44). *Lecidea Kolaensis* NYL.

Lecidea Kolaensis TH. FRIES Lich. Scand. II (1874) pag. 553, ubi syn.

II. Matotchkin Shar: Mt. Wilczek and Chalhonik Valley.

I only detected a few plants, growing on drift-wood. They are well developed and fertile.

Thallus tenuis, fere ecrustacea (f. *dolosula* NYL.).

Hypothecium subincolor, hymenium subincolor vel dilute violaceum, maculis obscuris numerosis instructum, superne caeruleo-fuligineum vel olivaceo-nigricans. Paraphyses arcte cohaerentes, KOH addito validae, ramosae, articulatae. Sporae simplices vel indistincte septatae (= *Catillaria*), subcylindricae vel anguste ellipsoideae, apice rotundatae, (10—) 12—17 $\times$3—4.5 μ.

Hymenium J e caeruleo sordide flavo-rubescens, asci impure nigrescentes.

As stated by TH. FRIES l. c. it is related to *Lecidea melancheima* (= *Lecidea elabens*) but it habitually differs from that species by its opaque apothecia; its spores are somewhat longer (in *Lecidea melancheima* 8—12$\times$3—4 μ), and the chemical reaction of its hymenium is different (in *Lecidea melancheima*: Jodo intense caerulescit).

In one of my plants I found a considerable number of spores that were 1-septated, as in *Catillaria*. The septum was not always equally distinct (apply zinc-chloriodide). But this plant agreed entirely with the other plants with simple spores. There is no real distinction between *Lecidea* and *Catillaria*.

The plant from Chalhonik Valley has larger apothecia, up to almost 1 mm. in diam., but the structure of the apothecia agrees quite well, only that the spores are rather short: 9—10.5×4—5 μ.

132. (45). *Lecidea migratoria* LYNGE n. sp.

Plate II, fig. 15—16.

II. Matotchkin Shar: Chalhonik Valley.

I detected a few plants only, but they are well developed. On cracked old drift-wood.

Thallus tenuis vel tenuissimus, obscure cinereus, vel cinereo-fuscescens, areolato-rimosus, areolae angulatae vel crenatae, irregulares, sed normaliter subplanae videntur.

Apothecia numerosa, dispersa vel interdum approximata, adpressa, diam. 0.5—0.7 mm., rotundata, rarius crenulata vel mutua pressione angulosa. Discus ater, epruinosus, planus, margine distincto, satis crasso, sed parce prominenti circumdatus, deinde interdum leviter subconvexus. Excipulum smaragdulo-nigrescens, hypothecium incolor. Hymenium 80—85 μ altum, superne smaragdulo-nigrescens, praeterea incolor. Paraphyses arcte cohaerentes, apicem versus caerulescenti-nigrescentes, incrassatae, KOH addito constricte septatae. Sporae cylindrico-ellipsoideae, incolores, simplices, rarissime indistincte septatae, 13—17×4.5—5 μ.

Asci J persistenter caerulescentes, praeterea hymenium deinde vinose rubescens coloratur.

It is nearly related to *Lecidea Kolaensis,* but it differs by its brownish thallus, its slightly broader spores and especially by its plane apothecia. The apothecia are appressed, but their margin is very distinct. The very convex apothecia of *Lecidea Kolaensis* have their contour almost imbedded into the thallus. In some sections of my species I only found simple spores, in others some spores were septate, as in *Catillaria.* In this section of *Lecidea* several species are transient into *Catillaria.*

Sometimes the thallus is only a thin film, other plants have squamulose thin areolae. The cracks of the thallus exactly correspond to the cracks of the substratum. This thallus is different from the "thallus granulato-areolatus vel granulosus" of *Lecidea Kolaensis* (TH. FRIES Lich. Scand. pag. 553).

o. Sect. *sylvicola* TH. FR.

133. (46). *Lecidea conferenda* NYL.

Lecidea conferenda ZAHLBRUCKNER Cat. Lich. III (1925) p. 535, ubi syn.

I. Goose Bay.
IV. Mashigin Fjord: Fram Bay (?) and Dal Bay.

Thallus tenuis, inconspicuus, maculis parvis (1—3 mm.), interdum elongatis dispositus, granulato-verrucosus (Goose Bay pl.) vel rimoso-areolatus (Fram Bay pl.), areolis minutis, diam. 0.2—0.3 (0.5) mm., subplanis, contiguis vel ± discretis, pallide flavescens, leviter et dilute in fuscescentem vergens. Thallus pruina sorediisque destitutus. Hypothallus non visus.

Apothecia ± dispersa, thallo adpressa vel subimmersa, minuta, diam. 0.2—0.4 mm., primo plana, tenuiter marginata vel deinde leviter convexa, margine excluso. Discus ater, omnino epruinosus, subopacus. Excipulum marginem versus etiam cum parte superiori hymenii intense caeruleo-fuligineum, hypothecium incolor vel dilute rufo-fuscescens, hymenium in parte inferiori dilutius caeruleum vel subincolor. Hymenium angustum: 40—45 μ. Paraphyses arcte cohaerentes, KOH addito articulatae et ramosae. Asci late saccati, membrana superne valde incrassata. Sporae (saepe immaturae) ellipsoideae, 8×4.5 μ (Fram Bay), 10—13×2.5—3.5 (Goose Bay).

Hymenium J e caeruleo intense vinosum vel (Fram Bay pl.) flavo-fuscescens vel in parte superiori subpersistenter caerulescens.

The plant from Goose Bay with its thin granular thallus is in my opinion a typical plant, but I have some doubts with respect to the plant from Fram Bay.

Its small apothecia and coherent paraphyses refer it to the *Microlecideae*, the section *sylvicola* TH. FR. It has the same intensely bluish-black colour of its excipulum and upper part of its hymenium as *Lecidea conferenda*. The other species of this section are evidently more distant. *Lecidea polycocca* SOMRFT. has pruinose apothecia, a reddish hypothecium and a paler hymenium. But its broad spores agree quite well with my Fram Bay plant: 10—12×4—5 (TH. M. FRIES Lich. Scand. pag. 559), I found the same size in SOMMERFELT's type plant in our herb.

There is one objection to the determination: the apothecia are more convex than in the (few) Norwegian plants seen.

In the Fram Bay plant the thallus is areolate more than granular and its spores (perhaps unripe) are too short and too broad for *Lecidea conferenda*. On the whole the spores are very narrow in this section. But there is only one plant in my collection, and I could not convince myself that its characters are sufficiently distinct to establish a proper species.

Krypt. Vind. No. 366 has considerably larger apothecia: 0.8—1.0 mm.

Probably the name *conferenda* covers several pétites éspèces.

134. (47). *Lecidea Mashiginii* LYNGE n. sp.

IV. Mashigin Fjord: Strömsnes Bay.

On rocks containing chalk, with *Protoblastenia rupestris*. I only detected one plant.

Thallus nullus visibilis vel maculas minutissimas dispersas albido-cinerascentes formans.

Apothecia minutissima, diam. 0.2—0.3 mm., primitus planiuscula, marginata, deinde mox convexa, immarginata. Discus ater, epruinosus, scabridus. Excipulum distincte roseo-violaceum, hypothecium fuligineum vel olivaceo-nigricans. Hymenium angustum: 45—50 μ, sat dilute vel interdum intensius smaragdulum. Paraphyses subconcretae, KOH addito laxius cohaerentes, (juniores?) graciles, in apice haud incrassatae vel (deinde?) validiores et clavatae vel etiam late capitatae (5—6 μ, KOH addito). Asci clavati. Sporae simplices, incoloratae, late ellipsoideae, 6—9$\times$4—5 μ.

Pycnides non visae.

Medulla J non caerulescens, sed hymenium J intense persistenterque caerulescens. Medulla KOH immutata, hymenium fere decoloratur, excipulum intensius violascit.

Its very small convex apothecia and its coherent paraphyses refer it to the "stirps *Lecidea sylvicolae*" of TH. FRIES Lich. Scand. II pag. 555. Its nearest relatives are evidently *Lecidea sylvicola* and *Lecidea polycocca*. But either of these species has a distinct, well developed thallus. *Lecidea polycocca* has considerably longer spores. *Lecidea sylvicola* has narrower spores and another chemical reaction of its hymenium ("J. vinose rubet"). There are several species, described in VAINIO's Adjumenta and in his Pitlekai work, which I have not seen, but I have found none where the description corresponds to my species.

B. *Biatora* (FR.) BRANTH et ROSTR.

a. Sect. *vernalis* TH. FR.

135. (48). *Lecidea cuprea* SOMRFT.

I. Goose Bay.
II. Matotchkin Shar: Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Strömsnes Bay.

On moist earth, not common and quite scarce. The plants are typical, with a thick, white or whitish thallus and well fertile. Generally but few spore are developed in each apothecium, I have measured 10—13$\times$4 μ. TH. FRIES has found 10—22$\times$3—6 μ (Lich. Scand. II pag.427).

136. (49). *Lecidea vernalis* (L). ACH.

I. Goose Bay. Gribovii Fjord: North side.
II. Matotchkin Shar: Mt. Lasareff, east of Cape Jouravleff, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, north side of Blaafjell Basin, Mt. Tveten, Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. South of Arkhangel Bay. Northern Kristovii Island.

Lecidea vernalis is found all over the regions investigated by us. It is common everywhere. I think I could have found it every day ashore.

Former investigations. Recorded from Bėlushii Bay only SAV. 1912 pag. 36).

b. Sect. *fusca* TH. FR.

137. (50). *Lecidea Berengeriana* (MASS.) NYL.

I. Goose Bay.
II. Matotchkin Shar: Mt. Lasareff, Mt. Wilczek, Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
VI. Berkh Island. Northern Kristovii Island.

Very widespread and quite common, but not plentiful.

Its very characteristic habitus: small, thick, somewhat crenate squamules, dark brownish-black at last convex apothecia readily suggest this species, if the thallus is well developed. Sometimes the thallus is $\pm$ darkened, but the pale squamules are generally seen at more protected places. Of course no safe determination can be made without a microscopical examination: Hypothecium obscure rufo-fuscescens; hymenium quam hypothecio obscurius; paraphyses capitatae, in apice interdum $\pm$ cohaerentes; sporae 9—13 (—16) $\times$ (3—) 4—5 μ. Hymenium J e caeruleo mox intense vinosum, asci solum interdum caerulescentes.

The breadth of the spores is fairly constant, but not their length which may vary in the same section from 9 to 16 μ.

138. (51). *Lecidea fuscorubens* NYL.

Lecidea fuscorubens TH. M. FRIES Lich. Scand. II pag. 440, ubi syn.

II. Matotchkin Shar: East of Cape Jouravlev.

There is only one plant in my collection, found on a schistose chalky rock.

Thallus tenuis, fere invisibilis, cinerascens. Apothecia diam. 0.5—0.8 mm., (rarius) primitus plana, marginata, vulgo (in planta mea) mox convexa, obscura, subnigricantia. Hypothecium nigrum vel nigrorubescens. Hymenium angustum, fusco-rubescens, superne obscurius coloratum. Paraphyses cohaerentes, validae, capitatae. Sporae male evolutae, 9—10.5×4—5 μ.

Hymenium J e caeruleo mox vinosum, medulla J÷, KOH÷.

ZAHLBRUCKNER does not mention this species in his Catalogus Lichenum under the head of *Lecidea*. He is of opinion that it is a *Protoblastenia* : *Protoblastenia monticola* (ACH.) STEINER.

Former investigations. Recorded from Möller Bay (KUSNETZOFF No. 59).

c. Sect. *rivulosa* TH. FR.

139. (52). *Lecidea mollis* (WBG.) NYL.

Lecidea mollis. MAGNUSSON, A. H. Studies in the Rivulosa-Group of the Genus Lecidea (1925) pag. 12 et 31, ubi syn.

I. Goose Bay. Gribovii Fjord, south side (not collected).

II. Matotchkin Shar: Mt. Matotchka and Belushii Bay. Serebryanka Fjord.

IV. Mashigin Fjord: South side of Blaafjell Basin and at Mt. Dietrichson.

I have only found *Lecidea mollis* on hard (i. e. not calcareous) rocks. It is widely distributed, quite common and generally plentiful on the large stones of the rock-falls.

My Novaya Zemlya plants agree very well with Norwegian plants, (revised by MAGNUSSON). The spores are very uniform, broadly elliptic or subglobose, 7—8×4.5—5.5 μ.

var. *caesioalbescens* H. MAGN.

Lecidea mollis var. *caesioalbescens* H. MAGNUSSON l. c. (1925) pag. 33.

II. Matotchkin Shar: Belushii Bay.

There is only a single plant in my collection (det. H. MAGN.).

Former investigations. *Lecidea mollis* has been recorded from Belushii Bay in Matotchkin Shar (VAIN. pag. 86).

d. Sect. *aenea* LYNGE sect. nov.

Differt a sectione *leucophaea* TH. FR. (sensu angustiore) thallo specierum fuscescenti vel fuscescenti-nigrescenti.

140. (53). *Lecidea aenea* (DUF.) NYL.

Lecidea aenea DUF.; vide TH. M. FR. Lich. Scand. II (1874) pag. 457.

I. Gribovii Fjord: Veselago Island.
II. Matotchkin Shar: Chalhonik Valley, Mt. Syernaia and Belushii Bay.
IV. Mashigin Fjord: South side of Blaafjell Basin and Nunatak on Lacroix (Norway) Glacier.
V. Admiralty Peninsula.

In Norway this species is found on the highest summits where it is supposed to be quite common. It was only natural that it should be widespread and quite common in Novaya Zemlya. At Chalhonik Valley I found splendid plants on drift-wood, they are larger than any saxicolous plant, which I have seen, up to 9 cm., but quite typical. It is a rare thing to find a plant so little altered by a change of substratum. All the other plants were found on hard rocks, as usual. My plants are well fertile.

Apothecia vulgo bene evoluta, supra thallum $\pm$ elevata, plana vel subplana, discus ater, epruinosus, margine crassitudine mediocri persistenti circumdatus. Hypothecium omnino incolor, hymenium superne olivaceum vel olivaceo-nigrescens (TH. M. FRIES Lich. Scand. II pag. 457: "paraphyses apicem versus fuligineo-fuscae vel fuscescentes fuligineaeve"), paraphyses validae, cohaerentes, apicem versus $\pm$ incrassatae, sporae vulgo male evolutae, $9—14 \times 5—6$ μ.

Pycnoconidia longa, arcuata, 26—35 μ.

I have found the apothecia and their structure quite constant in my material, as far as my investigations go, but the development of the thallus is highly variable and may suggest different types. Generally the thallus is developed as in Norway, but in some plants it is very thin. Especially in the Nunatak-plant it is so "macra" that the plant is hardly to be determined with certainty.

I have found sublecanorine apothecia in the plants on drift-wood: There are no gonidia in the margin, but in the centre of the apothecia they advance almost to the hymenium.

Lecidea aenea has a great habitual resemblance to several other species, which has repeatedly been pointed out. It differs from *Lecidea atrobrunnea* by its negative reaction with J, from *Lecidea fuscoatra* by its pale hypothecium and from some formae of *Lecidea armeniaca* by its negative reaction with KOH.

ZAHLBRUCKNER has referred *Lecidea aenea* to the *Eulecideae* (Cat. Lich. III pag. 500); it seems to me that it must be a *Biatora*, as stated by TH. FRIES (Lich. Scand. pag. 457).

141. (54). *Lecidea Arnoldi* LYNGE n. sp.

Plate X, fig. 2, XII, fig. 3.

An syn. *Psora aenea* f. *corrugata* ARNOLD Lich. Ausfl. in Tirol. XXV (1893) pag. 383?

II. Matotchkin Shar: Belushii Bay, on hard rocks.

Thallus 50—60 mm. latus, valde incrassatus, usque ad 2 mm., diffracto-areolatus, obscure castaneus, nitidus. Areolae 3—4 mm. latae, angulatae, ± convexae, valde inaequales, irregulariter rimoso-ruptae, marginibus atris ± elevatis circumdatae. Hypothallus circum thallum non visus.

Apothecia satis sparsa, biatorina, adpressa, diam. ca. 1 mm. Discus primo planus marginatus, deinde mox convexus immarginatus; discus nitidus, epruinosus, siccus obscure rufo-fuscus, fere ater, humidus rufo- fuscus. Excipulum etiam cum hypothecio omnino incolor. Hymenium superne rufo- vel flavo- fuscescens, strato incolorato ± alto tectum. Paraphyses arcte cohaerentes, in apice capitato-incrassatae. Sporae parcissime evolutae, unam solum maturam invenimus, 9×5 μ.

Pycnides non visae.

Medulla J non caerulescens, cortex thalli KOH rubescens, crystalla fasciculata sanguinea praecipituntur, medulla KOH ÷. Hymenium J e caeruleo sordide vinosum, asci subpersistenter caerulescentes.

I have seen "*Psora aenea* f. *corrugata* ARN." in herb. VAINIO in Åbo. It has the same thick diffract thallus as this species and the habitual conformity is so great that most probably they are identical. But ARNOLD expressly states: "med. K ÷" (l. c.). This statement should be tested again.

No hypothallus is visible at the circumference of the thallus, but the thick thallus itself advances like a glacier upon its small defenceless neighbours.

I have tested several plants of *Lecidea aenea* with KOH and always found either a quite negative reaction or a faint, yellow colour.

142. (55). *Lecidea picea* LYNGE n. sp.

Plate IX, fig. 4.

II. Matotchkin Shar: Mt. Syedlho, on a hard rock.

Thallus mediocris vel parvus, diam. 20 mm., satis tenuis, piceus, subnitidus, diffracto-areolatus, areolae angulatae, 0.5—0.7 mm., planae vel marginibus concoloribus elevatis subconcavae. Hypothallus non visus.

Apothecia dispersa, non numerosa, magna, diam. usque 2 mm., biatorina, adpressa, primo plana, tenuiter marginata, sed mox convexa, immarginata. Discus epruinosus, nitidus, ater (siccus et humidus). Excipulum in parte inferiore plus minusve violascens vel quin etiam violascenti-nigrescens. Hypothecium etiam cum parte interiori hymenii violascens, hymenium superne maculis coloratis aeruginosum vel aeruginoso-fuligineum. Hymenium altum: 130—150 (—160) μ. Paraphyses arcte cohaerentes, septatae, interdum ramosae, superne leviter clavatae. Sporae octonae, minutae: 5—7×3.5—4 μ.

Pycnides non visae.

Medulla J non caerulescens, KOH immutata. Hymenium J caerulescens, gelatina deinde sordide vinosum. Hydrate kalico addito omnes partes violascentes apothecii pulchre aeruginosae colorantur.

Related to *Lecidea aenea*, but quite distinct, on account of its plane black areolae, the colour of its hymenium and excipulum and its small spores. I have only seen them in their asci and they were perhaps not quite ripe. But I have seen so many of them, with conformable size, that I have ventured to give their dimensions. These small spores are very inconspicuous in their asci and to study them it may be recommended to clear up with KOH, wash with water and stain with chlorzinkiodide.

No hypothallus is visible, but the black areolae advance irregularly at the margin of the thallus, giving it a crenate circumference.

143. (56). *Lecidea discreta* LYNGE n. sp.

Thallus 60—80 mm. latus, areolatus, areolis tenuibus, discretis, rarius subdiscretis, planis vel leviter convexis, angulatis vel rotundatis, hypothallo atro, crasso, areolato-diffracto, rugoso adpressis vel etiam subimmersis. Areolae laevigatae, epruinosae, vulgo margine dealbato circumdatae. Thallus zona angusta hypothallino circumdatus.

Apothecia dispersa, sed numerosa, magna, diam. usque ad 35 mm., adpressa vel subimmersa. Discus persistenter planus, ater, epruinosus, saepe umbonatus, rugis radiatis et margine persistenti elevato atro rotundato-lobato compositus videtur (= in *Lecidea auriculata*). Excipulum etiam cum hypothecio p. p. incoloratum, p. p. obscuratum, in aliis plantis magis obscuratum, fuscescens. Hymenium 80—100 μ altum, superne anguste intense fuligineum vel interdum aeruginoso-fuligineum. Paraphyses arcte cohaerentes, graciles, in apice leviter incrassatae. Asci anguste clavati, 10—12 μ crassi, saepe numerosissimi, octospori. Sporae anguste oblongae, 7—11×4—5 μ.

Pycnides non visae.

Medulla J non caerulescens, KOH intense sanguinea, crystalla fasciculata praecipituntur. Hymenium J intense caerulescens, gelatina deinde vinosa, asci sordide obscurati, hymenium KOH non sanguinea. Medulla $CaCl_2O_2$ immutata.

var. *opaca* LYNGE nov. var.

VI. Lichutin Island.

Areolae opacae, obscuriores, fere nigrescentes, hypothecium dilutius coloratus, usque incolor.

var. *nitida* LYNGE nov. var.

II. Serebryanka Fjord.

IV. Mashigin Fjord: On the large stones in the rock-fall at the foot of Mt. Dietrichson.

Areolae nitidae, castaneae, hypothecium obscurius, fuscescens.

Its habitus is very like *Lecidea paupercula*, apart of its large apothecia, but it is sufficiently distinct from all the species of that tribus by its medullary reaction with J, which is entirely negative, i. e. not blue. — Its habitus also suggests some affinity to *Lecidea fuscoatra*, but its hypothecium is too pale for that tribus. In var. *nitida* I found a dark lower part of the excipulum and some dark broad lines projecting from the excipulum into the thallus itself. The hypothecium was pale brown, but if KOH was added, it lost its colour entirely (the brown colour was evidently due to air?). Var. *nitida* had a brown hypothecium, persistently so, even if KOH was added. Investigations on more material must decide whether this difference is sufficient for specific distinction.

It is difficult to find a place in any of the *Lecidea* sections for this species. For the present I will place it near *Lecidea aenea,* in spite of its black apothecia.

I am not convinced that TH. M. FRIES's section Stirps "*Lecideae leucophaeae*" (TH. M. FRIES Lich. Scand. pag. 457) is natural, in spite of the important conformity of the pycnoconidia. *Lecidea aenea* and the allied species here described, and the species of the sections *Lecideae atrobrunneae* and *Lecideae fuscoatrae* have many characters in common. The different reaction with J is excellent for specific distinction, but it places in different sections species that appear related.

e. Sect. *leucophaea* TH. FR. p. p.
(excl. *aeneae* LYNGE).

144. (57). *Lecidea subplumbea* ANZI.

Lecidea subplumbea ANZI Analecta Lichenum (1868) pag. 16 (169). VAINIO Adjum. Lich. Lapp. II (1883) pag. 80. ANZI Lich. Lang. No. 573. MALME Lich. suec. No. 719.

Lecidea inserena NYLANDER Addenda nova. etc. Flora (1869) pag. 84. ARNOLD Lich. Ausfl. XIII (1874) pag. 9. ZAHLBRUCKNER Cat. Lich. III (1925) pag. 559, ubi syn.

Lecidea obnubila TH. FR. et HELLB. in TH. M. FR. Lich. Scand. II (1874) pag. 459.

I. Goose Bay.
II. Matotchkin Shar: Belushii Bay.
IV. Mashigin Fjord: Mt. Tveten and Strömsnes Bay.
VI. Northern Kristovii Island.

I have found it on hard rocks or on schistose rocks, at the first mentioned locality in considerable number. Evidently not rare.

The determination of these plants has been difficult for me, and I do not feel quite sure that I have succeeded. My best plant, one from Goose Bay, agrees so well with ANZI Lich. Lang. No. 573 that I can see no habitual specific difference between them. Generally my plants are not so well developed. The leaden-coloured (cinereo-plumbeae), convex or tumidous areolae are not always contiguous, but more or less discrete or even scattered over a conspicuous black hypothallus. My plants are well fertile. The apothecia are small or middle-sized: 0.5—0.75 mm. in diam.; the disc is absolutely black, also in moistened plants, with a nitidous, sharp margin. Old apothecia are slightly convex, some very convex apothecia are evidently morbose. The apothecia originate near the margin of very young areolae, they remain elevated on the thallus.

The hypothecium is always quite uncoloured, as is the central part of the excipulum. But along its margin and often at its lower part the excipulum is more or less reddish and this colour is considerably intensified if KOH is applied. I found this rosy tinge constant in my plants, but I was disappointed at not finding it in ANZI's plant. TH. M. FRIES writes: "Excipulum atropurpureum" VAINIO also found an "excipulum . . . . hydrate kalico fere rubricosum".

The hymenium is not high, about 65 μ; it is always smaragdine at its upper part. The paraphyses are concrete, covered with an uncoloured gelatinous epithecium. Only few spores are seen in every section, their common size is 11—14×5.5—6.5 μ, in one plant only I found the spores as long as up to 16—17 μ. TH. FRIES has measured plus-variants of the spores 12—17×4—6 μ; in ANZI's Lich. Lang. I measured 11—13×5.5 μ.

Some fertile pycnides were detected, the pycnoconidia are very thin, very arcuate, of a variable size: in one plant (Belushii Bay) I measured 16—18 μ, in another (Goose Bay) 26—32 μ between their apices.

TH. FRIES writes that *Lecidea subplumbea* is nearly allied to *Lecidea leucophaea,* that is to its β *griseoatra* as understood by him, for *Lecidea leucophaea* α *genuina* cannot be confused with *Lecidea subplumbea.* VAINIO has attributed convex areolae to *Lecidea subplumbea* (Adjum. l. c.), agreeing well with ANZI Lich. Lang. No. 573, and more plane areolae to *Lecidea leucophaea* β *griseoatra* (Lich. Pitlek. pag. 123). — The specific name *subplumbea* was happily chosen.

I have not seen the type of FLOTOW's *Lecidea griseoatra* (SCHAERER Enum. Crit. (1850) pag. 101). — The name has been used in a different sense by lichenological authors. "*Lecidea griseoatra*" in A. L. SMITH's Mon. Brit. Lich. (1926) pag. 73 = *Lecidea tenebrosa* FLOT. is a quite different plant. ZAHLBRUCKNER has given preference to NYLANDER's name *Lecidea inserena* (Cat. Lich. l. c.). I do not know why; ANZI's specific name is one year older.

145. (58). *Lecidea leucophaea* (FLK.) TH. FR. β. *griseoatra* (FW.) TH. FR.

Lecidea leucophaea var. *griseoatra* (FW.) TH. FR. Lich. Scand. II (1874) pag. 460, ubi syn.

Cfr. *Lecidea griseoatra* FW. ZAHLBRUCKNER Cat. Lich. III (1925) pag. 776, ubi syn.

IV. Mashigin Fjord: Sol Bay. North of the Mashigin Fjord entrance.

Areolae atrogriseae, parvae, < 0.5 mm., subplanae.

Apothecia majora, diam. usque ad 1 mm., nitida, praecipue margo, discus diu planus, bene marginatus, deinde convexus immarginatus. Excipulum etiam cum hypothecio omnino incolor, etiam KOH addito, hymenium superne subcaerulescens vel smaragdulo-fuligineum. Paraphyses cohaerentes. Asci anguste saccati vel subcylindrici, sporae 7—9 ×4.5—5 μ.

Medulla J ÷, KOH ÷, hymenium J caeruleo-nigrescens, hymenium superne KOH magis in olivascentem vergens.

The uncoloured excipulum and the small spores remove it from *Lecidea subplumbea,* which is otherwise more common in Novaya Zemlya. *Lecidea aenea* has brown, more nitidous, larger and thicker areolae; it is on the whole a considerably larger plant.

In Norway this species generally develops thicker thalli, but my plants agree well with VAINIO's Pitlekai plant in hb. Riksmuseum, Stockholm.

There is a *Lecidea* from the nunatak on Lacroix (Norway) glacier, which can hardly be determined with certainty, owing to the poor development of its thallus. Habitually it is more like *Lecidea subplumbea* than *Lecidea leucophaea* var. *griseoatra*, but its uncoloured excipulum and its small spores: 7—8×5—5.5 μ, are in favour of the latter species.

Does not the name *Lecidea griseoatra* in ZAHLBRUCKNER Cat. Lich. III pag. 776 cover two different species, viz. *Lecidea tenebrosa* and *Lecidea leucophaea* var. *griseoatra*, as understood by TH. M. FRIES in Lich. Scand. II pag. 540 and 460?

I think it quite probable that *Lecidea leucophaea* β. *griseoatra* is specifically distinct from (the more southern?) *Lecidea leucophaea* α. *genuina* (KBR.) TH. FR.; if so a new specific name should be attributed to the former species, on account of the confusion about the name *griseoatra*.

146. (59). *Lecidea (*an *Lecanora?) tenebricans* NYL.

Lecidea tenebricans NYL. ZAHLBRUCKNER Cat. Lich. III (1925) pag. 708, ubi syn. (There is an error in ZAHLBRUCKNER's citation of OLIVIER's work: pag. 111, 112 et 165. The pag. 111 and 146 concern *Lecidea tenebricans*, pag. 112 and 165 *Lecidea tenebrica*).

IV. Mashigin Fjord: Fram Bay, only one plant.

Hypothecium incolor, hymenium angustum: 50—85 μ, superne infuscatum. Paraphyses satis validae, cohaerentes. Sporae 10.5—12×5—5.2 μ. Medulla J et KOH ÷, hymenium J e caeruleo sordide decoloratur: asci sordide obscurati, gelatina subvinosa.

As stated by NYLANDER this species must by nearly allied to *Lecidea leucophaea*, if it is specifically distinct. It has a darker thallus, greyish-brown, and darker apothecia, almost black. It has therefore generally been referred to the *Eulecideae* (ZAHLBRUCKNER l. c.), whereas *Lecidea leucophaea* is more typically a *Biatora*. Is there a more unhappy creation in lichenology than the "genus" *Biatora?*

My plant agrees well with VAINIO's type plant from Padasjoki with respect to its colour and VAINIO has acknowledged the determination. Its apothecia have a more prominent margin than in the type, as in *Lecidea lulensis*. — It is distinguished from that species by its negative reaction with KOH and from the var. *griseoatra* of *Lecidea leucophaea* by its thin subdiscrete areolae. The latter distinction is open to criticism.

147. (60). *Lecidea Karaënsis* LYNGE n. sp.

II. Matotchkin Shar: South side at the Kara Sea entrance, on a stone containing chalk.

Thallus tenuis, valde inconspicuus, parvus, diam. ca. 15 mm., limitatus, mollis, olivaceus vel olivaceo- cinerascens, rimoso-areolatus, areolis rugosis crenatis. Hypothallus non visus.

Apothecia mollia, dispersa, thallo arcte adpressa, diam. 0.4—0.5 mm., epruinosa, obscure fusco-nigrescentia, primo plana, indistincte marginata, deinde magis convexa. Excipulum dilute vel satis obscure fusco-rubescens, hypothecium pallidius coloratum, magis flavo-fuscescens vel aurantiaco- rubescens. Hymenium superne (paraphysum apicibus capitatis) fusco-rubescens, praeterea incolor vel dilute flavescens; ca. 80 μ altum. Paraphyses satis cohaerentes, sed non conglutinatae. Sporae anguste ellipsoideae, elongato-oblongatae, 9—12×3.7—4.5 μ.

Pycnides parvae, ostiolum quam thallo leviter solum obscurius coloratum. Pycnoconidia longa, valde arcuata, interdum fere semicirculosa, 10—13 μ.

Thallus J ÷, KOH ÷, $CaCl_2O_2$ ÷; hymenium J e caeruleo sordide vinosum, asci obscurius colorantur.

In a very thin section the colour of excipulum and hypothecium is so pale that it is more "pallidum" than "obscurum". This excludes *Lecidea fuscorubens* with its black excipulum.

It is impossible to measure the true length of the pycnoconidia of this type, the above dimension (10—13 μ) represents the distance between their apices, (a chord, ev. a diameter).

These pycnoconidia refer *Lecidea Karaënsis* to the *Lecidea (Biatora) leucophaea* section, and it is nearly related to this species itself. A section of their apothecia shows much the same colours and the same texture; the spores of the latter species are a little larger (TH. M. FRIES Lich. Scand. pag. 460: 9—14×5—7 μ, in MALME Lich. suec. No. 646 I measured 11—13×4.5—5.5 μ). *Lecidea leucophaea* has rather firm areolae resting on a distinct black hypothallus, in my species the areolae are very soft and there is no visible hypothallus. More Arctic material alone can show us the degree of variation of *Lecidea leucophaea*. In the Arctis there are evidently several critical small species of this section.

148. (61). *Lecidea glacialis* LYNGE n. sp.

IV. Mashigin Fjord: Nunatak on Lacroix (Norway) Glacier, on a quartzitic rock (no CO_2 with HCl).

Thallus cinereo-flavescens vel cinerascens, late expansus, 6—7 cm. (plantis confluentibus), m o l l i s s i m u s, c r a s s u s, continuus, rimoso-areolatus, a r e o l i s c o n v e x i s u s q u e v e r r u c o s i s. Hypothallus ater.

Apothecia diam. usque ad 1.5 mm., sessilia, sed non adpressa, rufo-fuscescentia, mollia, opaca, epruinosa, mox convexa, immarginata. Excipulum incolor, etiam cum hypothecio. Hymenium superne fuscescens, 55—60 μ altum. Paraphyses cohaerentes, in apice levissime solum incrassatae. Asci evacuati (ob semper?) transverse striati. Sporae parcissime evolutae, octonae, ellipsoideae, 11—12×5.5—6 μ.

Pycnides sparsae, pycnoconidia longa, tenuissima, subrecta vel irregulariter arcuata vel geniculata, 13—17 μ.

Medulla J, KOH, $CaCl_2O_2$ et KOH + $CaCl_2O_2$ immutata. Asci J subpersistenter caerulescentes vel saltem obscurascentes, gelatina hymenialis deinde sordide vinosa.

Its brown apothecia and long pycnoconidia refer it to the *Lecidea leucophaea* section. It is one of several Arctic small species, related to *Lecidea leucophaea* itself. The spores and pycnoconidia do not differ much in these plants. *Lecidea glacialis* is distinguished by the colour of its soft, thick, verrucose thallus. Its soft cortex is easily rubbed off, largely exposing its white medulla. It is difficult to understand that a plant of this soft texture can exist on a nunatak, exposed to so hard conditions of life.

149. (62). *Lecidea lulensis* HELLB.

ZAHLBRUCKNER Cat. Lich. vol. III (1925) pag. 794, ubi syn. LYNGE Lich. Bear Isl. (1926) pag. 25.

I. Goose Bay.
II. Matotchkin Shar: Mt. Matotchka, Mt. Lasareff, Mt. Syernaia and Belushii Bay.
IV. Mashigin Fjord: Fram Bay, Nunatak on Lacroix (Norway) Glacier, Dal Bay and Sol Bay.
VI. Berkh Island.

On hard rocks. It is widespread in Novaya Zemlya, and quite common. But the number of plants in my collection is not large and I do not venture to call it plentiful.

The areolae are grey, often quite pale, not black. They are small, ± verrucose, but low. If they are contiguous, they determine the thalline colour, if they are discrete as they often are in the Arctis the black hypothallus is more distinctly seen. In very reduced plants there are but a few scattered areolae on a black hypothallus.

Though with much doubt I have referred to *Lecidea lulensis* a plant, collected at Belushii Bay. The structure of the apothecia and the chemical reaction correspond entirely, but the areolae are much larger than usual, they are of a pale grey colour, and crenate at their margin. The hypothallus is very dark and surrounding the thallus there is a thick black protothallus, like a thick zone of Chinese ink. The whole plant invades a *Lecidea albocaerulescens*.

The small apothecia (diam. 0.3—0.4 mm.), which for a long time remain plane with a thin persistent margin, as well as the chemical reaction (K+rub.), are good characters. The hypothecium is uncoloured, but if the excipulum is dark (brownish), the colour of the hypothecium must be observed with attention.

The spores are not well developed. I have often found only a few spores in every section, or they were entirely lacking. Their size was $9—11 \times 5—5.5$ μ, agreeing well with my observations on the Bear Island plants. — On thin sections it is seen that the blue staining of the hymenium with J is due to the asci. I measured the pycnoconidia in one plant (from Belushii Bay) and found 13—16 μ, considerably shorter than in *Lecidea subplumbea:* 26—32 μ.

The Nunatak plants have a very reduced thallus, as was to be expected.

A very typical *Lecidea lulensis* has been distributed by MALME in Lich. suec. No. 449. Its thallus is considerably darker than in my plants. This is not only due to the colour of the small areolae, but also to the black, well developed hypothallus.

f. *elevata* LYNGE n. f.

IV. Mashigin Fjord: South side of Blaafjell Basin, on a moraine covering a "dead" glacier.

Differt a typo thallo magis cinereo et apotheciis magis elevatis, demum convexis, margine excluso. Hypothallus tenuis.

The apothecia of the f. *elevata* differ considerably from the type. They are larger, diam. up to one mm., not so appressed (the name "elevata"), slightly convex with a disappearing margin. No ripe spores could be detected.

The structure of its apothecia agree quite well with *Lecidea Konyamensis* NYL. (vide Lich. Freti Behr. pag. 32). The type plant in herb. NYL. consists of a part of an apothecium imbedded in gummi arabicum, but there is a better plant in the Riksmuseum of Stockholm. It differs from f. *elevata* and from *Lecidea lulensis* by its scattered white, very verrucose areolae; they rest on a continuous, black hypothecium.

Former investigations. F. epichlora VAIN. has been recorded from Belushii Bay in Matotchkin Shar (VAIN. pag. 86).

150. (63). *Lecidea* cfr. *hypopta* ACH.

Lecidea hypopta ZAHLBRUCKNER Cat. Lich. III (1925) pag. 783, ubi syn.

VI. Northern Kristovii Island, on drift-wood.

I only detected one plant of this very inconspicuous plant, growing on drift-wood.

There is hardly any thallus visible. The apothecia are small, diam. up to 0.5 mm., closely appressed to the substratum.

The hypothecium is uncoloured, paraphyses dark olive-coloured, concrete, distinctly capitate, spores uncoloured, simple, ellipsoid, $9—10 \times 4—5$ μ. Pycnoconidia were not detected.

My plant agrees well with TH. FRIES'S excellent description in Lich. Scand. pag. 463, and quite well with the plants distributed in MALME Lich. suec. 94 and 987 and in NORRL. et NYL. Herb. Lich. Fenn. No. 742; but it is small and miserable and it is hardly possible to determine it with absolute certainty.

151. (64). *Lecidea sorediata* LYNGE n. sp.

Plate II, fig. 17—18, IX, fig. 2.

II. Matotchkin Shar: Chalhonik Valley and south side of the Shar at the Kara See entrance. Sukhoi Noss.
IV. Mashigin Fjord: Blomster Bay.
VI. South of Arkhangel Bay. Berkh Island. Northern Kristovii Island.

Supposed to be quite common on drift wood, on account of the number of localities. In places it is quite plentiful.

Thallus interdum tenuis, fere obsoletus, sed vulgo melius evolutus, quin etiam crassus. Thallus late expansus, flavescens, leviter in virescentem vergens, granuloso- verrucosus, isidiis destitutus, sorediatus: soredia apotheciorum instar in centro granulorum erumpentia, deinde subglobosa.

Apothecia biatorina, sparsa, dispersa, adpressa, parva: diam. 0.5—1 mm., mox convexa, usque subglobosa. Discus primo laevigatus, deinde varie rugosus, in apotheciis vetustis subbotryosus, immarginatus vel in juventutem thallo cinctus. Discus pallide vel obscure olivaceus, in aetatem olivaceo-nigrescens. Excipulum intus incolor et ad ambitum anguste olivaceo-fuscescens, ex hyphis formatum radiantibus, gonidia nulla includens. Hypothecium incolor, crassum. Hymenium superne dilute cinereo-olivaceum vel (deinde) umbrino-fuscum, subcorneum, altum: 90—100 μ. Paraphyses arcte conglutinatae, in apice haud incrassatae (KOH addito). Asci octospori videntur, sed sporae parcissime evolutae sunt, paucas solum invenimus, anguste ellipsoideas: 10—13$\times$4.5 μ.

Pycnides vulgo bene evolutae, pycnoconidia cylindrica, arcuata, elongata: 14—19 μ.

Thallus J et KOH immutatus, sed $CaCl_2O_2$ intense rubescens.

A very characteristic species, well defined by its soredia, colour, chemical reaction and long arcuate pycnoconidia. It agrees with *Lecidea granulosa* with respect to its reaction, but its long arcuata pycnoconidia more suggest the *leucophaea*-section.

f. Sect. *Tornöensis* TH. FR.

152. (65). *Lecidea Tornöensis* NYL.

II. Matotchkin Shar: South side of the Shar at the Kara Sea entrance.

I only detected one plant, on drift-wood.

Hymenium hypotheciumque fere sanguinea, sporae dupliciter limbatae, late ovales vel subglobosae, 16×12—14 μ.

g. Sect. *erythrophaea* TH. FR.

153. (66). *Lecidea erythrophaea* FLK.

Lecidea erythrophaea FLK., vide TH. M. FRIES. Lich. Scand. II (1874) pag. 465, ubi syn.

Lecidea tenebricosa NYL. ZAHLBRUCKNER Cat. Lich. III (1925) pag. 836 (excl. *Lecidea tenebrica* NYL.), ubi syn.

IV. Mashigin Fjord: Sol Bay.

I detected only one plant in my collection, growing on drift-wood, with *Caloplaca discoidalis.*

There is no visible thallus. The apothecia are small, diam. 0.2—0.3 mm. soft, dark reddish-brown, almost plane; the youngest apothecia are quite plane with a distinct margin, which later on disappears. Moistened apothecia are almost translucent. Hypothecium uncoloured, hymenium pale yellowish-brown at the upper part. Paraphyses coherent, not capitate, but only almost imperceptibly incrassated at their tips. Spores 10—13×4—5 μ. Thin sections of the hymenium are stained blue with J, sometimes darker bluish-black.

In our country *Lecidea erythrophaea* is characteristic of *Populus tremula*, but TH. FRIES also records plants from naked wood.

ZAHLBRUCKNER has given preference to the name *Lecidea tenebricosa* NYL. NYLANDER maintains that *Lecanora anomala* var. *tenebricosa* ACH. Lich. Univ. (1810) pag. 382 is in part identical with our plant. This was contested by TH. FRIES, famous for his unrivalled determinations of our *Lecideae* (Lich. Scand. II pag. 466). VAINIO has followed TH. FRIES (Adjum. Lich. Lapp. pag. 46).

As specific name *tenebricosa* dates from RÖHLING'S Deutschl. Flora 1813 pag. 78 (sec. ZAHLBRUCKNER l. c.), it is older than FLOERKE'S *Lecidea erythrophaea* in SOMMERFELT Suppl. Flor. Lapp. 1826 pag. 163. If RÖHLING'S plant really is our species, preference must be given to his name. But as far as I can see no competent botanist has studied his type. It is therefore more prudent to retain than to reject FLOERKE'S well known and clearly understood name. To reject well known names only on account of literary studies is a most objectionable praxis, which only leads to an unnecessary confusion.

ZAHLBRUCKNER quotes MAGNUSSON in Göteborgs Kgl. Vetensk. och Vetterh.-Handl. (1925) pag. 13 et 43; but MAGNUSSON here describes *Lecidea tenebrica* NYL.

154. (67). *Lecidea*, cfr. *turgidula* FR.

IV. Mashigin Fjord: Rækved Bay.

I have one plant, growing on drift-wood.

Apothecia convexa, immarginata, atra. Hypothecium dilute flavescens, hymenium maculis obscuris dispersis ± caerulescens. Paraphyses cohaerentes, sporae anguste ellipsoideae, 9—11.5×4—5 μ. Hymenium J e caeruleo sordide vinosum.

The determination is not quite certain. My chief cause for doubt is a white thallus with granular verrucose areolae, found on the same piece of wood with the apothecia described but also in places where there are no *turgidula*-apothecia. There are also some apothecia in places where there is only an almost hypophloeodical thallus. If the apothecia belong to the white thallus, the determination is evidently incorrect, but my impression is that the apothecia emerge from a deeper thallus, and that they have in part grown through the white thallus, which they have damaged.

155. (68). *Lecidea rufofusca* (ANZI) NYL.

Lecidea rufofusca TH. M. FRIES Lich. Scand. II (1874) pag. 476, ubi syn.

I. Gribovii Fjord: North side.

There is only one plant in my collection, growing on mosses, killed by lichens: *Lecidea rufofusca*, *Lecidea glomerulosa* var. *muscorum*, *Leciophysma finmarkicum*, *Rinodina roscida*, *Blastenia tetraspora*, *Caloplaca Jungermanniae* and *Caloplaca stillicidiorum*.

The thallus is more brownish than the pale thallus of *Biatora rufofusca* ANZI Lich. Lang. No. 178. Several plants in our herb., collected in Arctic Norway, have the same brownish thallus as my Novaya Zemlya plant. The same is the case with MALME Lich. suec. No. 361 (s. n. *Lecidea septentrionalis*, cfr. MALME in Svensk Bot. Tidsskr. VII, 1913, pag. 376).

My plant is well fertile: Excipulum fuscescens, hypothecium dilute flavo-fuscescens, hymenium ca. 65 μ altum, granulis coeruleis sparsis inspersum, in KOH dissolutis, paraphyses non concretae, satis laxe cohaerentes, sporae octonae, (in apoth. exam.) parce evolutae, 12—13 $\times 5$—6.5 μ. Medulla J et KOH immutata, hymenium J e caeruleo vinosum: asci intensius et magis persistenter colorantur.

I have seen no literary record of the grains in the hymenium, are they incidental? *Lecidea atrofusca* has a much darker hypothecium.

C. *Psora* SCHAER.

156. (69). *Lecidea rubiformis* WBG.

Plate IX, fig. 1.

II. Matotchkin Shar: Mt. Matotchka.
IV. Mashigin Fjord: Strömsnes Bay, Dal Bay and Rækved Bay.

On schistose and calcareous rocks, in the fissures of the precipices. It is not common and quite scarce, only at Dal Bay I found it to be more plentiful.

The plant from Mt. Matotchka is a poor plant, much resembling the sterile squamules of a *Cladonia*, otherwise it is well developed, fine fertile plants as in Norway.

157. (70). *Lecidea decipiens* (EHRH.) ACH.

I. Gribovii Fjord: South coast.
II. Matotchkin Shar: Mt. Syernaia.
IV. Mashigin Fjord: South side of Blaafjell Basin.

On the earth in chalky regions, not common, but quite plentiful where I found it. Nowhere more plentiful than at the last mentioned locality where it directly lived on the moraines. My plants are well developed and apothecia are frequent.

Psora decipiens (EHRH.) KBR. from Ellesmereland: Goosefjord, det. DARBISHIRE, Rep. Sec. Arct. Exp. Fram pag. 23, is *Lecidea rubiformis.*

Former investigations. Recorded from Kristovii Fjord: Tschevkonoff Valley (ELENK. et SAV. pag. 78).

158. (71). *Lecidea demissa* (RUTSTR.) ACH.

I. Goose Bay.
II. Matotchkin Shar: East of Cape Jouravlev, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance.
VI. South of Arkhangel Bay

At our southernmost station, Goose Bay, it was very plentiful, on naked moist soil, but otherwise it was quite scarce. It cannot be called common in the region investigated by us.

Hymenium superne flavofuscescens, ca. 90 μ altum. Paraphyses arcte conglutinatae, sporae 13—15$\times$5—7 μ. Asci J persistenter caerulescentes.

A very characteristic species, generally easily recognized even habitually. But the thallus is often infested by parasitic hyphae and then more or less deformed. — It should be distinguished with some care from *Rinodina nimbosa*, at least in the Arctis, where the thallus is generally not so well developed as in Norway. Plants with a large continuous thick crusta are quite rare.

One plant (Cape Jouravlev) differs from the type. It has a more nitidous thallus and a brownish hypothecium and its spores are a little too small: 8.5—11$\times$4.5—5 μ. It resembles considerably a *Lecidea lurida*, but yet I think that it must be referred to *Lecidea demissa*. It has the same J-reaction of the hymenium as that species. *Lecidea lurida* has been found far north in Norway, in Finmarken, (TH. M. FR. Lich. Scand. II pag. 413), but I did not detect it in Novaya Zemlya.

Lecidea aglaea SOMRFT. Recorded from Belushii Bay in Mashigin Fjord (VAIN. pag. 87).

Lecidea alpestris SOMRFT. Recorded from Möller Bay (KUSNETZOFF No. 69).

Lecidea botryosa (FR.) TH. FR. Recorded from Novaya Zemlya (DEICHMANN BRANTH pag. 76).

Lecidea elata SCHAER. Recorded from Novaya Zemlya (DEICHMANN BRANTH pag. 76).

Lecidea Konyamensis NYL. Recorded from Karmakuly (MAGN. pag. 9).

Lecidea lithophila (ACH.) TH. FR. Recorded from Novaya Zemlya (DEICHMANN BRANTH pag. 76), Möller Bay (KUSNETZOFF No. 66), Matotchkin Shar (HEUGL. pag. 315) and Tolyenii Bay in Matotchkin Shar (STIZ. pag. 421).

Lecidea Nowajae KBR. Recorded from Matotchkin Shar (KBR. pag. 4).

Lecidea tenebrosa FW. Recorded from Novaya Zemlya (DEICHMANN BRANTH pag. 77); Karmakuly (MAGN. pag. 9).

Catillaria TH. FR.

159. (1). *Catillaria Holtedahlii* LYNGE n. sp.

IV. Mashigin Fjord: Sol Bay, ad rupes schistosas, calcem continentes.

Thallus orbicularis, diam. ca. 10 mm., cinereus, sat crassus, areolato-rimosus, areolis granulato-verrucosis. Thallus hypothallo tenui subconcolori circumdatus. Gonidia viridia, diam. 10—13 μ, membrana tenui.

Apothecia dispersa, diam. 0.5—0.7 mm., sessilia, adpressa, rotunda; discus planus, ater, epruinosus, margine concolori, persistenti circumdatus. Excipulum violaceo-atrum, fere carbonaceum; hypothecium omnino nigricans. Hymenium (45—) 50—55 μ, superne olivaceo-nigricans. Paraphyses laxe cohaerentes, indivisae, aliae validae, clavato vel capitato-incrassatae, articulatae, apicem versus nigricantes, aliae (juniores?) gracilentae, dilutius coloratae vel obscure capitatae. Sporae halone nullo praeditae, omnino incoloratae, septatae, septo interdum levissime constrictae, 10—11×4—4.5 μ.

Medulla J ÷, hymenium J e caeruleo mox sanguineo-vinosum, etiam asci; medulla KOH ÷, excipulum KOH magis in violascentem coloratum.

The description will show its near affinity to *Catillaria subalpina* TH. FRIES Lich. Scand. II (1874) pag. 583. But I have ventured to describe it as a new species on account of the following facts:

1) The spore difference. I have measured the spores of several apothecia and I have found the spore size constant. I have also controlled TH. FRIES's measures on the type plant in our herb. and found the same spore size as he found: 12—18×6—7 μ (usually about 16 μ long). In addition the spores of *Catillaria subalpina* are broader (more rounded) at their tips.

2) *Catillaria subalpina* has a much higher hymenium, I have measured 80—85 μ, and it is smaragdine and not olive-black at its upper part.

The disc of the apothecia is persistently plane in my plant, but in *Catillaria subalpina* it becomes ± convex. The granular thallus of *Catillaria Holtedahlii* is well developed. But the difference is supposed to be within the limits of a normal variation.

Catillaria Höferi has been recorded from Möller Bay (KUSNETZOFF No. 70, with an ?).

Bacidia (DNTRS.) A. ZAHLBR.

Sect. a. *Weitenwebera* (OPIZ) A. ZAHLBR.

160. (1). *Bacidia sphaeroides* (DICKS.) A. ZAHLBR.

Bacidia sphaeroides ZAHLBRUCKNER Cat. Lich. IV (1927) pag. 147, ubi syn.

II. Matotchkin Shar: Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Strömsnes Bay, Sol Bay and Rækved Bay.

Found here and there on mossy ground, but neither common nor plentiful.

161. (2). *Bacidia microcarpa* (TH. FR.) LETTAU.

Plate II, fig. 4—6.

Bacidia microcarpa ZAHLBRUCKNER Cat. Lich. IV (1927) pag. 125, ubi syn. LYNGE Lich. Bear Isl. (1926) pag. 32.

I. Goose Bay.
II. Matotchkin Shar: Mt. Lasareff (?) and Belushii Bay (?).
VI. Berkh Island.

Widely distributed, at the last mentioned station in considerable abundance. Often poorly developed, the determinations are then not quite certain.

My well developed plants agree so well with TH. FRIES's diagnosis and type plants that it is unnecessary to repeat my observations.

Former investigations. SAVICZ's *Bilimbia triplicans* (NYL.) ELENK. from Kolgueff (SAV. 1912 pag. 36) is supposed to be this species. Not recorded from Novaya Zemlya.

162. (3). *Bacidia coprodes* (KBR.) LETTAU.

Bacidia coprodes ZAHLBRUCKNER Cat. Lich. vol. IV (1927) pag. 107, ubi syn. LYNGE Lich. Bear Isl. (1926) pag. 32.

II. Matotchkin Shar: at the foot of Mt. Syedlho, Mt. Syernaia and in Belushii Bay.
VI. Northern Kristovii Island.

Only a few plants, at the first stations on hard rocks (i. e. no CO_2 with HCl), at the last on a chalky rock.

Hypothecium valde obscurum, hymenium dilute roseo-violaceum, superne smaragdulo-fuligineum, paraphysum apices incrassatae. Sporae triseptatae, $14—22 \times 3—4\,(—4.5)\ \mu$.

Medulla J ÷, K ÷, hymenium J e caerulescenti mox ± obscure flavescens vel vulgo vinosum.

STIZENBERGER has called attention to the difference between the type of "*Lecidea trachona*" and its var. *coprodes* (*Lecidea sabuletorum*, 1867, pag. 58—61) and LETTAU has distinguished between them as distinct species (Lich. Thür. 1912, pag. 132, 133), but without comments. STIZENBERGER writes: "Jodtinktur färbt das Hymenium blau" (*trachona*) and "Jodtinktur färbt das Hymenium erst blau, dann weinroth" (*coprodes*).

I have tested all my plants with J and found that each of them has the reaction of *Bacidia coprodes*. The same is the case with the Bear Island plant from Mt. Misery, mentioned in LYNGE Lich. Bear Island pag. 32. The paraphyses are branched, not always quite coherent. The spores are 3-septate, only in one plant I detected a few 1-septate spores together with the much more numerous 3-septate ones (Belushii Bay). The spore size agree well with the data of TH. FRIES Lich. Scand, pag. 385: 12—19×3—6, I found (in different plants): 14—22 ×3—3.5, 13—16×4, 15—16×4—4.5. STIZENBERGER writes: 13, 18—19 ×(2—) 3—4 μ. l. c. pag. 80.

The thallus is quite variable: very thin in the greater part of my plants, in some others (Mt. Syernaia and Belushii Bay) much better developed, with a granular crusta. The colour is "cinereo-fuscescens", if the thallus is thin, the colour is paler, greyish-white.

Sect. b. *Eubacidia* A. ZAHLBR.

163. (4). *Bacidia muscorum* (SW.) MUDD.

Plate II, fig. 12.

Bacidia muscorum. ZAHLBRUCKNER Cat. Lich. IV (1927) pag. 224, ubi syn. VAINIO Lich. Fenn. II (1922) pag. 162, ubi syn. LYNGE Lich. Bear Isl. (1926) pag. 33.

II. Matotchkin Shar: Vasnetsoff Glacier, Mt. Lasareff, Mt. Wilczek and Mt. Syernaia.
IV. Mashigin Fjord: South side of Blaafjell Basin, Mt. Dietrichson and Dal Bay.
VI. Berkh Island.

Not rare, but generally quite scarce or overlooked. There were but few plants in my collection.

The spores are very narrow: 2.5—3 μ, their length is more variable: 28—38 μ.

var. *irrorata* TH. FR.

II. Matotchkin Shar: Mt. Syernaia.

Sect. c. *Arthrorhaphis* TH. FR.

164. (5). *Bacidia alpina* (SCHAER.) VAIN.

Bacidia alpina. ZAHLBRUCKNER Cat. Lich. IV (1927) pag. 173, ubi syn.

I. Goose Bay. Gribovii Fjord, south side.
IV. Mashigin Fjord: Strömsnes Bay and Sol Bay.

Its apothecia are very rare, in my Novaya Zemlya material there is only one fertile plant, from Sol Bay. This is accordingly the only plant where the determination is quite certain.

I have found the thallus of the other plants too intensely "citrinus" for *Bacidia Anziana.* Sterile plants cannot easily be distinguished from *Buellia scabrosa.* If apothecia are present, but no spores, that species is characterized by its dark hypothecium and epithecium and its very stout paraphyses.

In the apothecia of *Bacidia alpina* I found the colours and structures agreeing with VAINIO's descriptions in Lich. Fenn. II pag. 224; the spores are acicular, multiseptate (6—10 septa) and their size (25 ripe? —) 35—40×3—4 μ.

165. (6). *Bacidia (Arthrorhapis) Anziana* LYNGE n. sp.

Plate II, fig. 10—11.

An syn.: *Mycobacidia plumbina* (ANZI) VOUAUX Synopsis Champ. paras. (suite) pag. 141.

I. Goose Bay.
II. Matotchkin Shar: Near Vasnetsoff Glacier and at Mt. Lasareff.

Parasitic on other lichens that can hardly be identified; perhaps *Baeomyces* sp.; in the from Vasnetsoff Gl. plant perhaps on *Dermatocarpon cinereum.* Only a few plants were obtained.

Thallus sulphureus vel dealbatus, lobatus, ambitu subeffiguratus, abrupte limitatus. Lobi diam. usque ad 2 mm., vulgo minores, contigui, crustam formantes vel magis discreti, verrucosi, laevigati, non sorediosofatiscentes.

Apothecia saepe congesta, late adnata, diam. 0.5—0.7 mm., plana, atra, epruinosa. Discus minute rugulosus, margine persistenti, sed tenui et leviter solum prominenti circumdatus. Hypothecium subincolor; hymenium altum: 90 usque ad 110 μ, inferne subincolor, superne aeruginosum; paraphyses tenuissimae, apice haud incrassatae, arcte vel arctissime cohaerentes, valde indistinctae. Asci subcylindrici, angusti, (8—) 10—12 μ crassi, 80—90 μ longi, sporae incolores, rectae, bifusiformes, triseptatae (rarissime quinqueseptatae), 16—20×3—4 μ.

Thallus KOH÷, hymenium J dilute flavescens.

It differs from *Bacidia alpina* by its paler thallus, that is not sorediate (firmer cortex), and especially by its short triseptate spores.

The apothecia do not differ from those of *Mycobacidia plumbina*, to judge from VOUAUX's description. It is quite probable that these plants are identical, but I have seen no *Mycobacidia plumbina* and VOUAUX does not mention its thallus with a single word. I have therefore not ventured to identify them and to avoid an eventuel confusion I have named it in honour of M. ANZI, the author of "*Leciographa plumbina*".

Bacidia subfuscula has been recorded from Novaya Zemlya by DEICHMANN BRANTH, pag. 76, s. n. *Lecidea subfuscula*).

Bacidia umbrina has been recorded from Tolyenii Bay in Matotchkin Shar (STIZ. pag. 421, s. n. *Lecidea umbrina* var. *asserculorum*).

Toninia (MASS.) TH. FR.

Sect. a. *Eutoninia* TH. FR.

166. (1). *Toninia squalida* (ACH.) MASS.

Plate II, fig. 13—14.

Toninia squalida (SCHLEICH.) MASS. Vide VAINIO Lich. Fenn. II pag. 130, ubi syn.

Toninia squarrosa ZAHLBR. Cat. Lich. IV (1927) pag. 292, ubi syn.

II. Matotchkin Shar: Mt. Lasareff. Serebryanka Fjord: in the rookery.
IV. Mashigin Fjord: Dal Bay.

Supposed to be quite rare, there are only a few plants in my collection.

Hypothecium omnino incolor, paraphyses validae, atro-capitatae, sporae cylindricae, in apicibus rotundatae, triseptatae, 21—33×3(—4) μ.

The plant from Serebryanka Fjord is so poorly developed that the determination must be uncertain, it should perhaps be referred to *Toninia fusispora*. Its dark hypothecium suggests that species, but its (miserable) squamules are too dark, and its spores too long: bacillares, apice obtusae, 3—5 (vulgo 3—) septatae, 20—35×3 μ.

TH. FRIES has used the specific name *squarrosa* and after him ZAHLBRUCKNER, but it is quite evident from their list of synonyms that preference must be given to the name *squalida* as the oldest specific name, used as such as early as in 1807 by SCHLEICHER and in 1810 by ACHARIUS (Lich. Univ. pag. 169).

Toninia cumulata, which is so common in our mountains, was quite lacking in my collections from Novaya Zemlya. It has never been recorded from the Arctis.

167. (2). *Toninia* cfr. *fusispora* (HEPP) TH. FR.

Toninia fusispora ZAHLBRUCKNER Cat. Lich. IV (1927) pag. 288, ubi syn.

II. Matotchkin Shar: Mt. Lasareff. Rookery in Serebryanka Fjord.
VI. Rookery south of Arkhangel Bay.

I only found two plants.

Thallus albescens vel albido-cinereus vel in fuscidulum vergens. Apothecia numerosa, atra, epruinosa, primum plana et bene marginata, deinde interdum convexa, immarginata. Hypothecium fusco-rubens excipulo subconcolor. Hymenium angustum, 50—65 μ, superne smaragdulum (saltem KOH addito); paraphyses facile liberae, sporae subrectae, cylindricae, apice rotundatae, tri-septatae, rarius uni-septatae, 15—24 $\times$2.5—3 μ.

Hymenium J e caeruleo sordide vinosum.

The thallus is lobulate, but the lobuli are so small that the thallus might quite as well be called granular. — Its narrow spores suggest a *Bacidia* more than a *Toninia*, they correspond to fig. 108, pl. II, in STIZENBERGER: *Lecidea sabuletorum*. *Bacidia subfuscula* is the only muscicolous *Bacidia*, known to me, with $\pm$ corresponding apothecia and spores, but that species has a colourless hypothecium and more convex apothecia. *Bacidia muscorum* has longer, multiseptate spores.

168. (3). *Toninia lobulata* (SOMRFT.) LYNGE.

Plate II, fig. 7—9.

Lecidea lobulata SOMRFT. Physisk-oeconomisk Beskrivelse over Saltdalen (1824—27) pag. 54.

Toninia lobulata (SOMRFT.) LYNGE Lich. Bear Island (1926) pag. 34.

Toninia syncomista (FLK.) TH. FR. Lich. Scand. II (1874) pag. 335. ZAHLBRUCKNER Cat. Lich. IV (1927) pag. 294, ubi syn.

0. Waigatsch: Kap Grebenii (KJELLM. et LUNDSTR. 1875).
I. Gribovii Fjord: south and north side.
II. Matotchkin Shar: Pomorskaya, Mt. Lasareff, Mt. Vasnetsoff, Mt. Wilczek, Chalhonik Valley, east of Cape Jouravlev, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord in the rookery.
IV. Mashigin Fjord: south side of Blaafjell Basin, Mt. Dietrichson and Rækved Bay. North of the Mashigin Fjord entrance.

V. Admiralty Peninsula.
VI. Berkh Island. Lichutin Island. Mainland east of Lichutin Island. Eastern Kristovii Island. Northern Kristovii Island.

Toninia lobulata is one of the most widespread lichens in Novaya Zemlya as far as explored by our expedition. Though best developed in the rookeries it is supposed to be common and plentiful everywhere. It is generally supposed to prefer chalky ground.

One-septate spores are much more common than three-septate (= *Catillaria Theobaldi* KBR. = *Toninia syncomista* var. *Theobaldi* in TH. FRIES Lich. Scand, l. c.), as usual in Arctic regions.

In his Catalogus l. c. ZAHLBRUCKNER has used the specific name *syncomista*; but as specific names SOMMERFELT's *lobulata* as well as KOERBER's *Theobaldi* are older.

If *Lichen leucophaeus* DICKSON Pl. Crypt. II (1790) pag. 20 is identical with our species, that is the oldest name, but A. L. SMITH has placed an "?" after her quotation (Brit. Lich. II (1926) pag. 147.

Sect. b. *Thalloedema* (MASS.) TH. FR.

169. (4). *Toninia candida* (WEB.) TH. FR.

I. Bessimyannii Fjord.

Supposed to be very rare, at least I only detected a few plants of this quite conspicuous species.

The distinction between this species and *Toninia caeruleo-nigricans* has given me some difficulty. My plants are white all over and intensely albo-pruinose, but the "rimuloso-dehiscent" structure of the upper cortex (TH. FRIES Lich. Scand. II pag. 338) is not so distinct as it generally is. My plants are well fertile. The hypothecium is pale yellowish with a tinge of reddish-brown; no spores were detected.

The squamules are broader, more button-like, in *Toninia candida*, more papillose in *Toninia caeruleo-nigricans*.

DARBISHIRE records "*Thalloidima vesiculare*" from several stations in Ellesmereland, collected by SIMMONS (Sec. Arct. Exp. Fram pag. 19). As far as I can see one plant from Harbourfjord in typically *Toninia candida*. The other three plants in our herb. (Muskoxfjord, Goosefjord and Harbourfjord) are more dubious, they have grown on clayey soil and have a poorly developed thallus with scattered white squamules. I would not have referred them to *Thalloidima vesiculare*, but either to *Toninia candida* or to some related West-Arctic species, hitherto unknown to me.

If we include *Psora* under *Lecidea* and *Placodium* under *Lecanora* it is not easily understood, how *Toninia* can be kept apart from the related genera *Catillaria* (and *Bacidia*?). But the distinction between the genera in this family is often more a matter of tact and convenience than it is based on logical reasons, as is often the case with our lichen genera. We attribute a great importance to the spores, their colour and septation, and in some cases to the development of the thallus, for the limitation of our genera. In many cases this is quite sufficient.

But it seems to me that a careful and broad investigation of the development of the apothecia and its different parts would often be more decisive. Such studies are sorely needed, we have too few of them.

170. (5). *Toninia squalescens* (NYL.) TH. FR.

Toninia squalescens ZAHLBRUCKNER Cat. Lich. IV (1927) pag. 275, ubi syn.

I. Goose Bay.

Only a few plants, but perfectly developed.

Thallus bullato-verrucosus, plumbeus. Hypothecium incolor, excipulo concolor; paraphyses validae, hymenium dilutissime flavescens, superne subfuligineum vel olivaceo-nigricans. Sporae dyblastae, ellipsoideae, parvae: 8—11 × 4—6 μ.

Habitually it much resembles *Toninia caeruleo-nigricans*, but it is on the whole smaller; its hypothecium is colourless and its spores are broader. TH. FRIES writes 7—10 × 4—6 μ (Lich. Scand. II pag. 340), against 14—25 × 2—4 μ (TH. FRIES l. c. pag. 337).

Lopadium KÖRB.

171. (1). *Lopadium fuscoluteum* (DICKS.) MUDD.

I. Goose Bay.

I only found one plant of this species which is so common along our Finmark coast.

It is fertile, but as usual very few spores are developed. (Size ca. 80 × 30 μ). But even if no spores are developed it is easily distinguished from a *Caloplaca*. *Lopadium fuscoluteum*: Hymenium intensely red with J, asci very thick-walled with a granular content. *Caloplaca Jungermanniae*: Hymenium intensely blue with J, asci thin-walled; in a section of a mature apothecium there are always spores.

SIMMONS collected a well fertile plant in Foulkefjord, Greenland, which DARBISHIRE named *Lopadium fuscoluteum*, its spores are well developed and typically *Caloplaca* spores.

172. (2). *Lopadium pezizoideum* (ACH.) KBR.

var. *coralloidea* (NYL.) TH. FR.

I. Goose Bay.
IV. Mashigin Fjord: Strömsnes Bay and Sol Bay.
V. Admiralty Peninsula.

var. *muscicola* (SOMRFT.) TH. FR.

II. Matotchkin Shar: Belushii Bay.
VI. South of Arkhangel Bay.

Lopadium pezizoideum is widely distributed in Novaya Zemlya, but it cannot be common, for I only found a few plants. Sterile plants are easily overlooked, and most probably it is more common than these few localities suggest.

Rhizocarpon (RAM.) TH. FR.

Sect. a. *Catocarpon* TH. FR.

173. (1). *Rhizocarpon alpicola* (HEPP).

Lecidea oreites VAIN. Adj. Lich. Lapp. II (1883) pag. 126.

Rhizocarpon oreites A. ZAHLBR. Cat. Lich. IV (1926—27) pag. 337, ubi syn. VAIN. Lich. Fenn. II (1922) pag. 322.

var. *simulans* (MAGN.) LYNGE.

Rhizocarpon simulans H. MAGNUSSON New Species of Lichens in the North of U. S. S. R. Bull. du Jard. Bot. Princ. U. R. S. S., vol. XXVI (1927) pag. 5.

Differt a typo sporis minoribus: $16-18.5 \times 8-10$ μ. Hymenium 85—95 μ altum, KOH dilute violaceum. Medulla J ÷, K ÷. Areolae convexiusculae, discretae, in ambitu thalli ± radiantes, rimosae et rugosae, pallide citrinae.

II. Matotchkin Shar: Belushii Bay.

Its spores are considerably smaller than in Scandinavian plants of *Rhizocarpon alpicola*: $21-36 \times 10-14$ (VAINIO l. c.), in Norwegian plants we have found the same dimensions.

I have carefully examined my material of yellow *Rhizocarpons*, but I only succeded in detecting one (aberrant) plant of this species. It must be very rare.

To judge from MAGNUSSON's careful description his species must be identical with my plant. The spores of the latter: 16—18.5×8—10 μ being intermediate between the spores of *Rhizocarpon simulans*: 12.5—15×7—8.5 μ and *Rhizocarpon alpicola*: 21—36×10—14 μ I have felt it difficult to distinguish MAGNUSSON's plant specifically from *Rhizocarpon alpicola*; it is however possible that its low hymenium is a sufficiently distinctive character.

For its synonymy cfr. my notes on *Rhizocarpon chionophilum* in this work.

SCHAERER's "*Lecidea geographica* d. *alpicola*" Lich. Helv. Exsic.(1828) No. 173 has muriform spores and simply is *Rhizocarpon geographicum*. I have not access to his herbarium and I cannot decide whether he has really described this species. HEPP's quite valid name from 1853 is older than VAINIO's *Lecidea oreites* from 1883. — I have not examined WAHLENBERG's *Lecidea atrovirens* var. *alpicola* from Flora Lapponica (1812) pag. 474. — I am not convinced that FLAGEY's *Rhizocarpon alpicolum* Lich. Franche-Comté II (1886) pag. 489 is this species.

f. *gerontoides* (NYL.)

II. Matotchkin Shar: Belushii Bay.

The plants are pale yellowish, partly whitish. Its spores are also remarkably small: 18—20×10—11 μ. Medulla J ÷, KOH ÷ and $CaCl_2O_2$ ÷

Rhizocarpon atroalbens (NYL.) Lich. Freti Behringii pag. 50 is KOH rubescens et J caerulescens, *Rhizocarpon atroalbescens* l. c. pag. 38 has also a "medulla J caerulescentem".

Former investigations. Vide *Rhizocarpon chionophilum*.

174. (2). *Rhizocarpon chionophilum* TH. FR.

Plate III, fig. 21—22, VIII, fig. 4.

Rhizocarpon alpicolum RABH. ZAHLBRUCKNER Cat. Lich. vol. IV (1926/27) p. 319, ubi syn. (vide infra!)

Rhizocarpon chionophilum TH. FRIES Lich. Scand. II (1874) pag. 612. MALME Västra Jämtl. Rhiz. (1914) pag. 276 et 280.

I. Goose Bay. Gribovii Fjord: south and north side.
II. Matotchkin Shar: Mt. Matotchka, Mt. Lasareff and Belushii Bay.
IV. Mashigin Fjord: Nunatak on Lacroix (Norway) Glacier, Mt. Dietrichson and Sol Bay. North of the Fjord entrance.

Rhizocarpon chionophilum is very characteristic of the large stones in the rock-falls and of the precipices of the middle-high mountains. It is quite common as far north as Mashigin Fjord, where it suddenly stops, at least in my collections. There is no climatic cause for this, for I found good specimens on the nunatak in Mashigin Fjord, where the conditions for plant life must necessarily be very precarious. Most probably I have overlooked its farther north. — I have only found it on hard rocks, it can live even on quarzite.

Many of my plants are splendid, quite as well developed as in Norway. Its carpological structure agrees perfectly with the data, given by TH. FRIES, MALME and VAINIO.

ZAHLBRUCKNER has reintroduced the name *Rhizocarpon alpicolum* RABH. Flechten Europas fasc. XXII (1861) No. 618 for this species. But this plant is typically *Rhizocarpon alpicola* (HEPP) FLAGEY, as limited by MALME l. c. pag. 276 and 280 = *Rhizocarpon oreites* (VAIN.) ZAHLBR., vide ZAHLBR. Cat. Lich. IV pag. 337. Its thallus is KOH÷, and its hymenium is KOH violet, its habitus is also that of *Rhizocarpon alpicola* (HEPP) FLAG. and not that of *Rhizocarpon chionophilum.*

HEPP's *Lecidea alpicola* in Flechten Europas (1853) No. 151 is a *Catocarpon,* as shown by his spore-figures. Its medulla is J÷, accordingly *Rhizocarpon alpicola* as limited by MALME and not *chionophilum. Buellia alpicola* ANZI Lich. Lang. is also MALME's *Rhizocarpon alpicola* (Thallus KOH ÷). — It seems to me that *Rhizocarpon chionophilum* TH. FR. is the valid name for this species, (KOH+), which has so often been confused with *Rhizocarpon alpicola* (HEPP) (KOH÷).

Former investigations. It is highly probable that "*Rhizocarpon alpicola*" in the Novaya Zemlya literature is *chionophilum*. There are then the following localities: Novaya Zemlya (DEICHM. BRANTH pag. 77), Matotchkin Shar (KBR. pag. 5), Tolyenii Bay and Belushii Bay (STIZ. pag. 421, VAIN. pag. 86), Kristovii Fjord (ELENK. et SAV. pag. 79—80). *Rhizocarpon chionophilum*: Karmakuly (MAGN. pag. 10).

Subsp. **Inarensis*: Belushii Bay (VAIN. pag. 86).

175. (3). *Rhizocarpon chionophiloides* (VAIN.) LETTAU.

Lecidea chionophila **L. chionophiloides* VAIN. Adjum. Lich. Lapp. II (1883) pag. 124.

Rhizocarpon chionophiloides vide ZAHLBR. Cat. Lich. IV (1926/27) pag. 229, ubi syn.

I. South side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Matotchka, in ipso cacumine.
IV. Mashigin Fjord: Nunatak on Lacroix (Norway) Glacier.

I had 40 plants of *Rhizocarpon chionophilum* in my collection. Each of them was tested with J, only these 3 gave a positive reaction. *Rhizocarpon chionophiloides* must be a rare plant.

Former investigations. Recorded by VAINIO (1898) pag. 86, from Belushii Bay, with its f. *variegata* VAIN.

176. (4). *Rhizocarpon rittokense* (HELLB.) TH. FR.

Rhizocarpon rittokense ZAHLBRUCKNER Cat. Lich. IV (1926—27) pag. 341, ubi syn.

IV. Mashigin Fjord: Sol Bay.

Supposed to be rare, for I only detected one small plant. But it is quite typical: scattered brownish, white-edged, plane areolae, resting on a dark hypothallus; upper part of hymenium violet with KOH, spores dark, one-septated, 25—28×12—13 μ.

"*Catocarpon Rittokense*" in DARB. Sec. Arctic Norw. Exp. Fram pag. 22 is *Rhizocarpon jemtlandicum.*

177. (5). *Rhizocarpon badioatrum* (FLK.) TH. FR.

Plate III, fig. 5—8.

I. Goose Bay.
II. Matotchkin Shar: Belushii Bay.
IV. Mashigin Fjord: Blomster Bay, Strömsnes Bay and Sol Bay.

Rhizocarpon badioatrum is here limited to those plants that have a distinctly violet upper part of their hymenium and large spores, in my plants 32—36 (40)×12—17 μ. It is no common plant in Novaya Zemlya, by far the greater part of my considerable material of this section must be referred to *Rhizocarpon jemtlandicum*, which see.

The spores are generally shrunken and badly developed; it is often difficult enough to find full-sized, well developed spores.

The thallus is much thinner than in Norwegian plants, it may be reduced to thin, scattered areolae, resting on a black, distinct hypothallus.

Former investigations. Novaya Zemlya (DEICHM. BRANTH pag. 77, s. n. *Lecidea atroalba*; spores 24—48 μ, suggesting *Rhizocarpon jemtlandicum*). Pomorskaia and Myss Popertschnoi in Matotchkin Shar (STIZ. pag. 421, s. n. *Lecidea atroalba* FLOT.). Tolyenii Bay in Matotchkin Shar (TH. FRIES pag. 16), Belushii Bay (SAV. 1912 pag. 39).

178. (6). *Rhizocarpon jemtlandicum* MALME.

Rhizocarpon badioatrum (FLK.) TH. FR. **jemtlandicum* MALME Lich. suec. fasc. XIV (1913) No. 349.

Rhizocarpon jemtlandicum MALME Västra Jämtl. Rhizoc. (1914) pag. 277 et 283.

Rhizocarpon Copelandii (KBR.) TH. FR. in VAINIO Lich. Fenn. II (1922) pag. 329.

Rhizocarpon Vainioense LYNGE Lich. Bear Isl. (1926) pag. 35.

Non *Buellia Copelandii* KOERBER Zweite Deutsche Polar Exp. (1874) pag. 79.

Non *Catillaria jemtlandica* TH. FR. Lich. Scand. II (1874) pag. 550. ZAHLBRUCKNER Cat. Lich. IV (1926/27) pag. 333.

I. Goose Bay.
II. Matotchkin Shar: Mt. Matotchka and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, nunatak on Lacroix (Norway) Glacier, Mt. Dietrichson and Strömsnes Bay.
VI. Rookery south of Arkhangel Bay.

Widespread in Novaya Zemlya, but supposed to be rare and perhaps scarce. At the Kara Sea locality — a blessed locality for lichenologists — I collected several plants. In Norway it prefers subalpine precipices, and in Novaya Zemlya I have also found my best plants in the precipices.

It should be distinguished from *Rhizocarpon badioatrum* with some attention. The leading character is certainly the spore size, 32—36 $\times$ 12—17 μ in *Rhizocarpon badioatrum*, (19—) 21—26(—30) $\times$ 10—14 μ in *Rhizocarpon jemtlandicum*. The spores are much better developed in the latter species than in the former, in *Rhizocarpon badioatrum* they are often corrugated and destroyed, even before they attain their full size and maturity. The purple or violet colour of the hymenium is intense in *Rhizocarpon badioatrum* and still more so, if KOH is applied. In *Rhizocarpon jemtlandicum* that colour is more variable. In my Novaya Zemlya plants a pale, sometimes not quite pale, reddish-violet colour is generally seen from the hypothecium upwards. The uppermost part of the hymenium is smaragdine to very dark, even blackish. If the reddish-violet colour advances from below and high up to the epithecium, such plants are easily confused with *Rhizocarpon badioatrum*. But if KOH is applied, the reddish-violet colour fades in *Rhizocarpon jemtlandicum*, and a $\pm$ distinctly smaragdine colour becomes visible in the upper part of the hymenium. I have seen hymenia that were smaragdine all over, as well as such that were distinctly reddish-violet in their lower half part and quite as distinctly smaragdine in their upper part.

One plant, from Mt. Dietrichson in Mashigin Fjord, has a distinctly violet hymenium, more intensely violet if KOH is applied, and small spores: 21—23 $\times$ 10—13 μ. I have referred it to this species, with much hesitation.

I have often seen a yellow colour of the medulla with KOH, but never the red precipitate of *Rhizocarpon Copelandii*. That species has also its convex apothecia, but on the whole they are nearly allied.

As usual with many Arctic *Rhizocarpons* the thallus is often very meagre in either of these 3 species, and offers no characters of high value.

SIMMON's plants from Ellesmereland have a distinctly smaragdine hymenium and small spores: *Rhizocarpon jemtlandicum* (DARBISHIRE: *Catocarpon badioatrum*, in Rep. 2nd Norwegian Exp. Fram. pag. 22).

As stated in my Lich. Bear Isl. (1926) pag. 35 KOERBER's *Buellia Copelandii* is the plant with distinctly positive KOH-reaction (=VAINIO's *Rhizocarpon hyperboreum*). Accordingly we cannot use the old name *Rhizocarpon Copelandii* in VAINIO's limitation. VAINIO states (Lich. Fenn. II pag. 320) the identity of MALME's *Rhizocarpon jemtlandicum* with his *Copelandii* and that is evidently quite correct. We must then relinquish VAINIO's name *Rhizocarpon Copelandii* for this species and give preference to MALME's name. — I was not aware of the identity between VAINIO's *Rhizocarpon Copelandii* and MALME's *jemtlandicum* when I wrote my Lich. Bear Isl. (1926) where I proposed the name *Rhizocarpon Vainioense* for VAINIO's *Copelandii*. This name must be relinquished.

Rhizocarpon jemtlandicum is quite different from *Catillaria (Biatorina) jemtlandica* TH. FRIES Lich. Scand. II pag. 550, a muscicolous *Catillaria* with uncoloured hypothecium and uncoloured spores without halo, as stated by TH. FRIES l. c. — Cfr. ZAHLBRUCKNER Cat. Lich. IV pag. 333.

Former investigations. VAINIO records his *Rhizocarpon hyperboreum* from Belushii Bay (pag. 86).

179. (7). *Rhizocarpon Copelandii* (KBR.) Th. FR.

Plate III, fig. 27—29, VIII, fig. 2.

Vide *Rhizocarpon Copelandii*, in ZAHLBR. Cat. Lich. IV (1926/27) pag. 331, ubi syn. LYNGE Lich. Bear Isl. (1926) pag. 35.

Vide etiam *Rhizocarpon hyperboreum*, in ZAHLBR. l. c. pag. 333, ubi syn.

I. Goose Bay.
II. Matotchkin Shar: Mt. Matotchka, Pomorskaya and Belushii Bay.
IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson and Blomster Bay.
VI. Pankratyeff Peninsula.

Found at our southernmost and northernmost station and at several intermediate localities. It is rather common, but not plentiful.

All my plants are J ÷ and K +: red crystals are precipitated by KOH. The spores are often shrunken and badly developed, as is often the case with Arctic *Rhizocarpons*, but I have found some mature spores in every section. Hymenium 120 μ high. In one plant (Fram Bay) I found an exceptionally high hymenium: 170—180 μ. In 2 of my plants (Belushii Bay and Blomster Bay) I have noticed an aeruginose epithecium, in the others it is generally ± violet. This character is important in *Rhizocarpon*, but the spore size agreed well in all my plants: (18) 20—27 (—30)×10—13 μ, the different colour of the epithecium was not connected with any difference in the spore size. The large spores of *Rhizocarpon cinereonigrum* VAIN. Lich. Fenn. II (1922) pag. 332: 28—35×14—17 μ, must exclude that species.

Former investigations. Möller Bay (KUSNETZOFF No. 76), Matotchkin Shar (KBR. pag. 5).

180. (8). *Rhizocarpon* cfr. *cinereonigrum* VAIN.

Rhizocarpon cinereonigrum VAIN. Lich. Fenn. II (1922) pag. 332.

IV. Mashigin Fjord: Mt. Tveten, on stones in the rock-fall.

The determination is uncertain, for I have not seen VAINIO's type plant. My plant is small, with a thin poor thallus resting on a distinct hypothallus, as usual in the Arctic *Rhizocarpons*. The structure of the apothecia agrees well: sporae obscuratae, dyblastae, medio constrictae, 25—27×11—12μ (smaller than in VAINIO's type plant: 28—35×14—17μ). Crusta KOH÷, hymenium KOH violaceum.

Former investigations. Recorded from Karmakuly (MAGN. pag. 10).

181. (9). *Rhizocarpon Massalongii* (KBR.) MALME.

Rhizocarpon Massalongii MALME Västra Jämtl. Rhizoc. (1914) pag. 278 et 285. ZAHLBRUCKNER Cat. Lich. vol. IV (1926—27) pag. 334, ubi syn.

Rhizocarpon Hochstetteri (KBR.) VAIN. Lich. Fenn. vol. II (1922) pag. 332, ubi syn.

II. Matotchkin Shar: Mt. Matotchka.
IV. Mashigin Fjord: In the rock-falls of the east side of Mt. Tveten.

Supposed to be rare, for I only found 3 plants.

The thallus is very thin, scattered, hardly perceptible areolae, more or less discrete, on a dark hypothallus. The apothecia are small, diam. about 0.5 mm. This suggests VAINIO's f. *dispersella* (which I have not seen).

As usual the structure of the apothecia is typical: upper part of the hymenium aeruginose, paraphyses concrete, capitate, spores uncoloured, one-septated, 18—27×8—10 μ. Medulla J÷, KOH÷.

182. (10). *Rhizocarpon polycarpum* (HEPP) TH. FR.

Plate III, fig. 15—16.

Vide ZAHLBRUCKNER Catalogus IV (1926—27) pag. 338, ubi syn.

II. Matotchkin Shar: Belushii Bay and south side of the Shar at the Kara Sea entrance.
V. Admiralty Peninsula.
VI. Lichutin Island.

Widespread, but rare and very scarce. I only detected a few plants on the stones of the strand-walls.

The thallus is generally badly developed, thin, ± pale brown areolae resting on a dark hypothallus. Medulla J+, KOH÷. The apothecia are quite typical, small, plane with a persistent sharp margin. The upper part of the hymenium is violet, more distinctly so, if KOH is applied. The spores are uncoloured, 1-septated, (18—) 21—24 (—28)×9—13 μ, if well developed, which is rare in Arctic plants of this species. In Spitsbergen plants (Sörkapplandet and Sörkappöy) I measured 18–23×10–11 μ.

183. (11). *Rhizocarpon expallescens* TH. FR.

Plate III, fig. 30—31, VII, fig. 4.

Vide ZAHLBRUCKNER Cat. Lich. IV (1926—27) pag. 333, ubi syn.

I. Gribovii Fjord: North side.
II. Matotchkin Shar: North side, at Mt. Syedlho and at Mt. Syernaia.
IV. Mashigin Fjord: Fram Bay, South side of Blaafjell Basin, Mt. Tveten and Strömsnes Bay.
VI. Pankratyeff Peninsula. Northern Kristovii Island.

Distributed throughout the whole area investigated by us, but it is rare and scarce; there are only a few specimens in my collection.

Well separated from *Rhizocarpon chioneum* (thallus albo-farinosus) by its plumbeous colour, by its very thick capitate paraphyses and the smaragdine colour of its hymenium, blackish at the upper part. In well developed plants the areolae are ± contiguuous towards the centre, scattered towards the circumference, where the thin, greyish-blue hypothallus is visible between the areolae. In some plants the thallus is extremely thin, almost evanescent, only some scattered small areolae. Hymenium 100—110 μ high. The spores are small, I have measured in my Novaya Zemlya plants: (12) 15—18×6.5—8 (10) μ.

184. (12). *Rhizocarpon chioneum* (NORM.) TH. FR.

Plate III, fig. 1—2, VII, 1.

Buellia coeruleoalba (KRPLH.) TH. FR. Lich. Spitsb. (1867) pag. 44.

Catillaria (Buellia) chionea NORM. Spec. loco natal. (1868) pag. 115. NORMAN Cives novi lich. arct. Norv., in Bot. Not. (1872) pag. 38.

Rhizocarpon chioneum (NORM.) TH. FR. Lich. Scand. II (1874) pag. 620, LYNGE Lich. Spitsb. I (1924) pag. 18. LYNGE Lich. Bear Isl. (1926) pag. 35.

Catocarpon caeruleoalbum (KRPLH.) HELLB. Norrl. lafvar (1884) pag. 107.

Non *Rehmia caeraleo-alba* KRPLH. Lich. Flora Bayerns (1861) pag. 211.

Rhizocarpon caeruleoalbum ZAHLBR. Cat. Lich. IV (1926—27) pag. 331, pro parte (ubi syn.).

II. Matotchkin Shar: Mt. Lasareff, Mt. Wilczek and Mt. Syedlho.

IV. Mashigin Fjord: Fram Bay, south and north side of Blaafjell Basin.

Rhizocarpon chioneum is not common and quite scarce. It is strictly restricted to calcareous rocks, either pure chalk or very chalky sandstones.

It is well known and I have little to add to the records by NORMAN and TH. FRIES. Its spores are often corrugated and when mature they are not so uncoloured as in some other *Rhizocarpons*. I have measured 16—21 $\times$ 8—12 μ in Novaya Zemlya plants.

NORMAN writes in his Cives novi etc. l. c. that his species "svadente cl:o ARNOLD, non specie a *Rehmia caeruleoalba* KRPLH. differt". This species was described by KREMPELHUBER in his Lich. Fl. Bayern l. c. But that cannot be correct. NORMAN was misled by ARNOLD's great authority. As already stated by TH. FRIES l. c. there is a specific difference between the internal structure of the apothecia. Few things, if any, are more characteristic of *Rhizocarpon chioneum* than the beautiful violet-purplish colour of its hymenium. *Rehmia caeruleoalba* KRMPLH. has a "hymenium hyalinum, supra fuscum" (KRPLH. l. c.), "Hymenium farblos" (ARNOLD Lich. Ausfl. V (1870) pag. 538.

Former investigations. Recorded from Mashigin Fjord: Cape Schantz (ELENK. et SAV. pag. 80).

185. (13). *Rhizocarpon albidum* LYNGE n. sp.

Plate III, fig. 3—4, VIII, fig. 1.

II. Matotchkin Shar: Chalhonik Valley.

IV. Mashigin Fjord district: North of the Fjord entrance.

VI. Lichutin Island (type plant).

It is widely distributed, but it is impossible to say anything of its frequency from these 3 plants.

Thallus orbicularis, diam. vulgo 7—10 mm., sed deinde plantis concrescentibus plagas majores, usque 6—7 cm. latas, tegit. Crusta alba, continua, reticulato-rimosa, areolis angulatis, diam. 0.5—0.8 (—1.0) mm., tenuibus, planis, sublevigatis, esorediatis, haud farinosis. Thallus hypothallo angusto plumbeo circumdatus.

Apothecia in partibus centralibus thalli dense conglomerata, numerosissima, fere confluentia, circulose dispersa, interdum tam dense ut in formam macularum confluere videantur. Apothecia in areolis immersa, thallum subaequantia, parva: diam. 0.5—1 mm. Discus ater, epruinosus, planus vel subconcavus, margine persistente, integro, satis crasso, saepe pruinoso circumdatus. Excipulum nigricans, hypothecium rufo- vel rubro-nigricans. Hymenium 130—140 μ altum, inspersum, superne pulchre violaceo-purpureum vel violaceo-nigricans. Paraphyses haud concretae, KOH addito facile discretae, tenues, septatae, apicem versus ramosae, leviter capitato-incrassatae. Sporae in ascis angustis octonae gignuntur, sed vulgo pauciores maturantur, saepe morbose corrugatae videntur. Si evolutae, sporae incolores sunt, vel partim ± maculatae, praecipue ad septum vel apices versus; dyblastae et septo distincte constrictae, 13—21 × 7—10 μ, halone crasso circumdatae.

Medulla J, KOH et $CaCl_2O_2$ non mutata, hymenium J intense caeruleo-nigricans, KOH colorem intensius provocat.

Its leading morphological characters are the numerous apothecia, crowded in the centre of the white, continuous thallus. Only if the areolae are very thin, the leaden-coloured hypothallus is indistinctly visible through the thallus.

The structure of its apothecia obviously refers it to the *Rhizocarpon chioneum — expallescens — glaucescens* tribus. *Rhizocarpon expallescens* differs from the other three species by its aeruginose hymenium. — Habitually my species differs much from *Rhizocarpon chioneum*, which has a very thick farinose thallus with more prominent, scattered, larger apothecia, often there are but a few apothecia in one plant. — I have not seen *Rhizocarpon glaucescens* TH. FRIES Lich. Scand. II pag. 621, but TH. FRIES writes: "Crusta disperse subsquamulosa verrucosa", which is quite different from the continuous, plane thallus of my species.

Sect. b. *Lepidoma* (LINK.) VAIN.

Syn. *Eurhizocarpon* STIZ. Beitr. Flechtensyst. (1862) pag. 160.

186. (14). *Rhizocarpon geographicum* (L.) DC.

Plate III, fig. 11—12.

I. Goose Bay. South side of Gribovii Fjord.

II. Matotchkin Shar: Mt. Lasareff, near Vasnetsoff Gl., Chalhonik Valley, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.

IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Nunatak on Lacroix (Norway) Glacier, Mt. Dietrichson, Blomster Bay, Mt. Tveten, Strömsnes Bay and Sol Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Lichutin Isl., Northern Kristovii Isl. and Pankratyeff Peninsula.

var. *subcinerascens* (NYL.) DEICHM. BRANTH.

More or less typical plants were collected at:
Matotchkin Shar: East of Cape Jouravlev and Belushii Bay.
Mashigin Fjord: South side of Blaafjell Basin and Sol Bay.

Rhizocarpon geographicum is so common and plentiful everywhere that it is almost unnecessary to enumerate its special localities. It is practically inevitable on hard rocks, even on quarzite, but I have neither collected it on chalk nor on slates. Fine plants are found in the rookeries, but it is quite as common in places where birds are not abundant.

In Bell Sound, Spitsbergen, *Rhizocarpon Lecanora* (FLK.), in my opinion a very good proper species, is very characteristic of bird-stones, but I did not collect it in Novaya Zemlya.

At the Kara Sea entrance I found a *Rhizocarpon geographicum* with discrete small verrucose areolae, resting on a black hypothallus. The apothecia are immersed at the margins of the areolae. On account of the small rounded verrucose areolae it resembles *Rhizocarpon Lecanora*, but the resemblance is illusive, for if these small areolae had been contiguous the apothecia would have been immersed between the areolae. If I have correctly understood *Rhizocarpon Lecanora* it has small convex areolae, where its apothecia are immersed in their very centre. My Kara Sea plant could perhaps be referred to f. *atrovirens* (L.) SCHAER.

The specific name *geographicum* was frequently used for all the yellow species of this genus by authors of the former generations. Such records cannot be used for reference without an examination of their plants. In our Ellesmereland-collection (leg. SIMMONS, det. DARBISHIRE) neither *Rhizocarpon chionophilum* nor *alpicola* is represented. But to judge from DEICHM. BRANTH & GRÖNLUND *Rhizocarpon "alpicola"* (most probably *Rhizocarpon chionophilum*) must be quite common in Greenland, and the said authors also detected it in HOLM's collection from Novaya Zemlya.

Former investigations. Novaya Zemlya, no localities (VON BAER; MARKH. pag. 332; DEICHM. BRANTH pag. 77). Rogatscheff Bay KBR. pag. 5). Karmakuli (MAGN. pag. 10). Möller Bay (KUSNETZOFF No. 77), Matotchkin Shar: Pomorskaya, Kuppe Silberberg, Myss Popertschnoi, Belushii Bay, Tolyenii Bay (TH. FRIES pag. 16, STIZ. pag. 421

KBR. pag. 5, HEUGL. pag. 316, VAIN. pag. 86, SAV. 1912 pag. 40). Kristovii Fjord (ELENK. et SAV. pag. 79). Also from Kolgueff (SAV. 1912 pag. 40) and Franz Joseph Land (JACKSON pag. 417, ABRUZZI pag. 675, ELENK. et SAV. pag. 89).

187. (15). *Rhizocarpon atroflavescens* LYNGE n. sp.

Plate III, fig. 17—18, VIII fig. 3.

IV. Mashigin Fjord district: North of the Fjord entrance.
V. Admiralty Peninsula.
VI. Pankratyeff Peninsula.

Thallus pallide ochroleucus, interdum prope albido-flavescens. Thalli singuli mediocres: diam. 2—3 cm., sed thallis in unum concrescentibus plagae majores formantur. Thallus centro tesselato-areolatus, areolis minutis: diam. 0.3—0.7—(1.0) mm., subplanis, non sorediatis, non pruinosis, sublaevigatis. Ambitum versus areolae majores, crenatae vel subpinnatae, rimosae et magis discretae sunt. Hypothallus eam ob causam magis distinctum. Thallus hypothallo cinereo-nigricanti circumdatus.

Thallus crassitudine mediocri: 0.4—0.5 mm. Cortex 55—55 μ altus, cinereo-inspersus. Stratum gonidiale crassum, 100—110 μ altum; utrumque stratum rimis thallinis profundis fissum. Gonidia virentia vel flavovirentia, diam. 10—15 (—24) μ. Hyphae medullares leptodermaticae, adspersissimae, 5 μ crassae.

Apothecia numerosissima, dispersa, in areolis immersa, thallum aequantia, rotundata, parva: diam. non fere ultra 0.5 mm. Discus ater, non pruinosus, planus, non umbonatus, margine tenui, persistenti circumdatus. Excipulum hypotheciumque nigricantia vel rubricoso-fuliginea. Hymenium superne (satis dilute) violaceum, strato tenui intermittenti tectum, inspersum, 130 μ altum. Paraphyses indistinctae, crassiusculae, in apice insensibiliter incrassatae, septatae, apicem versus crebris ramis. Asci 24—26 μ crassi, octospori. Sporae primitus cinereo-nigricantes, deinde obscurius coloratae, tetrablastae, ad ultimum septo longitudinali unico submurales, sed pauciloculatae, parvae: (13) 15—21 $\times$ 8—10 μ, halone tenui circumdatae.

Medulla J intense caerulescens, KOH et $CaCl_2O_2$ et his reagentibus unitis non mutata. Hymenium J intense et persistenter caerulescens.

The spores refer this species to VAINIO's section *Lepidoma* and not to *Catocarpus*. But they are very few-celled, there is only one longitudinal, oblique septum, often developed only in the central part of the spore. It is nearly allied to *Rhizocarpon geographicum*. Apart of habitual differences, not easily expressed in words, it differs from *Rhizocarpon geographicum* by its smaller spores: 13—21 $\times$ 8—10 against

24—35×11—14 (VAIN. Lich. Fenn. II pag. 281), 22—36×11—18 (MALME Rhizocarpon pag. 276) in *Rhizocarpon geographicum.*

Rhizocarpon superficiale (SCHAER.) VAIN. = *effiguratum* TH. FR. has the same reaction and spore-size, but it is a *Catocarpus* with much intenser colour and convex dispersed areolae.

If an apothecium is immersed in a small areola, it easily gets a lecanorine (aspicilioid) habitus, for the rest of the areola is then so thin that it looks like a thalline margin.

188. (16). *Rhizocarpon disporum* (NAEG.) MÜLL. ARG.

Rhizocarpon disporum A. ZAHLBR. Cat. Lich. IV (1926—27) pag. 353, ubi syn.

Rhizocarpon geminatum (FLOT.) KÖRB. Syst. Lich. Germ. (1855) pag. 259.

I. Goose Bay. Veselago Island in Gribovii Fjord.
II. Matotchkin Shar: Mt. Wilczek, East of Cape Jouravlev, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay. North side of Blaafjell Basin, Blomster Bay, Mt. Tveten, Strömsnes Bay, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Lichutin Island. Berkh Island. Eastern and Northern Kristovii Islands. Pankratyeff Peninsula.

Rhizocarpon disporum is common and plentiful all over the area investigated by us. It is especially common along the beach, on the stones of the strand-wall, together with *Lecidea Dicksonii.* But it is difficult to give prominence to any special locality for this lichen which is almost inevitable everywhere.

I have observed the monosporous var. *Montagnei* in my collection, but in my opinion it is too inconspicuous for special mention.

There is no great difference between the Arctic plants and the Norwegian ones; the thallus of the former plants is generally thinner with more discrete areolae, resting on a conspicuous black hypothallus.

Former investigations. Novaya Zemlya (DEICHM. BRANTH pag. 77). Karmakuly (MAGN. pag. 10), Möller Bay (KUSNETZOFF No. 78), Matotchkin Shar: Tolyenii Bay (STIZ. pag. 421, TH. FRIES pag. 16, HEUGL. pag. 316).

189. (17). *Rhizocarpon grande* (FLK.) ARN.

Rhizocarpon grande, vide ZAHLBR. Cat. Lich. IV (1926—27), ubi syn.

I. Goose Bay. Gribovii Fjord: Veselago Island.
II. Matotchkin Shar: Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance.

IV. Mashigin Fjord: Nunatak on Lacroix (Norway) Glacier, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. The large rookery south of Arkhangel Bay.

Rhizocarpon grande is very widespread, but it is generally not plentiful. It is distinctly nitrophilous, in the rookeries I found magnificent plants with thick verrucae. In the nunatak plants the thallus is hardly perceptible, but distinctly $CaCl_2O_2$ +; its apothecia are typical, its spores 32—35×15—16 μ.

In one plant I found the epithecium KOH + smaragdine, but other apothecia in the same plant gave the typical violet colour with KOH. The $CaCl_2O_2$ reaction is not always equally intense, more distinct is the reaction KOH + $CaCl_2O_2$ rubescens.

I examined every plant in my collection (26 in number) microscopically, in search of *Rhizocarpon eupetraeum*, but that species was not detected. Nor did I find it in the Bear Island and Spitsbergen collections hitherto determined by me.

Former investigations. Recorded from Novaya Zemlya (DEICHM. BRANTH pag. 77), Möller Bay (KUSNETZOFF No. 79).

190. (18). *Rhizocarpon Anseris* LYNGE. n. sp.

Plate III, fig. 13—14.

I. Goose Bay, at lapides non calcareas.

Thallus suborbicularis, magnitudine mediocri, diam. 30—35 mm. tenuis, verrucoso-areolatus, areolae convexae vel tantum convexiusculae, parvae, rotundatae, diam. 0.2—0.35 mm., cinereae, in hypothallo conspicuo nigricante disperse vel subdisperse jacentes.

Apothecia inter areolas sita, supra thallum tenuem elevata, dispersa, rotundata, satis magna: diam. ca. 1 mm. Discus ater, non pruinosus, primitus planus, deinde convexus, neque tamen semiglobosus, margine crassitudine mediocri, sed subpersistenti, circumdatus. Excipulum carbonaceum, hypothecium nigricans vel fusco-nigricans. Hymenium 110—120 μ altum, superne satis anguste olivaceo- nigricans, interdum, sed raro, inspersum. Paraphyses arcte conglutinatae, ± ramosae, obscuris capitibus. Sporae omnino incolores, semper triseptatae, ad septa leviter constrictae, 18—24×8—11 μ, halone distincto, 2—3 μ crasso, circumdatae.

Hymenium J pulchre persistenterque caeruleum, KOH addito magis in smaragdulum transit. Medulla J ÷, KOH ÷.

I have examined a number of apothecia and always found three-septate uncoloured spores and a hymenium of the described colour. There are not many *Rhizocarpons* with such spores:

Rhizocarpon distinctum TH. FR. has very small apothecia (0.4—0.7 mm.) with larger spores: 24—30×12—14 μ, and another colour of the hymenium: rosy-violet with KOH (MALME Västra Jämtl. Rhiz. pag. 279).

Rhizocarpon reductum TH. FR. has larger muriform or submuriform spores: 23—34×10—14 μ (TH. FR. Lich. Scand. II pag. 634), 22—36×10—16 μ (VAIN. Lich. Fenn. II pag. 313).

Rhizocarpon subreductum VAIN. l. c. pag. 315 has minute apothecia (0.2—0.4 (0.5) mm.) with a narrow hymenium (60—90 μ). Its spores agree with those of my species (15—25×7—9 μ).

Rhizocarpon submodestum VAIN. l. c. pag. 315 also has small apothecia (0.4—0.8 mm.) with a narrow hypothecium (80—100 μ) and very small spores (14—22×7—9 μ). Either of these two species has an indistinct hypothallus.

There is a small parasitic Pyrenomycet in the areolae: Perithecia omnino immersa, diam. ca. 200—210 μ, cortex perithecii superne nigricans, praeterea infuscatum, sporae fuscae, dyblastae, septo non constrictae, 13—16×6—8 μ. Nucleus J rubescens.

As there was only one type plant of my *Rhizocarpon* I hesitated to send it abroad for the determination of this fungus, and tried to determine it myself with the aid our Government mycologist I. JÖRSTAD, after VOUAUX's Synopsis. We found that VOUAUX's description of *Didymosphaeria microsticta* var. *alboatrae* agreed quite well.

191. (19). *Rhizocarpon cinereoflavescens* LYNGE n. sp.

VI. Pankratyeff Peninsula, ad saxa arenaria.

Thallus plagas determinatas, irregulares, 2—3 cm. latas, format. Crusta cinereo-flavescens, marginem versus vulgo pallidius colorata; satis crassa, ± regulariter rimoso-areolata; areolis continuis (areolis juvenilibus marginalibus solum subcontinuis), majusculis, usque ad 1—2 mm., subplanis, deinde convexiusculis, laevigatis, non sorediatis. Thallus hypothallo distincto livido circumdatus.

Thallus usque ad 0.6 mm. crassus. Stratum gonidiale ca. 80 μ, gonidia laete viridia. Cortex superior 20—25 μ, granulis subcinereis adeo inspersus, ut hyphae corticales aegre discernantur.

Apothecia rotundata, matura diam. 1 mm., dispersa, numerosa, in ipsis areolis immersa, thallum subaequantia, fere ut in Aspicilibus. Discus planus non umbonatus, ater, non pruinosus, margine tenui integro subpersistente circumdatus. Excipulum nigricans, hypothecium superne obscure rufo-fuscescens. Hymenium altum vel altissimum: 160

—190 (200) μ, ± inspersum, superne olivaceo-nigricans. Paraphyses tenuissimae, in apice non vel levissime incrassatae, arcte cohaerentes, indistinctae, septatae et ramis ut videtur increbris. Asci octospori, 20—25 μ crassi. Sporae incolores, deinde (morbose) ± obscurascentes, diu triseptatae, deinde septo unico longitudinali submurales, halone crasso circumdatae. Sporae satis parvae: (16) 19—25 (28)×9—12 μ.

Pycnides non visae.

Medulla J, KOH et $CaCl_2O_2$ immutata, hymenium J persistenter caerulescens, KOH colorem olivaceum non mutat.

In MALME'S Conspectus its place would be near *Rhizocarpon obscuratum* or *Rhizocarpon lavatum*, but it cannot be confused with either of them. The latter has much larger spores: 35—40×13—16 μ, the former species a much darker, brown thallus and a lower hymenium: 125 μ high.

In VAINIO'S Lich. Pitlekai there is no comparable species.

Its nearest relative is evidently *Rhizocarpon amphibium* (FR.) TH. FR. That species has another colour: "caesio-cinerascens" (TH. FR. Lich. Scand. pag. 630), "caesio-cinereus" (VAIN. Lich. Fenn. II pag. 306) and very small, generally about 0.5 mm. large areolae, often verrucose or convex. They are so small that they are almost entirely occupied by the apothecia. The apothecia of *Rhizocarpon amphibium* are not so profoundly immersed: "immersa vel paullum emergentia" (TH. FR. l. c.), otherwise the structure of the apothecia agrees well in the two species.

I have so far found my plant (there is only one) specifically distinct from *Rhizocarpon amphibium*, but a larger Arctic material may modify this view.

At Mt. Syernaia in Matotchkin Shar I collected a *Rhizocarpon* of the section *amphibium*. It was infested by a parasite: *Phaeospora rimosicola* (det. KEISSLER), that had damaged it and made its determination difficult and uncertain.

Its differs from *Rhizocarpon amphibium* itself by its greyish-yellow colour. All the *amphibium*-plants, which I have seen, have an ash-grey thallus, not a yellowish, e. g. E. FRIES Lich. Suec. No. 381, TH. M. FRIES Lich. Scand. No. 45, HAVÅS Lich. Norv. No. 467 and Lich. Norv. Occid. No. 46.

My plant has a high hymenium, about 150 μ and uncoloured, muriform, but few-celled spores: 3 transversal septa, 1 longitudinal septum, 26—29×16—19 μ.

It is thinner than *Rhizocarpon cinereoflavescens*, it has smaller areolae and a very narrow, hardly visible hypothallus. But it is hardly possible to distinguish it specifically from that species.

192. (20). *Rhizocarpon distinctum* TH. FR.

Rhizocarpon distinctum TH. FR. Lich. Scand. II (1874) pag. 625. MALME Västra Jämtlands Rhizocarpon-arter, Sv. Bot. Tidsskr. VII (1914) pag. 290. VAINIO Lich. Fenn. II (1922) pag. 310, ubi syn.

Rhizocarpon ambiguum ZAHLBR. Cat. Lich. IV (1927) pag. 344.

MALME Lich. suec. exsiccati No. 15 et 173.

II. Matotchkin Shar: south side of the Shar, near the Kara Sea entrance.

There is only one small plant in my collection, heavily attacked by the surrounding crustaceous lichens, *Lecidea Dicksonii*, *Aspicilia* sp. a. o. But small as it is, it offers the characters necessary for determination and I cannot refer it to any other species:

Areolae parvae, 0.2—0.4 mm., cinereo-fuscescentes, hypothallo atro conspicuo impositae.

Apothecia juvenilia margine distincto circumdata, margo deinde plus minusve exclusus. Hypothecium fusco-rubescens, hymenium incolor vel vulgo plus minusve rubescens, superne valde obscuratum, subnigrescens. Sporae persistenter incolores, tetrablastae, deinde septo singulo longitudinali submurales, 22—27×11—12 μ.

Medulla J caerulescens, hymenium KOH distinctius roseo-violascens, etiam infra epithecium obscuratum.

There is much uncertainty about the correct name of this species, and I can do nothing to clear up the question. Th. FRIES quotes *Lecidea atroalba* α *ambigua*, from HEPP Flecht. Eur. No. 36, as a synonym. ZAHLBRUCKNER has raised the name *ambiguum (Lecidea petraea* var. *ambigua* SCHAER.) to specific rank. (Cat. Lich. IV (1927) pag. 344). But that can not be justified, for it is quite evident from his own enumeration that the name *ambiguum* has formerly never been used as a specific name and that valid specific names already exist. It is impossible to judge of the value of the names "*atroalba* ACH." and "*confervoides* SCHAER." without an examination of the types. VAINIO, who has access to ACHARII herb. in Helsingfors, has rejected ACHARII name and used TH. FRIES's name *Rhizocarpon distinctum*.

Former investigations. Novaya Zemlya (DEICHM. BRANTH pag. 77).

193. (21). *Rhizocarpon verrucosum* LYNGE n. sp.

IV. Mashigin Fjord: Fram Bay (planta singula).

Planta parva (in specimine), verrucis minutis (0.25—0.35 mm.), dispersis, scabriusculis, nitidis, obscure cinereis, hypothallo atro impositis, formata.

Apothecia prominentia, dispersa, rotundata, (diam. 0.5—0.7 mm.), inter verrucas thalli sita. Discus ater, epruinosus, rugulosus vel scabriusculus, convexus (ut in *Rhizocarpon Copelandii*) et (dein) immarginatus. Excipulum etiam cum hypothecio nigricans vel fusconigricans. Hymenium 120—130 μ altum, superne olivaceo-nigricans. Paraphyses tenuissimae, filiformes, septatae, crebre ramosae, apice leviter clavatae. Sporae octonae, incolores vel deinde morbose ± obscuratae et corrugatae, diu vel persistenter tetrablastae, rarius 5-septatae, ad septa constrictae, cellulis eam ob causam rotundatis, deinde interdum septo longitudinali singulo submurales, 28—31 × 11—12 μ. Sporae halone crasso circumdatae.

Hymenium J persistenter caerulescens, medulla J intense caerulescens. Hymenium KOH intensius olivaceo-smaragdulum coloratur, sed non violascens.

It is easily seen that its leading characters refer it to the *Rhizocarpon distinctum* section of TH. FRIES. VAINIO has removed one species of that tribus, *Rhizocarpon endamyleum* TH. FR., uniting it with *Rhizocarpon grande* and I think that he is right. Apart of the colour of the upper part of the hymenium the carpological characters of my species are almost identical with *Rhizocarpon distinctum.* But its leading morphological characters (verrucose areolae and convex prominent apothecia) are quite different from that species as well as from *Rhizocarpon hyalescens* VAIN.

194. (22). *Rhizocarpon lavatum* (FR.) HAZSL.

Rhizocarpon lavatum. ZAHLBRUCKNER Cat. Lich. IV (1927) pag. 374, ubi syn.

II. Matotchkin Shar: Mt. Syernaia.

Planta parva, tenuis, rimoso-areolata.

Apothecia satis parva, diam. 0.8—1.0 mm., margine crasso, sublecanorino circumdata. Hymenium altum, 130—150 μ, superne olivaceo-fuligineum. Sporae incoloratae, multiloculatae, magnae: 30—40 × 12—18 μ.

Medulla J ÷, KOH ÷, epithecium KOH dilutius coloratur: olivaceum, sed non violaceum.

The thallus is very thin, and paler than in MALME Lich. suec. No. 623. But the apothecia agree so well that I have ventured the determination.

Another plant from the same locality has a still paler thallus, with grey, almost squamulose, subdiscrete areolae, its hymenium is high: 120—130 μ, aeruginose at its upper part and unchanged by KOH, its spores are large: (26—) 32—34 × 13—17 μ.

It is hardly possible to determine that plant with absolute certainty. Habitually it resembles *Rhizocarpon roridulum* as distributed by MALME

(Lich. suec. No. 669), but the hymenium of this species is stained violet by KOH.

It is difficult of distinction from *Rhizocarpon lavatum*. VAINIO has refused to accept the *lavatum* as a proper species; he refers it to *Rhizocarpon obscuratum* as a forma (Lich. Fenn. II pag. 299), it is quite probable that he is right.

195. (23). *Rhizocarpon obscuratum* (ACH.) MASS. var. *fuscocinereum* ARN.

Rhizocarpon obscuratum. ZAHLBRUCKNER Cat. Lich. vol. IV (1926—27) pag. 379, ubi syn.

II. Matotchkin Shar: South side, at the Kara Sea entrance.
IV. Mashigin Fjord: North of the Fjord entrance.

Rhizocarpon obscuratum must be a rare species, for there are only three plants in my collection, all of them growing on slaty rocks that gave no CO_2 with HCl.

Sporae murales, incoloratae, magnitudine variantes (vide infra). Hymenium 80—100 (rarius usque ad 130) μ altum, superne dilute aeruginosum et KOH immutatum. Thallus J et KOH immutatus.

These data refer my plants to *Rhizocarpon obscuratum*.

The colour is more or less pale greyish, hardly with a tinge of brown, the hypothallus is also grey, not brown. The thallus is always reticulato-rimose with very small areolae, but otherwise it varies considerably. In one plant the thallus is so poor that the areolae are not always contiguous and in another it almost resembles *Lecanora flavida*. In these two plants the spores vary from $21—28 \times 10—13$ μ, which is a very normal size, the apothecia themselves are also typical, with a plane disc and a thick persistent margin. The third plant, from the Kara Sea entrance, has a thicker almost leprose thallus, with convex, immarginate apothecia and larger spores: $28—35 \times 13—15$ μ; there are two longitudinal septa. It is only with much hesitation that I venture to name this plant *Rhizocarpon obscuratum*, but MALME found that he could not distinguish it from that species. It has possibly been damaged by irrigation.

Former investigations. DEICHM. BRANTH records "*Lecidea petraea* var. *obscurata*" from Novaya Zemlya (pag. 77).

196. (24). *Rhizocarpon orphninum* VAIN. (ex descr.)

Rhizocarpon orphninum VAIN. Lich. Fenn. II (1922), pag. 301, ubi syn.

IV. Mashigin Fjord: Mt. Tveten.

I only detected one plant.

It is very nearly related to *Rhizocarpon obscuratum* and separated from that species especially by the colour of the upper part of its hymenium. I only found a few mature spores: they are uncoloured, first 3-septate, then muriform, 25—30×12 μ. The hymenium is not aeruginose, but violet, and more intensely so, if KOH is added. Medulla J ÷, KOH ÷ and $CaCl_2O_2$ ÷.

I have seen no type plant, but my plant agrees so well with VAINIO's description that I have ventured the determination.

197. (25). *Rhizocarpon petraeum* (WULF.) MASS.

Rhizocarpon petraeum ZAHLBRUCKNER Cat. Lich. IV (1926 —27) pag. 382, ubi syn.

var. *excentricum* (ACH.) A. L. SM.

A. L. SMITH Brit. Lich. II (1911) pag. 194.

Rhizocarpon excentricum Arn. Vide ZAHLBRUCKNER Cat. Lich. IV (1926—27) pag. 358, ubi syn.

IV. Mashigin Fjord: Fram Bay.

I had a lot of plants of the nearly related *Rhizocarpon pseudospeireum*, but only one specimen of this species. It is most probably rare.

Thallus tenuis, parvus, diam. 1.5 cm., albidus, subcretaceus, crebre rimoso-areolatus, areolis contiguis. Hypothallus indistinctus.

Apothecia numerosa, dispersa, primo thallo immersa, dein emergentia, adpressa. Discus planus, epruinosus, non papillatus, margine albido et (ut videtur) persistenti circumdatus. Hymenium altissimum: 170—175 μ, superne aeruginosum, ± inspersum. Sporae omnino incoloratae, diu tetrablastae, dein pro maxime parte submurales: sept. transv. 3—5, sept. long. 1, rarius typice murales; sporae elongatae, angustae, saepe altero apice angustiores, fere acutatae: 37—45×12—16 μ, blastidiis ± rotundatis.

The mature apothecia are appressed; the thallus is so thin that they simply cannot be immersed. MALME's Lich. suec. No. 350 is darker, more greyish, than my plant, which is almost purely white.

The true *Rhizocarpon calcareum* ANZI (= α. WEISII in TH. FRIES Lich. Scand. p. 631) has a much thicker thallus. The difference between it and the other species of this section must be cleared up by a lichenologist, who is able to study it in nature. All records of "*Rhizocarpon calcareum*" from the Arctis should be regarded with suspicion.

The first to use the name *Lichen petraeus* was WULFEN in his Winterbelustigungen of 1788 pag. 89, and in his Plantae rariores of 1789 pag. 116 and tab. VI fig. 2. According to ARNOLD: Zur Erin. an

WULFEN (1882) pag. 157 *Lichen petraeus* in WULFEN's herb. comprises 4—5 different species. But there is little doubt that WULFEN'S table, which I have before me, is really = *Rhizocarpon concentricum.* The same is the case with HOFFMANN'S excellent figure in his Plantae Lichenosae III (1801) fig. (1 and) 2 and pag. 4 of the text (s. n. *Verrucaria petraea*).

The name *Lichen concentricus* DAVIES dates from 1794, Descript. of four new Brit. Lich., in Transact. Linn. Soc. II (1794) pag. 284 (sec. VAIN. Lich. Fenn. II pag. 295).

Even if *Lichen petraeus* in herb. WULFEN is a mixtum, his excellent figure must be solid enough as a foundation for *petraeum* as a specific name and this name must be given preference to DAVIES's younger name. Most authors have accepted this view. — VAINIO has accepted DAVIES'S name *Lichens concentricus* (Lich. Fenn. II (1922) pag. 295).

MASSALONGO'S description and figure (Ric. Lich. (1852) pag. 102 and fig. 206) agree perfectly with my plant.

I do not know have many different species there are in our herb. sub nom. *Rhizocarpon petraeum.* The same is the case in literature. It would have been more convenient if we could entirely have abandoned that name, but it is hardly possible.

Former investigations. A plant called "*Lecidea petraea* WULF." has been recorded from Tolyenii Bay, Matotchkin Shar, by STIZENBERGER (pag. 421).

198 (26). *Rhizocarpon pseudospeireum* (TH. FR.) LYNGE.

Plate III fig. 9—10, VII fig. 3.

Rhizocarpon calcareum α WEISII f. *pseudospeirea* TH. FR. Lich. Scand. II (1874) pag. 632.

Rhizocarpon calcareum (WEIS) TH. FR. var. *pseudospeireum* TH. FR. MALME Västra Jämtl. Rhizoc. (1914) pag. 280 et 294. ZAHLBRUCKNER Cat. Lich. IV. (1926/27) pag. 349, ubi syn.

Rhizocarpon pseudospeireum (TH. FR.) LYNGE Lich. Bear Island (1926) pag. 37.

I. Bessimyannii Fjord.
II. Matotchkin Shar: Chalhonik Valley and Mt. Syernaia. Serebryanka Fjord.
IV. Mashigin Fjord: South side of Blaafjell Basin, Sol Bay and north of the Mashigin Fjord entrance.
V. Admiralty Peninsula.

Widely distributed in Novaya Zemlya, and in places plentiful, but only on calcareous rocks.

Thallus tenuis, magnitudine mediocri, diam. 3—4 cm. vel interdum plantis in unum concrescentibus plagas majores, 13—14 cm. latas tegens, albissimus vel subplumbeus, cretaceus, continuus, minute reticulato-rimosus, areolis minutis, ca. 0.5—0.75 mm., subplanis vel convexiusculis. Thallus hypothallo inconspicuo tenui, subplumbeo, effuso impositus.

Apothecia numerosa, irregulariter dispersa, diam. 0.5—1 (1.25) mm., supra crustam tenuem elevata. Discus ater, planus, sublaevigatus, non pruinosus, margine albosuffuso, persistenti, crasso, integro circumdatus. Excipulum omnino nigrum (etiam margo apotheciorum) et gonidiis destitutum. Hypothecium cum excipulo confluens, ater vel superne fusconigrescens. Hymenium altum: 125—135 (140) μ, superne olivaceo-nigrescens (non violaceum), praeterea incolor, ± inspersum. Paraphyses valde concretissimae, ramosae, in apice clavato-incrassatae, sed leviter (KOH addito). Asci angusti, 20—24 μ crassi, sporas octonas biseriales continentes. Sporae (saepe corrugatae) omnino incolores (si bene evolutae), diu tetrablastae, ad ultimum submurales, pauciloculatae: septa transversalia 3, septum longitudinale 1, (rarissime 2), halone incolorato, ± crasso circumdatae, 18—24 (27)×11—12 μ.

Thallus nec KOH nec J reagens. Hymenium J caerulescens vel subnigrescens, KOH non mutatum vel superne ± decoloratur, neque tamen violascens.

TH. FRIES has described its leading morphological characters (l. c. pag. 632): "crusta tenuiore, apotheciis magis elevatis, disco vulgo nudo, margine (saepe) albosuffuso." It cannot be expressed better. Its paraphyses are very concrete, even if KOH is added, and its spores small: rarely more than 24 μ, usually about 20—22 μ, and "submurales", the other species of the *calcareum* section have larger and more muriform spores.

In his excellent paper on the *Rhizocarpons* of Western Jämtland in Sweden MALME has called attention to this species which in his opinion most probably deserves the rank of a proper species; he also describes its leading characters. Its name was well chosen, I repeatedly found it amongst plants which I had provisionally arranged as "*Lecidea speirea*" according to their habitus.

In the plant from Serebryanka Fjord the thallus is aberrant, very thin.

I found this species in the Bear Island collection of TH. FRIES (1868). DARBISHIRE'S *Rhizocarpon calcareum* has the small, submuriform spores of *Rhizocarpon pseudospeireum*, but it differs by its slightly darker colour and more concentrically arranged apothecia. I am not quite convinced of the specific value of the latter character.

"*Lecidea atroalba* var. *chlorospora* NYL." has been recorded from Novaya Zemlya by DEICHMANN BRANTH, pag. 77. According to TH. FRIES Lich. Scand. pag. 618 this name is a synonym of *Rhizocarpon applanatum*.

"*Lecidea petraea* var. *Oederi* (ACH.)" has been recorded from Novaya Zemlya by DEICHMANN BRANTH, pag. 77, cfr. pag. 83 of this work.

Rhizocarpon phalerosporum VAIN. has been recorded from Karmakuly by MAGNUSSON (pag. 10).

Rhizocarpon simulans H. MAGN., vide *Rhizocarpon alpicola*.

CLADONIACEAE.

Baeomyces PERS.

199 (1). *Baeomyces placophyllus* ACH.

I. Goose Bay.
II. Matotchkin Shar: Mt. Lasareff. Sukhoi Noss.
IV. Mashigin Fjord: Rækved Bay.

Represented in my collections only by a few small, sterile plants. I was astonished to find it so rare; has it escaped my attention?

In Norway this species is easily distinguished from *Baeomyces rufus* (= *byssoides*) by its large marginal squamose lobes. But in the Arctis its lobes are so small that the value of that character is reduced, and the distinction between them may be difficult. *Baeomyces placophyllus* has crateriform soredia in varying number, especially on the broad lobes just inside the circumference of the thallus. They are marginal and superficial; if marginal soredia are confluent, the lobes resemble those of *Physcia grisea* (= *pityrea*), as justly remarked by CROMBIE, the eminent observer. (Brit. Lich. I, pag. 111). In *Baeomyces rufus* (= *byssoides*) I have not seen soredia of that kind, they are small, punctiform, and if confluent they may give the thallus a somewhat leprose habitus. — In the Arctis the distinction between soredia and isidia is not so marked as it is in southern countries.

A more greenish colour suggests *Baeomyces rufus*, but the colour is quite variable.

Cladonia (HILL) VAIN.

Sect. *Cladina* VAIN.

200. (1). *Cladonia alpestris* (L.) RABH.

I. Goose Bay.
II. Matotchkin Shar: Near the summit of Mt. Matotchka.

In northern countries *Cladonia alpestris* is a continental species and it was only to be expected that it should be rare in Novaya Zemlya. At the former station it was not quite scarce, at the latter I only found a few plants in the upper part of the rock-fall and on the ridge of the mountain.

The plants are small, but typical.

Former investigations. Recorded from Kolgueff (SAV. 1912 pag. 41), but not from Novaya Zemlya.

201 (2). *Cladonia rangiferina* (L.) WEB.

I. Goose Bay.
II. Matotchkin Shar: Mt. Matotchka and south side of the shar at the Kara Sea entrance.
IV. Mashigin Fjord: Rækved Bay, Mt. Tveten and Mt. Dietrichson.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay.

Cladonia rangiferina is widespread, but not common; plentiful only in moist screes, together with *Alectoria ochroleuca* a. o. — It was well developed but it did not attain any large size. Only found sterile.

Former investigations. Recorded from Möller Bay (KUSNETZOFF No. 7) and from Belushii Bay (SAV. 1912 pag. 50). Also from Franz Joseph Land (ELENK. et SAV. pag. 90).

202 (3). *Cladonia silvatica* (L.) HARM.

I. Gribovii Fjord, north side.

There was only one plant in my collection, which SANDSTEDE referred to this species.

Former investigations. See *Cladonia mitis*.

203 (4). *Cladonia mitis* SANDST.

Cladonia mitis SANDST. ZAHLBR. Cat. Lich. IV (1927) pag. 561, ubi syn.

I. Goose Bay. Gribovii Fjord: North side.
II. Matotchkin Shar: Pomorskaya, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson, Mt. Tveten, Strömsnes Bay, Dal Bay and Sol Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay.

My Novaya Zemlya material has confirmed my former opinion that *Cladonia mitis* is the commonest *Cladina* in the Arctis. In Novaya Zemlya it is common on the tundra, with *Luzula confusa* and *nivalis* a. o., but the best plants are found in the upper part of the rock-falls.

Former investigations. There are the following records of "*Cladonia sylvatica*", which are supposed to represent this species: Möller Bay (KUSNETZOFF No. 7), Matotchkin Shar (TH. FRIES pag. 14, HEUGL. pag. 310, and — var. *sylvestris* — SAV. 1911 pag. 49). Belushii Bay (SAV. 1912 pag. 52). Mashigin Fjord: Cape Schantz (ELENK. et SAV. pag. 81). Also from Kolgueff (SAV. 1912 pag. 52).

204 (5). *Cladonia impexa* HARM.

Cladonia impexa HARM. ZAHLBR. Cat. Lich. IV (1927) pag. 550, ubi syn.

I. North side of Gribovii Fjord.

SANDSTEDE (in lit.): "Die groben Gonidienflecke deuten auf *impexa*, *mitis* stets glatt".

Sect. *Cenomyce* TH. FR.

205 (6). *Cladonia uncialis* (L.) WEB.

I. Goose Bay. North side of Gribovii Fjord.
II. Matotchkin Shar: Pomorskaya and Belushii Bay. Serebryanka Fjord. Sukhoi Noss.
IV. Mashigin Fjord: Rækved Bay, Sol Bay, Dal Bay and Strömsnes Bay, Mt. Tveten in the scree, Mt. Dietrichson in the scree and Fram Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay.

It is widespread in Novaya Zemlya and quite common as far north as Admiralty Peninsula. Farther north I only found a few plants, and I did not find it in Blaafjell Basin. It is possible that its distribution is limited by climatic causes.

The development of *Cladonia uncialis* shows a remarkable analogy to that of *Cl. elongata.* Long and slender podetia are rare. Very often the apices are destroyed (frost?), and low, cespitose plants are formed. Plants from moist stations (moist grass land, and the like) are more or less turgid. — I only saw sterile plants.

Former investigations. Novaya Zemlya (DEICHM. BRANTH pag. 74). Möller Bay (KUSNETZOFF No. 8). Matotchkin Shar, var. *obtusata* (SAV. 1911 pag. 49). Also from Waigatsch (STIZ. pag. 420), Kolgueff (SAV. 1912, pag. 52) and from Franz Joseph Land, var. *paradoxa* (ELENK. et SAV. pag. 90).

206. (7). *Cladonia amaurocraea* (FLK.) SCHAER.

I. Goose Bay.

Cladonia amaurocraea is perhaps rare, for I only detected a few plants. They are large and well developed and carry some small apothecia. The scyphi are small and deeply cristate.

Former investigations. Recorded from Möller Bay (KUSNETZOFF No. 9), Karmakuly (SAV. 1912 pag. 40), Belushii Bay 71° 30′ (SAV. 1911 pag. 49), Matotchkin Shar (TH. FRIES pag. 14, SAV. 1911 pag. 49), Belushii Bay (SAV. 1912 pag. 40) and from Cape Schantz in Mashigin Fjord, f. *fruticulescens* and f. *oxyceras* (SAV. 1912 pag. 40). Also from Waigatsch (TH. FRIES pag. 14) and from Kolgueff (SAV. 1912 pag. 40).

207. (8). *Cladonia bellidiflora* (ACH.) SCHAER.

II. Matotchkin Shar: Pomorskaya, and south side of the Shar, near the Kara Sea entrance.

It must be rare, I only detected a few plants, which I refer to var. *coccocephala* (ACH.) VAIN. They are not small, one of them is 40 mm. high. The squamules are numerous, but small. There are a few small apothecia.

Former investigations. Recorded only from Möller Bay (KUSNETZOFF No. 10) in Novaya Zemlya. Also from Waigatsch (TH. FRIES pag. 14, HEUGL. pag. 310), Kolgueff (f. *coccocephala* SAV. 1912 pag. 42) and Franz Joseph Land (f. *coccocephala*, ELENK. et SAV. pag. 89).

208. (9). *Cladonia deformis* HOFFM.

VI. On old drift wood in the beach south of Arkhangel Bay.

I only detected a few plants, it must be very rare in Novaya Zemlya. It is quite probable that this drifting stem has brought the propagating factor — we can here only think of its soredia — from a remote (Siberian?) home, an interesting case of spreading over long distances.

Former investigations. Recorded from Kolgueff (SAV. 1912 pag. 45), but not from Novaya Zemlya.

209. (10). *Cladonia coccifera* (L.) WILLD.

var. *pleurota* (FLK.) SCHAER.

I. Goose Bay.
II. Matotchkin Shar: Mt. Matotchka.

var. *stemmatina* ACH.

I. Goose Bay. North Gusinnoi Noss (KJELLM. et LUNDSTR.). North side of Gribovii Fjord.
II. Matotchkin Shar: Pomorskaya, Belushii Bay, and south side of the Kara Sea entrance. Sukhoi Noss.
IV. Mashigin Fjord: Scree at the foot of Mt. Dietrichson, Strömsnes Bay and Dal Bay.
V. Admiralty Peninsula.
VI. At the foot of the great rookery south of Arkhangel Bay.

Cladonia coccifera is common, but not plentiful, as far north as Mashigin Fjord, farther north it is supposed to be rare.

By far the greater part of my material belongs to var. *stemmatina*. The cortex is usually areolate, the areolae are either flat and strictly adherent to the podetia, or they are more or less granular; in some plants they loosen from the podetia at their lower part. Plants with typical squamules at the margins of the scyphi (var. *phyllocoma* FLK.) were only found at Pomorskaya; at the same station I detected a few plants with central prolifications (f. *asotea* ACH.) — Typical var. *pleurota* is rare.

Prominent experts on *Cladonia* as VAINIO and SANDSTEDE regard the *pleurota* to be a proper species. I have been unable to accept that view; in Arctic plants the soredia are often so poorly developed that it can be quite difficult to separate the *pleurota* from var. *stemmatina*. In some plants the determination becomes uncertain, for the cortex is often quite destroyed by some detrimental Arctic factor.

Apothecia are badly developed, usually the plants are quite sterile. I never saw quite mature apothecia, but often a delicate red line at the margin of the scyphi.

Former investigations. Recorded from Möller Bay (β. *pleurota*, KUSNETZOFF No. 11) and Matotchkin Shar (TH. FRIES pag. 14, HEUGL.

pag. 310), and (var. *stemmatina*) SAV. 1911 pag. 60. Also from Waigatsch (TH. FRIES pag. 14, HEUGL. pag. 310) and from Franz Joseph Land (ELENK. et SAV. pag. 89).

210. (11). *Cladonia cyanipes* (SOMRFT.) VAIN.

I. Karmakuly. (T. ALM Aug. 1901).

The plants are quite as large as Norwegian plants. Their podetia are ramose at the upper part, suggesting var. *Despreauxii* (BORY) TH. FR.

I did not find it in Novaya Zemlya, and I suppose it to be rare in the regions investigated by us.

Former investigations. Recorded from Matotchkin Shar, var. *Novajae-Semljae* SAVICZ (SAV. 1911 pag. 50).

211. (12). *Cladonia furcata* (HUDS.) SCHRAD. var. *truncata* FLK.

II. Matotchkin Shar: south side at the Kara Sea entrance.

SANDSTEDE, who determined these (few) plants, writes: "unmöglich *crispata* oder *Delessertii*, denn beiden fehlt der Bitterstoff. Dieser vorliegende bitter, K÷. Auffallend die kräftigen, eingeschnürten Pycniden, gut entwickelt im Innern, ohne rote Gallert; vgl. VAINIO I p. 333".

Former investigation. Möller Bay (KUSNETZOFF No. 12, with an?). Also from Kolgueff (var. *palamaea*, SAV. 1912 pag. 48).

212. (13). *Cladonia gracilis* (L.) WILLD. var. *chordalis* (FLK.) SCHAER.

I. Goose Bay.
II. Matotchkin Shar: Mt. Matotchka.
IV. Mashigin Fjord: Mt. Tveten and Dal Bay.

If the "*elongata*" is excluded, *Cladonia gracilis* is certainly a rare plant in Novaya Zemlya. It is there restricted to favourable localities, well exposed rock-falls and the like.

There is a distinct positive reaction with KOH on the pale young podetia. Some small scyphi are perforated. The plants were submitted to SANDSTEDE, who referred them to *Cladonia gracilis* var. *chordalis*.

Former investigations. Möller Bay (KUSNETZOFF No. 13); he suggests a var. *chordalis* f. *aspera*. I have ventured to refer the other literary records of "*Cladonia gracilis*" to *Cladonia elongata*.

213. (14). *Cladonia elongata* (JACQ.) HOFFM.

I. Goose Bay. Möller Bay (KJELLM. et LUNDSTR. 1875). Gribovii Fjord: South and north side, and Veselago Island.
II. Matotchkin Shar: Mt. Syernaia, Vasnetsoff Glacier, and south side at the Kara Sea entrance. Rookery in Serebryanka Fjord.
IV. Mashigin Fjord: Sol Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Berkh Isl. Lichutin Isl. Northern Kristovii Isl. Pankratyeff Peninsula.

Cladonia elongata is one of the few *Cladoniae* that are really common all over the area investigated by us.

It is very variable: The "typical" elongated greyish plant (=MALME Lich. suec. No. 478) is found in moist places, as bogs and between the stones in the rock-falls, but it is not the commonest forma. More common are plants, the apices of which are destroyed (by frost?), and only a subulate tip is left on the short, stout podetia. Such plants are often quite cespitose, their colour is greyish-brown to chestnut-brown, their cortex coarsely bullate or rarely smooth. A few plants are squamose, approaching var. *laontera* (DEL.) ARN. Scyphi are very rare and apothecia were never found.

Opinions differ with respect to its specific rank. I have become more and more convinced that it is a proper species, on account of its well-known habitus as well as its chemical reaction (KOH+yellow).

Former investigations. Novaya Zemlya (MARKH. pag. 332, s. n. *Cladonia gracilis*), Karmakuli (SAV. 1912 pag. 49). Matotchkin Shar (TH. FRIES pag. 14, HEUGL. pag. 310, SAV. 1911 pag. 50). Belushii Bay (SAV. 1912 pag. 49). Also from Waigatsch (TH. FRIES pag. 14, HEUGLIN pag. 310) and from Kolgueff (SAV. 1912 pag. 49).

214. (15). *Cladonia verticillata* HOFFM.

var. *cervicornis* (ACH.) FLK.

I. Goose Bay.
II. Matotchkin Shar: Pomorskaya and Belushii Bay.

Only a few plants, it must be quite as rare as many other *Cladoniae* in Novaya Zemlya.

**Krempelhuberi* VAIN.
var. *subcervicornis* VAIN.

II. Matotchkin Shar: Belushii Bay.
IV. Mashigin Fjord: Fram Bay, Blomster Bay and Mt. Tveten in the scree.

I found considerably more plants of this subspecies than of var. *cervicornis*, but not sufficient to say much of its distribution and frequency.

Former investigations. *Cladonia verticillata* var. *evoluta* has been recorded from Matotchkin Shar (SAV. 1911 pag. 50).

215. (16). *Cladonia degenerans* (FLK.) SPRENG.

II. Matotchkin Shar: Belushii Bay.
IV. Mashigin Fjord: Dal Bay.

The plants were submitted to SANDSTEDE, who referred them to *Cladonia degenerans*: He wrote of the first mentioned plant: "anscheinend alles *degenerans*, verkümmerte Pflanze". There are a few scyphi and the scyphose podetia are almost esquamose. But the ascyphous podetia are well squamose. — I do not venture to refer it to any special forma. The plants from Dal Bay are more typical; var. *euphorea* (ACH.) FLK.

On the whole only few plants were found, *Cladonia degenerans* must be rare in Novaya Zemlya. Its development suggests it to be growing near its climatic limit.

Former investigations. Recorded from Kolgueff (SAV. 1912 pag. 45), but not from Novaya Zemlya.

216. (17). *Cladonia lepidota* NYL.

Vide DU RIETZ: Flechtensyst. Studien III. Bot. Not. (1924) pag. 66—68, ubi syn.

I. Goose Bay. South and north side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Matotchka, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Mt. Dietrichson, Mt. Tveten, Dal Bay, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay.

Cladonia lepidota is found in moist, often irrigated places, between the stones, in the rock-falls (the finest plants), along brooklets and the like, often with *Cetraria Delisei*. It is one of the few really common *Cladoniae* in Novaya Zemlya. I have not found it on chalky ground.

In the Norwegian mountains the ascyphous *Cladonia gracilescens* var. *cerasphora* (VAIN.) LYNGE = *Cladonia lepidota* NYL. var. *stricta* (NYL.) DR. is by far more common than the scyphiferous *Cladonia gracilescens* (FLK.) VAIN. = *lepidota* NYL. var. *gracilescens* (FLK.) DR. It is in good accordance with this fact that my entire Novaya Zemlya material must be referred to the former variety, though some plants have small, often indistinct scyphi. My study of these Novaya Zemlya plants have only confirmed my former opinion that they are not specifically distinct.

The development of the primary thallus and the phyllocladia is very variable and of little systematic value. F. *hypophylla* (NYL.) VAIN. with persistent macrosquamous primary thallus is not common: Goose Bay, Serebryanka Fjord, Admiralty Peninsula. F. *pterophora* VAIN. with squamous podetia is by far the commonest forma. The f. *stricta* (NYL.) as defined by VAINIO: disappearing primary thallus and few or no squamules on the podetia is quite common: Goose Bay, Gribovii Fjord, Mt. Matotchka, Kara Sea entrance, Mt. Tveten, Mt. Dietrichson, Admiralty Peninsula and Arkhangel Bay.

But if the name *stricta* is used as a synonym for VAINIO's species *Cladonia cerasphora*, it cannot also be used for the esquamous forma of this species (or variety). I will therefore propose the name f. *aphylla* LYNGE (*Cladonia lepidota* var. *gracilescens* f. *aphylla* LYNGE for VAINIO's *Cladonia cerasphora* f. *stricta* (NYL.) VAIN.)

A considerable part of the Arctic "*Cladonia degenerans*" is supposed to be *Cladonia lepidota* var. *stricta*, e. g. in our herb. a plant from Godthaab in Greenland (leg. RINK, exhb. JOH. LANGE).

217. (18). *Cladonia pyxidata* (L.) FR.

var. *chlorophaea* FLK.

I. Goose Bay.
II. Matotchkin Shar: Pomorskaya.
VI. Rookery south of Arkhangel Bay.

var. *neglecta* (FLK.) MASS.

I. Goose Bay.
II. Matotchkin Shar: Pomorskaya, at the foot of Mt. Wilczek and south side near the Kara Sea entrance.
IV. Mashigin Fjord: Rækved Bay, Dal Bay, Strömsnes Bay, Mt. Tveten in the upper part of the scree, Mt. Dietrichson in the scree south side of Blaafjell Basin on the moraines, and Fram Bay North of the entrance to Mashigin Fjord.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay.

var. *Pocillum* (ACH.) FLOT.

I. Goose Bay.
II. Matotchkin Shar: At the foot of the Mts. Wilczek and Lasareff, Chalhonik Valley, Moraine at Vasnetsoff Glacier, East of Cape Jouravlev, At the foot of Mt. Syernaia, and Belushii Bay. In the rookery in Serebryanka Fjord.
III. Kristovii Fjord.
IV. Mashigin Fjord: Fram Bay, Mt. Tveten in the scree, Mt. Dietrichson in the scree Dal Bay, Sol Bay, and south side of Blaafjell Basin.
V. Admiralty Peninsula.
VI. Berkh Island, Lichutin Island, Mainland east of Lichutin Island, and Northern Kristovii Island.

Var. *chlorophaea* is rare, var. *neglecta* is common, but not plentiful, var. *Pocillum* is common and plentiful. I brought home more than 100 numbers of *Cladonia pyxidata*, and almost $^3/_4$ of them are var. *Pocillum*.

As usual var. *Pocillum* prefers slaty and chalky ground, it is then associated with *Physcia muscigena*, *Dryas octopetala* and their usual companions.

The appressed, nitidous chestnut-coloured squamules of var. *Pocillum* are beautifully developed. Their cortex is sometimes destroyed in old parts of the plants, exposing the white medulla. As usual the podetia are not well developed and apothecia are neither found in this, nor in the other two varieties. — Its habitus is very characteristic and generally it is well separated from var. *neglecta*. But sometimes the squamules are smaller, more bullate, and not always strictly appressed along their whole circumference. The squamules of var. *neglecta* are considerably coarser than in southern countries, accordingly the two varieties are more confluent in Novaya Zemlya than they are farther south.

Var. *chlorophaea* is sorediate, the other varieties not, and it contains an acid, ZOPF's "Chlorophaea-Säure". The opinion has gained ground, that it should be a proper species (SANDSTEDE, VAINIO), but I have been unable to accept this opinion (cfr. my Studies, 1921, pag. 65—66), for I cannot find sufficient morphological difference.

Former investigations. Novaya Zemlya (DEICHM. BRANTH pag. 74). Matotchkin Shar (TH. FR. pag. 14, HEUGL. pag. 310).

Var. *chlorophaea* from Franz Joseph Land (ELENK. et SAV. pag. 90) but not from Novaya Zemlya.

Var. *neglecta*: Karmakuli (SAV. 1912 pag. 50), Matotchkin Shar (SAV. 1911 pag. 50), Mashigin Fjord: Cape Schantz (ELENK. et SAV. 1912 pag. 80). Also from Kolgueff (SAV. 1912 pag. 50).

Var. *Pocillum*: Möller Bay (KUSNETZOFF No. 14) and Mashigin Fjord: Cape Schantz (ELENK. et SAV. pag. 80). Also from Franz Joseph Land (ELENK. et SAV. pag. 90).

218. (19). *Cladonia cariosa* (ACH.) SPRENGEL.

V. Admiralty Peninsula.

Only a very poor fragment, with *Stereocaulon alpinum* and *Parmeliella arctophila*. The determination is not quite certain, but it has the typical structure of the cortex, and the yellow KOH reaction. There are a few apothecia.

Former investigations. Recorded from Kolgueff (SAV. 1912 pag. 42), but not from Novaya Zemlya.

219. (20). *Cladonia alpicola* (FR.) VAIN.

II. Matotchkin Shar: South side at the Kara Sea entrance.

This is one of the rarest lichens of Novaya Zemlya. I only detected one specimen. The podetia are incurved, with damaged apices (frost?), as is so often the case with Arctic Cladoniae; the squamules are coarse and appressed, almost covering the sterile podetia.

Cladonia alcicornis. KUSNETZOFF has recorded this species from Möller Bay, with doubt. VAINIO has not acknowledged this statement (Mon. Clad. II pag. 391). It seems to me that it must be quite impossible.

Cladonia decorticata has been recorded from Kolgueff (SAV. 1912 pag. 45—47, but not from Novaya Zemlya.

Cladonia fimbriata var. *simplex* has been recorded from Kolgueff (SAV. 1912 pag. 48), but not from Novaya Zemlya.

Stereocaulon SCHREB.

220. (1). *Stereocaulon* cfr. *paschale* (L.) ACH.

II. Matotchkin Shar: Pomorskaya.

Stereocaulon paschale has very often been recorded from the Arctis, especially by authors who have not collected the plants themselves. If I have been able to control those determinations I have generally found that the plants are *Stereocaulon alpinum* (or one of the other species of this section, which MAGNUSSON has described in his Boreal Stereocaula). In reality *Stereocaulon paschale* is very rare in the Arctis.

When I studied my material of *Stereocaulon alpinum* (sensu latiore) I very carefully considered the possibility of detecting *Stereocaulon paschale* in it. But there were very few plants that approached it. To ensure the determinations I submitted those few plants to A. H. MAGNUSSON. As expected he referred all my doubtful plants, except one, to *Stereocaulon alpinum.*

This plant was collected at Pomorskaya, and MAGNUSSON remarks that it "quite probably" is *Stereocaulon paschale.* Its phyllocladia are more incised than in *Stereocaulon alpinum.*

Former investigations. Novaya Zemlya (VON BAER, without locality). Möller Bay (KUSNETZOFF No. 4) and Kristovii Fjord (ELENK. et SAV. pag. 76). Also from Franz Joseph Land (ELENK. and SAV. pag. 87). Some of these plants should perhaps be referred to *Stereocaulon alpinum.*

221. (2). *Stereocaulon alpinum* LAUR.

Stereocaulon alpinum MAGN. Boreal Stereocaula (1926) pag. 52, ubi syn.

I. Goose Bay. Gribovii Fjord: South and north side and Veselago Island.
II. Matotchkin Shar: Pomorskaya, Mt. Lasareff, Mt. Wilczek, Vasnetsoff Glacier, Chalhonik Valley, Mt. Syernaia, Belushii Bay, and south side at the Kara Sea entrance. Serebryanka Bay. Sukhoi Noss.
III. Kristovii Fjord.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Mt. Dietrichson, Strömsnes Bay, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Berkh Island. Lichutin Island. Mainlaind east of Lichutin Island. Pankratyeff Peninsula.

Stereocaulon alpinum is one of the really common lichens of Novaya Zemlya, it is widespread and plentiful all over the area explored by us. Found on gravelly moist soil, often amongst mosses and grasses.

It is not always easy of distinction from some related species. *Stereocaulon tomentosum* is generally well fertile, with numerous small apothecia. The apothecia of *Stereocaulon alpinum* are rare, at least in the Arctis. The phyllocladia of *Stereocaulon alpinum* are very characteristic: entire or slightly crenate, they are much more incised, dactyloid in *Stereocaulon tomentosum* as well as in *Stereocaulon paschale.* From the latter species it is also separated by its tomentum, which is better developed and more equally distributed over the podetia, especially well developed at their apices. In my opinion *Stereocaulon alpinum* is specifically distinct from *Stereocaulon paschale* as well as from *Stereocaulon tomentosum.*

Records of the two latter species from the Arctis should be regarded with much suspicion, they are generally based on plants of *Stereocaulon alpinum* or some of the nearly related species. For even the plants named *Stereocaulon alpinum* in Arctic literature are not monotypous. Plants with large terminal flat apothecia should be compared with *Stereocaulon rivulorum* MAGN. Boreal Stereoc. (1926) pag. 63. Plants belonging to *Stereocaulon glareosum* (SAV.) MAGN. l. c. pag. 60 have also been referred to *Stereocaulon alpinum* (cfr. Krypt. Exsic. Vind. No. 152 b from Finland).

In Norway *Stereocaulon alpinum* is not so common as formerly supposed by myself (Stud. Lich. Fl. Norway (1916) pag. 83). I had not then studied the Arctic *Stereocaulons* as I now have, and several of the plants mentioned in that book must be referred to the above mentioned species (especially to *Stereocaulon rivulorum*).

Former investigations. Novaya Zemlya (DEICHM. BRANTH pag. 74). Matotchkin Shar (TH. FR. pag. 14, HEUGL. pag. 310, SAV. 1911 pag. 49, MAGN. pag. 7). Belushii Bay (SAV. 1912 pag. 31, MAGN. pag. 7). Kristovii Fjord (ELENK. et SAV. pag. 76, MAGN. pag. 7). Mashigin Fjord: Cape Schantz (ELENK. et SAV. pag. 87). Also from Kolgueff (SAV. 1912 pag. 31) and from Franz Joseph Land (ABRUZZI pag. 669, ELENK. et SAV. pag. 87).

It is very probable that *Stereocaulon tomentosum* from Möller Bay (KUSNETZOFF No. 5) and from Kolgueff (SAV. 1912 pag. 32) is *Stereocaulon alpinum.*

222. (3). *Stereocaulon rivulorum* H. MAGN.

Plate VI, fig. 5—6.

Stereocaulon rivulorum H. MAGN. Boreal Stereocaula (1926) pag. 23 et 63.

I. Goose Bay.
II. Matotchkin Shar: Mt. Lasareff, Vasnetsoff Gl., Mt. Wilczek, Chalhonik Valley, East of Cape Jouravlev, Mt. Syernaia and south side of Matotchkin Shar at the Kara Sea entrance. Sukhoi Noss.
IV. Mashigin Fjord: Fram Bay, Nunatak on Norway Glacier, Mt. Dietrichson, Blomster Bay, Mt. Tveten, Dal Bay, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. South of Arkhangel Bay. Lichutin Isl. Eastern Kristovii Island. Pankratyeff Peninsula.

Stereocaulon rivulorum is very common on the Norwegian mountains "on the banks of torrents in subalpine and alpine situations", as MAGNUSSON very appropriately remarks (l. c. pag. 65). It occasionally covers the ground to some extension, almost like *Stereocaulon condensatum*. It has for a long time attracted the attention of Scandinavian lichenologists, I well remember that I saw it for the first time in 1910 in Bardo, Troms fylke, Northern Norway. But in our literature it has hitherto been recorded under the head of *Stereocaulon alpinum*.

It was only to be expected that a species of this Scandinavian distribution should be common in Novaya Zemlya, and I found it from the farthest south to the farthest north, all over the regions explored by us, plentiful everywhere at its proper localities.

Its wide distribution in Novaya Zemlya suggests it to be a lichen of more general distribution through other Arctic regions. Well fertile Arctic plants of "*Stereocaulon alpinum*" in our herbaria should be carefully compared with *Stereocaulon rivulorum*, for it is much better fertile than *Stereocaulun alpinum*. It is a very good proper species, its large terminal apothecia on short podetia are very characteristic. Badly developed sterile plants are not so easily recognized, but that is the case with every species of *Stereocaulon*.

It is more exposed to the attacks of a parasitic fungus, which has been called *Catillaria Stereocaulorum* by lichenologists, than the other *Stereocaulon* species. DEICHM. BRANTH records "*Catillaria Stereocaulorum*" from Novaya Zemlya (Dijmphna pag. 76).

223. (4). *Stereocaulon fastigiatum* ANZI.

Plate VI, fig. 3—4.

Stereocaulon fastigiatum MAGNUSSON Boreal Stereoc. (1926) pag. 33, ubi syn. LYNGE Bear Island (1926) pag. 41.

I. Gribovii Fjord: South side.
II. Matotchkin Shar: Mt. Matotchka, Mt. Lasareff, east of Cape Jouravlev and Belushii Bay.
IV. Mashigin Fjord: Fram Bay, Nunatak on Lacroix (Norske) bræen, Mt. Dietrichson, Blomster Bay, Mt. Tveten, Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay.

In Novaya Zemlya *Stereocaulon fastigiatum* is a widely distributed plant and quite as common as in the Scandinavian mountains.

Its great variability has been carefully described by MAGNUSSON l. c. The greater part of my plants form compact, $\pm$ semiglobular tufts, but there are also plants with more elongated podetia. At Belushii Bay I found a typical "*Stereocaulon spathuliferum* VAIN." (unfortunately it was lost in my collections); MAGNUSSON refers this species to *Stereocaulon fastigiatum* as a forma, and I agree with him. — One plant from Matotchkin Shar, east of Cape Jouravlev, has fine capitate apical soredia.

Stereocaulon fastigiatum must be widely distributed in the Arctis. Two Ellesmereland plants from Twin Glacier Valley (det. DARBISHIRE: *Stereocaulon paschale*) are typically *Stereocaulon fastigiatum.*

Former investigations. Möller Bay (KUSNETZOFF No. 3). Most probably *Stereocaulon evolutum* (TH. FRIES pag. 14, HEUGL. pag. 310) from Matotchkin Shar represents this species.

224. (5). *Stereocaulon denudatum* FLK.

Stereocaulon denudatum FLOERKE Deutsch. Lich. IV (1815) pag. 13 (1819?), TH. M. FRIES Mon. Ster. (1858) pag. 350, Lich. Scand. (1871) pag. 50, SAVICZ Stereoc. e Kamcz. (1923) pag. 10, DU RIETZ Skand. Stereoc. (1926) pag. 96, MAGNUSSON Boreal Stereoc. (1926) pag. 78.

I. Goose Bay. South side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Matotchka, Mt. Wilczek, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson, Mt. Tveten, Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Lichutin Island.

Farthest north I only found a few plants; otherwise *Stereocaulon denudatum* is one of the commonest lichens in Novaya Zemlya.

As was to be expected sorediate plants are very rare in Novaya Zemlya. There is only one slightly sorediate plant in my collection, a low densely pulvinate plant from Goose Bay.

Stereocaulon denudatum is very variable and a number of formae have been described and named. But in my opinion there is every transitional stage between them, they are only individual variations, probably induced by external conditions, as moisture, exposition and the like. I am not much inclined to name such formae. A name should indicate a circumscribed systematical unit, and the names of several formae belong to the locality rather than to the plant.

Several authors have described its formae (or its variation) in a very appropriate manner, but as usual nothing has been written that is better than TH. M. FRIES's description in Lich. Scand. l. c. He describes two principal types:

1) α. *genuinum* TH. FR.: ± long plants with furcate or unbranched free tops, often ending in a glomerulus of very compact phyllocladia.

2) β. *pulvinatum* (SCHAER.) FLOT.: densely pulvinate plants, podetia closely contiguous, not much protruding above the surface of the tuft.

In one of my plants (from Goose Bay) the tufts are so dense that the podetia are hardly visible on their almost plane surface, the tufts are as it were covered with a false crusta of phyllocladia.

These two principal types are equally common in my collections, connected by every transitional stage.

All these formae or varieties are united by their very characteristic phyllocladia: an olive-coloured centre with a pale crenate margin (cfr. MAGNUSSON's excellent description, l. c. pag. 79). In young plants these phyllocladia are generally ± flat and easily observed. But in old plants and in some pulvinate types the phyllocladia become verruciform, and of a uniform whitish or whitish-grey colour. The habitus of such plants generally identifies them and a careful observation will always bring to light some bicolorous flat phyllocladia.

At the Kara Sea entrance I detected a very peculiar *Stereocaulon*. It has the typical branching and the characteristic phyllocladia of *Stereocaulon denudatum*, but it is densely tomentose. I referred this plant to that species and MAGNUSSON did the same.

All my plants are sterile.

Former investigations. Novaya Zemlya (MARKH. pag. 332), Möller Bay (KUSNETZOFF No. 6), Belushii Bay (SAV. 1912 pag. 31, MAGN. pag. 7), Mashigin Fjord: Cape Schantz (ELENK. et SAV. pag. 76). Also from Franz Joseph Land (ELENK. et SAV. pag. 87).

I look with much suspicion on the records of *Stereocaulon coralloides* from the Arctis. It is rare enough in Northern Norway. A plant from Bedford Pim Island, Ellesmereland (leg. SIMMONS), which DARBISHIRE referred to that species, (Lichens, pag. 25. Rep. 2nd Norw. Exp. Fram), is certainly another species.

Stereocaulon evolutum has been recorded from Matotchkin Shar (TH. FRIES pag. 14). It is highly probable that this plant is *Stereocaulon fastigiatum*, which TH. FRIES referred to *evolutum* (cfr. Lich. Scand. pag. 45).

Stereocaulon tomentosum has been recorded from Möller Bay (KUSNETZOFF No. 5) and from Kolgueff (SAV. 1912 pag. 32). It is quite probable that this is *Stereocaulon alpinum*.

GYROPHORACEAE

Gyrophora ACH.

225. (1). *Gyrophora rugifera* (NYL.) TH. FR.

II. Matotchkin Shar: Mt. Syernaia.
IV. Mashigin Fjord: Mt. Dietrichson.
VI. Rookery south of Arkhangel Bay.

At Mt. Dietrichson it was very plentiful in the upper part of the scree. It is supposed to be a somewhat nitrophilous species.

I was astonished to find it so scarce in Novaya Zemlya. In Spitsbergen it is plentiful in Bell Sound, (LYNGE 1926), it is also found in Greenland and in the Ellesmereland collections, and it is quite common in the Norwegian high mountains. Not mentioned by VAINIO in his Pitlekai work; is it a Western Arctic species lacking in the eastern Arctis?

In Novaya Zemlya stipitate as well as estipitate plants are found. They grow together on the same stones. In my opinion this character is only an individual variation, hardly worthy of a name.

226. (2). *Gyrophora decussata* (VILL.) ZAHLBR.

Lichen decussatus VILL. Hist. Plant. Dauphin. vol. III (1789) pag. 964, tab. LV. Vide NYLANDER Circa Lichenes regionis Alpinae Delphinatus observationes (1863) pag. 268.

Umbilicaria reticulata NYLANDER De react. in genere Umbilicaria. Flora LII (1869) pag. 389.

Gyrophora reticulata (SCHAER.) TH. FR. Lich. Scand. I (1871) pag. 167 (p. p.). DU RIETZ Die europ. Arten d. Gyrophora anthracina, in Ark. f. Bot. XIX, No. 12 (1925) pag. 9, ubi syn.

Gyrophora decussata (VILL.) ZAHLBR. Cat. Lich. IV (1927) pag. 678, ubi syn.

Thallus monophyllus, crassitudine mediocri, rarius satis crassus, rigidus, sed fragilis, parvus, diam. vulgo 20, rarius usque ad 30 mm. Thallus superne albidus vel albido-cinerascens, usque ad marginem grosse reticulato-costatus, minute reticulato-rimosus, areolis ± verrucosis; subtus omnino erhizinosus, laevigatus, usque ad marginem fuligineus vel interdum secundum marginem decoloratus. Thallus isidiis sorediisque destitutus.

Cortex superior valde irregularis, 40—50 μ crassus, strato incolorato crasso (usque 40 μ), rupto, verrucoso, tectus. Hyphae corticis superficiei ± perpendiculares, indistinctae, 5 μ crassae, in parte exteriore flavescentes vel deinde obscurius coloratae. Medulla alba, arachnoidea, hyphae medullares non inspersae, tenues, 2.5—4 μ. Cortex inferior a medulla valde irregulariter limitatus, in parte exteriore obscure violaceus, praeterea incolor. Hyphae corticis inferioris in omnes partes currentes. Gonidia strato crasso continuo formata vel magis dispersa, diam. 8—11 μ, interdum angulosa (morbosa?).

Apothecia rarissima, parva et immatura saltum visa, simplicia videntur, discus interdum umbonatus vel varie rugosus. Paraphyses validae, constricte septatae, in apice obscuratae. Sporae frustra quaesitae.

Cortices et minus distincte etiam medulla J rubescentes.

f. *reticulata* (SCHAER., NYL.) LYNGE comb. nova.

Cortex et pars superior medullaris $CaCl_2O_2$ rubescentes.

II. Matotchkin Shar: Belushii Bay.
VI. Rookery south of Arkhangel Bay (c. fr.).

f. *discolor* (TH. FR.) LYNGE comb. nova.

Non differt a f. *reticulata* nisi reactione chemica: thallus $CaCl_2O_2$ immutatus.

I. Gribovii Fjord.
II. Matotchkin Shar: Mt. Syernaia and Belushii Bay. Serebryanka Fjord.
IV. Mashigin Fjord: South side of Blaafjell Basin, Mt. Dietrichson, Mt. Tveten and Dal Bay.
VI. Rookery south of Arkhangel Bay. Eastern Kristovii Island.

Common and widespread. It is a nitrophilous species, plentiful on large stones along the beach and on prominent rocks in the low mountains. It is evident from this enumeration of localities that f. *discolor* is by far the commonest of these two formae, as was to be expected.

All my plants are of the common Scandinavian type, small, rigid, but fragile plants. Plants of the large thin perforated type, as represented in the Ellesmereland collection of SIMMONS, were never seen (*Gyrophora discolor* f. *perforata* LYNGE Stud. Lich. Flora of Norway (1921) pag. 91). This remarkable plant is evidently a Western Arctic plant, perhaps a proper species, which must be studied, when more material is at disposal.

I have not seen *Lichen decussatus* VILL. Hist. Plant. Dauphin. vol. III (1789) pag. 964, tab. LV. HARMAND does not mention it in his Lich. France (pag. 690—691). Its chemical reaction is unknown. If it is identical with *Gyrophora reticulata* (or *G. discolor*), preference must be given to that name (*decussatus*), which is the oldest specific name.

NYLANDER writes (l. c. pag. 268) that he has seen VILLAR's type and he adds: "*L. decussatus* p. 964 est *Umbilicaria atro-pruinosa* var. *reticulata* (DUF.) Nomen Villarsii sit retinendum". I am indebted to dr. BOULY DE LESDAIN for this reference. After this positive statement it is hardly possible to escape this almost forgotten name.

Dr. ED. FREY has been kind enough to study the material of *Gyrophora reticulata* in herb. SCHÄRER (Genève). His results are: 1) a plant collected in 1814 at Grimsel: $CaCl_2O_2 \div$; 2) 1822, Susten: $CaCl_2O_2 \div$; 3) 1822, Rothern: $CaCl_2O_2 \div$; 4) 1840, St. Bernhard, two plants: $CaCl_2O_2 \div$ and $CaCl_2O_2 +$; 5) 1841, Jungfrau: $CaCl_2O_2 \div$; 6) 1842, Schreckhorn: $CaCl_2O_2 \div$; 7) 1852, Kreuzlipass, one plant $CaCl_2O_2 \div$, and another plant p. p. $\div$, p. p. $+$. Dr. FREY could not detect any morphological difference between the plants with positive and those with negative reaction. — One plant "in summo m. St. Bernhard" (undated?) there was an apothecium with spores, $8—11 \times 4.5—6$ μ large.

Accordingly the greater part of SCHÄRER's plants have a negative reaction with $CaCl_2O_2$, others have a positive reaction, and it is impossible to say that one special plant is the type of SCHÄRER's *reticulata*.

Gyrophora discolor TH. FR. is $CaCl_2O_2 \div$ (cfr. TH. FRIES Lich. Scand. pag. 167).

Founded on a plant, named *Gyrophora reticulata* SCHAER. in hb. Upsala, TH. FRIES attributed the positive reaction to that species. But DU RIETZ has shown, that this plant is *Gyrophora fuliginosa* HAVAAS, not *Gyrophora reticulata*. I have again tested the reaction of this species, and found that my former observation ($CaCl_2O_2 \div$, LYNGE Studies Lich. Flora Norway (1921) pag. 97) is incorrect, it is $CaCl_2O_2 +$ red.

To obtain a correct reaction with $CaCl_2O_2$ in this genus it is absolutely necessary to remove the air which prevents the solution from acting upon the hyphae. Many differing statements are due to the negligence of that fact.

Dr. BOULY DE LESDAIN has been kind enough to send me his material of this species for comparison: France: Isère: La Pic du Bec (leg. RAVAUD), Pyrénées: Gavarnie (PITARD) and Canigon summit 2500 m (MARC); Italia: Volpeline 3000 m (HENRY) and Allagna Prov. Vallis Sessitis in monte Ebeltonberg (CARESTIA, RABH. Lich. eur. No. 424). In all these plants I found a distinctly positive reaction with $CaCl_2O_2$. But I could find no morphological distinction between them and our Scandinavian plants and my Novaya Zemlya plants with negative reaction. My Novaya Zemlya plants with positive reaction are remarkably thick, but that may be due to their favourable locality (rich supply of Nitrogen in the rookery).

I had expected to find a negative reaction with $CaCl_2O_2$ in my entire material, the same reaction, as DU RIETZ and all other authors have found in the entire Scandinavian material. But I was much astonished to find a distinctly red reaction in some plants, from Belushii Bay and especially from the rookery south of Arkhangel Bay.

As is known NYLANDER has distinguished specifically between the plants with positive reaction with $CaCl_2O_2$, which he calls *Gyrophora reticulata* (DUF.) SCHAER, and the plants with negative reaction, which he calls *Gyrophora ptychophora* (Unfortunately DU RIETZ has confused these two names, l. c. pag. 12).

It has repeatedly been stated that there is no morphological difference between these plants. It seems to me that as yet a chemical difference alone is insufficient for specific distinction with the lichens. We must define the term "species" as the constant morphological unit. It is well known that this morphological notion has been largely decomposed by the results of cytological investigation. The constant unit is not the plant as seen by us, or a group of apparently uniform plants, but its single characters, based on its chromosomes. Of course the same is the case with the lichens. But as long as the question has not been attacked and cleared up from that side, and as long as the experimental physiology of the lichens is still in nuce the morphological distinction must be the safest platform for a species.

On the other side it is quite objectionable to neglect a chemical difference.

Allowance is made to these views if we retain the oldest name *Gyrophora decussata* for the whole species, referring the name f. *reticulata* (SCHAER., NYL.) to the plants with a positive reaction, and the name f. *discolor* (TH. FR.) to the others (The name *discolor* dates from 1867, the name *ptychophora* from 1869).

Former investigations. "*Umbilicaria atropruinosa*" in DEICHMANN BRANTH pag. 75) is possibly this species.

227. (3). *Gyrophora cylindrica* (L.) ACH. var. *Delisei* (DESPR.) TH. FR.

Umbilicaria cylindrica var. *Delisei* DESPR. mscr. in NYL. Lich. Scand. (1861) pag. 117.

Gyrophora cylindrica var. *Delisei* TH. FR. Lich. Scand. I (1871) pag. 158. *Zahlbr.* Cat. Lich. IV (1927) pag. 677, ubi syn.

Umbilicaria Feildenii VAIN. Lich. in Nov. Semlja (1898) pag. (85).

Gyrophora cylindrica var. *Delisei* f. *Feildenii* (VAIN.) ELENKIN Lich. Spitsb. (1906) pag. 2.

II. Matotchkin Shar: East of Cape Jouravlev and Belushii Bay. Serebryanka Fjord.

IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Mt. Dietrichson and Sol Bay.

Var. *Delisei* is evidently widespread in Novaya Zemlya, but I had expected to find it much more plentiful than it really was. The different formae of the typical *Gyrophora cylindrica*, especially its f. *fimbriata*, are much more plentiful.

VAINIO has described *Umbilicaria Feildenii*, differing from *Gyrophora cylindrica* by its stipitate thalli. The greater part of my *Delisei*-material must be referred to the *Feildenii*, in some small plants (from Mt. Dietrichson) the stalk is so long that the plants are quite tubiform.

But I can not attribute specific value to that character. In some plants the stalk is very long, in others shorter, in others again so short that it is difficult to say whether there really is a stalk. Quite the same is the case with NYLANDER's *Umbilicaria stipitata*, Lich. Scand. (1861) pag. 289, which has generally not been recognized as specifically distinct from *Gyrophora rugifera*. — I am glad to see that ELENKIN has taken the same view.

The *Feildenii* is not restricted to Novaya Zemlya and to Spitsbergen. There are also such plants in our Ellesmereland collection (leg. SIMMONS).

f. *fimbriata* ACH.

I. Goose Bay. South side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Lasareff, Mt. Syernaia, Belushii Bay, and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Nunatak on Lacrox (Norske) Bræen, Blomster Bay and Sol Bay.
VI. Rookery south of Arkhangel Bay. Pankratyeff Peninsula.

Distributed from the farthest south to the farthest north of the regions, explored by us, common and plentiful everywhere.

Former investigations. Novaya Zemlya (DEICHMANN BRANTH pag. 75), Möller Bay (KUSNETZOFF No. 29), Matotchkin Shar (TH. FRIES pag. 15, HEUGL. pag. 312), Tolyenii Bay and Belushii Bay (STIZ. pag. 420, VAIN. pag. 85, SAV. 1912 pag. 21). Mashigin Fjord: Cape Schantz (ELENK. et SAV. pag. 73). Also from Franz Joseph Land (JACKSON pag. 417 (*Gyrophora Delisei*), ABRUZZI pag. 671 (*Gyrophora tornata* and *Gyrophora cylindrica*), ELENK. et SAV. pag. 82).

Gyrophora Feildenii (VAIN.): Ziwolka Fjord (VAIN. pag. 85).

228. (4). *Gyrophora erosa* (WEB.) ACH.

I. Goose Bay. South side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Lasareff, east of Cape Jouravlev, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance.

IV. Mashigin Fjord: Fram Bay, Nunatak on Lacroix (Norske) Bræen, Mt. Dietrichson, Blomster Bay, Dal Bay, Sol Bay and Rækved Bay.
VI. South of Arkhangel Bay. Lichutin Island.

Common and plentiful all over the land investigated by us; perhaps the commonest *Gyrophora* in Novaya Zemlya. Especially abundant along the beach, but also in the screes.

It varies considerably in Novaya Zemlya as in Norway (cfr. LYNGE Studies Lich. Flora of Norway pag. 92): more or less rigid, more or less erose. In thin thalli the perforations are only seen as crenate lines. The development of the trabeculae and the fibrillae of the under side is also somewhat variable. I tested all the plants of the *Gyrophora erosa* section, mentioned in this work with $CaCl_2O_2$; only two plants gave the positive red reaction, all the others were negative. The reaction was never doubtful. I could not test all my duplicates of *Gyrophora erosa*, they may also contain a *Gyrophora torrefacta*. But certainly the latter species is quite as rare as the former is common.

Former investigations. Novaya Zemlya (MARKH. pag. 332, DEICHMANN BRANTH pag. 75). Matotchkin Shar (HEUGL. pag. 312). Tolyenii Bay, Belushii Bay (STIZ. pag. 420).

229. (5.) *Gyrophora torrefacta* (LIGHTF.) CROMB.

II. Matotchkin Shar: Mt. Wilczek and at Vasnetsoff Glacier.

Certainly rare; cfr. *Gyrophora erosa*.

This species does not only differ from *Gyrophora* erosa by its different chemical reaction, but also by a morphological character: its characteristic lacunose or trabeculose under side. It seems therefore reasonable to treat it as a proper species.

Former investigations. Belushii Bay (VAIN. pag. 85, SAV. 1912 pag. 21).

230. (6). *Gyrophora hyperborea* ACH.

I. Goose Bay. Möller Bay (KJELLMAN and LUNDSTRÖM). South and north side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Matotchka, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson, Dal Bay, Sol Bay and Rækved Bay.
VI. Berkh Island. Lichutin Island.

Common and widespread, but not so plentiful as the coprophilous *Gyrophora arctica*.

Former investigations. Novaya Zemlya (DEICHMANN BRANTH pag. 75). Möller Bay (KUSNETZOFF No. 30). Matotchkin Shar (TH. FRIES pag. 15, HEUGL. pag. 312), Kristovii Fjord (ELENK. et SAV. pag. 73).

231. (7). *Gyrophora arctica* ACH.

I. *Goose Bay.
II. Matotchkin Shar: *Mt. Matotchka, *Mt. Syernaia and Belushii Bay.
IV. Mashigin Fjord: Fram Bay, *Mt. Dietrichson, *Dal Bay, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Pankratyeff Peninsula.

It is a highly nitrophilous species and the well known magnificent plants (diam. 15—20 cm.) are restricted to bird-stones and prominent rocks in the rookeries, where it is very plentiful. Otherwise it is widely distributed, but plants of so extreme demands of life cannot be ubiquitous.

The "typical" *Gyrophora arctica* with large, rigid and coriaceous thalli is strictly limited to bird-stones and other cophrophilous localities. Less peculiar with respect to their stations are plants with a thinner, smaller thallus, beneath pale and blackish at the centre. NYLANDER has referred such plants to *Gyrophora hyperborea* (*Umbilicaria hyperborea* var. *subarctica* NYL. Lich. Lapp. orient. pag. 123). TH. FRIES is of opinion that they are less luxuriantly developed *Gyrophora hyperborea* (Lich. Scand. pag. 162), and he is evidently right.

Such plants have been marked with an asterisc (*) in the above enumeration of localities.

Former investigations. Matotchkin Shar (KBR. pag. 2, SAV. 1911 pag. 46). Also from Franz Joseph Land (ABRUZZI pag. 671, ELENK. et SAV. pag. 82).

232. (8). *Gyrophora proboscidea* (L.) ACH.

I. Goose Bay. South side of Gribovii Bay.
II. Matotchkin Shar: Mt. Matotchka, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Nunatak on Lacroix (Norske) Bræen, Mt. Dietrichson, Mt. Tveten and Sol Bay.
V. Admiralty Peninsula.
VI. South of Arkhangel Bay.

Common, widespread and quite plentiful everywhere. One of the few lichens that were plentiful in the Nunataks. It is best developed in the upper part of the rock-falls.

Former investigations. Novaya Zemlya (DEICHMANN BRANTH pag. 75). Möller Bay (KUSNETZOFF No. 31). Matotchkin Shar (SAV. 1911 pag. 47), Belushii Bay (VAIN. pag. 85, SAV. 1912 pag. 21, with f. *subnuda*). Also from Kolgueff (f. *rhizophora*, SAV. 1912 pag. 21) and from Franz Joseph Land (ABRUZZI pag. 670, ELENK. and SAV. pag. 83).

233. (9). *Gyrophora deusta* (L.) ACH.

II. Serebryanka Fjord.

Supposed to be rare, for I only collected one small, but typical plant.

234. (10). *Gyrophora vellea* (L.) ACH.

IV. Mashigin Fjord: Mt. Dietrichson and Sol Bay.
VI. Rookery south of Arkhangel Bay.

Scarce and rare, I only found a few small plants.

"*Umbilicaria polyphylla*" has been recorded from Novaya Zemlya (MARKH. pag. 332). I have not been able to verify this record.

ACAROSPORACEAE

Biatorella TH. FR.

235. (1). *Biatorella cinerea* (SCHAER.) TH. FR.

I. Goose Bay.
II. Matotchkin Shar: Mt. Wilczek.
IV. Mashigin Fjord: Mt. Dietrichson, Mt. Tveten and Strömsnes Bay.
VI. Lichutin Island.

My collections suggest a lichen that is widely distributed, but not too common and quite scarce where I found it. But most probably it is more common than these few stations suggest. It is a summit lichen in Norway and I may have overlooked it in Novaya Zemlya, for I did not know it well enough in 1921.

var. *incolorata* LYNGE nov. f. ad int.

II. Matotchkin Shar: Chalhonik Valley.

Thallus mediocris, diam. ca. 2—3 cm., pallide cinereus, centrum versus areolis ± rotundatis, subdiscretis, hypothallo atro impositis, formatus, marginem versus rimoso-areolatus, subeffiguratus, hypothallo atro anguste (0.3 mm.) circumdatus. Areolae leviter convexa, minutissime gyroso-plicatae, opacae.

Apothecia rotundata vel saepe angulata, minuta, diam. 0.2 mm., rarius usque ad 0.5 mm., dispersa, numerosa, inter areolis immersa, thallum aequantia. Apothecia composita, discus papillatus vel vulgo subgyrose plicatus, inter rugis ater, epruinosus. Margo apotheciorum albus vel albido-cinereus, tenuis, ut videtur persistens, subinteger. Hypothecium excipulumque incoloria. Hymenium strato amorpho tectum, superne olivaceo-fuligineum, praeterea incolor vel dilutissime in roseolum vergens, 90—95 μ altum. Paraphyses inferne tenues, laxe cohaerentes, superne clavatae (4—4.5 μ), obscuratae et ibi cohaerentes. Sporae numerosissimae, globosae vel subglobosae, diam. 2.5—2.8 (—3) μ.

Medulla J÷, KOH÷, sed $KOH + CaCl_2O_2$ rubescens. Hymenium J e caeruleo vinosum.

The diagnosis shows its near affinity to *Biatorella cinerea.* The only distinguishing character of importance is the different colour of the hypothecium. TH. M. FRIES writes "hypothecium fuscum vel fusconigrum" (Lich. Scand. pag. 404); I found this colour in all the other plants of *Biatorella cinerea.* A different colour of the hypothecium is generally a specific character, it may here be a variable character. This question can only be solved by a monographical investigation. I found an uncoloured hypothecium in MALME Lich. suec. No. 666 (*Biatorella cinerea*) and also in a plant collected by KOERBER "in Sudetis" in our herb. (*Sporastatia cinerea*).

Having no access to SCHAERER's type plant I cannot clear up this question.

The thallus of my *incolorata* is leaden-grey, not or indistintly effigurate at the circunference. Its areolae are more discrete towards the centre than in the type.

It has profoundly corroded apothecia with dark (reddish-brown) hypothecium and often the same colour in its hymenium, at least pro parte. Its apothecia are often morbous.

I have never seen *Biatorella coracina* with this colour. It is well separated from that species by its opaque thalline colour, cariose apothecia and dark hypothecium.

Former investigations. Tolyenii Bay in Matotchkin Shar (STIZ. pag. 421, s. n. *Gyrothecium polysporum*), Belushii Bay in Matotchkin Shar (VAIN. pag. 87, s. n. *Acarospora cinerea*).

236. (2). *Biatorella coracina* (SOMRFT.) LYNGE.

Lecidea coracina SOMRFT. Suppl. Fl. Lapp. (1826) pag. 142.

Biatorella testudinea (ACH.) MASS. TH. FRIES Lich. Scand. (1874) pag. 403, ubi syn.

Biatorella coracina (SOMRFT.) LYNGE Lich. from Spitsbergen (1924) pag. 5. Lich. Bear Island (1926) pag. 44.

I. Goose Bay. North side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Matotchka, Mt. Lasareff, near Vasnetsoff Gl., Chalhonik Valley, east of Cape Jouravlev, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, several localities on the south side of Blaafjell Basin, Nunatak on Lacroix (Norway) Glacier, Mt. Dietrichson, Mt. Tveten and Sol Bay. North of the Fjord entrance.
VI. Lichutin Island. Berkh Island. Mainland east of Lichutin Island. Pankratyeff Peninsula.

Plentiful all over the area investigated by us, from the beach to the nunataks, even on the moraines. It is one of the commonest plants of Novaya Zemlya.

Its colour is very variable, from pale, almost ochroleucous, to dark, almost black. But no systematical importance is to be attributed to this variation. — Generally stated to be KOH ÷, I have found its cortex to give a violet colour with KOH.

I found nothing that could be referred to *Biatorella tenuirimata* TH. FR. Lich. Spitsb. pag. 42.

Former investigations. Only recorded from Karmakuli (*Biatorella testudinea* et var. *coracina*, MAGN. pag. 10) and from Tolyenii Bay in Matotschkin Shar (STIZ. pag. 421).

237. (3). *Biatorella* cfr. *pruinosa* (SM.) MUDD.

VI. Berkh Island.

Only a few apothecia without thallus. They are not pruinose, as usual in this species, adpressed to (not immersed into) the calcareous stone. Their size is up to 1,7 mm., the moistened disk is reddish-brown.

When I first looked over my material I referred this plant to the genus *Acarospora* and sent it to MAGNUSSON, who has determined that genus in my material. But he returned it with the following remarks: "Excipulum dark brown, without gonidia. No or few gonidia below the hypothecium. Hymenium 110—130 μ, J + dark blue, uppermost 10 μ reddish brown. Hypothecium 60—70 μ, white. Ripe spores rare, 3—4.5 $\times$ 1.8 μ. Paraphyses gelatinized. *Biatorella* sp."

My determination is quite approximate.

238. (4). *Biatorella simplex* (DAV.) BR. et ROSTR.

Biatorella simplex TH. M. FRIES Lich. Scand. II pag. 407, ubi syn.
Biatorella privigna A. L. SMITH Brit. Lich. II (1926) pag. 121, ubi syn.

IV. Mashigin Fjord: South side of Blaafjell Basin and at Mt. Tveten, on hard rocks.

There are only two plants in my collection. — It may be common enough for that reason, for it is easily overlooked.

Crusta obsoleta. Apothecia dispersa vel subdispersa, elevata, corrugata vel interdum haud difformia. Discus primo concavus, dein planus, ater, epruinosus, rugosus (sub lente), margine crasso radiatim rupto vel crenato circumdatus. Excipulum carbonaceum, gonidiis destitutum, hypothecium omnino incoloratum. Hymenium altum: 130 μ, superne flavofuscescens. Sporae anguste ellipsoideae: 3—5$\times$1—1.5 μ.

Hymenium J e caeruleo mox vinosum.

The colour of the hypothecium, the form of the spores and the chemical reaction of the hymenium exclude *Biatorella Clavus.*

The anatomical texture of the apothecia agrees better with *Biatorella pruinosa.* I have measured very narrow spores (3—4$\times$1 μ) in a *Biatorella pruinosa* (leg. & det. J. M. NORMAN) from Trondenes in Northern Norway. But *Biatorella pruinosa* is typically a chalk plant with larger, more immersed and pruinose apothecia with a thin, entire margin, I cannot identify my plant with it.

My plant differs from *Biatorella simplex*, as generally seen in Norway (e. g. HAVAAS Lich. exsic. Norv. No. 130) by the habitus of its apothecia (see my description). They are not so "difformia . . . corrugata", as stated by TH. FRIES Lich. Scand. II pag. 407. — It is quite possible that a monographer could divide the genus into many pétites éspèces, as MAGNUSSON has done with the related genus *Acarospora.*

TH. FRIES names this species *Biatorella simplex*, based on "*Lichen simplex* DAV. Transact. Linn. Soc. II (1794) pag. 283 (sec. spec. orig.)". A. L. SMITH (l. c.) writes: *Biatorella privigna*, based on *Lecidea privigna* ACH. Meth. Lich. (1803) pag. 49. She adds: "*Lichen simplex* SM. Engl. Bot. t. 2152 (two right-hand figs.) (1810) non DAV." It is impossible for me to decide the question without access to DAVIES' type plant.

Acarospora MASS.

My material of this genus has been determined by Mr. A. H. MAGNUSSON, Göteborg, who identified the following 10 species (A. H. MAGNUSSON: *Acarospora*, Report of the Scientif. Results of the Norwegian Expedition to Novaya Zemlya 1921, No. 34, pag. 1—7. Oslo 1926.

239. (1). *Acarospora badiofusca* (NYL.) TH. FR.
240. (2). — *bullata* ANZI var. *arctica* H. MAGN. n. var.
241. (3). — *chlorophana* (WNBG.) MASS. (= *A. flava* in ZAHLBR. Cat. Lich. V pag. 104.
242. (4). — *glaucocarpa* (WNBG.) KBR.
243. (5). — *interposita* H. MAGN. n. sp.
244. (6). — *Lesdainii* (HARM.) A. L. SMITH.
245. (7). — *molybdina* (WNBG.) MASS.
246. (8). — *Novae Zemliae* H. MAGN. n. sp.
247. (9). — *sinopica* (WNBG.) KBR.
248. (10). — *veronensis* MASS.

Former investigations. HEUGLIN pag. 314 records a "*Lecanora* a stirpe *cervinae*". No locality.

DEICHM.-BR. pag. 76 records "*Lecanora fuscata* var. *rufescens*". No locality.

MAGNUSSON pag. 10 records *Acarospora molybdina* from Karmakuly.

PERTUSARIACEAE

Pertusaria DC.

249. (1). *Pertusaria bryontha* (ACH.) NYL.

II. Matotchkin Shar: Pomorskaya, near Vasnetsoff Gl. and south side of the Shar at the Kara Sea entrance. Sukhoi Noss.

I only found a few plants. This suggests it to be scarce. But all the localities being in one district, this species has perhaps been overlooked in other districts. All my plants are fertile: one spore in each ascus, thick-walled and large (about 170 μ long).

250. (2). *Pertusaria oculata* (DICKS.) TH. FR.

I. Goose Bay.
II. Matotchkin Shar: Pomorskaya, Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, Mt. Tveten, Dal Bay and Sol Bay.

This is the only *Pertusaria* that is really common. I have a lot of plants, but I did not find it north of Mashigin Fjord.

My plants are perfectly developed, just as in Norway, and some of them are fertile (from Goose Bay).

Former investigations. Recorded from Franz Joseph Land (ABRUZZI pag. 674), but not from Novaya Zemlya.

251. (3). *Pertusaria panyrga* (ACH.) TH. FR.

II. Matotchkin Shar: Near Vasnetsoff Glacier.

Supposed to be rare, I only found a few plants.

Former investigations. Recorded from Franz Joseph Land (ABRUZZI pag. 674), but not from Novaya Zemlya.

252. (4). *Pertusaria dactylina* (ACH.) NYL.

I. Goose Bay.
II. Matotchkin Shar: Belushii Bay. Sukhoi Noss.
IV. Mashigin Fjord: Strömsnes Bay.
V. Admiralty Peninsula.
VI. South of Arkhangel Bay.

Pertusaria dactylina is distributed all over the region investigated by us, but it must be rare, for I only detected a few plants. All my plants are sterile. Distinguished from *Pertusaria oculata* by its white ("albissimae" TH. FR. Lich Scand. I pag. 310) and much thicker papillae.

Former investigations. Recorded from Möller Bay (KUSNETZOFF No. 58) and Matotchkin Shar (TH. FRIES pag. 15, HEUGL. pag. 314).

253. (5). *Pertusaria coriacea* TH. FR.

Pertusaria coriacea TH. FR. Lich. Scand. (1871) pag. 318, ubi syn. VAINIO Lich. Pitlek. (1909) pag. 57.

Pertusaria subobducens NYL. DARBISHIRE Lichens pag. 29, in Report Sec. Arct. Exp. Fram 1898—1902 No. 21. Non *Pertusaria subobducens* NYL. Lichenes novi e Freti Behr. Flora 1884 pag. 221.

I. Möller Bay (KJELLMAN & LUNDSTR. 1875).
II. Matotchkin Shar: Near Vasnetsoff Gl., Mt. Wilczek, east of Cape Jouravlev and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: South and north side of Blaafjell Basin and Mt. Tveten.
VI. Berkh Island.

Pertusaria coriacea is widely distributed, but perhaps scarce in Novaya Zemlya. There are numerous black spots on the verrucae, resembling apothecia. But if these spots are apothecia they are aborted at an early stage, I cut several of them and found no hymenia. At least some of them are pycnides. I detected fertile pycnides, with conidia bacilliform, straight or slightly curvate, 10—14 μ long. TH. FRIES measured just the same size (l. c. pag. 319).

This species is easily mistaken for an *Ochrolechia*, but it differs by its intensely red reaction with KOH. *Pertusaria glomerata* has the same reaction, but apart of the differences in the apothecia and the spores the latter species is almost opaque, whereas *Pertusaria coriacea* is nitidous, with a corneous lustre.

Pertusaria coriacea is widely distributed in the Arctis. During the Second Norw. Exped. in the Fram SIMMONS collected a considerable number of plants, which DARBISHIRE referred to *Pertusaria subobducens* NYL. But NYLANDER expressly states that this species differs from *Pertusaria obducens* NYL. (= *coriacea* TH. FR.) by its negative reaction with KOH. I have tested all the Ellesmereland plants with KOH and always found an intensely red reaction.

Former investigations. Recorded from Waigatsch (TH. FRIES pag. 15, HEUGL. pag. 314), but not from Novaya Zemlya.

254. (6). *Pertusaria lactea* (L.) NYL.

IV. Mashigin Fjord: Mt. Tveten at the upper part of the rock-fall.

There are only two plants in my collection, but they are perfectly developed, diam. up to 7—8 cm., quite white (cretaceus), radiate at the circumference, cracked-areolate, the few soredia are globular with an almost coralloid surface, sometimes they are dehiscent, leaving a crateriform impression. There are no apothecia. Intensely red with $CaCl_2O_2$.

MALME as well as ERICHSEN confirmed my determination.

Pertusaria cribellata DB. DEICHMANN BRANTH has described this species from Novaya Zemlya (pag. 76).

Pertusaria glomerata (ACH.) SCHAER. has not been recorded from Novaya Zemlya, but (with doubt) from Franz Joseph Land (ABRUZZI pag. 674). Can it be *Pertusaria coriacea*?

Pertusaria solitaria H. MAGN. has been described from Karmakuly (MAGN. pag. 7).

LECANORACEAE

Lecanora (ACH.) A. ZAHLBR.

Dr. ALEXANDER ZAHLBRUCKNER, Wien, has determined my large material (more than 1000 plants) of this important genus. His paper will be published in our Reports, as No. 44.

We have received Dr. ZAHLBRUCKNER'S manuscript, which contains the following species, alphabetically arranged:

255. (1). *albescens* (HOFFM.) TH. FR.
256. (2). *aliena* A. ZAHLBR.
257. (3). *alpina* SOMRFT.
258. (4). *atra* (HUDS.) ACH.
259. (5). *atrosulphurea* ACH.
260. (6). *atrynea* (ACH.) RÖHL.
261. (7). *badia* ACH.
262. (8). *Behringii* NYL.
263. (9). *bicincta* RAM.
264. (10). *castanea* (HEPP) TH. FR.
265. (11). *cenisea* ACH.
266. (12). *cinerea* (L.).
267. (13). *cingulata* A. ZAHLBR.
268. (14). *coilocarpa* (ACH.) NYL.
269. (15). *conizaea* (ACH.) NYL.
270. (16). *contractula* NYL.
271. (17). *dispersa* (PERS.) RÖHL.
272. (18). *epibryon* ACH.
273. (19). *flavida* HEPP.
274. (20). *frustulosa* (DICKS.).
275. (21). *gelida* (LINN.) ACH.
276. (22). *gibbosa* (ACH.) NYL.
277. (23). *glaucoma* ACH.
278. (24). *granatina* SOMRFT.
279. (25). *gyrodes* NYL.
280. (26). *heteroplaca* A. ZAHLBR.
281. (27). *hyperboreorum* A. ZAHLBRUCKNER.
282. (28). *intricata* (SCHRAD.) ACH.
283. (29). *lacteorosulans* A. ZAHLBRUCKNER.
284. (30). *lacustris* (WITHER) NYL.
285. (31). *laevata* (ACH.) NYL.
286. (32). *Lyngei* A. ZAHLBR.
287. (33). *maschiginensis* A. ZAHLBRUCKNER.
288. (34). *mastrucata* (WBG.) TH. FR.
289. (35). *melanaspis* (ACH.) TH. FR.
290. (36). *Nordenskiöldii* VAIN.
291. (37). *Novaiae-Semliae* A. ZAHLBR.
292. (38). *ochrofusca* A. ZAHLBR.
293. (39). *ossiseda* A. ZAHLBR.
294. (40). *peltata* (RAM.) A. ZAHLBRUCKNER.
295. (41). *permelancholica* A. ZAHLBR.
296. (42). *perradiata* NYL.
297. (43). *plicigera* A. ZAHLBR.
298. (44). *polytropa* (EHRH.) TH. FR.
299. (45). *proserpens* NYL.
300. (46). *silvatica* (ZW.) SANDST.
301. (47). *sublapponica* A. ZAHLBR.
302. (48). *subtorrida* A. ZAHLBR.
303. (49). *supertegens* (ARN.) A. ZAHLBR.
304. (50). *varia* (EHRH.) ACH.
305. (51). *verrucosa* ACH.
306. (52). *verruculosa* (KREMPLH.) STEINER.

Ochrolechia MASS.

307. (1). *Ochrolechia frigida* (SW.).

Ochrolechia tartarea var. *frigida* (SW.); vide TH. M. FRIES Lich. Scand. I (1871) pag. 234, ubi syn.

Crusta satis tenuis, granulosa vel subramulosa vel etiam fere coralliformis, fragilis, albida vel pallide cinerascenti-albida, continua, sorediis isidiisque destituta, spinulis ± longis instructa.

Apothecia non rara, magna, diam. usque 6—7 mm., sessilia. Discus planus, epruinosus, testaceus vel magis fuscescens, margine persistenti, integro vel crenato circumdatus. Cortex receptaculi incolor, crassus, usque 200 μ, hyphis indistinctis conglutinatis formatus. Hymenium incolor, etiam cum hypothecio, strato incolori tectum, altum (e. g. 130 μ altum). Paraphyses cohaerentes, tenuissimae (1 μ), apicem versus saepe geniculatae, furcatae, non incrassatae. Sporae ± pachydermaticae, 28—40 (—50) × 15—22 μ.

Hymenium J e caeruleo intense vinosum, praecipue asci. Thallus KOH ÷ vel flavescens, cortex $CaCl_2O_2$ rubescens.

f. *typica* LYNGE n. f.

Crusta granulosa, breviter spinulosa. Apothecia non rara.

I. Goose Bay.
II. Matotchkin Shar: Mt. Lasareff, Mt. Wilczek, Chalhonik Valley, east of Cape Jouravlev, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, south of Blaafjell Basin, Mt. Dietrichson, Mt. Tveten, Strömsnes Bay and Sol Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Berkh Island. Lichutin Island.

f. *gonatodes* (ACH.)

Lecanora tartarea var. *gonatodes* (ACH.) TH. FR. Lich. Scand. I (1871) pag. 234, ubi syn.

Crusta luxurians, papillosa vel ramulosa vel intertum subcoralloidea, breviter cornuto-spinulosa vel espinulosa. Vulgo bene fertilis.

II. Matotchkin Shar: Near Vasnetsoff Gl. and at Mt. Wilczek.
VI. Berkh Island. Northern Kristovii Island.

[f. *thelephoroides* (TH. FR.).

Lecanora tartarea var. *thelephoroides* TH. FR. Lich. Spitsb. (1867) pag. 21. Lich. Scand. I (1871) pag. 234.

Crusta varia evoluta, spinulae longae, filiformes, saepe ramosae, crusta vulgo leviter in rosaceum vergens, praecipue spinulae.

Exsic. Krypt. Exsic. Vind. 2460].

It is impossible to understand how a plant could be more common than the *frigida typica*. It is plentiful all over the region explored by us (perhaps with the exception of the chalky regions?). It is equally plentiful on naked earth, often with *Lecidea ramulosa*, on small mosses and amongst the perennial parts of several vascular plants. It is a dangerous neighbour, it invades other lichens and mosses as well as vascular plants, it covers them and kills them. It must have an extraordinarily rapid growth.

f. *gonatodes* is but sparingly represented in my collection, but it is widespread; curiously enough f. *thelephoroides* was entirely lacking.

These formae represent types of variation. They are connected by every intermediate stage.

Ochrolechia frigida is distinguished from *Ochrolechia tartarea* by its thinner esorediate thallus. The latter species has a thick, friable, sorediate thallus. It seems to me that this is sufficient for specific distinction.

Plants with a destroyed cortex are quite common. They regenerate new granules, without developing soredia. Espinulose plants with very convex granules can be confused with *Pertusaria glomerata* or *Pertusaria coriacea*. These species have a firmer cortex and it are easily recognized by their intensely blood-red staining with KOH.

Miss A. L. SMITH has been kind enough to examine *Lichen tartareus* in herb. LIN. in London. There are sorediate as well as esorediate plants under this name. His *Lichen frigidus* is "evidently var. *frigida*."

Former investigations. "*Ochrolechia tartarea*" has been recorded by many authors, as was to be expected. Möller Bay (KUSNETZOFF No. 45), Matotchkin Shar (TH. FRIES pag. 15, HEUGL. pag. 314), Belushii Bay (MAGN. pag. 7), Mashigin Fjord: Cape Schanz (ELENK. et SAV. pag. 77).

F. *thelephoroides:* Karmakuli (SAV. 1912 pag. 33), Matotchkin Shar: Belusha (SAV. 1911 pag. 49, 1912 pag. 33), Kristovii Fjord (ELENK. et SAV. pag. 77).

F. *gonatodes*: Novaya Zemlya (DEICHM. BRANTH pag. 75).

Var. *grandinosa*: Belushii Bay (MAGN. pag. 7).

Also from Waigatsch (TH. FRIES pag. 15, HEUGL. pag. 314). KOLGUEFF (SAV. 1912 pag. 33) and Franz Joseph Land (ELENK. et SAV. pag. 88).

308. (2). *Ochrolechia Grimmiae* LYNGE n. sp.

Plate XI, fig. 4.

I. Goose Bay. South side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Matotchka and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson, Mt. Tveten and Sol Bay.
V. Admiralty Peninsula.
VI. South of Arkhangel Bay.

Planta semper supra *Grimmia (Rhacomitrium) hypnoides* parasitica. Protothallus tenuissimus, membranaceus, albida vel pallide albido-cinerascens, supra hanc crustam glomeruli protothallo concolores, dispersi, rotundati, parvi, diam. 0.2—0.5 mm., nascuntur. Thallus sorediis, isidiis ciliisque destitutus.

Thallus optime fertilis. Apothecia satis parva, diam. 1—2(—2.5) mm.; discus pallide flavo-fuscescens, planus, epruinosus, margine albido persistenti integro vel leviter crenulato, satis tenui, circumdatus. Hypothecium incolor, ca. 50 μ altum; hymenium altum, usque 170—200 μ, saepe male evolutum. Sporae 27—38×12—22 μ.

Praeterera ut in *Ochrolechia frigida*.

There are 42 plants in my collection, suggesting a common and widespread species, each and every of them growing on *Grimmia (Rhacomitrium) hypnoides*. The apothecia are considerably smaller than in *Ochrolechia frigida*. It is almost invariably fertile (40 fertile out of 42 plants), but the hymenium often degenerates, few spores, if any, are then seen. The asci are originally octosporous, but generally only a few of these 8 spores arrive at maturity.

It first draws a thin, sometimes almost invisible film (protothallus) over the attacked *Grimmia*, then it develops its button-like small scattered glomeruli. It might be discussed whether this peculiar habitus is due to its substratum only, a rapidly growing *Grimmia* might disperse its thalline glomeruli, which would otherwise have been continuous. In that case it would not have been a proper species, but only a biological modification. But the *Ochrolechia* must also be a quick grower and it soon prevails over its unhappy substratum, the *Grimmia* is literally killed. Plants growing on killed *Grimmiae* preserve their habitus, a thin protothallus and dispersed small button-like glomeruli, these never form a continuous crusta as they do in *Ochrolechia frigida* (and still more in *tartarea*).

309. (3). *Ochrolechia inaequatula* (NYL.) A. ZAHLBR.

Lecanora inaequatula NYLANDER Lich. novi e Freti Behringii; Flora (1885) pag. 603. Enum. Lich. Freti Behringii (1888) pag. 63. HUE Lich. Exotici (1892) pag. 153, No. 1459.

Ochrolechia inaequatula (NYL.) ZAHLBR. Krypt. Exsic. Vind. No. 2069 (1913), ubi syn.

I. Goose Bay (?).
II. Matotchkin Shar: Pomorskaya (?) and Belushii Bay.
IV. Mashigin Fjord: Fram Bay, Nunatak on Lacroix (Norway) Glacier, Mt. Dietrichson, Mt. Tveten and Dal Bay.
VI. On the beach south of Arkhangel Bay (?).

There are not many plants in my collections, but the localities are so numerous that it must be quite common. Its distribution in the Scandinavian peninsula has not yet been cleared up, but there are so many plants in the Scandinavian herbaria from the Northern parts of our peninsula that it must be quite common there.

Ochrolechia inaequatula is distinguished by its granulato-papillose thallus which on a more superficial examination quite suggests a *Pertusaria*, and especially by its limited small granular erect isidia. The apical cortex of these isidia is often destroyed and soredia are developed. If the isidial cortex is destroyed all over subleprose granulations are formed (isidia sorediiformiter fatiscentia). In these Arctic plants the isidia are often small and inconspicuous, a quite unobjectionable determination of such atypical plants is often difficult.

Ochrolechia geminipara has just the same type of isidia, but it is distinguished by its asci which only contain two spores. Practically all my plants are sterile. There is only one really fertile plant (Mt. Tveten), the spores were not ripe in its best apothecium, which was sectioned, but the asci were distinctly octosporous. I cannot exclude the possibility that some of my sterile plants should belong to *Ochrolechia geminipara*.

In the type of *Ochrolechia subtartarea* (hb. Helsingfors) the thallus is continuous, leprose, not papillose. Such plants were not collected in Novaya Zemlya.

Lichenologists do not agree with respect to the specific rank of *Ochrolechia inaequatula*. Du Rietz who has devoted much study to this genus is of opinion that *Ochrolechia inaequatula* is only an alpine forma of *Ochrolechia tartarea*, A. H. Magnusson and the present writer are inclined to regard it a proper species.

310. (4). *Ochrolechia upsaliensis* (L.) Mass.

II. Matotchkin Shar: Mt. Wilczek, Chalhonik Valley and Belushii Bay.
IV. Mashigin Fjord: Mt. Tveten.

Hardly common and generally not plentiful, only at Mt. Wilczek I found many plants.

My plants are well fertile and perfectly developed.

It must be widely distributed in the Arctis, for it has been recorded by Nylander from Konyam Bay (Lich. Freti. Behr. pag. 81) and from Ellesmereland: Harbourfjord (Darb. Lichens pag. 28. Rep. Arct Exp. Fram).

Icmadophila ericetorum has been recorded from Kolgueff (Sav. 1912 pag. 36), but not from Novaya Zemlya.

Lecania (MASS.) TH. FR.

311. (1). *Lecania alpivaga* TH. FR.

VI. Berkh Island.

I only detected one plant. Its thallus is much thinner than in the Scandinavan plants which I have seen, and its colour is paler (more grey). Spores one-septate, uncoloured, 13—18×4.5—6 μ.

Lecania aipospila which is so common along the Norwegian Arctic coasts was not found. It has been recorded from Spitsbergen and from Bear Island, but as a rare plant.

312. (2). *Lecania arctica* LYNGE n. sp. ad int.

An syn. *Lecania Ralfsii* (CROMB.) A. L. SM.?

II. Matotchkin Shar: Near Vasnetsoff Gl., only one plant on a siliceous rock.

Thallus crustaceus, sed bene evolutus, reticulato-rimosus, areolae cinerascentes, leviter in fuscescentem vergentes, convexae. Hypothallus quam thallo obscurior, parce evolutus.

Apothecia adpressa vel satis prominentia, parva: 0.4—0.7 mm., primo diuque plana, dein ± convexa. Discus epruinosus, ater vel madefactus obscure fuscescenti-nigrescens. Excipulum gonidiis numerosis instructum, superficiem versus subplectenchymaticum. Hypothecium omnino incolor, hyphae crebre contextae. Hymenium 80—90 μ altum. Paraphyses facile discretae, apicem versus clavatae, constricte septatae, fuscescentes. Sporae magnae: 13—17×7—9 μ, incolores, interdum leviter constrictae, sed si bene evolutae vulgo non constrictae; episporium mediocriter incrassatum.

Pycnoconidia minuta, ellipsoidea, 2 μ longa.

Hymenium J caerulescens, apices ascorum persistenter colorantur, hymenium praeterea vinosum.

The size of its spores and pycnoconidia suggests a near relationship to *Lecania Ralfsii*, found on siliceous maritime rocks round the British coast. *Lecania Ralfsii* has also been recorded from the Norwegian west coast by HAVÅS. I have examined the apothecia of his Lich. Norv. Occid. No. 49 and found its spores too small for this species: 12—13×5—6 μ.

Unfortunately I have not seen British *Lecania Ralfsii*, and I cannot exclude the possibility that it is identical with my plant. But it is highly improbable to find an endemic British species in Novaya Zemlya. To judge from the descriptions in British floras my plant has shorter spores: 13—17×7—9 μ, against 18—23×6—9 μ, and another colour:

grey with a tinge of brown, against the "dark-green" colour described by A. L. SMITH in Brit. Lich. 1918 pag. 342.

"*Lecanora disceptans* NYL.", which is a *Lecania*, (NYL. Flora 1884 pag. 212 and Lich. Freti Behr. pag. 28) has a "thallus albidus vel albido-cinerascens"; it is impossible to find this colour in my plant. Otherwise it is difficult to find the difference between *Lecania disceptans* and *Lecania Ralfsii* after NYLANDER's diagnosis.

313. (3). *Lecania flavescens* LYNGE n. sp.

Plate II, fig. 20—21.

VI. Mainland east of Lichutin Island.

Only one plant, but it is perfectly developed. It was found on a chalky rock (pure chalk).

Thallus flavescens vel cinereo-flavescens, parvus, maculas irregulares, 1—2 mm. latas format, determinatus, hypothallo tenui, $\pm$ distincto, angusto, quam thallo pallidiori, circumdatus. Thallus satis crassus, verrucoso-granulatus vel si bene evolutus rimoso-areolatus, areolae convexae, saepe apotheciis ornatae.

Apothecia dispersa, in areolis convexis immersa, parva, diam. 0.2—0.3 mm. Discus ater, epruinosus, deinde convexus, margine primo integro, tum excluso. Excipulum incolor vel in parte exteriori pallide cinereo-flavescens, gonidiis repletum. Hypothecium incolor. Hymenium angustum, 45—50(—55) μ altum, dilute violaceum, superne intensius coloratum, intense violaceum vel violaceo-fuligineum. Paraphyses laxe cohaerentes, superne violascentes, capitatae vel clavatae (5—7 μ), constricte septatae. Asci saccati, 30—35 $\times$ 13—15 μ, octospori, membrana superne valde incrassata. Sporae incolores, medio constricte septatae, 9—13 $\times$ 4—5 μ; episporium tenue.

Pycnoconidia filiformia, arcuata, 11—15 μ, vulgo 13 μ longa.

Medulla J non caerulea, KOH $\div$, hymenium J primo fere nigrescens, deinde asci caerulescentes et gelatina hymenialis obscure vinosum colorantur.

Its spores and pycnoconidia agree with those of *Lecania actaea* (NYL.), but the thallus of that species is leaden-grey and much thinner; in the type plant it is hardly visible to the naked eye; and its epithecium is blue. The colour of thallus and apothecia must also distinguish *Lecania flavescens* from *Lecania spodophaeiza*. Its name suggests a resemblance with *Lecanora spodophaea*, but the papillose thallus of that species is very different from my species, which is areolate more than verrucose, if the thallus is sufficiently developed. The spores of *Lecania disceptans* (NYL.) Enum. Lich. Freti Behr. (1888) pag. 28 are much larger: 15—25 $\times$ 7—8 μ.

Haematomma MASS.

314. (1). *Haematomma ventosum* (L.) MASS.

I. Goose Bay. South side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Matotchka, Belushii Bay and at the Kara Sea entrance. Serebryanka Fjord, in the rookery.
IV. Mashigin Fjord: Mt. Dietrichson and Sol Bay.

In Novaya Zemlya *Haematomma ventosum* is distinctly southern. The Mashigin Fjord plants were small and poorly developed, on the whole it is not so well fertile as in Norway, and the spores are often shrunken.

Haematomma ventosum is not common and rather scarce.

Former investigations. Novaya Zemlya (MARKH. pag. 332. DEICHMANN BRANTH pag. 76). Karmakuli (SAV. 1912 pag. 33, MAGN. pag. 7), Möller Bay (KUSNETZOFF No. 57), Matotchkin Shar (TH. FRIES pag. 15, HEUGL. pag. 314), Belushii Bay (VAIN. pag. 86).

Candelariella MÜLL. ARG.

315. (1). *Candelariella cerinella* (FLK.) A. ZAHLBR.

II. Matotchkin Shar: East of Cape Jouravlev (lignicola) and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Reidar River delta, Blomster Bay and Rækved Bay.
VI. Berkh Island. Northern Kristovii Island.

Very widespread, certainly found all over the region explored by us. The saxicolous plants are evidently restricted to chalky rocks. I have found several muscicolous plants; they should not be confused with *Caloplaca Jungermanniae*.

var. *unilocularis* ELENK.

Elenkin Lich. Florae Ross. Med. II (1907) pag. 273.

II. Serebryanka Fjord.

Examining a *Candelariella* from a whale-bone I found octosporous asci with simple, slightly fabaceous and very large spores: 24—30 $\times$6—8 μ. This size is so much larger than the common size of *Candelariella cerinella*-spores: 10—17$\times$4.5—6 (TH. FR. Lich. Scand. pag. 190), 14—21$\times$4—7 (HARM. Lich. France pag. 869), 12—21$\times$5—7 (SMITH Mon. Brit. Lich. pag. 229) that it suggested a new species. But other apothecia on the same bone (plant) gave spores of intermediate size: 13—19×5—6.5, 18—24×6.5—8. The spore size is, accordingly, very variable. I only found rather few uniseptate spores with the typical, approximated loculi.

Former investigations. *Candelariella cerinella* has been recorded from Möller Bay (KUSNETZOFF No. 38). Also from Jugor Shar (TH. FRIES pag. 15, HEUGL. pag. 313), and from Franz Joseph Land (ABRUZZI pag. 673).

316. (2). *Candelariella vitellina* (EHRH.) MÜLL. ARG.

I. Goose Bay. Veselago Isl.

II. Matotchkin Shar: Mt. Lasareff, Mt. Wilczek, Vasnetsoff Gl., Chalhonik Valley, Mt. Syernaya, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.

IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Blomster Bay, Dal Bay, Sol Bay and Rækved Bay. North of the Fjord entrance.

V. Admiralty Peninsula.

VI. Rookery south of Arkhangel Bay.

Very common all over the area investigated by us; it is almost ubiquitous. It grows on hard rocks, decayed mosses and on the soil, rarely on drift-wood.

The saxicolous plants generally have no thallus developed or only a poor and thin one. Their apothecia are numerous, but small, with crenate margins. Asci are always found, but the spores are evidently more rapidly ejaculated than usual with the lichens, for empty asci are very common.

These plants differ considerably from a variety, growing on the soil, especially in the rookeries. Its thallus is thicker, often forming a continuous thick crusta. It is usually sterile and spores are still rarer than the apothecia. It is so distinct that it might be regarded a proper species, but it is safer to regard it an overfed plant.

There is a certain nuance of colour between this species and *Candelariella cerinella*, but I do not venture to distinguish them externally. I have therefore examined the apothecia of all the fertile plants above mentioned. I have referred to this species many sterile plants, growing on mosses and on the soil. Some of them are, perhaps, *Candelariella cerinella*.

There are two plants of "*Candelaria concolor*" from the 2nd. Arctic Exp. Fram (Goosefjord and Framshavn), growing on naked earth, leg. SIMMONS, det. DARBISHIRE. I would refer them to *Candelariella vitellina*, but the plants are sterile and I cannot exclude *Candelariella cerinella*.

Former investigations. Novaya Zemlya (DEICHM. BRANTH pag. 75), Möller Bay (KUSNETZOFF No. 37) and Tolyenii Bay in Matotchkin Shar (TH. FRIES pag. 15, HEUGL, pag. 313). var. *xanthostigma*: Novaya Zemlya (DEICHM. BRANTH pag. 75).

317. (3). *Candelariella crenulata* (WBG.)

Vide TH. FRIES Lich. Scand. I (1871) pag. 187, ubi syn.

VI. Rookery south of Arkhangel Bay.

One of the most ornithocoprophilous lichens existing. I collected it in considerable abundance in Spitsbergen (Bell Sound) in 1926 and had expected to find more of it in Novaya Zemlya, which is so well stocked with birds.

PARMELIACEAE

Parmeliopsis NYL.

318. (1). *Parmeliopsis ambigua* (ACH.) NYL.

VI. On drift-wood south of Arkhangel Bay.
Certainly rare, I only found a few plants.

Parmelia (ACH.) DE NOTRS.

Sect. *Hypogymnia* NYL.

319. (1). *Parmelia physodes* (L.) ACH.

I. Goose Bay. South side of Gribovii Fjord.
II. Matotchkin Shar: Pomorskaya, Belushii Bay and south side at the Kara Sea entrance.

These stations suggest a species of more southern distribution in Novaya Zemlya. *Parmelia physodes* grows on the stones of the beach; it is not common, but rather plentiful where I found it.

It has the condensed habitus of alpine *Parmelia physodes*, the lobes are then connivent and short. Plants with elongated lobes, approaching *Parmelia vittata*, are rare. I detected no plant that could be referred to *Parmelia vittata*. Some plants were blackened and fragile, suffering from a fungal disease.

320. (2). *Parmelia subobscura* VAIN.

Parmelia subobscura VAIN. Lich. Pitlek. (1909) pag. 33.

I. Gribovii Fjord: North side.
II. Matotchkin Shar: Near the Kara Sea entrance.
IV. Mashigin Fjord: North of the fjord entrance.

V. Admiralty Peninsula.
VI. Lichutin Isl. Mainland east of Lichutin Isl. Eastern and Northern Kristovii Islands.

Widely distributed and quite common, in places plentiful. It is a nitrophilous plant, found on prominent rocks etc. where birds like to rest. In the Arctis "nitrophilous" is almost synonymous with "ornithocoprophilous."

It is widely distributed in the Arctis. VAINIO records it from the North-Eastern Siberian coast at Pitlekai, leg. ALMQUST s. n. *Parmelia physodes*.

During the 2nd. Norw. Exp. in the Fram SIMMONS collected some *Hypogymniae* which DARBISHIRE determined: *Parmelia physodes*. They resemble some darkened alpine formae of our own *P. vittata*, and in my paper on the Gjöa lichens I referred them to that species, together with a lichen, collected by LINDSTRÖM at Herschel Island. Having now seen *Parmelia subobscura* in nature, I have found that all these plants must be referred to that species.

321. (3). *Parmelia intestiniformis* (VILL.) ACH.

Parmelia encausta β *intestiniformis* (VILL.) Th. Fr. Lich. Scand. pag. 119.

I. Goose Bay. Bessimyannii Fjord. South side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Syernaia, Belushii Bay pluribi, etiam fructifera, and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Mt. Dietrichson, Mt. Tveten and Sol Bay.
VI. Rookery south of Arkhangel Bay. Pankratyeff Peninsula.

Parmelia intestiniformis is quite common, though not ubiquitous, on hard rocks all over the region investigated by us, and in places quite plentiful. Farthest north the plants are small and stunted, otherwise they are developed quite as well as in Norway. It prefers weather-beaten stations, flat stones on the terraces, rock-falls and the like.

The laciniae vary: broad, somewhat flattened and connivent or apiculate with divaricate branches (the commonest plants in Novaya Zemlya). Luxuriant plants of the former type often develop secondary central laciniae of the latter type.

It seems to me that this plant is specifically distinct from the "*Parmelia encausta* α *multipuncta* (EHRH.) TH. FR." Their geographical distribution is also in favour of this view. The difference has been explained with wonted mastery by TH. M. FRIES in Lich. Scand. pag. 118—119.

Sect. *Euparmelia* NYL.

322. (4). *Parmelia pubescens* (L.) VAIN.

I. Möller Bay (KJELLMAN and LUNDSTRÖM). Goose Bay.
II. Matotchkin Shar: Mt. Matotchka, east of Cape Jouravlev, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, Nunatak on Lacroix (Norske) bræen, Mt. Dietrichson, Mt. Tveten, Strömsnes Bay and Sol Bay. North of the Fjord entrance.
V. Admiralty Peninsula.
VI. South of Arkhangel Bay. Lichutin Island. Pankratyeff Peninsula.

Parmelia pubescens sensu latiore is one of the commonest lichens in all Arctic regions. It has been mentioned by almost all authors who have written on Arctic lichens and it is usually found in all collections of Arctic lichens brought home by botanists who are not lichenologists. In Novaya Zemlya it is quite as common as elsewhere in the Arctis all over the regions investigated by us.

Parmelia pubescens is found on stones and rocks along the beach, in the rock-falls and high up the mountains, even on the nunataks. I have not found it on chalk. It has a great predilection for rocks well exposed to the terrible Arctic gales. Apothecia are quite common.

It includes several types that have been differently judged of. In Novaya Zemlya the southern type of *Parmelia pubescens*, as represented in MALME Lich. suec. No. 405, is not at all common. Much more frequent are smaller plants with short internodia and involute laciniae, justifying the old name *Parmelia "lanata"*. They resemble a narrowly laciniate, small *Parmelia stygia* or a *Cetraria aculeata* with adpressed laciniae.

Former investigations. Recorded from Novaya Zemlya (DEICHM. BRANTH pag. 74), Karmakuly (MAGN. pag. 6), Möller Bay (KUSNETZOFF No. 24), Matotchkin Shar (KBR. pag. 2, HEUGL. pag. 310), Tolyenii Bay and Belushii Bay (STIZ. pag. 420, TH. FRIES pag. 15, VAIN. pag. 85, SAV. 1912 pag. 30), Mys Popertschnoi (STIZ. pag. 420), Kristovii Fjord (ELENK. et SAV. pag. 76). Also from Franz Joseph Land (ELENK. et SAV. pag. 86).

323. (5). *Parmelia minuscula* NYL.

Parmelia minuscula NYL. Vide VAIN. Lich. Pitlek. (1909) pag. 29, ubi syn.

II. Matotchkin Shar: East of Cape Jouravlev and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Mt. Tveten and Sol Bay.

Supposed to be more common than these few localities suggest.

I have formerly hesitated to acknowledge the *minuscula* as a proper species. Having now been able to study the type and some well determined plants in Helsingfors (hb. NYLANDER) and in Åbo (hb. VAINIO), my doubts have diminished and I have tried to enumerate the plants that were, in my opinion, typically *Parmelia minuscula*.

Parmelia minuscula has very entangled branches with very short internodia. It is very tiny, only on flat slates it develops better plants. *Parmelia pubescens* is coarser and its laciniae much less entangled, but in the Arctis the internodia are often very short, a common Arctic feature. Such plants may be difficult of distinction from *Parmelia minuscula*. CROMBIE'S description of his var. β. *reticulata* (Brit. Lich. (1894) pag. 257) suggests such plants as I collected in Matotchkin Shar at Mt. Syernaia and in Mashigin Fjord in Fram Bay. But I have not seen his type and I have no good plants for comparison.

Parmelia minuscula in NYL. Enum. Lich. Freti Behr. pag. 10 is a nomen nudum.

324. (6). *Parmelia striata* LYNGE n. sp.

Plate II, fig. 19.

II. Matotchkin Shar: Belushii Bay.

Thallus orbicularis, (in specimine) diam. 6—7 cm., ater, subnitidus. Laciniae decumbentes, teretes, toruloso-rugosae vel longitudinaliter striato-lacunosae, saepe tortuosae, crebre dichotome ramosae, sed non crustiformiter confluentes.

Apothecia (in specimine) sparsa, sessilia; discus ater, epruinosus, subconcavus, margine crasso crenato circumdatus. Sporae late ellipsoideae, 7—8×5—6 μ.

Praeterea ut in *Parmelia pubescenti.*

It differs from *Parmelia pubescens* by its striate and lacunose laciniae, which I have never seen in that species. But *Parmelia pubescens* has occasionally torulose laciniae, especially if its internodes are short.

Parmelia pubescens sensu latiore is a collective species, comprising several "small" species, often difficult of distinction and differently judged of by lichenologists. Conclusive for the appreciation of their specific value is only the constancy, not the quantity of their separating characters.

VAINIO, who has seen my plant, is of opinion that it is a proper species. I have described it as a n. sp. and recommend *Parmelia pubescens* sensu latiore to the attention of my colleagues.

325. (7). *Parmelia stygia* (L.) ACH.

I. Goose Bay.
II. Matotchkin Shar: Belushii Bay pluribi, and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson, Dal Bay, Sol Bay and (?) north of the Mashigin Fjord entrance.

The number of localities is quite considerable, suggesting a plant, that is not rare, though far from plentiful.

The determination of this species, so common and well known in my own country, was unexpectedly difficult. — In the Arctis *Parmelia stygia* and *Cetraria hepatizon* develop morphologically quite convergent formae and the pycnides alone can decide the question with certainty. But the pycnides are not always present. In Novaya Zemlya *Parmelia stygia* is often more black and more opaque than in Norway. Such plants must be carefully distinguished from *Parmelia sorediata*, for in the Arctis the soredia are generally ineffective, often more or less covered with a cortex and only seen as unequal verrucae (cfr. *Parmelia centrifuga* and *incurva*).

TH. FRIES writes: "thallus reagentiis solitis non afficitur" (Lich. Scand. pag. 125), and CROMBIE: "K =" (Lich. Brit. I pag. 255). In the Norwegian plants examined I found a distinctly yellowish-orange colour of the medulla with KOH, as well as in MALME Lich. suec. No. 933, agreeing with HARMAND's statement (Lich. France pag. 529). My Novaya Zemlya plants are KOH ÷. Does this name cover two small species?

F o r m e r i n v e s t i g a t i o n s. *Parmelia stygia* has been recorded from Novaya Zemlya (DEICHM. BRANTH pag. 74) and from Möller Bay (KUSNETZOFF No. 22).

326. (8). *Parmelia alpicola* TH. FR.

I. Goose Bay.
II. Matotchkin Shar: Mt. Matotchka, Mt. Wilczek, east of Cape Jouravlev, Mt. Syernaia, Belushii Bay pluribi, and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Nunatak on Lacroix (Norske) bræen, Mt. Dietrichson, Mt. Tveten, Strömsnes Bay and Sol Bay.
VI. South of Arkhangel Bay.

Common and plentiful as far north as Mashigin Fjord. Farther north I only detected a few small specimens. Is it rare there? Usually perfectly developed and well fertile.

Former investigations. Recorded from Novaya Zemlya (DEICHM. BRANTH pag. 74). Karmakuly (MAGN. pag. 6). Möller Bay (KUSNETZOFF No. 23). Matotchkin Shar (KBR. pag. 2, HEUGL. pag. 311), Tolyenii Bay and Belushii Bay (STIZ. pag. 420, VAIN. pag. 85).

327. (9). *Parmelia* cfr. *nigra* VAIN.

Parmelia nigra VAIN. Lich. Pitlek. (1909) pag. 31.

II. Matotchkin Shar: Mt. Matotchka and Mt. Syedlho.

I have been much interested in finding *Parmelia nigra* in my material. It is almost crustaceous and a smaller plant than *Parmelia alpicola.* Even the tips of its marginal laciniae are closely affixed to the substratum and its torulose laciniae might be compared with tumidous areolae, it is not unlike *Lecidea aenea.*

Parmelia alpicola has radiating marginal laciniae, much branched (repeatedly furcate) towards their tips, more or less contiguous, yet quite distinct. Moistened and well developed plants, growing on a plane substratum, can generally be detached with a thin knife; that is quite impossible with *Parmelia nigra.*

Small and young plants of *Parmelia alpicola*, or undeveloped plants, reduced by hard conditions of life, are difficult of distinction from *Parmelia nigra.* — I have found that the two above mentioned plants resemble *Parmelia nigra* more than *alpicola*, but the determination is open to criticism. VAINIO himself suggested *Parmelia nigra* for the latter plant.

328. (10). *Parmelia Almquistii* VAIN.

Plate II, fig. 23.

Parmelia Almquistii VAIN. Lich. Pitlek. (1909) pag. 32.

II. Matotchkin Shar: Mt. Lasareff and Belushii Bay.
IV. Mashigin Fjord: South side of Blaafjell Basin.

Thallus late expansus, usque 7—8 cm., siccus coriaceus. Laciniae in ambitu thalli adpressae, undulatae, torulosae, laevigatae, radiantes, leviter applanatae, apiculatae, crebre divergenter dichotome ramosae, internodiae 0.2—0.5 mm. Laciniae centrum versus primo magis applanatae, deinde crustiformiter conglutinatae, crusta ibi ramoso-areolata, areolae angulatae, 1—3 mm. latae, laciniis parvis, intricatis, incurvatis, confluentibus valde rugosae. Thallus isidiis sorediisque destitutus, nitidus, castaneus vel castaneo-nigrescens vel opacus et tum magis obscuratus usque omnino nigrescens.

Thallus rhizinis destitutus. Laciniae radiatae, utrinque corticatae. Cortex firmus, hyphae valde pachydermaticae, conglutinatae, indistinctae, in omnes partes currentes, sed vulgo superficiei $\pm$ perpendiculares. Cortex crassitudine valde irregulari, 40—80 μ; strato amorpho incolori tenui (4—5 μ) tectus, in parte exteriori obscuratus (10—15 μ), praeterea incolor. Medulla laxe arachnoidea.

Apothecia dispersa vel in al. pl. numerosa, adpressa, diam. 2—3 mm. Discus ater vel (saltum madefactus) obscure castaneus, epruinosus, nitidus vel opacus, primo planus, margine tenui crenulato circumdatus, deinde vulgo convexus, margine $\pm$ excluso, rarius persistenter planus. Cortex excipuli usque 65 μ altus, in parte exteriori anguste fusco-nigricans, praeterea incolor, hyphis pachydermaticis, corneis, valde indistinctis, contextus. Stratum gonidiale continuum, sed irregulare, gonidia in margine fere usque ad superficiem visa. Medulla excipuli angusta, hyphae medullares laxe contextae. Cortex interior infrahypothecialis 20—25 μ, hypothecium verum 20—25 μ. Hymenium 80—90 μ altum, superne fuscescens, praeterea incolor, etiam cum hypothecio et cortice interiori. Paraphyses ramosae, in apice haud incrassatae. Sporae ellipsoideae, 6—8$\times$5 μ.

Thallus J intense vinosum, praecipue cortex, KOH et $CaCl_2O_2$ immutatus, etiam his materiis unitis.

Asci J persistenter caerulescentes, gelatina hymenialis J fere immutata; cortex interior J non caerulescens, hypothecium verum J dilute caerulescens.

f. *nitida* LYNGE n. f.

Thallus nitidus, castaneus.

Evidently the type of the species, found at all the localities.

f. *opaca* LYNGE n. f.

Thallus opacus, nigrescens.

Detected at Belushii Bay.

Characterized by its almost placodioid central thallus. It is affixed to its substratum much like a crustaceous lichen, only quite exceptionally a plant can be detached from the rock with a thin knife. The marginal free laciniae are about 0.1—0.25 mm. thick, as stated by VAINIO, the central laciniae are so interfused that only a section can show their individual nature. A section shows that the laciniae are closely conglutinated, but not grown together, no hyphae unite them.

The dry thallus is rigid; that depends entirely upon the firm, almost corneous cortex. The arachnoid medulla adds nothing to the firmness, biologically the thallus is a cylinder.

VAINIO found its pycnoconidia: 4—5$\times$1 μ.

329. (11). *Parmelia centrifuga* (L.) ACH.

I. Goose Bay. South side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Matotchka and Belushii Bay.

Found at a few places in the southern part of our district. It is far from common.

The plants are small and sterile, but well developed and quite typical. To prevent a confusion with *Parmelia Birulae*, which it much resembles, all the plants were tested with J.

DARBISHIRE's *Parmelia centrifuga* from Ellesmereland (Sec. Norw. Exp. Fram pag. 35) is an esorediate *Parmelia incurva*.

Former investigations. Recorded from Matotchkin Shar (TH. FRIES pag. 15, HEUGL. pag. 311), Belushii Bay (VAIN. pag. 85).

330. (12). *Parmelia Birulae* ELENKIN.

Parmelia Birulae. ELENKIN Species novae lichenum in Sibiria arctica a cl. A. A. Birula-Bialynizki collectae. Annales Mycologici vol. IV, 1906, p. 36. Les Lichens des côtes polaire de la Siberie in Resultat scient. de l'Exp. polaire Russe en 1900—1903, Livraison 1, St. Pétersbourg 1909, pag. 19, Tab. I fig. 4, II fig. 11—12..

II. Matotchkin Shar: Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Mt. Dietrichson.
VI. Rookery south of Arkhangel Bay. Lichutin Island.

Widely distributed in Novaya Zemlya, but it cannot be common. It grows on stones and rocks, much in the same manner as *Parmelia centrifuga.*

All my plants are sterile. There are numerous black points near the apices of the laciniae, in the normal position of the pycnides. But they contained no conidia.

Its habitus is intermediate between *Parmelia conspersa* and *Parmelia centrifuga*, more approaching the former species. It is hardly possible to confuse it with the former species, the chemical reaction is too different, and *Parmelia conspersa* is evidently lacking in the Arctis, as stated also by ELENKIN, at least in the European and Asiatic Arctic regions. CUMMINGS mentions *Parmelia conspersa* from Alaska, even from elevated stations, MERRILL does the same in his paper on the Canadian Arctic Expedition, pag. 9 D. In our country *Parmelia conspersa* and *Parmelia stenophylla* are decidedly rare in the northern provinces. — From *Parmelia centrifuga* it is sufficiently separated by its chemical reaction, for that species is J ÷, *Parmelia Birulae* is J +, though not so intensely as in many other lichens. The colour of *Parmelia Birulae* is also more intensely yellow than in *Parmelia centrifuga*, and the under side much darker.

The medullary hyphae are not easily moistened, and some attention is necessary to ensure a safe J-reaction. The test should be made under the microscope (low power) to exclude a confusion with the J colour of the gonidia. It seems to me that the J-reaction is the best distinctive character between *Parmelia Birulae* and *Parmelia separata* of TH. M. FRIES. Hardly any other lichenologist makes more reliable statements than TH. M. FRIES. Nevertheless I may suggest a new test of the *Parmelia separata*, I am not quite convinced of its specific difference from *Parmelia Birulae*. I have seen a little *Parmelia separata* in Upsala, but it was so fragmentary that no test could be made.

I am indebted to professor SAVICZ for a fine collection of *Parmelia Birulae* from Kamczatka. His plants agree entirely with mine. If studied under the microscope there is a faint yellowish cortical KOH-reaction, but the medulla is quite unchanged. I could not obtain the positive $KOH + CaCl_2O_2$ reaction, which ELENKIN describes.

In my material *Parmelia Birulae* is quite variable: Laciniae elongated, narrow and divaricately ramose (var. *angustior* ELENKIN) or shorter, broader and more connivent or even imbricate, then approaching *Parmelia centrifuga*.

Former investigations. *Parmelia Birulae* was described from the Siberian gouvernement Jeniseisk (ELENKIN 1906 pag. 36), but it has not been recorded from Novaya Zemlya.

331. (13). *Parmelia incurva* (PERS.) FR.

I. Goose Bay. South side of Gribovii Fjord.
II. Matotchkin Shar: Belushii Bay.
IV. Mashigin Fjord: Sol Bay.

Parmelia incurva is rare, but I found several plants at each station. They are well developed, the laciniae are narrower than they usually are in our country. All the plants are sterile and soredia often lacking, as is often the case in the Arctis.

Former investigations. Recorded from Matotchkin Shar (KBR. pag. 2).

332. (14). *Parmelia sorediata* (ACH.) TH. FR. var. *borealis* LYNGE var. nova.

Thallus isidiis dispersis, bene limitatis, globosis, superficie ± rugosis, sed non coralloideis, sorediose fatiscentibus et tum albidis, in apicibus ramorum evolutis et saepe distincte stipitatis, instructus. Laciniae magis discretae, saepe distincte pinnato-ramosae.

II. Matotchkin Shar: Mt. Lasareff, Belushii Bay and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, Blomster Bay, Dal Bay and Sol Bay.
VI. In the rookery south of Arkhangel Bay.

It differs from a more southern type, which I will call

var. *coralloidea* LYNGE var. nova.

Thallus isidiis magis confluentibus, haud stipitatis, coralloideis, dein interdum crateriformibus, instructus. Laciniae magis contiguae, vulgo ± imbricatae.

The type of the former variety is my plant from Mt. Lasareff, of the latter ARNOLD Lich. Exsic. 743 b.

I have studied their distribution in Norway in our herbarium. Our very large material from Northern Norway exclusively belongs to var. *borealis*; in Southern Norway this plant is common on the mountains and it advances far down the valleys into the lowlands or even to the coast. But the lowland plants and especially the west coast plants generally are var. *coralloidea*. Our *Parmelia sorediata* from Central Europe is exclusively var. *coralloidea*. There is accordingly a distinct difference with respect to their geographical distribution.

I have considered the question whether the different type of isidia could justify a specific distinction. But I could not always with absolute certainty refer any plant to its type. And a specific distinction would involve changes in the nomenclature of well known plants which should be avoided if not absolutely necessary.

ACHARIUS described his *Parmelia stygia* β. *sorediata* in Lich. Univ. (1810) pag. 471. TH. M. FRIES raised it to specific rank in Lich. Arct. (1860) pag. 56. — French authors (HARMAND, OLIVIER) write *Parmelia sorediata* NYL. Flora 1879, pag. 223; this combination is, accordingly, not correct.

Undoubtedly TH. M. FRIES's type plants from Mortensnes and Klubben in Varanger (Finnmark, Arctic Norway) belong to my var. *borealis*. A specific distinction would involve that the name *Parmelia sorediata* TH. FR. must be reserved for the northern and Arctic type (my var. *borealis*), and that a new name must be created for the well known plant, which in southern lichenological works has always been called *Parmelia sorediata*, a most undesirable consequence.

All my Novaya Zemlya plants are sterile.

333. (15). *Parmelia infumata* NYL.

II. Matotchkin Shar: south side at the Kara Sea entrance.
VI. Rookery south of Arkhangel Bay.

At the former station it was quite plentiful, at the latter I only found a few plants. I was astonished to find this species so rare in Novaya Zemlya. In Spitsbergen I found it to be very common, almost on all bird-stones. In herb. Upsala there are two plants from Grant Land: 1) Mt. Stevenson, leg. H. C. HART 3. 8. 1875 and 2) Grant Land 82° 17′, leg. H. W. FEILDEN; TH. M. FRIES referred them to *Parmelia olivacea*, but they are *Parmelia infumata*.

Parmelia infumata is accordingly widely distributed in the Arctis. Neither VAINIO (Pitlekai) nor ELENKIN (Exped. polaire Russe) makes any mention of it; it is perhaps a species of western Arctic distribution.

It is highly nitrophilous or even coprophilous, found on large stones and prominent rocks where birds are abundant, together with *Xanthoria candelaria* (= *lychnea*) and *Physcia muscigena* a. o.

334. (16). *Parmelia saxatilis* (L.) ACH.

I. Goose Bay. North side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Matotchka, east of Cape Jouravlev and Belushii Bay. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay.

Parmelia saxatilis is common and abundant all over our part of Novaya Zemlya, perhaps with the exception of the northernmost district. It is the commonest species of its tribus there. Only found sterile.

It is very variable, as usual, with respect to colour and development of isidia. A pale, almost white plant was found here and there, it is only slightly isidiate, and resembles *Parmelia sulcata*. Caesio-pruinose plants are rare (f. *caesiopruinosa* NYL.).

Former investigations. Recorded from Novaya Zemlya (DEICHM. BRANTH pag. 74), Karmakuly (MAGN. pag. 6), Matotchkin Shar (SAV. 1911 pag. 48), Belushii Bay (SAV. 1912 pag. 30).

335. (17). *Parmelia omphalodes* (L.) ACH.

I. Goose Bay. Möller Bay (KJELLMAN and LUNDSTRÖM). Gribovii Fjord, south and north side.
II. Matotchkin Shar: Pomorskaya, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.

IV. Mashigin Fjord: Mt. Dietrichson, Mt. Tveten, Dal Bay, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay, Lichutin Island, Berkh Island, Northern Kristovii Island.

Parmelia omphalodes is common and abundant on hard rocks all over the regions investigated by us. It is found on rocks and stones along the beach and in the rock-falls. It is somewhat nitrophilous.

It presents the usual variation with respect to the colour and the development of the laciniae; brownish plants are more common than grey ones; imbricate plants are not common. It is very often caesio-pruinose. I did not find apothecia. All the plants tested gave the normal reaction with KOH: first yellow, then red.

Former investigations. This common and conspicuous species has been recorded from Novaya Zemlya by several authors: Novaya Zemlya (DEICHM. BRANTH pag. 74), Karmakuli (SAV. 1912 pag. 30, MAGN. pag. 6), Möller Bay (KUSNETZOFF No. 21), Matotchkin Shar (HEUGL. pag. 311, SAV. 1911 pag. 48), Tolyenii Bay and Belushii Bay (STIZ. pag. 420, VAIN. pag. 85). Also from Franz Joseph Land (ELENK. and SAV. pag. 86).

336. (18). *Parmelia sulcata* TAYL.

I. Matotchkin Shar: East of Cape Jouravlev, Belushii Bay and south side at the Kara Sea entrance.
IV. Mashigin Fjord: North of the Fjord entrance.
V. Admiralty Peninsula.
VI. On bird-stones south of Arkhangel Bay.

In Novaya Zemlya this species is far from common. It is highly coprophilous, as in other Arctic regions, and strictly limited to the top of the bird-stones.

All my plants are sterile. The soredia are poorly developed, as is often the case in the Arctic. Generally the size of the plants does not exceed 5—6 cm., my largest plant is 9 cm.; in Norway it is much larger.

Former investigations. Recorded from Möller Bay (KUSNETZOFF No. 21). Also from Kolgueff (SAV. 1912 pag. 31).

337. (19). *Parmelia fraudans* NYL.

I. Goose Bay.

Parmelia fraudans is very rare. I only detected a few plants, small, but typical, half overgrown by other lichens.

Parmelia olivacea (L.) ACH. (NYL.?) has been recorded from Kolgueff (SAV. 1912 pag. 30), but not from Novaya Zemlya.

Parmelia prolixa ACH. has been recorded from Novaya Zemlya by DEICHMANN BRANTH (pag. 74).

Cetraria ACH.

Sect. I. *Platysma* KBR.

338. (1). *Cetraria hepatizon* (ACH.) VAIN.

I. Goose Bay. Möller Bay (KJELLMAN and LUNDSTRÖM 1875). Bessimyannii Bay. Gribovii Bay: north side.
II. Matotchkin Shar: Mt. Matotchka, Mt. Lasareff, Mt. Wilczek, east of Cape Jouravlev, Mt. Syernaia, Belushii Bay, south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, nunatak in Lacroix (Norske) Bræen, Mt. Dietrichson, Mt. Tveten, Strömsnes Bay, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay.

Very common and widespread as far north as Admiralty Peninsula. Farther north I only collected it once. It has possibly escaped me there, but I think it more probable that it is rare or at least less common in the northernmost part of Lütke Land. It prefers large stones in the lowlands and in the rock-falls; common up to considerable elevations.

It varies from the type in the usual manner: in some plants the laciniae are long, linear and loosely imbricate, in others short, ascending or erect and densely imbricate. The former plants evidently represent VAINIO's var. *linearis* (Lich. Pitl. pag. 24), but such plants are only individual variations, hardly deserving a name.

Usually sterile, but I also found apothecia, even in the nunatak plants.

Much attention was given to *Cetraria fahlunensis*, but I did not find it. The colour of the under side is variable in *Cetraria hepatizon*, from the typical black colour to pale brown, especially in the var. *linearis* and in plants where the light can penetrate to the under side. A great number of pycnides were examined. They were not always fertile, but if detected the pycnoconidia were always cylindrical with incrassated apices, even in plants with a pale brown lower side.

One plant from the south side of Gribovii Fjord, might be referred to f. *polyschiza* NYL.

Former investigations. Novaya Zemlya (DEICHM. BRANTH pag. 74), Karmakuli (MAGN. pag. 6), Möller Bay (KUSNETZOFF No. 20), Matotchkin Shar (TH. FRIES pag. 15, KBR. pag. 2), Myss Popertschnoi (STIZ. pag. 420) and Belushii Bay (SAV. 1912 pag. 26). Also from Franz Joseph Land (ELENK. et SAV. pag. 85).

To judge from my own results *Cetraria fahlunensis* vera must be very rare in Novaya Zemlya, if present there. I have therefore ventured to refer all literary records of it to *Cetraria hepatizon*.

339. (2). *Cetraria chrysantha* TUCK.

SAVICZ, V. P. Notes on *Cetraria chrysantha* TUCK. and *C. lacunosa* ACH. in Russia. The Bryologist 1926 pag. 26 (ubi syn.).

I. Goose Bay. Bessimyanni Fjord. Gribovii Fjord: south side.
II. Matotchkin Shar: Belushii Bay.

Cetraria chrysantha is quite common in the southern fjords; at Belushii Bay it was very plentiful on a terrace, 100 m. s. m. It was much searched after farther north, but in vain. It is therefore probable that *Cetraria chrysantha* is a plant of more southern distribution in Novaya Zemlya. I did not find it in Bellsund, Spitsbergen, in 1926.

It grows on the flat stones of the terraces and rock-falls. All my plants were esorediate and sterile; pycnoconidia could not be detected.

Former investigations. Matotschkin Shar (SAV. 1911 pag. 48, s. n. *Cetraria lacunosa*).

340. (3). *Cetraria juniperina* (L.) ACH.

var. *terrestris* SCHAER.

VI. Rookery south of Arkhangel Bay. Lichutin Island. Mainland east of Lichutin Island. Berkh Island.

Only obtained farthest north where it was quite common. It is not probable that it should be lacking southwards, for it is common enough in the Norwegian mountains. But I ought to have found this very conspicuous plant if it had been common there. — The plants are quite typical.

Former investigations. MARKH. records *Cetraria juniperina* from Novaya Zemlya (without special locality).

Sect. II. *Eucetraria* KBR.

341. (4). *Cetraria nivalis* (L.) ACH.

I. Goose Bay c. fr. Möller Bay and Udde Bay (KJELLMAN and LUNDSTRÖM 1875). South and north side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Matotchka, Vasnetsoff Glacier, Mt. Syernaia, Belushii Bay, and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord in the rookery. Sukhoi Noss.
IV. Mashigin Fjord: South side of Blaafjell Basin, Mt. Dietrichson, Mt. Tveten, Strömsnes Bay, Dal Bay and Sol Bay. North of the Fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Lichutin Island. Berkh Island.

Common all over the area investigated by us.

Apothecia are very rare, only found at Goose Bay.

Former investigations. As was to be expected there are several records of this common and well-known species: Novaya Zemlya (MARKH. pag. 332, DEICHM. BRANTH pag. 74), Kostin Shar (TH. FRIES pag. 14, HEUGL. pag. 310), Möller Bay (KUSNETZOFF No. 19), Matotchkin Shar (TH. FRIES pag. 14, HEUGL. pag. 310, SAV. 1911 pag. 48), Belushii Bay (SAV. 1912 pag. 29), and Kristovii Fjord (ELENK. et SAV. pag. 75). Also from Waigatsch (TH. FRIES pag. 14, STIZ. pag. 420, HEUGL. pag. 310), Kolgueff (SAV. 1912 pag. 29) and Franz Joseph Land (ABRUZZI pag. 669, ELENK. et SAV. pag. 84).

342. (5). *Cetraria cucullata* (BELL.) ACH.

I. Goose Bay. Bessimyannii Fjord. North side of Gribovii Fjord.
II. Matotchkin Shar: Pomorskaya, Chalhonik Valley, Belushii Bay, south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Mt. Dietrichson, Mt. Tveten c. fr., Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Berkh Island.

Common and abundant all over the area investigated by us. At Mt. Tveten I found a few apothecia. *Cetraria cucullata* is developed quite as in Norway.

Former investigations. Recorded from Matotchkin Shar (TH. FRIES pag. 14, SAV. 1911 pag. 48) and from Belushii Bay (SAV. pag. 26). Also from Kolgueff (SAV. 1912 pag. 26) and from Franz Joseph Land (ELENK. et SAV. pag. 84).

343. (6). *Cetraria crispa* (ACH.) NYL.

I. Goose Bay. Gribovii Fjord, south and north side.

II. Matotchkin Shar: Pomorskaya, Mt. Wilczek, Chalhonik Valley, Mt. Syernaia, Belushii Bay and south side of the Shar near the Kara Sea entrance. Serebryanka Fjord in the rookery. Sukhoi Noss.

IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson, Mt. Tveten, Strömsnes Bay, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.

V. Admiralty Peninsula (ad *islandicam*).

VI. Rookery south of Arkhangel Bay. Lichutin Island. Mainland east of Lichutin Isl. Northern Kristovii Island.

Cetraria crispa is one of the commonest lichens in Novaya Zemlya, it is common or plentiful all over the area investigated by us. I only detected sterile plants.

It is generally not so narrowly crispate and its margins are rarely so connivent as in Scandinavia (see MALME Lich. suec. No. 127 and NORRL. et NYL. No. 105 a). The Novaya Zemlya plants agree better with No. 478 of the latter collection. — In the rookeries we find overfed plants, which are coarser, larger and less branched, approaching f. *subtubulosa* E. FR. Their thallus is also broader than in the typical *Cetraria crispa*, and if I had not found them in such stations, I might quite as well have referred them to *Cetraria islandica*. Typical *Cetraria islandica* was not detected.

Former investigations. Recorded from Kristovii Fjord (ELENK. et SAV. pag. 75—76). Also from Kolgueff (SAV. 1912 pag. 26) and from Franz Joseph Land (ABRUZZI pag. 670, ELENK. et SAV. pag. 86).

344. (7). *Cetraria Delisei* (BORY) TH. FR.

Syn. *Cetraria hiascens* (FR.) TH. FR.

I. Goose Bay.

II. Matotchkin Shar: Pomorskaya, Mt. Wilczek, Chalhonik Valley, east of Cape Jouravlev, Vasnetsoff Glacier, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord in the rookery.

IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson, Mt. Tveten, Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay.

V. Admiralty Peninsula.

VI. Rookery south of Arkhangel Bay. Lichutin Island. Berkh Island. Eastern and Northern Kristovii Island.

Cetraria Delisei is one of the commonest and most widespread lichens in Novaya Zemlya, I am convinced that I have seen it every day ashore. It is more plentiful than all the other *Cetrariae* together, as in other Arctic regions and also in our own country. Together with *Lecidea ramulosa* and *Saxifraga oppositifolia* it fills extensively low depressions in the soil which are frequently irrigated with cold water from the melting snow and ice. Every Arctic traveller knows the extension of such localities.

It is a variable species. Its principal formae have been well described by VAINIO in his Pitlekai work pag. 22—23. VAINIO's "*Cetraria hiascens* var. *Delisei* (BORY) VAIN." which may be taken as the type of the species is by far the commonest. In comparison with this the other formae are rare. I have found:

var. *fastigata* (DEL.): Goose Bay, Belushii Bay, Kara Sea entrance; Fram Bay; Berkh Island.

var. *subdilatata* (VAIN.) in NYL. et NORRL. Herb. Lich. Fenn. No. 481: Sol Bay.

var. *dilatata* (VAIN.). Admiralty Peninsula.

I only collected sterile plants.

Former investigations. Novaya Zemlya (DEICHM. BRANTH pag. 74), Karmakuli, f. *dilatata* (SAV. 1912 pag. 26—28), Matotchkin Shar (TH. FRIES pag. 14), Matotchkin Shar f. *dilatata* et f. *fastigiata* (SAV. 1911 pag. 47). Also from Kolgueff (SAV. 1912 pag. 26—28) and from Franz Joseph Land (ELENK. et SAV. pag. 86 and pag. 85 (*Cetraria nigricascens* (NYL.?) ELENK., with description).

345. (8). *Cetraria nigricans* NYL.

II. Matotchkin Shar: Belushii Bay.
IV. Mashigin Fjord: Mt. Dietrichson.

Cetraria nigricans is evidently a rare species, for I only found a few plants. It grows in the rock-falls, where there is water in the underground.

Former investigations. *Cetraria nigricans* has been recorded from Franz Joseph Land (ELENK. et SAV. pag. 85), but not from Novaya Zemlya.

346. (9). *Cetraria capitata* LYNGE n. sp.

Plate II, fig. 22.

I. Goose Bay.
II. Mt. Matotchka, in ipso cacumine.

Laciniae adscendentes vel suberectae, tenues, ca. 15 mm. longae, 0.5—1 (1.5) mm. latae, marginibus incrassatis ± canaliculatae, furcatae vel subpinnatae. Laciniae fuscescentes, subnitidulae, leviter lacunosae vel sublaevigatae, margine spinosae, spinae 1—2 mm. longae, indivisae vel furcatae, rarius iteratim furcatae, apice sorediis capitatis fusco-nigrescentibus terminatae.

Thallus tenuis: crassitudine in margine laciniarum ca. 250 μ, in centro ca. 125—150 μ. Cortex superior 25—30 μ, superne fuscescens, praeterea incolorata et refractiva. Hyphae corticis superficiei perpendiculares, crassae (usque 8 μ) et pachydermaticae, sat indistinctae, septatae, articulis rotundatis. Cortex inferior eodem structura. Hyphae medullares 5—6 μ crassae, J intense caerulescentes, etiam partes incoloratae corticum. Thallus KOH immutatus. Gonidia diam. 8—10 μ, in marginibus laciniarum et infra corticem superiorem sat disperse disposita.

Plantae steriles sunt, pycnides frustra quaesivimus.

Cetraria capitata is related to *Cetraria nigricans*, but differs from that species in the capitate soredia, that terminate the laciniae and their branches. Found on rocks and large stones.

Sect. III. *Cornicularia* Fr.

347. (10). *Cetraria aculeata* (Schreb.) Fr.

Lichen aculeatus Schreber Fl. Lips. 1771 pag. 125. E. Fries Syst. Orb. Veg. 1825 pag. 239.

Lichen islandicus γ. *tenuissimus* L. Spec. Plant. 1753 pag. 1145.

Cetraria tenuissima Vainio Not. Syn. Lich. 1886 pag. 21.

I. Goose Bay. North and south side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Matotchka and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Fram Bay and Rækved Bay. North of the Fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Eastern and Northern Kristovii Islands.

Cetraria aculeata is rather common, but not plentiful, all over the regions, investigated by us. It is always sterile.

Vainio has introduced Linneus's name which is the oldest. But Schreber's name is the oldest specific name and must accordingly be given the preference.

Former investigations. Novaya Zemlya (Deichm. Branth pag. 74), Möller Bay (Kusnetzoff No. 18), Matotchkin Shar (Th. Fries pag. 14, Heugl. pag. 311), Belushii Bay (Sav. 1912 pag. 25). Also from Kolgueff (Sav. 1912 pag. 25) and from Franz Joseph Land (Elenk. et Sav. pag. 84).

Cetraria islandica. There are numerous records of "*Cetraria islandica*", but it is impossible to see whether they refer to this species itself or to *Cetraria crispa*: Möller Bay (KUSNETZOFF pag. 17, an *crispa*?), Matotchkin Shar (TH. FRIES pag. 14, HEUGL. pag. 311, SAV. 1911 pag. 47), Belushii Bay (SAV. 1912 pag. 28). Also from Waigatsch (TH. FRIES pag. 14, HEUGL. pag. 311), Kolgueff (SAV. 1912 pag. 28) and Franz Joseph Land (ELENK. et SAV. pag. 86).

Cetraria lacunosa has been recorded from Franz Joseph Land (ABRUZZI pag. 670). The determination is very improbable, cfr. *Cetraria chrysantha.*

USNEACEAE

Evernia ACH.

348. (1). *Evernia arctica* (ELENK. et SAV.) LYNGE comb. nov.

Alectoria arctica ELENK. et SAV. Lich. in reg. arct. Oceani Glac. ab I. V. Palibin anno 1901 collecti. Acta Horti Petrop. XXXII (1912) pag. 73, pl. I, fig. 1—3.

VI. Berkh Island.

Thallus fruticulosus, erectus vel adscendens, 3—5 cm. altus, caespitosus, mollis, fragilis, subteres, 1—1.5 mm. latus, vel praecipue ad angulos ± compressus, usque 2 vel etiam 2.5 mm. latus, crebre iteratim divergenter furcatus, reticulato-rugosus vel subcostatus, fibrillis, sorediis isidiisque omnino destitutus. Thallus pallide ochroleucus, vel ochroleuco-virescens, undique similaris.

Thallus radialis, solidus. Cortex chondroideus, crassitudine (30—) 40—55 μ, hyphis indistinctis, corpusculis adspersis, arcte conglutinatis, saltem in parte exteriori corticis superficiei perpendicularibus, angulatis, diam. 16—20 μ, luminibus minutissimis, formatus, in parte interiori axin magis parallelae. Medulla alba, arachnoidea, hyphae medullares in omnes partes currentes, ramosae, minute adspersae, crassitudine 5—8 μ. Medulla axis chondroideis omnino destituta. Gonidia diam. 10—16 μ, in glomerulis parvis dispersis disposita.

Apothecia et pycnides desunt.

Medulla J ÷, KOH ÷, $CaCl_2O_2$ ÷, KOH + $CaCl_2O_2$ ÷.

Unfortunately I was not aware of the high interest of this plant, when I collected my few specimens. Habitually it somewhat resembles an intricately branched *Cladonia uncialis* and in the hurry of a very forced collecting I mistook it for that species.

The figures in ELENKIN and SAVICZ's plate are excellent. Their fig. 1, a photograph of their plant, agrees so perfectly with my plant that is impossible to doubt of the identity. But my observations on the thalline anatomy do not quite agree with their fig. 2—3. In the inner part of the cortex I also found hyphae that are parallel to the surface, but the medulla itself is typically arachnoid, its hyphae are quite loosely interwoven, without any predominating direction. They have evidently examined a plant with more densely branched medullary hyphae. — I could not obtain any staining with $KOH + CaCl_2O_2$.

My Russian friends referred their species to the genus *Alectoria*, I would prefer to place it in *Evernia*.

The nearest relative of this species is *Evernia mesomorpha*, especially its var. *esorediosa*, a Japanese plant described by MÜLLER ARGOVIENSIS in Lich. Beitr. No. 1593. DU RIETZ regards this variety a proper species, on account of its lacking soredia. (DU RIETZ Die Sored. und Isid. d. Flecht., Svensk Bot. Tidsskr. (1924) pag. 390, and his *Evernia*, *Letharia* etc. l. c. (1926) pag. 90).

Professor CHODAT has been kind enough to send me MÜLLER'S type for comparison. This plant has entirely the habitus of *Evernia mesomorpha*, but it is esorediate. It is much coarser than my plant, its branches are much broader and more compressed and its colour is more greyish-green, there is more of a yellowish-green colour in *Evernia arctica*. The surface of MÜLLER'S plant is deeply reticulato-lacunose, much more so than in *Evernia arctica*. I have found a thinner cortex in *Evernia thamnodes* (25—30 μ), but that character varies from plant to plant, and from basis to apex; HUE records 25—40 μ in *Evernia thamnodes*.

HUE describes an axis centralis in *Letharia thamnodes*, and he writes that the cortical hyphae are parallel to the axis. I could find no axis in either of these species in the plants, which I examined, and I found the cortical hyphae to be perpendicular to the surface, at least near the surface and in full-grown branches.

In *Evernia esorediosa* the gonidia are lying in small scattered glomeruli, in erect stems under either surface, in side-branches chiefly under the upper surface.

Former investigations. Kristovii Fjord (ELENK. et SAV. pag. 73).

Dufourea (ACH.) NYL.

349. (1). *Dufourea madreporiformis* (WULF.) ACH.

0. Udde Bay (KJELLM. and LUNDSTR. 1875).
I. Bessimyannii Fjord.
II. Matotchkin Shar: Mt. Wilczek, east of Cape Jouravlev and Mt. Syernaia. Serebryanka Fjord.

IV. Mashigin Fjord: Trehörningen.
VI. Rookery south of Arkhangel Bay. Lichutin Island. Mainland east of Lichutin Island. Berkh Island. Eastern and Northern Kristovii Islands.

Widespread and generally abundant. Curiously enough there was but one station from Mashigin Fjord, did it escape me there? Found on the beach and the strand-walls, on gravelly soil and amongst pebbles.

Former investigations. Novaya Zemlya (MARKH. pag. 332). Kristovii Fjord (ELENK. et SAV. pag. 75). Cape Nassau, 76° 30′ N., 61° 25′ E. (TH. FRIES pag. 14, HEUGL. pag. 311).

350. (2). *Dufourea ramulosa* HOOK.

Syn. *Dufourea muricata* LAUR.

II. Matotchkin Shar: Mt. Wilczek, Belushii Bay, south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Mt. Tveten.
VI. Rookery south of Arkhangel Bay. Lichutin Island.

Widespread but scarce. I generally found it in the screes.

Former investigations. Recorded from Kristoviĭ Fjord (ELENK. et SAV. 1912 pag. 75).

Dactylina NYL.

351. (1). *Dactylina arctica* (HOOK.) NYL.

I. Karmakuli (leg. T. ALM 1901).

I never found this conspicuous species. We cannot conclude much from this, for experience shows that every species can be overlooked, however conspicuous, but it suggests it to be a rare species in the regions explored by us, if found there.

Former investigations. Recorded from Matotchkin Shar, (with var. *minor* ELENK. (SAV. 1911 pag. 47). Also from Kolgueff (SAV. 1912 pag. 25).

Alectoria ACH.

352. (1). *Alectoria ochroleuca* (EHRH.) NYL.

I. Goose Bay, Möller Bay (KJELLMANN and LUNDSTRÖM), Bessimyannii Fjord. South side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Matotchka, Belushii Bay, south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.

IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Mt. Dietrichson, Mt. Tveten, Strömsnes Bay and Sol Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Lichutin Island.

Very widespread and in places common. But I do not venture to say that it is more common than *Alectoria nigricans*, most probably the latter species has been somewhat neglected. *Alectoria ochroleuca* is common in the upper part of the screes and on the ridges of the lower mountains.

Former investigations. Recorded from Möller Bay (KUSNETZOFF No. 1), Belusha (SAV. pag. 22) and from Zivolka Fjord (VAIN. pag. 85). Also from Franz Joseph Land (ELENK. et SAV. pag. 83).

353. (2). *Alectoria nigricans* (ACH.) NYL.

I. Goose Bay. Möller Bay (KJELLMAN and LUNDSTRÖM).
II. Matotchkin Shar: Belushii Bay.
IV. Mashigin Fjord: Mt. Dietrichson. North of the fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Lichutin Island. Berkh Island. Northern Kristovii Island.

Widespread, but generally scarce. Found especially in the upper part of the screes and on the lower mountains.

Former investigations. Recorded from Karmakuli (SAV. 1912 pag. 23). Also from Kolgueff (SAV. 1912 pag. 23) and from Franz Joseph Land (ELENK. et SAV. pag. 83).

354. (3). *Alectoria divergens* (ACH.) NYL.

I. Goose Bay. Gribovii Fjord, north side.
II. Matotchkin Shar: Pomorskaya and Belushii Bay.
V. Admiralty Peninsula.

Rare and scarce. Generally considerably smaller than in Norway, and not so shining. I often found it necessary to test its reaction with $CaCl_2O_2$.

Former investigations. Recorded from Karmakuli (SAV. 1912 pag. 23) and from Möller Bay (KUSNETZOFF No. 2). Also from Kolgueff (SAV. 1912 pag. 23) and from Franz Joseph Land (ABRUZZI pag. 668, ELENK. et SAV. pag. 83).

355. (4). *Alectoria jubata* (L.) NYL. var. *chalybeiformis* (L.).

VI. On a beach stone at the rookery south of Arkhangel Bay.

It must be rare, for this conspicuous plant was only found once. It was well developed, but there were only a few plants.

Alectoria cincinnata has been recorded from Waigatsch (HEUGL. pag. 309), but not from Novaya Zemlya.

Alectoria nidulifera has been recorded from Kolgueff (SAV. 1912 pag. 24), but not from Novaya Zemlya.

Alectoria nitidula has been recorded from Franz Joseph Land (ELENK. et SAV. pag. 84), but not from Novaya Zemlya.

Alectoria thrausta has been recorded from Matotchkin Shar (TH. FRIES pag. 14, HEUGL. pag. 310).

Usnea (DILL.) PERS.

356. (1). *Usnea sulphurea* (KÖNIG) TH. FR.

IV. Mashigin Fjord: Mt. Dietrichson, in the upper part of the scree.

It must be rare, for I only found one developed plant and a few initiating ones. Evidently a plant of western Arctic distribution. — I found it to be very plentiful in Bell Sound in Spitsbergen (1926).

Former investigations. Recorded from Franz Joseph Land (JACKSON pag. 417, ABRUZZI pag. 667, ELENK. et SAV. pag. 84), but not from Novaya Zemlya.

Thamnolia ACH.

357. (1). *Thamnolia vermicularis* (SW.) ACH.

I. Goose Bay, Bessimyanni Fjord, Gribovii Fjord: North side and Veselago Island.

II. Matotchkin Shar: Mt. Lasareff, Chalhonik Valley, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.

III. Kristovii Fjord.

IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Mt. Dietrichson, Mt. Tveten and Dal Bay.

V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay, Berkh Island, Lichutin Island, Mainland east of Lichutin Island, Eastern Kristovii Island, Pankratyeff Peninsula.

Thamnolia vermicularis is one of the commonest lichens in Novaya Zemlya. I am sure that I have seen it every day ashore.

My material shows the usual variation: from long and very slender *tenuis*-formae to the coarse, ventricose f. *taurica*. In my opinion these plants only represent the extremes of its individual variation.

Former investigations. Novaya Zemlya (DEICHM. BRANTH pag. 74). Möller Bay (KUSNETZOFF No. 16). Matotchkin Shar (TH. FRIES pag. 16, SAV. 1911 pag. 48), Belushii Bay (SAV. 1912 pag. 31). Kristovii Fjord (ELENK. et SAV. pag. 76). Also from Waigatsch (TH. FRIES pag. 16, STIZ. pag. 420, HEUGL. pag. 310), from Kolgueff (SAV. 1912 pag. 31) and from Franz Joseph Land (JACKSON pag. 417, ELENK. et SAV. pag. 87).

Siphula ceratites (WBG.) TH. FR. has been recorded from Matotchkin Shar, collected by NIEMAN in 1908 (SAV. 1911 pag. 53), but I did not find it. It is a conspicuous plant and Matotchkin Shar was carefully investigated by us, with the exception of the part east of Belushii Bay, where ice difficulties impeded our work. We may perhaps conclude that it is not too common in Novaya Zemlya.

In his interesting paper (Die Verbreitung von Siphula ceratites (1926) pag. 379—392) ARWIDSSON has discussed the distribution of *Siphula ceratites*. He has entered all known localities on a map of distribution and he arrives at the conclusion, that it is an Arctic coast lichen ("eine arktische Uferflechte", l. c. pag. 388). His map shows that this is, on the whole, correct. There are, however, some exceptions, one of them being its distribution on the Norwegian west coast. The Lofoten Islands are an important barrier to the advancement of Arctic lichens in Norway, or to use a more neutral expression, they are acknowledged to represent a boundary line between Arctic and more southern lichens. But *Siphula* advances far south, down to Stavanger, one of the mest occidental points of our coast with a markedly Atlantic flora.

Is it, perhaps, a relic plant from the Ice Age on our west coast? There are many points of resemblance between the alpine and the maritime lichen flora, e. g. the distribution of *Cetraria nivalis*, which is quite common in sandy places on the beaches of Norway. The maritime climate with its cool summers cannot fail to be attractive to several northern or even to Arctic plants.

In our country *Cetraria normörica* has much the same distribution as *Siphula* on our west coast, where it is quite common. But the

Cetraria is also found on our southern mountains; it is, however, absolutely lacking in the Eastern continental lowlands and subalpine regions.

Siphula is generally placed near the *Usneaceae*; is it not more related to the *Pertusariae*?

THELOSCHISTACEAE

Protoblastenia STEINER.

358. (1). *Protoblastenia rupestris* (SCOP.) A. ZAHLBR.

var. *typica* TH. FR. Lich. Scand. II pag. 424.

II. Matotchkin Shar: East of Cape Jouravlev.
IV. Mashigin Fjord: North of Blaafjell Basin (?), Mt. Tveten.
VI. Mainland east of Lichutin Island.

subsp. *Siebenhaariana* (KBR.):

Biatora Siebenhaariana KOERBER Syst. Lich. Germ. (1855) pag. 207. KOERBER Lich. Sel. Germ. 104. ARNOLD Lich. Exsic. 1047.

II. Matotchkin Shar: Near Vasnetsoff Glacier and Mt. Lasareff.
IV. Mashigin Fjord: Blaafjell Basin, north side, and Rækved Bay.
V. Admiralty Peninsula.
VI. Eastern Kristovii Island, a very typical plant.

It seems to me that the plants with a well developed epilithous thallus (the f. *typica* TH. FR. = f. *rufescens* LEIGHT. and the *Siebenhaariana*) are not a little different from the plants with an endolithous thallus (f. *calva* and f. *encrustans*), more different than f. *typica* is from *Siebenhaariana*, often treated as two different species. The epilithous thallus is not due to the substratum, for it is equally distinct on chalk as on hard rocks.

I have tried to regard the two epilithous types as two different species, but I failed, for I could not find any character that absolutely separated them, though the extreme types are different enough.

f. *typica*.	*Siebenhaariana*.
Thallus epilithinus, bene evolutus subleprosus, (saltem in pl. arct.) corrosus, $\pm$ verrucosus, fulvo-aurantiacus vel cinereo-obscuratus, rarius dealbatus.	Thallus epilithinus, bene evolutus, verniceus, reticulato-rimosus, areolae contiguae, convexae, undulatae, aurantiacus vel pallidius coloratus.

f. *typica.* (cont.)	*Siebenhaariana.*
Hypothecium flavescens vel incolor.	Hypothecium flavescens vel fuscescens, rarius violaceo-rubescens.
Vulgo calcicola.	Vulgo rupes duriores incolit.

A reddish excipulum and hypothecium was only found in the plant from Rækved Bay.

It is too much to say that the epilithous plants are rare, but they are less common by far than the endolithous types.

f. *calva* (DICKS.)
(incl. f. *incrustans* (DC).

I. Gribovii Fjord: South coast (f. *incrustans*).
II. Matotchkin Shar: Mt. Lasareff, Mt. Wilczek, Near Vasnetsoff Gl., Chalhonik Valley (f. *incrustans*), East of Chalhonik Valley and Belushii Bay.
IV. Mashigin Fjord: Fram Bay, Nunatak on Lacroix (Norway) Glacier (?), Mt. Tveten and Strömsnes Bay. North of the Mashigin Fjord entrance.
VI. Berkh Island (f. *incrustans*). Lichutin Island. Mainland east of Lichutin Island (f. *incrustans*).

The endolithous types of *Protoblastenia rupestris* are of the commonest lichens all over the region investigated by us. They are inevitable on chalky and dolomitic rocks. The locality from the nunatak is uncertain, for only the empty alveolae were left. A Pyrenolichen (*Polyblastia?*) is possible, but size of the alveolae agrees well with *Protoblastenia rupestris*.

By far the greater part of my material is typically f. *calva*, some plants with more immersed apothecia (f. *incrustans*) have been indicated in the above list of localities. I can find no distinction of value between these formae, which are, in my opinion, only confluent types of variation.

359. (2). *Protoblastenia terricola* (ANZI).

Lecidea rupestris var. *terricola* (ANZI) TH. FR. Lich. Scand. II (1874) pag. 425, ubi syn.

Blastenia terricola (ANZI) LYNGE Lich. from Spitsb. I (1924) pag. 6.

II. Matotchkin Shar: Near Vasnetsoff Glacier, Chalhonik Valley, Mt. Syernaia and Belushii Bay. Serebryanka Fjord.
IV. Mashigin Fjord: Moraines south of Blaafjell Basin and Sol Bay. North of the Fjord entrance.
VI. Mainland east of Lichutin Island. Berkh Island.

Widely distributed in Novaya Zemlya, and quite common, but not plentiful. Found on mosses and especially on the earth in localities that are not too dry. It endures much moisture and can grow on the moraines or even along depressions in the ground, together with *Lecidea ramulosa*, moistened by very cold water.

Habitually it much resembles *Lecidea cuprea*, but it is easily separated from that species by the purplish reaction of its apothecia with KOH.

Blastenia MASS.

360. (1). *Blastenia tetraspora* (NYL.) TH. FR.

Plate V, fig. 28—29.

I. Gribovii Fjord: North side.
II. Matotchkin Shar: Mt. Lasareff, Mt. Wilczek, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson, Mt. Tveten, Dal Bay, Sol Bay and Rækved Bay. North of the Fjord entrance.
V. Admiralty Peninsula.
VI. Berkh Island. Pankratyeff Peninsula.

On more or less decayed mosses, with the lichens of the *Caloplaca stillicidiorum* association.

It is distributed all over the region investigated by us, as one of the commonest lichens. I am convinced that I could have found it every day.

I have examined more than 50 Novaya Zemlya plants, hunting for *Blastenia leucoraea* (ACH.) TH. FR. But it was all in vain. There were a few asci in one plant, containing 2 spores, but *Blastenia leucoraea* was not found.

VAINIO records *Blastenia tetraspora*, but not *Blastenia leucoraea* from Pitlekai in Eastern Siberia. The same is the case in NYLANDER'S Lich. Freti Behr. and in TH. FRIES'S Lich. Spitsb. TH. FRIES records *Blastenia leucoraea* from Greenland in his Lich. Arct. and DEICHM. BRANTH— GRÖNLUND also from Greenland (Grönl. Lich. Fl. pag. 482). I have again examined *Blastenia leucoraea* from Gjöa Harbour (King William's Land, LYNGE Lich. Gjöa Exped. pag. 4) and found the determination to be correct. Our knowledge of the distribution of the Arctic lichens is still very imperfect, but the available facts suggest *Blastenia leucoraea* to be a Western Arctic species, whereas *Blastenia tetraspora* is widely distributed (all over the Arctis?) in the Arctis.

I have examined the excipulum of several apothecia, there were no gonidia in them. I have therefore retained this species in the genus *Blastenia*.

Caloplaca TH. FR.

In his very remarkable paper Lichenes Blasteniospori herb. Regnelliani, Arkiv f. Botanik vol. XX A (1926) No. 9, MALME has united the family *Caloplacaceae* with the *Theloschistaceae*. On equally good reason he has united the two genera *Caloplaca* and *Blastenia*, substituting the generic name *Callopisma* DE NOT. for the new genus. MALME states that there is every transition between the types of the excipulum in these two genera.

From fear of bibliographical inconsistency I have not been able to follow him on the latter point in this book. It has been under work for several years and species of this genus have been frequently mentioned in the work. It would hardly be possible for me now to trace out all these names and to find their correct combinations, if referred to the genus *Callopisma*.

Sect. a. *Eucaloplaca* TH. FR.

361. (1). *Caloplaca ursina* LYNGE.

Plate V, fig. 35—37.

Caloplaca ursina LYNGE Lich. Bear. Isl. (1926) pag. 64.

II. Matotchkin Shar: East of Cape Jouravlev, Mt. Syedlho and on the south side of the Shar at the Kara Sea entrance.

VI. Mainland east of Lichutin Island.

The last mentioned plant was found on chalk, otherwise the plants were collected on hard rocks. There are but a few plants in my collection, but if botanists will pay special attention to this species, it will perhaps be found in many localities.

Ripe spores are always broad or even very broad, I have found some spores so broad as 16×12 μ; their size is (12—) 13—18×8—10 (—12) μ. Young or immature spores are narrower, often constricted at the middle.

Its thalline colour calls to mind the "*diphyes*" which shall be a *Blastenia*, according to TH. FRIES Lich. Scand. II pag. 395. MALME as well as VAINIO have suggested a comparison with that species. "*Blastenia*" *diphyes* has very small apothecia; it is especially characterized by its long arcuate pycnoconidia: 18—22 μ. In one of my plants (Kara Sea entrance) I succeeded in detecting fertile pycnides. The pycnoconidia were elliptical, 2—3 μ long, thus excluding the *diphyes*.

The reaction of the epithecium "KOH omnino immutatum" is almost incredible in a *Caloplaca*. In some of my plants from hard rocks a very faint tinge of violet was obtained with KOH, and in the last mentioned calcicolous plants the violet colour was very distinct.

362. (2). *Caloplaca gilva* (HOFFM.) A. ZAHLBR.

Plate V, fig. 19—23.

Placodium gilvum (HOFFM.) VAIN. Lich. Pitlek. (1909) pag. 64, ubi syn.

Caloplaca gilva (HOFFM.) ZAHLBR. LYNGE Lich. Spitsb. I (1924) pag. 6. LYNGE Lich. Bear Isl. (1926) pag. 63.

I. Goose Bay.
II. Matotchkin Shar: Mt. Wilczek. Serebryanka Fjord.
VI. Berkh Island.

Restricted to bones and to drift-wood, but quite plentiful where I found it.

The plant from Mt. Wilczek was found on drift-wood. It has a well developed, greyish-white, rimose thallus and a very distinct, white, crenate, presistent thalline margin surrounding the margo proprio. There is no trace of pruina on the apothecia. Its spores are narrow: 15—17.5 ×5—5.5 μ.

The colour of its apothecia suggests *Caloplaca pyracea* more than *Caloplaca gilva*, but I have referred it to the latter species on account of its well developed thallus, the thalline margin, and the narrow spores. VAINIO has suggested that it might be related to his *duplicata:* "*Lecanora cerina L. duplicata* n. subsp." in Lich. Vib. (1878) pag. 55.

The Berkh Island plant is practically athalline, it is a poor little plant, growing on drift-wood. The spores are considerably broader than in the lignicolous plants: 12—15×7—8 μ.

The other plants were growing on old bones. In his Lich. Pitlek. pag. 64 VAINIO has referred his ossicolous plants to var. *Ehrhartii*, and the same should be done with my plants. In a few of them the thallus is unusually thick, but bones are a favourable substratum. The colour of the disc is darker than usual in some plants.

Former investigations. *Caloplaca* "*cerina*" has been recorded from Novaya Zemlya (DEICHM. BRANTH pag. 75, on bones); Matotchkin Shar (TH. FRIES pag. 15, HEUGL. pag. 312, on bones).

Var. *chlorina* from Novaya Zemlya (DEICHM. BRANTH pag. 75).

363. (3). *Caloplaca stillicidiorum* (VAHL) LYNGE.

Plate V, fig. 17—18.

Lichen stillicidiorum MARTIN VAHL Nogle Iagttagelser ved en Reise giennem Norge til dets nordlige Dele, pars. I pag. 28. Naturhist. Selsk. Skr. vol. II, Köbenhavn 1792. Flora Danica, Hefte XVIII (1792) pag. 6 et tab. 1063 fig. 2. RETZIUS A. J. Flora Scand. Prodr. (1795) pag. 278.

Parmelia cerina ε P. stillicidiorum ACHARIUS Meth. Lich. (1803) pag. 176. FRIES Lich. Eur. (1831) pag. 169.

Lecanora cerina γ. stillicidiorum ACHARIUS Lich. Univ. (1810) pag. 390.

Caloplaca cerina f. *stillicidiorum* TH. FR. Lich. Scand. I (1871) pag. 175, ubi syn.

Caloplaca stillicidiorum (HORNEM.) LYNGE Lich. Bear Island (1926) pag. 64.

An syn: *Lichen chloroleucus* SM. Eng. Bot. (1805) pag. 1373.

Lecanora chloroleuca ACHARIUS Lich. Univ. (1810) pag. 405. Syn. Lich. (1814) pag. 160.

Caloplaca cerina β. chloroleuca TH. FR. Lich. Scand. I (1871) pag. 174.

I. Goose Bay. Gribovii Bay: north side.
II. Matotchkin Shar: Near Vasnetsoff Glacier, Mt. Wilczek, Chalhonik Valley, Mt. Syernaia and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Strömsnes Bay, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Berkh Island. Pankratyeff Peninsula.

It will be seen from this enumeration of localities that *Caloplaca stillicidiorum* is distributed all over the region investigated by us. And it is one of the commonest lichens of the islands.

On dead vascular plants, as *Saxifraga oppositifolia*, *Dryas octopetala, Silene acaulis* a. o., furthermore on the thallus of several large lichens, especially *Physcia muscigena* and *Peltigerae*, and also on mosses there is found an association of very common lichens. This *Caloplaca* is one of the commonest and most conspicuous of them and I propose the name *Caloplaca stillicidiorum* association for these plants. The most important of the other lichens are: *Caloplaca cinnamomea* and *subolivacea*, *Rinodina roscida* and *turfacea*, *Buellia disciformis* var. *muscorum*, *Lecanora verrucosa* and *L. epibrya; Leciophysma finmarkicum* is also quite common.

It is evident from their manner of growth that several of these lichens are nitrophilous, hardly a single of them is nitrophobous. Physiological questions cannot be decided without exact experiments, but it deserves an investigation, whether these lichens — or some of them — are not ± saprophytous or perhaps even parasitic on their organic substratum.

According to VAINIO Lich. Bres. I (1890) pag. 122 the *Lichen cerinus* of EHRHART Plant. Crypt. (1791) No. 216 is not identical with

Caloplaca cerina (EHRH.) TH. FR. Lich. Scand. I (1871) pag. 173, but with TH. FRIES's *Caloplaca pyracea*, l. c. pag. 178. VAINIO has therefore reestablished the specific name *gilva*, based on *Verrucaria gilva* HOFFM. Deutschl. Flora II (1796) pag. 179. — I have not had access to those old type plants.

But even if this species is limited in the same wide sense as TH. FRIES has done, the entirely valid name *stillicidiorum* from 1792 must take the preference.

It is quite evident from VAHL's description that his *Lichen stillicidiorum* is a muscicolous plant with pruinose margins round the apothecia: "scutellis flavis cinereomarginatis." TH. FRIES has found (l. c.) that it is confluent with his β. *chloroleuca* (SM.) TH. FR. and that is quite possible, at least I can find no great difference between that plant in MALME Lich. suec. No. 810 and my Arctic plants. But VAHL's name from 1792 is older than *Lichen chloroleucus* from 1805.

HORNEMANN is certainly not the author of "*Lichen stillicidiorum*", this mistake has been copied from work to work.

I think it possible to regard VAHL's plant a proper species, specifically distinct from the other varieties of *Caloplaca cerina* TH. FR. (= *C. gilva* VAIN.). But the final decision of this intricate question must be left to a coming monograph on this difficult genus, which we sorely want.

Former investigations. Möller Bay (KUSNETZOFF No. 33), Kristovii Fjord (ELENK. et SAV. pag. 78). Also from Kolgueff (SAV. pag. 35).

364. (4). *Caloplaca* cfr. *aurantiaca* (LIGHTF.) TH. FR.

Plate V, fig. 24—25.

VI. Berkh Island, one plant on drift-wood.

Thallus tenuis, sed distincte evolutus, granulosus, flavescens vel pallide flavescens.

Apothecia numerosa, flavo-aurantiaca, discus planus (apothecia juvenilia), margine concolori vel magis flavescenti, crasso, prominenti, saepe crenulato circumdatus. Hypothecium subplectenchymaticum. Paraphyses articulatae. Sporae polari-dyblastae, late ovales, 13—16 (—18) × 8—10 μ, septum crassum: 5—6 μ.

The spores were generally badly developed, often shrunken. The thick septum is more resistant than the thin-walled apices with the cell-rooms and the shrunken spores therefore more or less pointed.

It was not expected that the determination of this species should offer any difficulties. But this plant, growing on an unusual substratum, is not quite typical and several possibilities had to be considered:

Caloplaca pyracea is almost athalline, its apothecia are numerous, as here, but dispersed or concentrated in a more regular manner, and its spores are smaller: 11—15×6—8 (TH. FRIES Lich. Scand. pag. 179), 11—14×5—8 (HARM. Lich. France pag. 842); in MALME Lich. suec. No. 311 I measured 9—13×7—8 μ, with a very broad septum: 4.5—5 μ.

Habitually my plant is not unlike *Caloplaca murorum* var. *steropea* with its more heaped apothecia (apothecia conferta). But *steropea* has a radiating, effuse, pale yellowish thallus and smaller spores of the usual *murorum* type and size, I have measured 9—12×5.5—6.5 μ.

DU RIETZ has suggested *Caloplaca fraudans*. This species has the same broad spores as I have measured in my plants. DU RIETZ writes that if *fraudans* has a thallus, it is yellowish, that is just the distinction against *amniospila*, as limited by him, with its more greyish thallus. But the colour of the apothecia distinctly places *fraudans* in the *ferruginea* section, the yellowish-orange colour of my plants is almost identical with the colour of the young apothecia of *Caloplaca aurantiaca*.

The distribution of this species is no objection to the determination; in Norway *Caloplaca aurantiaca* advances as far north as our deciduous trees, especially *Populus*.

365. (5). *Caloplaca vitellinula* (NYL.) OLIV.

Caloplaca vitellinula (NYL.) OLIVIER Expos. syst. I (1897) pag. 232, ubi syn. BOULY DE LESDAIN Lich. Dunk. (1910) pag. 126. LYNGE Lich. Spitsb. I (1924) pag. 6.

Lecanora vitellinula NYLANDER Flora (1863) pag. 305. NYLANDER Lich. Lapp. orient. (1866) pag. 127. TH. M. FRIES Lich. Scand. I (1871) pag. 179. HUE Addenda (1886) No. 510, pag. 73. HARMAND Lich. France V (1913) pag. 841.

Placodium vitellinulum VAINIO Lich. exped. Amdrup (1905) pag. 131.

An syn. *Callopisma vitellinulum* in ARNOLD Lich. Fränk. Jura (1885) pag. 90. ARNOLD Lich. Exsic. No. 923 (under that name) contains *Candelariella vitellina* and a *Caloplaca* of the *ferruginea* section.

For (bibliographical) synonymy see Krypt. Exsic. Vind. No. 1779.

II. Matotchkin Shar: Mt. Lasareff and Vasnetsoff Glacier.
IV. Mashigin Fjord: South and north side of Blaafjell Basin and Sol Bay.

Collected on more or less chalky slates, also on pure chalk. The number of plants is not inconsiderable, and they are quite monotypical.

f. *approximata* LYNGE nova forma.

Plate V, fig. 15—16.

Sporis angustis et loculis ± approximatis notata.

Descriptio copiosior:

Thallus ecrustaceus vel tenuissimus, si evolutus, in flavescentem vergens.

Apothecia dispersa vel crebria, vitellina, subnitida, parva: diam. haud ultra 0.5 mm., vulgo minora, primo plana, margine prominenti, concolori vel leviter dilutiori cincta, deinde subconvexa margine magis excluso. Excipulum in margine et in parte inferiori gonidiis repletum, omnino incolor, etiam cum hypothecio. Hypothecium hyphis dense contextis formatum, sed non plectenchymaticum. Paraphyses laxe cohaerentes, apicem versus adspersae, incrassatae, $\pm$ ramosae. Asci angusti, 35—45 $\times$10—12 μ, octospori. Hymenium 65—75 μ altum, superne flavo-aurantiacum, praeterea incolor. Sporae ellipsoideae, dyblastae, loculis vulgo approximatis, septo 1.7—2 μ crasso separatis, 9—12 (—15) $\times$ 4—5,5 μ. Episporium in apice sporarum tenuissimum.

Hymenium J persistenter caerulescens, praecipue apices ascorum.

Caloplaca vitellinula is difficult of distinction from *Caloplaca pyracea* and many excellent systematists (e. g. TH. M. FRIES and DU RIETZ) only recognize it to be a saxicolous *pyracea*. The spores are narrow in all my plants, typically elliptical, generally twice as long as broad and often longer. Together with these spores (in the same sections) I have often seen a few shorter broadly elliptical spores (were they developed in the ends of the asci?). These narrow spores might suggest the *ferruginea* section, but the colour of the apothecia, a very important character in this genus, decides the question in favour of the *pyracea* section.

In his first description NYLANDER attributed narrow spores to his *vitellinula*: 11$\times$4.5—5.5 μ (HUE l. c.). HARMAND describes the same narrow spores: 9—14$\times$4.5—7 and also BOULY DE LESDAIN: 11—13 $\times$5—7 μ. The approximated cellules, sometimes only separated by a common septum, are still more characteristic than the narrow spores, and I think that my plants deserve a proper name, independently of the question *vitellinula-pyracea*.

In some plants referred to *vitellinula* I have measured broad spores of the common *pyracea* type, e. g. NORRL. et NYL. Herb. Lich. Fenn. No. 271: sporae late ellipsoideae, typice polari-dyblastae, 10.8—13$\times$7—8 μ.

Former investigations. Novaya Zemlya (DEICHM. BRANTH pag. 75), Möller Bay (KUSNETZOFF No. 34, on rocks). I have ventured to refer all "*pyracea*" records to *vitellinula*. Also from Jugor Shar (TH. FRIES pag. 15, STIZ. pag. 420, HEUGLIN pag. 313).

366. (6). *Caloplaca Jungermanniae* (VAHL). TH. FR.

Plate V, fig. 30—31.

Lichen Jungermanniae MARTIN VAHL Nogle Iagttagelser ved en Reise giennem Norge til dets nordlige Dele, pars I, pag. 29. Naturh. Selsk. Skr. vol. II, Köbenhavn 1792. Flora Danica, Heft XVIII (1792) pag. 6 et tab. 1063, fig. 1.

Caloplaca Jungermanniae (VAHL) TH. FR. Lich. Arct. (1860) pag. 121. Lich. Scand. I (1871) pag. 179 (excl. β. *subolivacea* TH. FR.), ubi syn.

Placodium Jungermanniae (VAHL) TUCK. VAINIO Lich. Pitl. (1909) pag. 66, ubi syn.

I. Gribovii Fjord: North side.
II. Matotchkin Shar: Mt. Wilczek (?).
IV. Mashigin Fjord: North of the Fjord entrance.
V. Admiralty Peninsula.

If we exclude β *subolivacea* TH. FR. (which see), here treated as a proper species, *Caloplaca Jungermanniae* is no common species in Novaya Zemlya. I found a number of plants at the first mentioned station, otherwise it was very scarce (or overseen). The plant from Mt. Wilczek is untypical and the determination is uncertain: its spore septum is so thin that the spores resemple *Candelariella* spores. But the reaction of the hymenium is KOH +, and I can find no other distinctive character from *Caloplaca Jungermanniae.*

In well developed apothecia the hymenium is rather high: 90—110 μ, generally about 100 μ, the spores 16—21×7—11 μ.

367. (7). *Caloplaca subolivacea* (TH. FR.) LYNGE.

Plate V, fig. 26—27.

Caloplaca Jungermanniae (VAHL) **subolivacea* TH. FRIES Lich. Spitsb. (1867) pag. 26. TH. FRIES Lich. Scand. I (1871) pag. 180. LYNGE Lich. Bear Isl. (1926) pag. 63.

Lecanora jungermanniae (VAHL) NYL. var. *subolivacea* VAINIO Adjum. Lich. Lapp. I (1881) pag. 147.

I. Goose Bay. Gribovii Fjord: North side.
II. Matotchkin Shar: Pomorskaya, Near Vasnetsoff Glacier, Mt. Wilczek, Chalhonik Valley and Mt. Syernaia. Serebryanka fjord in the rookery.
IV. Mashigin Fjord: Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Berkh Island. Mainland east of Lichutin Island. Eastern Kristovii Island, on whale bones. Northern Kristovii Island. Pankratyeff Peninsula.

I have ventured to treat it as a proper species on account of its small apothecia (0.3—0.5 rarely 0.7 mm.), considerably smaller than in the *Caloplaca Jungermanniae* α. *genuina* TH. FR. (1—1.5 mm.), and its low hymenium: 70—80 (—90), against (90—) 100 (—110) in the "*genuina*" (full-grown apothecia). The spore size is not a little variable. I have measured slightly longer spores in the *genuina*: 16—21×7—10 μ, against 13—16×8—9 in *subolivacea*. But T. FRIES made the inverse observation: 12—14×7—8 in *genuina*, against 13—16×7—10 μ in *subolivacea* (Lich. Spitsb. l. c.). In *subolivacea* they are generally broadly elliptical: their long axis is not twice as long as their short axis.

There is an interesting difference with respect to their geographical distribution. In Norway *genuina* is much more common than *subolivacea*, which in Southern Norway is restricted to high alpine localities. In Northern Norway *Caloplaca subolivacea* is much more common than in Southern Norway (vide etiam TH. FR. Lich. Scand. l. c.).

Quite naturally we have the inverse proportion in the Arctis. In Spitsbergen the *genuina* "parcissime modo obvia fuit" (TH. FR. Lich. Spitsb. l. c.), the *subolivacea* on the contrary has been recorded from the whole of Spitsbergen. I can only confirm this statement from my own investigations in Bell Sound 1926.

The Ellesmereland *Caloplaca Jungermanniae* of the 2nd Arct. Exp. Fram only contains *Caloplaca subolivacea*. The same is the case with the plants from Arctic America, collected by the Gjöa Expedition (B. LYNGE Lich. Gjöa Exp. pag. 4).

VAINIO only found the *genuina* in the Pitlekai collection from the Vega Expedition. But the available material is, as yet, too small to suggest an Eastern origin (or distribution) for this species.

Especially on dead plants, as *Saxifraga oppositifolia* and *Dryas octopetala*, also on the thallus of lichens, e. g. *Physcia muscigena*, *Peltigera aphthosa* a. o., and on mosses.

In Novaya Zemlya as in other Arctic regions it is very common and widespread and always associated with some other lichens; see *Caloplaca stillicidiorum*, the most conspicuous member of this association.

The colour of the apothecia varies, in the Arctis the commonest colour is the bright yellow (vitelline) colour of *Candelariella cerinella*, paler than in MALME's Lich. suec. 784. The small apothecia are ± plane, but they are easily mistaken for concave, on account of the relatively thick persistent margin.

Former investigations. Recorded from Novaya Zemlya (DEICHM. BRANTH pag. 75), Möller Bay (KUSNETZOFF No. 35) and Matotchkin Shar (TH. FRIES pag. 15). Most probably HEUGLIN's *Caloplaca Jungermanniae* refers to this species.

368. (8). *Caloplaca* cfr. *fraudans* (TH. FR.) OLIV.

Caloplaca ferruginea ε. *fraudans* TH. FR. Lich. Spitsb. (1867) pag. 27. Lich. Scand. I (1871) pag. 184.

f. *latispora* LYNGE n. f.

Differt a typo sporis latioribus: 11—16×7—9 μ et septo crassiori: 4.5—5 μ. Plantae habitu *Caloplacae fraudantis*.

II. Matotchkin Shar: Near Vasnetsoff Glacier, on hard slates.

Habitually my plants resemble TH. FRIES's type very much. They have been submitted to DU RIETZ, Upsala, who refers them to "*Callopisma fraudans* (TH. FR.) DR." But they differ in an important point: the broadly elliptical spores and their broad septum. In TH. FRIES's type I have measured narrow spores, 2 or even 3 times as long as broad, with a septum that is less than 1/3 of the spore length (TH. FR. l. c.: "sporae angustae, oblongae").

There is hardly any thallus visible. The colour of the apothecia is "subaurantiaca v. fulvorufa" as stated by TH. FR. l. c. The slightly paler margin is very thin, a section shows it to be filled with gonidia, as is also the lower part of the excipulum. The hyphae of the hypothecium are so densely contexted as to form a practically plectenchymatous tissue.

The significance of the spore breadth is one of the many questions in this genus that can only be solved by a monography, based on a large material.

The relation between these saxicolous plants and the lignicolous *amniospila* (WBG.) with its "sporae ellipsoideae, late ellipsoideae v. ovoideae" (TH. FRIES l. c.) should be studied. I have seen the *amniospila*-plants in herb. WBG. in Upsala and also in the Finnish herb. in Helsingfors and Åbo. These plants are hardly conformous and I do not know, how to circumscribe a species *Caloplaca amniospila*.

I have formerly referred some of my Novaya Zemlya *Caloplacae* to *amniospila* (Lich. Bear Isl. (1926) pag. 61). Having now seen the type of the *discoidalis*, I have convinced myself of their identity with that plant (which see), but is the *discoidalis* a proper species or should it be united with a *Caloplaca amniospila*, sensu latiore?

See *Caloplaca aurantiaca* and *caesiorufa*.

369. (9). *Caloplaca caesiorufa* (ACH.). sensu VAINIO.

Vide LYNGE Lich. Bear Isl. (1926) pag. 61, ubi syn.

II. Matotchkin Shar: South side of the Shar at the Kara Sea entrance.

It is impossible to say anything about its distribution in Novaya Zemlya, for only few plants were collected. But this fact suggests a rare species.

Thallus tenuis, sed distincte evolutus, c i n e r a s c e n s, rimoso-areolatus. Hypothallus non visus.

Apothecia numerosa, parva, diam. 0.3—0.5 mm. Discus (vulgo satis obscure) ferrugineo-fuscus, epruinosus, planus vel subplanus, margine obscuriori persistenti, saepe varie flexuoso, circumdatus. Excipulum gonidiis instructum, in parte exteriori late aeruginoso-nigrescens. Hypothecium (in specimine) flavo-fuscescens, hyphis densissime contextis formatum. Hymenium 75—85 μ altum, in parte superiori aeruginoso-obscurascens, in parte inferiori dilutius coloratum vel incolor. Paraphyses facile discretae, gracilentae, in apice leviter solum incrassatae. Sporae polari-dyblastae, medio non constrictae, 11—13 (—16)×6—7.5 μ, isthmus distinctus, 3 μ longus.

Few species of this genus are so difficult of limitation as *Caloplaca caesiorufa*. VAINIO has told me that it is chiefly distinguished from *Caloplaca ferruginea* by its distinct, often well developed greyish-white (not yellow) thallus. He has acknowledged my plant to be *Caloplaca caesiorufa*. — It will then be necessary to reconsider my Bear Island *Caloplaca caesiorufa*, which are athalline or almost athalline; at present I can neither defend nor attack these determinations.

HUE has arranged the species of this tribus according to the texture of the hypothecium. He refers i. a. NORRL. and NYL. Herb. Lich. Fenn. No. 272 to a new species "*Lecidea Norrliniana*", distinguished from *caesiorufa* by its hypothecium. It there consists of a single stratum, in *caesiorufa* it should consist of a double stratum. The value of this character should be tested by a trained anatomist. My hand sections gave no satisfactory answer, even if they were relatively thin.

At Belushii Bay I collected a saxicolous *Caloplaca* of this section, with a relatively thick granular thallus of a colour, which is difficult of definition: yellowish-brown or greyish-brown, often pale to almost white on the upper part of the granules. Spores thick: 13—16×6.5—10 μ, in one apothecium larger (sp. quaternae?): 17—18.5×8—10 μ. VAINIO has placed this plant with *caesiorufa*. DU RIETZ is of opinion that *caesiorufa* is a "nomen delendum". WAHLENBERG's *caesiorufa* is *aurantiaca* var. *erythrella* (DU RIETZ in litt.); and the name *caesiorufa* has been used for so many different plants that its synonymy is inextricable. DU RIETZ gives prefence to the name *amniospila*, to this species he refers plants with a greyish thallus and a ± ferrugineous disc with a greyish thick margin. He refers my plant to *amniospila*. Its colour is not quite typical, but in the Arctis irrigation and other factors often damage the lichens, changing their colours and habitus beyond recognition.

NYLANDER has called attention to the hypothecium, which is plectenchymatous in his *caesiorufa* (see my Lich. Bear Isl. (1926) pag. 62, ubi syn). I have found a hypothecium of that kind in other saxicolous plants also of the *ferruginea* section.

370. (10). *Caloplaca invadens* LYNGE n. sp. ad int.

An syn. *Caloplaca Turneriana* (ACH.) OLIV.? (vide infra).

II. Matotchkin Shar: Mt. Syernaia and Belushii Bay. Serebryanka Fjord, in the rookery.

Thallus parasiticus vel thallum aliorum lichenum invadens, crustaceus, determinatus, mollis, crassus, pallide flavo-cinerascens, opacus, irregulariter diffracto-areolatus, areolae argillaceae, epruinosae, subplanae. Hypothallus non visus.

Apothecia numerosa vel numerosissima, dispersa vel contigua, rotundata vel mutua pressione angulata, diam. usque ad 1 mm., sed vulgo minora, arcte adpressa, thallum leviter superantia. Discus planus vel leviter convexus, satis obscure luteo-ferrugineus, epruinosus, laevigatus, margine crasso, ceraceo-nitido, quam disco dilutiori, magis in flavescentem vergenti, circumdatus. Excipulum incolor, etiam cum hypothecio. Gonidia excipularia usque in marginem numerosa. Hyphae hypotheciales dense contextae. Hymenium 90—95 μ altum, superne fuscescenti-granosum. Paraphyses non cohaerentes, (maturae) apicem versus clavato-incrassatae, constricte septatae, ramosae. Asci octospori, 16—18 μ crassi, membrana in apice incrassata. Sporae polari-dyblastae, medio non constrictae, late ellipsoideae, 13—16×8—10 μ, porus distinctus, (3—) 4—5 μ longus. Episporium in apice sporarum tenue, aequa tenuitate.

Thallus KOH immutatus. Hymenium J caerulescens vel caeruleo-nigrescens, KOH roseum.

Caloplaca Turneriana was described by ACHARIUS in Lich. Univ. (1810) pag. 206, from "Anglia" (*Lecidea Turneriana*). His description of the thallus is not unlike my plant, but its colour: "nigro-fusca" . . . "obscura e cinereo-fusca" is different, as are also its "areolae papillato-verrucosae".

NYLANDER referred it to *Lecanora*, in LAMY DE LA CHAPELLE Lich. Mt. Dore (1880) pag. 60. LAMY also describes a "Croûte thalline d'un brun foncé, allant au noir".

A. L. SMITH describes its broad spores: 11—16×7—10 μ (Brit. Lich. I (1918) pag. 227); she attributes a "thin or thickish, warted or areolate, dark-grey or blackish" thallus to this species.

Unfortunately I did not study the type in hb. ACHARIUS in Helsingfors. Professor LINKOLA has sent me a "*Lecanora Turneriana*" from herb. NYLANDER for comparison (leg. E. LANG = VAINIO, at Hollola, in 1874). This plant has hardly any thallus at all, the colour of its apothecia is as in my plants, and also its spores: 10—15×8—10 μ. VAINIO himself describes a "Thallus obscure viridis" (Adjum. Lich. Lapp. I (1881) pag. 145). A "*Lecanora Turneriana*" in our herb., collected by M. C.

KNOWLES at Howth Co near Dublin, is quite parasitic, I cannot decide whether it has a proper thallus or not.

On the whole my Novaya Zemlya plants must be nearly related to *Caloplaca Turneriana*, if specifically distinct. It differs chiefly by its pale yellowish-grey thallus and its planer (?) areolae.

TH. FRIES refers *Caloplaca Turneriana* to his *Caloplaca ferruginea* var. *obscura* ("forma ad *obscuram* accedens", Lich. Scand. I (1871) pag. 186. But do not its broad spores suggest a nearer relationship to the *Caloplaca pyracea* tribus?

371. (11). *Caloplaca discoidalis* (VAIN.) LYNGE.

Lecanora ferruginea var. *discoidalis* VAIN. (ACH. in herb.) VAINIO Adjum. Lich. Lapp. I (1881) pag. 45.

Placodium ferrugineum var. *discoidalis* VAINIO Lich. Pitlek. (1909) pag. 65.

IV. Mashigin Fjord: Rækved Bay.
VI. South of Arkhangel Bay (?). Northern Kristovii Island.

Evidently quite common on drift wood. Sometimes parasitic, on *Lecidea* sp., but that is evidently more incidental.

Thallus (semper?) obsoletus vel tenuissimus, cinerascens.

Apothecia numerosa vel numerosissima, rotundata vel mutua pressione angulata, diam. vulgo 0.7—0.8 mm., sed interdum usque ad 1.3—1.5 mm. Discus leviter convexus, epruinosus, opacus, ferrugineus vel fulvo-ferrugineus, margine proprio crasso (deinde tenuiori), nitido, luteo-ferrugineo, primo integro, deinde crenato circumdatus. Excipulum incolor, gonidiis usque in marginem repletum. Hypothecium incolor, non plectenchymaticum. Hymenium 75—80 μ altum, superne flavo-fuscescens, granulosum. Paraphyses cohaerentes, septatae, graciles, in apice non vel leviter solum incrassatae. Asci angusti, 10—12 μ crassi, in apice protracti et crasse membranati. Sporae rectae vel levissime fabaceae, anguste oblongae: (11—) 14—16×(4—) 4.5—5.5 (—6) μ, porus 2.5—3 μ. Episporium in apice sporarum tenuissimum.

Hymenium etiam cum hypothecio J persistenter caeruleo-nigrescens, epithecium KOH roseum.

Caloplaca discoidalis is characterized by its thick yellow margin (young apothecia are not unlike *Caloplaca subolivacea*, which however has another colour and much broader spores) with a waxy lustre and by its narrow oblong spores, generally 3 times as long as broad.

I have not clearly understood the difference between this and the *Caloplaca amniospila* before I could compare them in the Finnish herbaria (Helsingfors and Åbo). The former, as understood by VAINIO has darker and smaller apothecia with a darker thin prominent margin.

In all the many apothecia which I have examined of *Caloplaca discoidalis* I have found the narrow spores, whereas *Caloplaca amniospila* has broad spores: "sporae ellipsoideae, late ellipsoideae vel ovoideae", such spores are 10—17×6—9 μ (TH. M. FRIES Lich. Scand. I pag. 183 and 185). I have tested this statement on WAHLENBERG's type plant, as usual TH. FRIES's data are correct.

The plants from Arkhangel Bay have a thick, rimoso-areolate thallus with convex areolae. I am not quite convinced that they should be referred to this species.

372. (12). *Caloplaca cinnamomea* (TH. FR.) OLIV.

Caloplaca ferruginea var. *cinnamomea* TH. FR. Lich. Arct. (1860) pag. 123.

Blastenia ferruginea var. *cinnamomea* TH. FR. Lich. Scand. I (1871) pag. 183, ubi syn. LYNGE Lich. Gjöa Exp. (1921) pag. 4.

Caloplaca cinnamomea OLIVIER Lich. Eur. II (1907) pag. 137 (109). LYNGE Lich. Bear Island (1926) pag. 62.

I. Goose Bay.

II. Matotchkin Shar: Near Mt. Vasnetsoff and Belushii Bay. Serebryanka Fjord.

IV. Mashigin Fjord: Fram Bay, Mt. Dietrichson, Mt. Tveten and Rækved Bay.

V. Admiralty Peninsula.

VI. Rookery south of Arkhangel Bay. Berkh Island. Northern Kristovii Island.

Widely distributed and quite common in Novaya Zemlya, as in other Arctic regions. But it is easily overlooked, owing to its minute apothecia which are often so dark of colour, that they are little visible on the substratum.

It grows together with *Caloplaca stillicidiorum* (which see), and other lichens on organic substratum.

Former investigations. Möller Bay (KUSNETZOFF No. 36, s. n. *Caloplaca ferruginea* ε. *cinnamomea*). SAVICZ records a "*Placodium ferrugineum*" from Kolgueff (pag. 35).

373. (13). *Caloplaca nigricans* (TUCK.?) OLIV.

Caloplaca ferruginea η. *nigricans* (TUCK.) TH. FR. Lich. Scand. I (1871) pag. 184, ubi syn.

Caloplaca nigricans OLIVIER Lich. Eur. II (1907) pag. 137 (109).

II. Matotchkin Shar: Mt. Syernaia.

There was only one good plant in my collection, growing on mosses.

It has the same small plane apothecia as the Bear Island plant, formerly determined by me (Lich. Bear Island pag. 63), but the disc is slightly pruinose and the spores broader: 10—11×7—8, against 15—17 ×5—6.5 μ in the Bear Island plant. — I have not seen TUCKERMAN's type plant.

The northern species of the genus *Caloplaca* are sorely in need of monographical work, and no section more than the different units which TH. FRIES united under his *Caloplaca ferruginea.* Such a work would most probably rearrange our species considerably.

374. (14). *Caloplaca ferruginea* (HUDS.).

var. *ferrugineofusca* (VAIN.).

Placodium ferrugineum var. *ferrugineofusca* VAIN. Lich. Pitlek. (1909) pag. 65.

I. Goose Bay.
IV. Mashigin Fjord: Sol Bay.

A few plants were collected on drift wood and on the twigs of a dead *Salix.*

var. *geophila* (WALLR.)

Placodium ferrugineum var. *geophila* (WALLR.) VAIN. Lich. Pitlek. (1909) pag. 66.

VI. Rookery south of Arkhangel Bay.

Only one plant was collected, growing on mosses in the rookery.

It is quite evident that the old comprehensive species *Caloplaca ferruginea*, as limited by TH. FRIES in Lich. Scand. pag. 187, must be divided into several other species. I have tried to regard as proper species the units which I found sufficiently distinct. But it is highly probable that a monographer on this interesting and difficult genus must rearrange the whole species. My poor material of these two varieties was the rest that was left as "*Caloplaca ferruginea* ad interim", simply on the reason that I could not find a satisfactory place for them. — I have compared them with VAINIO's types and I think that they are identical.

A monographer would hardly find it possible to refer the *ferrugineofusca* to any other species than that, which would also comprise the *cinnamomea*; its apothecia are darker, but that is no specific difference.

The *geophila* is more difficult. My material is to small for suggestions. Its spores are relatively broad: 13—16×7—8 μ.

At Berkh Island I collected a *Caloplaca* of the *ferruginea* section on drift-wood. It has very dark, almost black, plane apothecia; spores 13—17×5.5—8 μ. VAINIO has suggested a form of *Caloplaca nigricans*, otherwise generally a saxicolous species, DU RIETZ a form of his *amniospila*. Either of them admits the possibility of a new species or a new form. But so many unhappy units have been created in this difficult section that it is a wise proceeding to avoid creating more of them. I have therefore (ad interim) placed this plant with f. *ferrugineofusca*. A monography (much desired!) must rearrange this whole genus.

Sect. b. *Fulgensia* A. ZAHLBR.

375. (15). *Caloplaca bracteata* (ACH.) JATTA.

I. Gribovii Fjord: North side.
II. Matotchkin Shar: Mt. Lasareff, Mt. Wilczek, Vasnetsoff Gl., Chalhonik Valley, east of Cape Jouravlev and Mt. Syernaia. Serebryanka Fjord.
III. Kristovii Fjord.
IV. Mashigin Fjord: Junior Glacier on the south coast of Blaafjell Basin.
VI. Berkh Island. Mainland east of Lichutin Island.

Widespread and common, in places plentiful. Apothecia are found here and there, but they are quite scarce.

Sect. c. *Gasparrinia* TH. FR.

376. (16). *Caloplaca elegans* (LINK) TH. FR.

I. *Goose Bay. Gribovii Fjord: *Veselago Island.
II. Matotchkin Shar: Mt. Lasareff, near Vasnetsoff Gl., Mt. Wilczek, Chalhonik Valley, *east of Cape Jouravlev, *Mt. Syernaia and Belushii Bay. Serebryanka Fjord.
IV. Mashigin Fjord: South side of Blaafjell Basin, Mt. Dietrichson, *Mt. Tveten, Strömsnes Bay, *Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Lichutin Isl. Mainland east of Lichutin Isl. *Berkh Isl. Northern Kristovii Isl.

A botanist cannot travel in the Arctis without finding *Caloplaca elegans* in abundance and it is quite as plentiful in Novaya Zemlya as elsewhere. But we cannot conclude from this that it is ubiquitous. Like so many other species of this genus it is a nitrophilous plant, which is, in the Arctis, almost the same as ornithocoprophilous. *Caloplaca elegans* occurs in abundance in the rookeries, on bird-stones and localites of that kind. It is, however, not so coprophilous as some other lichens, e. g. *Caloplaca granulosa*, *Rinodina balanina* and *Buellia coniops*, it is also found, though not plentifully, in localities, where birds only occasionally rest.

Caloplaca elegans prefers hard rocks and mica slates, as stated by many authors, but I have also found a few quite typical plants on chalk, and one plant on drift wood.

Its colour varies considerably; in some plants the laciniae are elongated and very narrow. These formae are, in my opinion, quite confluent. F. *tenuis* (WBG.) TH. FR.: "thallus minor, fulvo-miniatus, laciniis subfiliformibus" (TH. FRIES Lich. Scand. I pag. 168) is found with the type. It is not so common, I collected it at the stations, marked with an asterisc (*) in the above list.

Former investigations. As was to be expected *Caloplaca elegans* has been collected at several localities: Novaya Zemlya (DEICHM. BRANTH pag. 75). Höfer Island (KBR. pag. 2), Möller Bay (KUSNETZOFF No. 32), Matotchkin Shar (TH. FRIES pag. 15, HEUGL. pag. 312), Belushii Bay (SAV. pag. 35) and Cape Schanz in Mashigin Fjord (ELENK. et SAV. pag. 77). Also from Waigatsch (TH. FR. pag. 15, HEUGL. pag. 312, STIZ. pag. 420) and from Franz Joseph Land (JACKSON pag. 416, ABRUZZI pag. 673, ELENK. et SAV. pag. 89).

F. *tenuis* has been recorded from Novaya Zemlya (HEUGL. pag. 312), Möller Bay (KUSNETZOFF No. 32) and from Belushii Bay (SAV. 1912 pag. 35). Also from Waigatsch (STIZ. pag. 420) and Franz Joseph Land (ELENK. et SAV. pag. 89).

F. *subtubulosa* TH. FR. from Matotchkin Shar (TH. FRIES pag. 15, HEUGL. pag. 312).

377. (17). *Caloplaca sorediata* (VAIN.) DU RIETZ.

Caloplaca sorediata DU RIETZ Lich. Fragm. II (1916), pag. 477, ubi syn. LYNGE Lich. Bear Island (1926) pag. 64.

I. Goose Bay. South side of Gribovii Fjord.
II. Matotchkin Shar: Mt. Lasareff, Mt. Syernaia and Belushii Bay.
IV. Mashigin Fjord: Strömsnes Bay and Dal Bay.
V. Admiralty Peninsula.
VI. Berkh Isl. Eastern and Northern Kristovii Islands.

Found all over the district investigated by us, but it is very scattered and nowhere plentiful. Generally found with *Caloplaca elegans* and on the same substratum. I detected one plant on chalk and one on drift-wood. It is always sterile.

The name has not been well chosen, for it is isidiate, not sorediate. In some plants the isidia are so badly developed that they are hardly visible.

Former investigations. Matotchkin Shar: Tolyenii Bay and Belushii Bay (TH. FRIES pag. 15, STIZ. pag. 420, HEUGL. pag. 312. I think it more probable that the "*granulosa*" of these authors is *Caloplaca sorediata* than *Caloplaca granulosa*, but I have not seen their plants. Karmakuli (MAGN. pag. 7, s. n. *Placodium sorediatum*).

378. (18). *Caloplaca granulosa* (MÜLL. ARG.) STEINER.

Plate XI, fig. 1.

Vide MALME Lich. suec. 774, ubi syn.

I. Gribovii Fjord: Veselago Isl.
VI. Rookery south of Arkhangel Bay. Northern Kristovii Isl.

It is one of the most ornithocoprophilous species existing. In the Arctis it is strictly restricted to the rookeries, where it can be collected in any quantity, for it colours the mountains. It grows there with *Lecanora contractula*, *Buellia coniops*, *Rinodina balanina* and other nitrophilous plants. *Candelariella crenulata* is the only lichen, which is perhaps still more coprophilous, but it is rare in Novaya Zemlya.

379. (19). *Caloplaca murorum* (HOFFM.) TH. FR. var. *obliterata* (PERS.) sensu VAINIO.

Plate V, fig. 32—34, X, fig. 1.

Placodium murorum var. *obliterata* (PERS.) VAINIO Lich. Pitlek. (1909) pag. 63.

Caloplaca murorum var. *obliterata* (PERS.). LYNGE Lich. Bear Isl. (1926) pag. 63.

Caloplaca murorum b. *marina* f. *obliterata* PERS., HAVÅS Lich. exsic. Norv. No. 438.

I. Goose Bay. Gribovii Fjord: Veselago Island.
II. Sukhoi Noss.
IV. Mashigin Fjord: Sol Bay and Rækved Bay.
VI. Northern Kristovii Island.

It is a highly coprophilous plant, *Buellia coniops* is found with nearly all my plants of it and *Lecanora contractula* is a faithful companion. As such it is widespread and very plentiful, but restricted to appropriate localities. It is evidently quite independent of its substratum (chalk, schistose hard rocks), but the supply of Nitrogen must be sufficient.

The name "*obliterata*" has been used for so many different *Caloplacae* that it should simply be "obliterated"; as it is, it only causes confusion. I have compared my plants with VAINIO's plants from the

Vega Expedition, and VAINIO has acknowledged the identity. But I have not seen PERSOON's type.

In my Novaya Zemlya plants the thallus is so poorly developed that VAINIO's name f. *subecrustacea* Adjum. Lich. Lapp. I (1881) pag. 143 (nomen nudum) would have been more appropriate. — I have thought it necessary to draw up a full description of my plants:

Planta fere athallina, apotheciis confertis pulvinatis tecta, in margine plus minusve, saepe obsolete placodiiformis, vulgo minute granulosa, fulvescens, epruinosa, non sorediata.

Apothecia numerosissima, conferta, saepe pulvinulos parvos formantia, crustam tegentia, diameter 1 vel interdum usque ad 1.2—1.3 mm. Discus epruinosus, planus vel deinde ± convexus, aurantiaco-fulvescens, margine fulvescenti, persistenti vel postremo ± evanescenti, integro vel crenato circumdatus. Excipulum gonidiis repletum, incolor, etiam cum hypothecio. Hypothecium hyphis dense contextis, subplectenchymaticis formatum. Hymenium ca. 80 μ altum, superne flavescenti-granosum. Paraphyses (saltem apicibus) satis cohaerentes, KOH addito clavatae et constricte septatae visae. Asci angusti, 10—12 μ crassi. Sporae ellipsoideae, medio non constrictae, polari-dyblastae, septum crassum, porus tenuissimus, 4.5—5.5 μ longus. Sporae 12—14×4.5—6 μ. Episporium in apice sporarum tenuissimum, crassitudine aequale.

Hymenium J persistenter caerulescens, KOH roseo-violascens.

var. *steropea* (ACH.) TH. FR.

Plate X, fig. 4.

Parmelia murorum γ. *steropea* ACH. Meth. Lich. (1803) pag. 196.

Lecanora vitellina η. *steropea* ACH. Lich. Univ. (1810) pag. 404. ACH. Syn. Lich. (1814) pag. 175.

Placodium murorum var. *steropea* (ACH.) NYL. Lich. Scand. (1861) pag. 136.

Caloplaca murorum f. *steropea* (ACH.) TH. FR. Lich. Scand. I (1871) pag. 171.

Lecanora steropea NYL. in LAMY Lich. Mt. Dore (1880) pag. 60. LAMY Lich. Caut. et Lourd. (1884) pag. 44. HARMAND Lich. France V (1913) pag. 840.

I. Goose Bay. Gribovii Fjord: Veselago Island.
IV. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Northern Kristovii Island.

Thallus tenuis, sed distincte evolutus, crustaceus, continuus vel rimosus, vulgo ± radiato-inaequalis, praecipue marginem versus, pallide flavus. Hypothallus pallidius sulphureo-albidus interdum visus. Sporae 9—12×5.5—6.5 μ.

Praeterea cum var. *obliterata* congruit.

It is quite as coprophilous as var. *obliterata* and restricted to the rookeries and other places where birds are very plentiful. My best plants were collected on old bones, an excellent substratum for Arctic lichens. It grows there with *Lecanora Behringii*, *Buellia coniops* o. a.

It is distinguished from var. *obliterata* by its thallus: a thin continuous or slightly rimose film, more or less radiating, often quite dendritic at the circumference. I cannot regard it as specifically distinct. On the contrary: does the thin filmy thallus suggest a juvenile stage of evolution?

I have not seen the French plants, but I have compared my plants with the types in Helsingfors and in herb. VAINIO and VAINIO has acknowledged the determinations.

Former investigations. "*Squamaria murorum* HOFFM." has been recorded from Novaya Zemlya by MARKH. pag. 332.

380. (20). *Caloplaca marina* (WEDDELL).

Lecanora (Sect. *Caloplaca*) *marina* WEDDELL Lich. de l'Ile d'Yeu (1875) pag. 275 (?).

Non *Lecanora lobulata* SOMRFT. Suppl. Flor. Lapp. (1826) pag. 87.

Caloplaca lobulata in ZAHLBR. Krypt. Exsic. Vind. No. 2370.

Exsic. (in our herb.) ARNOLD 1374 a et b (b from Ile d'Yeu), HARMAND Lich. Gall. praecipui 514, HAVAAS Lich. Norv. 437, HAVAAS Lich. Norv. Occid. 35, ZAHLBRUCKNER Krypt. Exsic. Vind. 2370.

V. Admiralty Peninsula.
VI. Northern Kristovii Island.

This species is extremely common along the whole Norwegian coast on hard rocks, I have never seen it on chalky or slaty rocks. It grows in the litoral zone, exposed to the spray of the waves, with *Lecanora quartzina* and other maritime lichens. It descends right down to the *Verrucaria maura* zone, and is often found with that lichen.

Such rocks are rare in Novaya Zemlya, where the beach line (the cliff) is generally formed of chalky or slaty soft rocks. That is most probably the reason why I found it so scarce. Its presence there, at our northernmost localities, is a remarkable example of the easy distribution of some lichens.

It is quite evident from SOMMERFELT's Suppl. Flor. Lapp. that his *Lecanora lobulata* is another species. His type plant, from Storengen in Saltdalen, was collected "in rupibus meridiei expositis inferalpinorum", but this species (i. e. *Caloplaca marina*) is strictly maritime, and

SOMMERFELT's type plant in our herb. is in reality *Caloplaca erythrella*, already described by ACHARIUS in Prodr. Lich. Suec. (1798) pag. 43. — There is also another "*Lecanora lobulata*" in SOMMERFELT's herbarium, collected in "Saltdalen: saxis litoralibus inter Rognan et Hals", but that plant is neither *erythrella* nor *marina*, it looks more like a *Caloplaca murorum*.

In reality SOMMERFELT is not the true author for the combination "*Lecanora lobulata*", as generally stated in our literature. It was FLOERKE who published "*Lecanora lobulata* FLOERKE" Deutsche Lichenen No. 14, Berlin 1815, as correctly stated by SOMMERFELT as well as by ZAHLBRUCKNER (Krypt. Exsic. 2370, in schedis). But FLOERKE's plant is a corticolous species, different from *Caloplaca marina*.

WEDDELL's *Lecanora (Caloplaca) marina* is a maritime species. This is easily seen from his locality: Très commun sur les rochers bordant la plage et humectés par l'embrun, à marée montante". His remark: "Thallus .... typice orbicularis .... ambitu subeffiguratus" might suggest *Caloplaca scopularis* or one of the other orbicular small maritime *Caloplacae* with radiant marginal lobes. I have not seen WEDDELL's plant. But HARMAND must have seen it, and CLAUD. et HARM. Lich. Gall. praecipui No. 514 is just our species, s. n. *Lecanora lobulata* SOMRFT. And in Lich. France pag. 833 HARMAND writes (on his *Lecanora lobulata* SOMRFT.): "Cette espèce est voisine du *L. scopularis* NYL., dont elle se distingue par son thalle beaucoup moins nettement lobulé-figuré au pourtour." HARMAND quotes WEDDELL's *Lecanora marina* as a synonym, but he gives preference to the older name *Lecanora lobulata*.

These facts are strongly in favour of the combination *Caloplaca marina* (WEDDELL).

ZAHLBRUCKNER's Krypt. Exsic. No. 2370 (*Caloplaca lobulata*) was collected by me, but unfortunately I sent the plants to him without comparing them with FLOERKE'S and SOMMERFELT's types in our herbarium. In his "Schedae" ZAHLBRUCKNER has a full (literary) bibliography of "*Caloplaca lobulata*"; at least the greater part of these names is supposed to represent this species. It must be widely distributed in Europe.

Caloplaca citrina has been recorded from Matotchkin Shar (STIZ. pag. 420, HEUGL. pag. 313).

Caloplaca nivalis has been recorded from Möller Bay (KUSNETZOFF No. 39).

Caloplaca variabilis var. *ecrustacea* has been recorded from Matotchkin Shar: Myss Popertschnoi, on bones (STIZ. pag. 420, HEUGL. pag. 313).

Caloplaca miniata has been recorded from FranzJoseph Land (perhaps *Caloplaca elegans*?, ABRUZZI pag. 674), but not from Novaya Zemlya.

Xanthoria TH. FR.

381. (1). *Xanthoria candelaria* (ACH.) ARN.

Syn. *Xanthoria lychnea* (ACH.) TH. FR. Vide DU RIETZ Lich. Fragm. III, Svensk Bot. Tidsskr. 1921, pag. 185, ubi syn.

I. Goose Bay. Gribovii Fjord: Veselago Island.
IV. Mashigin Fjord: Rækved Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay.

Evidently distributed all over Novaya Zemlya in suitable places. All my plants were collected along the coast and the reason for this is easily understood: *Xanthoria candelaria* is a highly ornitho-coprophilous species, that in the Arctis is strictly restricted to rookeries, bird-stones &c. It is there found with other coprophilous lichens, e. g. *Physcia tribacia*, *Lecanora contractula*, *Gyrophora arctica*, *Parmelia infumata* and others, and an alga, *Prasiola* sp. Fertile plants from Arkhangel Bay.

Xanthoria candelaria is much more common than these few stations suggest. Plants that are ubiquitous in special localities, are easily neglected by collectors.

Xanthoria candelaria is one of the most widely distributed lichens in the world. It is a circumpolar species, found also in the Antarctis.

Former investigations. As was to be expected this common species has been recorded from several localities: Novaya Zemlya (DEICHM. BRANTH pag. 74), Karmakuli (MAGN. pag. 7), Möller Bay (KUSNETZOFF No. 28), and Cape Schantz in Mashigin Fjord (ELENK. et SAV. pag. 77). Also from Kolgueff (SAV. 1912 pag. 35) and from Franz Joseph Land (ABRUZZI pag. 672, ELENK. et SAV. pag. 88).

I look with some suspicion on the records of *Xanthoria parietina* from the Arctis. DEICHMANN BRANTH writes that the supposed Greenland plants are missing in the Copenhagen herb. (Grönl. Lich. Flora (1888) pag. 472—473).

DARBISHIRE'S *Xanthoria parietina* from Ellesmereland (Goosefjord) (Sec. Arct. Exp. Fram (1909) pag. 30) is in my opinion not that species, but a *Caloplaca*, either *Caloplaca elegans* itself or a nearly related species.

"*Xanthoria parietina*" has been recorded from two localities in Novaya Zemlya: Möller Bay (KUSNETZOFF No. 27) and Barents Island KBR. pag. 2). Is it *Caloplaca elegans*?

BUELLIACEAE

Buellia DNOTRS.

Sect. a. *Eubuellia* KBR.

382. (1). *Buellia disciformis* (FR.) DEICHM. BRANTH et ROSTR.

f. *muscorum* (SCHAER.) VAIN.

Plate IV, fig. 15—17.

VAINIO Lich. Pitlekai (1909) pag. 83, ubi syn.

I. Goose Bay.
II. Matotchkin Shar: Pomorskaya, Mt. Lasareff, near Vasnetsoff Gl., Mt. Wilczek, Chalhonik Valley, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Mt. Tveten, Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Berkh Island. Northern Kristovii Island.

Distributed all over the region investigated by us as one of the commonest and most plentiful lichens. There were more than 100 plants in my collection.

It is best developed in the rookeries, but it does not demand an ample supply of Nitrogen, for it is almost equally common everywhere on mossy rocks.

It varies: crusta thin or thick, purely white or more greyish, merely individual variations of no systematical importance.

f. *triphragmia* (NYL.)

Plate IV, fig. 14.

II. Matotchkin Shar: Belushii Bay.
IV. Mashigin Fjord: Dal Bay, Sol Bay and Rækved Bay.

It is far from common. I have examined microscopically my whole material of muscicolous plants of *Buellia disciformis*, and I only detected a few plants with triseptate spores.

It is a variation of no great importance, for in the same apothecium I have found two and tri-septate spores.

var. *papillata* (SOMRFT.) VAIN.

VAINIO Lich. Pitlek. (1909) pag. 83, ubi syn.

Buellia papillata (SOMRFT.) ARN. LYNGE Lichens from the Gjöa Exp. (1921) pag. 4.

II. Matotchkin Shar: Belushii Bay.

The (only) plant agrees perfectly with SOMMERFELT'S type plant in our herbarium.

var. *albocincta* TH. FR.

II. Matotchkin Shar: Mt. Syernaia.

I only detected one plant.

383. (2). *Buellia punctiformis* (HOFFM.) VAIN.

Syn. *Buellia myriocarpa* (DC.) MUDD; TH. FRIES Lich. Scand. II pag. 595, ubi syn.

f. *myriocarpa* (DC.) VAIN.

Plate V, fig. 20—22.

Syn. *Buellia punctiformis* f. *chloropolia* KBR.; TH. FRIES Lich. Scand. II pag. 595.

II. Matotchkin Shar: Mt. Wilczek.
IV. Mashigin Fjord: Sol Bay.
VI. Berkh Island. Northern Kristovii Island.

f. *punctata* (KBR.) VAIN.

Buellia punctiformis f. *punctata* (KBR.) VAIN. Adjum. Lich. Lapp. II (1883) pag. 114.

IV. Mashigin Fjord: Sol Bay.
VI. Berkh Island.

Buellia punctiformis is not too common, but it is found here and there on drift-wood. The former forma is by far the more common.

Former investigations. Möller Bay (KUSNETZOFF No. 71: "on stone and rocks", perhaps *Buellia stigmatea*). Karmakuly (MAGN. pag. 11), Tolyenii Bay in Matotchkin Shar (STIZ. pag. 421, s. n. *Lecidea myriocarpa*).

384. (3). *Buellia stigmatea* KBR.

Buellia stigmatea KOERBER Syst. Lich. Germ. (1855) pag. 226, Parerga Lich. (1865) pag. 185. TH. M. FRIES Lich. Arct. (1860) pag. 230.

Buellia myriocarpa f. *stigmatea* (KBR.) VAIN. Adjum. Lich. Lapp. II (1883) pag. 114.

Buellia punctiformis f. *stigmatea* (KBR.) VAIN. Lich. Pitlek. (1909) pag. 87, ubi syn.

According to ARNOLD (Vide DALLA TORRE et SARNTHEIM Flechten v. Tirol pag. 459) and VAINIO Adjum. Lich. Lapp. l. c. this species is not syn. with *Lecidea stigmatea* ACH. Lich. Univ. (1810) pag. 161.

I. Goose Bay.
VI. Northern Kristovii Island.

Perhaps scarce, for there are only a few plants in my collection.

Buellia stigmatea is widely distributed in the Arctis: Jan Mayen (VAIN. Lich. Exp. Amdr. pag. 133) and Spitsbergen (TH. M. FRIES Lich. Arct. pag. 230). There is also a fine plant in TH. M. FRIES's collection from Bear Island, it was unfortunately overlooked, when I prepared the manuscript of my Lich. Bear Island. Further from Eastern Siberia: Pitlekai and Jinretlen (VAIN. Lich. Pitl. pag. 87).

Thallus tenuis, albidus v. albido-cinereus, areolis ± convexis, crenatis, ± dispersis compositus.

Apothecia minuta, diam. 0.2—0.3 mm., supra thallum tenuem elevata, discus primo planus et margine integro prominenti cinctus, deinde subconvexus, margo tum evanescens. Excipulum gonidiis destitutum, in parte externi carbonaceum. Hypothecium nigricans. Hymenium 90—95 μ altum; paraphyses facile discretae, superne incrassatae et obscuratae. Sporae dyblastae, obscurae, 11—14×5.5—7 μ (Goose Bay plant), 16×8—9 μ (Kristovii Island plant); membrana tenui, aequaliter incrassata.

Medulla J ÷, KOH ÷; hymenium J e caeruleo persistenter nigricans.

In the Bear Island plant the thallus is still poorer than in the Novaya Zemlya plant, but the apothecia are very numerous. They are more convex (as usual), the hymenium is lower: 55—60 μ, the paraphyses are more coherent, the spores are 10.5—12×6.5—8 μ.

Former investigations. Recorded from Tolyenii Bay in Matotchkin Shar. (TH. FRIES pag. 16).

385. (4). *Buellia concinna* TH. FR.

Plate XIII, fig. 2.

Buellia concinna TH. FR. Lich. Scand. II (1874) pag. 600, ubi syn.

V. Admiralty Peninsula.

Supposed to be rare, for I only found a few plants.

I have compared them with TH. FRIES's type plants in Upsala and I can find no difference.

Hypothecium obscurum, sporae obscurae, dyblastae, medio haud constrictae, membrana mediocris, subaequaliter incrassata; sporae 13—18.5×7—8 μ. Medulla J ÷, $CaCl_2O_2$ rubescens.

386. (5). *Buellia vilis* TH. FR.

Plate IV, fig. 25—27.

Buellia vilis TH. FR. Lich. Scand. II (1874) pag. 599. STEINER Ueber Buellia saxorum etc. (1907) pag. 366.

II. Matotchkin Shar: south side at the Kara Sea entrance.
IV. Mashigin Fjord: Mt. Dietrichson and Mt. Tveten.

Evidently not common, for I only detected a few plants.

It is easily determined: apothecia atra, plana, epruinosa, margine elevato circumdata. Hypothecium incolor, excipulum purpureum. Sporae dyblastae, fuscescentes vel magis obscuratae, medio constrictae, 14—17 $\times$8—11 μ. Medulla J intense caerulescens, KOH incolorata.

387. (6). *Buellia atrata* (SM.) MUDD.

Plate IV, fig. 3—6.

Buellia moriopsis (MASS.) TH. FR. Lich. Scand. II pag. 606. Vide VAINIO Lich. Pitlek. (1909), ubi syn.

I. Gribovii Fjord: north side.
II. Matotchkin Shar: Mt. Matotchka and Belushii Bay.
IV. Mashigin Fjord: Mt. Dietrichson and (?) Sol Bay.

On the summits, in the precipices and on the large stones of the rock-falls. It is widely distributed, but it is not supposed to be common, there are but a few plants in my collection.

The colour of the hymenium is quite variable. The upper part is olivaceous to smaragdine and practically unchanged by KOH. But otherwise the hymenium varies from a more or less intensely violet colour to almost uncoloured. KOH intensifies the violet colour, it dissolves a violet substance that is diffused in the surrounding liquid. In one plant this violet colour with KOH is almost as intense as in a *Caloplaca*. I could not obtain a clear blue colour of the medulla with J. If KOH is applied to a thick section or to a thalline verruca a faint reddish colour is observed after some time.

Young spores are simple, but septate spores are more common in my Novaya Zemlya material than in Norwegian plant.

The splendour of the thallus varies, but generally the Novaya Zemlya plants are more opaque than Norwegian ones. — As was to be expected the areolae are less contiguous than in Norwegian plants, if they are discrete, the black hypothallus is very distinct.

The Sol Bay plant differs considerably: its apothecia are much smaller than usual, plane, opaque, with a distinct margin. But there are also a few larger, convex and more nitidous apothecia of the common type, the former are perhaps young, though their spores are well enough developed.

Former investigations. Recorded from Novaya Zemlya (DEICHM. BRANTH pag. 77), Rogatscheff Bay (KBR. pag. 5), Karmakuly (MAGN. pag. 10), Möller Bay (KUSNETZOFF No. 74), and Belushii Bay in Matotchkin Shar (VAIN. pag. 86).

388. (7). *Buellia coniops* (WBG.) TH. FR.

Plate IV, fig. 10–13, XII, fig. 2.

I. Goose Bay. Gribovii Fjord: Veselago Island.
II. Matotchkin Shar: East of Cape Jouravlev.
IV. Mashigin Fjord: Sol Bay and Rækved Bay.
VI. Rookery south of Arkhangel Bay. Northern Kristovii Island.

This lichen is not found everywhere, for it has very special demands: it is extremely coprophilous. It is therefore restricted to the rookeries, where it is found in abundance on maritime rocks. — I found it still more plentiful in Bell Sound, Spitsbergen; in the rookeries or in the bird-islands it gave a brownish colour to the maritime rocks. — It is not restricted to the beach itself, but it is most plentiful there.

Its thallus varies considerably: thick or thin, sometimes almost lacking. Its colour varies from the typical brownish to a pale grey. Its pycnoconidia are generally well developed and prevent it from being confused with other *Buelliae*, e. g. *Buellia stigmatea* a. o.

Former investigations. Karmakuly (MAGN. pag. 10) and Möller Bay (KUSNETZOFF No. 73).

389. (8). *Buellia avium* LYNGE n. sp.

Plate IV, fig. 7—9, XII, fig. 1.

VI. Rookery south of Arkhangel Bay.

Thallus obscure fuscescens, magnus, plagas latas tegens (plantis confluentibus?), crassus, areolato-rimosus, areolae furfuraceae.

Apothecia sparsa et dispersa, in furfure thallino immersa, parva, diam. 0.3—0.5 mm. Discus obscurus, fere fusco-nigricans, convexus, epruinosus, laevigatus, margine crenato vel subfurfuraceo coronatus. Excipulum carbonaceum, gonidiis omnino destitutum. Hypothecium excipulo concolor. Hymenium 90—95 μ altum. Paraphyses apicem versus fusco-nigrescentes, clavato-vel capitato-incrassatae (3 μ), et ibi distincte septatae. Asci saccati, membrana superne mediocriter incrassata. Sporae octonae, fuscescentes, satis pellucidae, dyblastae, ad septum leviter, sed distincte constrictae vel rarius econstrictae; septum et episporium tenuia, episporium 1 μ crassum, aequaliter incrassatum. Sporae in apices late rotundatae, 13—16.5×8—10 μ.

Pycnides frustra quaesitae.

Medulla J non caerulescens, KOH ÷; hymenium J e caeruleo vinosum, asci subpersistenter caerulescentes.

Unfortunately only one plant was collected. Most probably it is related to *Buellia coniops*, but no pycnides were detected. It differs from that species by its furfuraceous surface.

There are several microthalli surrounding the large thallus. They have evidently been developed from germinating diaspores. Most probably the large continuous thallus has been formed by such confluent microthalli.

The name *Buellia avium* suggests it to be a highly coprophilous plant, it was found in the rookery, with *Physcia tribacia* and *Ph. caesia*, and infested by *Acarides* (det. H. Lindberg).

390. (9). *Buellia aethalea* (Ach.) Th. Fr.

Plate IV, fig. 1—2.

II. Matotchkin Shar: Summit of Albert Hill in Belushii Bay.

I detected only one plant, this suggests a rare lichen. It is very small and poorly developed.

Thallus maculis parvis, diam. 1—3 mm., dispersis compositus, cinereus vel cinereo-fuscescens, rimosus, hypothallo atro radianti conspicuo circumdatus.

Apothecia immersa. Hypothecium subincolor, sporae 10—12×6.5—7 μ.

Medulla J caerulescens, KOH primo immutatus, deinde rubescens.

As stated by Vainio Lich. Pitlek. pag. 80 it is a *Melanaspicilia*.

391. (10). *Buellia* cfr. *spuria* (Schaer.) Arn.

Buellia spuria (Schaer.) Arn.; vide Th. M. Fries Lich. Scand. II (1874) pag. 605, ubi syn.

IV. Mashigin Fjord: Mt. Tveten.

There is only one plant in my collection.

It agrees with Th. Fries's diagnosis of *Buellia spuria* f. *fraterna* in Lich. Scand. II (1874) pag. 605: Hypothecium dilute cinereo-fuscescens, paraphyses superne smaragdulo-fuliginosae, distincte septatae, capitatae, satis cohaerentes. Sporae dyblastae, obscurae, 11—13×6.5—8 μ, sed vulgo corrugatae et tum angustiores. Medulla J caerulea, KOH immutata, etiam hymenium KOH immutatum, non roseum.

The synonymy of "*Buellia spuria*" is very unclear. Having no access to type plant of SCHÄRER'S I cannot do much to clear it up.

It seems to me improbable that HEPP'S plant in his Flechten von Europa No. 33 can be specifically identical with my Novaya Zemlya plant, and TH. FRIES has called attention to the difference between his *Buellia spuria* and HEPP'S plant with its "crusta albida, apothecia paulo minora habitusque alienus" (Lich. Scand. l. c.). HEPP'S No. 33 corresponds to the description by SCHAERER: "*Lecidea* areolis candidis (Spicilegium (1828) pag. 127).

In our herb. there is a plant, collected by MALME at Skurdalsporten in Jämtland and determined by him *Buellia spuria* f. *fraterna* TH. FR. It comes very near to my plant, but its epithecium is "KOH violascens", as in a *Caloplaca*.

KOERBER'S *Buellia ocellata* (Lich. sel. germ. No. 106) has a pale greyish-brown hypothecium of about the same colour as in my Novaya Zemlya plant, but its medulla is J ÷ and KOH +, red fasciculate crystals.

As mentioned I have not seen a type plant of *Buellia spuria,* and my determination is approximate.

Former investigations. DEICHMANN BRANTH records *Buellia spuria* from Novaya Zemlya, without locality.

392. (11). *Buellia minutissima* LYNGE n. sp.

II. Matotchkin Shar: East of Cape Jouravlev.

Thallus crustaceus, uniformis, crassitudine mediocri, parvus: diam. in spec. 14—15 mm., cinereo-fuscescens, irregulariter areolatus, areolae contiguae, diam. 0.2—0.3 mm., angulatae vel crenulatae, interdum rimosae, leviter convexae, nitidulae, epruinosae, laevigatae. Hypothallus ater inter areolas passim visus, circum thallum zonam angustam format.

Apothecia sparsa, dispersa, in areolis profunde immersa, minutissima: discus diam. 0.1—0.2 mm., ater, epruinosus, margine spurio thallino tumidulo circumdatus. Hypothecium omnino incolor. Paraphyses laxe cohaerentes, apice capitatae. Sporae obscurae, dyblastae, medio constrictae, late ovales: 15—16×9—11 μ.

Pycnides frustra quaesitae.

Medulla J, KOH et $CaCl_2O_2$ immutata.

Only one plant was detected. Its profoundly immersed apothecia and its uncoloured hypothecium refer this species to VAINIO'S section *Semibuellia* of his genus *Melanaspicilia*, which is so well represented in the Arctis. The minute apothecia are so profoundly immersed in the thallus that the surrounding parts of the small areolae imitate a thick thalline margin.

393. (12). *Buellia Malmei* LYNGE.

Plate IV, fig. 23—24, XIII, fig. 1.

Buellia Malmei LYNGE Lich. Bear Island (1926) pag. 65.

II. Serebryanka Fjord, in the rookery.
IV. North of the Mashigin Fjord entrance.

The very few plants agree well with my type plant from Bear Island. The localities suggest a nitrophilous species.

Hypothecium subincolor, hymenium 55—76 μ altum, superne fuligineum. Paraphyses apice nigrocapitatae. Sporae parvae, obscurae, dyblastae, medio constrictae, membrana aequaliter incrassata, magn. 9—13 ×5—6 μ. — Hymenium J rubescens (sect. tenuis). Praeterea ut in typo.

In one of my Serebryanka plants plant the spores are 9—11×5—6 μ, in another 9—13×5.5—6 μ, the Mashigin Fjord plant 8.5—13× 5.5—6 μ, the Bear Island plant has slightly larger spores: 11—15× 6.5—8 μ.

394. (13). *Buellia immersa* LYNGE n. sp.

Plate IV, fig. 18—19, XIII, fig. 3.

IV. North of the Mashigin Fjord entrance.

Thallus parvus, diam. ca. 10 mm. Areolae minutae, diam. 0.2—0.5 mm., planae vel leviter convexae, rotundatae vel magis angulatae, pallide albido-cinerascentes, laevigatae, subnitidae, marginem versus distincte dispersae, centrum versus magis confluentes. Areolae hypothallo conspicuo atro, plicato-rimoso et in margine thalli bene radianti impositae. Zona hypothallina extrathallina 1.5—2 mm. lata.

Apothecia numerosa, minuta, diam. 0.2—0.45 mm., in areolis immersa, thallum subaequantia vel margine leviter elevata. Discus ater, planus vel subconcavus, rugosus, epruinosus, margine crasso, postremo fere excluso circumdatus. Hypothecium dilute fuscidulum. Hymenium 65—70 μ altum, paraphyses non cohaerentes, apice incrassatae et olivaceo-fuligineae. Sporae octonae, obscuratae, dyblastae, medio leviter constrictae, 13—17×8—10 μ; membrana sporarum satis tenuis, inaequaliter incrassata.

Pycnides non visae.

Thallus J ÷, $CaCl_2O_2$ ÷, KOH interjecto tempore rubescens (crystalla fasciculata praecipituntur). Hymenium J persistenter caerulescens.

Its immersed apothecia refer it to the *Melanaspicilia* of VAINIO. It differs from all the species described by VAINIO in Lich. Pitlek. by its chemical reaction. It is nearly allied to the two species *Buellia sororia* TH. FR. Lich. Scand. pag. 603 and *Buellia aethalea* (Ach.) Th. Fr. l. c. pag. 604. VAINIO, who has been kind enough to study my plant, suggested *Buellia aethalea.* Is agrees morphologically quite well with that species, but I have tested its reaction with J over and over again, and always found it negative. That should exclude *Buellia aethalea.* Its spores are a little larger, especially somewhat broader than in *Buellia aethalea*: 13—17×8—10 against 10—15×6—8, but this difference must be within the limits of variation. The different colour is more important. *Buellia aethalea* is "cinerascens vel fuscidulo-cinerascens" (TH. FR. Lich. Scand. pag. 604) and this agrees with all the plants, which I have seen, e. g. MALME Lich. Suec. No. 12 and ARNOLD No. 1628. ARNOLD No. 1767 is paler, but distinctly brown.

Buellia immersa agrees with *Buellia sororia* with respect to its reaction, but the brown colour of the latter species should make them distinct.

The genus *Buellia* is much in want of a monography. It is quite possible that a monography based on a larger material would rearrange several species, but so far I have been unable to find another *Buellia* so nearly related to this species that I could unite them.

395. (14). *Buellia scabrosa* (ACH.) KBR.

Lecidea scabrosa ACH. VAINIO Adj. Lich. Lapp. II, pag. 118, ubi syn.

I. Goose Bay.
II. Matotchkin Shar: Mt. Syernaia.
IV. Mashigin Fjord: Mt. Tveten and Dal Bay.

Supposed to be a rare species, for I only found a few plants. It is always parasitic, generally on *Baeomyces*, but not exclusively on that species.

Hypothecium obscurum, hymenium ca. 65 μ, superne fuligineo-smaragdulum. Paraphyses validae, atro-capitatae. Sporae 12—17×7—8 μ, dyblastae, obscurae, medio constrictae.

Some authors have referred it to the fungi, others to the lichens. It parasitic nature strongly suggests a fungus.

Sect. b. *Diplotomma* (FR.) KBR.

396. (15). *Buellia margaritacea* (SOMRFT.) LYNGE.

Plate IV, fig. 28—29, XIII, fig. 4.

Lecidea margaritacea SOMRFT. Suppl. Florae Lapp. (1826) pag. 143. Plant. Crypt. Norv. No. 50.

Buellia alboatra α *vulgata* TH. FR. Lich. Scand. II (1874) pag. 608 p. p.

var. *coprophila* LYNGE nov. var.

VI. Northern Kristovii Island.

It was quite plentiful in this small island, where innumerable birds rest. On rocks (not chalky).

Thallus maculos parvos, diam. haud ultra 10 mm. formans, albissimus, crassus, rimoso- areolatus, areolis ± convexis, in centro thalli etiam bullatis, in margine thalli non effiguratis. Thallus laevigatus, vel vulgo leviter rugulosus, sed non farinosus.

Apothecia numerosa, interdum adeo numerosa, ut contigua sint et mutua pressione angulosa, supra thallum irregulariter dispersa, parva, diam. vulgo haud ultra 0.5 mm., sed interdum usque ad 1 mm., primo thallo subimmersa, vel saltem arcte adpressa, deinde magis elevata, sessilia. Discus primo planus, deinde mox convexus, aterrimus, omnino epruinosus, margine atro, distincto, sed deinde evanido circumdatus. Excipulum atrum, plectenchymaticum (KOH addito); hypothecium fusconigrum. Hymenium ca. 100 μ altum, superne fusco-fuligineum, praeterea incolor vel dilute flavo-fuscescens, non inspersum. Paraphyses cohaerentes, apicem versus ramosae, incrassatae et ibi constricte vel fere moniliformiter septatae, articulis conidiorum instar facile dehiscentibus, epithecium formantibus. Asci angusti, 12—15 μ crassi, sporae eam ob causam saepe fere uniseriatae. Sporae octonae gignuntur, triseptatae, saepe septo longitudinali singulo submurales, ad septa non constrictae, cinereae vel cinereo-fuscescentes, late ellipsoideae, luminibus lentiformibus vel ± angulatis. Sporae 13—18×7—10 μ, halone hyalino non circumdatae.

Pycnoconidia recta, subcylindrica, 5—6 (—7) μ longa.

Thallus KOH ÷, hymenium J pulchre persistenterque caerulescens, medulla J ÷.

The name "*margaritacea*" was used by ACHARIUS in Synopsis pag. 32, it is there older than SOMMERFELT'S name. But I am not convinced of their identity, and I have therefore referred my plant to SOMMERFELT'S species, which I have before me.

My plant differs considerably from SOMMERFELT'S. It is not "pulveracea", its surface is firm enough. Its apothecia are absolutely epruinose and more prominent. It is quite probable that my plant should be a proper species: *Buellia coprophila* LYNGE.

Former investigations. KUSNETZOFF records *Buellia alboatra* from Möller Bay (No. 75).

Sect. c. *Diploicia* STZBGR.

397. (16). *Buellia epigaea* (PERS.) TUCK.

Buellia epigaea TH. M. FRIES Lich. Scand. II (1874) pag. 587, ubi syn.

II. Serebryanka Fjord.

There is only one small plant in my collection, but it seems to me that it is typical.

It has a thick, white, esorediate, lobate thallus. The apothecia are esorediate, epruinose or very slightly pruinose; spores 18—21×8—9 μ.

It corresponds well to ANZI Lich. Lang. 136, but not to his Lich. rar. Ven. No. 48, "*Rinodina cacuminum*", which JATTA refers to this species (Sylloge pag. 385). Can JATTA's statement be correct?

Buellia rinodinoides has been recorded from Möller Bay (KUSNETZOFF No. 72).

"*Melanaspicilia microplaca*" VAIN. has been recorded from Karmakuly (MAGN. pag. 11).

Rinodina (S. GRAY) MASS.

398. (1). *Rinodina nimbosa* (FR.) TH. FR.

Plate V, fig. 9—11.

Rinodina nimbosa TH. FRIES Lich. Scand. I (1871) pag. 193, ubi syn.

Non *Lecidea phaeocarpa* SOMRFT. Suppl. Florae Lapponiae (1826) pag. 159, in our herb.

Rinodina phaeocarpa VAIN. Lich. Cauc. (1899) pag. 302.

II. Matotchkin Shar: Mt. Syernaia and Belushii Bay.
IV. Mashigin Fjord: South side of Blaafjell Basin and Mt. Tveten.
V. Admiralty Peninsula.

Found on naked earth. It is far from common. There are only a few plants (10) in my collection.

Following STIZENBERGER Lich. Helv. (1882) pag. 104 VAINIO has reintroduced the name *phaeocarpa* FLOERKE apud SOMMERFELT Suppl. Fl. Lapp. (1826) pag. 159.

In SOMMERFELT's herb. in our museum there is only one plant of his (*Lecidea*) "*phaeocarpa* β. *microcarpa* SOMRFT.", from Saltdalen. SOMMERFELT writes "apotheciis minutissimis." His plant is a (fertile) *Psoroma hypnorum*, infested by a parasitic fungus. The "apothecia minutissima" belong to the fungus, probably its perithecia, but I found no asci and no spores.

I have seen no plant, determined by FLOERKE himself. — So far the safest proceeding is to use the well known name *nimbosa* E. FR. Lich. Eur. (1831) pag. 129.

If well developed *Rinodina nimbosa* is easily recognized by its brown appressed lobate squamules. But in the Arctis its thallus is sometimes, though not often, so reduced that we must examine the spores. They are considerably smaller than in *Rinodina turfacea*: I have measured (14—) 16—18 (—21)×7—9 μ in my Novaya Zemlya plants (TH. FRIES Lich. Scand. pag. 193: 17—22×7—10 μ), against 18—34×10—14 in *Rinodina turfacea* (TH. FRIES l. c. pag. 197). These sizes overlap each other, but the spore wall is very different. In *Rinodina nimbosa* it is rather thin and equally thick all over, in *Rinodina turfacea* considerably thickened at the apices of the spores and at the septum ("Episporium inaequaliter incrassatum", cfr. MALME *Rinodina sophodes* etc. pag. 12 and 18 and tab. I fig. 14).

The "*Dimelaena nimbosa*" of DARBISHIRE, Sec. Arct. Exp. Fram (1909) pag. 41 (in our herb.) is a calcicolous lichen, it cannot be that species.

399. (2). *Rinodina balanina* (WBG.) VAIN.

Rinodina balanina VAINIO Lich. Pitl. (1909) pag. 69, ubi syn.

VI. Rookery south of Arkhangel Bay.

It is an extremely ornithocoprophilous plant, growing in the rookeries exposed to a heavy fire from the birds. Hardly any other lichen can endure more than this species, perhaps only *Candelariella crenulata*. *Rinodina balanina* is found with *Buellia coniops, Physcia tribacia* and some other coprophilous plants. Like many other nitrophilous plants it is much preyed on by insects.

In Norway it is found here and there in suitable localities, but as far as my knowledge goes it is not common. In Spitsbergen I found it to be more common, often quite plentiful in some bird-islands in Bell Sound (1926). In Novaya Zemlya it was plentiful on drift-wood and on rocks at this single place, but I was surprised at not finding it elsewhere. Have I overlooked it?

400. (3). *Rinodina mniaraea* (ACH.) TH. FR.

Rinodina mniaraea Vide VAIN. Lich. Pitlek. (1909) pag. 70, ubi syn.

I. Goose Bay.

II. Matotchkin Shar: Belushii Bay and south side of the Shar at the Kara Sea entrance.

IV. Mashigin Fjord: South and north side of Blaafjell Basin, Mt. Tveten and Strömsnes Bay.
V. Admiralty Peninsula.
VI. Northern Kristovii Island.

It is widely distributed all over the region investigated by us, but it is far from common. In Novaya Zemlya I have found it on decaying mosses, not on the naked ground.

In the Arctis the thallus is generally meagre, and the distinction between this species and *Rinodina turfacea* becomes difficult. In *Rinodina mniaraea* the apothecia are usually smaller and more scattered and finally they are ± convex. The spores are on the whole smaller in *Rinodina mniaraea*, rarely more than 30 μ long, in *Rinodina turfacea* they often attain 35 and — though rarely — even 40 μ. But each of these characters is variable and the variations often overlap each other in the two species.

Former investigations. Recorded from Novaya Zemlya (DEICHM. BRANTH pag. 75). Möller Bay (KUSNETZOFF No. 40).

401. (4). *Rinodina calcigena* (TH. FR.) LYNGE comb. nov.

Rinodina mniaraea β. calcigena TH. FRIES Lich. Spitsb. (1867) pag. 25. Lich. Scand. I (1871) pag. 195.

VI. Northern Kristovii Island.

Thallus (in planta mea) subevanescens.

Apothecia parva, diam. haud ultra 0.5 mm., demum convexa. Discus fusco-nigricans, epruinosus, margine tenui, persistenti, integro circumdatus. Excipulum plectenchymaticum, incolor, gonidia in margine et infra corticem continens. Hypothecium incolor. Hymenium altum: 130 μ. Paraphyses fusco-capitatae, satis concretae, KOH addito distincte septatae videntur. Sporae octonae, cinereo-fuscescentes, medio non obscurius coloratae, medio non vel leviter incrassatae, dyblastae, loculis remotis, episporium tenue ad apices interdum leviter incrassatum, ad septum magis et inaequaliter incrassatum. Sporae 16—20 (—24) × 10—12 (—13) μ.

Hymenium J e caeruleo vinosum.

I have seen TH. FRIES's plants in Upsala. His plant from Mortensnes, Arctic Norway, corresponds entirely to mine; but his Spitsbergen plant has a better developed thallus, as stated in his first description ("crusta crassiuscula").

Its spores are considerably smaller than those of *Rinodina mniaraea*, as are also its apothecia, it seems to me that it deserves the rank of a proper species.

Rinodina Bischoffii has a lower hymenium (80—90 μ), and a different type of spores, with an equally incrassated episporium, a thin septum and a dark equatorial zone.

Former investigations. Recorded from Russia, at Jugor Shar (TH. FRIES pag. 15, HEUGL. pag. 314), but not from Novaya Zemlya.

402. (5). *Rinodina turfacea* (WBG.) TH. FR. p. p.

Plate V, fig. 4—6.

Lichen turfaceus WAHLENBERG Fl. Lapp. (1812) pag. 408.

Rinodina turfacea TH. FRIES Lich. Arct. (1860) pag. 126, Lich. Scand. I (1871) pag. 195, ubi syn.

Rinodina orbata (ACH.) VAIN. Lich. Pitlekai (1909) pag. 71, ubi syn. ampl.

The oldest specific name is *Lichen turfaceus* WBG., which must be given preference in relation to the still older varietal name *orbata* ACH. Lich. Univ. (1810) pag. 678), according to the present rules of nomenclature.

I. Goose Bay.
II. Matotchkin Shar: Mt. Syernaia, Mt. Wilczek, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord. Sukhoi Noss.
IV. Mashigin Fjord: Fram Bay, Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Berkh Island. Northern Kristovii Island.

Rinodina turfacea is one of the commonest lichens all over the region investigated by us, and plentiful almost everywhere. Also found on naked moist earth. Its localities show a wide range: it grows in places where no extraordinary supply of Nitrogen can be supposed, but it can live in most coprophilous localities, and in the rookeries and near the bird-stones it develops very luxuriant forms.

A great number of formae have been described, according to the development of the thallus. I am unable to attribute much importance to these characters in my Novaya Zemlya material, from the reason suggested above: That the different development is largely due to a different supply of Nitrogen.

Rinodina turfacea is not rare on drift-wood: Mt. Wilczek and Northern Kristovii Island. These plants have a very thick thallus.

The f. *ecrustacea* VAIN. Adj. Lich. Lapp. I (1881) pag. 153 was found on the stems of old dead Salices at Goose Bay. I have ventured this determination on account of the large spores (up to 33 μ) and the congested apothecia; but the disc is somewhat convex, and other lichenologists might perhaps refer these plants to *Rinodina mniaraea.*

Former investigations. Recorded from Möller Bay (KUSNETZOFF No. 41), Belushii Bay (SAV. 1912 pag. 53) and from Kristovii Fjord (ELENK. et SAV. pag. 81). Also from Kolgueff (SAV. 1912 pag. 53) and from Franz Joseph Land (ELENK. et SAV. pag. 92).

403. (6). *Rinodina roscida* (SOMRFT. p. p.) LYNGE.

Plate V, fig. 1—3.

Lecanora roscida SOMRFT. Suppl. Fl. Lapp. (1826) pag. 97 p. p.

Rinodina turfacea β. *roscida* (SOMRFT.) TH.FR. Lich. Scand. I (1871) pag. 196, ubi syn.

Rinodina roscida (SOMRFT.) LYNGE Lich. Gjöa Exp. (1921) pag. 7; Lich. Spitsb. I (1924) pag. 20; Lich. Bear Island (1926) pag. 67.

I. Gribovii Fjord, north side.
II. Matotchkin Shar: Near Vasnetsoff Gl., Mt. Wilczek, Chalhonik Valley, East of Cape Jouravlev, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Fram Bay, south and north side of Blaafjell Basin and Mt. Tveten. North of the Mashigin Fjord entrance.
VI. Berkh Island. Mainland east of Lichutin Island. Eastern Kristovii Island. Pankratyeff Peninsula.

One of the commonest and most widespread lichens in Novaya Zemlya. It is hardly ever missing in the *Caloplaca stillicidiorum*-associations (see this species).

As stated by TH. FRIES Lich. Scand. pag. 196 it is synonymous with SOMMERFELT's *Lecanora roscida* "p. max. part." SOMMERFELT's muscicolous plants are entirely identical with this species, but — as was to be expected — not his saxicolous plants, they represent a calcicolous *Lecanora* with pruinose apothecia.

I have found it impossible to accept TH. FRIES's opinion that the *roscida* could be included in the species *Rinodina turfacea. Rinodina roscida* has smaller apothecia, a pruinose, very thick and almost entire margin and generally, though not always, a pruinose disc. Disc and margin are epruinose in *Rinodina turfacea* (α. *nuda* TH.FR.). *Rinodina roscida* has a very thin, often almost lacking, pale, almost white thallus; *Rinodina turfacea* a darker, greyish or greyish-brown thallus. The spore size is very variable, I have measured up to 40 μ in one of SOMMERFELT's own *roscida* plants.

Hundreds of plants have passed before my eyes, but as yet I do not think that I have seen transitionel stages. Even if the anatomical texture of the apothecia should be quite conformous, morphological differences must also be admitted to be valid specific characters.

Rinodina roscida is widely distributed in the Arctis; the whole material of "*Rinodina turfacea*" from the 2nd Arctic Exp. in the Fram (Ellesmereland &c) is *Rinodina roscida*.

Former investigations. Recorded from Kristovii Fjord (ELENK. et SAV. pag. 81).

404. (7). *Rinodina milvina* (WBG.) TH. FR.

Plate V, fig. 12—14.

Rinodina milvina MALME Rinodina sophodes etc. (1895) pag. 24, ubi syn.

II. Matotchkin Shar: East of Cape Jouravlev and Belushii Bay.
VI. Northern Kristovii Island.

Detected only at these few localities, it was in places quite plentiful.

Apothecia numerosissima, conferta, interdum totum fere thallum tegentia, diam. 0.3—0.7 mm. Discus planus vel leviter convexus, margine pallido, integro, persistenti circumdatus. Gonidia infra corticem excipuli numerosissima, infra ipsum hypothecium parcius adsunt. Hypothecium omnino incoloratum. Hymenium superne flavofuscescens, usque ad 120 μ altum. Paraphyses cohaerentes, saltem apicem versus, leviter capitato-incrassatae (2.5—3, rarius usque 3—4 μ). Sporae cinereae, dein obscurius coloratae et tum subimpellucidae, medio $\pm$ constrictae, rectae, episporium crassum, aequaliter incrassatum. Sporae (16—) 18—22 $\times$ (9—) 10—12 (—13) μ.

In our Norwegian herbarium there were several plants, labelled *Rinodina milvina*. An examination of their spores showed that all the plants from Southern Norway had too small spores for that species, they must be referred to *Rinodina cacuminum* MALME. Only two plants from Northern Norway (Bodö, leg. SOMRFT. and Lyngen, leg. NORMAN) had the spores of *Rinodina milvina*. WAHLENBERG's type plant was collected in Northern Norway, at Talvik in Alten.

There are a considerable number of *Rinodina milvina* from Sweden and Finland in our herb. I have examined the spores of several of them and found them to be the true *Rinodina milvina*.

The genus *Rinodina* has not been much studied in Norway. It is quite possible that *Rinodina milvina* has been largely overlooked. But the reliable records, available today, suggest it to be a species of Northern and Eastern distribution, substituted by *Rinodina cacuminum* in Southern Norway.

I have been much interested in finding *Rinodina cacuminum* in the Arctis, but as yet I have not succeeded.

The reaction of the hymenium with J is variable (or does it suggest different types?). It has always been recorded as "hymenium J intense caerulescens". This agrees with several plants (e. g. NORRL. et NYL. Herb. Lich. Fenn. No. 274) which I have tested. But if the section was thin enough, I found in my Novaya Zemlya plants: "hymenium J e caeruleo mox sordide vinosum (etiam asci)". I also found that reaction in a plant collected by MALME at Värmdön near Stockholm.

405. (8). *Rinodina laevigata* (ACH.) MALME.

Plate V, fig. 7—8.

Rinodina laevigata (ACH.) MALME Rinodina sophodes etc. (1895) pag. 25.

Rinodina archaea (ACH.) VAINIO Lich. Pitlek. (1909) pag. 73.

I. Goose Bay, on a small twig of a *Salix*.
VI. Arkhangel Bay, on drift-wood.

Supposed to be rare, for I had only very few plants.

Its small apothecia, rarely surpassing 0.5 mm., and its small spores separate it from lignicolous *Rinodina turfacea*. But I have measured somewhat larger spores than VAINIO and MALME: 17.5—22 (—25)×8 —10 (—12) μ. The hymenium is low: 80—90 μ. The Arkhangel Bay plants have a thick thallus: var. *maculiformis*. I am not absolutely convinced that my plants are quite identical with the Scandinavian *Rinodina laevigata*, but MALME verified the determination of the Arkhangel Bay plant.

The name *archaea* dates from ACHARIUS' Meth. Lich. (1803) pag. 156, *laevigata* is younger: ACHARIUS Lich. Univ. (1810) pag. 357, in either work the name was used for a variety. But the *specific* name *laevigata* (NYLANDER Flora (1878) pag. 345) must take preference to the younger specific name *archaea* (VAINIO l. c. 1909).

406. (9). *Rinodina Bischoffii* (HEPP) KBR. var. *protuberans* KBR.

Vide TH. FRIES Lich. Scand. I (1871) pag. 204, ubi syn.

II. Matotchkin Shar: Chalhonik Valley. Rookery in Serebryanka Fjord.

I only detected a few most inconspicuous apothecia with a hardly visible thallus, on chalky rocks. As this species is easily overlooked we cannot conclude from this, that it should be rare in Novaya Zemlya.

Hypothecium omnino incolor, hymenium 100—110 μ altum, superne fuscatum. Paraphyses non conglutinatae, apicem versus distincte septatae, fusco-capitatae. Sporae octonae, cinerascentes, subimpellucidae, 18—22 ×10—11 μ, medio levissime constrictae et ibi obscurius coloratae, episporium aequaliter incrassatum.

Rinodina chionea has been recorded from Möller Bay (KUSNETZOFF No. 42).

Rinodina exigua (ACH.) an *Bischoffii* KOERB. has been recorded from Novaya Zemlya (DEICHM. BRANTH pag. 75).

PHYSCIACEAE

Physcia (ACH.) VAIN.

407. (1). *Physcia marina* (E. NYL.) LYNGE.

Physcia marina LYNGE in Krypt. Exsic. Vind. No. 2366, ubi syn.
Physcia tenella var. *marina* LYNGE Mon. Norw. Physciaceae (1916) pag. 41.

IV. Mashigin Fjord: Rækved Bay.
VI. Mainland east of Lichutin Island. Northern Kristovii Island.

I only found a few plants of this species, which is so common in Northern Norway. It prefers hard rocks, which are quite rare on the beach in Novaya Zemlya.

My plants are small, very dark and sterile. The plants from Northern Kristovii Island are quite typical with spreading rhizinae. In the other two there are no such rhizinae and a dark *Physcia tribacia* might be possible.

The more I have studied this plant in nature the more I have felt convinced of its specific rank.

408. (2). *Physcia tribacia* (ACH.).

Physcia tribacia LYNGE Mon. Norw. Physc. (1916) pag. 45, ubi syn.

I. Goose Bay. Bessimyannii Fjord. Gribovii Fjord: Veselago Island.
II. Matotchkin Shar: Near Vasnetsoff Glacier, Belushii Bay and south side of the Shar near the Kara Sea entrance.
IV. Mashigin Fjord: Strömsnes Bay, Sol Bay and Rækved Bay. North of the Fjord entrance.
V. Admiralty Peninsula.
VI. On the beach in front of the large rookery south of Arkhangel Bay. East of Lichutin Island.

Physcia tribacia is distributed all over the area investigated by us. In places it is quite plentiful, but on the whole it is not so common as in Norway in localities where nitrogenous substances accumulate (e. g. on bird-stones and at the great northern Norwegian fishing-ports). Found on rocks and on drift-wood.

Apothecia are very rare.

Former investigations. This common species has only been recorded from Karmakuli (MAGN. pag. 10).

409 (3). *Physcia muscigena* (ACH.) NYL.

Physcia muscigena LYNGE Mon. Norw. Physc. (1916) pag. 55, ubi syn.

I. Goose Bay. Bessimyanni Fjord: North side. Gribovii Fjord: Veselago Island and north side of the Fjord.
II. Matotchkin Shar: Near Vasnetsoff Gl., Chalhonik Valley, east of Cape Jouravlev, Mt. Syernaia, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
III. Kristovii Fjord.
IV. Mashigin Fjord: Fram Bay, south side of Blaafjell Basin, Mt. Dietrichson, Strömsnes Bay, Dal Bay, Sol Bay and Rækved Bay. North of the Mashigin Fjord entrance.
V. Admiralty Peninsula.
VI. Rookery south of Arkhangel Bay. Berkh Island. Mainland east of Lichutin Island. Eastern and Northern Kristovii Islands. Pankratyeff Peninsula.

General and plentiful, almost inevitable, on chalky and slaty ground and in the rookeries all over the area investigated by us. It is equally common farthest north as in the southern fjords; found, and often quite well developed, also on the moraines.

As usual fertile plants are not common, but I found them even farthest north. The spore size agrees well with the measures from Norwegian plants: $24—30.5 \times 13—16$ μ.

My large material (almost 100 plants) shows the same variation as described from Norway and other northern countries: Laciniae entirely caesio-pruinose in some plants, in others less pruinose, only at the apices of the laciniae, rarely quite epruinose. Laciniae elongated, narrow and discrete, or broader, contiguous or even imbricate or panniform. The colour of the thallus varies with the development of the pruina from greyish-brown or chestnut-brown to glaucous or caesious.

I have seen no reliable record of *Physcia pulverulenta* typica from the real Arctis (Northern Norway is not included in this zone), all the plants thus labelled which I have seen, are *Physcia muscigena*.

Former investigations. If we include "*Physcia pulverulenta*" *Physcia muscigena* has been recorded from the following localities: Möller Bay (KUSNETZOFF No. 25), Matotchkin Shar (TH. FRIES pag. 15, HEUGL. pag. 311), Belushii Bay (SAV. 1912 pag. 52). Mashigin Fjord: Cape Schantz (ELENK. et SAV. pag. 81). Also from Waigatsch (STIZ. pag. 420, TH.FRIES pag. 15, HEUGL. pag. 311) and from Franz Joseph Land (ELENK. et SAV. pag. 92).

410. (4). *Physcia sciastra* (ACH.) DU RIETZ.

Physcia sciastra (ACH.) DU RIETZ Lich. Fragm. VII (1925) pag. 77.

Physcia lithotea (ACH.) NYL. LYNGE Mon. Norw. Physc. (1916) pag. 76.

I. Goose Bay. North side of Gribovii Fjord.
II. Matotchkin Shar: Near Vasnetsoff Glacier and east of Cape Jouravlev.
IV. Mashigin Fjord: Mt. Dietrichson, Dal Bay and Sol Bay.
VI. Rookery south of Arkhangel Bay. Mainland east of Lichutin Island. Berkh Island. Northern Kristovii Island.

var. *lithotodes* (NYL.).

II. Matotchkin Shar: Mt. Wilczek, east of Cape Jouravlev and south side of the Shar at the Kara Sea entrance.
IV. Mashigin Fjord: Blomster Bay and Sol Bay. North of the Fjord entrance.
VI. Berkh Island. Northern Kristovii Island.

Physcia sciastra is common all over the area investigated by us. It grows on stones and sometimes also on mosses.

A study of the Arctic material of this species can only confirm the well-known fact that soredia and isidia are miserably developed in the Arctis. They are organs of high importance in damp climates and under favourable conditions of life. They facilitate the spreading of the plants, increase the assimilating surface and probably they are also useful for the absorption of water. But the severe Arctic climate necessitates an intense concentration of the plant body and prevents the formation of delicate and exposed organs.

This species can be divided into three formae: 1) f. *lithotea* (ACH.) with profusely developed isidia, often covering large parts of the thallus, 2) *Physcia sciastra typica* with marginal isidia and 3) f. *lithotodes* (NYL.), which is entirely lacking isidia. I find every transitional stage between these 3 formae. — I refer my f. *nuda* (l. c. pag. 78) to f. *lithotodes*, I can see no difference between them.

DU RIETZ has referred the *lithotodes* to his *Ph. ciliata* (HOFFM.) DR. It is quite possible that he is right, it gives an easier distinction (in the clavis) between that species and *Physcia sciastra.* But at least in the Arctis I have found *Physcia sciastra* and the *lithotodes* so intimately connected that I am unable to separate them specifically.

Unnecessary to say that a typical f. *lithotea* is not present in my collections. *Physcia sciastra typica* and f. *lithotodes* are almost equally common. They are often found together. The isidia are often only seen as cristate margins. Some plants have numerous small, almost panniform laciniae on the older parts of the thallus. They are not isidia, but the difference between such laciniae and isidia is quite formal.

The laciniae are very variable. In some plants they are appressed to the substratum, flat and divaricately ramose, and more or less discrete. Convex and contiguous laciniae are very common; imbricate, almost panniform plants occur, especially on mosses.

I did not find mature apothecia in Novaya Zemlya; in Norway they are common enough.

The names *lithotea* and *sciastra* are equally old, from ACHARIUS Methodus Lichenum (1803), the latter from its Supplementum. But *sciastra* was used as a specific name there, NYLANDER was the first to use *lithotea* as a specific name (De gonidiis etc., Flora 1877 pag. 354). Accordingly *Physcia sciastra* is the valid name after the present rules of nomenclature, as stated by DU RIETZ l. c.

411. (5). *Physcia caesia* (HOFFM.) NYL.

I. Goose Bay. Gribovii Fjord: Veselago Island and north side of the fjord.
II. Matotchkin Shar: Near Vasnetsoff Gl., Chalhonik Valley, east of Cape Jouravlev, Belushii Bay and south side of the Shar near the Kara Sea entrance. Serebryanka Fjord. Sukhoi Noss.
IV. Mashigin Fjord: Blomster Bay, Sol Bay and Rækved Bay. North of the fjord entrance.
VI. Rookery south of Arkhangel Bay. Berkh Island. Northern Kristovii Island.

Physcia caesia is one of the really common lichens in Novaya Zemlya, it is common and plentiful all over the area investigated by us. Like the other *Physciae* it is distinctly a nitrophilous plant, but several other lichens are more nitrophilous (coprophilous) than *Physcia caesia.*

In Novaya Zemlya it shows a considerable variability, just as in Norway. Its colour varies from white, almost chalky-white, to greyish-violet; the white colour is not common, the latter tinges are the same which are so common in Norway in alpine and subalpine localities. This is the same colour as in my **ventosa* Mon. Norw. Physc. (1916) pag. 94.

But this subspecies, as seen in Norway, generally has divaricately ramose and accordingly more ore or less discrete laciniae. In Novaya Zemlya this type of branching is rare, plants with contiguous or even closely contiguous laciniae are much more common.

The soredia are very variable. The "typical" globular soredia are not rare, but often they are not so well developed: smaller of size, lower, even quite crateriform soredia of the *Peltigera erumpens* type. Some plants are almost or quite esorediate, or the soredia are corticated and not functional as such. The poor development of the soredia is a common feature in the Arctis, cfr. Arctic *Parmelia incurva*, which is often labelled *Parmelia centrifuga*. Such *Physcia caesia* plants are determined by their colour, their rugulose surface and their chemical reaction.

Apothecia are very rare, I only detected a few small ones.

Former investigations. Recorded from Matotchkin Shar (TH. FRIES pag. 15, HEUGL. pag. 311). Also from Waigatsch (STIZ. pag. 420), TH. FRIES pag. 15, HEUGL. pag. 311) and from Franz Joseph Land (ELENK. et SAV. pag. 92).

412. (6). *Physcia intermedia* VAIN.

Physcia intermedia VAINIO Lich. Vib. (1875) pag. 51. LYNGE Mon. Norw. Physc. (1916) pag. 97.

I. Goose Bay. Gribovii Fjord: Veselago Island.
II. Matotchkin Shar: Near Vasnetsoff Glacier, Chalhonik Valley, Belushii Bay and south side of the Shar at the Kara Sea entrance. Serebryanka Fjord.
IV. Mashigin Fjord: Dal Bay and Rækved Bay.
VI. Mainland east of Lichutin Island. Eastern and Northern Kristovii Islands.

Physcia intermedia is a widely distributed species in Novaya Zemlya and to judge from the number of plants in my collection it must also be rather common. I have found it on hard rocks, slates and (rarely) on bones of birds. Apothecia are occasionally found.

It seems to me that my material is homogeneous. In his diagnosis VAINIO describes the colour: "in cinereum vergens" and "cinereo-albicans vel caesio-cinereus, sub microscopio passim lividus". I might define the colour of my plants as "lividus, vulgo ± in lilacinum vergens". VAINIO's type plant is evidently paler than mine, but that cannot be of much importance.

The laciniae are very narrow, elongated, convex and very fragile. The chemical reaction with KOH must be studied with much attention. Having first removed a piece of the cortex with a razor, I have applied a drop of KOH and studied the reaction under a microscope of low power. The cut must go well down below the gonidia, but that is a little difficult on account of the narrow and very brittle laciniae. There is a distinctly yellow KOH-reaction on the cortex with a pale, almost white medullary spot in the centre, but the yellow colour rapidly diffuses through the drop over the medulla. — The reaction was correctly described in my diagnosis of *Physcia Wahlenbergii* = *Physcia intermedia* var. *Wahlenbergii*. In my Stud. Norw. Physc. (1916) pag. 98, I was misled by the difusion-colour in the drop of KOH. As was to be expected VAINIO's statement of the reaction is correct.

Physcia intermedia has more elongated laciniae than *Physcia tribacia* and a considerably darker colour. *Physcia caesia* agrees better with respect to the colour, but that species has an intensely yellow medullary reaction with KOH. *Physcia sciastra* is KOH ÷.

Physcia intermedia was first described from the Viburg district in Finland. It has been recorded from several localities in Northern Norway. Its occurrence in Novaya Zemlya is an interesting extension of its known range. It is recommended to the attention of eastern lichenologists.

Unfortunately *Physcia intermedia* in ZAHLBRUCKNER Lich. rar. exsic. No. 233, collected by me, is *Physcia caesia* var. *ventosa* LYNGE, not *Physcia intermedia.*

413 (7). *Physcia teretiuscula* (ACH.) LYNGE.

Physcia teretiuscula LYNGE Mon. Norw. Physc. (1916) pag. 96, ubi syn.

I. Goose Bay.
II. Matotchkin Shar: Belushii Bay.
IV. Mashigin Fjord: Fram Bay.

Supposed to be scattered and rare, but I do not venture to say much of its distribution in Novaya Zemlya. Only found sterile.

The plants agree well with my Norwegian plants. It is not rare in Northern Norway on chalky rocks and it was not unexpected to find it farther north. — Since 1916 I have also detected it at several localities in Southern Norway.

Owing to its very narrow laciniae its reaction with KOH is easily misinterpreted, and I am obliged to correct my statement from 1916 on that point. When KOH is applied the yellow colour of the cortex is very rapid and distinct, but there is at first no yellow colour in the medulla. After a short time there is also a faint yellow tinge over the medulla, but that is due to the diffusion of the yellow cortical colour in the drop of solution. The correct statement is KOH$\pm$, as recorded by the French authors HARMAND and BOISTEL.

Its surface is uneven, rugulose, almost as in *Physcia caesia* or *Physcia aipolia.* Its laciniae are elongated and considerably narrower than in *Physcia tribacia*, its soredia are apical and laminar. *Physcia tribacia* is intensely nitrophilous, *Physcia teretiuscula* is much less nitrophilous, its distribution is — at least in Norway — evidently more determined by a chalky substratum.

Former investigations. "*Parmelia caesia* var. *teretiuscula* ACH. has been recorded from Franz Joseph Land (ABRUZZI pag. 672), but not from Novaya Zemlya.

"*Physcia stellaris* var. *albinea*" has been recorded from Novaya Zemlya by DEICHMANN BRANTH (pag. 74) and from Möller Bay by KUSNETZOFF (No. 26). To judge from a remark by the former author his plant is possibly an esorediate *Physcia caesia.*

Summary.

In the following list I have enumerated all the lichens mentioned in this work and all the lichens that have been recorded from Novaya Zemlya in the literature accessible to me. The columns refer to the geographical regions of Novaya Zemlya according to our investigations (cfr. pag. 5 and the map pag. 7).

In Kristovii Fjord (region no. III) hardly any lichens were collected, the few hours spent there were reserved for the Vascular plants. The column III has therefore been omitted in this list.

The last column "F. i." (Former investigations) is strictly bibliographical.

	I	II	IV	V	VI	F. i.
Verrucaria (Wigg.) Th. Fr.						
1. (1) Verrucaria aethiobola Wbg.	—	+	+	+	+	*
2. (2) — arctica Lynge	—	+	+	—	+	
3. (3) — devergens Nyl.	—	+	+	—	—	
4. (4) — acrotella Ach.	—	—	+	—	—	
5. (5) — ossiseda Lynge	+	—	—	—	—	
6. (6) — obsoleta Lynge	—	+	+	—	—	
7. (7) — maura Wbg.	+	—	—	—	+	
8. (8) — convexa Lynge	—	—	—	—	+	
9. (9) — bullata Lynge	+	—	—	—	—	
10. (10) — ceuthocarpa Wbg.	—	+	—	—	+	
11. (11) — striatula Wbg.	—	—	—	—	+	
12. (12) — rupestris Schrad.	—	—	+	—	—	
Thelidium Mass.						
13. (1) Thelidium decipiens (Hepp) Krplh. .	—	+	—	—	—	
14. (2) — pyrenophorum (Ach.) Mudd.	—	+	+	+	+	
15. (3) — microsporum Lynge	—	—	+	—	—	
16. (4) — aeneovinosum (Anzi) Arn. .	—	+	—	—	+	
17. (5) — cataractarum (Hepp) Lönnr.	—	—	+	—	—	

	I	II	IV	V	VI	F. i.
18. (6) Thelidium papulare (E. Fr.) Arn.	—	+	+	—	—	
— umbrosum Mass.	—	—	—	—	—	*
Polyblastia Lönnr.						
19. (1) Polyblastia quartzina Lynge	—	+	—	—	—	
20. (2) — verrucosa (Ach.) Lönnr.	—	+	—	—	—	
21. (3) — Friesii Lynge	—	+	—	—	—	
22. (4) — Sendtneri Krplh.	—	+	+	—	+	
23. (5) — bryophila (Nyl.) Lönnr.	—	+	—	—	+	
24. (6) — gelatinosa (Ach.) Th. Fr.	—	+	—	—	+	
25. (7) — forana (Anzi) Kbr.	—	+	+	+	+	
26. (8) — septentrionalis Lynge	—	—	—	—	+	
27. (9) — hyperborea Th. Fr.	+	+	+	—	+	*
28. (10) — scotinospora (Nyl.) Hellb.	—	+	—	—	—	
29. (11) — theleodes (Somrft.) Th. Fr.	—	+	+	—	+	*
30. (12) — Sommerfeltii Lynge	—	+	+	—	—	
31. (13) — terrestris Th. Fr.	—	+	+	—	—	
Staurothele Norm.						
32. (1) Staurothele clopima (Wbg.) Th. Fr.	—	+	+	—	—	
33. (2) — septentrionalis Lynge	—	+	—	—	—	
34. (3) — Hazslinskyi (Kbr.) Forss. et Blomb.	—	+	—	—	—	
35. (4) — guestphalica (Lahm) Th. Fr.	—	—	+	—	+	
36. (5) — hymenogonia (Nyl.) Th. Fr.	—	+	—	—	+	
Dermatocarpon (Eschw.) Th. Fr.						
37. (1) Dermatocarpon miniatum (L.) Mann.	+	—	—	—	—	
38. (2) — cinereum (Pers.) Th. Fr.	—	+	+	—	+	
39. (3) — lachneum (Ach.) A. L. Sm.	—	+	+	—	+	
Belonia Kbr.						
40. (1) Belonia arctica Lynge	—	+	—	—	—	
Sphaerophorus Pers.						
41. (1) Spaerophorus globosus (Huds.) Vain.	+	+	+	+	+	*
— fragilis Pers.	—	—	—	—	—	*
Allarthonia Nyl.						
Allarthonia fusca (Mass.) Sandst.	—	—	—	—	—	*
Catinaria Vain.						
42. (1) Catinaria athallina (Hepp) Lynge	—	+	—	—	—	
43. (2) — atomaria Lynge	—	—	—	—	+	
Diploschistes Norm.						
44. (1) Diploschistes scruposus (L.) Norm.	—	+	—	—	—	

	I	II	IV	V	VI	F. i.
Sagiolechia Mass.						
45. (1) Sagiolechia rhexoblephara (Nyl.) Zahlbr.	—	+	—	—	—	
Ionaspis Th. Fr.						
46. (1) Ionaspis arctica Lynge	—	+	+	+	+	
47. (2) — melanocarpa (Krphl.) Arn.	—	—	—	—	+	
Gyalecta Ach.						
48. (1) Gyalecta foveolaris (Ach.) Schaer.	+	+	+	—	+	
Polychidium (Mass.) A. Zahlbr.						
49. (1) Polychidium muscicola (Sm.) S. Gray	—	+	+	—	—	
Pyrenopsis Nyl.						
50. (1) Pyrenopsis macrospora Lynge	—	+	—	—	—	
51. (2) — pulvinata (Schaer.) Hellb.	+	+	—	—	—	
— granatina (Smrft.)	—	—	—	—	—	*
Leciophysma Th. Fr.						
52. (1) Leciophysma finmarkicum Th. Fr.	+	+	+	+	+	
Collema (Hill) A. Zahlbr.						
53. (1) Collema rupestre (Sw.) Rabh.	—	—	—	—	+	
54. (2) — arcticum Lynge	+	+	+	—	+	
55. (3) — multifidum (Scop.) Rabenh.	+	+	+	—	+	
56. (4) — pulposum Ach.	—	+	+	—	—	
Arctomia Th. Fr.						
57. (1) Arctomia delicatula Th. Fr.	+	+	+	—	—	
58. (2) — interfixa (Nyl.) Vain.	—	+	—	—	—	
Leptogium S. Gray.						
59. (1) Leptogium lichenoides (L.) A. Zahlbr.	—	+	—	—	—	
60. (2) — pulvinatum (Hoffm.) Cromb.	+	+	+	—	+	
61. (3) — scotinum (Ach.) Fr.	—	—	—	—	+	
62. (4) — saturninum (Dicks.) Nyl.	+	+	—	—	—	
Placynthium S. Gray.						
63. (1) Placynthium asperellum (Ach.) Trev.	+	+	+	—	+	
64. (2) — nigrum (Huds.) S. Gray	—	—	—	—	+	
Parmeliella Müll. Arg.						
65. (1) Parmeliella arctophila (Th. Fr.) Malme	—	+	+	+	—	*
66. (2) — furfurascens (Nyl.) Lynge	—	+	—	—	—	
67. (3) — lepidiota (Smrft.) Vain.	—	+	+	—	+	

	I	II	IV	V	VI	F. i.
Pannaria Del.						
68. (1) Pannaria elaeina (Wbg.) Nyl. . . .	—	+	+	—	—	
69. (2) — Hookeri (Borr.) Nyl.	—	+	+	+	—	
70. (3) — pezizoides (Web.) Lightf. . .	+	+	+	+	+	*
Psoroma (Ach.) Nyl.						
71. (1) Psoroma hypnorum (Dicks.) Hoffm.	+	+	+	+	—	*
Lobaria (Schreb.) A. Zahlbr.						
72. (1) Lobaria linita (Ach.) Rabh..	+	+	+	+	—	*
Solorina Ach.						
73. (1) Solorina bispora Nyl.	+	+	+	—	+	
74. (2) — octospora Arn..	—	+	+	—	—	
75. (3) — spongiosa (Sm.) Anzi	+	+	+	—	—	
76. (4) — saccata (L.) Ach.	—	+	—	—	+	*
77. (5) — crocea (L.) Ach..	+	+	+	+	+	
Nephroma (L.) Fr.						
78. (1) Nephroma arcticum (L.) Forss.. . .	+	+	—	—	—	*
79. (2) — expallidum Nyl.	+	+	+	+	+	*
— resupinatum (L.) Ach. . . .	—	—	—	—	—	*
Peltigera Willd.						
80. (1) Peltigera aphthosa (L.) Hoffm. . . .	+	+	+	+	+	*
81. (2) — venosa (L.) Hoffm.	—	+	—	—	—	
82. (3) — malacea (Ach.) Fr.	+	+	+	—	—	
83. (4) — canina (L.) Hoffm.	+	+	+	+	+	*
84. (5) — erumpens (Tayl.) Vain. . . .	+	+	+	—	+	
85. (6) — lepidophora (Nyl.) Bitter . .	—	+	+	—	+	
86. (7) — scabrosa Th. Fr..	+	+	+	+	—	
87. (8) — polydactyla (Neck.) Hoffm. .	+	—	+	+	+	
Lecidea (Ach.) A. Zahlbr.						
88. (1) Lecidea atrobrunnea (Ram.) Schaer.	—	+	+	—	+	*
89. (2) — paupercula Th. Fr.	—	+	+	—	+	
90. (3) — confluens Ach..	+	+	+	—	+	*
91. (4) — speirea Ach..	—	+	+	+	+	*
92. (5) — symphycarpea Lynge	—	—	—	—	+	
93. (6) — Syernaiae Lynge	—	+	—	—	—	
94. (7) — cyanea (Ach.) Röhl..	—	+	+	+	+	*
95. (8) — lapicida Ach..	+	+	+	—	+	*
96. (9) — pantherina Ach.	+	+	+	+	+	*
97. (10) — Swartzioidea Nyl.	—	+	—	—	—	*
98. (11) — theiodes Smrft.	—	+	—	—	—	*
99. (12) — plana Lahm	—	—	—	—	+	

	I	II	IV	V	VI	F. i.
100. (13) Lecidea auriculata Th. Fr..	—	+	+	—	—	
101. (14) — reducens Vain.	—	+	—	—	—	
102. (15) — panaeola Ach.	+	+	+	+	—	
103. (16) — macrocarpa (DC.) Steud. .	—	+	+	+	+	*
104. (17) — albocoerulescens Ach. . . .	—	+	+	—	—	*
105. (18) — albosuffusa Th. Fr..	—	+	+	—	—	
106. (19) — rhaetica Hepp	+	+	—	+	—	
107. (20) — emergens Fw.	+	—	—	—	—	
108. (21) — vorticosa (Flk.) Kbr.. . . .	+	—	+	—	—	
109. (22) — Dicksonii Ach.	+	+	+	—	+	*
110. (23) — Sommerfeltii Lynge	—	+	+	—	—	
111. (24) — crassipes (Th. Fr.) Nyl. . .	—	+	—	—	—	
112. (25) — ramulosa Th. Fr..	+	+	+	+	+	
113. (26) — assimilata Nyl..	+	+	+	+	—	
114. (27) — neglecta Nyl..	+	+	+	—	+	
115. (28) — impavida Th. Fr..	+	+	+	—	—	*
116. (29) — armeniaca (DC.) Fr.. . . .	+	+	+	—	+	
117. (30) — arctogena Th. Fr.	+	+	+	—	—	*
118. (31) — limosa Ach..	+	+	+	+	—	
119. (32) — sublimosa Nyl..	+	+	+	+	—	
120. (33) — arctica Somrft.	+	+	—	—	—	
121. (34) — terricola Lynge.	—	—	—	+	—	
122. (35) — macrospora Lynge	—	—	—	—	+	
123. (36) — somphotera Vain.	—	+	+	—	—	
124. (37) — epiioidiza Nyl.	—	+	+	—	—	
125. (38) — endolithea Lynge.	—	—	—	—	+	
126. (39) — glomerulosa (DC.) Steud. .	+	+	+	+	+	
127. (40) — latypea Ach.	+	—	—	—	—	*
128. (41) — latypiza Nyl.	—	+	—	—	—	
129. (42) — goniophila Flk.	+	+	+	—	+	*
130. (43) — pungens (Kbr.) Nyl.	+	+	+	—	—	*
131. (44) — Kolaensis Nyl.	—	+	—	—	—	
132. (45) — migratoria Lynge	—	+	—	—	—	
133. (46) — conferenda Nyl.	+	—	+	—	—	
134. (47) — Machiginii Lynge	—	—	+	—	—	
135. (48) — cuprea Somrft.	+	+	+	—	—	
136. (49) — vernalis (L.) Ach.	+	+	+	+	+	*
137. (50) — Berengeriana (Mass.) Nyl.	+	+	+	—	+	
138. (51) — fuscorubens Nyl.	—	+	—	—	—	*
139. (52) — mollis (Wbg.) Nyl..	+	+	+	—	—	*
140. (53) — aenea (Duf.) Nyl.	+	+	+	+	—	
141. (54) — Arnoldi Lynge	—	+	—	—	—	
142. (55) — picea Lynge	—	+	—	—	—	
143. (56) — discreta Lynge	—	+	+	—	+	
144. (57) — subplumbea Anzi.	+	+	+	—	+	
145. (58) — leucophaea (Flk.) Th. Fr. .	—	—	+	—	—	
146. (59) — tenebricans Nyl.	—	—	+	—	—	
147. (60) — Karaënsis Lynge	—	+	—	—	—	
148. (61) — glacialis Lynge	—	—	+	—	—	

	I	II	IV	V	VI	F. i.
149. (62) Lecidea lulensis Hellb.	+	+	+	—	+	*
150. (63) — hypopta Ach.	—	—	—	—	+	
151. (64) — sorediata Lynge	—	+	+	—	+	
152. (65) — Tornöensis Nyl.	—	+	—	—	—	
153. (66) — erythrophaea Flk.	—	—	+	—	—	
154. (67) — turgidula Fr.	—	—	+	—	—	
155. (68) — rufofusca (Anzi) Nyl.	+	—	—	—	—	
156. (69) — rubiformis Wbg.	—	+	+	—	—	
157. (70) — decipiens (Ehrh.) Ach.	+	+	+	—	—	*
158. (71) — demissa (Rutstr.) Ach.	+	—	—	—	+	
— aglaea Somrft.	—	—	—	—	—	*
— alpestris Somrft.	—	—	—	—	—	*
— botryosa (Fr.) Th. Fr.	—	—	—	—	—	*
— elata Schaer.	—	—	—	—	—	*
— invadens H. Magn.	—	—	—	—	—	*
— Konyamensis Nyl.	—	—	—	—	—	*
— lithophila (Ach.) Th. Fr.	—	—	—	—	—	*
— Nowajae Kbr.	—	—	—	—	—	*
— tenebrosa Fr.	—	—	—	—	—	*
Catillaria Th. Fr.						
159. (1) Catillaria Holtedahlii Lynge	—	—	+	—	—	
— Höferi (Kbr.)	—	—	—	—	—	*
Bacidia (DNotrs.) A. Zahlbr.						
160. (1) Bacidia sphaeroides (Dicks.) A. Zahlbr.	—	+	+	—	—	
161. (2) — microcarpa (Ach.) Lettau	+	+	—	—	+	*
162. (3) — coprodes (Kbr.) Lettau	—	+	—	—	+	
163. (4) — muscorum (Sw.) Mudd.	—	+	+	—	+	
164. (5) — alpina (Schaer.) Vain.	+	—	+	—	—	
165. (6) — Anziana Lynge	+	+	—	—	—	
— umbrina (Ach.) Br. et Rostr.	—	—	—	—	—	*
Toninia (Mass.) Th. Fr.						
166. (1) Toninia squalida (Ach.) Mass.	—	+	+	—	—	
167. (2) — fusispora (Hepp) Th. Fr.	—	+	—	—	+	
168. (3) — lobulata (Somrft.) Lynge	+	+	+	+	+	
169. (4) — candida (Web.) Th. Fr.	+	—	—	—	—	
170. (5) — squalescens (Nyl.) Th. Fr.	+	—	—	—	—	
Lopadium.						
171. (1) Lopadium fuscoluteum (Dicks.) Mudd.	+	—	—	—	—	
172. (2) — pezizoideum (Ach.) Kbr.	+	+	+	+	—	
Rhizocarpon (Ram.) Th. Fr.						
173. (1) Rhizocarpon alpicola (Hepp)	—	+	—	—	—	*

		I	II	IV	V	VI	F. i.
174.	(2) Rhizocarpon chionophilum Th. Fr.	+	+	+	—	—	*
175.	(3) — chionophiloides (Vain.) Lettau	+	+	+	—	—	*
176.	(4) — rittokense (Hellb.) Th. Fr.	—	—	+	—	—	
177.	(5) — badioatrum (Flk.) Th. Fr. .	+	+	+	—	—	*
178.	(6) — jemtlandicum Malme . . .	+	+	+	—	+	*
179.	(7) — Copelandii (Kbr.) Th. Fr. .	+	+	+	—	+	*
180.	(8) — cinereonigrum Vain.	—	—	+	—	—	*
181.	(9) — Massalongii (Kbr.) Malme .	—	+	+	—	+	
182.	(10) — polycarpum (Hepp) Th. Fr.	—	+	—	+	+	
183.	(11) — expallescens Th. Fr.	+	+	+	—	+	
184.	(12) — chioneum (Norm.) Th. Fr. .	—	+	+	—	—	*
185.	(13) — albidum Lynge	—	+	+	—	+	
186.	(14) — geographicum (L.) DC. . .	+	+	+	+	+	*
187.	(15) — atroflavescens Lynge. . . .	—	—	+	+	+	
188.	(16) — disporum (Naeg.) Müll. Arg.	+	+	+	+	+	*
189.	(17) — grande (Flk.) Arn.	+	+	+	+	+	*
190.	(18) — Anseris Lynge	+	—	—	—	+	
191.	(19) — cinereoflavescens Lynge . .	—	—	—	—	+	
192.	(20) — distinctum Th. Fr.	—	+	—	—	—	*
193.	(21) — verrucosum Lynge	—	—	+	—	—	
194.	(22) — lavatum (Fr.) Hazsl.	—	+	—	—	—	
195.	(23) — obscuratum (Ach.) Mass. .	—	+	+	—	—	*
196.	(24) — orphninum Vain.	—	—	+	—	—	
197.	(25) — petraeum (Wulf.) Mass. . .	—	—	+	—	—	*
198.	(26) — pseudospeireum (Th. Fr.) Lynge	+	+	+	+	—	
	— applanatum (Fr.) Th. Fr.. .	—	—	—	—	—	*
	— Oederi (Web.) Kbr.	—	—	—	—	—	*
	— phalerosporum Vain.. . . .	—	—	—	—	—	*
	Baeomyces Pers.						
199.	(1) Baeomyces placophyllus Ach. . . .	+	+	+	—	—	
	Cladonia (Hill.) Vain.						
200.	(1) Cladonia alpestris (L.) Rabh. . . .	+	+	—	—	—	
201.	(2) — rangiferina (L.) Web. . . .	+	+	+	+	+	*
202.	(3) — silvatica (L.) Harm.	+	—	—	—	—	
203.	(4) — mitis Sandst.	+	+	+	+	+	*
204.	(5) — impexa Harm.	+	—	—	—	—	
205.	(6) — uncialis (L.) Web.	+	+	+	+	+	*
206.	(7) — amaurocraea (Flk.) Schaer.	+	—	—	—	—	*
207	(8) — bellidiflora (Ach.) Schaer. .	—	+	—	—	—	*
208.	(9) — deformis Hoffm.	—	—	—	—	+	
209.	(10) — coccifera (L.) Willd.	+	+	+	+	+	*
210.	(11) — cyanipes (Somrft.) Vain.. .	+	—	—	—	—	*
211.	(12) — furcata (Huds.) Schrad. . .	—	+	—	—	—	*
212.	(13) — gracilis (L.) Willd..	+	+	+	—	—	?

			I	II	IV	V	VI	F. i.
213.	(14)	Cladonia elongata (Jacq.) Hoffm. .	+	+	+	—	+	*
214.	(15)	— verticillata Hoffm.	+	+	—	—	—	*
215.	(16)	— degenerans (Flk.) Spreng. .	—	+	+	—	—	
216.	(17)	— lepidota Nyl.	+	+	+	+	+	
217.	(18)	— pyxidata (L.) Fr.	+	+	+	+	+	*
218.	(19)	— cariosa (Ach.) Spreng. . . .	—	—	—	+	—	
219.	(20)	— alpicola (Fw.) Vain.	—	+	—	—	—	
		Stereocaulon Schreb.						
220.	(1)	Stereocaulon paschale (L.) Ach. .	—	+	—	—	—	*
221.	(2)	— alpinum Laur.	+	+	+	+	+	*
222.	(3)	— rivulorum H. Magn.	+	+	+	+	+	
223.	(4)	— fastigiatum Anzi.	+	+	+	+	+	*
224.	(5)	— denudatum Flk.	+	+	+	+	+	*
		Gyrophora Ach.						
225.	(1)	Gyrophora rugifera (Nyl.) Th. Fr.	—	+	+	—	+	
226.	(2)	— decussata (Vill.) Zahlbr. .	+	+	+	—	+	*
227.	(3)	— cylindrica (L.) Ach.	+	+	+	—	+	*
228.	(4)	— erosa (Web.) Ach.	+	+	+	—	+	*
229.	(5)	— torrefacta (Lightf.) Cromb.	—	+	—	—	—	*
230.	(6)	— hyperborea Ach.	+	+	+	—	+	*
231.	(7)	— arctica Ach.	+	+	+	+	+	*
232.	(8)	— proboscidea (L.) Ach. . . .	+	+	+	+	+	*
233.	(9)	— deusta (L.) Ach.	—	+	—	—	—	
234.	(10)	— vellea (L.) Ach	—	—	+	—	+	
		— Feildenii Vain.	—	—	—	—	—	*
		— polyphylla (L.)	—	—	—	—	—	*
		Biatorella (Schaer.) Th. Fr.						
235.	(1)	Biatorella cinerea (Schaer.) Th. Fr.	+	+	+	—	+	
236.	(2)	— coracina Somrft.	+	+	+	—	+	*
237.	(3)	— pruinosa (Sm.) Mudd. . . .	—	—	—	—	+	
238.	(4)	— simplex (Dav.) Br. et Rostr.	—	—	+	—	—	
		Acarospora.						
239.	(1)	Acarospora badiofusca (Nyl.) Th. Fr.	—	+	+	—	—	
240.	(2)	— bullata Anzi	—	—	+	—	—	
241.	(3)	— chlorophana (Wbg.) Mass. .	—	—	+	—	—	
242.	(4)	— glaucocarpa (Wbg.) Kbr. .	—	+	—	—	—	
243.	(5)	— interposita H. Magn.	—	+	—	—	—	
244.	(6)	— Lesdainii (Harm.) A. L. Sm.	+	+	+	—	+	
245.	(7)	— molybdina (Wnbg.) Mass. .	+	—	+	—	+	*
246.	(8)	— Novae Zemliae H. Magn. .	—	—	+	—	—	
247.	(9)	— sinopica (Wnbg.) Kbr. . . .	—	+	—	—	—	
248.	(10)	— veronensis Mass.	—	—	+	—	—	
		— e stirpe cervinae.	—	—	—	—	—	*
		— fuscata var. rufescens (Turn.)	—	—	—	—	—	*

	I	II	IV	V	VI	F. i.
Pertusaria DC.						
249. (1) Pertusaria bryontha (Ach.) Nyl.	—	+	—	—	—	
250. (2) — oculata (Dicks.) Th. Fr.	+	+	+	—	—	
251. (3) — panyrga (Ach.) Th Fr.	—	+	—	—	—	
252. (4) — dactylina (Ach.) Nyl.	+	+	+	+	+	
253. (5) — coriacea Th. Fr.	+	+	+	—	+	
254. (6) — lactea (L.) Nyl.	—	—	+	—	—	
— cribellata D. B.	—	—	—	—	—	*
— solitaria H. Magn.	—	—	—	—	—	*
Lecanora (Ach.) A. Zahlbr.						
255. (1) Lecanora albescens (Hoffm.) Th. Fr.	+	—	—	—	—	
256. (2) — aliena A. Zahlbr.	—	+	—	—	—	
257. (3) — alpina Somrft.	—	+	—	—	—	
258. (4) — atra (Huds.) Ach.	+	+	+	+	+	*
259. (5) — atrosulphurea Ach.	+	+	+	+	+	*
260. (6) — atrynea (Ach.) Röhl.	—	+	—	—	—	
261. (7) — badia Ach.	—	+	+	—	—	*
262. (8) — Behringii Nyl.	+	+	+	+	+	(* ?)
263. (9) — bicincta Ram.	—	+	—	—	+	
264. (10) — castanea (Hepp) Th. Fr.	—	+	+	+	—	
265. (11) — cenisea Ach.	—	+	+	—	—	*
266. (12) — cinerea (L.)	—	—	—	+	—	*
267. (13) — cingulata A. Zahlbr.	+	—	+	—	+	
268. (14) — coilocarpa (Ach.) Nyl.	—	+	—	—	+	
269. (15) — conizaea (Ach.) Nyl.	—	—	—	—	—	
270. (16) — contractula Nyl.	+	—	—	+	+	*
271. (17) — dispersa (Pers.) Röhl.	—	—	+	—	+	*
272. (18) — epibryon Ach.	+	+	+	—	+	*
273. (19) — flavida Hepp.	—	+	+	+	+	
274. (20) — frustulosa (Dicks.)	—	+	+	—	—	
275. (21) — gelida (Linn.) Ach.	—	+	+	—	—	*
276. (22) — gibbosa (Ach.) Nyl.	—	+	—	—	—	*
277. (23) — glaucoma Ach.	—	+	—	—	+	
278. (24) — granatina Somrft.	—	—	—	+	—	
279. (25) — gyrodes Nyl.	—	+	—	—	—	
280. (26) — heteroplaca A. Zahlbr.	—	+	+	—	+	
281. (27) — hyperboreorum A. Zahlbr.	—	—	—	—	+	
282. (28) — intricata (Schrad.) Ach.	+	+	—	—	+	*
283. (29) — lacteorosulans A. Zahlbr.	—	—	+	—	—	
284. (30) — lacustris (Wither.) Nyl.	—	+	—	—	—	
285. (31) — laevata (Ach.) Nyl.	—	—	—	—	—	*
286. (32) — Lyngei A. Zahlbr.	+	+	+	—	+	
287. (33) — maschiginensis A. Zahlbr.	—	+	+	—	—	
288. (34) — mastrucata (Wbg.) Th. Fr.	+	+	+	—	—	
289. (35) — melanaspis (Ach.) Th. Fr.	—	+	+	—	—	
290. (36) — Nordenskiöldii Vain.	+	—	—	—	+	
291. (37) — Novaiae-Semliae A. Zahlbr.	—	+	—	—	+	

			I	II	IV	V	VI	F. i.
292.	(38)	Lecanora ochrofusca A. Zahlbr. . .	—	+	—	—	—	
293.	(39)	— ossiseda A. Zahlbr..	+	—	—	—	—	
294.	(40)	— peltata (Ram.) A. Zahlbr. .	—	—	—	—	+	
295.	(41)	— permelancholica A. Zahlbr.	+	+	—	—	+	
296.	(42)	— perradiata Nyl..	+	+	+	+	+	*[1]
297.	(43)	— plicigera A. Zahlbr.	+	+	+	—	+	
298.	(44)	— polytropa (Ehrh.) Th. Fr. .	+	+	+	+	+	*
299.	(45)	— proserpens Nyl.	+	+	+	—	+	
300.	(46)	— silvatica (Zw.) Sandst.. . . .	—	+	—	—	—	
301.	(47)	— sublapponica A. Zahlbr. . .	—	+	+	—	—	
302.	(48)	— subtorrida A. Zahlbr.. . . .	+	—	—	—	+	
303.	(49)	— supertegens (Arn.) A. Zahlbr.	—	+	—	—	—	
304.	(50)	— varia (Ehrh.) Ach.	—	+	—	—	—	*
305.	(51)	— verrucosa Ach..	+	+	+	—	+	
306.	(52)	— verruculosa (Krplh.) Steiner	—	+	+	—	—	
		— calcarea (L.) Somrft.. . . .	—	—	—	—	—	*
		— cartilaginea Ach.	—	—	—	—	—	*
		— cinereorufescens (Ach.) Th. Fr..	—	—	—	—	—	*
		— complanata Kbr.	—	—	—	—	—	*
		— crenata Nyl.	—	—	—	—	—	*
		— crenulata (Dicks.)	—	—	—	—	—	*
		— Hageni (Ach.) Nyl. (= Behringii?)	—	—	—	—	—	*
		— leptacina Somrft.	—	—	—	—	—	*
		— melinodes (Kbr.)	—	—	—	—	—	*
		Ochrolechia Mass.						
307.	(1)	Ochrolechia frigida (Sw.)	+	+	+	+	+	*
308.	(2)	— Grimmiae Lynge	+	+	+	+	+	
309.	(3)	— inaequatula Nyl.	+	+	+	—	+	
310.	(4)	— upsaliensis (L.) Mass. . . .	—	+	+	—	—	
		Lecania (Mass.) Th. Fr.						
311.	(1)	Lecania alpivaga Th. Fr..	—	—	—	—	+	
312.	(2)	— arctica Lynge	—	+	—	—	—	
313.	(3)	— flavescens Lynge	—	—	—	—	+	
		Haematomma Mass.						
314.	(1)	Haematomma ventosum (L.) Mass.	+	+	+	—	—	*
		Candelariella Müll. Arg.						
315.	(1)	Candelariella cerinella (Flk.) A. Zahlbr.	—	+	+	—	+	*
316.	(2)	— vitellina (Ehrh.) Müll. Arg.	+	+	+	+	+	*
317.	(3)	— crenulata (Wbg.)	—	—	—	—	+	

[1] s. n. Lecanora gibbosa var. squamata.

	I	II	IV	V	VI	F. i.
Parmeliopsis Nyl.						
318. (1) Parmeliopsis ambigua (Ach.) Nyl.	—	—	—	—	+	
Parmelia (Ach.) De Notrs.						
319. (1) Parmelia physodes (L.) Ach. . . .	+	+	—	—	—	
320. (2) — subobscura Vain..	+	+	+	+	+	
321. (3) — intestiniformis (Vill.) Ach..	+	+	+	—	+	
322. (4) — pubescens (L.) Vain. . . .	+	+	+	+	+	*
323. (5) — minuscula Nyl..	—	+	+	—	—	
324. (6) — striata Lynge	—	+	—	—	—	
325. (7) — stygia (L.) Ach.	+	+	+	—	—	*
326. (8) — alpicola Th. Fr..	+	+	+	—	+	*
327. (9) — nigra Vain..	—	+	—	—	—	
328. (10) — Almquistii Vain.	—	+	+	—	—	
329. (11) — centrifuga (L.) Ach.	+	+	—	—	—	*
330. (12) — Birulae Elenkin.	—	+	+	—	+	
331. (13) — incurva (Pers.) Fr..	+	+	+	—	—	*
332. (14) — sorediata (Ach.) Th. Fr. . .	—	+	+	—	+	
333. (15) — infumata Nyl.	—	+	—	—	+	
334. (16) — saxatilis (L.) Ach.	+	+	+	+	+	*
335. (17) — omphalodes (L.) Ach. . . .	+	+	+	+	+	*
336. (18) — sulcata Tayl.	+	—	+	+	+	*
337. (19) — fraudans Nyl.	+	—	—	—	—	
— prolixa Ach.	—	—	—	—	—	*
Cetraria Ach.						
338. (1) Cetraria hepatizon (Ach.) Vain.. .	+	+	+	+	+	*
339. (2) — chrysantha Tuck..	+	+	—	—	—	*
340. (3) — juniperina (L.) Ach.	—	—	—	—	+	*
341. (4) — nivalis (L.) Ach..	+	+	+	+	+	*
342. (5) — cucullata (Bell.) Ach. . . .	+	+	+	+	+	*
343. (6) — crispa (Ach.) Nyl.	+	+	+	+	+	*
344. (7) — Delisei (Bory) Th. Fr. . . .	+	+	+	+	+	*
345. (8) — nigricans Nyl.	—	+	+	—	—	
346. (9) — capitata Lynge	+	+	—	—	—	
347. (10) — aculeata (Schreb.) Fr. . . .	+	+	+	+	+	*
— islandica (L.) Ach..	—	—	—	—	—	*
Evernia Ach.						
348. (1) Evernia arctica (Elenk. et Sav.) Lynge	—	—	—	—	+	*
Dufourea (Ach.) Nyl.						
349. (1) Dufourea madreporiformis (Wulf.) Ach.	+	+	+	—	+	*
350. (2) — ramulosa Hook.	—	+	+	—	+	*
Dactylina Nyl.						
351. (1) Dactylina arctica (Hook.) Nyl. . .	+	—	—	—	—	*

	I	II	IV	V	VI	F. i.
Alectoria Ach.						
352. (1) Alectoria ochroleuca (Ehrh.) Nyl.	+	+	+	+	+	*
353. (2) — nigricans (Ach.) Nyl. . . .	+	+	+	+	+	*
354. (3) — divergens (Ach.) Nyl. . . .	+	+	—	+	—	*
355. (4) — jubata (L.) Nyl.	—	—	—	—	+	
— thrausta (Ach.).	—	—	—	—	—	*
Usnea (Dill.) Pers.						
356. (1) Usnea sulphurea (König) Th. Fr. .	—	—	+	—	—	
Thamnolia Ach.						
357. (1) Thamnolia vermicularis (Sw.) Ach.	+	+	+	+	+	*
Siphula Fr.						
Siphula ceratites (Wbg.) E. Fr..	—	—	—	—	—	*
Protoblastenia Steiner.						
358. (1) Protoblastenia rupestris (Scop.) A. Zahlbr.	+	+	+	+	+	
359. (2) — terricola (Anzi)	—	+	+	—	+	
Blastenia Mass.						
360. (1) Blastenia tetraspora (Nyl.) Th. Fr.	+	+	+	+	+	
Caloplaca Th. Fr.						
361. (1) Caloplaca ursina Lynge	—	+	—	—	+	
362. (2) — gilva (Hoffm.) A. Zahlbr. .	+	+	—	—	+	*
363. (3) — stillicidiorum (Vahl) Lynge	+	+	+	+	+	*
364. (4) — aurantiaca (Lightf.) Th. Fr.	—	—	—	—	+	
365. (5) — vitellinula (Nyl.) Oliv.. . . .	—	+	+	—	—	*
366. (6) — Jungermanniae (Vahl) Th. Fr.	+	+	+	+	—	
367. (7) — subolivacea (Th. Fr.) Lynge	+	+	+	+	+	*
368. (8) — fraudans (Th. Fr.) Oliv. . .	—	+	—	—	—	
369. (9) — caesiorufa (Ach.)	—	+	—	—	—	
370. (10) — invadens Lynge	—	+	—	—	—	
371. (11) — discoidalis (Vain.) Lynge .	—	—	+	—	+	
372. (12) — cinnamomea (Th. Fr.) Oliv.	+	+	+	+	+	*
373. (13) — nigricans (Tuck.?) Oliv.. .	—	+	—	—	—	
374. (14) — ferruginea (Huds.)	+	—	+	—	+	
375. (15) — bracteata (Ach.) Jatta. . . .	+	+	+	—	+	
376. (16) — elegans (Link) Th. Fr.. . . .	+	+	+	+	+	*
377. (17) — sorediata (Vain.) Du Rietz	+	+	+	+	+	*
378. (18) — granulosa (Müll.Arg.) Steiner	+	—	—	—	+	
379. (19) — murorum (Hoffm.) Th. Fr..	+	+	+	+	+	*
380. (20) — marina (Weddell)	—	—	—	+	+	*
— citrina (Hoffm.) Th. Fr. . .	—	—	—	—	—	*
— nivalis (Kbr.) Th. Fr. . . .	—	—	—	—	—	*
— variabilis (Pers.) Th. Fr . .	—	—	—	—	—	

		I	II	IV	V	VI	F. i.
	Xanthoria Th. Fr.						
381. (1)	Xanthoria candelaria (Ach.) Arn. .	+	—	+	+	+	*
	— parietina.	—	—	—	—	—	(*?)
	Buellia D. Ntrs.						
382. (1)	Buellia disciformis (Fr.) Deichm. Branth et Rostr.	+	+	+	+	+	
383. (2)	— punctiformis (Hoffm.) Vain.	—	+	+	—	+	*
384. (3)	— stigmatea Kbr.	+	—	—	—	+	*
385. (4)	— concinna Th. Fr.	—	—	—	+	—	
386. (5)	— vilis Th. Fr.	—	+	+	—	—	
387. (6)	— atrata (Sm.) Mudd.	+	+	+	—	—	*
388. (7)	— coniops (Wbg.) Th. Fr. . .	+	+	+	—	+	*
389. (8)	— avium Lynge.	—	—	—	—	+	
390. (9)	— aethalea (Ach.) Th: Fr. . .	—	+	—	—	—	
391. (10)	— spuria (Schaer.) Arn. . . .	—	—	+	—	—	*
392. (11)	— minutissima Lynge.	—	+	—	—	—	
393. (12)	— Malmei Lynge	—	+	+	—	—	
394. (13)	— immersa Lynge	—	—	+	—	—	
395. (14)	— scabrosa (Ach.) Kbr.. . . .	+	+	+	—	—	
396. (15)	— margaritacea (Kbr.) Lynge	—	—	—	—	+	*
397. (16)	— epigaea (Pers.) Tuck. . . .	—	+	—	—	—	
	— rinodinoides Anzi	—	—	—	—	—	*
	— microplaca Vain.	—	—	—	—	—	*
	Rinodina (S. Gray) Mass.						
398. (1)	Rinodina nimbosa (Fr.) Th. Fr. . .	—	+	+	+	—	
399. (2)	— balanina (Wbg.) Vain. . . .	—	—	—	—	+	*
400. (3)	— mniaraea (Ach.) Th. Fr. . .	+	+	+	+	+	
401. (4)	— calcigena (Th. Fr.) Lynge .	—	—	—	—	+	*
402. (5)	— turfacea (Wbg.) Th. Fr. . .	+	+	+	+	+	*
403. (6)	— roscida (Somrft.) Lynge . .	+	+	+	—	+	
404. (7)	— milvina (Wbg.) Th. Fr. . .	—	+	—	—	+	
405. (8)	— laevigata (Ach.) Malme . .	+	—	—	—	+	
406. (9)	— Bischoffii (Hepp).	—	+	—	—	—	
	— chionea Th. Fr..	—	—	—	—	—	*
	— exigua (Ach.) Th. Fr. . . .	—	—	—	—	—	*
	Physcia (Schreb.) Vain.						
407. (1)	Physcia marina (E. Nyl.) Lynge .	—	—	+	—	+	
408. (2)	— tribacia (Ach.)	+	+	+	+	+	*
409. (3)	— muscigena (Ach.) Nyl. . .	+	+	+	—	+	*
410. (4)	— sciastra (Ach.) Du Rietz .	+	+	+	—	+	
411. (5)	— caesia (Hoffm.) Nyl.. . . .	+	+	+	—	+	*
412. (6)	— intermedia Vain.	+	+	+	—	+	
413. (7)	— teretiuscula (Ach.) Lynge .	+	+	+	—	—	
	— stellaris var. albinea	—	—	—	—	—	*
	Total	191	308	252	99	208	

These figures are high, higher than I would have expected. It should however be remembered that they are much dependant on the limitation of the species. In this work the species have been narrowly limited. Other authors might have preferred a wider limitation, resulting in lower figures.

In spite of all care a certain number of incorrect determinations will be inevitable. This number must be greater, if the species are narrowly limited. I have often been much in doubt. Sometimes the plants were insufficiently developed, in other cases the sections in question were critical and the decision doubtful.

I am very thankful for all suggestions and corrections from my colleagues. They will be useful, if I should be able to collaborate these results with the results of the large collections from Spitsbergen and Bear Island, the greater part of which are still undetermined, and with the lichen vegetation in the Western Arctic and on the Siberian Arctic coast. We would then be able to understand the Scandinavian lichen flora better than now, its composition, distribution and history.

A comparison between the relative sizes of these figures is of greater value than the figures themselves. But unfortunately we cannot compare all these figures.

It is hardly possible to give the exact number of lichens, collected in Novaya Zemlya. Very few of the plants, which other botanists have collected there, have been accessible to me. Several authors record species, that are decidedly southern even in our country. Several of these determinations must be incorrect. Some names are so collective that they cannot be numbered with the more elementary species.

In the enumation of my own plants the column V only gives the results of a few hours' work at a very limited locality. The scarcity of time did not even enable us to find the best locality near this anchorage, we had to collect within a short distance from our ship. This is the reason, why we only found about 100 different lichens there.

Column I is not sufficiently representative for comparison. In the southern fjords we worked at Goose Bay July 3—5th and in the Gribovii and Bessimyannii fjords Augt. 31st—Sept. 2nd (see our map pag. 7). During the first visit the weather was very rough, one whole day we were unable to leave our ship and we were very glad that we saved it at all. The Arctic gales penetrate all the clothes, which a man can carry. They can be duly appreciated only by a scientist, who is obliged to lie quietly for hours, as a lichenologist must do. Towards the end of our visit the lichenological collections had increased so much that I began to doubt of being able to determine them. It is well known that the microscopical work, necessitated by the determination of a large collection of lichens, demands much time. My work was therefore more concentrated on the Vascular plants. One day (Sept. 3rd) was reserved for a rich locality, which would have increased the numbers in column I considerably. But this day was lost for me, it was resolved that we should return that morning.

Accordingly the lichenological results from the southern fjords were not so rich that the figure 191 in column I can be comparable with the figures from the remaining 3 regions.

I think it probable that the lichen flora of these southern fjords is poorer than that of Matotchkin Shar, but the difference cannot be so great. There is no great difference between the number of Vascular plants from these two regions, 127 in the southern fjords against 138 in Matotchkin Shar or 157 against 159, if we will add the plants, obtained also by former expeditions.

It is supposed that the number of lichen species, which we collected in the other 3 regions, viz. II: Matotchkin Shar about 73° 20′ n., IV: Mashigin Fjord about 74° 40′ n., and VI: Farthest north, a little south of 76° n., is representative and comparable.

The time at our disposal was of course insufficient for anything like exhaustive collections. It is sufficient to remember that so conspicuous lichens as *Parmelia sulcata*, *Xanthoria candelaria* and *Siphula ceratites* were not collected in the Shar, our best investigated region.

But during our work in these 3 regions the weather was satisfactory, the investigation lasted for several days or even weeks and the time was chiefly devoted to the lichens.

Matotchkin Shar opens towards the west as well as towards the east, which facilitates the spreading of western as well as eastern plants. On the other side its topography is not equally favourable everywhere. In the central parts of the Shar steep mountains rize almost directly from the beach to considerable elevations. The lowland, which is of interest to the vegetation, is reduced in extension, and the Shar is so narrow that the sides are insufficiently exposed to the sun. The lowlands are exposed to the avalanches of snow and stones, resulting in disturbed habitats, a serious factor in a region, where propagation is so difficult. Nearer to the Barents Sea in the west and the Kara Sea in the east the mountains are lower and the topography softer. The richest vegetation was therefore found about Pomorskaya in the west and in Belushii Bay and east of this Bay in the east.

In Matotchkin Shar the chalk is chiefly found in the greater elevations, where the botanist has nothing to do. It also consists of hard and little friable dolomites, which are not fertile.

The same is the case with the Mashigin Fjord chalk. The surprisingly rich lichen flora of this fjord is evidently not so much due to the differences in the composition of the underground as to its favourable topography, some (small) rookeries, the length of the fjord and especially to the fact that lichens are able to resist the destructive influence of the Arctic climate better than other plants. Our map (*Holtedahl* Brief Account of the Expedition, our Reports No. 1) shows, that the northern side of the fjord has considerable plains and several well exposed small Bays, protected from the rough sea-gales by small promontories.

Mashigin Fjord is so long that its inland end is situated in the glaciated area and there are practically only moraines between the beach and the glaciers, irrigated by cold water. A botanist cannot expect much from these moraines.

The influence of the exposition is immense. One day's work in Fram Bay and west of this bay on the south side of the fjord was sufficient to show us an unpromising vegetation.

Near the sea, by Rækved Bay and north-west of this bay, the vegetation is also poorer, evidently due to the terrible sweeping sea-gales.

Mashigin Fjord is an ideal field for such investigations. But our available time was so scarce that it is impossible for me to give exact detailed data. I can only say that I found the central part of the north side to be the richest part of the fjord.

Farthest north the vegetation profited by a carbonic chalk near the coast, which is softer and more fertile than the dolomites of Matotchkin Shar and Mashigin Fjord.

The result of our botanical work in these 3 regions was:

	Total	Matotchkin Shar	Mashigin Fjord	Farthest north
Vasculares	155	138	105	70
Lichenes	413	308	252	208

The number of lichen species in these Arctic regions is accordingly much greater than the number of the Vasculares. The difference is so great that even a very wide limitation of the lichen species will not be able to bridge over the difference.

We found in all 155 species of Vascular plants and in Matotchkin Shar alone we obtained 138 of them, no less than 89 %. In Mashigin Fjord the percentage sank to a little less than 68 % and "farthest north" to 45 %.

For the lichens the corresponding figures are: Matotchkin Shar 75 %, Mashigin Fjord 61 % and farthest north 51 %.

Supposing an equally continuous distribution for the lichens as for the Vasculares, which we however cannot prove, these figures show that it is more difficult to get an exhaustive collection of the lichens than of the Vasculares. This is easily understood. The large and conspicuous lichens (*Stereocaulon*, *Gyrophora*, *Cetraria* a. o.) are quite as continuously distributed in our collections as the Vasculares. But the many microlichenes that can only be detected by the aid of a good lens are easily overlooked. For these lichens our collections can only suggest the average richness of the different localities, but we cannot always say that species A is southern and species B is northern.

The figures show that the number of Vascular plants is rapidly decreasing northwards. During our field work much attention was given to this interesting question. For every move northwards some species were missing that were found, often plentifully, at our former anchorage. We found hardly any other locality so well stocked with individual plants as the rookery south of Arkhangel Bay. But the number of species was not so great. From Matotchkin Shar the number of species sank from 138 to 108, with 24 %, in Mashigin Fjord, and to 70, with 49.5 % farthest north.

The number of lichen species is more constant. From Matotchkin Shar to Mashigin Fjord it only sank from 308 to 252, with 18.5 %, and to our region VI "farthest north" to 208, with 32 %.

We can perhaps conclude from this that on an average the lichens are better adapted to the Arctic climate than the Vasculares. If we would look after special causes I might suggest one factor. A minimum factor for the spreading of the Phanerogamous plants is the difficult production of the seeds. Some plants are entirely sterile under these conditions and their presence is dependant on the supply of seeds, bulbillae and the like (SERNANDER's diaspores) from more favoured southern localities. But apart from a few species it is a rare thing to cut a lichen apothecium without finding spores, no matter the season and the quality of the summer. And the evacuation of the spores in each apothecium is extended over a long period. There are always spores at disposal, when circumstances are favourable for a new start.

In the Arctic soredia are of no importance for the propagation of the lichens. Sterile lichens must be propagated by thallus fragments, which are always at disposal.

The importance of this factor the Arctic is evident.

The rich lichen flora so far north and also the considerable flora of Vascular plants in these glaciated regions is in my opinion the most important general botanical result of our expedition. Farthest north we found in all 278 different species of these two plant groups. In the rookery the moss flora was very luxuriant, much more conspicuous than the lichens. Competent bryologists have told me that the number of mosses in the Arctic is not so high as the number of lichens. But yet it is quite considerable. S. BERGGREN enumerates no less than about 230 species of mosses in his work Musci et Hepaticae Spetsbergenses and the number is certainly larger in Novaya Zemlya. We must also suppose a considerable number of fungi, even if the fungi are poorer represented in the Arctic than the other groups.

It is difficult to estimate the number of vascular plants and lichens that escaped my attention during our short visit (8 days of work).

Considering all these things I estimate the total number of land plants in the region about Arkhangel Bay and the adjacent islands at about 500.

In order to appreciate this figure it is necessary to consider the conditions for plant life there, especially the glaciation.

So far north Novaya Zemlya is covered with a continuous ice-cap, leaving only a narrow zone along the coast, or at times only the islands. The breadth of the ice-free zone varies: Over large distances there is no ice-free zone, the glacier front is in the sea. In other places the ice-free zone is broader, especially if there is a peninsula or a promontory in front of the ice. Pankratyeff Peninsula is practically an island.

Apart from the islands and peninsulas the ice-free zone here rarely surpasses 5 km. It is generally narrower.

As an illustration of this I can refer to plate XVII, fig. 3, in *Grønlie* Contrib. to the Quatern. Geology, No. 21 of our Reports, and to plate XXXI, fig. 1, in my Vascular plants from Novaya Zemlya, No. 13 of our Reports. The former picture represents a scenery north of Arkhangel Bay, the latter a part of the large rookery south of Arkhangel Bay, where the ice-cap is more retired.

The great number of plants in this glaciated region confirms the well-known observation, made by all Arctic travellers, that the Arctic vegetation is more dependant on local factors, exposition, supply of Nitrogen from the birds, substratum &c. than on the distance from the ice-cap or from the glaciers. I have described this in a popular paper in the Norwegian periodical "Naturen" vol. XLVIII, pag. 70—97, Bergen 1924.

In this particular place the most important local factor is certainly the innumerable birds that breed in the large rookery south of Arkhangel Bay and on the adjacent islands. Next comes the soft and friable carbonic chalk.

The flora in the rookeries is much richer than it is in places where the birds are scarce, e. g. in Pankratyeff Peninsula. I hunted over this Peninsula for one whole day and the result was only about 15 vascular plants. The number of lichens was of course considerably higher.

The birds are again dependant on the food in the sea. The fundamental problem for the rich vegetation in the rookeries is accordingly the supply of anorganic food substances and the plankton in the sea.

We must suppose that the conditions for plant life on our own coast have once been analogous to the present conditions in the glaciated Arctic regions. A study of the Arctic flora is therefore a valuable clue to the understanding of the vegetation on our coast during these past epochs. This applies most directly to the postglacial epoch. But the comparison gains in importance if we suppose that the last glaciation did not entirely cover our country, but that it left an ice-free zone of different breadth here and there along our coast.

Our geologists find it probable that there has been a zone of that kind during the last glaciation. Interglacial plants would in that case have had a chance of surviving the glaciation.

We do not know much of the conditions for plant life along our coast during the last glaciation(s). Most probably the climate has been comparable to that of the Arctic regions that are glaciated at the present day. We do not know anything of the breadth of the ice-free zone, except it has been oscillating.

There is every reason to suppose that the coast was stocked with lots of breeding birds, as are the Arctic coasts now, and this is very important.

Another important factor suggests a richer flora on our coast during the last glaciation than at the present day in Novaya Zemlya: the age of the flora.

It is probable, but not quite certain, that Novaya Zemlya has been entirely covered with ice at a relatively late period. In that case the whole present flora consists of new-comers, geologically spoken.

Novaya Zemlya has been profoundly immersed into the sea during a postglacial period. The highest beach line is now so high, that practically its whole vegetation is now found below it. The vegetation must have descended from the old levels to the lower levels that have emerged from the sea. But though the propagation is difficult and slow in the Arctic, this migration downwards must have been able to follow the raising of the land, for there is no zone near the sea where the vegetation is poorer than it is higher up.

On the whole it is impossible to avoid the impression of a young flora in Novaya Zemlya. It is very probable that the flora would have been richer if it had been older.

In Scandinavia the advancing ice met an interglacial flora, perhaps quite as rich as our present flora, when the last glaciation began.

The greater part of this flora must have been destroyed. But some plants were perhaps able to meet the new conditions and others might have been able to adapt themselves to them. Anyhow the selection would have acted on a greater material and ceteris paribus there is a strong probability that the flora of an ice-free coast in Scandinavia during the last glaciation must have been richer than the present flora in our region VI in Novaya Zemlya is at the present day.

It is no unreasonable conclusion that it could have yielded a considerable part of our present "Arctic" alpine flora, e. g. on the Dovre mountains.

Considering the present distribution of the plants in the Arctic this is especially probable for our alpine lichen vegetation.

In the first place we must think of those lichens, which at present have a wide distribution in the Arctic. Our knowledge of the western Arctic lichens is unfortunately still very insufficient. It is to be hoped that further lichenological investigation will increase our knowledge on that point. But we know so much that there is a great number of circumpolar lichens. A Scandinavian botanist cannot open a book on Arctic lichens from any region without finding a lot of those species, which are the commonest on our own mountains.

It is also natural to think of those lichens, which on our mountains prefer localities, that have been nunataks during a glaciation. Every naturalist, who has travelled in the Arctic, will rapidly become aware of these localities. Such species are in the first place the alpine *Gyrophorae: Gyrophora rugifera*, *decussata*, *proboscidea* and perhaps *vellea* and *rigida (leiocarpa)*. A number of crustaceous lichens could also be added, e. g. *Biatorella coracina*, found on all the Novaya Zemlya nunataks, which we examined.

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Special references in the text have therefore been limited to works later than ZAHLBRUCKNER's *Catalogus* or to such species where fuller references were desirable, either for the sake of priority or on the reason that the species in question is critical.

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PLATES

On the plates VI—XIII the size of the plants is shown by a measuring scale under each figure. On this scale the interval between the vertical lines is equal to 1 mm. in all cases.

Plate I.

Fig. 10—12: × 400, all other figures: × 800 (1 μ = 0,8 mm).

Fig. 1— 2. *Thelidium papulare* (E. FR.) ARN. Mashigin Fjord: south side of Blaafjell Basin.

» 3— 4. *Thelidium pyrenophorum* (ACH.) MUDD. Mashigin Fjord: Rækved Bay.

» 5— 6. *Thelidium pyrenophorum* (ACH.) MUDD. Matotchkin Shar: Chalhonik Valley.

» 7— 9. *Thelidium microsporum* LYNGE. Mashigin Fjord: south side of Blaafjell Basin.

» 10—12. *Belonia arctica* LYNGE. Mashigin Fjord: Chalhonik Valley.

» 13 *Polyblastia quartzina* LYNGE. Matotchkin Shar: Chalhonik Valley.

» 14 *Polyblastia theleodes* (SOMRFT.) TH. FR. Matotchkin Shar: Chalhonik Valley.

» 15—16. *Polyblastia Friesii* LYNGE. Matotchkin Shar: Chalhonik Valley.

» 17 *Polyblastia theleodes* (SOMRFT.) TH. FR. Matotchkin Shar: Chalhonik Valley.

» 18—20. *Polyblastia quartzina* LYNGE. Matotchkin Shar: Chalhonik Valley.

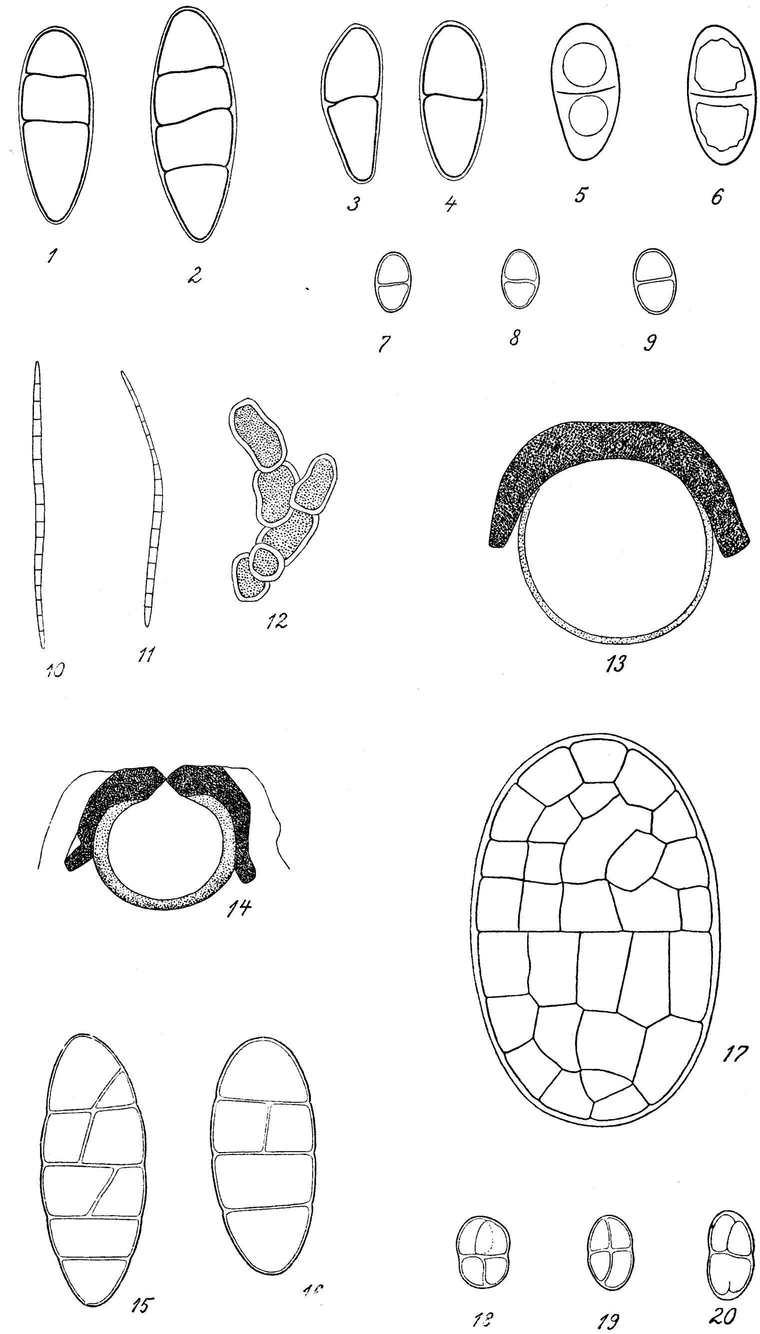
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Plate II.

Fig. 19: × 4, fig. 22 × 2, all other figures × 800 (1 μ = 0,8 mm.).

Fig.	1— 3.	*Catinaria atomaria* LYNGE. Northern Kristovii Island.
„	4— 6.	*Bacidia microcarpa* (ACH.) LETTAU. Berkh Island.
„	7— 9.	*Toninia lobulata* (SOMRFT.) LYNGE. Berkh Island.
„	10—11.	*Bacidia Anziana* LYNGE. Goose Bay.
„	12	*Bacidia muscorum* (SW.) MUDD. Berkh Island.
„	13—14.	*Toninia squalida* (ACH.) MASS. Mashigin Fjord: Dal Bay.
„	15—16.	*Lecidea migratoria* LYNGE. Matotchkin Shar: Chalhonik Valley.
„	17—18.	*Lecidea sorediata* LYNGE. Pycnoconidia. Matotchkin Shar: East of Cape Jouravlev.
„	19	*Parmelia striata* LYNGE. Matotchkin Shar: Belushii Bay.
„	20—21.	*Lecania flavescens* LYNGE. Mainland east of Lichutin Island.
„	22	*Cetraria capitata* LYNGE. Goose Bay.
„	23	*Parmelia Almquistii* VAIN. Matotchkin Shar: Belushii Bay. Section of areole, showing conglutinated laciniae.

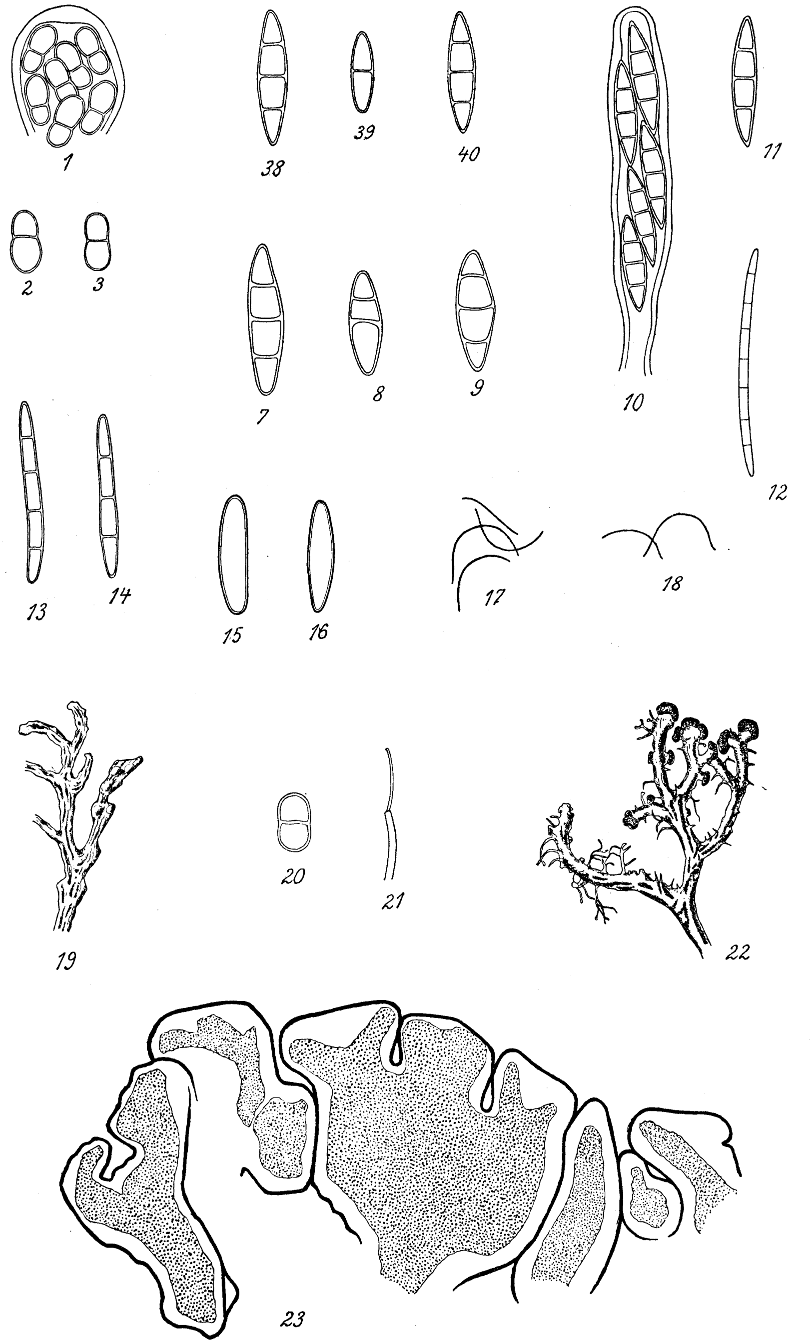
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Plate III.

All figures × 800 (1 μ = 0,8 mm).

Fig. 1— 2. *Rhizocarpon chioneum* (NORM.) TH. FR. Matotchkin Shar: Mt. Wilczek.
„ 3— 4. *Rhizocarpon albidum* LYNGE. Lichutin Island.
„ 5— 8. *Rhizocarpon badioatrum* (FLK.) TH. FR. Mashigin Fjord: Strømsnes Bay.
„ 9—10. *Rhizocarpon pseudospeireum* (TH. FR.) LYNGE. Mashigin Fjord: Sol Bay.
„ 11—12. *Rhizocarpon geographicum* (L.) DC. Mashigin Fjord: Blomster Bay.
„ 13—14. *Rhizocarpon Anseris* LYNGE. Goose Bay.
„ 15—16. *Rhizocarpon polycarpum* (HEPP) TH. FR. Matotchkin Shar: south side of the Shar at the Kara Sea entrance.
„ 17—18. *Rhizocarpon atroflavescens* LYNGE. North of the Mashigin Fjord entrance.
„ 19—20. *Collema arcticum* LYNGE. Matotchkin Shar: Chalhonik Valley.
„ 21—22. *Rhizocarpon chionophilum* TH. FR. Goose Bay.
„ 23. *Leciophysma Finmarkicum* TH. FR. Matotchkin Shar: Chalhonik Valley.
„ 24—26. *Arctomia delicatula* TH. FR. Matotchkin Shar: South side of the Shar at the Kara Sea entrance.
„ 27—29. *Rhizocarpon Copelandii* (KBR.) TH. FR. Mt. Matotchka.
„ 30—31. *Rhizocarpon expallescens* TH. FR. Matotchkin Shar: Mt. Wilczek.

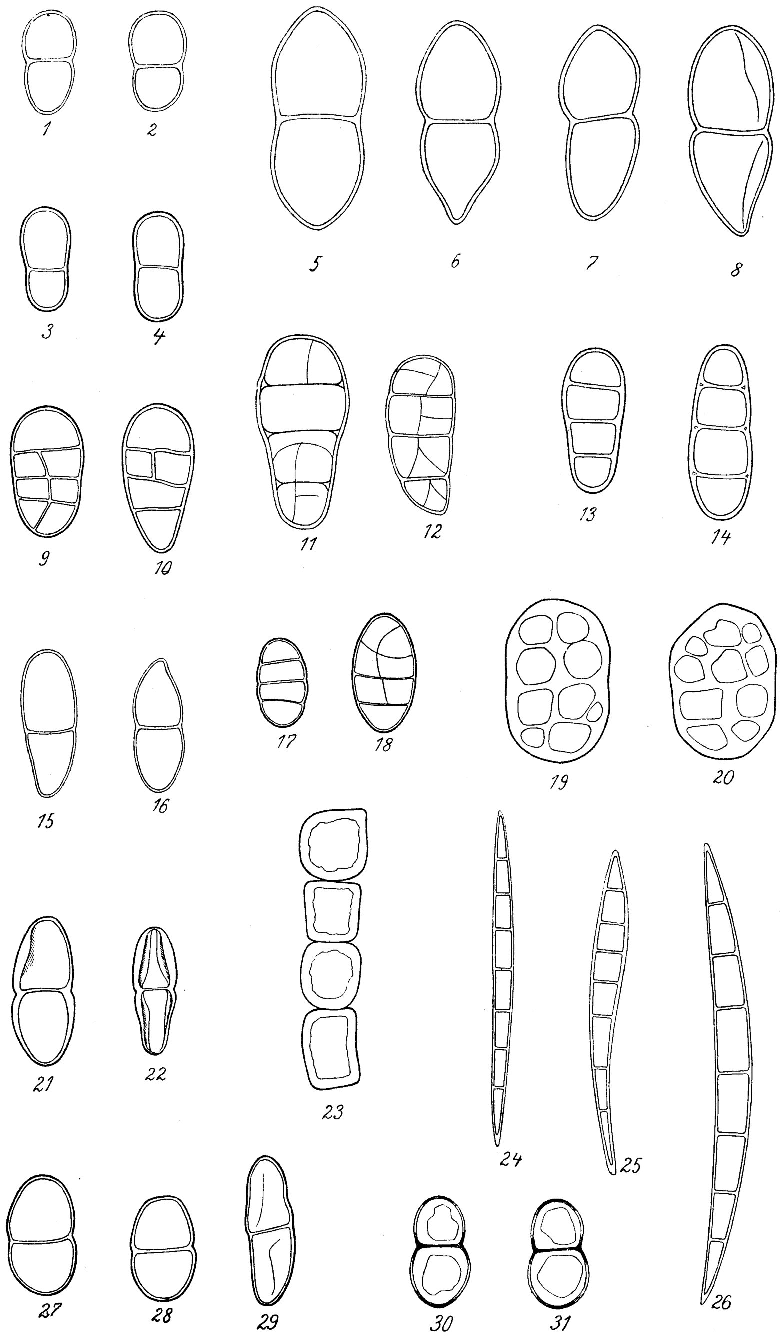
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Plate IV.

All figures × 800 (1 μ = 0,8 mm).

Fig. 1— 2. *Buellia aethalea* (ACH.) TH. FR. Matotchkin Shar: Belushii Bay.
„ 3— 6. *Buellia atrata* (SM.) MUDD. Mashigin Fjord: Mt. Dietrichson.
„ 7— 9. *Buellia avium* LYNGE. Matotchkin Shar: Chalhonik Valley.
„ 10—13. *Buellia coniops* (WBG.) TH. FR. Mashigin Fjord: Sol Bay.
„ 14. *Buellia disciformis* f. *triphragmia* NYL. Mashigin Fjord: Sol Bay.
„ 15—17. *Buellia disciformis* f. *muscorum* (SCHAER.) VAIN. Matotchkin Shar: Mt. Wilczek.
„ 18—19. *Buellia immersa* LYNGE. Mashigin Fjord: Sol Bay.
„ 20—22. *Buellia punctiformis* f. *myriocarpa* (HOFFM.) VAIN. Mashigin Fjord: Sol Bay.
„ 23—24. *Buellia Malmei* LYNGE. Mashigin Fjord: Sol Bay.
„ 25—27. *Buellia vilis* TH. FR. Mashigin Fjord: Mt. Dietrichson.
„ 28—29. *Buellia margacea* var. *coprophila* LYNGE. Northern Kristovii Island.
„ 30—31. *Ionaspis arctica* LYNGE. Mashigin Fjord: Strømsnes Bay.
„ 32—35. *Ionaspis arctica* LYNGE. Matotchkin Shar: Chalhonik Valley.

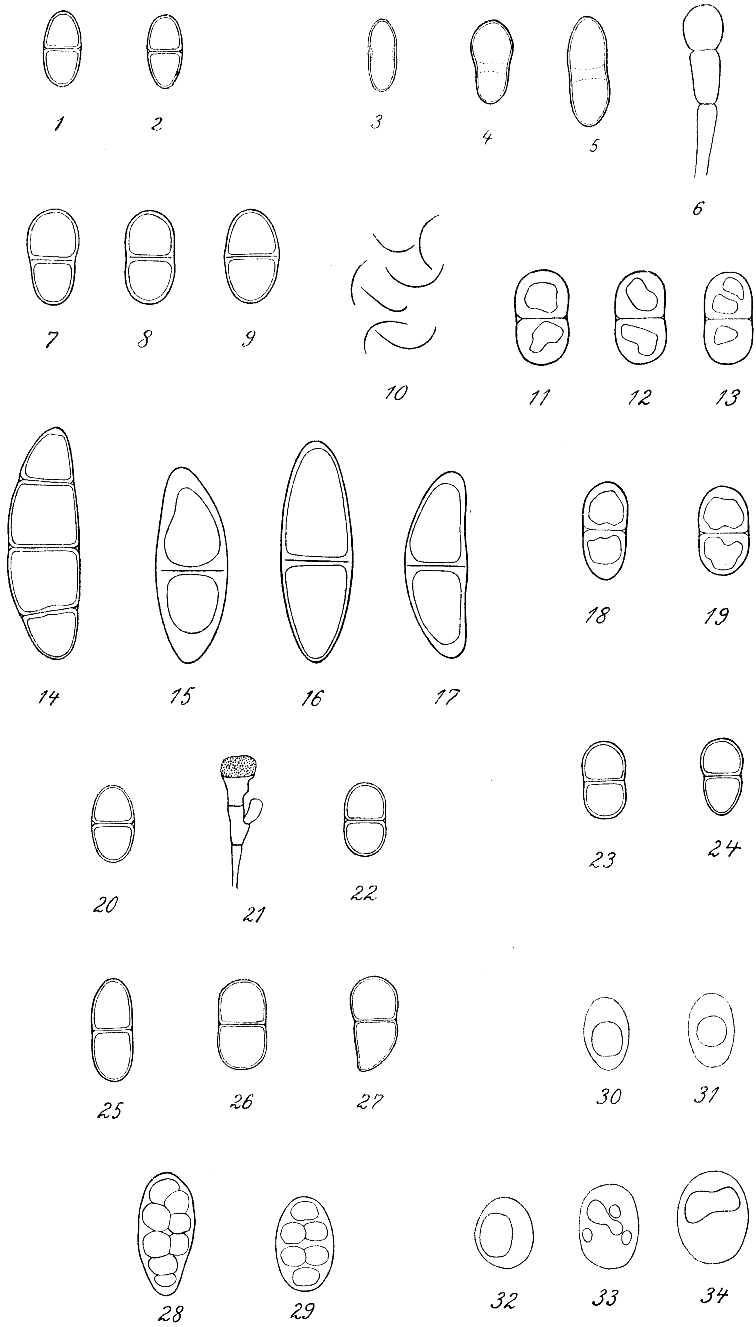
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Plate V.

All figures × 800 (1 μ = 0,8 mm).

Fig. 1— 3. *Rinodina roscida* (SOMRFT.) LYNGE. Matotchkin Shar: Mt. Syernaia.

„ 4— 6. *Rinodina turfacea* (WBG.) TH. FR. Mashigin Fjord: Sol Bay.

„ 7— 8. *Rinodina laevigata* (ACH.) MALME. Arkhangel Bay.

„ 9—11. *Rinodina nimbosa* (FR.) TH. FR. Mashigin Fjord: Mt. Tveten.

„ 12—14. *Rinodina milvina* (WBG.) TH. FR. Northern Kristovii Island.

„ 15—16. *Caloplaca vitellinula* f. *approximata* LYNGE. Mashigin Fjord: north side of Blaafjell Basin.

„ 17—18. *Caloplaca stillicidiorum* (VAHL) LYNGE. Arkhangel Bay.

„ 19—21. *Caloplaca gilva* (HOFFM.) A. ZAHLBR. Goose Bay.

„ 22—23. *Caloplaca gilva* (HOFFM.) A. ZAHLBR. Matotchkin Shar: Mt. Wilczek.

„ 24—25. *Caloplaca aurantiaca* (LIGHTF.) TH. FR. Berkh Island.

„ 26—27. *Caloplaca subolivacea* (TH. FR.) LYNGE. Goose Bay.

„ 28—29. *Blastenia tetraspora* (NYL.) TH. FR. Matotchkin Shar: Mt. Lasareff.

„ 30—31. *Caloplaca Jungermanniae* (VAHL) TH. FR. Gribovii Fjord: north side.

„ 32—34. *Caloplaca murorum* f. *obliterata* (PERS.) VAIN. Mashigin Fjord: Rækved Bay.

„ 35—37. *Caloplaca ursina* LYNGE. Matotchkin Shar: east of Cape Jouravlev.

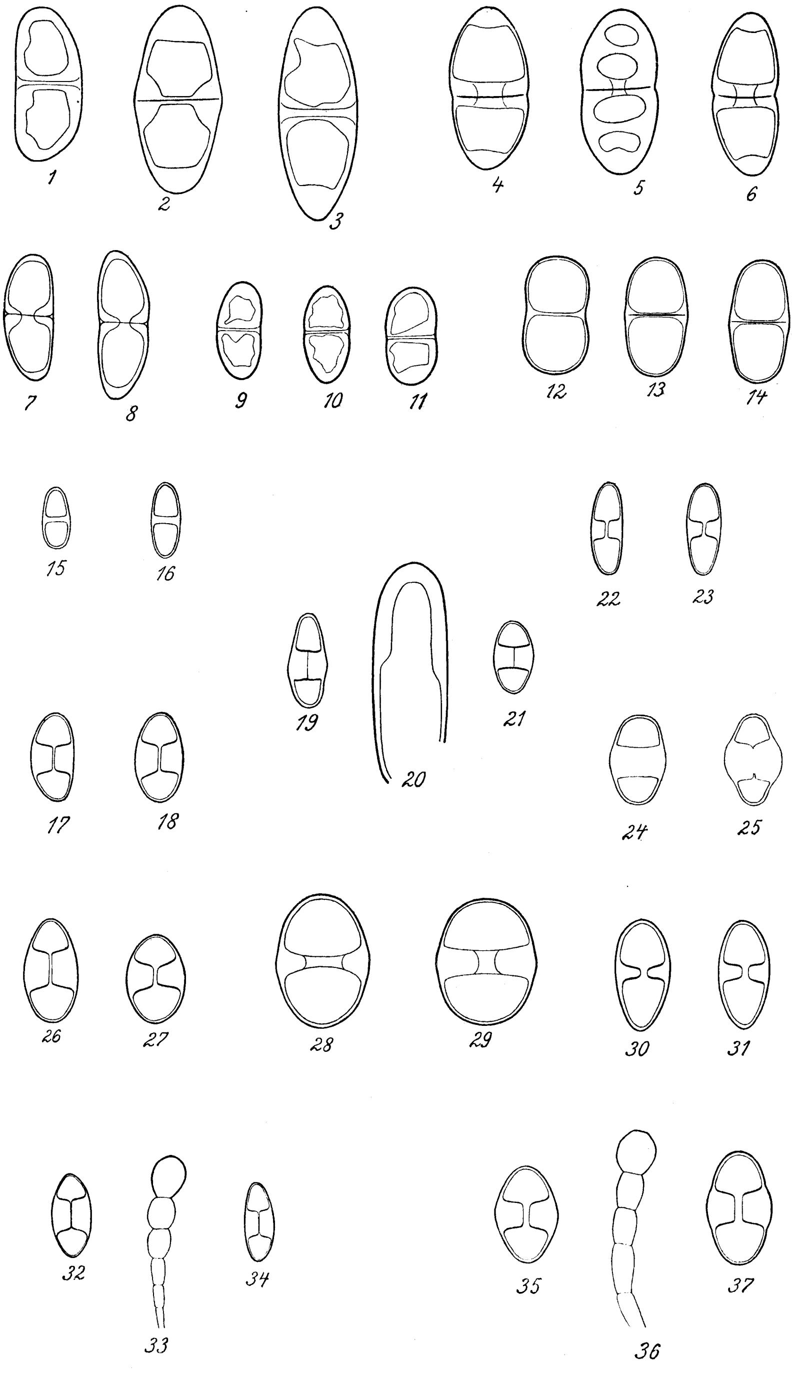
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Plate VI.

Interval between the vertical lines = 1 mm.

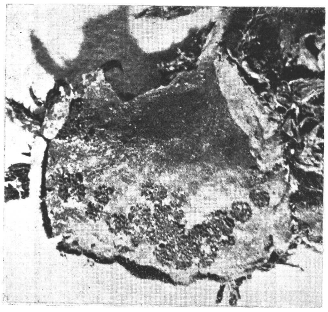
Fig. 1. *Peltigera erumpens* (TAYL.) VAIN. North of the Mashigin Fjord entrance.

„ 2. *Peltigera lepidophora* (NYL.) BITTER. South of Arkhangel Bay.

„ 3. *Stereocaulon fastigiatum* ANZI. Admiralty Peninsula.

„ 4. *Stereocaulon fastigiatum. Anzi* Mashigin Fjord: Mt. Tveten.

„ 5—6. *Stereocaulon rivulorum* H. MAGN. Matotchkin Shar: South side of the Shar at the Kara Sea entrance.



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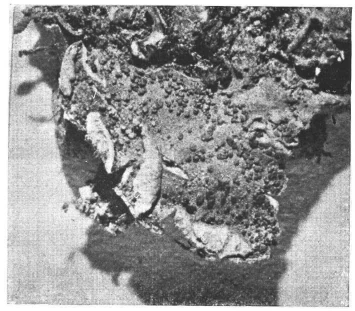

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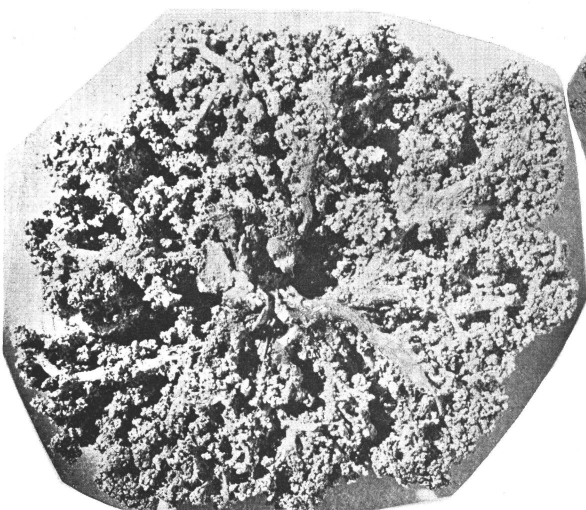

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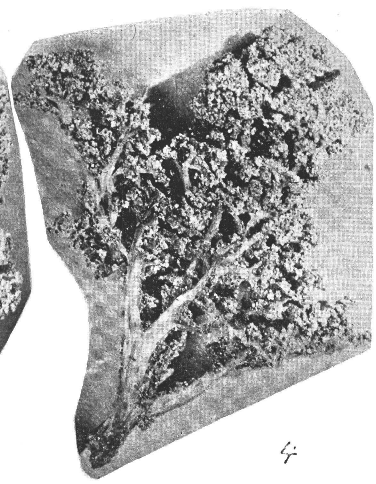

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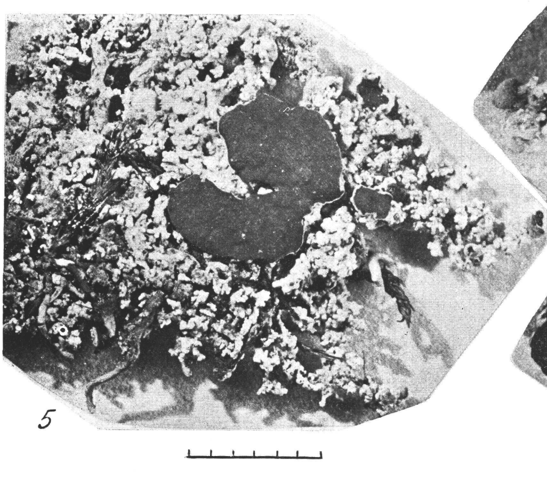

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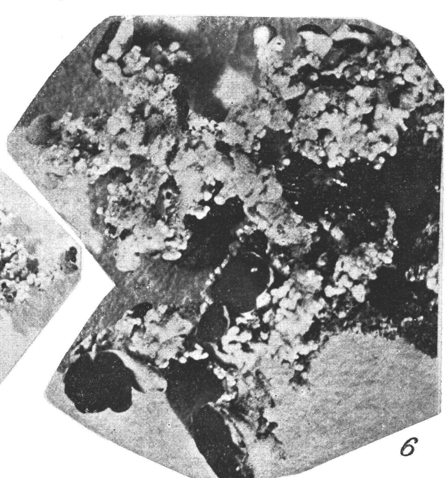

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Plate VII.

Interval between the vertical lines = 1 mm.

Fig. 1. *Rhizocarpon chioneum* (NORM.) TH. FR. Matotchkin Shar: Mt. Wilczek.
„ 2. *Pannaria Hookeri* (BORR.) NYL. Mashigin Fjord: Blomster Bay.
„ 3. *Rhizocarpon pseudospeireum* (TH. FR.) LYNGE. Mashigin Fjord: Sol Bay.
„ 4. *Rhizocarpon expallescens* TH. FR. North side of Gribovii Fjord.


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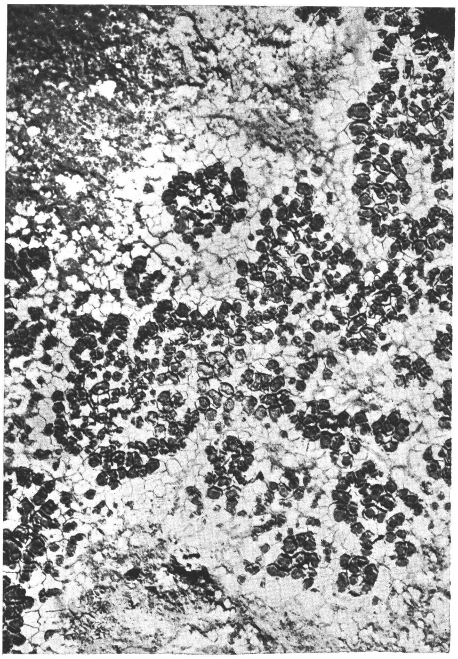
Plate VIII.

Interval between the vertical lines = 1 mm.

Fig. 1. *Rhizocarpon albidum* LYNGE. Lichutin Island.
„ 2. *Rhizocarpon Copelandii* (KBR.) TH. FR. Matotchkin Shar: Belushii Bay.
„ 3. *Rhizocarpon atroflavescens* LYNGE. North of the Mashigin Fjord entrance.
„ 4. *Rhizocarpon chionophilum* TH. FR. Matotchkin Shar: Belushii Bay.



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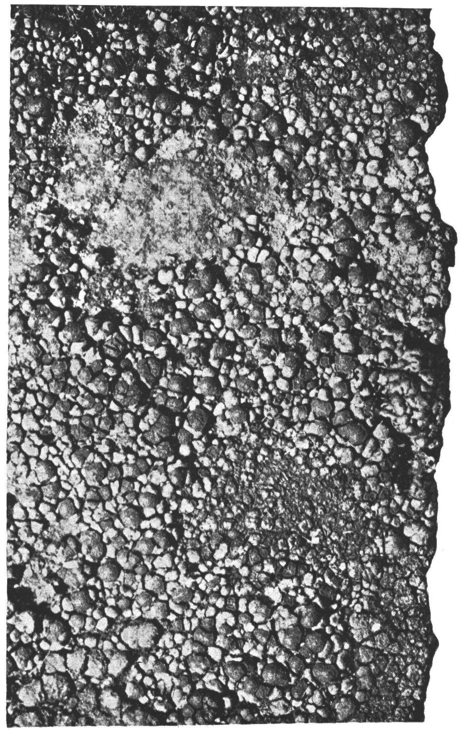

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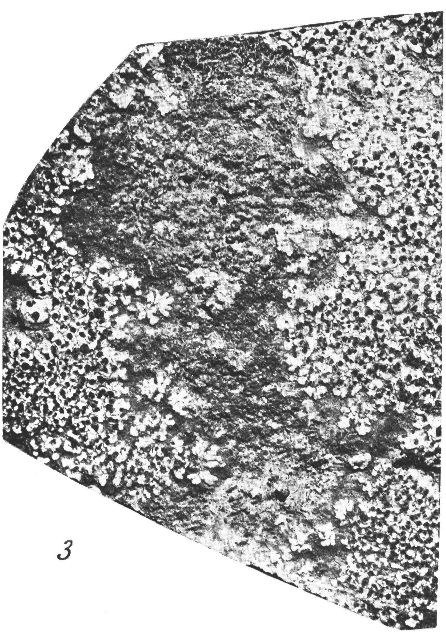

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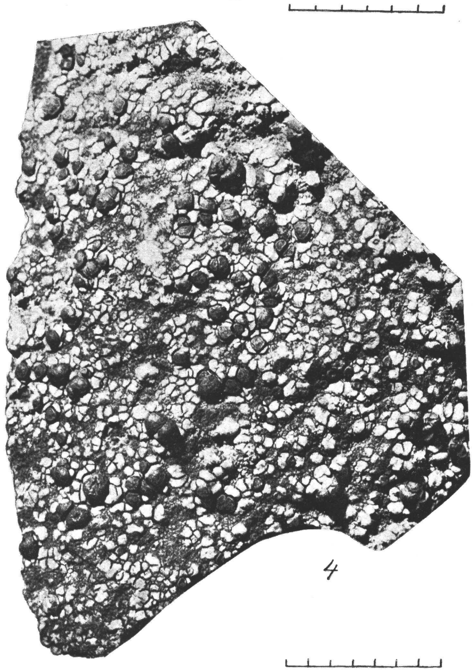

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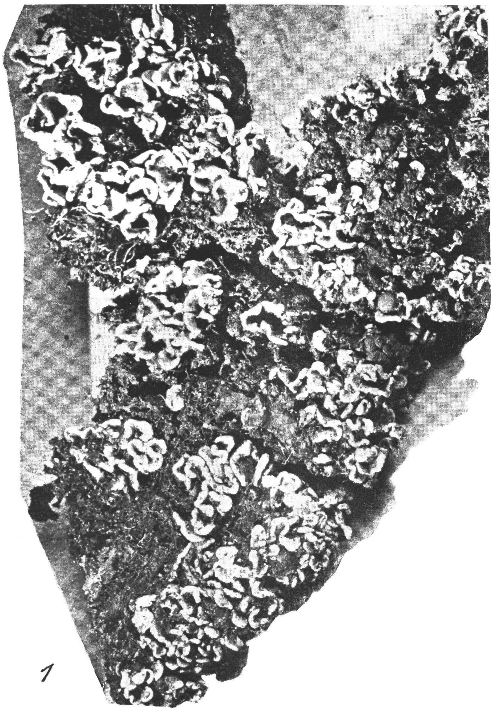
Plate IX.

Interval between the vertical lines = 1 mm.

Fig. 1. *Lecidea rubiformis* WBG. Mashigin Fjord: Dal Bay.
„ 2. *Lecidea sorediata* LYNGE. Northern Kristovii Island.
„ 3. *Lecidea atrobrunnea* (RAM.) SCHAER. South of Arkhangel Bay.
„ 4. *Lecidea picea* LYNGE. Matotchkin Shar: Mt. Syedlho.



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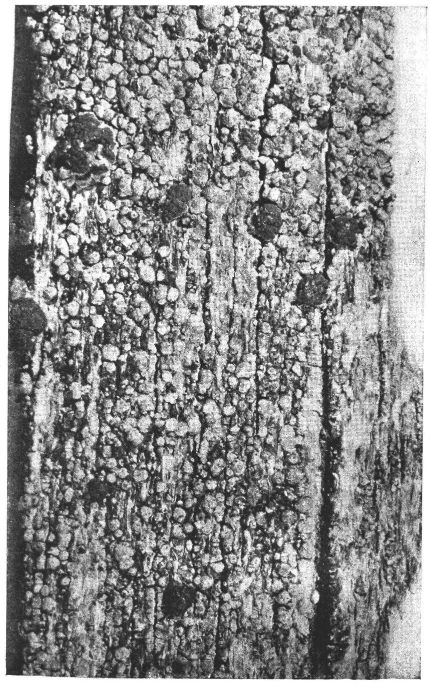

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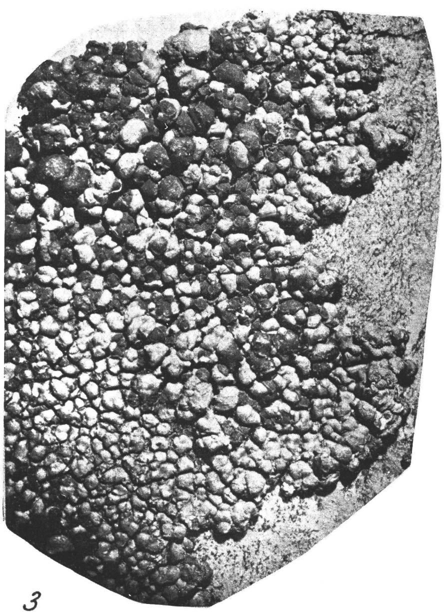

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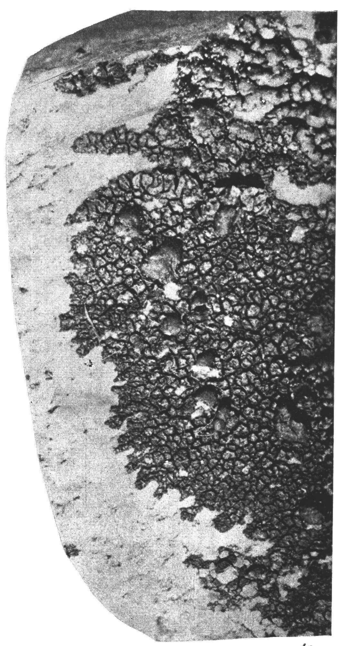

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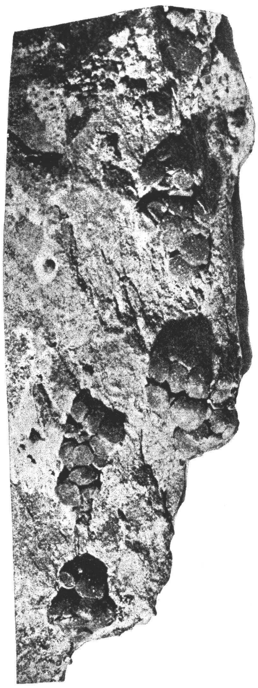
Plate X.

Interval between the vertical lines = 1 mm.

Fig. 1. *Caloplaca murorum* var. *obliterata* (PERS.). Mashigin Fjord: Rækved Bay.
„ 2. *Lecidea Arnoldii* LYNGE. Matotchkin Shar: Belushii Bay.
„ 3. *Lecidea ramulosa* TH. FR. Matotchkin Shar: Mt. Wilczek.
„ 4. *Caloplaca murorum* var. *steropea* (ACH.) TH. FR. Goose Bay.



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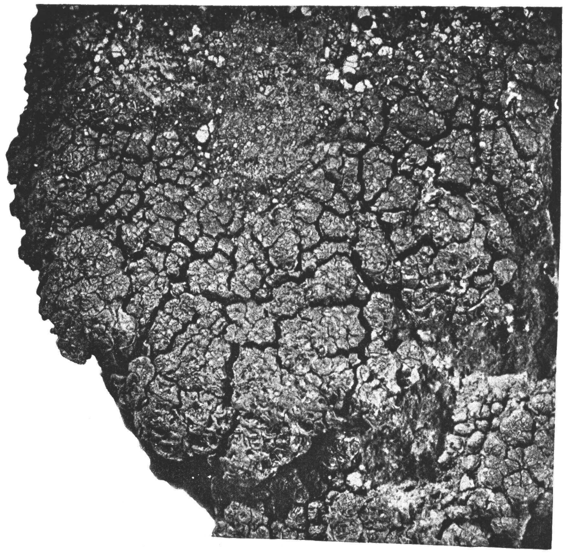

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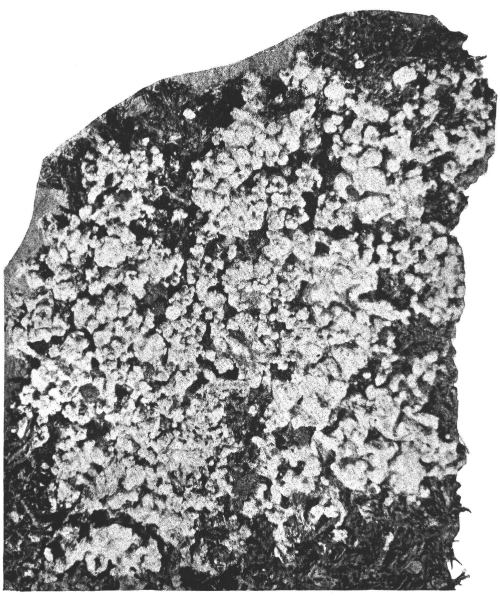

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Plate XI.

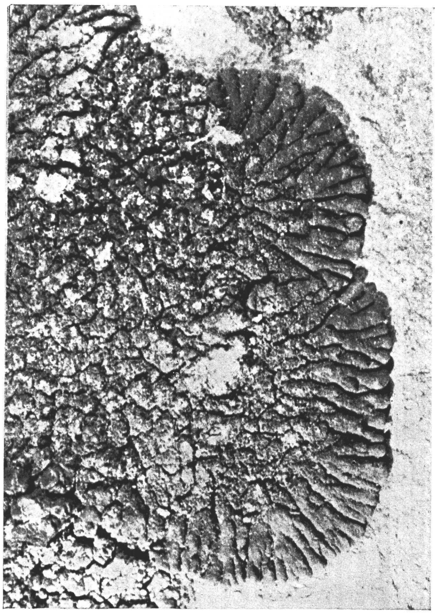
Interval between the vertical lines = 1 mm.

Fig. 1. *Caloplaca granulosa* (MÜLL. ARG.) STEINER. Gribovii Fjord: Veselago Island.

„ 2. *Collema arcticum* LYNGE. Mashigin Fjord: Sol Bay.

„ 3. *Lecidea Syernaiae* LYNGE. Matotchkin Shar: Syernaia Bay.

„ 4. *Ochrolechia Grimmiae* LYNGE. Mashigin Fjord: Fram Bay.



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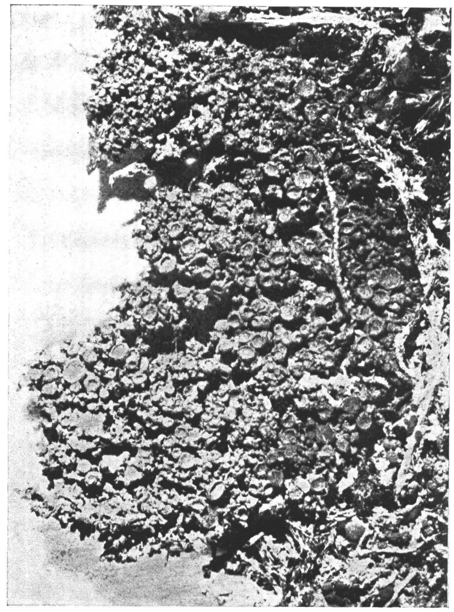

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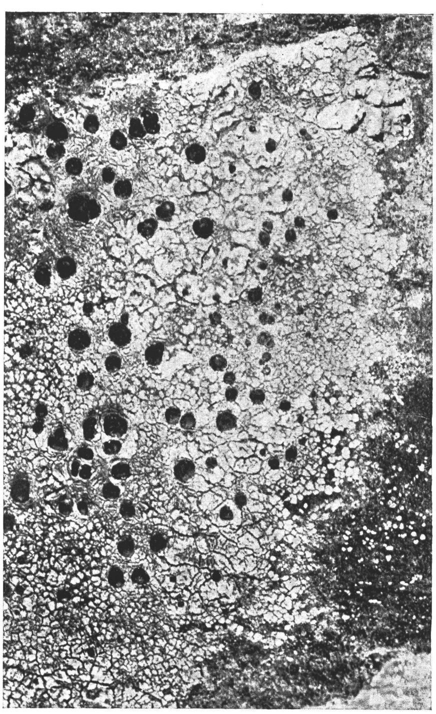

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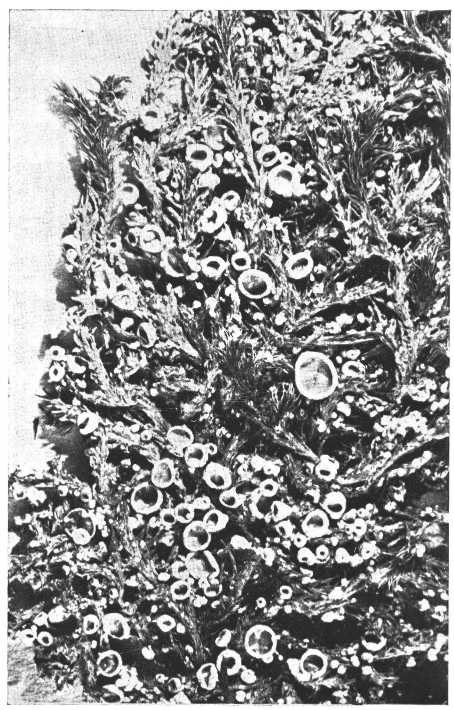

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Plate XII.

Interval between the vertical lines = 1 mm.

Fig. 1. *Buellia avium* LYNGE. South of Arkhangel Bay.
„ 2. *Buellia coniops* (WBG.) TH. FR. Gribovii Fjord: Veselago Island.
„ 3. *Lecidea Arnoldii* LYNGE. Matotchkin Shar: Belushii Bay.
„ 4. *Lecidea symphycarpea* LYNGE. Eastern Kristovii Island.

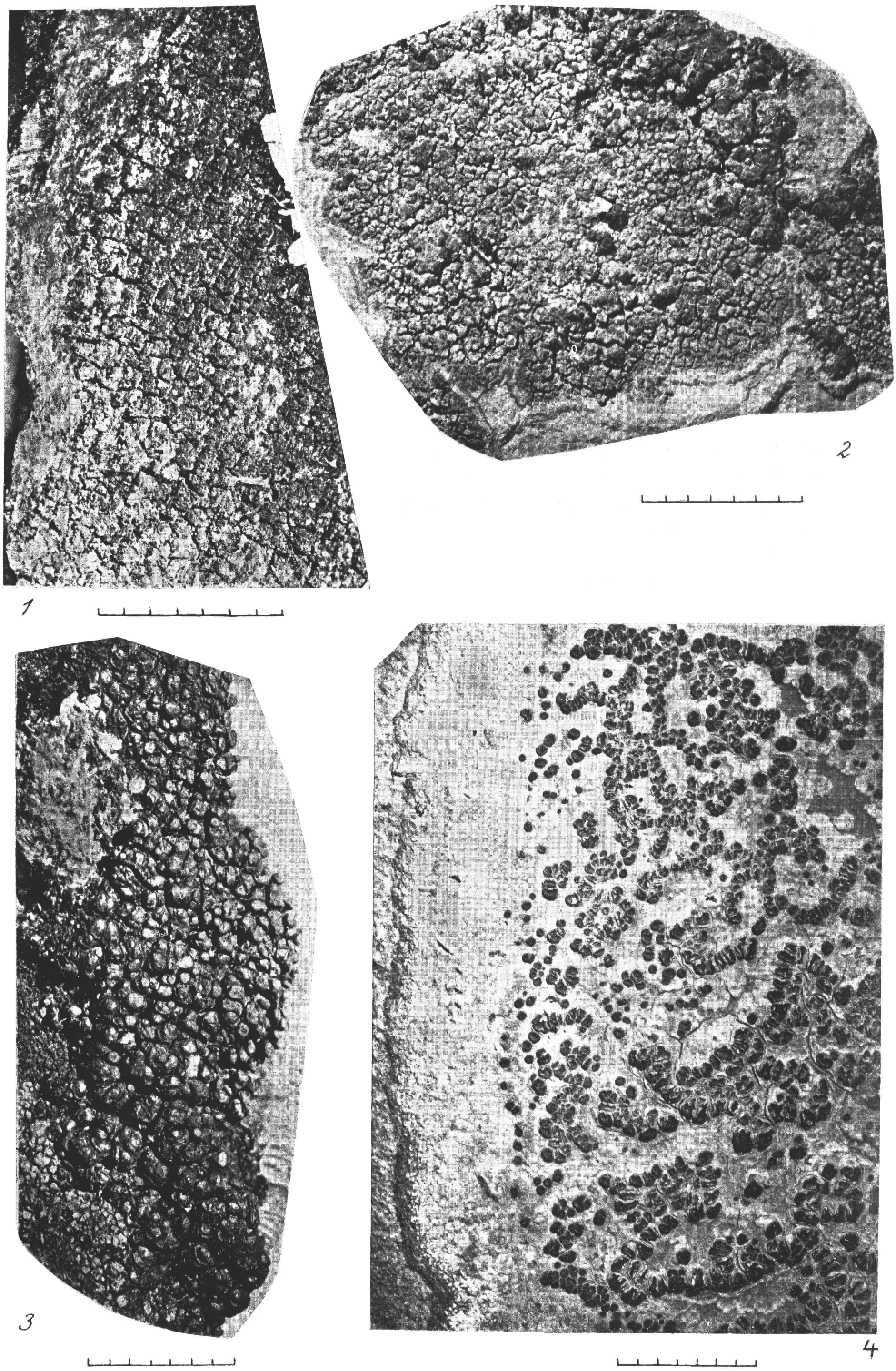

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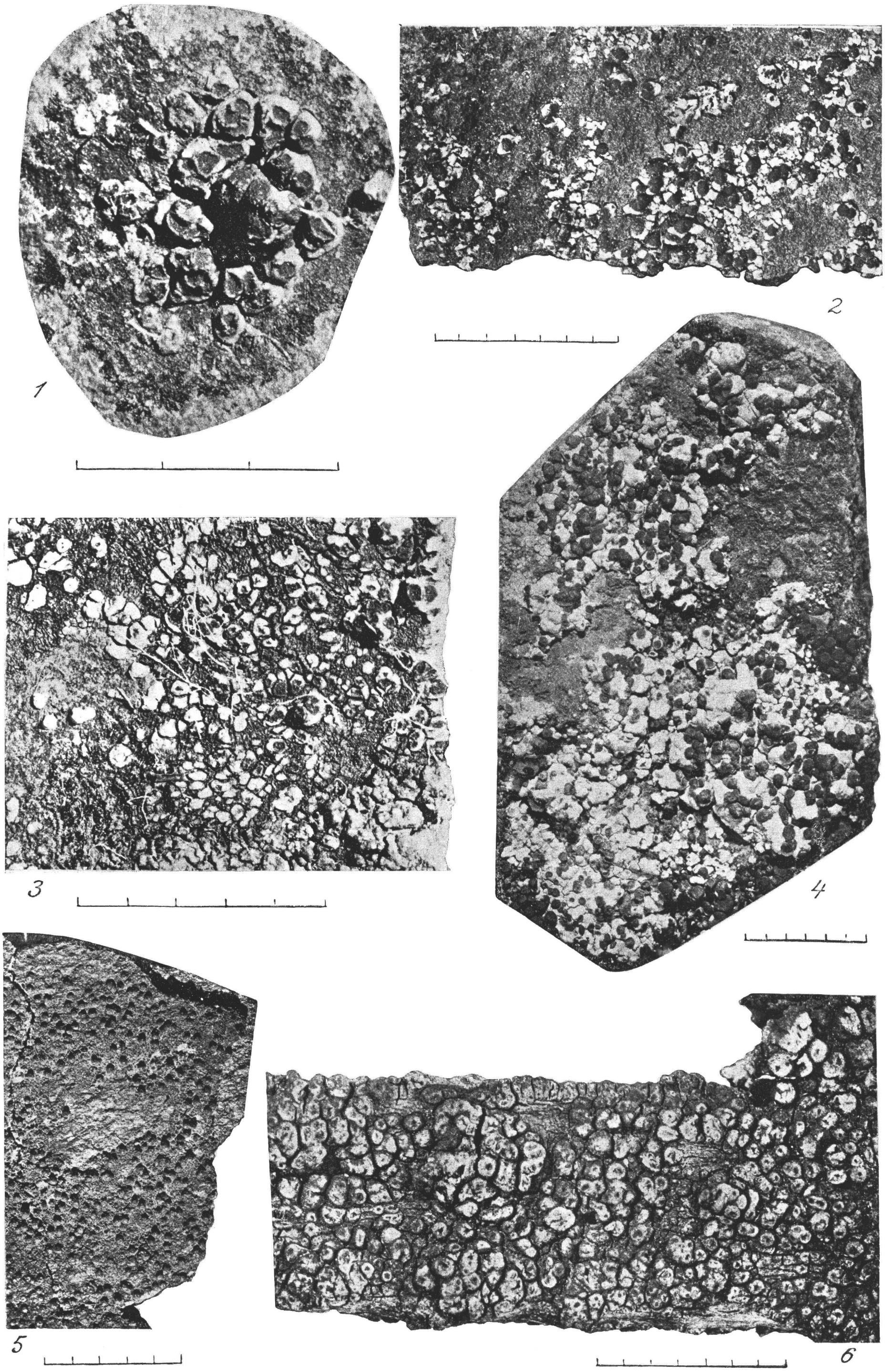
Plate XIII.

Interval between the vertical lines = 1 mm.

Fig. 1. *Buellia Malmei* LYNGE. North of the Mashigin Fjord entrance.
„ 2. *Buellia concinna* TH. FR. Admiralty Peninsula.
„ 3. *Buellia immersa* LYNGE. North of the Mashigin Fjord entrance.
„ 4. *Buellia margaritacea* var. *coprophila* LYNGE. Northern Kristovii Island.
„ 5. *Staurothele septentrionalis* LYNGE. Matotchkin Shar: Belushii Bay.
„ 6. *Belonia arctia* LYNGE. Matotchkin Shar: Chalhonik Valley.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