REVISION OF THE LICHENS OF THE NETHERLANDS

II. PHYSCIACEAE

by

R. A. MAAS GEESTERANUS

(Rijksherbarium, Leiden)

(Issued 1. IX. 1952)

Published with the support of the "Korthals-fonds"
of the „Koninklijke Nederlandse Akademie van Wetenschappen"

CONTENTS.

ACKNOWLEDGMENTS.

When preparing this paper I have had the privilege of the extensive help from both institutes and private persons. I have borrowed valuable material from the following institutes: "Laboratoire de Botanique de l'Université Catholique de l'Ouest" (Angers), "Conservatoire botanique de la Ville" (Genève), "Staatsinstitut für allgemeine Botanik" (Hamburg), the Botanical Museum (Helsinki), "Botanische Staatssammlung" (München), the Botanical Museum (Oslo), the National Museum (Praha), "Museum der Finnischen Universität" (Turku). Photographs of type material were sent to me from the Botanical Museum (Helsinki), the British Museum, Natural History (London), "Muséum National d'Histoire Naturelle, Laboratoire de Cryptogamie" (Paris). Type-written copies of quotations or descriptions not available in this country have on my request been sent by the "Westdeutsche Bibliothek" (Marburg/L.) and the "Botanische Staatssammlung" (München). To the directors and curators of these institutes I express my sincerest thanks for their generous help.

I am also very much indebted to Mr. V. Räsänen (Kuopio) for the loan of some of his specimens, to Dr C. N. Tavares (Lisboa) for sending

me the copy of the original description of *Parmelia astroidea,* to Mr R. Santesson (Uppsala) for the occasions of argument on the desirability of distinguishing so many varieties or forms in lichenology, and to Mr J. J. Barkman (Leiden) for valuable criticism concerning the ecology.

INTRODUCTION.

1. Again the taxa below the rank of species.

In my paper on *Parmeliaceae* (in Blumea, vol. 6, 1947) some remarks have been made concerning the taxa below the rank of species (p. 3—4), one of them being the statement that I was to try to hold an intermediate course between those authors accepting multitudes of varieties and forms, and others abandoning them all. In the eyes of both I may have failed.

In the present paper I am going to alienate myself still farther from the former group of authors in reducing varieties to forms and doing away with many other forms. Although in a way this contradicts my inclination towards a meticulous classification in my former paper, it should be borne in mind that not all genera in lichenology can be treated alike. I still believe in varieties and forms — considering e. g. *Parmelia physodes* a very good illustration — but on the other hand I am well aware now that in following Hillmann, whom I shall always gratefully remember for his kind help during the early days of my lichenological training, I have been decidedly all too punctilious.

Some lichenological authors have been or still are too quick in describing forms which properly speaking fall within the limits of variability of the type form. Furthermore, too many forms have been described as varieties or raised to varietal rank. To my mind, a variety should be the taxon in which genetic factors cause it to be different from the type variety, whereas in the case of a form it is the environmental factors which determine the difference from the type form. As far as I am aware little or no proof has ever been given of the genetic relationship (or, better, genetic difference) in any set of variety and type variety, but, considering the complex nature of the lichens, it remains to be seen whether one may expect a definite proof anyway. For the time being, therefore, it is subject to personal views whether any taxon differing from the type specimen is considered a variety or a form. Some authors content themselves with calling a taxon a variety, if the differences are deemed great (important) enough; others, working with extremely polymorphous species, unite such "Formenkreise" in varieties as to obtain a more convenient or practicable survey. Inherent with this method, however, is the danger of exaggeration, of overemphasising the importance of certain characters. Now, I think that especially in *Physciaceae* some characters show so many intergradations that it would be exaggeration indeed for the taxa based upon them to be called varieties.

In agreement to Art. 28 bis of the International Rules of Botanical Nomenclature as sanctioned by the Botanical Congress at Stockholm, the type form has been here designated by the repetition of the specific epithet without the citation of an author's name.

2. Comment on the distribution of the Physciaceae in the Netherlands.

For a taxonomic treatise like the present paper, it is common use to enumerate all indigenous specimens examined. Yet, I shall deviate from this practice, mainly under the pressure of the appalling costs of printing which long lists of quotations would entail. In the case of common species I have therefore omitted such lists, commenting under the head of "Ecology and distribution in the Netherlands" in what habitats and in what parts of the country the species concerned has been reported or is most likely to be found.

TAXONOMICAL PART.

Chacun pense trouver le "criterium" et ce criterium varie avec chacun.

M. Potron in Bull. Soc. Mycol. France, vol. 66, 1950, p. 240.

PHYSCIACEAE.

A. Zahlbr. in Engler-Prantl, Die natürl. Pflanzenfam., vol. 1, pars 1*, 1907, p. 234 et ed. 2, vol. 8, 1926, p. 256; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 41.

Thallus foliaceous or more rarely fruticose, with a dorsiventral or radiate structure, closely appressed to loosely adhering, ascendant to pendulous, usually attached to the substratum by rhizinae. Lobes stratified, corticated, containing *Protococcaceous* gonidia. *Apothecia* laminal or marginal, sessile or shortly pedicellate, orbicular, (lecideoid or) lecanoroid. Asci octosporous. *Spores* some shade of brown, 2-celled (more rarely 4-celled or paucilocular-muriform), with thickened cell-wall. Paraphyses simple or branched, especially towards their apices. *Pycnidia* with endobasidial, septate fulcra. *Pycnoconidia* colourless, short and straight, or rarely elongate and curved (description somewhat altered after Zahlbruckner and Lynge; family-characters which do not apply to the indigenous species have been put between brackets).

Key to the genera.

(After Lynge, l. c., p. 41)

1a. Upper cortex plectenchymatous, with the hyphae parallel to the surface . . . . . **1. Anaptychia** Körb.

1b. Upper cortex either plectenchymatous, with the hyphae perpendicular to the surface, or paraplectenchymatous . . **2. Physcia** (Schreb.) Th. Fr. em. Vain.

1. ANAPTYCHIA Körb.

in Mass., Memor. Lichenogr., 1853, p. 33; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 13; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 704 et vol. 10, 1940, p. 656 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 41.

Thallus foliaceous or fruticose, loosely adhering to ascending, deeply incised, usually attached to the substratum by means of rhizinae. Lobes dorsiventrally flattened, plane or convex and with the underside canaliculate, often with marginal cilia, stratified, with an upper cortex, not

always with a lower cortex. Upper cortex more or less cartilaginous, densely plectenchymatous, consisting of conglutinate hyphae parallel to the surface. Gonidia bright green (*Protococcus* Ag.), arranged in a layer under the upper cortex or also under the lower cortex. Medulla plectenchymatous, composed of leptodermatous hyphae. Lower cortex, if present, similar to the upper one. *Apothecia* laminal or marginal, lecanoroid, discoid, with orbicular, dark-coloured, naked or pruinose disc. Asci 8-spored. *Spores* brown, ellipsoidal, 2-celled, with thickened cell-walls. Paraphyses conglutinate, often furcate at their apices. Hypothecium colourless. *Pycnidia* immersed in the thallus and flush with the surface or located in distinct warts and prominent. Fulcra endobasidial, articulated. *Pycnoconidia* colourless, short, straight, cylindrical (description after Zahlbruckner and Lynge).

Remarks. As Körber already commented in a note (Syst. Lich. German., 1855, p. 49), his newly created genus *Anaptychia* had been adopted by Massalongo, to be sure, but this author did not sufficiently recognise its character, adding considerably to the general confusion by mixing up species of the genus *Physcia* (which at that time was still called *Parmelia*).

In Act. Bot. Fenn., vol. 33, 1943, p. 41, Räsänen subdivided the genus into two new sections, viz. sect. *Melancholia* (thallus dark, K—) and sect. *Albidopallidae* (thallus pallid, K + yellowish).

According to their dark colour and negative reaction to K, the species mentioned in the present paper would belong to the former section, but it should be noted that for the publication to be valid Art. 38 of the International Rules of Botanical Nomenclature explicitly requires the name of any new group of plants to be accompanied by a Latin diagnosis.

Key to the species.

(After Lynge, l. c. p. 42)

1a. Thallus fruticose. Lobes loosely adhering, ciliate, grey in various shades . . . . . **1. A. ciliaris** (L.) Körb.

1b. Thallus foliaceous. Lobes closely appressed, without marginal cilia, brown in various shades . . . . . **2. A. fusca** (Huds.) Vain.

1. Anaptychia ciliaris (L.) Körb. in Mass., Memor. Lichenogr., 1853, p. 35; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 13; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 707 et vol. 10, 1940, p. 656 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 43 — *Lichen ciliaris* L., Spec. Pl., vol. 2, 1753, p. 1144 — *Parmelia ciliaris* Ach., Meth. Lich., 1803, p. 255; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 128.

Exsiccata: Breutel, Fl. Germ. exs., no 309; Claud. et Harm., Lich. Gall. exs., no 23; Delise, Lich. France, ed. I, no 14; Desmazières, Pl. Cryptog. Nord France, no 40; idem, Pl. Cryptog. France, ed. II, no 423; Elenkin, Lich. Fl. Ross., no 85a—c; Erb. Crittog. Ital., no 162; Floerke, Deutsche Lich., no 152; Fl. exs. Austro-Hung., no 343; Funck, Cryptog. Gew. Fichtelgeb., no 161; Hepp, Flecht. Europ., no 168; Malbranche, Lich. Normand., no 24; Marcucci, Un. Itin. Cryptog. 1866, no 24; Massalongo, Lich. Ital. exs., no 39; Rabenhorst, Lich. Europ., no 63; Räsänen, Lichenoth.

Fenn. I, no 16; Reichenb. et Schub., Lich. exs., no 38; Schaerer, Lich. Helv. exs., no 388; Stenhammar, Lich. Suec. exs., no 42.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 30, fig. 9; Fink in Contrib. United States Nation. Herb., vol. 14, pars 1, 1910, tab. 47, fig. A et Lich. Fl. United States, 1935, tab. 47, fig. B; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 45—54, fig. 273—281, 284—286, 290—318; Lynge in Bergens Mus. Aarb., 1910, no 9, tab. 4, fig. 5 et in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 3, fig. 1, 3; Migula, Kryptog.-Fl. Deutschl., vol. 4, pars 1, 1929, tab. 1, fig. 3; Schaerer, Enum. Crit. Lich. Europ., 1850, tab. 2, fig. 1; Smith et Sowerby, Engl. Bot., vol. 19, 1804, tab. 1352; Wulf. in Jacquin, Collect. Bot., vol. 4, 1790, tab. 13, fig. 1.

Macroscopical description — Thallus fruticose, wide-spreading, up to some 10 cm in diam., erect to subpendulous, attached to the substratum by cilia, deeply incised. Lobes fairly rigid, discrete, more or less stellate at the circumference, growing more entangled towards the centre of the thallus, rather short and broad to elongate and almost linear, up to several cm long, 1—2 mm broad, narrower in some forms, usually richly furcate or irregularly pinnatifid, convex, with involute, entire margins. Tips more or less broadened and fan-shaped, incised, terminating in two or more cilia. Cilia marginal and terminal, 2—5 mm long, simple or more rarely furcate, concolorous with the thallus, but growing darker to almost black towards their apices, partly acting as haptera and fastening the thallus to the substratum. Upper surface of the lobes light grey, grey-brown to dark grey (greenish when moistened), somewhat tanned at the tips, dull, minutely tomentose-felty, faintly indented or lengthways striate, without *soredia* or *isidia*, but with age getting more and more knobbly with warts, part of which contain pycnidia. Lower side of the lobes white to dirty white, dull, felty, canaliculate, distinctly lengthways striate and irregularly veined, the veins indicating the corticated parts, without rhizinae. *Microscopical description* — Upper cortex colourless with a dark exterior zone, very irregularly developed, densely plectenchymatous, with the hyphae parallel to the surface and partly projecting outward, forming the tomentum, 50—180 μ, sometimes connected with the underside of the lobe by strands of plectenchymatous tissue. Gonidia bright green, spherical, 9—15 μ, arranged in a layer of 30—75 μ, or in clusters under the upper cortex or deeply penetrating into it. Medulla colourless, white in reflected light, fairly densely plectenchymatous, 120—180 μ, consisting of leptodermatous hyphae. Lower cortex only partially developed, especially well-developed near the margins of the lobes, colourless, densely plectenchymatous, with the hyphae parallel to the surface, gradually passing into the medulla, 30—100 μ. *Apothecia* abundant in earlier days, rare at present, laminal or marginal, sessile or pedicellate with a stalk of 2 mm, deeply cup-shaped to discoid, usually 3—5 mm in diam., sometimes attaining as much as 7 mm. Amphithecium concolorous with the thallus, dull, minutely tomentose, smooth. Margin persistent, entire, crenate or laciniate. Disc plane, becoming wavy with age, dull, black-brown or light caesio-pruinose. Epithecium brown, hypothecium yellowish, with a gonidial layer underneath. Hymenium colourless, 150—170 μ. Asci cylindrical or

somewhat clavate, 30—35 × 110—135 μ, 8-spored. *Spores* dark brown, 2-celled, constricted in the centre, ellipsoidal, straight or curved, thick-walled, with rounded or acute apices, and with coarse episporium, 18—24 × 40—45(—54) μ. Paraphyses branched towards their apices, septate, little or not conglutinate, slightly incrassate at the apices. *Pycnidia* usually abundant, immersed in the upper side of the thallus or in small warts which are concolorous with the thallus or brownish black, spherical or pyriform, 185—350 × 250—380 μ. Perifulcrium colourless or brown, ostiolum brownish or black. *Pycnoconidia* colourless, cylindrical, straight, 1—1.5 × 3—5 μ. *Chemical reactions* — Upper cortex and medulla remain unaffected by the usual reagents, it looks, therefore, as if Zopf when reporting the presence of atranorine (Flechtenstoffe, 1907, p. 415) has had heterogeneous material for investigation.

Ecology and distribution in the Netherlands. *Anaptychia ciliaris* is a corticolous species which has been found on fruit trees, *Fagus, Pinus* (!), *Salix,* and most frequently on *Populus, Quercus* and *Ulmus.* It is a decidedly nitrophilous species preferring well-exposed habitats even if in close proximity of farm-yards. Probably, however, it stands present-day conditions along our modern highways much less than most other nitrophilous species, and this, together with the gradual disappearance of our old way-side trees, may account for the comparative rareness of the species which certainly was very common in former times. Also the small, blackish, stunted and mostly sterile specimens we find to-day, poorly contrasting with the beautifully developed, richly apotheciferous specimens of earlier days, clearly indicate that *A. ciliaris* feels ill at home in a mechanised and industrialised country. The best chances of finding the species are on trees along remote country-roads away from highway traffic and industrial centres, as for instance in the north-eastern provinces.

Distribution in Europe. According to the records in literature, *A. ciliaris* is a wide-spread species in Europe.

Variability. Of the various forms described in *A. ciliaris* only a few may be recognized among the indigenous specimens, but they are of minor importance.

f. *agriopa* (Ach.) Boist. (A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 713 et vol. 10, 1940, p. 656; Lynge, l. c., p. 47) with its short and broad lobes which have somewhat hand-shaped tips seems to be a form thwarted in its normal growth by unfavourable environmental conditions.

In some cases the lobes become strongly distorted by numerous, large, bullate warts which in part contain one or more pycnidia. This stage has been called f. *verrucosa* (Ach.) Boist. (A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 715; Lynge, l. c., p. 46).

It is a common feature in *ciliaris* to find the apothecial margin beset with secondary laciniae. It is much less common, however, to find those laciniae tapering into long cilia, a stage which has been designated f. *actinota* (Ach.) Arn. (A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 712 et vol. 10, 1940, p. 656; Lynge, l. c., p. 47). Genuine *actinota* has not been found in this country, only transitional stages between it and f. *ciliaris* being known.

Specimens examined; only material not older than 25 years has been considered.

Groningen: Groningen, 21 IX 1950, *Barkman* (L); Haren, Harendermolen, IV 1941, *Van Veen* (U).

Friesland: Franeker, 16 VIII 1951, *Barkman* (L); Sexbierum, 25 VIII 1942, *Maas G. 2190* (L).

Drente: Paterswolde, 31 XII 1938, *Insje* (VS).

Overijsel: Zwolle, Herkulo, VIII 1940, *Stafleu*, c. ap. (U).

Gelderland: Elburg, VI 1940, *Stafleu* (U); Wezep, III 1940, *Stafleu* (U).

Utrecht: De Bilt, 19 I 1930, *Wassink 130* (Wask); Maarssen-Breukelen, 11 X 1943, *Maas G. 2807* (L); Veldhuizen-De Meern, 23 II 1941, 4 IV 1942, *Stafleu* (U).

Noord-Holland: Alkmaar, 16 V 1942, *Stafleu* (U); Alkmaar-Heiloo, 16 IX 1943, *Barkman 592* (L); Bloemendaal, 1926, *Mrs. De Visser—Roelofs*, c. ap. (L); Hoorn, 8 IX 1951, *Barkman 2821* (L); St. Maartensbrug, "Wildrijk", 29 IX 1943, *Barkman 594* (L); Wognum, 10 V 1945, *Maas G. 3200* (L).

Zuid-Holland: Leiden-Oud Ade, 21 VIII 1943, *Maas G. 2746* (L); Leiderdorp-De Kaag, VIII 1941, *Stafleu* (U); Wassenaar, Meiendel, 15 III 1942, *Van Rossem* (L).

Zeeland: Schouwen, Haamstede, 18 IX 1951, *Barkman 2829* (L), 20 IX 1951, *Barkman 2842*, c. ap. (L); Walcheren, Serooskerke, 1945, *Brakman* (L); Zuid-Beveland, Goes, 12 XI 1943, *Maas G. 2948* (L).

(Two more finds have been reported by *Barkman*, viz. from Tholen, Oud Vossemeer and Zuid-Beveland, Ellewoutsdijk; no specimens were collected).

Noord-Brabant: Lage Zwaluwe, 3 VII 1951, *Barkman* (L).

2. Anaptychia fusca (Huds.) Vain. in Termesz. Füzetek, vol. 22, 1899, p. 299; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 720 et vol. 10, 1940, p. 657 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 55 — *Lichen fuscus* Huds., Fl. Anglica, ed. 2, vol. 2, 1778, p. 533 (non vidi) — *Parmelia aquila* Ach., Lich. Un., 1810, p. 488; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 22.

Exsiccata: Claud. et Harm., Lich. Gall. exs., no 235; Desmazières, Pl. Cryptog. France, ed. II, no 250; Erb. Crittog. Ital., ser. I, no 467; Fl. Gall. Germ. exs., no 1396; Hepp, Flecht. Europ., no 602; Kryptog. exs. Vindob., no 2179, 2179b; Leighton, Lich. Brit. exs., no 144; Malbranche, Lich. Normand., no 172; Marcucci, Un. Itin. Cryptog. 1866, no 27; Massalongo, Lich. Ital. exs., no 87; Rabenhorst, Lich. Europ., no 586; Schaerer, Lich. Helv. exs., no 565; Schultz et Winter, Herb. Normale, no 98; Stenhammar, Lich. Suec. exs., no 43; Welwitsch, Cryptotheca Lusitana, no 70.

Iconography: Dietrich, Deutschl. Kryptog. Gew., vol. 4, 1846, tab. 51; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 48, 56, fig. 287—289, 323—334; Smith et Sowerby, Engl. Bot., vol. 14, 1802, tab. 98.

Macroscopical description — Thallus foliose, growing in rosettes and stellate or irregularly wide-spreading with age, attached to the substratum by rhizinae, deeply incised. Lobes rigid and hard, somewhat discrete to contiguous or overlapping, elongate, 1 cm or more long, 0.4—1(—2) mm broad, richly and irregularly pinnately branched, plane or convex, towards the centre of the thallus completely covered with imbricate or entangled, 0.2—0.4 mm broad secondary lobules. Margins entire or somewhat sinuate, eciliate, not involute. Tips more or less broadened and fan-shaped, lobate or incised. Upper side of the lobes variously coloured, yellow-brown, chestnut, purplish brown, or almost black-brown, the parts exposed to the sun being always darker than those turned away, dull or somewhat shiny, naked, smooth or faintly lengthways striate, without *isidia* or *soredia*. Lower side of the lobes dirty white, yellowish or light brown at the circumference, black towards the centre, dull, longitudinally striate,

sparingly rhizinose. Rhizinae thick, simple or furcate, brown-black. *Microscopical description* — Upper cortex colourless with a brown exterior zone and covered with a horny, necrotic layer, very densely plectenchymatous, with the hyphae more or less parallel to the surface, irregularly developed, with spurs into the medulla or even connected to the lower cortex by some strands of plectenchymatous tissue, 75—130 μ. Gonidia bright green, spherical, 6—10 μ, scattered throughout the medulla, densified into clusters or a continuous layer under the upper cortex, sometimes penetrating into both cortices. Medulla colourless, white in reflected light, rather thinly plectenchymatous, 0—75 μ, composed of mesodermatous hyphae. Lower cortex colourless, densely plectenchymatous, gradually passing into the medulla, 60—250 μ. *Apothecia* laminal or almost marginal, sessile or with constricted base, discoid, 1—1.5 mm in diam. Amphithecium concolorous with the thallus, dull, smooth or somewhat rugose. Margin persistent, broad, entire or crenate. Disc plane, black-brown, dull, smooth or rough, without pruina. Epithecium brown, granular, hypothecium colourless or yellowish, with a gonidial layer underneath. Hymenium colourless, 150—300 μ. Asci slender, clavate, 30—40 × 90—150 μ, 8-spored. *Spores* dark brown, 2-celled, constricted in the centre, ellipsoidal, straight or somewhat fabiform, thick-walled, with rounded or somewhat acute apices, 15—18 × 30—36 μ. Paraphyses hardly conglutinate, septate, simple or furcate upwards, with somewhat incrassate apices. *Pycnidia* common, located on the secondary lobes in the centre of the thallus, laminal, blackish, flush with the surface or protruding as small warts, spherical or pyriform, crateriform with age, 300—340 μ. Perifulcrium colourless, ostiolum brown to black. *Pycnoconidia* colourless, cylindrical, straight, 1—1.5 × 3—5 μ. *Chemical reactions* — Upper cortex N + red-brown, otherwise indifferent to the usual chemicals, as is the medulla.

Ecology and distribution in the Netherlands. In this country the species seems to have been strictly saxicolous and maritime. As nearly a century has elapsed since this rare species was found, it may be safely assumed that *A. fusca* is no longer a member of the native lichen flora.

Distribution in Europe. Considering the localities indicated on the labels of the exsiccata mentioned and of many more collections in our possession which have not been distributed as exsiccata, it appears that *A. fusca* is a maritime species occurring all along the coasts from Norway and Great Britain down to Italy in the Mediterranean. This distribution is largely in concordance with the data which may be compiled from the literature quoted on p. 280—284 and which show that *A. fusca* is lacking in the East European countries. It seems strange, therefore, that the species should also occur as far inland as the Swiss Alps. Lynge himself expressed his doubts as to the identity of those specimens with the Scandinavian material (l. c., p. 59). It is not impossible that the record of the inland occurrence of *A. fusca* in reality refers to var. *stippaea* (Ach.) Lynge, about the taxonomic position of which I would not venture to give my opinion. The different general appearance and geographical distribution, however, might point to another relation to *A. fusca* than on the level of a variety. Suffice it to state that Nádvorník (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 75) considered *stippaea* a separate species.

Specimens examined.
Groningen: Uitwierde, 14 VIII 1856, *Acker Stratingh* (Gro).
Noord-Holland: Amsterdam, Zeeburg, *Van der Sande Lacoste*, c. ap. (NBV).

2. PHYSCIA (Schreb.) Th. Fr. em. Vain.

Th. Fr., Gen. Heterolich. Europ. Recogn., 1861, p. 59 (quoad nomen); Vain., Étude Lich. Brésil, pars 1, 1890, p. 138; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 577 et vol. 10, 1940, p. 650 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 60 — *Lichen Physcia* Schreb., Gen. Pl., vol. 2, 1791, p. 768 (pr. p.).

Thallus foliaceous, more or less orbicular, appressed to ascending, mostly attached to the substratum by rhizinae, deeply incised. Lobes dorsiventrally flattened, corticated, stratified, sometimes ciliate. Upper cortex densely plectenchymatous or paraplectenchymatous, always consisting of conglutinate hyphae perpendicular to the surface. Gonidia bright green (*Protococcus* Ag.), arranged in a layer under the upper cortex. Medulla plectenchymatous, consisting of leptodermatous or mesodermatous hyphae, white or rarely red. Lower cortex very densely plectenchymatous or paraplectenchymatous. *Apothecia* laminal, sessile or shortly pedicellate, discoid, lecanoroid, with orbicular, brown to black, naked or pruinose disc. Asci octosporous, though not all of the spores may reach maturity. *Spores* brown, 2-celled, ellipsoidal, with thickened cell-walls. In some extra-European species the spores are 4-celled or even muriform. Paraphyses mostly conglutinate, septate, simple or branched, more or less incrassate at their apices. Hypothecium colourless or dark-coloured, with gonidia underneath. *Pycnidia* immersed in the thallus, flush with the surface or protruding. Fulcra endobasidial, articulate. *Pycnoconidia* either short, cylindrical or ellipsoidal, and straight, or long, filiform and curved (description after Zahlbruckner in Engler-Prantl, Die natürl. Pflanzenfam., ed. 2, vol. 8, 1926, p. 257).

Subdivision. According to the classification in Zahlbruckner's Cat. Lich. Un., vol. 7, 1931, the genus *Physcia* includes the following groups: 1. *Hypomelaena* (Trevis.) Vain. (= sect. *Dirinaria* [Tuck.] Vain.); 2. *Euphyscia* Th. Fr.; 3. *Tetramelaena* (Trevis.) A. Zahlbr.; 4. *Hyperphyscia* (Müll. Arg.) A. Zahlbr. Of these, only *Euphyscia* occurs in Europe. The taxonomic rank of this group does not seem very well understood, and there is also some controversy as to its subdivision. Th. Fries in his Lich. Scand., vol. 1, 1871, p. 135 denotes *Euphyscia* with two asterisks, and in all probability herewith the subgenus was meant, as appears from the classification of the next genus *Xanthoria* which he divided into A. *Euxanthoria* and B. *Candelaria*. About these Fries says at page 145: "Plures auctores nostram *Xanthoriam* in duo sejungunt genera; duas sectiones admittere melius videtur". Obviously, the sections have been indicated by characters, the subgenera by asterisks.

Lynge (l. c., p. 61) describes the genus in a more restricted way than has been done by Zahlbruckner, so that his *Physcia* corresponds with the "Hauptgruppe" *Euphyscia*. Consequently he writes: "Obige Gattungsdiagnose entspricht dieser Gruppe", but this statement does not in the least explain the relation between the genus *Physcia* and his "group".

The less so as he again subdivides *Euphyscia* in *Brachysperma* and *Macrosperma* which are designated subgenera! At least, the latter has been so designated (p. 181); Lynge apparently forgot to describe the former. The "subgeneric" epitheta have been adopted from Vainio, but they differ in rank and partly also in conception. The former he divided into 7 sections, whereas the latter has only one species in Europe. When adopting Lynge's classification, it may be evident from the above explanation that the ranks necessarily have to be altered again.

Much on the same lines of Vainio's classification Räsänen subdivides the genus *Physcia,* only adding a third section, viz. *Parvulae* (in Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 12, 1938/39, p. 94—102 and in Act. Bot. Fenn., vol. 33, 1943, p. 12). Since this system, however, has the same shortcoming in disregarding the importance of the types of the soralia and of the form and size of the pycnoconidia, I am inclined to keep to the views expressed by Lynge.

Subgenus EUPHYSCIA Th. Fr.,

Lich. Scand., vol. 1, 1871, p. 135 — *Physcia* sect. *Euphyscia* Th. Fr.; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 584 (ubi lit. et synon.).

Hypothecium colourless or pallid. *Spores* 2-celled.

Artificial key to the species.

1a. Lobes, at least at the periphery of the thallus, with marginal cilia [1] . . . 2
2a. Thallus with soredia 3
3a. Lobes with inflated, helmet-like tips, at the inside of which the soredia are produced . . . **6. Ph. adscendens** (Th. Fr.) Oliv. sensu Bitt.
3b. Lobes with apical labriform soralia **7. Ph. tenella** (Scop.) DC. sensu Bitt.
2b. Thallus esorediate, nearly always with apothecia **5. Ph. leptalea** (Ach.) DC.
1b. Lobes without marginal cilia 4
4a. Thallus sorediate (or isidiate, the isidia eventually turning into soredia) . 5
5a. Upper surface K + yellow 6
6a. Medulla K + yellow 7
7a. Soredia originate by the disintegration of the warty isidia which are scattered all over the surface; whole thallus sometimes turned into a soredial mass . . . . **4. Ph. clementi** (Sm.) Lynge
7b. Soredia originate otherwise 8
8a. Thallus with apical labriform soralia and a few laminal maculiform soralia . . . . . **8. Ph. wainioi** Räs.
8b. Thallus with laminal, globose soralia, never with labriform soralia . . . . . **3. Ph. caesia** (Hoffm.) Hampe
6b. Medulla K — 9
9a. Lobes with apical labriform soralia 10
10a. Soralia may extend towards the centre of the thallus, passing into marginal soralia, grey or white; lobes more appressed **9. Ph. dubia** (Hoffm.) Lettau

[1]) Cilia should not be confused with rhizinae which, too, may project sideways. The former are as a rule longer and thicker and often tortuously curved, projecting freely into the air, and thus lending a tangled, disorderly and hairy appearance to the plant. Another expedient in distinguishing cilia and rhizinae is that ciliate species have few rhizinae or none at all. Yet, it cannot be denied that the discrimination is often badly hampered by incomplete development or by damage due to insects.

10b. Soralia may be broad and strongly curved upwards, but never merge into marginal soralia, greenish white; lobes more ascending . . . **7. Ph. tenella** (Scop.) DC. sensu Bitt.

9b. Lobes with crenate, partly sorediate margins; soredia sometimes confluent, forming marginal soralia. If apical soralia occur, in the centre of the thallus, they are never labriform **10. Ph. tribacia** (Ach.) Nyl.

5b. Upper surface K — 11

11a. Thallus very small, about 1 cm across, lobes extremely narrow, 0.1—0.5 mm broad, brown, loosely attached to ascending; soredia marginal, originating from minute marginal isidia which have disintegrated . . . . . **13. Ph. nigricans** (Flk.) Stizenb.

11b. Not the above characters combined; in case of very small thalli, they are closely appressed to the substratum 12

12a. Thallus rigid, rather thick, loosely attached, large pieces may be easily lifted from the substratum with a knife 13

13a. Soralia maculiform, laminal or subterminal at the tips of sidelobes, never merging into a sorediate border along the margins of the lobes[1]). Thallus epruinose **12. Ph. orbicularis** (Neck.) Pötsch

13b. Soralia mainly marginal, forming a sorediate border along the sides or sometimes also along the tips of the lobes[1]). Lobes often pruinose, at least at the tips **15. Ph. grisea** (Lam.) A. Zahlbr.

12b. Thallus thin, closely appressed to the substratum and hardly to be removed with a knife without damage 14

14a. Lower cortex plectenchymatous, colourless, less than 20 μ thick **16. Ph. elaeina** (Sm.) A. L. Sm.

14b. Lower cortex paraplectenchymatous, dark-coloured, more than 20 μ thick . . . . **12. Ph. orbicularis** (Neck.) Pötsch

4b. Thallus esorediate 15

15a. Upper side K + yellow 16

16a. Medulla K + yellow; pseudocyphellae clearly visible, especially when thallus moistened . . . . **1. Ph. aipolia** (Ehrh.) Hampe

16b. Medulla K —; pseudocyphellae inconspicuous **2. Ph. stellaris** (L.) Nyl.

15b. Upper side K — 17

17a. Thallus rather thick, coarse, more or less loosely attached, pruinose in several forms. Upper and lower cortices densely plectenchymatous, with transitions to paraplectenchyma. Medulla usually more than 70 μ thick. Margin of apothecia without rhizinae **14. Ph. pulverulenta** (Schreb.) Hampe

17b. Thallus thin, closely attached to the substratum, never pruinose. Upper and lower cortices paraplectenchymatous. Medulla usually less than 70 μ thick. Margin of apothecia often with rhizinae **11. Ph. ciliata** (Hoffm.) DR.

Key to the sections.

1a. Pycnoconidia short, straight . . . sect. 1. BRACHYSPERMA (Vain.) em. Maas G.
1b. Pycnoconidia long, filiform, curved . . sect. 2. MACROSPERMA (Vain.) Maas G.

Sectio 1. BRACHYSPERMA (Vain.) em. Maas G. nov. comb.

— *Physcia* sect. 1. *Euphyscia* b. *Sordulenta* 1. *Brachysperma* Vain., Etude Lich. Brésil, pars 1, 1890, p. 144 (quoad nomen) — *Physcia* subgen. *Brachysperma* (Vain.) em. Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 62.

[1]) To be examined at the circumference of the thallus, since the centre may be completely turned into a sorediose mass.

Pycnoconidia short, cylindrical or ellipsoidal, straight.

Remarks. It is obvious that *Brachysperma* taken in this sense has a much broader delimitation than originally conceived by Vainio.

Key to the subsections.

(After Lynge, l. c., p. 62)

1a. Upper side K + yellow 2
2a. Lobes ascending or at least more or less free from the substratum, supplied with mostly long marginal cilia . . subsect. 4. Tenella (Lynge) Maas G.
2b. Lobes more or less closely appressed, rarely ascending, without marginal cilia 3
3a. Thallus without soralia or isidia subsect. 1. Stellaris (Lynge) Maas G.
3b. Thallus sorediate or isidiate 4
4a. Thallus exclusively sorediate 5
5a. Soralia laminal, maculiform, globose subsect. 2. Caesia (Lynge) Maas G.
5b. Soralia apical and labriform, or marginal; laminal ones may also occur . . . subsect. 5. Tribacia (Lynge) Maas G.
4b. Thallus covered with isidia which eventually may disintegrate, turning into soralia . . subsect. 3. Astroidea (Lynge) Maas G.
1b. Upper side K — 6
6a. Thallus dark grey to brown-black, epruinose, 1—4(—5) cm across. Apothecia small, 1—1.5(—2) mm in diam., with small spores, rarely reaching 25 μ in length subsect. 6. Obscura (Lynge) Maas G.
6b. Thallus greyish white to brown, usually pruinose, 5—10(—12) cm across. Apothecia large, 2—4(—5) mm in diam., with spores longer than 25 μ subsect. 7. Pulverulenta (Lynge) Maas G.

Subsectio 1. Stellaris (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma*, sect. *Stellaris* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 65; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus medium to large, 2—10 cm in diam., appressed, white, grey, blue-grey or ash-grey, without *soralia* or *isidia*, eciliate. Upper cortex K + yellow.

Key to the species.

1a. Medulla K + yellow. Pseudocyphellae clearly visible, especially after the thallus has been moistened . . . . . 1. **Ph. aipolia** (Ehrh.) Hampe
1b. Medulla K —. Pseudocyphellae inconspicuous . . . 2. **Ph. stellaris** (L.) Nyl.

1. Physcia aipolia (Ehrh.) Hampe in Fürnr., Naturh. Topogr. Regensburg, vol. 2, 1839, p. 249; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 590; vol. 8, 1932, p. 596 et vol. 10, 1940, p. 650 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 66 — *Lichen aipolius* Ehrh. in Humb., Fl. Friburg. Spec., 1793, p. 19 — *Parmelia stellaris* var. *aipolia* Fr., Sched. Crit., vol. 7, 1826, p. 4 (non vidi); Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129; Abelev. in Prodr. Fl. Batav., ed. 2, vol 2, pars 2, 1898, p. 20.

Exsiccata: Claud. et Harm., Lich. Gall. exs., no 127; Desmazières, Pl. Cryptog. Nord France, no 145; Elenkin, Lich. Fl. Ross., no 88; Erb. Crittog. Ital., no 115; Floerke, Deutsche Lich., no 135; Fl. Hungarica exs.,

no 220; Funck, Cryptog. Gew. Fichtelgeb., no 475; Hepp, Flecht. Europ. no 877; Kryptog. exs. Vindob., no 2078; Leighton, Lich. Brit. exs., no 6; Malbranche, Lich. Normand., no 25; Massalongo, Lich. Ital. exs., no 318A; Nádvorník, *Physciac.* exs., II, no 11; Rabenhorst, Lich. Europ., no 185 (pro min. parte); Räsänen, Lichenotheca Fenn., II, no 40; Schaerer, Lich. Helv. exs., no 350; Schrader, Samml. Cryptog. Gew., no 149; Stenhammar, Lich. Suec. exs., no 73 inf.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 29, fig. 9; Cretzoiu in Inst. Cercetar. Experim. Forest., ser. 2, vol. 47, 1941, tab. 18, fig. 1; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 19—20, fig. 113—125; Magnusson, Fl. Skand. Busk-och Bladlav., 1929, tab. 2, fig. 15; Migula, Kryptog.-Fl. Deutschl., vol. 4, pars 1, 1929, tab. 3, fig. 1—3; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 13, fig. 2.

Macroscopical description — Thallus foliaceous, growing in rosettes, more or less stellate, rather large, 6—10 cm in diam., attached to the substratum by rhizinae, deeply incised. Lobes pretty rigid, thick, as a rule long and narrow, 2—4 cm long, 1—1.5 mm broad, appressed, contiguous and sometimes even with plicate, ascending margins when tightly pressed against each other, or overlapping or more or less widely discrete (very rare in the indigenous material), richly and irregularly pinnatifid, plane or somewhat corrugated at the circumference, more or less convex towards the centre. Margins entire. Tips broadened and fan-shaped, incised. Upper surface grey-white to ash-grey, dull, smooth or irregularly indented or becoming wrinkled with age and often with secondary laciniae in the centre of the thallus, without *isidia* or *soredia* and epruinose, densely spotted with more or less conspicuous, whitish, irregular dots (pseudocyphellae). Lower surface dirty white to brown, dull, densely covered with pallid or dark brown rhizinae. *Microscopical description* — Upper cortex colourless with a broad yellow-brown exterior zone, paraplectenchymatous, 45—75 μ, frequently ruptured and alternating with spurs of medullary tissue and gonidia (pseudocyphellae). Gonidia bright green, spherical or broadly ellipsoidal, 7—12(—16) μ, arranged in clusters or in an uninterrupted layer of 15—60(—100) μ, closely under the upper cortex or, in the pseudocyphellae, reaching the surface. Medulla colourless, white in reflected light, densely plectenchymatous, consisting of mesodermatous hyphae, 45—120 μ. Lower cortex colourless except for a narrow brownish exterior zone, very densely plectenchymatous, with an occasional indication of paraplectenchyma in the outer zone, 30—75 μ. *Apothecia* nearly always extant, numerous, frequently completely covering the centre of the thallus, laminal or marginal, sessile, deeply cup-shaped to discoid, up to 2 mm in diam. Amphithecium concolorous with the thallus or lighter, dull, smooth or faintly indented. Margin persistent, entire when young, later on crenulate. Disc plane or corrugated with age, chestnut to almost black, usually covered with a thick bluish grey pruina. Epithecium brown-yellow, hypothecium colourless, with a layer of gonidia underneath. Hymenium colourless, 90—120 μ. Asci clavate to cylindrical, 12—24 × 60—85 μ, 8-spored. *Spores* dark brown, 2-celled, not constricted in the centre, ellipsoidal, straight or somewhat fabiform, with strongly thickened cell-walls at the septum and the rounded apices, 9—11 × 19—23(—27) μ. Para-

physes unbranched, septate, slightly clavate at the apices, conglutinate. *Pycnidia* common, located at the tips of the lobes, especially of those in the centre of the thallus, laminal, visible as black dots or warts, spherical or pyriform, 180—200 μ in diam. Perifulcrium colourless or brownish. Ostiolum black. *Pycnoconidia* colourless, cylindrical, straight, $\pm$ 1 $\times$ 4—5 μ. *Chemical constituents* and *reactions* — Upper cortex as well as medulla K+ intensively yellow; other chemicals such as C and Pd do not evoke any reaction. According to Zopf (Flechtenstoffe, 1907, p. 226 and 416), the species contains atranorin ($C_{19}H_{18}O_8$).

Ecology and distribution in the Netherlands. Although *Ph. aipolia* has been found on a wooden fence and on a boulder, the species may generally speaking be considered corticolous. It has been found on a variety of trees, such as *Aesculus, Alnus, Betula* (!), *Fagus* (!), *Fraxinus, Juglans, Populus, Quercus, Salix, Sambucus, Tilia* and *Ulmus*. Finds on the bark of *Populus* and *Salix* are not rare, but there is no doubt that *Ulmus* is by far the most favoured tree. *Ph. aipolia* is said to be a nitrophilous species, and I certainly found it in company of such nitrophilous lichens as *Xanthoria parietina, Ph. adscendens, tenella* and *orbicularis*. Yet, it is rarely if ever found at the very base of the trees which is supposed to be richest in nitrogen compounds. Furthermore, it is my impression that the species decidedly avoids too near proximity of farmyards which as a rule are favourable places for collecting the above mentioned lichens.

Judging from the herbarium material, *Physcia aipolia* must have been quite common in this country up to the beginning of this century, and growing in large thalli. Recent finds, however, are getting rare, whereas the thalli never exceed 8 cm in diam. Since *Ulmus* is favourite as a host and is most extensively used for a wayside-tree in the northern and western provinces of the country, *Ph. aipolia* is common in Groningen, Friesland, Noord- and Zuid-Holland and Zeeland, and to a somewhat lesser extent in the western portions of the provinces Utrecht, Gelderland and Noord-Brabant. Whereas in former times the species has only been collected from few localities in the other provinces, recent finds are lacking altogether. It is not known whether this is merely due to the scarcity or even lack of elms in those regions.

Distribution in Europe. Judging from the records mentioned in the literature cited on p. 280—284, *Ph. aipolia* is a wide-spread species in Europe.

Remarks. Though it has become generally accepted to attribute to Ehrhart the first use of the specific epithet, it should be borne in mind that the identity of Ehrhart's *Lichen aipolius* does not seem to be established, cf. Lynge, l. c., p. 67. Neither the original diagnosis nor the "observatio", which were copied and sent to me by the "Westdeutsche Bibliothek" at Marburg/Lahn, carry us any further. It should be pointed out, however, that contrary to Lynge's findings with the Viennese specimen of *Lichen aipolius* in Ehrhart's Pl. cryptog., no 197, the specimen sent to me from Geneva is true *Ph. aipolia*: conspicuous pseudocyphellae, medulla staining yellow when touched with K, large spores measuring 8.5—12 $\times$ 19—26 μ.

Concerning the difference of *Ph. aipolia* from *stellaris* and *pulverulenta*, I may refer to those species.

Variability. Among the varieties described in *Ph. aipolia*, var. *acrita* (Ach.) Hue had puzzled me for a long time. Now that I have seen the species and its varieties in Lynge's herbarium, I have come to the conclusion that var. *acrita* is nothing else but f. *typica* or, more correctly, f. *aipolia*. Already the remarks made by Acharius in his Lichenographia universalis, 1810, give a clue in this direction. Of *Ph. aipolia* he stated: "Thallus junior et adultus valde differens unde sub utroque statu considerandus ac describendus..." (p. 477), and continuing with var. *acrita*: "Est haec quae ... per aetatem in varietatem *cercidiam* et *anthelinam* abit" (p. 478). It follows that Acharius considered *acrita* a juvenile stage of *aipolia* which with age would develop into *cercidia*, a statement which is certainly correct. *Cercidia* only differs from f. *aipolia* in having crenulate apothecial margins, and I agree with Lynge that a separate name is superfluous.

It is different in the case of *anthelina* which I prefer to rank as forma rather than variety. Most certainly it is not an older stage of f. *aipolia*, as supposed by Acharius, since already in very young specimens the lobes are widely discrete with a more or less conspicuous felt of black rhizines in between. True *anthelina* has never been found in Holland, having a more boreal-alpine distribution, but transitional stages do occur in our older collections.

A characteristic feature in older specimens is the warted or wrinkled centre of the thallus. Such specimens have been called f. *verruculosa* Vain. (apud Räs. in Medd. Soc. F. Fl. Fenn., vol. 46, (1920) 1921, p. 166), but again, there is no need of designating them by a separate name.

As a rule, the apothecia in *aipolia* are caesio-pruinose, though specimens showing completely naked apothecial discs are not uncommon. Wishing to express the difference, Sántha in his monograph (in Fol. Cryptog., vol. 1, 1928) designated the modifications by calling them f. *caesiopruinosa* Arn. (p. 475) and f. *melanophthalma* (Mass.) Arn. (p. 474). As to the former, it might be disputed whether Arnold (in Flora, vol. 67, 1884, p. 168) really intended *caesiopruinosa* to be used as a subdivisional epithet. With regard to *melanophthalma*, it should for accuracy's sake be pointed out that the first author to transfer the form to *Ph. aipolia* was Sántha himself, not Arnold. It should be borne in mind, however, that it is rather useless to try to discriminate between either "forms", since it is not rare for *Ph. aipolia* to have pruinose and epruinose apothecia in the same specimen, see e. g. Galløe, l. c., tab. 19, fig. 113 and 117.

Another form described as new by Sántha (l. c., p. 478) is var. *angulosa* which is characterised in that the apothecia are so densely crowded as to loose their originally circular shape, becoming angular. It is an insignificant modification which hardly deserves mentioning.

2. Physcia stellaris (L.) Nyl. in Act. Soc. Linn. Bordeaux, vol. 21, 1856, p. 307 (quoad nomen); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 681 et vol. 10, 1940, p. 655 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 75 — *Lichen stellaris* L., Spec. Pl., vol. 2, 1753, p. 1144 — *Parmelia stellaris* var. *ambigua*

Schaer., Lich. Helv. Spicileg., sect. 9, 1840, p. 439; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 20.

Macroscopical description — Thallus foliaceous, growing in rosettes, more or less stellate, small to medium-sized, 2—4 cm in diam., attached to the substratum by rhizinae, deeply incised. Lobes pretty rigid, 1—1.5 cm long and 0.2—1.5 mm broad, loosely attached, discrete or closely contiguous or overlapping near the tips, richly and irregularly pinnately branched, plane or somewhat corrugated at the circumference of the thallus, convex in the centre. Margins entire. Tips as broad as the lobes or even somewhat attenuate, in other cases broadened and fan-shaped, emarginate or incised. Upper side grey-white to ash-grey, dull, smooth or somewhat indented, in the centre becoming wrinkled or warty with age or sometimes distinctly papillate, without *isidia* or *soredia*, epruinose, with inconspicuous, minute, whitish dots (pseudocyphellae). Under surface dirty white, dull, with pallid rhizinae whose tips are brownish and frequently project sideways. *Microscopical description* — Upper cortex colourless but for a broad brownish exterior zone, indistinctly paraplectenchymatous with transitions to palisade plectenchyma, 25—60 μ, with numerous breaks through which the gonidia reach the surface (pseudocyphellae). Gonidia bright green, spherical, 8—14 μ, arranged in clusters or in an uninterrupted layer of 20—40 μ, closely under the upper cortex or the surface. Medulla colourless, white in reflected light, fairly densely plectenchymatous, about 60 μ thick, consisting of mesodermatous hyphae. Lower cortex colourless or with a narrow brownish zone, very densely plectenchymatous, with the hyphae more or less parallel to the surface, rather gradually passing into the medulla, 45—60 μ. *Apothecia* nearly always extant and sometimes numerous, laminal, sessile or shortly pedicellate, cup-shaped to discoid, generally 2 or 3 mm in diam., sometimes up to 4—4.5 mm. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, entire, later on crenulate. Disc plane or becoming corrugated in older specimens, brown to dark fuscous or almost black, naked or caesio-pruinose. Epithecium yellow-brown, hypothecium yellowish, with a layer of gonidia underneath. Hymenium colourless, 80—90 μ. Asci cylindrical, 10—20 $\times$ 58—75 μ, octosporous. *Spores* brown, 2-celled, ellipsoidal, straight or somewhat curved, not constricted at the septum or only slightly so, with strongly thickened cell-walls at the septum and the rounded apices, 7—9 $\times$ 18—24 μ. Paraphyses simple or branched, septate, conglutinate, clavato-incrassate at the apices. *Pycnidia* common, scattered over the upper side of the lobes, laminal, submerged in the thallus or somewhat protruding and warty, spherical or pyriform, 100—180 $\times$ 200—250 μ. Perifulcrium colourless or brownish yellow. Ostiolum brown-black. *Pycnoconidia* colourless, cylindrical, straight, 0.8 $\times$ 4.5—5.5 μ. *Chemical constituents* and *reactions* — Upper cortex K + yellow, Pd + slowly light lemon-yellow, C —. Medulla K —, C —, Pd —. The positive reaction of the upper cortex upon K may possibly be attributed to the presence of atranorin ($C_{19}H_{18}O_8$).

Ecology and distribution in the Netherlands. In this country the species has been found on *Alnus, Betula* (!), *Fraxinus, Larix* (!), *Populus, Ulmus* and fruit trees. *Ph. stellaris* seems to be less

nitrophilous than *Ph. aipolia*; it also is and has most probably always been much rarer.

Distribution in Europe. *Ph. stellaris*, as its nearest relative *Ph. aipolia*, is a wide-spread lichen in Europe, though various comments show that it is far less common.

Remarks. The first to make the combination *Ph. stellaris* was Nylander, to be sure, but as appears from his description, he also included such varieties as *tenella* and *leptalea* which we now consider separate species. The first modern delimitation originates from Harmand (in Bull. Soc. Sci. Nancy, ser. 2, vol. 31, (1896) 1897, p. 258), which made Lynge write *Ph. stellaris* (L.) Nyl. em. Harm.

Physcia stellaris differs from *Ph. aipolia* in that its pseudocyphellae are far less visible, in its lobes maintaining approximately the same width at their apices or, if fanning out, not getting so broad, and in its medulla which remains unaltered when treated with K. For the discussion of the difference between *stellaris* and *leptalea*, I may refer to the remarks under the latter.

Variability. As far as this country is concerned, the variability of *Ph. stellaris* trends into 2 main directions. Firstly, the lobes may be narrow and very distinctly discrete, much more so than in f. *stellaris* (f. *radiata*); secondly, the lobes may be broader and more contiguous than in f. *stellaris*, with considerably broadened tips (f. *rosulata*). Intermediate stages are common.

Nádvorník (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 81), mentioning Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 29, fig. 7 for a picture, described a new f. *subradiata* which is intermediate between f. *stellaris* and f. *radiata*. One may well wonder at the use of distinguishing such forms.

If f. *rosulata* should represent a stage modified by age, as was already supposed by Acharius and subsequently by Lynge, this is certainly not so in the case of f. *radiata*. Fact is, however, that it is common, though by no means the rule, for f. *rosulata* to have the centre of the thallus wrinkled or warty which is generally held as a sign of advanced age. In some cases the thallus is not only warty, but distinctly papillate as well. It is to such stages that the following epithets refer: f. *granulata* Bouly de Lesd. (in Bull. Soc. Bot. France, vol. 59, 1912, p. 207), var. *pergranulata* Mereschk. (in Ann. Cons. Jard. Bot. Genève, vol. 21, 1919, p. 193; I have seen this collection) and var. *papillosa* Hillm. (in Verh. Bot. Ver. Prov. Brandenburg, vol. 65, 1923, p. 74). Most probably they are identical. It is hard to say, however, going by the descriptions only, whether they are also synonymous with var. *tuberculata* (Kernst.) DT. et Sarnth. which was originally described by Kernstock (as *Parmelia stellaris* f. *tuberculata* in Verh. zool. bot. Ges. Wien, vol. 46, 1896, p. 295) as being covered with "tuberculis carneo-albicantibus".

f. *ambigua* Rabenh. which figured in several older floras has disappeared in modern works, the obvious reason being that its basinym, *Lichen ambiguus* Ehrh. (1785), though antedating *Lichen ambiguus* Wulf. (1790) by 5 years, was not validly published. When issuing his *Lichen ambiguus* as Cryptog. exs., no 207, Ehrhart omitted to add a diagnosis.

I have seen the specimen from the Geneva herbarium and found it to agree with *Ph. stellaris* f. *stellaris*.

Ph. stellaris f. *subtenella* described by Anders in Hedwigia, vol. 63, 1922, p. 319 ought to be withdrawn. I have seen the authentic material kindly sent on loan from the Prague Museum by Dr A. Pilát, and it appears that the subdivisional epithet had been based on two different species, viz. *Ph. stellaris*, on one side partly overgrown by *Ph. adscendens*.

f. **stellaris**.

Exsiccata: Arnold, Lich. exs., no 788b—d; Arnold, Lich. Monac. exs., no 462, 466; Claud. et Harm., Lich. Gall. exs., no 179; Elenkin, Lich. Fl. Ross., no 87a; Fl. exs. Austro-Hung., no 2732 I—II; Funck, Kryptog. Gew. Fichtelgeb., no 475; Hepp, Flecht. Europ., no 878; Kryptog. exs. Vindob., no 1260; Rabenhorst, Lich. Europ., no 185 (pro max. parte); Räsänen, Lichenotheca Fenn., II no 39; Reichenb. et Schub., Lich. exs., no 86; Schaerer, Lich. Helv. exs., no 351; Stenhammar, Lich. Suec. exs., no 73 sup.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 29, fig. 7 (ad f. *radiatam* vergens); Cretzoiu in Inst. Cercetar. Experim. Forest., ser. 2, vol. 47, 1941, tab. 20, fig. 2; Fink in Contrib. United States Nation. Herb., vol. 14, pars 1, 1910, tab. 47, fig. B et Lich. Fl. United States, 1935, tab. 47, fig. A; Harmand, Lich. France, vol. 4, 1909, tab. 15, fig. 4; Lynge in Bergens Mus. Aarb., 1910, no 9, tab. 4, fig. 6; Magnusson, Fl. Skand. Busk- och Bladlav., 1929, tab. 2, fig. 12 (indistinct); Migula, Kryptog.-Fl. Deutschl., vol. 4, pars 1, 1929, tab. 2, fig. 2 (indistinct); Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 13, fig. 1.

Description — Lobes 0.5—1 mm broad, equally broad or somewhat broadening at the tips, either somewhat discrete or contiguous or overlapping.

Specimens examined.

Groningen: Groningen, III 1839, *Van Hall* (NBV); Haren, 12 VI 1845, c. ap. (NBV).

Drente: Beilen, 25 V 1943, *Wasscher*, transition to f. *rosulata* (Wasr).

Overijsel: Kampen, *Top* (L).

Gelderland: Groesbeek, 16 VIII 1869, *Van Hall*, c. ap. (NBV); Renkum-Heelsum, 1840, *Buse & Gildemeester-Buse*, c. ap. (NBV).

Utrecht: Driebergen, 4 IX 1868, *Oudemans*, c. ap. (U).

Noord-Holland: Nieuwer Amstel, Meerhuizen, I 1849, *Van der Sande Lacoste*, c. ap. (L).

Zuid-Holland: Leiden-'s-Gravenhage, *Perein*, c. ap. (NBV).

Zeeland: Walcheren, Arnemuiden, Sloedam, 1 V 1941, *Brakman*, c. ap., transition to f. *rosulata* (L); Walcheren, Veere, 24 IX 1951, *Barkman 2855* (L).

Noord-Brabant: Coudewater, 3 VII 1904, *Wakker*, c. ap. (L).

Limburg: Maastricht, *Franquinet*, c. ap. (Maastr.).

f. **radiata** (Ach.) Nyl. in Notis. Sällsk. F. Fl. Fenn. Förh., vol. 5, 1861, p. 111 — *Parmelia stellaris* var. *radiata* Ach., Lich. Un., 1810, p. 477 — *Physcia stellaris* var. *radiata*; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 689 et vol. 10, 1940, p. 655 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 79.

Iconography: Lynge in Vidensk. Selsk. Skrift., Mat.-Naturvid. Kl., vol. 1, 1916, tab. 3, fig. 5; Smith et Sowerby, Engl. Bot., vol. 24, 1807, tab. 1697 (uncertain).

Description — Lobes narrow, 0.2—0.5 mm broad, discrete and equally broad from centre to periphery, stellate. *Apothecia* with pruinose disc and entire margin.

Specimens examined .
Drente: Wijster, 20 V 1943, *Wasscher* (Wasr).
Noord-Holland: Nieuwer Amstel, Meerhuizen, I 1849, *Van der Sande Lacoste*, c. ap., not typical (NBV).

f. **rosulata** (Ach.) Nyl. in Notis. Sällsk. F. Fl. Fenn. Förh., vol. 5, 1861, p. 111 — *Parmelia stellaris* var. *rosulata* Ach., Lich. Un., 1810, p. 477 — *Physcia stellaris* var. *rosulata*; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 690 et vol. 10, 1940, p. 655 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 80.

Iconography: Lynge in Vidensk. Selsk. Skrift., Mat.-Naturvid. Kl., vol. 1, 1916, tab. 3, fig. 4 et in Rabenh., l. c., tab. 5, fig. 3.

Description — Lobes 1—1.5 mm broad, closely contiguous, broadened and fan-shaped at the tips and here frequently overlapping, becoming wrinkled and warty in the centre of the thallus. *Apothecia* with slightly pruinose or epruinose disc and entire to crenate margin.

Specimens examined.
Overijsel: Kampen, *Top*, c. ap. (L); Zwolle, XI 1908, *Lako*, c. ap. (L).
Gelderland: Renkum-Heelsum, 1840, *Buse & Gildemeester-Buse*, c. ap. (NBV).
Zeeland: Walcheren, Nieuw en St. Joosland, 23 VII 1946, *Brakman* (L).
Limburg: Maastricht, *Franquinet*, c. ap. (L).

Subsectio 2. Caesia (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma* sect. *Caesia* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 86; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus small to medium, 2—3(—5) cm in diam., closely appressed, light grey, lead-grey to bluish grey, without *isidia* or marginal cilia, but with laminal, whitish or blue-grey, maculiform *soralia*. Upper cortex K + yellow.

3. **Physcia caesia** (Hoffm.) Hampe in Fürnr., Naturh. Topogr. Regensburg, vol. 2, 1839, p. 250; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 600 et vol. 10, 1940, p. 651 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 86 — *Lichen caesius* Hoffm., Enum. Lich., 1788, p. 65 (non vidi) — *Parmelia caesia* Ach., Meth. Lich., 1803, p. 197; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 130; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 21.

Exsiccata: Arnold, Lich. Monac. exs., no 87, 88; Claud. et Harm, Lich. Gall. exs., no 74 (pro parte *Ph. dubia*); Cretzoiu, Lich. Roman. exs., no 40; Elenkin, Lich. Fl. Ross., no 117a, 117b; Floerke, Deutsche Lich., no 71; Malbranche, Lich. Normand., no 273; Rabenhorst, Lich. Europ., no 930; Räsänen, Lichenotheca Fenn., II no 42; Schaerer, Lich. Helv. exs., no 347 (pro parte); Stenhammar, Lich. Suec. exs., no 212.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 30, fig. 4; Dietrich, Deutschl. Kryptog. Gew., vol. 4, 1846, tab. 46 (discoloured); Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 21—23,

fig. 126—145; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 6, fig. 2; Migula, Kryptog.-Fl. Deutschl., vol. 4, pars 1, 1929, tab. 2, fig. 1; Rieber, Zur Flechtenfl. Ehingen, 1901, fig. infima sinistr.; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 14, fig. 6; Smith et Sowerby, Engl. Bot., vol. 15, 1802, tab. 1052; A. Zahlbr. in Engler-Prantl, Die natürl. Pflanzenfam., ed. 2, vol. 8, 1926, fig. 126A.

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate but becoming more irregular with age or in specimens fused together, medium-sized, averaging 2—4 cm in diam., closely attached to the substratum by rhizinae, deeply incised. Lobes rigid, long and narrow, 1—1.5 cm long and 0.5—1 mm broad, closely appressed, somewhat discrete to contiguous or overlapping, irregularly and richly pinnately branched, plane or concave or corrugated at the tips, becoming more or less strongly convex towards the centre, sometimes with small secondary laciniae which may cover the centre. Margins entire. Tips as broad as the remainder of the lobes or broadened an fan-shaped, rounded to crenate or incised. Upper surface white-grey, bluish grey to ash-grey, often darker towards the centre, dull, epruinose or slightly pruinose at the tips of the lobes, smooth but getting wrinkled or warty with age, either with or without inconspicuous whitish dots — no pseudocyphellae, properly speaking, since the upper cortex is not ruptured; the dots are due to the gonidial clusters being situated at various heights —, without *isidia* but with maculiform *soralia*. *Soralia* laminal, scattered over the upper side of the lobes but also close to the tips and therefore, when growing out, seemingly apical, globose, 0.8—2 mm in diam., coarsely grained, at first dark grey or bluish grey, later on more white. Lower surface of the lobes white or dirty white to brownish, dull, smooth, plane or somewhat concave, with simple or furcate, short dark rhizinae. *Microscopical description* — Upper cortex colourless except for a broad brownish outer zone, paraplectenchymatous, 35—65 μ. Gonidia bright green, spherical or broadly ellipsoidal, 7—12 μ, arranged in a continuous stratum or in clusters of 30—50(—60) μ, closely under the cortex or penetrating into it. Medulla colourless, white in reflected light, fairly densely plectenchymatous, 30—140 μ, composed of leptodermatous hyphae. Lower cortex colourless or with a narrow brownish exterior zone, very densely plectenchymatous, though sometimes tending to form a paraplectenchyma, 30—60 μ, gradually passing into the medullary stratum. *Apothecia* rare and, if extant, in small numbers only, laminal, sessile, cup-shaped to discoid, 0.8—1.5 mm in diam. Amphithecium of the same colour as the thallus, dull, smooth. Margin persistent, entire or slightly crenate. Disc plane, brown-black, dull, epruinose or covered with a light bluish pruina. Epithecium brown, hypothecium colourless to yellowish, with clusters of gonidia underneath. Hymenium colourless, 60—75(—90) μ. Asci cylindrical to clavate, 15—17 × 45—65 μ, 8-spored. *Spores* olive-brown, 2-celled, more or less constricted, ellipsoidal, straight or somewhat curved, with strongly thickened cell-walls at the septum and at the rounded apices, 8—9.5 × 15—18 μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnidia* rather rare, laminal, scattered over the lobes, single or in small groups of 2—3, visible as black dots, spherical, pyriform or irregularly shaped, 70—120 × 135—150 μ.

Perifulcrium colourless or yellowish brown, ostiolum black-brown. *Pycnoconidia* colourless, cylindrical, straight, ± 1 × 4—5 μ. *Chemical constituents* and *reactions* — Upper cortex K + yellow, Pd + slowly yellow; medulla K + yellow, Pd —. According to Zopf (Flechtenstoffe, 1907, p. 226, 415), *Ph. caesia* contains atranorin ($C_{19}H_{18}O_8$) and zeorin ($C_{30}H_{52}O_2$).

Ecology and distribution in the Netherlands. *Physcia caesia* in this country is predominantly a saxicolous species, but it is also very common on trees and occurs, more rarely, on lignum. It has been found on sandstone, granite, concrete, bricks, slates, roofing tiles and the like, whereas not infrequently it grows over adjoining mosses. Among the trees, of which *Betula, Fraxinus, Populus, Salix* and *Ulmus* may be enumerated, the latter is undoubtedly most favoured as a host. *Ph. caesia* certainly is extremely nitrophilous — both koniophilous and ornithokoprophilous — for it is one of the few species which really thrive on brick walls near human dwellings, on roofs of farm-yard sheds, or on the bark of dust-encrusted trees along country-roads. It is a common species throughout the country.

Distribution in Europe. The species abounds throughout Europe.

Remarks. On account of its notable globose soralia, *Ph. caesia* is not liable to be mistaken for any other grey *Physcia,* not even for *Ph. dubia* which, on bricks or tiles, strikingly often occurs in its company and even grows partly mixed with it. At times, however, *Ph. orbicularis,* belonging to the subsection *Obscura* and also possessing spherical soralia, may be so light-grey as to allow confusion. Very light-coloured thalli of *orbicularis,* however, turn distinctly green when moistened, whereas *caesia* changes only little in colour. Moreover, the underside of *orbicularis* is black, and the abraded soralia have a greenish hue. In *caesia,* on the contrary, the lower side is dingy white to brownish, and the abraded soralia are white. Finally, upper cortex and medulla of *orbicularis* never react upon K.

Variability. The arboreal occurrence of *Ph. caesia* seems to have attracted the attention to such an extent that the corticolous form was twice described: first as *Ph. caesia* var. *corticola* by Kullhem (in Notis. Sällsk. F. Fl. Fenn. Förh., vol. 11, 1871, p. 272), secondly as *Ph. caesia* f. *corticola* by Eitner (in 88 Jahresber. Schles. Ges. vaterl. Kult., (1910) 1911, p. 22). According to Art. 30 of the Rules of Botanical Nomenclature, the last-mentioned subdivisional epithet is illegitimate anyway. Though I have not seen the original specimens, it may be safely assumed that between them there will be no more appreciable difference, than between Kullhem's var. *corticola* and *Ph. caesia* itself.

Eitner (l. c., p. 22) also described a f. *pruinosa* which should be characterised in having densely caesio-pruinose apothecia, but here again I consider the difference negligible, since sometimes specimens may be found of which the older apothecia are epruinose, but the youngest show traces of a bluish pruina, thus forming a transition to the modification with permanently pruinose apothecial discs.

In Hedwigia, vol. 63, 1922, p. 320, Anders described f. *dendritica* and f. *panniformis,* neither of which in reality belong to the present species. The former was correctly recognised as belonging to *Ph. wainioi* (= *caesiella*)

by both Schade (note on the label) and Nádvorník (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 87), whereas Schade may be right in identifying f. *panniformis* also as *Ph. wainioi*. The material from herb. Anders which I have seen is rather poor.

Subsectio 3. Astroidea (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma* sect. *Astroidea* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 92; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus small to medium, 1—5 cm in diam., appressed to the substratum, white-grey, without marginal cilia, with warty *isidia* which may disintegrate and turn *sorediose*. Upper cortex K + yellow.

4. Physcia clementi (Sm.) Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1. 1935, p. 93 — *Lichen Clementi* Sm. in Smith et Sowerby, Engl. Bot., vol. 25, 1807, tab. 1779 — *Parmelia Clementiana* Ach., Lich. Un., 1810, p. 483; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129 — *Parmelia astroidea* var. *Clementiana*; Rabenh., Deutschl. Kryptog.-Fl., vol. 2, 1845, p. 63; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 21 — *Physcia Clementiana* Kickx, Fl. Cryptog. Flandres, vol. 1, 1867, p. 226; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 607 et vol. 10, 1940, p. 651 (ubi lit. et synon.).

Misapplications: Physcia astroidea (Clem.) Nyl. in Act. Soc. Linn. Bordeaux, vol. 21, 1856, p. 308; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 92.

Exsiccata: Claud. et Harm., Lich. Gall. exs., no 269; Desmazières, Pl. Cryptog. France, éd. 2, sér. 1, no 246; Erb. crittog. Ital., ser. 1, no 830; Harmand, Lich. Gall. rar., no 150bis; Hepp, Flecht. Europ., no 601; Körber, Lich. sel. Germ., no 303; Leighton, Lich. Brit. exs., no 324; Malbranche, Lich. Normand., no 171; Mougeot et Nestler, Stirp. Cryptog. Vogeso-Rhen., no 737; Schaerer, Lich. Helv. exs., no 610; Welwitsch, Cryptotheca Lusitana, no 104.

Iconography: Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 8, fig. 1; Smith et Sowerby, Engl. Bot., vol. 25, 1807, tab. 1779; Turner in Transact. Linn. Soc. London, vol. 9, 1808, tab. 13, fig. 1.

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate, 3—5 cm in diam., attached to the substratum by means of rhizinae, more or less deeply incised. Lobes flaccid, 0.5—1 cm long and 0.3—0.6 mm broad, closely appressed, contiguous or overlapping, richly pinnatifid, plane or somewhat corrugated. Margins entire. Tips broadened and fan-shaped, crenate to deeply incised. Upper surface of the lobes almost white to light ash-grey, dull, epruinose, smooth to wrinkled or strongly lengthways rugged, almost without *isidia* to more or less densely *isidiate*. *Isidia* white, or grey, papillary and short, 0.1—0.2 mm broad, bursting at their apices and becoming coarsely sorediose, eventually widening into irregular, crateriform, 0.5 mm wide *soralia*. The *soralia*, in their turn, may completely fuse into a continuous or areolate soredial crust which covers the whole upper side, only leaving free a narrow peripheral zone. Lower surface of the lobes

white to pale brown, dull, plane, with scattered whitish or brownish, short rhizinae. *Microscopical description* — Upper cortex colourless or brownish, paraplectenchymatous, 20—30 μ, sometimes hardly distinguishable owing to the gonidia. Gonidia bright green, spherical, 8—11(—15) μ, arranged in clusters, deeply penetrating into the upper cortex and almost reaching the surface. Medulla colourless, white in reflected light, more or less densely plectenchymatous, 45—70 μ, consisting of leptodermatous hyphae. Lower cortex brownish or colourless with a brownish exterior zone, densely plectenchymatous, with the hyphae mainly parallel to the surface, here and there with transitions to paraplectenchyma, 18—30 μ, very gradually passing into the medulla which makes it difficult to rate the thickness of both lower cortex and medulla separately. *Apothecia* laminal, sessile, cup-shaped to discoid, 1—2(—2.5) mm in diam. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, entire, later on deeply crenulate or sometimes sorediate. Disc plane, becoming corrugated with age, dark brown to almost black, naked or covered with a dense bluish grey pruina. Epithecium brownish, hypothecium yellowish with some clusters of gonidia underneath. Hymenium colourless, 90—95 μ. Asci cylindrical to clavate, 14—17 × 63—78 μ, 8-spored. *Spores* brown, 2-celled, little or not constricted, ellipsoidal, straight, with rounded or slightly acute apices, with strongly thickened cell-walls at the septum and at the apices, 7.5—9 × 17—22 μ, not infrequently sterile. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnidia* not observed. *Chemical reactions* — Upper cortex K + yellow (owing to atranorin?), Pd + slowly yellow. Medulla K + yellow, Pd —.

Ecology and distribution in the Netherlands. *Ph. clementi* is a mainly arboricolous species which has been found to occur on *Fagus* (!), *Fraxinus, Populus, Quercus, Salix, Ulmus* and fruit trees; only once (1942) a specimen, which I refer with some doubt to the present species, was collected on the (tiled?) roof of a barn. It may be observed, however, that Borrer (in Smith et Sowerby, l. c.) is stated to have found the species "on trees and tiled roofs in Sussex", that Crombie in his Lichenes Brittannici, 1870, p. 39, reports *Ph. clementi* to occur "Ad arbores et saxa...", whilst Nádvorník (in Stud. Bot. Cechoslov., vol. 9, 1948, p. 147) also mentions a find on a "toit de tuiles".

From the presence of such accompanying species as *Ph. tenella, Xanthoria candelaria, X. parietina* and *Candelariella vitellina,* as well as from my own experiences in Ticino (Switzerland), it appears that *Ph. clementi* is a nitrophilous species.

Going by the scanty material extant in the herbarium, it may be assumed that the species was rare already in former times. Except for two recent finds, all collections were made in the former century.

Distribution in Europe. In Europe the species has a pronounced western and southern range, having been reported from southern Ireland, southern and central England, Belgium, western Germany, France, southernmost Switzerland, Austria, Portugal, Spain, Sardinia, Italy and Yugoslavia.

Remarks. In 1807 Clemente de Royas (or: de Roxas Clemente?) published his *Parmelia astroidea* (Essayo sobre las variedades de la vid

comun que vegetan en Andalucia, 1807, p. 302). As may be inferred from the facts known, many years prior to his publication he had sent some specimens of a lichen to Turner in England which he had collected on olive-trees near Cadiz (cf. Turner in Transact. Linn. Soc. London, vol. 9, 1808, p. 147). This author thereupon made a description of the material (supplemented with collections from English localities) which, however, he was not to publish until 1808. In the mean-time he was preceded by Smith who in 1807 published his *Lichen Clementi*, referring to Turner's *Parmelia Clementi* mss. as a synonym.

Through the diligence and perseverance of Dr Tavares, I have been so fortunate as to be supplied with a typewrited copy of Clemente's description, from which it became instantly manifest that the species described by the latter has nothing whatever in common with that he had sent to England. Neither the description, nor the locality, nor the host-tree agree.

The first to misinterpret Clemente's species was Nylander (l. c., p. 308), as appears from his remark: "nec species sit autonoma, sed modo forma minor pro maxima parte leprose dissoluta praecedentis". He would not have considered *Parmelia astroidea* a sorediose form of *Ph. stellaris*, had he actually seen the original description.

Nylander was followed by Lynge who, not having seen Clemente's description either, briefly discussed the possibility of using the combination *Physcia Clementi*. Eventually he decided in favour of *Ph. astroidea*, advancing as his reasons that this was the name almost exclusively in use in German lichenological literature.

Since Clemente's description, which suggests some form of *Ph. pulverulenta*, may be equally inaccessible to others, the text as I received it is copied here in full.

..... **astroidea** — Thallo cartilagineo-membranaceo stellato glabro cinereo-fuscescenti, subtus fusco-nigricanti fibrilloso lacinis periphericis subimbricatis angustis multifidis adpressis planiusculis; scutellis concaviusculis tandem planis atris, margine subintegro albo-subfuscescente.

Thallus suborbicularis, laciniis quandoque margine subconnexis, humectatus colore servat. Scutellae magnitudine et forma ut in Parmelia leptalea, in centro subconfertae, nunquam pruinosae, omnino atrae; margine inflexo: seniores subcrenulatae, ob mutuam pressionem saepe irregulariter flexuosae, et nunquam convexae. Cir. Cazalla at truncos quercus.

Several authors regard the plant completely devoid of isidia or with only a small number of them as the typical form. Beside it there is supposed to exist a "*Ph. astroidea* var. *caricae* (Ach.) Colmeiro" which should be characterised in that the thallus is almost completely covered with an isidiate-sorediate crust. The first objection that can be raised against maintaining this variety is that it is perfectly clear from the descriptions by both Smith and Turner, as well as from Sowerby's drawing and, above all, from Turner's superb plate, that the type itself is strongly sorediate, which renders the introduction of a separate varietal epithet superfluous.

Besides, there is something more. The first use of the epithet *caricae* has always been ascribed to Acharius, but this author himself (Syn. Meth. Lich., 1814, p. 188) refers to *Parmelia Caricae*. Clement. Ensay. etc. in Add. p. 302. Unfortunately, it occurred too late to me that I might need a copy of the description of this *Parmelia caricae* as well, but even if I

would have had it, in this case it would be unwise to decide on the identity or non-identity from a description alone without having seen the material. Considering the trouble in securing a copy of the description of *P. astroidea,* the prospect of ever getting any authentic specimen does not seem very hopeful. However, if *Parmelia caricae* could be proved to be identical with *Lichen clementi,* and the date of publication of the former to be prior to that of the latter, the correct name for the present species would be *Physcia caricae.*

After having settled the matter of strongly sorediate plants, something remains to be said about little isidiate specimens. Lynge (l. c., p. 95) questions whether plants without isidia really exist, and if they do at all, he is inclined to consider them to belong to a related but separate species. He would not have come to this conclusion, had he known such South European specimens as are preserved in the Rijksherbarium: from Como, Italy, leg. ?; from Setubal, Portugal, leg. R. P. Valerio Cordeiro and issued in Harmand, Lich. Gall. rar., no 150bis; and from Olissip, Portugal, issued in Welwitsch, Cryptotheca Lusitana, no 104. Part of the specimens show numerous apothecia and most of them are notable in that they are almost devoid of isidia. Yet, their identity is beyond doubt. Furthermore, we possess some native material, one lot collected in 1842 by Van den Bosch near Zwake (island of Zuid-Beveland), the other in 1942 by Van Rossem near Lisse. In the Zwake collection one specimen is only sparingly isidiate, but some of the isidia have disintegrated, showing the characteristic crateriform soralia. The other specimen is almost devoid of isidia, possessing only a few soralia which reveal the identity of the species. The two specimens in the Lisse collection are very sparingly warty and show no soralia at all, which renders the identity somewhat doubtful. On account of their difference from other grey *Physciae,* however, I decided on their belonging to the present species.

The above may suffice to show that there is an appreciable variability as to the number of isidia and to the extent of the isidia turning sorediose. In this connection, too, it is of interest to draw the attention to *Ph. astroidea* f. *pollinifera* as described by Des Abbayes (in Bull. Soc. Sci. Natur. Ouest France, ser. 5, vol. 1, 1931, p. 81) which shows that even the outward appearance of the soralia and the size of the soredial granula are subject to some variability.

For a possible confusion of scantily isidiate specimens of *Ph. clementi* with other grey species, only those of subsection *Stellaris* are considered. *Ph. albinea* and *Ph. melops,* apart from being highly improbable for this country, may be told from *Ph. clementi* by the negative medullary reaction in the former, and the size and colour of the thallus in the latter. *Ph. biziana,* another species which is certain never to be found in Holland, may also be distinguished by the different medullary reaction upon K. In my opinion it is more especially with old and warty specimens of *stellaris* and *aipolia* that *clementi* may be confused. *Ph. stellaris* differs in the reaction of the medulla, as well as in the general appearance of the more convex lobes. *Ph. aipolia,* finally, may be told by the whitish pseudocyphellae and the thicker upper cortex.

It cannot be denied that densely sorediate *Ph. clementi* has some super-

ficial resemblance to such strongly sorediate forms with short and contiguous lobes as occasionally occur in *Parmeliopsis aleurites*. Closer investigation, however, shows that differences are numerous. The tips of the lobes are somewhat scabrous and at the same time shiny in *aleurites*, smooth and dull in *clementi*. The isidia of *aleurites*, though turning sorediose, never form crateriform soralia and often have a brownish colour unknown in *clementi*. Both species differ from each other in the structure of their upper and lower cortices, and *aleurites* has a thinner upper cortex than *clementi*. *P. aleurites* contains lobaric acid which accounts for the medulla staining orange-red when treated with Pd; in *clementi* the medulla remains unaltered. Still more differences may, of course, be disclosed when taking the apothecia into consideration, but the above may suffice to tell the species apart when sterile.

Specimens examined.

Groningen: Groningen, *Acker Stratingh* (L).

Overijsel: Kampen, *Top* (NBV); Kampen, Zandberg, *Top* (NBV); IJselmuiden, *Bondam* (L, NBV).

Utrecht: Huis ter Heide, 15 VII 1861, *Van Hall*, c. ap. (NBV).

Noord-Holland: Amsterdam, Amsteldijk, I 1849, *Van der Sande Lacoste* (L, NBV); Amsterdam, Sloten, I 1849, *Van der Sande Lacoste* (NBV).

Zuid-Holland: Leiden, *Van den Bosch* (*Körber*, Typenherbar in L); Lisse, Keukenhof, 30 VII 1942, *Van Rossem 288c*, identity uncertain (L).

Zeeland: Zeeland, no locality, *Van den Bosch*, c. ap. (NBV); Zeeuws-Vlaanderen, Kloosterzande, 5 IV 1952, *Walrecht* (L); Zuid-Beveland, no locality, *Van den Bosch*, c. ap. (NBV); Zuid-Beveland, Noorddijk, IV 1841, *Van den Bosch*, c. ap. (NBV); Zuid-Beveland, Zwake, VI 1840, *Van den Bosch*, c. ap. (NBV); V 1842, *Van den Bosch* (L).

Noord-Brabant: Teteringen, 1852, unio NBV (L).

Subsectio 4. Tenella (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma* sect. *Tenella* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 96; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus small, 1—2 cm in diam., loosely adhering to ascending, light grey to ash-grey, *sorediate* or *esorediate*, with usually long marginal cilia. Upper cortex K + yellow.

Key to the species.

1a. Thallus sorediate 2
2a. Soralia labriform . . . . . **7. Ph. tenella** (Scop.) DC. sensu Bitt.
2b. Soralia helmet-shaped, i. e. soredia produced in the interior of apical, inflated parts of the lobes . . . . **6. Ph. adscendens** (Th. Fr.) Oliv. sensu Bitt.
1b. Thallus without soredia, nearly always with apothecia **5. Ph. leptalea** (Ach.) DC.

5. Physcia leptalea (Ach.) DC. in Lam. et De Cand., Fl. Franç., ed. 3, vol. 2, 1805, p. 395; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 107; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 653 — *Lichen leptaleus* Ach., Lich. Suec. Prodr., 1798, p. 108 (pr. p.) — *Parmelia stellaris* var. *hispida* Fr., Lich. Europ. Reform., 1831, p. 82; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129 (pr. p.); Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 20 (pr. p.) — *Physcia hispida* var. *leptalea* A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 633 (ubi lit. et synon.).

Exsiccata: Desmazières, Pl. Cryptog. Nord France, no 146; Marcucci, Unio itin. cryptog., 1866, no XIX; Schaerer, Lich. Helv. exs., no 349, 562 (pr. p.); Welwitsch, Cryptotheca Lusitana, no 73.

Iconography: Cretzoiu in Inst. Cercetar. Experim. Forest., ser. 2, vol. 47, 1941, tab. 19; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 31, fig. 188; tab. 34, fig. 204—212; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 7, fig. 3 and 4; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 13, fig. 4.

Macroscopical description — Thallus foliaceous, growing in rosettes, indistinctly stellate, small, 1—3 cm in diam., fixed to the substratum by a few rhizinae, deeply incised. Lobes little flexible, about 1 cm long and 0.4—0.8 mm broad, loosely attached to ascending, clearly discrete from centre to circumference (probably in young specimens) or contiguous (in older thalli?), in either case as a rule with side-lobes growing irregularly entangled, richly and irregularly furcate or pinnately branched, plane or convex, ciliate. Margins entire. Tips broadened up to 1—1.2 mm, fan-shaped, incised. Cilia marginal and terminal, 1—2(—3) mm long (in very old thalli they may be much shorter), simple or furcate, pale at the base, brown towards the apex. Upper surface of the lobes almost white to light ash-grey, dull, smooth or faintly indented, in older specimens becoming more and more warty and rugged, epruinose, without *isidia* or *soredia*, with more or less conspicuous light-coloured pseudocyphellae. Lower side white with a brownish tinge, dull, with a few pale rhizinae which have brownish apices. *Microscopical description* — Upper cortex colourless except for a broad brownish exterior zone, densely plectenchymatous, with the hyphae predominantly perpendicular to the surface, in older parts of the lobes sometimes very indistinctly paraplectenchymatous, 40—60 μ, with numerous ruptures into which clusters of gonidia penetrate. Gonidia bright green, spherical, 8—13 μ, arranged in a continuous stratum or in clusters of 25—40 μ, closely under the upper cortex or reaching as far as the surface. Medulla colourless, white in reflected light, more or less densely plectenchymatous, 60—100 μ, consisting of mesodermatous hyphae. Lower cortex colourless or with a narrow brownish exterior zone, very densely plectenchymatous, with the hyphae more or less parallel to the surface, gradually passing into the medulla, 25—75(—90) μ. *Apothecia* nearly always extant, sometimes numerous, laminal and marginal, sessile or shortly pedicellate, cup-shaped to discoid, 3—5 or even 8 mm in diam. Amphithecium concolorous with the thallus, dull, smooth or slightly wrinkled. Margin persistent, entire or minutely crenulate. Disc plane, much corrugated and torn with age, black-brown, naked or light caesio-pruinose. Epithecium brown-yellow, hypothecium yellowish, with a layer of gonidia underneath. Hymenium colourless, 75—85 μ. Asci cylindrical or somewhat clavate, 12—18 × 58—70 μ, 8-spored. *Spores* brown, 2-celled, with strongly thickened cell-walls at the septum and the apices, not constricted in the middle or slightly so, ellipsoidal, straight or curved, with rounded apices, 8.5—9.5 × (16—)18—22 μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the tips. *Pycnidia* common, laminal, scattered over the lobes as black dots or warts, spherical, pyriform or of variable shape, 200—240 μ in diam. Perifulcrium brownish. Ostiolum brown-black. *Pycno-*

conidia colourless, cylindrical, straight, 0.8 × 4—5 μ. *Chemical constituents* and *reactions* — Upper cortex K + yellow (probably owing to atranorin), Pd + slowly lemon-yellow. Medulla K —, Pd —.

Ecology and distribution in the Netherlands. *Ph. leptalea* is an arboricolous species which has been found on a great variety of trees such as *Alnus, Betula, Fraxinus, Pinus* (!), *Populus, Quercus, Salix, Sambucus* and *Ulmus*, as well as on lignum. From herbarium specimens it is apparent that the species was rather common formerly, but it has almost disappeared nowadays and recent finds are extremely rare. In this respect it behaves totally different from its relatives *Ph. adscendens* and *Ph. tenella*. If air pollution is the only factor to be blamed for its disappearance, the best chances of refinding the species will be along the coast and in the northeastern part of the country.

Distribution in Europe. According to the literature records cited on p. 280—284, the species is reported to occur in nearly all European countries on the understanding that it is most abundant in southern parts of Europe, becoming rarer farther north. In Scandinavia *Ph. leptalea* has a decidedly southern distribution, whereas even in in Denmark only a few localities are known. Inaccessibility to sufficient Polish literature may account for the fact that *Ph. leptalea* seems to be missing in Poland. On the other hand, it is significant that for Czechoslovakia Nádvorník (1947, p. 79) explicitly states: "C'est une plante du Midi, elle sera à peine trouvée dans nos pays..."

Remarks. From De Candolle's material which I have examined, it appears that this author's conception of the species perfectly agreed with our modern views.

In Lynge's description (l. c., p. 107) *Physcia leptalea* is said to have no rhizinae, but some of the exsiccata cited by this author do have rhizinae, although sparingly. For the matter of that, the difference between rhizinae and cilia does not seem quite so essential.

In working up the material, I was several times in doubt about how to discriminate between *leptalea* and *stellaris*. Sure enough, if well-developed, *leptalea* may at once be told from *stellaris* by its long marginal cilia and by its ascending lobes growing more entangled. But those cilia are not always too well-developed, frequently looking much like some rhizinae projecting sideways from the lobes, as they are also known to occur in *stellaris*. Then, the conspicuous pseudocyphellae of *leptalea* may serve as a character in separating the species from *stellaris*, but, again, they are not always distinct. Finally, we might take refuge to microscopical features, but here the difference is no decisive either. The upper cortex in *leptalea* is densely plectenchymatous with an occasional indication of palisade plectenchyma or indistinct paraplectenchyma even, whereas in *stellaris* it is palisade plectenchyma occasionally inclining to paraplectenchyma. Though Lynge rightly ranged *Ph. leptalea* in his section *Tenella*, it cannot be denied that the species unmistakably shows affinity to *Ph. stellaris*. As is the case in several other groups of closely related species, it may be difficult, if not quite impossible, to distinguish between both species occurring in an area where conditions apparently thwart the normal growth.

Variability. In Ann. Mycol., vol. 40, 1942, p. 187 Erichsen de-

scribed *Ph. leptalea* var. *soralifera*. I examined the type specimen only to find that it is nothing but *Ph. tenella*, as was already pointed out by Nádvorník (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 79).

var. *albescens* described by Olivier (in Rev. Bot., vol. 12, 1894, p. 87) is a slight colour modification characterised by the thallus being "d'un beau blanc de lait".

Specimens examined (recent finds only are considered).

Zuid-Holland: Wassenaar, Meiendel, 21 VI 1939, *Groot* (VS); 31 X 1940, *Maas G. 106*, c. ap. (L).

Zeeland: Schouwen, Haamstede, 18 IX 1951, *Barkman 2833*, c. ap. (L); Walcheren, Oostkapelle, 30 IV 1951, *Walrecht*, c. ap. (L).

6. Physcia adscendens (Th. Fr.) Oliv. sensu Bitt. in Pringsh., Jahrb. wiss. Bot., vol. 36, 1901, p. 431; Oliv., Fl. Lich. Orne, vol. 1, 1882, p. 79 (quoad nomen); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 588; vol. 8, 1932, p. 595 et vol. 10, 1940, p. 650 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 96 — *Lichen hispidus* Schreb., Spicil. Fl. Lips., 1771, p. 126 (incerte, non vidi) — *Physcia hispida* Frege, Deutschl. Bot. Taschenb., vol. 2, 1812, p. 169 (incerte, non vidi); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 626 (pr. p.) et vol. 10, 1940, p. 653 (pr. p.) — *Parmelia stellaris* var. *hispida* Fr., Lich. Europ. Reform., 1831, p. 82 (incerte); Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129 (pr. p.); Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 20 (pr. p.) — *Physcia stellaris* var. *adscendens* Th. Fr., Lich. Scand., vol. 1, 1871, p. 138 (incerte).

Exsiccata: Arnold, Lich. exs., no 920; Claud. et Harm., Lich. Gall. exs., no 128; Hepp, Flecht. Europ., no 879; Leighton, Lich. Brit. exs., no 174; Kryptog. exs. Vindob., no 248 et 880; Magnusson, Lich. sel. scand. exs., no 413; Malbranche, Lich. Normand., no 71 (pr. p. *Ph. tenella*); Mougeot et Nestler, Stirp. Cryptog. Vogeso-Rhen., no 450 (pr. p.); Rabenhorst, Lich. Europ., no 378; Schaerer, Lich. Helv. exs., no 352.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tabl. 30, fig. 1 (indistinct) et 2; Bitter in Pringsh., Jahrb. wiss. Bot., vol. 36, 1901, tab. 12, fig. 58; Cretzoiu in Inst. Cercetar. Experim. Forest., ser. 2, vol. 47, 1941, tab. 18, fig. 2; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 31—32, fig. 183—186, 189—193; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 6, fig. 1, 3 et 4; Magnusson, Fl. Skand. Busk- och Bladlav., 1929, tab. 2, fig. 13 (indistinct); Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 13, fig. 5 (indistinct); Smith et Sowerby, Engl. Bot., vol. 19, 1804, tab. 1351.

Macroscopical description — Thallus foliaceous, originally growing in rosettes and more or less distinctly stellate, small, 1—2 or at most 3 cm in diam., later on fusing with other thalli into larger swards, fixed to the substratum by rhizinae and cilia, deeply incised. Lobes flexible, long and narrow or short and broad, 1—1.5 cm long, 0.3—1 mm broad, usually discrete from centre to circumference, growing entangled with age, richly and irregularly pinnately branched, plane at the tips, more convex towards the centre, ciliate, *sorediate*. Cilia marginal and apical, 1—2 mm long, simple, pale with brownish or blackish tips or dark brown all over. Not always are the cilia marginal, quite frequently they are also inserted on the

underside of the thallus, and equally often they behave as plain rhizinae, attaching the thallus to the substratum instead of projecting sideways into the air. Tips of the esorediate lobes little ascending and little or not broadened, rounded or incised; tips of the *sorediate* lobes ascending or upright, broadened to 1.5—2 mm, with a markedly inflated, helmet-shaped dilatation, at the inside of which the *soredia* are produced (*soralia forniciformia*). In the course of their development, these helmets become more and more lumpy, getting perforated and, eventually, completely disintegrating by the progress of soredial production. Upper side of the lobes white-grey, pale bluish grey to ash-grey, mostly paler at the tips and the helmet, dull, smooth, often becoming warty or wrinkled in the centre of older thalli, without *isidia*, sometimes slightly pruinose (especially in specimens growing on calcareous substrata), either with or without indistinct light dots, owing to the unequal depth of the clusters of gonidia under the cortex. Underside white, dull, more or less canaliculate, with a few rhizinae (and cilia). *Microscopical description* — Upper cortex colourless except for a broad brownish exterior zone, densely plectenchymatous, with the hyphae predominantly perpendicular to the surface, gradually passing into paraplectenchyma in older parts of the lobe, 45—60 μ, with numerous narrow ruptures into which the gonidia penetrate. Gonidia bright green, spherical, 9—15 (—18) μ, arranged in clusters or in a continuous layer of 20—50 μ, closely under the cortex, filling up the whole medullary stratum in the ascending lobes. Medulla colourless, white in reflected light, more or less densely plectenchymatous, 30—60 μ, but locally also lacking, consisting of mesodermatous hyphae. Lower cortex colourless, with narrow or broad brownish exterior zone, very densely plectenchymatous, with the hyphae fairly parallel to the surface, gradually passing into the medulla and sometimes connected with the upper cortex by strands, 60—120 μ. *Apothecia* rare and occurring in small numbers, laminal, sessile or pedicellate, cup-shaped to discoid, 1—2 mm in diam. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, entire or crenate. Disc plane, red-brown to black-brown, naked or light caesio-pruinose. Epithecium brown-yellow, hypothecium yellowish or colourless, with a layer of gonidia underneath. Hymenium colourless, 75—85 μ. Asci cylindrical to clavate, 10—16 $\times$ 54—65 μ, 8-spored. *Spores* olive-brown, 2-celled, little constricted in the centre, ellipsoidal, straight or curved, with strongly thickened cell-walls at the septum and the rounded apices, 7—9 $\times$ 15—18 μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnidia* rather common, laminal, scattered over the lobes, single or in small groups, visible as small black warts, spherical, ellipsoidal or pyriform, 50—110 $\times$ 100—140 μ. Perifulcrium colourless or brownish. Ostiolum brown-black. *Pycnoconidia* colourless, cylindrical, straight, $\pm$ 0.8 $\times$ 3.5—4 μ. *Chemical reactions* — Upper cortex K + yellow (owing to atranorin?), Pd + more or less vivid lemon-yellow, less distinct in dark thalli. Medulla K —, Pd —.

Ecology and distribution in the Netherlands. *Ph. adscendens* is equally common on stony substrata as on the bark of trees or the wood of fences and the like. It has been found on roofing tiles, bricks, sandstone, masonry, concrete, as well as on *Acer*, *Aesculus*, *Betula*, *Fagus*, *Platanus*, dead twigs of *Picea*, *Quercus*, *Salix* and *Sorbus*.

Most favoured host-trees, however, are *Populus, Ulmus* and fruit trees. It prefers exposed habitats rich in nitrogen compounds, and in fact does not shun the vicinity of human dwellings. One of our commonest species.

Distribution in Europe. The species is common all over Europe.

Remarks. It appears from the ample and critical considerations by Lynge (l. c., p. 96) how complicated and inextricable the synonymy of this species is. Yet, we should not, in trying to escape the difficulties, omit the names of the early authors. The writing, for instance, of *Ph. adscendens* Bitter has no nomenclatural status since it is illegitimate. The first author from whom the epithet *adscendens* originates is Th. Fries. To be sure, this author refers to his father, Elias Magnus Fries, but, as pointed out by Lynge, Fries's *Parmelia stellaris* var. *adscendens* (in Summa Veg. Scand., sect. 1, 1846, p. 105) is a nomen nudum. The first to make the combination *Ph. adscendens* has been Olivier, but it is clear that this author had a wider conception of the species, for our genuine *adscendens* is called *adscendens* var. *tenella* by him: "laciniures à extrémitées recourbées en forme de capuchon..." Eventually, it was Bitter (l. c.) who had a clear comprehension of the confusion showing the difference between *adscendens* and *tenella.*

Though Schreber's *Lichen hispidus* might have been the first binomial used for the present species, Lynge was perfectly right in entirely disregarding it. It is no use indeed to try to reintroduce such a highly uncertain epithet instead of another which has become widely familiar and established. Moreover, the authentic material of *Lichen hispidus* seems to have gone lost; it is not in the München herbarium, as I have been informed.

As already stated by Lynge (l. c., p. 101), scrupulous observation is needed in distinguishing *Ph. leptalea* from young specimens of *Ph. adscendens* whose helmets have not yet developed. The only anatomical difference seems to be in the upper cortex which in older parts of the lobes turns more distinctly paraplectenchymatous in *adscendens* than in *leptalea.*

On the other hand, the helmets of *adscendens* may in such a manner be affected and corroded by the soredial production as to deceivingly resemble the labriform soralia of *tenella.*

In this connection it may be remembered that Anders (Strauch- u. Laubfl. Mitteleurop., 1928, p. 198) actually considered *adscendens* and *tenella* (as well as *leptalea*) to be mere forms of one and the same species. Even to-day this belief is occasionally upheld, and I fully admit that under circumstances it may be exceedingly difficult to tell both species apart. In this connection I may also refer to Kusan's remark in Hedwigia, vol. 74, 1935, p. 296. Anatomically I can find no appreciable difference, but the two species differ in the development of their soralia. Although Bitter (l. c., p. 432—433) gave a description of these organs, there is a detail which I wish to be stressed more explicitly.

When in *tenella* the soredia are being formed, medulla and lower cortex alike are destroyed, whereas the upper cortex, arching upwards, holds out longest. This results in the sorediferous part of the lobe showing an oblique face which, owing to the vaulting of the upper cortex, may become some-

what concave, but never becomes a cavity. A longitudinal section of such a lobe is well depicted in fig. 2 of Bitter's paper.

The soredial production in *Ph. adscendens* is initiated by the appearance of a slit at the very tip of the lobe on the borderline between upper and lower cortex. As the slit widens, partly through the tearing apart of the tissue of both upper and lower cortex, partly also somewhat at the cost of the lower cortex, the upper side of the tip of the lobe starts arching upwards, eventually causing a considerable swelling. The soredia are produced in the interior of the swelling, consuming in the process all the medullary tissue available, but both upper and lower cortex remain untouched. Only in much later stages the upper cortex becomes perforated, and gradually crumbles away before the destructive action of the soredial production, soon followed by the lower cortex. It is in such a stage, as already referred to above, that the sorediferous part of the lobe very much resembles the lip-shaped soralium of *Ph. tenella*. Generally, however, there are at least a few lobes in a less advanced stage, showing the critical points which enable us to distinguish *tenella* (sorediferous part of the lobe on a solid, slanting face, and the lower cortex bordering at the sorediose mass) from *adscendens* (sorediferous part within an inflated cavity and the lower cortex clean-cut, with no soredia visible at its margin).

Variability. Specimens growing horizontally usually retain their orbicular form, but in very old specimens the centre may die off, leaving a ring-shaped thallus. Possibly this is the stage called f. *orbicularis* by Bouly de Lesdain (Rech. Lich. Dunkerque, 1910, p. 109).

Thalli exposed to the sun are more white, whereas plants from shaded habitats are more ash-grey.

Pruinose thalli do occur, in contradistinction to Lynge's statement (l. c., p. 100), but they are rare and only occur on concrete or masonry.

In old specimens, after soredial production has entirely consumed the apical helmets, the remainder of the lobes may become plane or concave or even curl upwards at their tips in imitation of the sorediferous lobes in *Ph. tenella*. Perhaps this is f. *distracta* Lettau as described in Hedwigia, vol. 52, 1912, p. 253, but it is difficult to ascertain the identity without having seen the authentic material which at the moment is not available (Mattick in litt.).

As to the general habitus and the width of the lobes, this species may vary not inconsiderably, but I shall refrain from describing forms.

Some more forms have recently been described by Nádvorník in Stud. Bot. Cechoslov., vol. 8, 1947, p. 78 and in vol. 9, 1948, p. 147.

7. **Physcia tenella** (Scop.) DC. sensu Bitt. in Pringsh., Jahrb. wiss. Bot., vol. 36, 1901, p. 431; DC. in Lam. et De Cand., Fl. Franç. ed. 3, vol. 2, 1805, p. 396 (quoad nomen); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 101; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 655 (ubi lit.) — *Lichen hispidus* Schreb., Spicil. Fl. Lips., 1771, p. 126 (incerte, non vidi) — *Lichen tenellus* Scop., Fl. Carniol., ed. 2, vol. 2, 1772, p. 394 (incerte) — *Physcia hispida* Frege, Deutschl. Bot. Taschenb., vol. 2, 1812, p. 169 (incerte, non vidi); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 626 (pr. p.) et vol. 10, 1940, p. 653 (pr. p.; ubi lit.

et synon.) — *Parmelia stellaris* var. *hispida* Fr., Lich. Europ. Reform., 1831, p. 82 (incerte); Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129 (pr. p.); Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 20 (pr. p.).

Exsiccata: Floerke, Deutsch Lich., no 73; Havås, Lich. Norveg. occid., no 111; Malbranche, Lich. Normand., no 170 (pr. p.); Reichenb. et Schub., Lich. exs., no 37; Stenhammar, Lich. Suec. exs., no 212 inf. (pr. p.).

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 29—30, fig. 172—182; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 7, fig. 1—2; Magnusson, Fl. Skand. Busk- och Bladlav., 1929, tab. 2, fig. 14.

Macroscopical description — Thallus foliaceous, growing in rosettes when young and more or less stellate, small, 1—2 cm in diam., later on fusing with other thalli into large, irregular swards, attached to the substratum by rhizinae and cilia, deeply incised. Lobes rather flexible, long and narrow or short and broad, up to 1 cm long and 0.2—1 mm broad, clearly discrete from centre to circumference or somewhat contiguous in forms with broad lobes, frequently covering each other, growing entangled with age, richly and irregularly furcate or pinnatifid, plane at the tips, more or less convex towards the centre of the thallus, ciliate, *sorediate*. Cilia marginal and apical, 0.5—1 or even 2 mm long, simple or furcate, pale with dark tips or dark all over. Esorediate lobes chiefly at the circumference of the thallus, loosely attached, with little or not broadened, crenate or incised tips. Sorediate lobes in young specimens only in the centre of the thallus, later on occurring all over the thallus, ascending, with fan-shaped, up to 1.5 or 2 mm broad, concave or flexuous tips. Upper surface of the lobes light grey to ash-grey, dull, smooth or becoming somewhat indented or wrinkled in the centre of the thallus, without pruina or *isidia*. *Soralia* lip-shaped, apical, white or greenish white. Owing to the corrosive soredial production, the lobes are gradually worn away farther backwards, so that the soralia, originally situated at the tips of the side-lobes, recede as far back as the main lobe, making the impression of being maculiform. Finally, they may fuse into larger sorediate complexes. Under surface of the lobes white, dull, more or less canaliculate, sparingly set with rhizinae and cilia. *Microscopical description* — Upper cortex colourless except for a broad brownish exterior zone, densely plectenchymatous in the youngest parts of the lobes, afterwards becoming paraplectenchymatous, 25—60 μ, here and there interrupted by clusters of gonidia. Gonidia bright green, spherical, 7—15(—18) μ, arranged in clusters or in a continuous layer of 30—60 μ, closely under the upper cortex or reaching the surface, scattered throughout the medullary layer in the ascending lobes or even occurring under the lower cortex. Medulla colourless, white in reflected light, more or less densely plectenchymatous, 20—70 μ, consisting of meso-leptodermatous hyphae. Lower cortex colourless or with a narrow brownish exterior zone, very densely plectenchymatous, gradually passing into the medulla, 27—60 μ. *Apothecia* common and usually in great numbers, laminal, sessile or shortly pedicellate, cup-shaped to discoid, 1—3(—3.5) mm in diam. Amphithecium of the same colour as the thallus, dull, smooth, once or twice seen with a rhizine. Margin persistent, entire

but becoming crenate or lobate or even sorediate. Disc plane or wavy, dark brown to almost black, epruinose or, very rarely, pruinose in young apothecia. Epithecium brownish, hypothecium colourless, with clusters of gonidia underneath. Hymenium colourless, 60—85 μ. Asci cylindrical to clavate, 12—15(—18) × 54—75 μ, octosporous. *Spores* olive-brown, 2-celled, more or less constricted, ellipsoidal, straight or somewhat curved, with strongly thickened cell-walls at the septum and the rounded apices, 9—10(—11) × (15—)17—19(—21) μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnidia* common, laminal, single or in small groups, visible as black warts, pyriform or ellipsoidal, 90—155 × 180—195 μ. Perifulcrium brownish to brown-black. Ostiolum brown-black. *Pycnoconidia* colourless, cylindrical, straight, ± 0.8 × 3—3.5 μ. *Chemical constituents* and *reactions* — Upper cortex K + yellow, Pd + more or less vivid lemon-yellow. Medulla K —, Pd —. According to Zopf (Flechtenstoffe, 1907, p. 226 and 415), *Ph. tenella* would contain atranorin ($C_{19}H_{18}O_8$), but it is not certain whether Zopf already distinguished between *Ph. tenella* and *Ph. adscendens*.

Ecology and distribution in the Netherlands. Occurring on much the same places as *Ph. adscendens*, in whose company it is usually found, *Ph. tenella* is even more abundant than that species.

Distribution in Europe. Common throughout Europe, though Nádvorník's remark (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 78) shows that the species locally may be not so common as *Ph. adscendens*.

Remarks. Nomenclaturally *Ph. tenella* offers much the same difficulties as *Ph. adscendens*, and it is with good reason that Lynge wrote (in Vid. Selsk. Skr., Mat.-Naturvid. Kl., vol. 1, 1916, p. 39) "The synonymy of this species is very intricate and the priority cannot be decided without a study of the authentic specimens of early authors." As for the authentic material of *Lichen tenellus*, I have been informed that it is not present in the herbarium in Pavia. The original diagnosis hardly gives a clue and rather suggests that Scopoli might have described a mixture of *Ph. tenella* and *adscendens*, the words "apice dilatata, ... tumida" referring to the latter, but "crenata" and "reflexa" more to the former, although it cannot be denied that in very old thalli of *adscendens* the tips of the sorediferous lobes may be reflexed.

There is no doubt that the second author, De Candolle, in making the combination *Ph. tenella*, entirely misunderstood the species as is perfectly clear from his diagnosis: "... divisés en lobes rameux, obtus, relevés en voûte...". The material in Herb. De Candolle is a mixture of *Ph. adscendens*, some *leptalea* and *stellaris*. Yet, it would be wrong to omit the author's name, since it is the combination that matters, not the material.

The marginal cilia in old specimens and in plants occurring in exposed habitats may be very short if not lacking altogether which, to a highly confusing extent, makes *tenella* resemble species of the *Tribacia*-group. Lynge accordingly remarks "Schwieriger ist die Unterscheidung von *Physcia dubia*" (l. c., p. 104). As to the difference, I may refer to that species.

Very young specimens of *tenella* in which the soredia have not yet developed may be mistaken for *leptalea*. A good character is the upper

cortex which in *tenella* soon becomes paraplectenchymatous, but remains plectenchymatous or, at the most, turns very indistinctly paraplectenchymatous in *leptalea*.

Old thalli of *tenella* may also greatly resemble worn-out and corroded thalli of *adscendens*, but it seldom happens that one cannot find some less advanced lobes showing the specific characters as expressed under *Ph. adscendens* (p. 238). As an auxiliary character may be regarded the apothecial disc which is nearly always naked in the case of *tenella*, and usually but not always pruinose in *adscendens*. For the rest, not too much importance can be contributed to this point of difference, since the presence of apothecia, at least in this country, is not a rule, especially not in *adscendens*. That is why dimensions of spores also are less useful. Moreover, I have come to results contrary to those mentioned by Lynge. On an average it is exactly of *tenella* that I have found the spores to be somewhat longer and broader.

As to the colour of the upper side of the thallus, I cannot as far as the Dutch material is concerned confirm the statement by Lynge (l. c., p. 101) that *adscendens* should be lighter than *tenella*; the reverse is quite as common.

Variability. As to the ratio of length and width of the lobes, the present species is fairly variable. Also the length of the cilia, the soralia, as well as the extent of the lobes being consumed by soredial production are subject to variability, and some forms have been described accordingly. A slight modification is f. *subbreviata* Nyl. (in Flora, vol. 65, 1882, p. 456) which has short, broad, somewhat ascending lobes.

In Ann. Mycol., vol. 40, 1942, p. 186 Erichsen described f. *pseudisidiata* and var. *revoluta*. The former is characterised by the production of coarse-grained soredia, whereas the soralia, after having consumed the side-lobes, soon turn to the main lobes. In var. *revoluta* the soralia are broad and strongly reflexed. I have seen the authentic specimens.

Some more forms have been described by Nádvorník in Stud. Bot. Cechoslov., vol. 9, 1948, p. 147 (var. *astroioides*) and p. 148 (f. *anaptychioides*).

In the same journal vol. 8, 1947, p. 78, Nádvorník mentions a f. *perisidiosa* which he ascribes to Erichsen in Ann. Mycol., 1942, p. 187. Here Erichsen enumerates his *Ph. perisidiosa* which he had described in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 57, considering it related to *Ph. pulverulenta*. Apparently, f. *perisidiosa* is to be taken for a slip, since *Ph. perisidiosa* again occurs in Nádvorník's paper on p. 120 as a basinym for a new combination.

Subsectio 5. Tribacia (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma* sect. *Tribacia* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 110; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus small to medium, 2—4 cm in diam., appressed to loosely attached, with the tips of the lobes usually free from the substratum or ascending, light grey to ash-grey, without cilia or *isidia, sorediate*. Upper cortex K + yellow.

Key to the species.

1a. Medulla K + yellow. Pseudocyphellae distinct . . . **8. Ph. wainioi** Räs.
1b. Medulla K —. No pseudocyphellae 2
2a. Lobes comparatively narrow, margin entire, soralia apical and labriform **9. Ph. dubia** (Hoffm.) Lettau
2b. Lobes comparatively broad, margin crenate, soredia marginal, sometimes confluent, never labriform . . . . . **10. Ph. tribacia** (Ach.) Nyl.

8. Physcia wainioi Räs. in Medd. Soc. F. Fl. Fenn., vol. 46, 1921, p. 166; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 703 — *Physcia tribacoides* var. *caesiella* Bouly de Lesd. in Bull. Soc. Bot. France, vol. 53, 1906, p. 515; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 696 (ubi lit.) — *Physcia caesiella* (Bouly de Lesd.) Suza, Zajémavé nálezy lisejniku v Ceskoslovensku, 1929, p. 9—11 (non vidi); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 117; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 651.

Iconography: Dahl in Nytt Mag. Naturvid., vol. 78, 1938, p. 133.

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate when young, later on more irregular, rather small, 1.5—3 cm in diam., merging with other thalli into larger expanses, attached to the substratum by rhizinae, deeply incised. Lobes fairly rigid, long and narrow, 0.5—1 cm long, 0.5—0.8 mm broad, closely appressed, somewhat discrete to contiguous, richly and irregularly pinnately branched, plane to somewhat corrugated. Margins entire or faintly undulate and notched. Tips broadened up to 1 mm, crenulate to deeply incised. Upper surface light grey to ash-grey with a brownish purple hue towards the centre of the thallus, dull, smooth, without pruina or *isidia*, but with numerous whitish, irregularly shaped pseudocyphellae, *sorediate*. *Lip-shaped soralia* marginal and apical, little raised, 0.4—0.8 mm broad, whitish. By further expansion over the upper surface of the lobe they may seem laminal. *Maculiform soralia* rather rare, laminal, whitish and as broad as the labriform soralia. Lower surface dingy white to brownish, dull, smooth, plane, more or less covered with black-brown, simple or furcate rhizinae. *Microscopical description* — Upper cortex colourless with a yellow-brown outer zone, paraplectenchymatous, 65—90 μ, with numerous ruptures (pseudocyphellae). Gonidia bright green, broadly ellipsoidal to spherical, 6—9 × 7—16 μ, arranged in more or less dense clusters of 30—60 μ. Medulla colourless, white in reflected light, densely plectenchymatous, 30—70 or even 120 μ, composed of lepto-mesodermatous hyphae. Lower cortex colourless or with a narrow brownish outer zone, very densely plectenchymatous, with the hyphae mainly arranged in a direction parallel to the surface, (24—)30—60 μ, more or less gradually passing into the medulla. *Apothecia* and *pycnidia* not observed. *Chemical constituents* and *reactions* — Upper cortex K + yellow, Pd + yellow. Medulla K + yellow, Pd —. The staining of the thallus on application of K may point to the presence of atranorin.

Ecology and distribution in the Netherlands. The species is reported to grow on rock as well as occasionally on trees or mosses (Dahl in Nytt Mag. Naturvid., vol. 78, 1938, p. 135 and Nádvorník in Stud. Bot. Cechoslov., vol. 8, 1947, p. 87). I collected my specimens from a granite boulder only little above water level of the IJselmeer.

It is probably only because of the lack of natural substrata suitable

for this species that *Ph. wainioi* is rare in our country. Since granite and basalt are mainly used for the reinforcement of our dikes, it is here that the species should be looked for.

Distribution in Europe. The find of *Ph. wainioi* in Holland is of some interest in relation to its distribution in Europe. As may be gathered from the paper by Schade (in Beih. Bot. Centralbl., vol. 58B, 1938, p. 55—99), the majority of localities were up till his time reported from areas south of latitude 51° N., namely 15 from Saxony, 37 from Czechoslovakia, 1 from Galicia as well as Ukrainia, 13 from Hungary, 3 from the Transsylvanian Alps, 4 from the Alps (Styria, southern Tyrol, Switzerland), 5 from France. North of this latitude only three more localities were recorded, viz. 2 in Germany (Brandenburg) and 1 in Sweden (Uppland). In the light of our present knowledge, however, it is obvious that this 51° line is quite meaningless in connection with the distribution of the species. It may suffice to quote some authors without going into further detail of the great number of localities mentioned by them. They are Ahlner (in Svensk Bot. Tidskr., vol. 35, 1941, p. 269), Albertson (in Act. Phytogeogr. Suec., vol. 20, 1946, p. 223), Christiansen (in Bot. Tidsskr., vol. 48, 1946, p. 84), Dahl (l. c., p. 135—136), Degelius (in Nytt Mag. Naturvid., vol. 78, 1938, p. 290; Uppsala Univers. Årsskr., 1939, no 11, p. 198; Svensk Bot. Tidskr., vol. 36, 1942, p. 47; ibidem, vol. 38, 1944, p. 61; ibidem, vol. 39, 1945, p. 41), Duvigneaud (in Bull. Soc. Roy. Bot. Belg., vol. 70, 1938, p. 167), Erichsen (in Ann. Mycol., vol. 40, 1943, p. 187), Gelting (in Bot. Tidsskr., vol. 44, 1938, p. 358; ibidem, vol. 45, 1941, p. 408), Hasselrot (in Bot. Notis., 1942, p. 305), Håkanson (in Svensk Bot. Tidskr., vol. 44, 1950, p. 229), Magnusson (in Bot. Notis., 1942, p. 18; Ark. f. Bot., vol. 33A, 1946, no 1, p. 142), Räsänen (in Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 12, 1939. no 1, p. 96). Certainly, the species is widely distributed in Europe and it may be only a matter of time before it will be recorded from such countries as Italy, Iberian Peninsula, Great Britain and Ireland.

Remarks. Until Dahl (l. c., p. 131) had shown the identity of *Ph. caesiella* and *Ph. wainioi*, the species was commonly known under the former epithet.

On comparison of the specimens found by me with the description given by Lynge, it appears that scattered over the lobes there are a few very distinct laminal soralia which were not mentioned by that author. One need not wonder at this discrepancy, since two different types of soralia are also known in other species of this subsection, viz. in *Ph. intermedia*. *Ph. teretiuscula*, too, is reported to have apical lip-shaped soralia, but "... mitunter beobachtet man auch ganz kleine, flächenständige Warzensorale" (Lynge, l. c., p. 119). Very convincing pictures of this type of soralia in *teretiuscula* may moreover be found in Galløe's outstanding work Natural History of the Danish Lichens, vol. 8, 1950. tab. 26 and 28. It is very interesting, therefore, to learn that Dahl (l. c., p. 133) and Degelius (in Nytt Mag. Naturvid., vol. 78, 1938, p. 290) also found laminal soralia in *Ph. wainioi*. In contrast to Degelius's assumption, however, I consider *Ph. wainioi* perfectly able to develop genuine laminal soralia which are not the result of an extended erosive action of the marginal

soralia, since I have seen the former without any connection whatever with the latter.

On account of the type of the soralia and the anatomical features of the apothecium, especially the paraphyses, which would resemble those found in subsection *Caesia,* rather than those in subsection *Tribacia,* Dahl refers *Ph. wainioi* to the former subsection. As to the paraphyses, I have not been able to observe any difference. With regard to the terminal soralia, Dahl remarks that they are not of the lip-shaped type, since "they leave the cortex of the under side intact to the very apex of the lobes". True, but irrelevant. According to Du Rietz's definition (in Svensk Bot. Tidskr., vol. 18, 1924, p. 380), labriform soralia "entstehen apikal an der Spitze der Lappen ..., vergrössern sich ... als eine plane oder konkave Fläche, welche das obere und das untere Ende der nichtsorediösen Rindenpartien auseinanderschiebt". This is wat happens in *Ph. wainioi,* only the labriform soralia are not confined to the tips of the lobes, but develop on the margins as well. In an early stage of the soralium, the upper cortex bulges and continues to move away from the lower cortex so as to form a lip which sooner or later curls upward. The lip may remain visible for some time. In other cases it is consumed very quickly by the soredial production which makes the labriform soralium resemble a maculiform one, the more so, since the soralium tends to shift its originally vertical position into a horizontal one. However, apart from the question what name might be applied to this type of soralia, it should be borne in mind that this type is common in subsection *Tribacia,* whereas it is not found in subsection *Caesia.*

In the laminal maculiform soralia, the pseudocyphellae and the general outward appearance *Ph. wainioi* resembles very much *Ph. caesia.* The latter, however, has more globose soralia and lacks the lip-shaped soralia. From *dubia* the species may be told by its pseudocyphellae, the thicker upper cortex and the positive reaction of the medulla upon K.

Specimen examined.
Gelderland: Hoef, 25 X 1941, *Maas G. 1660* (L).

9. **Physcia dubia** (Hoffm.) Lettau in Hedwigia, vol. 52, 1912, p. 254; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 110 (exclus. f. *lata*); A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 652 (exclus. f. *lata*) — *Lobaria dubia* Hoffm., Deutschl. Fl., vol. 2, 1795, p. 156 — *Physcia caesia* var. *dubia* (Hoffm.) Th. Fr., Lich. Scand., vol. 1, 1871, p. 141; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 605 (ubi lit. et synon.) — *Physcia dubia* f. *angusta* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 116.

Exsiccata: Arnold, Lich. exs., no 429, 745, 787, 787b; Floerke, Deutsche Lich., no 72; Funck, Cryptog. Gew. Fichtelgeb., no 417 (pr. p. *Ph. caesia*); Havaas, Lich. Norveg., no 110; Kryptog. exs. Vindob., no 2290; Leighton, Lich. Brit. exs., no 266; Mougeot et Nestler, Stirp. Cryptog. Vogeso-Rhen., no 447.

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 24—25, fig. 146—152; Lynge in Vid. Sellsk. Skr., Mat.-Naturvid. Kl., vol. 1, 1916, tab. 2, fig. 3 et in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9,

pars 6/1, 1935, tab. 9, fig. 1, 4; Rieber, Zur Flechtenfl. Ehingen, 1901, fig. infima dextr. (incerte).

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate, becoming more irregular with age, rather small, 1.5—3 cm in diam., fusing with other thalli into larger swards, attached to the substratum by rhizinae, deeply incised. Lobes fairly flexible, long and narrow, 0.5—1.5 cm long, 0.4—0.8 mm broad, closely appressed, contiguous or overlapping, richly and irregularly furcate or pinnatifid, plane at the tips, more or less convex towards the centre. Margins entire. Tips not or slightly broadened, crenate to strongly incised, usually ascending. Upper side of the lobes white-grey to ash-grey, dull, epruinose or with a faint whitish pruina, smooth or wrinkly-rugged, without *isidia, sorediate. Soralia* labriform, terminal at the tips of the side lobes, later on also at the main lobes, short, dark grey to white, in the course of their development destroying the side lobes which shorten gradually, and eventually reaching the main lobes. This process results in the soralia uniting into a broad, wavy, sorediose fringe bordering the main lobes. Lower surface of the lobes white to dirty white, dull, smooth, plane at the tips, growing more canaliculate towards the centre of the thallus, with scattered, pale or brownish, simple or furcate rhizinae. *Microscopical description* — Upper cortex colourless except for a broad exterior zone which again is covered with a crumbly layer, paraplectenchymatous, 40—60 μ. Gonidia bright green, spherical, (6—)10—15(—18) μ, arranged in dense clusters or in a continuous stratum of 40—90 μ, closely under the upper cortex, in places penetrating into it. Medulla colourless, white in reflected light, more or less densely plectenchymatous, (20—)30—60(—120) μ, composed of mesodermatous hyphae, scarcely marked off from the lower cortex. Lower cortex colourless or with a narrow brownish outer zone, very densely plectenchymatous, 30—75 μ; very rarely the exterior zone is seen to form a paraplectenchyma. *Apothecia* very rare, not found any more in recent times, laminal, sessile, cup-shaped to discoid, 1.5—2.5 mm in diam. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, entire or somewhat crenulate. Disc plane, black-brown, epruinose. Epithecium brown-yellow, hypothecium colourless to yellowish, with clusters of gonidia underneath. Hymenium colourless, about 70 μ. Asci clavate, 12—14 × 45—60 μ, octosporous. *Spores* olive-brown, 2-celled, not or little constricted in the centre, ellipsoidal, straight or fabiform, with strongly thickened cell-walls at the septum and the rounded apices, 6—8 × (15—)17—20 μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnidia* not observed. *Chemical reactions* — Upper cortex K + yellow (presumably owing to atranorine), Pd + slowly yellow. Medulla K—, Pd—.

Ecology and distribution in the Netherlands. In a few cases *Ph. dubia* has been found on a wooden fence, once on the bark of *Ulmus* and once on that of *Acer*. Otherwise it is a saxicolous species which has been collected on bricks, roofing tiles and granite. In nature it is often found in company of *Ph. caesia*, and, like this species, *dubia* does not shun the neighbourhood of human dwellings. I have collected fine specimens in the centre of towns and once on a factory-wall near a railway-yard. From its usual substratum the species may grow

over mosses. *Ph. dubia* is far from common in this country, even if it is true that the species is liable to be easily overlooked. In the old collections it is poorly represented, having been inserted as *Ph. caesia.*

Distribution in Europe. When collecting data for its distribution in Europe, I failed to find records of the occurrence of *Ph. dubia* in Finland, Ireland, Great Britain, Poland, U. S. S. R., Roumania, Portugal, Spain and Italy. There seems to be no plausible reason, however, why the species should not be found in these countries as well.

Remarks. *Physcia dubia* is a difficult species about which there is still much confusion. Since I long expected closely related *Ph. tribacia* to turn up some time — it was actually discovered only quite recently —, I examined the exsiccata present in the Rijksherbarium in order to find out what exactly the differences between this species and *Ph. dubia* are.

All the material of *tribacia* proves to be strikingly homogeneous, the specimens answering in every respect to the description and photographs given by Lynge in Rabenh., 1935, p. 122. In short, the main characters are: lobes broad, margin crenato-incised, soredia marginal, eventually confluent, lower cortex paraplectenchymatous.

Difficulties arise in the exsiccata of *Ph. dubia*, but if we consider first those numbers cited by Lynge at page 111 (Arnold, Lich. exs., no 429, 745, 787) in addition to the specimens we possess of this author, collected in Novaia Semlja, 13 VII 1921, all of which fully conform to the description of his f. *angusta* (l. c., p. 116), we arrive at the following characters: lobes narrow, margin entire, soralia terminal, labriform and ascending, lower cortex plectenchymatous.

Comparing this diagnosis with that of *tribacia*, it seems incomprehensible that both species could have so often been confused. Yet, this is really the case, and Lynge's statement (l. c., p. 113) already points to the difficulties which may be encountered when trying to identify the species: "... er traut sich nicht, die Arten *Physcia dubia* und *Physcia tribacia* nur habituell zu unterscheiden, wenn es auch in den meisten Fällen mit erheblicher Sicherheit möglich ist".

The lip-shaped soralia at the tips of the side lobes in *dubia* may extend sideways, merging into each other and giving the impression of marginal soralia. Moreover, by the destructive action of the soredial production, the side lobes become gradually shorter and even disappear. The soralia continue their existence as marginal soralia of the main lobes which makes the thallus resemble a specimen of *tribacia*. That is why Lynge refers to the lower cortex as providing the one safe distinguishing mark, being plectenchymatous in *dubia* and paraplectenchymatous in *tribacia* (it is rather confusing that Lynge by his "nicht plektenchymatisch" exactly means plectenchymatous, and by his "plektenchymatisch" paraplectenchymaotous).

Unfortunately, this lower cortex just makes a character of somewhat dubious value, since between the two types there are transitional stages. The hyphae of the exterior zone in the plectenchymatous lower cortex, growing perpendicularly to the surface, may start forming a paraplectenchyma. This is the case in Arnold, Lich. exs., no 787b and Floerke, Deutsche Lich., no 72, and I found the same in specimens of *dubia* collected by

myself (no 1980). An even more complete stage in the transition towards a paraplectenchyma has been reached in the lower cortex of the specimens in Havaas. Lich. Norveg., no 110.

However, if we would overlook this initial phase of the formation of paraplectenchyma, in such a case still calling the lower cortex plectenchymatous, which value should then be given to this character? If, for instance, several characters such as broad lobes, crenate margin, marginal soredia speak for *tribacia*, whereas only one, such as the plectenchymatous lower cortex, tells in favour of *dubia*, then, to my mind, the majority of the characters should turn the scale. As examples I may put forward Arnold, Lich. exs., no 272 and 1367, and Arnold, Lich. Monac. exs.. no 326 extant in the Rijksherbarium. Judging from their outward appearance, I feel perfectly unable to separate these plants from the exsiccata of *Ph. tribacia*, and, consequently, I think they belong here indeed. Similar plants seem to have been observed by Lettau (Hedwigia, vol. 60, 1918, p. 100 and 1919, p. 276).

Of course, the splitter, being keen on maintaining small species, may rather prefer to give such plants a different name, and going by the quotation of Lettau (in Hedwigia, vol. 52. 1912, p. 253) these may be called *Ph. dimidiata* (Arn.) Nyl. or, better still, *Ph. caesitia* Nyl., since Lynge has shown *caesitia* and *dimidiata* to be identical, and the former epithet the older (l. c., p. 114).

To what consequences such splitting might lead, may be illustrated by the following example. If in the combination of properties, which characterises *tribacia*, one different factor would justify another species (*caesitia*) to be separated, then the plant differing in a single character from *dubia* ought to be specifically separated in accordance! This would be the case in Kryptog. Vindob. exs., no 2290 which differs from *dubia* in having a paraplectenchymatous lower cortex, and to a somewhat lesser extent in Havaas, Lich. Norveg., no 110, the lower cortex of which still shows signs of a plectenchymatous nature.

The above sufficiently shows that the lower cortex cannot always be relied upon for distinguishing between *dubia* and *tribacia*. On the other hand, I admit that for solving the *dubia-caesitia-tribacia*-problem, one should have the disposal of much more material. I especially regret that up to this time it was impossible to consult Lynge's material of *Ph. dubia* and more particularly his f. *angusta* and f. *lata* (l. c.. p. 116). Another species, too, which circumstances prevented from being sent for comparison is *Ph. vitii* Nádv., published in Stud. Bot. Cechoslov., vol. 8, 1947, p. 94.

As a provisional solution I accept two species, viz. *Ph. dubia* and *Ph. tribacia*, the former being in a narrower sense than conceived by Lynge. I consider his *dubia* and *dubia* f. *angusta* to be identical, whilst his *dubia* f. *lata* (= *Ph. caesitia* auct.) is included in *Ph. tribacia*.

As a rule, *Ph. dubia* is well marked off from species of the *Tenella* group by the absence of marginal cilia. But, owing to certain unknown conditions, there exist forms of *Ph. tenella* which lack cilia. It may be really difficult then to distinguish between both species, particularly if the thalli are strongly sorediate. The lobes of *dubia*, however, are appressed and the colour of the soredia is grey or white. In *tenella* the lobes are more ascending and the soredia are often greenish white.

An interesting specimen was once collected (Heikop, VIII 1830, Van Hall) with narrow (0.3—0.5 mm), discrete, somewhat convex lobes, almost equally broad from centre to circumference. The one secure character I have been able to find, distinguishing this form from (not indigenous) *Ph. teretiuscula*, is in the medullary reaction upon K which is negative in the former and yellow in the latter. The laminal, warty soralia mentioned for *teretiuscula* cannot always serve as a differential character, since they are said sometimes to be lacking (Lynge, l. c., p. 119). This only shows the close affinity of *dubia* and *teretiuscula* (see also Schade in Beih. Bot. Centralbl., vol. 58B, 1938, p. 83). In this connection it is of some interest to note that difficulties have also been encountered in distinguishing *dubia* from *Ph. albinea* (Magnusson in Ark. f. Bot., vol. 33A, 1948, no 16, p. 35), whereas Degelius commented upon the trouble of separating *teretiuscula* and *tribacia*: "Die Grenze gegen *Ph. tribacia* scheint nicht immer scharf zu sein" (in Ark. f. Bot., vol. 25A, 1934. no 1, p. 68).

Specimens examined.

Groningen: Haren, V 1857, *Van Hall*, c. ap. (NBV).

Friesland: Terschelling, Hoorn, 5 IX 1951, *Barkman 2816* (L).

Drente: Bronneger, 6 V 1941, *Maas G. 981b* (L); Drouwenerveld, 6 V 1941, *Maas G. 965* (L); Eext, 3 V 1941, *Maas G. 740a* (L); Lhee, 14 XII 1940, *Maas G. 304b* (L); Valtherveld, 7 V 1941, *Maas G. 1013* (L).

Overijsel: Diepenheim, 20 VII 1941, *Maas G. 1160b* (L).

Gelderland: Groesbeek, 7 III 1941, *Maas G. 494* (L); Renkum, *Buse & Buse-Koppiers* (NBV); Wageningen, *Van Hall*, c. ap. (NBV).

Utrecht: Houten, 21 II 1942, *Stafleu* (U); Leersum, Kolland, 19 IV 1941, *Maas G. 673b, 676* (L).

Noord-Holland: Bennebroek, 28 VI 1942, *Maas G. 1980* (L).

Zuid-Holland: Heikop, VIII 1830, *Van Hall* (L, NBV); Hekendorp, 22 V 1941, *Miss Koster* (L); Leiden, 2 XII 1940, *Maas G. 248* (L); 25 VII 1944, *Maas G. 3030*; 15 VIII *1952, Maas G. 8187* (L); Voorschoten, De Knip, 7 III 1943, *Maas G. 2309b* (L).

Zeeland: Walcheren, Nieuw en St. Joosland, 20 V 1946, 30 VII 1946, *Brakman* (L).

Noord-Brabant: Bergeyk, 25 VII 1942, *Maas G. 2110* (L); Dommelen, 12 VI 1951, *Barkman* (L); Oss, 20 IX 1942, *Maas G. 2231b* (L).

Limburg: Gennep-Afferden, 8 III 1941, *Maas G. 511a* (L).

10. Physcia tribacia (Ach.) Nyl. in Flora, vol. 57, 1874, p. 307; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 122; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 693 (pr. p.) et vol. 10, 1940, p. 656 (ubi lit. et synon.) — *Lecanora tribacia* Ach.. Lich. Un., 1810, p. 415 — *Physcia dubia* f. *lata* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 116.

Exsiccata: Arnold, Lich. exs., no 248, 1152; Claud. et Harm., Lich. Gall. exs., no 318; Fl. exs. Austro-Hung., no 1947; Nádvorník, *Physciac.* exs., no 6; Rabenhorst, Lich. Europ., no 587.

Iconography: Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935. tab. 8, fig. 2—4; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 14, fig. 5.

Macroscopical description — Thallus foliaceous, growing in rosettes, more or less stellate, rather small, 2—3 cm in diam., attached to the substratum by rhizinae, deeply incised. Lobes flaccid and fragile, 3—4 mm long, 0.5—1 mm broad, more or less closely appressed, contiguous to somewhat overlapping, irregularly pinnately branched, plane to somewhat convex, towards the centre split up into numerous, crowded, ascending or im-

bricate secondary lobules. Margins crenate. Tips fan-like broadened, up to 2 mm broad, crenate to incised, appressed to ascending. Upper side of the lobes pale ash-grey, white pruinose and smooth at the tips, becoming epruinose and wrinkled towards the centre, without *isidia* but *sorediate*. *Soredia* concolorous with the thallus, marginal, somewhat coarse-grained, in places confluent into marginal soralia and in the centre of the thallus also enveloping the tips of the lobules, without, however, forming labriform soralia. Lower side of the thallus white to whitish or somewhat roseate, dull, smooth, plane, with scattered, whitish, simple rhizinae. *Microscopical description* — Upper cortex colourless except for a brownish exterior zone, paraplectenchymatous, 20—40 μ. Gonidia bright green, spherical, (6—)10—16(—19.7) μ, arranged in dense clusters or in a continuous layer of 40—50 μ, closely under the upper cortex, or in places penetrating into it. Medulla colourless, white in reflected light, more or less densely plectenchymatous, 30—70 μ, consisting of leptodermatous hyphae, well marked-off from the lower cortex. Lower cortex colourless, paraplectenchymatous, 20—30 μ. *Apothecia* and *pycnidia* not observed. *Chemical reactions* — Upper cortex K + yellow (atranorine?), Pd + slowly yellowish. Medulla K —, Pd —.

Ecology and distribution in the Netherlands. The specimens described have been found in company of such nitrophilous species as *Physcia adscendens, tenella, orbicularis, grisea* and *Xanthoria parietina,* although a small amount of *Parmelia dubia, sulcata* and *Buellia canescens* was also present. The habitat, on the trunk of an elm along a canal on the outskirts of a small town, moreover suggests that the species is fairly capable of maintaining itself in surroundings obnoxious to most other lichens. Some more finds may be recorded in future, but in all probability they all will come from southern portions of the contry.

Distribution in Europe. The species seems to have its main area in southern Europe, being known from Great Britain, France, Switzerland, southern Germany, Czechoslovakia, Hungary, Portugal, Spain, Italy and Bulgaria.

Remarks. For a discussion of the distinction between *Ph. tribacia* and *dubia,* I may refer to the latter species.

Specimens examined .
Zeeland: Schouwen, Zierikzee, 21 IX 1951, *Barkman 2846* (L).

Subsectio 6. Obscura (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma* sect. *Obscura* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 125; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus small to medium, 0.5—4 cm in diam., appressed to ascending, grey-brown, dark grey to black-brown (occasionally also very light grey), always epruinose, *sorediate* or *isidiate* or entirely devoid of *soredia* and *isidia,* without marginal cilia. Upper cortex K —. *Apothecia* small, 1—1.5(—2) mm in diam. *Spores* rarely reaching 25 μ.

Key to the species.

1a. Thallus without isidia or soredia . . . . . **11. Ph. ciliata** (Hoffm.) DR.
1b. Thallus isidiate or sorediate 2

2a. Thallus small, 1 cm in diam. or less, with marginal, warty isidia which may disintegrate and become sorediose . . **13. Ph. nigricans** (Flk.) Stizenb.
2b. Thallus larger, 2—3 cm in diam., with laminal or somewhat marginal maculiform soralia . . . . . **12. Ph. orbicularis** (Neck.) Pötsch

11. Physcia ciliata (Hoffm.) DR. in Svensk Bot. Tidskr., vol. 15, 1921, p. 168 et vol. 19, 1925, p. 79; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 126; A. Zahlbr., Cat. Lich. Un.. vol. 10, 1940, p. 651 — *Lichen ciliatus* Hoffm., Enum. Lich., 1784, p. 69 (non vidi) — *Physcia obscura* var. *ciliata* Tuck. in Proc. Americ. Acad. Arts Sci., vol. 4, 1860, p. 398; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 658 (ubi lit. et synon.).

Pro maxima parte sub nomine: *Parmelia obscura*; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 130; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 22.

Exsiccata: Anzi, Lich. rar. Veneti, no 22; Elenkin, Lich. Fl. Ross., no 90a; Erbar. crittog. Ital., ser. 1, no 1163; Funck, Cryptog. Gew. Fichtelgeb., ser. 1, no 498; Hepp, Flecht. Europ., no 596, 597; Kryptog. exs. Vindob., no 577; Leighton, Lich. Brit. exs., no 80; Mougeot et Nestler, Stirp. Cryptog. Vogeso-Rhen., no 448; Rabenhorst, Lich. Europ., no 461, 553, 935; Schaerer, Lich. Helv. exs., no 353, 354; Sommerf., Pl. Cryptog. Norveg., no 68; Stenhammar. Lich. Suec. exs., no 211.

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 4—6, fig. 24—38; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 10, fig. 2; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 16, fig. 7.

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate, medium-sized, 2—3 cm in diam., attached to the substratum by rhizinae, deeply incised. Lobes fairly flexible, long and narrow, about 1 cm long and 0.4—0.8 mm broad, closely appressed, contiguous to overlapping or growing entangled, richly and irregularly pinnately branched, plane or slightly convex, sometimes somewhat corrugated. Margins entire but usually densely setose on account of the numerous, short, black rhizinae projecting sideways. Tips little or not at all broadened, crenate to incised. Upper surface light grey-brown to dark brown, sometimes with a ruddy hue, with or without a narrow darker zone along the margin, dull or slightly shiny, smooth, epruinose, without *isidia* or *soredia*. Lower surface black, dull or somewhat shiny, plane, smooth, with numerous black, rather short, simple or furcate rhizinae which at the tips of the lobes may show white apices. *Microscopical description* — Upper cortex colourless or with a narrow brownish outer zone, paraplectenchymatous, 36—48 μ. Gonidia bright green, spherical, 8—15 μ, arranged in clusters or in a continuous layer of 30—50 μ, closely under the upper cortex or penetrating into it. Medulla colourless, white in reflected light, more or less densely plectenchymatous, particularly densely packed near the lower cortex, 30—70 μ, composed of mesodermatous hyphae. Lower cortex brown-black, paraplectenchymatous, sharply marked off from the medulla, 24—35 μ. *Apothecia* fairly common, sometimes crowded, laminal, sessile, cup-shaped to discoid, 1—2 mm in diam. Amphithecium concolorous with the thallus, dull, smooth, very often with a more or less dense and conspicuous aureole of short, black or white-tipped rhizinae. Margin persistent, entire or slightly crenulate. Disc

black-brown, dull or somewhat shiny, epruinose. Epithecium yellow-brown, hypothecium colourless to yellowish, with clusters of gonidia underneath. Hymenium colourless, 80—85 μ. Asci cylindrical-clavate, 15—20 × 60—75 μ, 8-spored. *Spores* mostly shrivelled, dark brown, 2-celled, with strongly thickened cell-walls at the septum and the apices, little or not constricted, ellipsoidal, straight or flattened on one side or somewhat curved, 8—10 × 21—25 μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnides* laminal, single, visible as black-brown spots or warts, spherical to pyriform, 195—300 μ in diam. Perifulcrium colourless, ostiolum black-brown. *Pycnoconidia* colourless, ellipsoidal, bulging, 1—1.5 × 2—3 μ. *Chemical reactions* — Neither upper cortex, nor medulla react upon the usual tests.

Ecology and distribution in the Netherlands. *Ph. ciliata* is mainly a corticolous species which has been found on *Betula, Fagus, Fraxinus, Populus, Salix* and occasionally on lignum. *Salix* proved to be by far the most favoured host. Though the herbarium material shows that the species occurred throughout our country, it was in no way common, and in all probability it is completely lost for the flora now. Most finds are from the period between 1830 and 1850, the latest being from 1881.

Distribution in Europe. As pointed out by Lynge, it is hardly possible to get an idea of the distribution of the species in Europe from the data in earlier litterature, since *ciliata* was rarely properly separated from *orbicularis*. Recent papers on the lichen flora, however, along with the exsiccata mentioned clearly show that *Ph. ciliata*, if far from common, occurs in most European countries.

Remarks. In Medd. Soc. F. Fl. Fenn., vol. 46, 1921, p. 167 Räsänen described *Ph. cycloselis* f. *elongata* Räs. which he later on (in Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 12, no 1, 1939, p. 98) changed into *Ph. orbicularis* f. *elongata*. In his original description Räsänen already stated "similis *Ph. ulothrix* f. *ciliatae* (Hoffm.), at th. sorediato." On examining the type specimen, it appears that f. *elongata* in reality is *Ph. ciliata* of which the upper cortex has been affected by insects, the damaged spots very much resembling soralia.

Lynge (l. c., p. 131) definitely showed *Physcia violaria* Erichs. to be *Ph. ciliata* with damaged, soralia-like spots, and he believed the upper cortex tinged yellow by parietin. Lynge came to that assumption on account of the yellow pigment turning purple when touched with K. In his opinion, parietin in certain circumstances would be dissolved in rain-water from nearby *Xanthoria parietina* and subsequently absorbed by the thallus of neighbouring *Ph. ciliata*. To this assumption something may be said, but I may refer to conditions in closely related *Ph. orbicularis* which I know better from own experience. *X. parietina* and *Ph. orbicularis* may be seen growing mixed and entangled without the upper cortex or the soredia of the latter showing any trace of yellow discolouring. Further, no study has been made of the mechanism by which parietin would be dissolved from the thallus of *Xanthoria* and precipitated again in *Ph. orbicularis*. The only thing known is that parietin is hardly soluble in several media except in dilute lye of natron or potassium (Zopf, Flechtenst., 1907, p. 306). Lichens growing on bark are not very likely to come into contact

with the latter compounds, since the rain-water which soakes the thalli is of acid reaction. According to the measurements by Duvigneaud, the hydrogen ion concentration of rain-water in several places in Belgium ranges from 3.6—4.9 (in Bull. Soc. Roy. Bot. Belg., vol. 74, 1941—42, p. 33). Moreover, in industrial centra the air is vitiated by impurities which, taken as a whole, will lower the pH of the rain-water. (Full particulars about the importance of the impurities are given by F. W. Clarke, The data of geochemistry, ed. 5, 1924, p. 48 and 54—55. More recent data about air pollution have been published by Leonard, Mc Verry and Crowley in Sci. Proc. Roy. Dublin Soc., N. S., vol. 23, 1942, p. 10—17.) Whether the bark of those trees on which the species is found to grow is of acid or alkaline reaction is insufficienlty known, but some recent investigations in this connection point to a subneutral to acid nature (Klement und Preis, Lichenol. Notiz. in Lotos, vol. 88, (1941—1942) 1943, p. 210; Du Rietz, Om fattigbark- och rikbarksamhällen in Svensk Bot. Tidskr., vol. 39, 1945, p. 147—150). Finally, though there is no proof against the yellow pigment being parietin, it has never to my knowledge been chemically analysed. It has been identified as parietin on account of its colouring purple when treated with K, but this reaction is no decisive feature of parietin alone. It applies to most of the other derivatives of anthracene known in lichens. This means that in the case of *Ph. orbicularis* f. *hueana*, the yellow or orange pigment in the soralia, as well as the "corpuscules écarlates" might prove to be some other lichen acid, viz. the final product of metabolism of the own thallus. In that case, it would be perfectly justified for f. *hueana* to be distinguished from *orbicularis*. It seems different, however, in the case of *Ph. violaria* of which I have seen the type specimen. Here some yellow pigment has apparently been washed over the thallus from another source, leaving a few lobes untouched. These lobes, consequently, do not turn purple with K.

Physcia ciliata seems to be effectively separated from *Ph. orbicularis* by a set of characters: lack of soralia, presence of rhizinae on the lower side of the amphithecium, sometimes even displaying a distinct corona; rhizinae protruding sideways from the lobes; and general habitus. These differences, however, are by no means all established. Lynge (l. c., p. 130) and Schade (in Beih. Bot. Centralbl., vol. 58B, 1938, p. 84) report the sporadical occurrence of amphithecial rhizinae in *orbicularis*, whereas once in a way they may lack in *ciliata* (Lynge in Vid. Selsk. Skr., Mat.-Naturvid. Kl.. vol. 1, 1916, no 8, p. 71). Rhizinae projecting sideways from the lobes may occur in *orbicularis* just as well, whereas again they may lack in *ciliata*. There may arise great difficulties in discriminating both species because they are equally liable to be eaten by insects in nature as well as in the herbarium which, in the case of *ciliata*, easily gives the impression of a thallus with abraded, worn-out soralia. In anatomical respect I fail to see any difference between *ciliata* and *orbicularis*. Also by their habitus it is not always easy to tell both species apart, although generally the lobes in *Ph. ciliata* are more slender and more closely appressed to the substratum, without ascending margins.

Specimens examined.

Groningen: Groningen 14 I 1834, *Van Hall*, c. ap. (L); Harendermolen, *Van Hall* (NBV).

Drente: Eelde, 14 VIII 1855, *Van Hall*, c. ap. (NBV).
Overijsel: Kampen, *Bondam*, identity uncertain (NBV).
Gelderland: Hoog Keppel, 1 IX 1850, *Abeleven* (NBV).
Utrecht: Utrecht, 1841, *Van der Sande Lacoste*, identity uncertain (L); 1843, *Van der Sande Lacoste* (NBV).
Noord-Holland: Bloemendaal, *Buse* (NBV); Diemen, XI 1848, *Van der Sande Lacoste* (NBV); Haarlem, *Buse*, identity uncertain (NBV); *Buse & Gildemeester-Buse*, c. ap. (NBV); *Splitgerber* (L); Overveen, 1841, *Buse & Gildemeester-Buse* (NBV).
Zuid-Holland: 's-Gravenhage, Eik en Duinen, 28 VII 1881, *Abeleven*, c. ap. (NBV); Leiden, I 1830, *Wttewaal*, c. ap. (L); Loosduinen, Ockenburg, 20 VII 1881, *Abeleven*, c. ap. (NBV); 21 VII 1881, *Abeleven*, c. ap., identity uncertain (NBV).
Zeeland: Zuid-Beveland, 1845, *Van den Bosch* (L, NBV); Zuid-Beveland, Goes, V 1843, *Van den Bosch* (NBV); Zuid-Beveland, Zwake, IX 1842, *Van den Bosch*, c. ap. (NBV).
Noord-Brabant: Beek, VIII 1847, *Van den Bosch*, c. ap. (NBV).

12. **Physcia orbicularis** (Neck.) Pötsch in Pötsch et Schiederm., System. Aufzähl. samenlos. Pfl., 1872, p. 247; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 144; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 654 — *Lichen orbicularis* Neck., Meth. Muse., 1771, p. 88 — *Lichen virellus* Ach., Lich. Suec. Prodr., 1798, p. 108 — *Physcia obscura* f. *orbicularis* (Neck.) Th. Fr. in Nov. Act. Reg. Soc. Sci. Upsala, ser. 3, vol. 3, 1861, p. 165; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 655 (ubi lit. et synon.) — *Physcia virella* Flagey in Rev. Mycol., vol. 13, 1891, p. 110; Lynge in Vid. Selsk. Skr., Mat.-Naturvid. Kl., vol. 1. 1916, no 8, p. 72; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 700 (ubi lit. et synon.).

Sub nomine: *Parmelia obscura* et var. *chloantha*, var. *ciliata*, var. *orbicularis*; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 130; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 22—23.

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate or more irregularly spreading with age, small to medium, 1—3 cm in diam., fixed to the substratum by means of rhizinae, deeply incised. Lobes flexible, long and narrow or short and broad, 6—10 mm long, 0.4—1 mm broad, closely appressed to loosely attached, contiguous or overlapping or irregularly growing over each other, richly and irregularly pinnatifid, plane or corrugated or somewhat convex. Margins entire. Tips little or considerably broadened, crenate or incised. Upper side of the lobes white-grey to ash-grey with a brownish or sometimes bluish hue or olive-coloured green-brown to very dark brown, with a tanned or blackish green border at the tips, dull, smooth, without pruina or *isidia, sorediate. Soralia* maculiform, laminal and scattered over the upper side of the lobes or more or less marginal, sometimes subterminal on the side-lobes, flat or globose, 0.2—1 mm in diam., coarse-grained, originally darker than the thallus, dark brown, blackish green to almost black, more greenish white when worn off, later on more and more confluent and in extreme cases completely covering the centre of the thallus with a sorediate crust. Underside of the lobes black except for a narrow whitish zone at the tips, dull or slightly shiny, smooth, plane, densely covered with black, short, simple or furcate rhizinae. At the tips of the lobes the rhizinae frequently have white apices or they are white altogether; they may protrude much in the way of cilia. *Microscopical description* — Upper cortex colourless or with a narrow brownish exterior zone, paraplectenchymatous, 18—45 μ.

Gonidia bright green, spherical, (7—)9—16 μ, arranged in clusters or in a continuous layer of 30—70 μ, closely under the upper cortex or deeply penetrating into it. Medulla colourless, white in reflected light, more or less densely plectenchymatous, especially densely packed towards the lower cortex, 45—160 μ, consisting of lepto-mesodermatous hyphae. Lower cortex brown-black, paraplectenchymatous, well marked off from the medulla, 22—35 μ. *Apothecia* rather rare, laminal, sometimes crowded, sessile, cup-shaped to discoid, 1—1.5(—2) mm in diam. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, entire or slightly crenate. Disc darkish red-brown to black, dull or somewhat shiny, without pruina. Epithecium yellow-brown, hypothecium colourless or yellowish, with clusters of gonidia underneath. Hymenium colourless, 75—100 μ. Asci cylindrical-clavate, 14—16 × 60—85 μ, 8-spored. *Spores* olive-brown to dark brown, 2-celled, with strongly thickened cell-walls at the septum and the apices, little or not constricted, ellipsoidal, straight, sometimes flattened on one side, fairly acute at the apices, 8—10 × 20—23 μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnids* not common, laminal, scattered over the upper surface, single or in small groups, visible as brown-black spots, spherical or pyriform, 190—250 μ in diam. Perifulcrium colourless, ostiolum black-brown, broad. *Pycnoconidia* colourless, ellipsoidal, bulging, 1—1.5 × 2—4 μ. *Chemical reactions* — Upper cortex as well as medulla unaffected by the usual chemicals.

Ecology and distribution in the Netherlands. *Physcia orbicularis* is even more abundant in our country than *Ph. caesia* with which it is frequently found growing mixed. Just like this species, it thrives on trees as well as on stony substrata, being found on *Alnus, Fraxinus, Juglans, Quercus; Sambucus, Tilia,* fruit trees, lignum, granite, sandstone, concrete and tiles. It has a decided preference, however, for *Populus, Salix, Ulmus,* bricks and eternite roofing material, growing in well-exposed places rich in nitrogenous compounds. From this it follows that its habitats may range from trees along roads to brick-built bridges or stone-reinforced dikes of rivers and waterways, and from roofs of isolated farms to those of houses on the outskirts of towns all over the country.

Distribution in Europe. Examination of the litterature cited on p. 280—284 clearly demonstrates that the species abounds throughout Europe.

Remarks. According to Du Rietz (in Svensk Bot. Tidskr., vol. 8, 1914, p. 389) and Lynge (l. c., p. 147), Dalla Torre and Sarnthein would have been the first authors to make the combination *Ph. orbicularis* (Die Flecht. Tirol, 1902, p. 165). As may be gathered, however, from Zahlbruckner (Cat. Lich. Un., vol. 7, 1931, p. 656), this combination had already been made 30 years earlier by Pötsch. The same objections which Lynge raised to the citation of DT. & Sarnth. as the authors who first made the combination, would in his eyes have existed with regard to the citation of Pötsch, since this author also included *Ph. ciliata* in his species. It is incorrect, however, to cite (Neck.) DR. At the most, if the urge is felt to commemorate the fact that Du Rietz was the first to delimit the species properly, one might write (Neck.) Pötsch em. DR.

Variability. Since *Ph. orbicularis* varies a great deal in the

size and shape of the lobes as well as in the colour of the thallus, there have been described a number of forms bearing upon these characters. Räsänen e. g. described f. *elongata*, f. *tristis* and f. *pallida*. With regard to f. *elongata* which proves to be *Ph. ciliata*, I may refer to the remarks under that species. f. *pallida* which was described in Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 12, 1939, no 1, p. 99, hardly deserves mentioning, since the one character "thallus pallido-griseus" is of doubtful value in a species displaying every shade of grey and brown. The material kindly sent to me by Räsänen convinced me of the absence of any other character which might differentiate f. *pallida* from typical *orbicularis*. Things look different in the case of f. *tristis* which, as I take it, was described in the scheda of Lich. Fenn. exs., 1936, no 244. The material put at my disposal by Räsänen shows a dark-coloured narrow-lobed specimen with black-brown soralia. By its appressed lobes with plane and smooth upper side and by its rhizinae projecting sideways it resembles *Ph. ciliata*. If it could be proved that Necker's *Lichen orbicularis* is a light-coloured specimen, and Necker's quotations suggest so, f. *tristis* would be worth considering.

Concerning the above-mentioned variability of the colour of the upper side of the thallus and the width of the lobes, it should be pointed out that there are two types in this country. One has a pale, mostly greyish, upper side and broad lobes; in the other the upper side is very dark brown to almost blackish, and the lobes are narrow. The peculiar thing is that, whereas both types may be found on stony substrata, the specimens occurring on trees almost exclusively belong to the former type. I have the impression that the morphological difference is mainly due to different insolation. Intermediate stages between both types are numerous, and anatomically there is no difference at all.

Under the specific epithet of *virella* Mereschkovsky describes (in Ann. Conserv. Jard. Bot. Genève, vol. 21, 1919, p. 178—180) several forms, some of the exsiccata of which have come to my hands. f. *nigricascens* (with black soredia) and f. *tenuisecta* (characterised by its lobes being narrower and more finely incised) are minor deviations. var. *gracilis*, however, is a distinct and fine form being characterised by its small and irregular rosettes, by its brownish colour and by its lobes which are closely appressed, somewhat discrete and extremely narrow, being 0.3—0.4(—0.6) mm broad. (Mereschkovsky also described the apothecia, but the words "subtus saepe rhizinis brevibus pallidis ornata" raise some doubts. In fact, the left-hand specimen of the exsiccata preserved in the Botanical Museum and Herbarium at Utrecht clearly proves that specimen to be *Ph. ciliata*). It certainly deserves mentioning, though it should be ranked as a forma rather than as a variety. Similar plants may once in while be found in our country, but at one time they differ from the authentic specimens in their colour being grey instead of brown, and at another the lobes are contiguous or even overlapping, or again they are too robust. So, strictly speaking it would be incorrect to designate such specimens f. *gracilis* (Mereschk.) Maas G. nov. comb., though they may probably be considered transitional stages.

Attention may be drawn to a most peculiar form which I once collected (Vennemeer, between Leiden and Oud-Ade, 1943, no 2752). The specimens

have sorediał isidia which in some cases completely cover the thallus with a dark brown areolate crust except for a narrow zone along the periphery. Here and there secondary folioles develop among the soredia.

Of *Ph. obscura* Nylander described two varieties which sound somewhat alike, viz. var. *sorediosa* (in Bull. Soc. Bot. France, vol. 13, 1866, p. 366) and var. *sorediifera* (in Notis. Sällsk. F. Fl. Fenn. Förh., vol. 11. 1871, p. 180). Judging from the short diagnosis, var. *sorediosa* seems to be *orbicularis* with strongly developed soralia. Var. *sorediifera* which does not seem to have been quoted in any of Nylander's previous papers is a nomen nudum. Fries in his Lichenogr. Scand., vol. 1, 1871, p. 143 commented upon this variety, saying: "a vulgari forma (which is *Ph. obscura* var. *orbicularis*) vix ulla nota differens".

f. **orbicularis.**

Exsiccata: Arnold, Lich. exs., no 880; Arnold, Lich. Monac. exs., no 227, 338 (unrecognisable); Claud. et Harm., Lich. Gall. exs., no 180 (pr. p.), 181, 379, 531; Floerke, Deutsche Lich., no 94; Hepp, Flecht. Europ., no 55 (fragments), 599; Kryptog. exs. Vindob., no 2580; Malbranche, Lich. Normand., no 26 (perhaps *Ph. ciliata*?); Massalongo, Lich. Ital. exs., no 247; Schaerer, Lich. Helv. exs., no 355 (pr. p.), 607, 609 (pr. min. p.).

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950. tab. 6—13, fig. 39—40, 42—83; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 10, fig. 1; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 16, fig. 3 (indistinct). 5; Smith et Sowerby, Engl. Bot., vol. 24, 1807, tab. 1696 (not quite certain).

This is the type form of *Ph. orbicularis* the description of which is given above. It differs from the next form in that its soralia are never yellow or orange and remain unaltered when treated with K.

Remarks. From herbarium specimens it appears that apothecia formerly were far more common than in recent times.

In some respects the Dutch material seems different from the description given by Lynge. This author describes the thalli as being small, 1—1.5 cm in diam., whereas the lobes also would be very short, 2—3 mm. Usually I find the plants larger and when growing horizontally on a smooth substratum, their lobes may be traced down to the very centre of the thallus, being at least 1 cm in length. For the rest, from the photograph in Lynge's revision it may be seen that some lobes are at least 6 mm long.

f. **hueana** (Harm.) Erichs. in Verh. Bot. Ver. Prov. Brandenburg. vol. 72, 1930, p. 57; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 147; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 654 — *Physcia obscura* var. *virella* f. *Hueiana* Harm. in Bull. Soc. Sci. Nancy, ser. 2, vol. 31, (1896) 1897, p. 262 — *Physcia virella* f. *Hueana* Lindau, Die Flecht., ed. 2, 1923, p. 234 (non vidi); A Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 702 (ubi lit. et synon.).

Type collection: *Physcia obscura* (Ehrh.) Nyl. var. *virella* (Ach.) Schaer. f. *Hueiana* Harm. in Lab. Bot. Univers. Cathol. Ouest, Angers.

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 7, fig. 41.

Description — Soredia yellow or orange, coloured intensively purple if brought into contact with K. Sometimes the cortex is tinged yellow also. In the gonidial zone in the proximity of the soralia there may be found "corpuscules écarlates" which also turn purple with K.

Remarks. Not uncommon, in the same habitats as f. *orbicularis*. It remains to be seen whether this form should be maintained at all, since it is uncertain yet whether the different colour of the soralia is an innate feature of the own thallus. For a discussion of this problem, I may refer to the remarks under *Ph. ciliata*.

Specimens of *Ph. orbicularis* with yellow soralia have long attracted the attention, and probably Körber was the first to publish a separate name, viz. *Parmelia obscura* (Ehrh.) Kbr. var. *aurella* Kbr. (Parerg. Lich. 1865, p. 36). The type specimen which was sent to him from Holland by Van den Bosch who collected it on *Salix* near Breda, is still in Körber's collection in the Rijksherbarium. The epithet *aurella* has no priority over *hueana*, since it was described on the level of a variety, not as forma. It is different in the case of *Ph. ulothrix* var. *virella* f. *flavescens* which was described by Crombie (Monogr. Brit. Lich., vol. 1, 1894, p. 320). Most probably this form is identical with f. *hueana* (which is hardly possible to establish from a photograph only) in which case f. *flavescens* should replace f. *hueana*.

13. **Physcia nigricans** (Flk.) Stizenb. in Ber. Thätigk. St. Gall. naturw. Ges., (1880—1881) 1882, p. 329 (quoad nomen); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 650 et vol. 10, 1940, p. 654 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9. pars 6/1, 1935, p. 148 — *Lecanora nigricans* Flk. in Sprengel, Neue Entdeck., vol. 2, 1821, p. 97 — *Parmelia obscura* var. *nigricans* Körb., Parerg. Lich., 1865, p. 35; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 23 — *Physcia lithotea* var. *sciastrella* Nyl. in Flora, vol. 60, 1877, p. 354 — *Physcia nigricans* var. *sciastrella* (Nyl.) Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 150; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 654.

Exsiccata: Arnold, Lich. exs., no 583 (fragments); Arnold, Lich. Monac. exs., no 9; Floerke, Deutsche Lich., no 91; Kuták, Lich. Bohem., no 398; Nádvorník, *Physciac.* exs., I, no 4, 7; Reichenb. et Schub., Lich. exs., no 84.

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 1—2, fig. 1—6, 8—17.

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate, very small, 0.5—1 cm in diam., later on uniting with other thalli into larger patches, fixed to the substratum by rhizinae, deeply incised. Lobes flexible, comparatively long and narrow, 2—5 mm long and 0.1—0.5 mm broad, loosely attached or somewhat ascending, contiguous or somewhat discrete or overlapping or growing intertwined, richly and irregularly pinnatifid, plane. Margins entire or irregularly crenate. Tips little or not broadened, crenate to incised. Upper surface of the lobes pale to dark brown, dull, smooth, epruinose, with *soredial isidia* or with true *isidia*

which soon turn *sorediose*. *Isidia* marginal and, more especially, apical, extremely small, 30—60 μ broad, roundish, warty to somewhat branched and coralloid, of the same colour as the thallus or darker, very brittle. According to Du Rietz (in Svensk Bot. Tidskr., vol. 19, 1925, p. 70), isidial soralia would develop on the wound where the isidia have broken off, but the isidia may also burst spontaneously, turning sorediose. Lower surface dingy white to pale brownish, dull, smooth, plane, with scattered, short, simple rhizines of the same colour. *Microscopical description* — Upper cortex colourless except for a very narrow brown exterior zone, paraplectenchymatous, 15—45 μ. Gonidia bright green, spherical, 6—12 μ, arranged in clusters or in a continuous layer of 20—30 μ closely under the cortex. Medulla not at all or only slightly developed, 0—20 μ, consisting of a few mesodermatous hyphae. Lower cortex colourless, paraplectenchymatous or inclining to a very dense plectenchyma, clearly marked off from the medulla, sometimes connected to the upper cortex by means of paraplectenchymatous strands, or completely pushing aside the medulla and reaching as far as the gonidial layer. *Apothecia* laminal, sessile, cup-shaped to discoid, 0.5—1 mm in diam. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, though somewhat receding with age, entire or slightly wrinkled. I once observed small marginal laciniae. Disc black, dull or somewhat shiny, without pruina. Epithecium brown, hypothecium colourless to yellowish, with some clusters of gonidia underneath. Hymenium colourless, 70—75 μ. Asci cylindrical to club-shaped, 15—20 $\times$ 55—66 μ, octosporous, with strongly thickened cell-wall at the apex. *Spores* partly shrivelled, dark brown, 2-celled, with strongly thickened cell-walls at the septum and the apices, not constricted in the middle, ellipsoidal, straight or curved, with rounded or slightly acute apices, 7—10 $\times$ 17—21 μ. Paraphyses simple or furcate, septate, conglutinate, strongly capitato-incrassate at the tips. *Pycnidia* not observed. *Chemical reactions* — Neither the upper cortex nor the medulla show any reaction upon the usual chemicals.

Ecology and distribution in the Netherlands. In our country the species has been found on *Salix* and *Populus*, as well as on stone. Being rare already in former times, there is only a single recent find, but possibly the species has been overlooked.

Distribution in Europe. It is no easy matter to get a clear idea of the distribution of *Ph. nigricans* in Europe. I suppose, however, it is mainly due to the lack of recent floristic publications that I have no records from Great Britain, Ireland, Poland, Rumania, Greece, Yugoslavia, Italy and Portugal.

Remarks. As in many other *Physciae*, particularly among the dark-coloured species, *Ph. nigricans* has offered considerable difficulties to the early authors which resulted in a great number of names and an equally great confusion. It is again Du Rietz to whom we owe the disentanglement of the mess. This author considered all the names, a bibliography of which is found in his paper mentioned above, synonymous with *nigricans*, but perhaps he went too far in this respect. In Lynge's opinion, the species is to be split up into two varieties, viz. var. *sciastrella* (Nyl.) Lynge and var. *tremulicola* (Nyl.) Lynge. The former is identical with Floerke's

Lecanora nigricans, so it is the typical form and should be called *Physcia nigricans* f. *nigricans*.

Du Rietz writes with good reason (l. c., p. 73) that of all other *Physcia* species *nigricans* is most related to *Ph. sciastra*. Though the latter has not yet been found in Holland, it may still be expected. *Sciastra* is much robuster, with the lobes appressed to slightly ascending and up to 1 mm broad, whereas the lower surface is always black. *Nigricans* is more delicate, being one of the tiniest species. Its lobes are usually 0.2 mm broad, at the utmost reaching a width of 0.5 mm, loosely attached to ascending or almost upright, whilst the underside is dingy white or locally somewhat brownish. Moreover, *sciastra* is mainly saxicolous, occasionally growing upon wood or mosses, whereas *nigricans* is chiefly corticolous.

Variability. As already stated by Du Rietz and Lynge, *Ph. nigricans* is a variable species whose forms gradually merge into each other. It is a matter of taste, of course, whether such forms should be maintained. *Physcia parvula*, for instance, which was described by Vainio (in Medd. Soc. F. Fl. Fenn., vol. 2, 1878, p. 52) as a separate species, but was subsequently reduced to synonymy by Du Rietz and Lynge, is being maintained as f. *parvula* by Nádvorník (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 108). Two more, equally slight, modifications have been described by Harmand (Lich. France, vol. 4. 1909, p. 652), viz. *Ph. sciastrella* f. *pallescens* and f. *nigrescens*, the type-collections of which I have seen. The former is well-developed, with very pale brown, richly sorediate lobes which are up to 4 mm long and 0.5 mm broad. The latter, on the contrary, is very small, with dark fuscous, sparingly isidiate rather than sorediate lobes which are 1—1.5 mm long and 0.1—0.2 mm broad and considerably more branched. On comparison of Harmand's *nigrescens* with specimens of *tremulicola* ex Herb. Oslo, which had been collected by Havaas and Lynge in Hakedalen near Kristiania (Oslo) and to which Lynge later on had added the words f. *atra* n. f., a form which only differs from typical *tremulicola* in its almost black colour, I arrive at the conclusion that *nigrescens* is a mere synonym of *tremulicola*.

Some of the Dutch specimens might be designated as f. *tremulicola* (Nyl.) Maas G. nov. comb., but most belong to f. *nigricans*. None of them belong to f. *pallescens* (Harm.) Lynge.

Nádvorník (l. c., p. 108) considers this f. *pallescens* to be synonymous with his f. *parvula*. Properly speaking this is not correct. From Vainio's description it may be gathered that f. *parvula* has short and dark lobes, whereas those of f. *pallescens* are elongated and pale.

Recently a peculiar form was collected by Barkman between Arcen and Well which differs from other forms known to me in that the colour of the upper side is dark ash-grey.

Specimens examined.
Gelderland: Kesteren, ± 1862, *Sprée* (NBV); Renkum, *Buse*, c. ap. (NBV).
Utrecht: vicinity Utrecht, 1841, *Van der Sande Lacoste* (L).
Noord-Brabant: 's-Hertogenbosch-Vught, 8 X 1904, *Wakker* (f. *tremulicola*) (L); Orthen-Hedel, 8 IV 1905, *Wakker*, c. ap. (L); Weil-Gestel, 26 XII 1904, *Wakker* (L).
Limburg: Arcen-Well, "De Hamert", 15 VI 1951, *Barkman* (L).

Subsectio 7. Pulverulenta (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma* sect. *Pulverulenta* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 152; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus medium to large, 5—10 cm in diam., loosely attached or with somewhat ascending lobes, light grey, grey-brown, grey-green or dark brown, more or less pruinose, without marginal cilia, *sorediate* or *esorediate*, rarely *isidiate*. Upper cortex K—. *Apothecia*, for all is known, large, 2—4(—5) mm in diam. *Spores* large, over 25 μ long.

Key to the species.

1a. Thallus esorediate . . . . . **14. Ph. pulverulenta** (Schreb.) Hampe
1b. Thallus sorediate, sometimes with soredial isidia
15. Ph. grisea (Lam.) A. Zahlbr.

14. Physcia pulverulenta (Schreb.) Hampe in Fürnr., Naturh. Topogr. Regensburg, vol. 2, 1839, p. 249 (quoad nomen); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 668 et vol. 10, 1940, p. 654 (ubi lit et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl.. ed. 2, vol. 9, pars 6/1, 1935, p. 153 — *Lichen pulverulentus* Schreb., Spicil. Fl. Lips., 1771, p. 128 (non vidi) — *Parmelia pulverulenta* Ach., Meth. Lich., 1803, p. 210; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 128; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2. 1898, p. 21.

Macroscopical description — Thallus foliaceous, more or less distinctly growing in rosettes and stellate, medium to large, 4—15 cm in diam., fixed to the substratum by means of rhizinae, deeply incised. Lobes very rigid, rather long and narrow, 0.5—1.5 cm long and 0.5—1.5 mm broad, appressed to loosely attached, contiguous or overlapping, sometimes discrete or growing entangled, richly and irregularly pinnately branched, plane, corrugated or lengthways wrinkled, more rarely warty to strongly papillate. Margins plane or ascending, entire or slightly crenate or lobate, sometimes with secondary laciniae which may cover nearly the whole of the thallus. Tips somewhat broadened, incised. Upper side of the lobes grey-brown to chestnut, dull, in some cases epruinose, but mostly granulato-pruinose, smooth or irregularly indented, without *isidia* or *soredia*. Pruina whitish or bluish, confined to the tips of the lobes or sometimes completely covering the whole of the thallus. Lower side of the lobes for the greater part black, pale brown to white at the tips, dull or somewhat shiny, smooth, rhizinose. Rhizinae at the margins of the lobes crowded, black or pale, short, toward the middle of the thallus always black, frequently strongly branched and developing into a dense felty layer. *Microscopical description* — Upper cortex colourless with a colourless or yellowish amorphous outer zone, very densely plectenchymatous merging into paraplectenchyma, 30—75(—90) μ. Gonidia bright green, spherical, 7—18 μ, arranged in clusters or in a continuous layer of 60—90 μ, closely under the upper cortex and partly penetrating into it. Medulla colourless, white in reflected light, rather densely plectenchymatous, especially toward the lower cortex and gradually passing into it, 70—180 μ, consisting of leptodermatous hyphae. Lower cortex black except near the tips of the lobes, very

densely plectenchymatous, gradually passing into paraplectenchyma, 20—30 μ. One might also say that the lower cortex is composed of a black outer zone and a colourless inner one transitionary into the medullary layer. *Apothecia* rather common and frequently crowded, laminal, sessile, cup-shaped to discoid, 1—3(—5) mm in diam. Amphithecium of the same colour as the thallus, becoming darker to black towards the base, dull, smooth or slightly rugged. Margin persistent, pruinose or epruinose, smooth, later on frequently warted to strongly crenate, in some cases with secondary laciniae. Disc dark brown to black, dull, naked or in the same plant light caesio-pruinose. Epithecium brownish, hypothecium colourless to yellowish with clusters of gonidia underneath. Hymenium colourless, 165—200(—230) μ. Asci cylindrical-clavate, 21—30 × 108—120 μ, 8-spored. *Spores* black-green. to dark brown-green, 2-celled, with strongly thickened cell-walls at the septum and the apices, constricted in the middle, broadly ellipsoidal, straight or curved and fabiform, with rounded apices, 14—18 × 27—39 μ. Paraphyses septate, scarcely conglutinate, with furcate to branched, somewhat incrassate tips. *Pycnidia* not common, laminal, immersed at the tips of the lobes, visible as brown spots or warts, single or in small groups, spherical or pyriform, 120—200 × 200—250 μ. Perifulcrium colourless, ostiolum brown. *Pycnoconidia* colourless, cylindrical, straight, ± 1 × 3.5—4.5 μ. *Chemical reactions* — Upper cortex and medulla indifferent to the usual reagentia.

Ecology and distribution in the Netherlands. *Physcia pulverulenta* in this country is a corticolous species, *Ulmus* being the most favoured tree for a host. Next come *Populus* and *Salix*, whereas the species may also be found on dust-encrusted trunks of such trees as *Fagus, Quercus* or *Juglans*. Yet, it seems to be far less kopronitrophilous than e. g. *Ph. grisea* which may account for its rarity in the vicinity of towns. In former times *Ph. pulverulenta* used to be a common species throughout the country, occurring in beautiful specimens, but in recent times it has lost ground and is not too common, probably even being rare in southern and eastern provinces. Specimens exceeding 10 cm in diam. have never been found any more and the variability of the species also seems to be less.

Distribution in Europe. Reported to occur throughout Europe.

Remarks. According to Lynge, a delimitation of the species answering our modern views was for the first time proposed by Sandstede (in Abh. naturw. Ver. Bremen, vol. 21, 1912, p. 236), and wishing to express this state of things Lynge therefore writes *Ph. pulverulenta* (Schreb.) Sandst. This is incorrect, for however Hampe's conception of *pulverulenta* may have diverged from ours, Hampe was the first to make the new combination.

From the labels in the early herbaria it appears that pale specimens of *Ph. pulverulenta* have frequently been mistaken for *aipolia*. The latter, however, has whitish pseudocyphellae which show more distinctly when moistened. *Ph. pulverulenta* lacks these white spots, its underside is black but for the margin, the upper surface becomes apple-green when moistened. In *aipolia* the lower surface is white, whereas the upper surface turns

grey-green when wetted. Moreover, the upper cortex and medulla of *aipolia* stain yellow with K, whereas in *pulverulenta* they remain unaltered. Finally, in *aipolia* the spores are always much narrower.

Dark and completely epruinose forms of *pulverulenta* might be mistaken for esorediate species of the *Obscura* subsection. Of these, however, *ciliata* is the only species which for this country needs to be taken into account, and from it *pulverulenta* may be told at once by the lack of rhizinae at the apothecial margin, the coarser thallus which is more loosely attached, the larger spores, and by several more anatomical features.

Variability. *Ph. pulverulenta* is one of the few species of the genus of which a great many varieties and forms have been described. Only a few will be discussed here in so far as they concern the native lichen flora.

Taking for convenience's sake the typical form as the centre of the species, which is only a historical arrangement, around this f. *pulverulenta* there have been grouped other forms which differ in various ways. The lobes may be stellate and very narrow (f. *angustata*), or densely pruinose (f. *argyphaea*), or epruinose (f. *nuda* and closely related forms), or covered with papillae (f. *subpapillosa*), or the central lobes may be very small, inflated and imbricate (f. *turgida*), or the apothecial margin may be set with a crown of secondary laciniae (f. *venusta*). It goes without saying that in so polymorphous a species the forms (and not only those mentioned here) do not represent well-delimited taxa. On the contrary, intergradations are numerous, and this is what necessitates a more detailed discussion especially of the epruinose forms.

A form strikingly differing from f. *pulverulenta* was described as f. *nuda* by Harmand in 1909. It is characterised by its brown, epruinose lobes, but on account of the few secondary lobules at the apothecial margin it is intermediate between f. *pulverulenta* and var. *subvenusta* which will be discussed later on.

Little different from f. *nuda* is var. *rufescens* Mereschk. (in Hedwigia, vol. 61, 1919, p. 231) with brown, epruinose lobes, but no secondary lobules at the apothecial margin. The difference is the less significant, since from the same locality Mereschkovsky had specimens about which he was in doubt whether or not to call them f. *atrynea* on account of the presence of some marginal laciniae on the apothecia. That the apothecial disc is entirely black in f. *atrynea* and more or less pruinose in var. *rufescens* is an immaterial difference, since naked and pruinose apothecia are known to occur in the same specimen in several other forms of *Ph. pulverulenta*.

Another brown, epruinose form is f. *fusca* Bouly de Lesd. (Rech. Lich. Dunkerque, 1910, p. 104) of which it is hard to ascertain whether it is identical with or different from f. *nuda*. Bouly de Lesdain (in litt. 1 II 1951) informed me that he had no recollection of the general appearance of his form, whereas the material had gone lost.

Körber in his Syst. Lich. Germ., 1855, p. 87 mentions a *Parmelia pulverulenta* var. *vulgaris* f. *polita* Fw., of which no evidence can be obtained whether Von Flotow supplied the name only or the description as well. It agrees with f. *nuda* in having the lobes epruinose but nothing

is said of the colour of the thallus. There is no material extant in Körber's collection.

Of the forms mentioned I am inclined to retain f. *nuda,* discarding *rufescens, atrynea, fusca* and *polita* as being either uncertain forms or trivial modifications of *nuda.*

Sometimes epruinose specimens are met with which, on account of their grey colour, cannot be considered to belong to f. *nuda.* They are best regarded as epruinose modifications of f. *pulverulenta.*

In Hedwigia, vol. 61, 1919, p. 230 Mereschkovsky described a f. *nuda,* designating an epruinose modification of var. *angustata.* The epithet is illegitimate, since it is a later homonym of Harmand's *nuda.*

Another form which will be disregarded in the present paper is *Physcia pulverulenta* var. *subvenusta* Nyl. (in Bull. Soc. Linn. Normand., ser. 2, vol. 6, 1872, p. 285). Though I have not been able to locate the type specimen (neither in Helsinki, nor in London, Paris or Rennes), I have seen some specimens ex herb. Nylander. no 32286, from Helsinki. They fully correspond to Nylander's short diagnosis. Since *subvenusta* is perfectly intermediate between *pulverulenta* (with little or non-coronate apothecia) and *venusta* (with richly proliferous apothecial margins), and no sharp line can be drawn on either side, I consider a separate form superfluous.

It is a well-kown phenomenon among *Physciae* that the apothecial margin, when growing older, tends to become increasingly crenate. This development may be traced in the same plant going from the circumference to the centre. I presume that Mereschkovsky in describing his f. *rugosa* (in Hedwigia, vol. 61, 1919, p. 229) just meant a very old stage in which the apothecia all have a crenate margin.

Key to the forms.

1a. Nearly the whole of the thallus warty or covered with papillae
f. **subpapillosa** (Cromb.) Erichs.

1b. Thallus different 2

2a. Centre of the thallus consisting of crowded, imbricate, inflated, small laciniae
f. **turgida** (Schaer.) Oliv.

2b. Thallus different, at the most with a few secondary laciniae or papillae scattered along the margins 3

3a. Thallus more or less pruinose 4

4a. Pruina occurring at the tips of the lobes, or occasionally extending somewhat further towards the centre 5

5a. Lobes contiguous, broadened at the tips 6

6a. Apothecial margin set with a crown of secondary lobules
f. **venusta** (Ach.) Sandst.

6b. Apothecia non-coronate, or rarely with some laciniae
f. **pulverulenta**

5b. Lobes very narrow, discrete, not broadened at the tips; in between the lobes a dense black felt . f. **angustata** (Hoffm.) Leight.

4b. Thallus completely covered with a thick pruina
f. **argyphaea** (Ach.) Oliv.

3b. Thallus epruinose 7

7a. Thallus grey or grey-brown
epruinose modification of f. **pulverulenta**

7b. Thallus brown . . . . . f. **nuda** Harm. or epruinose modification of f. **angustata** (Hoffm.) Leight.

f. **pulverulenta** — *Lichen allochrous* Ehrh., Lich. exs., no 187 (Genève) — *Parmelia pulverulenta* var. *allochroa* Schaer., Lich. Helv. Spicil., sect. 9, 1840, p. 445; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 128; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 22 — *Physcia pulverulenta* var. *allochroa* Th. Fr., Lich. Scand., vol. 1, 1871, p. 136; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 674 et vol. 10, 1940, p. 655 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 157.

Type collection: *Lichen pulverulentus* Schreb. in Botanische Staatssammlung, München.

Exsiccata: Claud. et Harm., Lich. Gall. exs., no 492; Desmazières, Pl. Cryptog. Nord France, no 144; Floerke, Deutsche Lich., no 172; Funck, Cryptog. Gew. Fichtelgeb., no 100, 597; idem, ed. 2, no 110; Hepp, Flecht. Europ., no 874 (pr. p.); Leighton, Lich. Brit. exs., no 49 (pr. min. p.); Rabenhorst, Lich. Europ., no 96, 187 (pr. min. p.); Schaerer, Lich. Helv. exs., no 356 (pr. p.); Stenhammar, Lich. Suec. exs., no 72 (pr. p.).

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 29, fig. 10 (not typical); Cretzoiu in Inst. Cercetar. Experim. Forest., ser. 2, vol. 47, 1941, tab. 20, fig. 1; Galløe. Natur. Hist. Danish Lich., vol. 8, 1950, tab. 40—44, fig. 251—253, 256, 258—269; Migula, Kryptog.-Fl. Deutschl., vol. 4, pars 1, 1929, tab. 2, fig. 6.

Description — Lobes contiguous or overlapping, upper side grey-brown, more or less pruinose, secondary lobules few or none. Apothecial margin without secondary laciniae or a few apothecia bearing some lobules.

Remarks. I examined Schreber's material which, apart from a few bits along with one specimen of *Ph. grisea,* contains 4 well-preserved specimens, all of which are fertile. Very few apothecia show secondary laciniae projecting from the amphithecium, sometimes only 1, in other cases 2 or 3. In most cases the margin is smooth, only in 1 specimen which has crowded apothecia it is crenulate.

It may be of interest to note that the majority of the indigenous specimens examined belong to f. *pulverulenta.* Some are intermediate between this and any of the other forms, whilst there are quite a few of the "*subvenusta*" type. Some epruinose specimens which I had formerly labelled f. *polita* Flot. in the herbarium, may be better considered epruinose modifications of f. *pulverulenta* since *polita* is a dubious form of which there is no authentic material left.

f. **argyphaea** (Ach.) Oliv. in Rev. Bot., vol. 12, 1894, p. 84 — *Parmelia pulverulenta* var. *argyphaea* Ach., Lich. Un., 1810, p. 474 — *Physcia pulverulenta* var. *argyphaea* (Ach.) Nyl. in Not. F. Fl. Fenn. Förh., N. S., vol. 2, 1861, p. 109; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 677 et vol. 10, 1940, p. 655; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 158.

Exsiccatum: Kryptog. exs. Vindob., no 2367.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 30, fig. 6; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 11, fig. 3; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 14. fig. 7.

Description — Lobes broad, contiguous or overlapping, broadened at

the tips, wholly covered with a thick, white or sometimes bluish pruina. *Apothecia* albo-pruinose as well, and with a light caesio-pruinose disc.

Remarks. Most specimens are transitional stages to f. *pulverulenta*, rather than true *argyphaea*.

f. **angustata** (Hoffm.) Leight., Lich. Fl. Great Brit., 1871, p. 147 — *Lichen angustatus* Hoffm., Enum. Lich., 1784, p. 77 (non vidi) — *Parmelia pulverulenta* var. *angustata* Ach., Lich. Un.. 1810, p. 474; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 22 — *Physcia pulverulenta* var. *angustata* Nyl. in Bot. Notis., 1853, p. 155; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 675 et vol. 10, 1940, p. 655; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 159.

Exsiccatum: Cretzoiu, Lich. Roman. exs., no 70 (not very typical).

Iconography: Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 14, fig. 1.

Description — Lobes narrow, 0.5—1 mm broad, not broadened at the tips, stellate, richly and pinnately branched, discrete, grey-brown to chestnut or dark brown, naked except for the whitish pruinose tips. Sometimes even the tips may be epruinose. In between the lobes the rhizinae form a conspicuous and often bulging, black, felty mass.

Remarks. The form has not been found any more in recent times.

f. **nuda** Harm., Lich. France, vol. 4, 1909, p. 634; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 673 (ubi lit.).

Type collection: *Physcia pulverulenta* f. *nuda* Harm. in Lab. Bot. Univers. Cathol. Ouest, Angers.

Description — Upper side red-brown to dark brown, epruinose. *Apothecia* with a few secondary laciniae at the margin. Disc naked or pruinose.

Remarks. The form may still be found in this country, but it has become rare. Stages intermediate between this and other forms, especially the "*subvenusta*" type, have been recorded.

f. **venusta** (Ach.) Sandst. in Abh. Naturw. Ver. Bremen, vol. 21, 1912, p. 237 — *Parmelia venusta* Ach., Meth. Lich., 1803, p. 211 — *Physcia pulverulenta* subsp. *venusta* Nyl., Syn. Lich., vol. 1, 1858—1860, p. 421; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 697 (pro spec., ubi lit. et synon.) — *Parmelia pulverulenta* var. *venusta* Genth, Cryptog.-Fl. Herzogth. Nassau, 1836, p. 345 (non vidi); Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 22 — *Physcia pulverulenta* var. *venusta*; Nyl. in Act. Soc. Linn. Bordeaux, vol. 21, 1856, p. 308; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 159; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 655.

Exsiccata: Claud. et Harm., Lich. Gall. exs., no 178 (not typical), 493; Marcucci, Un. Itin. Cryptog., 1866. no 17.

Iconography: Ach., Meth. Lich., 1803, tab. 8, fig. 5; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 42, fig. 257; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 11. fig. 1; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 15, fig. 4; Smith et Sowerby, Engl. Bot., vol. 29, 1809, tabl. 2063.

Description — Lobes grey-brown to brown, little pruinose, more or less imbricately overlapping. In the centre the thallus tends to be covered with numerous secondary laciniae. Apothecial margin surrounded by a dense corona of simple, incised or furcate lobules. Disc caesio-pruinose.

Remarks. This form, already being rare in the former century, has never been found in recent times. According to Lynge, it comes to a richer development in southern portions of Europe where it is more abundant.

f. **subpapillosa** (Cromb.) Erichs. in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 59 (pro var. *turgidae* forma); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 673 (ubi lit.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 158 — *Physcia pulverulenta* var. *subpapillosa* Cromb. in J. of Bot., vol. 20, 1882, p. 273.

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 41—42, fig. 254—255.

Description — Almost the whole of the upper side warty or covered with papillae, more or less pruinose.

Remarks. In the original diagnosis by Crombie nothing was said about the pruina. In the description given later on in his Brit. Lich., vol. 1, 1894, p. 308 — a book I did not see myself, but the crucial passage of which was quoted by Mereschkovsky in Hedwigia, vol. 61, 1919, p. 228 — it runs: "Th. greyish-white, pruinose, ..."

The present form is not uncommon in this country.

Sometimes it may be difficult to know whether a specimen has to be placed under f. *subpapillosa* or under f. *turgida,* and in the same way stages intermediate between *subpapillosa* and *pulverulenta* are by no means rare.

f. **turgida** (Schaer.) Oliv. in Mém. Soc. Nation. Sci. Natur. Cherbourg, vol. 36, 1906—1907, p. 236; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 674 (ubi lit. et synon.) — *Parmelia pulverulenta* var. *turgida* Schaer., Enum. Crit. Lich. Europ., 1850, p. 38 — *Physcia pulverulenta* var. *turgida* Mong. in Bull. Acad. Internat. Géogr. Bot., vol. 16, 1906, p. 160; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 158; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 655.

Type collection: *Parmelia pulverulenta* var. *turgida* Schaer. in Herb. Schaer., Genève.

Iconography: Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 11, fig. 4; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 14, fig. 3.

Description — Upper surface of the thallus brown, epruinose or with a faint pruina. Central lobes very small, more or less inflated, crowded, imbricately overlapping. Peripheral lobes as in f. *pulverulenta.*

Remarks. Not uncommon in this country.

As stated above, there is a close relationship between *turgida* and *subpapillosa.* Some authors (Erichsen in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 58—59; Lynge, l.c., p. 158) wish to express this relation by raising *turgida* to varietal rank and subordinating *subpapillosa* to it as a forma. Besides, another form is added, viz. f. *panniformis* Cromb. which will be discussed below.

Lynge deviates from the original diagnosis in allowing the thallus of *turgida* to be "wenig bis sehr wenig bereift". Actually, some of the lobes in Schaerer's type specimens ("ad arbores circa Bernam") which I have examined show a very faint pruina. Other specimens, however, which I also received from Schaerer's herbarium, collected by Philippe in the Pyrenees, are devoid of the slightest trace of a pruina. These specimens differ from Schaerer's description in that the central lobes are not turgid at all. But in this respect, the type collection itself is not homogeneous. The left-side specimen very well fits the description which Schaerer wrote on his label "... foliol. centralib. congestis breviss. imbricatis erectiusculis (pulposis) peripheric is discretis laciniatis depressis". The specimen in the middle, however, has a few panniform, appressed, not pulpose secondary lobules which do not look as if combed into one direction. In conforms to the collection from the Pyrenees and likewise resembles the type collection of f. *panniformis* Crombie of which I received a photograph from the British Museum, Natural History, London. (Crombie published his form in J. of Bot., vol. 20, 1882, p. 273; his *panniformis* in J. Linn. Soc. Bot., vol. 17, 1880, p. 571 is a nomen nudum.) I am inclined to think, as Schaerer might have done, that *turgida* should be allowed a variability somewhat wider than the description properly speaking requires, although others may maintain that *panniformis* cannot be considered synonymous with *turgida*.

var. *imbricata* B. de Lesd., of which I have seen no other description than that quoted by Mereschkovsky in Hedwigia, vol. 61, 1919, p. 231, only seems to differ from *turgida* in having poorly developed peripheral lobes.

15. Physcia grisea (Lam.) A. Zahlbr. in Ann. Naturhist. Hofmus. Wien, vol. 26, 1912, p. 177; Cat. Lich. Un., vol. 7, 1931, p. 619; vol. 8, 1932, p. 596 et vol. 10, 1940, p. 653 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 167 — *Lichen griseus* Lam., Encycl. Meth. Bot., vol. 3, 1789, p. 480 — *Physcia pulverulenta* var. *arisea* Kickx, Fl. Cryptog. Flandres, vol. 1, 1867, p. 225; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129; Abelev. in Prodr. Fl. Batav.. ed. 2, vol. 2, pars 2, 1898, p. 22.

Macroscopical description — Thallus foliaceous, growing in rosettes or irregularly spreading, distinctly stellate when young, less so with age, medium-sized to large, 3—8 cm in diam., attached to the substratum by rhizinae, deeply incised. Lobes flexible, long and narrow, hardly to be traced down to the centre, at least 1 cm long, 0.5—1.5 mm broad, appressed to loosely attached, contiguous or overlapping at the margins, growing entangled in the centre of the thallus, richly and irregularly pinnatifid, plane at the tips but soon becoming concave owing to the ascending margins, or corrugated or lengthways folded. Margins more or less ascending, slightly crenulate or lobate or incised. Tips broadened to 2—3 mm, lobate or incised. Upper surface usually light grey-brown, not infrequently also grey-green, pale grey or chestnut to dark brown, sometimes with tanned tips, dull, smooth or wrinkly-rugged, pruinose or more rarely epruinose, *sorediate*. Pruina white or bluish white, granular, usually occurring at the tips of the lobes, but often extending over a lesser or greater part of the

surface or completely covering the lobes. *Soralia* for the greater part marginal, occasionally also laminal, of the same colour as the thallus or lighter or darker, coarse-grained, towards the centre of the thallus tending to spread more and more over the surface of the lobes, growing into larger lumps and occasionally turning into an extensive soredial mass, sometimes gradually passing into *soredial isidia*. True *isidia* may also occur. Lower side of the lobes white to brownish and dull, or black for the greater part and more or less shiny, smooth or indented, more or less covered with rhizinae. Rhizinae white, black-tipped or black, short, simple or fibrillose and branched, in some cases covering the whole underside with a black felty layer. *Microscopical description* — Upper cortex colourless or with a yellowish exterior zone above which there is an amorphous layer, paraplectenchymatous, 30—60 μ. Gonidia bright green, spherical 10—14(—16) μ, arranged in clusters or in a continuous layer of 25—66 μ, closely under the upper cortex and partly penetrating into it. Medulla colourless and white in reflected light, or yellowish, densely plectenchymatous, 75—200 μ, consisting of meso-to leptodermatous hyphae. Lower cortex colourless to yellowish, either hardly developed, only consisting of medullary hyphae being put more closely together and, moreover, having the cell-walls thickened, or in other places well-developed and more or less paraplectenchymatous, up to 40 μ thick, gradually passing into the medulla. At the base of the rhizinae at any rate, the lower cortex is always extant, being either very densely plectenchymatous or paraplectenchymatous or any intermediate stage. *Apothecia* very rare, single, laminal, sessile or shortly pedicellate, cup-shaped to discoid, 1—1.5 mm in diam. Amphithecium of the same colour as the thallus, dull, smooth or ribbed, pruinose, sometimes becoming sorediose. Margin persistent, crenate or sorediate. Disc brown-black, dull, naked or strongly caesio-pruinose. Epithecium brown, hypothecium colourless to brownish, with clusters of gonidia underneath. Hymenium colourless, about 120 μ. Asci cylindrical-clavate, 27—30 × 78—105 μ, 4(?)-spored. *Spores* brown-black, 2-celled, with strongly thickened cell-walls at the septum and the apices, constricted in the middle, ellipsoidal, straight or fabiform, 13—17 × 24—33 μ. Paraphyses simple or furcate, septate, conglutinate, not incrassate at the apices. *Pycnidia* laminal, extremely difficult to discern, probably very soon destroyed by the soredia, visible as brown-black spots, single or in groups of 3—4, pyriform, 120—150 × 150—200 μ. Perifulcrium colourless, ostiolum for the greater part colourless, with a narrow brown exterior zone. *Pycnoconidia* colourless, cylindrical, straight or slightly curved, ± 1 × 3.5—5 μ. *Chemical reactions* — None of the usual chemicals cause any reaction.

Ecology and distribution in the Netherlands. In this country *Ph. grisea* may be found on trees and almost equally often on concrete and bricks of bridges and old walls. The species has been collected on fruit trees, *Fraxinus, Juglans, Populus, Quercus, Salix* and, most of all, on *Ulmus*. It is a (kopro)nitrophilous and very common species which is even found to thrive in the midst of smaller towns.

Distribution in Europe. Common throughout Europe.

Variability. As in the preceding species, *Ph. grisea* gives some trouble on account of the numerous forms described, some of which need to be discussed in detail.

A problem which with time does not seem to have grown less is the question *grisea—leucoleiptes*. The colour of the underside used to be looked upon as an important character by which both groups could be distinguished. A white lower surface was considered characteristic of *Ph. grisea* and allied forms, a black one of *Ph. leucoleiptes*.

Leucoleiptes was originally described by Tuckerman as a variety of *Parmelia pulverulenta*, and in this respect he was followed, amongst others, by Hue (in Nouv. Arch. Mus., ser. 4, vol. 2, 1900, p. 68) and by Harmand (Lich. France, vol. 4, 1909, p. 635). It is true that both *pulverulenta* and *leucoleiptes* show a black underside which formerly was apparently considered of greater importance than the presence or absence of soredia.

Lettau was the first to realise the value of the soredia, segregating *leucoleiptes* as a species of its own (in Hedwigia, vol. 52, 1912, p. 254). Afterwards it was the merit of Lynge (in Vid. Selsk. Skr., Mat.-Naturvid. Kl., vol. 1, 1916, no 8, p. 66—67) to have lumped all esorediate forms under *Ph. pulverulenta* and all sorediate ones under *Ph. grisea*. Later on, too, Lynge kept to his view that the colour of the lower side is inappropriate as a specific distinguishing character (in Rabenh., p. 172, 174).

Erichsen (in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 54), however, observed: "Typische *leucoleiptes* ... verdient durchaus, wenn auch nicht als Art, so doch als Varietät abgetrennt zu werden, auch wenn sich Uebergänge zu anderen Formen nachweisen lassen. Solche kommen auch zwischen den von Lynge aufgestellten Formen übergenug vor". But Erichsen did not know himself how to deal properly with the difficulties, and eventually subdivided *grisea* into two main groups "ohne Rücksicht auf die Färbung der Unterseite", ignoring the fact that it was exactly the colour of the lower side which had mattered.

In recent times the colour of the underside has again been considered a factor of taxonomical importance by Nádvorník (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 69—124) who introduced two more characters, viz. the structure of the lower surface and the general appearance of the rhizinae.

First the colour of both rhizinae and underside will be discussed jointly. As pointed out by Nádvorník, the difference between *Ph. grisea* and *Ph. leucoleiptes* would, among others, lie in the entirely pale lower side and pale rhizinae of the former species, and the "sombre" lower side and black rhizinae of the latter. As regards the colour of the rhizinae in *grisea*, I have studied specimens distributed by Nádvorník under the name of *Physcia grisea* f. *albida* Nádv. in his *Physciac.* exs., no 1 and found the rhizinae to be white or black-tipped or black. Generally, beside black rhizinae inserted in a pale lower side, it is no trouble at all in specimens of the *grisea*-group to find examples in which the black colour seems to have spread from the base of the rhizinae onto the surrounding surface so as to form a dark blotch. The further down to the centre of the thallus, the better the chance of finding such spots. To take one example only, I may refer to *Physcia grisea* in Nádvorník, *Physciac.* exs., no 19. The above observation is not new, it has already been made by Lynge who over and over again commented upon it (e. g. 1916, p. 67). This observation leads us to the value of the colour of the underside as a distinguishing character. In Kryptog. exs. Vindob., no 2780 (which

Lynge considered typical f. *pityrea*) I found the lower surface to be entirely pale, while in no 1980 (*Ph. grisea*) it is brownish with scattered dark patches. Claud. et Harm., Lich. Gall. exs., no 494 (f. *brunnea* Harm., though rather thought to be f. *semifarrea* by Lynge, 1916, p. 67), extant in this institute, shows the underside white from the tips of the lobes to halfway down the centre, and black for the remainder. A similar colour pattern is found in our specimen of Rabenhorst, Lich. Europ. exs., no 909 which Vainio considered to correspond with his f. *subnitens* (in Medd. Soc. F. Fl. Fenn., vol. 6, 1881, p. 132). On examining Vainio's type specimens, however, I found the lower side to be black except for a whitish zone at the tips of the lobes. It should be noted that Nádvorník counts *subnitens* a variety of *Ph. grisea* which should have a pale underside. A black lower surface with only a pale zone at the tips of the lobes is furthermore found in Claud. et Harm., no 495 which, according to Lynge (1916, p. 63), is *Ph. grisea* f. *alphiphora*, but should be placed under *Ph. leucoleiptes* according to Nádvorník (1947, p. 121). Another transitional stage is seen in the description of Malme's specimens of f. *alphiphora* about which Lynge (1935, p. 173) writes: "hat im groszen und ganzen eine schwarze Unterseite, aber zwischen den Rhizinen sieht man stellenweise hellere bis ungefärbte Partien ..." A very illustrative example of the unsuitability of the colour of the lower surface as a specific character is given by Nádvorník in his *Ph. leucoleiptes* var. *griseoides* of which he says: "Le dessous obscur au centre seulement" (1947, p. 120).

The above mentioned examples show that it is not a case of either — or whether the colour of the underside is pale or dark, but there exist intermediate stages. I should like to stress this fact, the importance of which was already fully realised by Lynge.

Leaving the structure of the rhizinae alone for a moment, I will discuss the structure of the lower side. Nádvorník rightly observed (1947, p. 71) that apart from the types of lower side found in the *grisea* and "*leucoleiptes*" group, there is another type which differs in that it is pale at the tips of the lobes, but becomes increasingly covered with dark fibres towards the middle of the thallus so as to form "une espèce d'enduit foncé et continu, ce qui fait l'impression du dessous réellement sombre. Quand ou humecte un tel envers, généralement les veines noires ressortent distinctement sur la base claire et même dans les endroits qui paraissent tout noirs". Nádvorník considers this type of underside specific of *Ph. farrea* and related forms. As a matter of fact, he is right in the case of f. *semifarrea* Vain. and partly so in the case of f. *brunnea* Harm., the type material of both of which I have examined, but I wonder how the lower surface of the thallus in the Acharian type of *Parmelia farrea* looks like. However, even if it would turn out to be as described by Nádvorník, I do not think the "*farrea*"-underside essentially different from the *grisea*- and "*leucoleiptes*"-underside. Of the "*leucoleiptes*" group I only examined the type material of f. *enteroxanthella* Harm., as well as f. *caesiascens* (Zahlbr., Lich. rarior., no 358, and a specimen in herb. Erichsen, collected by Lettau). The under cortex in these forms appeared to be made up of a very dense, black plectenchyma, distinctly separated from the loosely interwoven medullary tissue.

In some specimens of f. *brunnea* Harm., a form which Nádvorník considers to belong to the "*farrea*" group, I found that the lower side either consists of a very loose plectenchymatous cortex which gradually passes into the medulla, or is hardly corticated at all which conforms to the situation as in *grisea*. In either case loose hyphae or strands of hyphae of the outermost parts only had taken on a brown hue, accounting for the "veines noires". In other specimens of f. *brunnea*, however, going from the tips of the lobes to their base, I found this type of underside gradually turn into the "*leucoleiptes*" type which should not surprise us, since the under cortex in typical *grisea* itself is known to vary from non existing via plectenchyma to paraplectenchyma. This at once eliminates the main difference which Nádvorník in his key (1947, p. 109) mentions to exist between *Ph. grisea* and *Ph. farrea*.

In the foregoing it is shown that I can find no more specific difference between *Ph. grisea* and *Ph. leucoleiptes* than between the latter and *Ph. farrea*, which comes down to the full agreement of my views with those originally expressed by Lynge.

With regard to the structure of the rhizinae, Nádvorník correctly observed that they are "soit ... pulpeuses, peu rameuses, soit ... fibrilleuses à la surface". Whereas the former are found in forms with a mainly pale underside, the latter seem without exception to occur in such forms of which the lower side is predominantly black. Usually, the rhizinae start as simple excrescences at the tips of the lobes, but soon get covered with a tangled mass of black fibrils.

Occasionally, isidia and soredial isidia do occur in this species, but few authors thought it necessary to pay special attention to them. For all I know, Elenkin (in Notul. Syst. Inst. Cryptog. Horti Bot. Petropol., vol. 1, 1922, p. 31) was the first to make mention of some isidiate forms, but from the short latin diagnoses it cannot possibly be gathered whether the author has seen genuine isidia with a thalline cortex, or soredial isidia.

Harmand (in Bull. Soc. Sci. Nancy, ser. 2, vol. 31, (1896) 1897, p. 61) also noticed the presence of isidia: "... garnis sur les bords de sorédies cendrées, ..., ou d'excroissances granuleuses-isidioides", but apparently he did not consider them sufficiently important to base a form on.

Much in the same way Schade (in Hedwigia, vol. 58 B, 1938, p. 94—95) thought little of the value of the isidia as a specific character in the case of *Physcia perisidiosa*. This species Erichsen separated from *Ph. pulverulenta* (in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 57) on account of the presence of isidia. It may be noted that a possible connection with *Ph. grisea* was not even discussed. Yet, this relation was instantly clear to Schade who saw the authentic specimens of Erichsen. He wrote: "Wenn man ferner die Sorale gewöhnlicher *Ph. grisea* unter dem Mikroskop bei auffallendem Licht betrachtet, findet man ganz dieselben isidienähnlichen, dunklen, braunen Sprossungen wie bei *perisidosa*..." (l. c., p. 94), and "Alle diese Beobachtungen zeigen einwandfrei, dass die scheinbaren Isidiengruppen in der Entwicklung zurückgebliebene, jedenfalls nur noch nicht zerfallene Sorale sind, die allein kein Artmerkmal abgeben können". He nevertheless refrains from facing the consequences of transferring *perisidiosa* to *grisea* or reducing it so synonymy. On studying the

type material of Erichsen's *Ph. perisidiosa,* I found the excrescences ecorticated. They are no genuine isidia, therefore, but soredial isidia in the sense of Du Rietz. Several isidia appeared to have disintegrated into soredia. I fully agree with Schade that there is no need of describing a new species on account of the presence of such soredial isidia, and even maintaining the epithet *perisidiosa* for a separate form may be subject to discussion.

An example of isidial soredia seems to occur in what Gyelnik called var. *neogrisea* (in Ann. Mycol., vol. 30, 1932, p. 448).

Truly isidiate forms have been described by Lynge (f. *hillmannii* in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 177) and by Nádvorník (f. *euisidiata* in Stud. Bot. Cechoslov., vol. 8, 1947, p. 119) of which I have not seen the types.

As far as this country is concerned, the species shows the following variability. The medulla, usually being white, is yellow in f. *enteroxanthella.* Strong development of the soredia in the central parts of the thallus is seen in f. *sorediosa.* f. *subnitens* is characterised by a very smooth, somewhat shiny and little pruinose upper side of the lobes. Whereas in most forms the pruina is white, it is bluish in f. *caesiella.* Marginal soralia are common to many forms in this species, but it is rare to have the margins reflexed in places so as to give the impression of labriform soralia. This is the case in f. *farrea.* Strikingly different from the forms mentioned is f. *harmandii* (= f. *brunnea*) of which the central lobes are crowded, ascending, imbricate, and fringed with confluent soralia.

Once in a while there may be found specimens encrusted with a thick, white pruina. Yet, they cannot be called f. *alphiphora* (Ach.) Lynge, since they lack the characteristic *farrea*-like type of soralia and the black lower surface.

Key to the forms.

1a. Medulla white 2
2a. Centre of the thallus completely turned into a sorediose crust . . . . . f. **sorediosa** (Malbr.) Maas G.
2b. Not so 3
3a. Lobes more or less pruinose, pruina white 4
4a. Central lobes crowded, ascending, imbricate, little pruinose, surrounded by a sorediose fringe . . . . . f. **harmandii** Maas G.
4b. Not so 5
5a. Sorediose margins of the lobes without reflexed parts which look like lip-shaped soralia 6
6a. Upper side of the lobes very smooth, somewhat shiny, very little pruinose . . . . . f. **subnitens** (Vain.) Räs.
6b. Upper surface more or less wrinkled and folded, pruina usually well-developed . . . . . f. **grisea**
5b. Sorediose margins with upturned parts which resemble labriform soralia . . . . . f. **farrea** (Ach.) Lynge
3b. Pruina bluish 7
7a. Lobes densely caesio-pruinose . . . . . f. **caesiella** Erichs.
7b. Pruina limited to the tips of the lobes; soredia sometimes caesio-pruinose . . . . . f. **harmandii** Maas G.
1b. Medulla and soredia yellow . . . . . f. **enteroxanthella** (Harm.) Erichs.

f. **grisea** — *Lichen pityreus* Ach., Lich. Suec. Prodr., 1798, p. 124 — *Physcia grisea* f. *pityrea* Flagey in Rev. de Mycol., vol. 13, 1891, p. 110;

A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 623 (pro var.); vol. 10, 1940, p. 653 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 173 — *Physcia grisea* f. *brunnea* Mereschk. in Ann. Cons. Jard. Bot. Genève, vol. 21, 1919, p. 195.

Type collection: *Lichen griseus* Lamarck in Mus. Nation. Hist. Natur., Lab. Cryptog., Paris.

Exsiccata: Arnold, Lich. Monac., no 89 (pr. p. ad f. *sorediosum* vergens); Claud. et Harm., Lich. Gall. exs., no 73; Hepp. Flecht. Europ., no 876; Kryptog. exs. Vindob., no 1980, 2780; Malbranche, Lich. Normand., no 70; Nádvorník, *Physciac.* exs., no 19; Reichenb. et Schub., Lich. exs., no 87; Schaerer, Lich. Helvet. exs., no 487.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 30, fig. 5; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 35—37, fig. 213—225; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 12, fig. 1, 3, 4; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 15, fig. 1.

Description — Lobes rather long and narrow, closely contiguous or overlapping, folded in the centre, appressed and plane or somewhat concave at the tips, with margins becoming increasingly sorediose towards the centre of the thallus, grey-brown to grey-green, more or less pruinose.

Remarks. Mr. R. Lami of the Laboratoire de Cryptogamie in Paris was so kind as to send me most beautiful photographs of some specimens of the type material of *Lichen griseus* which enabled me to check them with Acharius's description of *Lichen pityreus* (l. c.) and *Parmelia pityrea* (Lich. Un., 1810, p. 483—484). The description Lynge gave of f. *pityrea* and part of his material which I had on loan from the Oslo herbarium also conform to the photographs. The identity found gives strong evidence that f. *pityrea* is synonymous to f. *grisea,* the type form.

Investigation of Mereschkovsky's type specimen of *Ph. grisea* f. *brunnea* showed this form to be ordinary f. *grisea* with the upper side of the lobes slightly more brown than grey-brown. The specimen has apparently been linked with less brown specimens lower down the trunk of the tree from which it was collected, for on his label Mereschkovsky added: "plus bas le thalle devient gris clair..."

Of the forms known to occur in this country f. *grisea* is the commonest one, but it will cause no surprise that in so variable a species stages intermediate between f. *grisea* and other forms are numerous.

f. **enteroxanthella** (Harm.) Erichs. in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 56 — *Physcia pityrea* var. *enteroxanthella* Harm. in Bull. Soc. Sci. Nancy, ser. 2, vol. 31, (1896) 1897. p. 258 — *Physcia leucoleiptes* f. *enteroxanthella* Mereschk., Enum. Lich. Prov. Balt., 1913, p. 33 (non vidi); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 641 (ubi lit. et synon.).

Type collection: *Physcia pityrea* var. *enteroxanthella* Harm. in Lab. Bot. Univers. Cathol. Ouest, Angers.

Exsiccatum: Claud. et Harm., Lich. Gall. exs., no 268.

Description — Medulla and soralia yellow, for the rest extremely variable in general appearance. The development of the soredia and the pruina may range from very slight to very strong. Lower surface black

in the centre, brownish or whitish towards the tips of the lobes. Rhizinae black, fibrillose. K intensifies the yellow colour of the medulla.

Remarks. Transitional phases to other forms are common, in fact, one may just as well state that it is common to find the other forms with the medulla white or yellow. Harmand's type material itself is far from homogeneous. This raises the question whether f. *enteroxanthella* should be maintained at all, ranging the colour of the medulla in *Ph. grisea* among those characters, on which it is impossible to base any form.

f. **sorediosa** (Malbr.) Maas G. nov. comb. — *Physcia pityrea* var. *sorediosa* Malbr. apud Oliv. in Rev. Bot., vol. 10, 1892, p. 620 — *Physcia grisea* var. *sorediosa* (Malbr.) Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, p. 536; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 625 (ubi lit. et synon.).

Description — Soralia at the margins of the lobes confluent, spreading over the upper surface of the thallus and eventually developing into a dense and areolate sorediate crust. Lobes sometimes only visible at the circumference.

Remarks. A form not uncommon in this country and connected with f. *grisea* by numerous intermediate phases.

f. **subnitens** (Vain.) Räs. in Medd. Soc. F. Fl. Fenn., vol. 46, (1919—1920) 1921, p. 168; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 622 et vol. 10, 1940, p. 653 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 175 — *Physcia pulverulenta* subsp. *farrea* f. *subnitens* Vain. in Medd. Soc. F. Fl. Fenn., vol. 6, 1881, p. 132.

Type collection: *Physcia farrea* f. *subnitens* in Inst. Bot Univers. Turkuensis, Turku.

Exsiccatum: Rabenhorst. Lich. Europ., no 909.

Description — Differs from f. *grisea* by the lobes being smooth, slightly shiny and presenting a faint pruina only at the very tips. Upper side grey-brown to brown. Soralia marginal, in places confluent.

Remarks. The description Lynge gave of f. *subnitens* conforms well to the specimen we have in Rabenhorst, no 909 which is an almost perfect rosette. Vainio refers to this exsiccatum, but the type material which I have examined looks different. Instead of being "recht verlängert, ... zuletzt längs den ganzen, leicht aufgebogenen Seitenrändern sorediös, daher recht schmal", the lobes range from rather long to rather short, growing rather irregularly, some of them even being somewhat discrete. Margins plane or occasionally incurved, either sparingly sorediate or in places covered with confluent soralia. Tips of some of the central lobes somewhat sorediate. Upper side ochry yellow.

On account of these differences it is difficult to put into words those features which Vainio had in mind, unless the 2 salient features which type material and our specimen of Rabenhorst's exsiccatum have in common, viz. the smoothness of the upper surface and the almost total lack of pruina, are the only characters that matter.

In that case some specimens in the indigenous material of *Ph. grisea* may be referred to f. *subnitens*. Most of the specimens, however, which I had formerly identified as f. *subnitens*, do not belong here. They can best be described as dark-coloured, (almost) epruinose modifications of f. *grisea*.

The present form may be told from f. *harmandii* by the central lobes which are not imbricate, by the (almost total) lack of confluent soralia at the tips of the lobes and by the smooth upper side.

f. **caesiella** Erichs. in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 55; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 623.

Type collection: *Physcia grisea* var. *detersa* f. *caesiella* Erichs. in Staatsinstitut für allgem. Botanik, Hamburg.

Description — Upper side of the thallus red-brown, densely caesio-pruinose. Lower side dark brown to black, with a lighter margin.

Remarks. It should be noted that Erichsen considered his form to belong to var. *detersa* which, according to Lynge's description (p. 174), is characterised by long, narrow, discrete, dark-coloured lobes with a faint pruina at the tips only. It does not seem advisable to connect *caesiella* (densely pruinose, contiguous lobes) with *detersa* (faintly pruinose, discrete lobes).

According to Erichsen, his f. *caesiella* would differ from f. *caesiascens* (Lettau) Erichs. in that the latter has the type of soralia characteristic of what he calls var. *leucoleiptes*, that is "nur mit Randsoralen, die sich besonders im peripherischen Teil des Lagers entwickeln". Besides, f. *caesiascens* has the lobes more discrete, much in the same way as in *Ph. muscigena*. f. *caesiella*, on the contrary, has contiguous lobes, whereas the soralia are confined to the central parts of the thallus.

Apart from the somewhat less developed pruina, our indigenous specimens conform to Erichsen's type, rather than to f. *caesiascens* of which I have studied Zahlbr., Lich. rarior., no 358, as well as a specimen in herb. Erichsen, collected by Lettau (Oberhof, Thür. Wald, a. Acer, 750 m. 11/10 1908) which may represent the syntype.

If one does not feel like attaching too much significance to the above mentioned differences, the present form should be called f. *caesiascens*, since Lettau's form (in Hedwigia, vol. 52, 1912, p. 254) was published many years prior to Erichsen's.

f. **farrea** (Ach.) Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 175; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 653 — *Parmelia farrea* Ach., Lich. Un., 1810, p. 475 — *Physcia grisea*; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 619 (pro parte!; ubi lit. et synon.).

Type collection: *Parmelia farrea* Ach. in the Botanical Museum, Helsinki.

Exsiccatum: Magnusson, Lich. sel. scand. exs., no 415.

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 37, fig. 226—227 (not quite typical).

Description — Lobes grey-brown to dark brown, more or less pruinose at the tips, more or less appressed, not imbricate, with ascending, flexuous margins. Soralia marginal and, in places, also terminal, confluent. A noteworthy character are the reflexed parts of the sorediose margin which resemble labriform soralia.

Remarks. A photograph enabled me to study the type material of *Parmelia farrea*. Consideration of both this photograph and Lynge's description shows that the indigenous specimens identified as f. *farrea* come

close to it, but differ in that the marginal soralia are poorly developed. Even this modification is rare in our country.

f. **harmandii** Maas G. nom. nov. — *Physcia pulverulenta* var. *leucoleiptes* f. *brunnea* Harm., Lich. France, vol. 4, 1909, p. 636 — *Physcia leucoleiptes* f. *brunnea*; Migula, Fl. Deutschl.. Abt. 2, vol. 12, 1924, p. 57 (non vidi); Kryptog.-Fl. Deutschl., vol. 4, pars 1, 1929, p. 57; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 641 — *Physcia grisea* f. *brunnea* (Harm.) Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 176.

Type collection: *Ph. pulverulenta* var. *leucoleiptes* f. *brunnea* Harm. in Lab. Bot. Univers. Cathol. Ouest, Angers.

Exsiccatum: Claud. et Harm., Lich. Gall. exs., no 494.

Description — Thallus growing in rosettes, upper side light brown to dark chestnut, usually epruinose or only slightly pruinose at the tips of the lobes, sometimes somewhat shiny. Peripheral lobes appressed, more or less plane, esorediate or with a few marginal soralia. Central lobes more imbricate and ascending, frequently concave on account of the flexuous and ascending margins, usually short, with confluent marginal and terminal soralia. Soredia whitish or yellowish or caesio-pruinose. Lower side black-brown at the base of the lobes, lighter brown to almost white at the tips. Rhizinae black, fibrillose.

Remarks. When mentioning f. *brunnea* Harm., Lynge was the first to make the new combination. It appears, however, that in this combination the subdivisional epithet is a later homonym, *Ph. grisea* f. *brunnea* having already been described by Mereschkovsky (in Ann. Cons. Jard. Bot. Genève, vol. 21, 1919, p. 195). On examination of Mereschkovsky's type specimen, it appeared that his form is in no way connected with Harmand's *brunnea*, but conforms to ordinary f. *grisea*.

The present form is rare in this country and the specimens are not quite typical.

In connection with f. *harmandii*, it may be useful to discuss f. *semifarrea* (Vain.) Lynge, though it does not occur here. *Semifarrea* was originally described as a form of *Ph. pulverulenta* ** *farrea* (in Medd. Soc. F. Fl. Fenn., vol. 6, 1881, p. 132), and subsequently transferred by Lynge to *Ph. grisea* (in Rabenh., l. c., p. 176). The following description has been drafted from Vainio's type material which was collected in Mäntyjóki, Finland: upper side of the lobes grey-brown to red-brown, almost entirely covered with a thick white or bluish pruina. Peripheral lobes appressed, strongly incised, with ascending margins which soon turn sorediose. Central lobes split up into numerous, crowded, upright, imbricate lobules with sorediate tips.

Other collections identified by Vainio and also put at my disposal show that the material is far from homogeneous. In some specimens the lobes may be traced down to the centre of the thallus, in others the centre is a profusion of short, ascending, imbricate lobules. The thalli may be hardly to strongly sorediate, densely caesio-pruinose to (almost) epruinose. Such epruinose specimens resemble f. *harmandii* indeed.

Since the author clearly states the thallus to be pruinose, and Vainio's description in other respects, too, is in keeping with the type material,

I am inclined to regard his later identifications as inadmissable alterations which affect the uniformity of his original form. From this I conclude that f. *harmandii* is not synonymous to f. *semifarrea,* though it is true that both forms are linked up by numerous intermediate phases.

By unfortunate coincidence I have not been able to examine the type specimens, but in all probability in describing his *Ph. lanuginosa* var. *semifarrea* f. *caesiella* (in Ann. Bot. Soc. Zool. Bot. Fenn. Vanamo, vol. 20, 1944, no 3, p. 13) Räsänen meant to distinguish typical *semifarrea* from epruinose specimens which he called f. *subnuda* (l. c., p. 14). In case of identity, *caesiella* is a superfluous epithet, and *subnuda,* if transferred to *Ph. grisea,* synonymous to f. *harmandii.*

Sectio 2. MACROSPERMA (Vain.) Maas G. nov. comb.

— *Physcia* sect. 1. *Euphyscia* b. *Sordulenta* 2. *Macrosperma* Vain. in Act. F. Fl. Fenn.. vol. 7, 1890, pars 1, p. 147 — *Physcia* subgen. *Macrosperma* (Vain.) Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 181.

Thallus light grey or dark, epruinose. *Pycnoconidia* long, filiform, curved. Upper cortex K—.

Remarks. In connection with the isolated taxonomic position of this section, attention may be drawn to the views of Choisy who, in Bull. Soc. Linn. Lyon, vol. 19, 1950, p. 20, for this taxon created the genus *Physciopsis.* This genus was, with disregard of the differences in the quality of the pycnidial fulcra and the spores, combined with the genera *Parmeliopsis, Squammaria* and *Lecanora* to form the family of the *Parmeliopsidaceae.*

16. Physcia elaeina (Sm.) A. L. Sm., Monogr. Brit. Lich., ed. 2, vol. 1, 1918, p. 244; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 181; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 652 — *Lichen elaeinus* Sm. in Smith et Sowerby, Engl. Bot., vol. 30, 1810, p. 2158 — *Lecanora adglutinata* Flk.. Deutsch. Lich., vol. 4, 1815, p. 7, adnot. 2 (non vidi) — *Parmelia obscura* var. *adglutinata* Schaer., Lich. Helv. Spicil., sect. 9, 1840, p. 442; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 130; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 23 — *Physcia adglutinata* Nyl. in Flora, vol. 45, 1862, p. 355 *); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 585.

Exsiccata: Claud. et Harm., Lich. Gall. exs., no 24, 501; Erb. crittog. Ital., no 468; Hepp, Flecht. Europ., no 374; Massalongo, Lich. Ital. exs., no 245, 246; Mougeot et Nestler, Stirp. Vogeso-Rhen., no 543; Rabenhorst, Lich. Europ., no 687.

Iconography: Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 10, fig. 4; Sántha in Fol. Cryptog., vol. 1,

[1]) Zahlbruckner (l. c.) was right in assuming that Nylander was the first to make this combination except for the date. In Mém. Soc. Imp. Sci. Natur. Cherbourg, vol. 5, 1857, p. 107 Nylander still looked upon *adglutinata* as a subspecies to *Ph. obscura,* and it was not before 1862 that he realised that *adglutinata* is a good species on account of the pycnoconidia being entirely different: "... nec amplius ullum restat dubium quin sit *Physcia adglutinata* species autonoma et distans..."

pars 6, 1928, tab. 15, fig. 6 (indistinct); Smith et Sowerby, Engl. Bot., vol. 30, 1810, tab. 2158.

Macroscopical description — Thallus foliaceous, growing in rosettes, more or less stellate, tiny, 0.5—1 cm in diam., frequently fusing with other thalli and covering larger patches, attached to the substratum by means of rhizinae, deeply incised. Lobes very thin, short and narrow, about 0.5 cm long, 0.2—0.5 mm broad, closely appressed, contiguous or overlapping at the margins, irregularly pinnatifid. Margins entire or somewhat sinuate, plane or corrugated. Tips little or not broadened, incised. Upper side of the lobes grey-green to light or dark grey-brown, darker towards the centre of the thallus, dull or slightly shiny, without pruina or *isidia*, though sometimes warty in the centre, *sorediate*. *Soralia* grey-green or whitish, maculiform, laminal and apical at the tips of the side-lobes, 0.1—0.5 mm in diam., sometimes confluent. Lower side of the lobes white to dirty white, dull, smooth, with a few whitish, very short rhizinae, partly also fastened to the substratum and not detachable without damage. *Microscopical description* — Upper cortex colourless, paraplectenchymatous, 12—15(—18) μ. Gonidia bright green, spherical, 8—18 μ, arranged in clusters or in a continuous layer of 20—50 μ, closely under the upper cortex. Medulla colourless, white in reflected light, rather densely plectenchymatous, 24—60 μ, composed of leptodermatous hyphae. Lower cortex colourless or yellowish, densely plectenchymatous, with the hyphae parallel to the surface, 9—18 μ, or locally lacking. *Apothecia* single or in small groups, laminal, sessile, cup-shaped to discoid, 0.5—0.8 mm in diam. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, entire or crenate. Disc brown-black, dull, naked. Epithecium brown-yellow, hypothecium yellowish, with clusters of gonidia underneath. Hymenium colourless, 80—90 μ. Asci cylindrical to clavate, 10—15 $\times$ 60—75 μ, 8-spored. *Spores* brown-black, 2-celled, little or not constricted in the centre, ellipsoidal, straight or slightly fabiform, with strongly thickened cell-walls at the septum and the rounded apices, 7—10 $\times$ 14—18 μ; well-developed spores are rare. Paraphyses simple or branched, septate, conglutinate, capitato-incrassate at the apices. *Pycnidia* not observed. *Chemical reactions* — Upper cortex as well as medulla indifferent to the usual reagents.

Ecology and distribution in the Netherlands. In this country the species has been found on fruit trees, *Aesculus*, *Populus*, *Salix*, and, preferably, *Ulmus*. It is a nitrophilous species which has frequently been found on trees in the middle of villages. *Ph. elaeina* which may have been uncommon already in former times, has become decidedly rare nowadays, except on the islands both in the south-west and the north. In my opinion it is the disappearance of our old wayside-trees which more than anything else accounts for the rarity of *Ph. elaeina*. Since, moreover, the species is a weak competitor, the chance of establishing itself in fresh habitats will become even slighter yet.

Distribution in Europe. As may be inferred from the records in literature, *Ph. elaeina* mainly occurs in the southern and central portions of Europe, extending to the west in Great Britain and Ireland, to the north in Denmark and southern Sweden (not in Norway), to the northeast in Estonia. As far as I know, the species seems to be

lacking in Finland, whereas I have no records from Poland or the U.S.S.R. Even in countries where the species is known to occur, *Ph. elaeina* is irregularly distributed. Schade (l. c., p. 95) at his time for instance could report no recent finds in Saxony, whereas prior to 1923 no finds were known from Schleswig-Holstein (Erichsen in Schr. Naturwiss. Ver. Schleswig-Holstein, vol. 22, 1937, p. 113).

Remarks. Contrary to what Lynge (l. c., p. 183) wrote about the colour of the lower side of the thallus, I find *Ph. elaeina* white to dingy white underneath. This makes a very good character for distinguishing *Ph. elaeina* in the field from small specimens of *Ph. orbicularis*. Another difference lies in the lower cortex which is plectenchymatous and less than 20 μ in *elaeina*, paraplectenchymatous and more than 20 μ in *orbicularis*. For the rest, it cannot be denied that *elaeina* strikingly resembles a tiny *orbicularis*. From equally small *Ph. nigricans* the present species is well marked off by its laminal maculiform soralia.

Specimens examined.

Friesland: Ameland, Ballum, 6 IX 1951, *Barkman 2824* (L); Paesens, 15 VIII 1951, *Barkman* (L); Terschelling, Midsland, 4 IX 1951, *Barkman 2807* (L); Vlieland, Oost Vlieland, 4 IX 1951, *Barkman 2810, 2814*, c. ap. (L); 1 IV 1948, *Maas G. 4007* (L).

Overijsel: Deventer, 10 X 1951, *Barkman* (L); Kampen, *Bondam*, c. ap. (NBV).

Noord-Holland: Amsterdam, *Van der Sande Lacoste*, c. ap. (NBV); 1849, *Van der Sande Lacoste*, c. ap. (L, NBV); Amsterdam, Kalfjeslaan, XI 1848, *Van der Sande Lacoste*, c. ap. (NBV); Amsterdam-Sloten, I 1849, *Van der Sande Lacoste*, c. ap. (NBV); Texel, De Cocksdorp, 2 IX 1951, *Barkman 2811* (L); Texel, Den Burg, 31 VIII 1951, *Barkman 2819* (L).

Zuid-Holland: Goeree, Goedereede, 15 IV 1952, *Barkman 2906* (L); Schoonhoven, 21 IV 1952, *Barkman 2878* (L); Voorschoten, 16 IV 1944, *Maas G. 3000* (L).

Zeeland: Noord-Beveland, Kortgene-Wissekerke, 23 IX 1951, *Barkman 2852* (L); Schouwen, Renesse-Brouwershaven, 20 IX 1951, *Barkman 2844*, c. ap. (L); Walcheren, Oostkapelle, 25 IX 1951, *Barkman 2859*, c. ap. (L); Zeeuws-Vlaanderen, Breskens, 26 IX 1951(*Barkman 2861* (L); Zuid-Beveland, *Van den Bosch* (NBV); *Van den Bosch*, c. ap. (NBV); IV 1841, *Van den Bosch* (L, NBV); Zuid-Beveland, Ellewoutsdijk, 22 IX 1951, *Barkman 2849* (L); Zuid-Beveland, Goes, *Van den Bosch* (NBV); Zuid-beveland, Wilhelminadorp, IX 1843, *Van den Bosch*, c. ap. (L).

Noord-Brabant: Bokhoven, 19 III 1905, *Wakker* (L).

References concerning the geographical distribution of the Physciaceae in Europe.

To the references cited in my paper on *Parmeliaceae* (in Blumea, vol. 6, 1947, p. 188—192) the following may be added. Completeness has not been reached.

AUSTRIA.

KLEMENT, O., Zur Flechtenflora der Umgebung von Seefeld in Tirol — Ber. Bayer. Bot. Ges., vol. 27, 1947, p. 191—201.

BULGARIA.

NÁDVORNÍK, J., Contribution aux Physciaceae d'Europe — Stud. Bot. Čechoslov., vol. 9, 1948, p. 144—154.

SZATALA, OE., Beiträge zur Flechtenflora von Bulgarien II — Mag. Bot. Lapok, vol. 29, 1930, p. 58—104.

CZECHOSLOVAKIA.

ANDERS, J., Die Strauch- und Blattflechten Nordböhmens — Böhmisch Leipa, 1906.

——, idem. 2 Nachtrag — Hedwigia, vol. 61, 1920, p. 351—374.

——, idem. 3 Nachtrag — Hedwigia, vol. 63, 1922, p. 269—322.

——, Zur Flechtenflora des Isergebirges — Hedwigia, vol. 64, 1923, p. 256—267.

——, idem. Nachtrag — Hedwigia, vol. 65, 1924, p. 65—84.

——, Die Flechten Nordböhmens. 4 Nachtrag — Beih. Bot. Centralbl., vol. 54 B, 1935, p. 429—488.

ČERNOHORSKÝ, Z., Epilithische Flechtengesellschaften der Prager Diabasfelsen — Preslia, vol. 18—19, (1939—1940) 1940, p. 37—52.

——, Flechten der Velká Hora bei Karlstein — Stud. Bot. Čechoslov., vol. 5, 1942, p. 148—155.

HILITZER, A., Les Lichens des rochers siliceux dans la partie centrale de la plaine de Labe — Preslia, vol. 3, (1923—25), 1925, p. 10—22.

——, Addenda ad lichenographiam Bohemiae series III — Act. Bot. Bohem., vol. 8, 1929, p. 104—118.

——, Ad distributionem lichenum in Carpatis orientalibus — Preslia, vol. 18—19, (1939—1940) 1940, p. 86—96.

KUTÁK, V., Troisième contribution à la connaissance des lichens de la Bohème — Preslia, vol. 5, 1927, p. 36—51.

NÁDVORNÍK, J., Physciaceae Tchécoslovaques — Stud. Bot. Čechoslov., vol. 8, 1947, p. 69—124.

SERVÍT, M., Zur Flechtenflora Böhmens und Mährens — Hedwigia, vol. 50, 1910, p. 51—85.

DENMARK.

CHRISTIANSEN, M. SKYTTE, Lavfloraen paa det fredede areal ved strankaer paa Mols — Bot. Tidsskr., vol. 48, 1946, p. 71—87.

DEGELIUS, G., Physcia dubia, P. nigricans och P. sciastra i Danmark — Bot. Tidsskr., vol. 43, 1935, p. 311—312.

ERICHSEN, C. F. E., Neue dänische Flechten — Ann. Mycol., vol. 40, 1942, p. 140—149.

LYNGE, B., Laverne av familien Physciaceae i Danmark — Bot. Tidsskr., vol. 43, 1935, p. 220—231.

MAGNUSSON, A. H., Förteckning över Skandinaviens växter. 4. Lavar — Lund, 1937.

——, Tillägg och ändringar till Skandinaviens växter. 4. Lavar — Uppsala, 1950, stencil.

FINLAND.

AHLNER, S., Flechten aus Nordfinnland — Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 9, 1937, no. 1.

——, Einige Flechtenfunde aus Karelien — Svensk Bot. Tidskr., vol. 35, 1941, p. 261—270.
HAKULINEN, R., Einige bemerkenswerte Flechtenfunde aus Finnland — Arch. Soc. Zool. Bot. Fenn. Vanamo, vol. 4 (1949) 1950, p. 105.
LÅNG, G., Lichenes Savoniae Borealis — Act. Soc. F. Fl. Fenn., vol. 34, 1910, no. 3.
RÄSÄNEN, V., Über Flechtenstandorte und Flechtenvegetation im westlichen Nordfinnland — Ann. Soc. Zool.-Bot. Fenn. Vanamo, vol. 7, 1927, no. 1.
——, Petsamon Jäkäläkasvisto — Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 18, 1943, no. 1.
VAARNA, V. V., Über die epiphytische Flechtenflora der Stadt Helsinki — Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 5, 1934, no. 6.

FRANCE.

ABBAYES, H. DES, Étude écologique des Lichens de l'étage du Hêtre dans la région sud des Monts-Dore (P.-de-D.) — Rev. Bryol. Lichénol., N. S., vol. 7, 1934, p. 5—27.
——, Contributions nouvelles à la connaissance des Lichens armoricains II — Bull. Soc. Sci. Bretagne, vol. 13, 1936, p. 122—144.
BERNER, L., Les principaux Lichens des environs de Marseille — Rev. Bryol. Lichénol., N. S., vol. 16, 1947, p. 113—130.
BOULY DE LESDAIN, M., Recherches sur les Lichens des environs de Dunkerque — Dunkerque, thesis, 1910.
——, Recherches etc., 1er Suppl. — Dunkerque, 1914.
——, Lichens recueillis aux environs de Nice (Alpes-Maritimes) en 1945 et 1946 — Rev. Bryol. Lichénol., N. S., vol. 18, 1949, p. 69—79.
CHOISY, M., Catalogue des Lichens de la région lyonnaise — Bull. Soc. Linn. Lyon, vol. 19, 1950, p. 138—141.
MAIRE, J., Lichens d'Aix-en-Provence (1926—1927) — Bull. Soc. Bot. France, vol. 77, 1930, p. 597—611.
NÁDVORNÍK, J., Contribution aux Physciaceae d'Europe — Stud. Bot. Čechoslov., vol. 9, 1948, p. 144—154.
OZENDA, P., Matériaux pour la flore lichénologique des Alpes-Maritimes — Bull. Soc. Bot. France, vol. 97, 1950, no. 10, p. 29—50.

GERMANY.

ERICHSEN, C. F. E., Die Flechten des Moränengebiets von Ostschleswig mit Berücksichtigung der angrenzenden Gebiete — Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 1—68.
——, Ein lichenologischer Ausflug nach Mecklenburg — Arch. Ver. Freund. Naturgesch. Mecklenburg, N. F., vol. 11, (1936) 1937, p. 5—31.
——, Weitere Beiträge zur Flechtenflora Schleswig-Holsteins und des Gebiets der Unterelbe — Schr. Naturwiss. Ver. Schleswig-Holstein, vol. 22, 1937, p. 89—116.
——, Neue Beiträge (3.) zur Kenntnis der Flechtenflora Schleswig-Holsteins und des Gebiets der Unterelbe — Ann. Mycol., vol. 36, 1938, p. 128—153.
——, 4. Beitrag etc. — ibidem, vol. 37, 1939, p. 61—87.
——, 5. Beitrag etc. — ibidem, vol. 39, 1941, p. 1—37.
——, 6. Beitrag etc. — ibidem, vol. 40, 1942, p. 163—189.
GRUMMANN, V. J., Die Flechtenflora der Insel Rügen mit Hiddensee — Rep. spec. nov. regn. veg. Beih., vol. 81, 1935, p. 1—56.
HILLMANN, J., Beiträge zur Flechtenflora Bayerns II — Ber. Bayer. Bot. Ges., vol. 22, 1937, p. 120—135.
——, Zur Flechtenflora der Mark Brandenburg VI — Verh. Bot. Ver. Prov. Brandenburg, vol. 79, 1939, p. 26—37.
——, Idem VII — ibidem, vol. 82, 1942, p. 100—107.
——, Beiträge zur Flechtenflora Bayerns III — Ber. Bayer. Bot. Ges., vol. 26, 1943, p. 139—150.
LANGERFELDT, J., Beiträge zur Flechtenflora Oldenburgs. Lichenologische Beobachtungen im alten Amte Varel — Rep. spec. nov. regn. veg. Beih., vol. 101, 1938, p. 1—25.
LAVEN, L., Beitrag zur Flechtenflora des Vereinsgebietes — Decheniana, Festschr., vol. 101 AB, 1942, p. 117—130.
LYNGE, B. Physciaceae in Rabenhorst, Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 41—188.

MATTICK, FR., Flechtenvegetation und Flechtenflora des Gebietes der Freien Stadt Danzig — 59 Ber. Westpreuss. Bot.-Zool. Ver., 1937, p. 1—53.
POELT, J., Beiträge zur Flechtenflora Bayerns — Ber. Bayer. Bot. Ges., vol. 28, 1950, p. 276—289.
SCHADE, A., Die sächsischen Arten der Flechtenfamilie der Physciaceae sowie die Verbreitung von Physcia caesiella (B. de Lesd.) Suza in Mitteleuropa — Beih. Bot. Centralbl., vol. 58 B, 1938, p. 55—99.
——, Beiträge zur Kryptogamenflora der Ostseeküste von Ostpommern — Rep. spec. nov. regn. veg. Beih., vol. 111, 1939, p. 105—152.
SCHINDLER, H., Flechtenflora von Rudolstadt. Ein Beitrag zur Lichenographie von Thüringen — Beih. Bot. Centralbl., vol. 56 B, 1937, p. 327—352.
SCHNEIDER, TH., Zur Flechtenflora der Schwellenburg — Mitt. Thüring. Bot. Ver., N. F., vol. 47, 1941, p. 140—150.
SCHWIND, J., Flechten aus Südbayern und dem Allgaü — Kryptog. Forsch., vol. 2, 1935, p. 246—254.
TOBLER, FR. & MATTICK, FR., Die Flechtenbestände der Heiden und der Reitdächer Nordwestdeutschlands — Bibl. Bot., Heft 117, 1938.

GREAT BRITAIN.

CROMBIE, J. M., Lichenes Brittannici — Londini, 1870.
SOWTER, F. A., The cryptogamic flora of Leicestershire and Rutland — Leicester, 1950.
WATSON, W., Notes on Lichens, mainly from Orkney, in the Herbarium of the Royal Botanic Garden, Edinburgh — Trans. Proc. Bot. Soc. Edinburgh, vol. 31, 1935, p. 505—520.
——, Notes on Lichens in the Herbarium of the Royal Botanic Garden, Edinburgh II — ibidem, vol. 32, 1939, p. 502—515.
——, Notes etc. III — ibidem, vol. 33, 1942, p. 183—208.
——, Notes etc. IV — ibidem, vol. 34, 1945, p. 233—243.

GREECE.

HARMAND, J. et MAIRE, R., Matériaux pour servir à l'étude de la flore et de la géographie botanique de l'orient. VI fasc. Contribution à l'étude des Lichens de la Grèce — Bull. Soc. Sci. Nancy, ser. 3, vol. 10, 1909, p. 143—176.
SZATALA, OE., Contributions à la connaissance de la flore lichénologique de la péninsule des Balkans et de l'Asie mineure — Borbasia, vol. 2, 1940, p. 33—50.
——, Contributions à la connaissance des lichens de la Grèce. I. La presqu'île Athos (Hagion Oros) — Borbasia, vol. 3, 1941, p. 113—136.

HUNGARY.

GALLÉ, L., Lichenassociationen aus Szeged — Fol. Cryptog., vol. 1, 1930, p. 933—946.
——, Soziologische und floristische Studie über die Flechten der Burgruine von Szeged — Bot. Közlemén., vol. 38, 1941, p. 143—146.
GYELNIK, V., Beiträge zur Flechtenvegetation Ungarns I — Fol. Cryptog. vol. 1, 1926, p. 237—242.
SZATALA, OE., Beiträge zur Kenntnis der Flechtenflora Ungarns — Mag. Bot. Lapok, vol. 24 (1925) 1926, p. 43—75.
——, idem II — ibidem, vol. 25, (1926) 1927, p. 201—218.
TIMKÓ, G., Turócer Flechten — Fol. Cryptog., vol. 1, 1930, p. 830—832.

ICELAND.

LYNGE, B., Lichens from Iceland, collected by Norwegian botanists in 1937 and 1939. I. Macrolichens — Skr. Norsk Vid. Akad. Oslo. I. Mat.-Naturvid. Kl., 1940, no. 7.

IRELAND.

ADAMS, J., The distribution of Lichens in Ireland — Proc. Roy. Irish Acad., sect. B, vol. 27, 1908—1909, p. 193—234.

ITALY.

CENGIA-SAMBO, M., Due excursione licheniche in Piemonte: Alta valle della Dora Baltea e alta valle d'Ala — Bull. Soc. Bot. Ital., 1925, p. 181—187.
——, Florula Lichenica del Passo de Piccolo S. Bernardo — Ann. Lab. Chanousia Giard. Bot. Alp. Ord. Mauriziano Picc. S. Bernardo, no. 2, 1932.
——, I licheni della Conca di Tesino (Trento) — Stud. Trentini Sci. Natur., vol. 18, 1937, fasc. 2.
——, I licheni della Laguna di Venezia — Arch. Bot., vol. 14, 1938, p. 113—125.

NÁDVORNÍK, J., Contribution aux Physciaceae d'Europe — Stud. Bot. Čechoslov., vol. 9, 1948, p. 144—154.

LIECHTENSTEIN.

DALLA TORRE, K. W. VON & SARNTHEIN, L. Grafen VON, Die Flechten van Tirol, Vorarlberg und Liechtenstein — Innsbruck, 1902.

NORWAY.

HAVÅS, J., Lichenvegetationen ved Mosterhaven — Bergens Mus. Aarb., 1917—1918, Naturvid. Raekke, no. 2.

LYNGE, B., A monograph of the Norwegian Physciaceae — Vid. Selsk. Skr. I, Mat.-Naturvid. Kl., 1916, no. 8.

MAGNUSSON, A. H., Förteckning över Skandinaviens växter. 4. Lavar — Lund, 1937.

——, Tillägg och ändringar till Skandinaviens växter, 4. Lavar — Uppsala, 1950, stencil.

POLAND.

KRAWIEC, F., Die Epiphyten-Flora der Buchenwälder Grosspolens — Act. Soc. Bot. Pol., vol. 11, 1934, Suppl., p. 317—327.

MOTYKA, J., Études sur la flore lichénologique du Tatra. Première partie. Lichens recueillis dans la vallée Kościeliska — Act. Soc. Bot. Pol., vol. 2, 1924, p. 44—59.

SUZA, J., Additamenta ad lichenes Poloniae cognoscendos — Act. Soc. Bot. Pol., vol. 5, 1928, p. 213—219.

TIMKÓ, G., Beiträge zur Flechtenflora von Polen — Bot. Közlemén., vol. 19, (1920—1921) 1921, p. 84—88.

TYSZKIEWICZ, J., Recherches sur les lichens corticoles dans les forêts de la partie Nord-Est du plateau Kielce-Sandomierz — Pl. Polonica, vol. 3, 1935, p. 1—119.

PORTUGAL.

COUTINHO, A. X. P., Lichenum Lusitanorum herbarii Universitatis Olisiponensis catalogus — Lisboa, 1916.

HARMAND, J., Notes relatives à la Lichénologie du Portugal. Suite. — Bull. Soc. Bot. France, vol. 56, 1909, p. 27—34.

TAVARES, C. N., Sôbre algumas espécies dos géneros Cladonia e Physcia — Bol. Soc. Broteriana, ser. 2, vol. 19, pars 1, 1944, p. 181—199.

——, Líquenes da Serra do Gerês — Portugal. Act. Biol., Ser. B, vol. 3, 1950, no. 1/2; idem in Agronomia Lusit., vol. 12, 1950, p. 123—163.

RUMANIA.

CRETZOIU, P., Neue Flechten aus Rumänien — Verh. Siebenburg. Ver. Naturw., 1940, p. 242—246.

STAMATIN, M., Contribution à la flore lichénologique de la Roumanie — Ann. Sci. Univers. Jassy, vol. 3, 1906, p. 79—94.

——, idem II — ibidem, vol. 4, 1906, p. 252—257.

SPAIN.

ABBAYES, H. DES, Lichens d'Espagne récoltés de 1926 à 1935 par M. et Mme P. ALLORGE — Rev. Bryol. Lichénol., N.S., vol. 15, (1945) 1946, p. 79—86.

MAHIEU, J. et WERNER, R. G., Lichénographie Catalane des laves d'Olot (Espagne). Comparaison avec la Flore calcaire du massif voisin de Puigsacalm — Rev. Bryol. Lichénol., N. S., vol. 7, 1934, p. 194—212.

SWEDEN.

AHLNER, S., Weitere Beiträge zur Strauch- und Laubflechtenflora von Åsele Lappmark — Ark. f. Bot., vol. 29 A, 1938, no. 9.

——, idem II — ibidem, vol. 30 A, 1940, no. 2.

——, Några lavar från Härnön i Ångermanland — Bot. Notis., 1943, p. 155—159.

——, Lavar från Långans övre vattenområde i västra Jämtland — K. Svensk. Vet. Akad. Skr. Naturskyddsär, 1944, no. 44.

ALMBORN, O., Lavfloran i Botaniska trädgården i Lund — Bot. Notis., 1943, p. 167—177.

MAGNUSSON, A. H., Två lavexkursioner i västra Sverige — Medd. Göteborgs Bot. Trädg., vol. 11, 1936, p. 43—60.

——, Förteckning över Skandinaviens växter. 4. Lavar — Lund, 1937.

——, Tillägg och ändringar till Skandinaviens växter. 4. Lavar — Uppsala, 1950, stencil.

SWITZERLAND.

LETTAU, G., Schweizer Flechten I — Hedwigia, vol. 60, 1918, p. 84—128.

——, idem II — ibidem, vol. 60, 1919, p. 267—312.

MEYLAN, CH., Contribution à la connaissance des Lichens du Jura — Bull. Soc. Vaud. Sci. Natur., vol. 54, 1922, p. 287—294.

——, La flore bryologique et lichénologique du bloc erratique de la Grange de la Côte — ibidem, vol. 56, 1926, p. 165—172.

——, Nouvelle contribution à la connaissance des Lichens du Jura, avec quelques indications de localités des Alpes — ibidem, vol. 56, 1926, p. 173—178.

——, Troisième contribution à la connaissance des Lichens du Jura — ibidem, vol. 57, 1930, p. 213—218.

——, 4me Contribution à la connaissance des Lichens du Jura — ibidem, vol. 59, 1936, 15—20.

NÁDVORNÍK, J., Contribution aux Physciaceae d'Europe — Stud. Bot. Čechoslov., vol. 9, 1948, p. 144—154.

U. S. S. R. (European part).

ANDRES, H., Beiträge zur Kryptogamenflora Wolhyniens I — Hedwigia, vol. 67, 1927, p. 214—222.

KREYER, G. K., Contributio ad floram lichenum gub. Mohilevensis annis 1908—1910 lectorum. Suppl. — Act. Hort. Petropol., vol. 31, 1913, p. 263—440.

OXNER, A., Matériaux pour la flore des Lichens de la Bélarussie — Bull. Jard. Bot. Kieff, vol. 1, 1924, p. 27—36.

——, Neue und bis jetzt für die Ukraïne wenig bekannte Flechtenarten — ibidem, vol. 2, 1925, p. 20—28.

STEINER, J., Flechten aus Transkaukasien — Ann. Mycol., vol. 17, 1919, p. 1—32.

SZATALA, OE., Lichenes in Peninsula Taurica et in Caucaso ab F. Kamienski, D. Sosnowsky et E. Koenig collecti — Borbasia, vol. 4, 1942, p. 70—96.

YUGOSLAVIA.

KUŠAN, F., Beitrag zur Kenntnis der Flechtenflora des Papuk-Gebirges in Slawonien — Hedwigia, vol. 74, 1935, p. 285—296.

——, Über die Flechtenvegetation auf Kalkfelsen in mittlerem Dalmatien — Act. Bot. Inst. Bot. Univ. Zagreb., vol. 10, 1935, p. 33—49.

NÁDVORNÍK, J. Contribution aux Physciaceae d'Europe — Stud. Bot. Čechoslov., vol. 9, 1948, p. 144—154.

SÁNTHA, L., Beiträge zur Flechtenflora der Umgebung von Kapronca (Koprivnica) — Bot. Közlemén., vol. 20, (1922) 1924, p. 56—66.

SERVÍT, M., Zur Flechtenflora Norddalmatiens — Mag. Bot. Lapok, vol. 9, 1910, p. 164—193.

SZATALA, OE., Beiträge zur Flechtenflora der Insel Arbe — Mag. Bot. Lapok, vol. 26, (1927) 1928, p. 27—45.

——, Enumeratio Lichenum a cl. F. Fóriss in Galicia lectorum — Fol. Cryptog., vol. 1, 1930, p. 985—988.

Index

New names or new combinations in heavy type; synonyms or misapplied names in italics; page number in heavy type denotes a description.