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## The lichen genus *Micarea* (Lecanorales, Ascomycota) in Poland

PAWEŁ CZARNOTA



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# THE LICHEN GENUS *MICAREA* (LECANORALES, ASCOMYCOTA) IN POLAND

PAWEŁ CZARNOTA

**Abstract.** A taxonomic revision of Polish lichen collections belonging to the genus *Micarea* in its broad sense is presented. 34 species are recognized, of which two, *Micarea nowakii* Czarnota & Coppins and *M. tomentosa* Czarnota & Coppins are new to science, and *M. globulosella* (Nyl.) Coppins is reported from Poland for the first time. A key for the identification of all Polish taxa is given. Detailed original descriptions, taxonomic remarks, notes on ecology, distribution in the country and known distribution in the world for each taxon are supplied. Lists of valid synonyms are also provided. Some additional collections from abroad, verified exsiccatae and reference material from type collections as well as lists of almost all examined specimens from Poland are also included. Morphological and anatomical characters of many species are illustrated and their distribution in Poland is mapped according to the ATPOL grid square system. Three species: *Micarea assimilata* (Nyl.) Coppins, *M. melaenida* (Nyl.) Coppins, *M. ternaria* (Nyl.) Vězda are excluded from the checklist of Polish lichens. *Micarea prasina* Fr. and *M. micrococca* (Körb.) Gams *ex* Coppins are separated on the basis of the presence of micareic acid and methoxymicareic acid respectively. *Lecidea semipallida* Nyl. is a new synonym for *M. denigrata* (Fr.) Hedl., *Lecidea meiocarpoides* Nyl. for *M. lithinella* (Nyl.) Hedl. and *Lecidea prasiniza* Nyl. for *M. prasina*. *Micarea melanobola* (Nyl.) Coppins is proposed as a synonym of *M. prasina* on the basis of its granular thallus composed of gonioscysts and the presence of micareic acid found in the type material from Finland and other reference specimens from Estonia.

**Key words:** Pilocarpaceae, *Micarea*, *Micarea nowakii*, *Micarea tomentosa*, lichen taxonomy, lichen ecology, lichen distribution, Poland

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## INTRODUCTION

Although the genus *Micarea* in Europe was revised extensively more than 20 years ago by Coppins (1983), taxa under this generic name appeared only occasionally in Polish lichenological literature over the next decade and, of the 45 European species listed by this author, only 13 appeared in the first Polish checklist of lichens and allied fungi by Fałtynowicz (1993), the position of many species included there being based on only sparse, historical data relating to former territories of Prussia and Silesia (e.g. Ohlert 1870; Stein 1879; Eitner 1896, 1901, 1911; Migula 1931), with, for example, *M. misella* supported by a single old report from East Prussia (Lettau 1912). Furthermore, as a consequence of the studies presented here, two species, *M. assimilata* (Nyl.) Coppins and *M. ternaria* (Nyl.) Vězda, should have been excluded from the Polish list.

Ignorance of *Micarea* in post-war Poland resulted from an oversight of these inconspicuous lichens, as well as from an unacquaintance of the genus in general. Intensive field studies carried out on the turn of the 20th century in many regions of the country almost doubled the number of known *Micarea* species (Czarnota 1997a, b, 1998, 2003b; Zalewska 1998) and most of them formerly reported as rare taxa have distinctly extended their geographical range (see e.g. Fałtynowicz 1992; Kukwa *et al.* 2000; Czarnota 2002; Cieśliński 2003b, c). As a consequence, the most recent checklist of Polish lichens (Fałtynowicz 2003) lists 24 members of the genus. Preliminary revisions of some collections related to *Micarea* from different Polish herbaria for the 'Atlas of the geographical distribution of lichens in Poland' showed that many collections were incorrectly identified. Moreover,

the author discovered that several, well known *Micarea* species had been frequently collected by Polish lichenologists before Coppins validly described them in 1983 (*M. adnata*, *M. hedlundii*, *M. nigella*; see for example Czarnota *et al.* 2005), being overlooked among other associated lichens or determined as other taxa.

In lichenological literature, there are also many regional reports based on field observations (e.g. Kiszka, pers. comm.) for which confirmation in the form of herbarium material is lacking. In the light of the above, it was clear that our knowledge on *Micarea* species in Poland was deficient. Therefore, since 2003, extensive studies to resolve this problem have been undertaken by the author, the first stage of a taxonomic revision has already been published (Czarnota 2004). As a consequence of which, the list of Polish *Micarea* species has increased, and *M. viridileprosa*, previously known from only one locality in Biebrza Basin (Sparrius 2003), appears not to be so rare. Intensive field studies throughout Poland during 2003–2006 and an examination of a larger number of specimens has also provided new and more detailed data on the ecology, etc. of particular species. This fieldwork has concentrated in areas where records of *Micarea* are rare or lacking, especially those with the potential to support them, such as the Sudetes, Carpathians and Roztocze regions. As a consequence, almost all collections referring to *Micarea* housed in Polish (including some private) herbaria have been revised and more than 1400 fresh gatherings recognized as belonging to this genus have been collected. The studies showed that at least 34 taxa certainly occur in Poland, two of which, *Micarea nowakii* Czarnota & Coppins and *M. tomentosa* Czarnota & Coppins, are described here as new to science. This list will no doubt

extend in the near future since some species known from neighboring countries, e.g. *Micarea lapillicola* (Vain.) Coppins & Muhr, *M. lynceola* (Th. Fr.) Palice and *M. vulpinaris* (Nyl.) Muhr (Palice 1999), and several others widespread in Europe, e.g. *M. confusa* Coppins & van den Boom and *M. subcinerea* Brand & van den Boom, probably occur also in Poland.

Although phylogenetic studies based on mitochondrial rDNA sequences (Andersen & Ekman 2005) provide new data on infrageneric taxa, they lack some formal nomenclatural innovations; therefore, *Micarea* sensu Coppins (1983) has been adopted for the present study which is based on revisions of rich reference materials (including many nomenclatoric types housed in H-NYL and E), resulting in new synonyms and typification (e.g. *M. denigrata*, *M. lithinella*, *M. micrococca*, *M. prasina* and *M. synotheoides*).

The main aims of this study were: (1) to make taxonomic revisions of all accessible collections related to *Micarea* stored in Polish herbaria, (2) to critically review the lichenological literature containing reports on *Micarea* from Polish localities, (3) to determine how many species related to *Micarea* actually occur in Poland, (4) to provide a key for identification of the species and (5) to assemble ecological and distributional data of the different species in Poland in order to compare them with their known status worldwide.

## MATERIALS

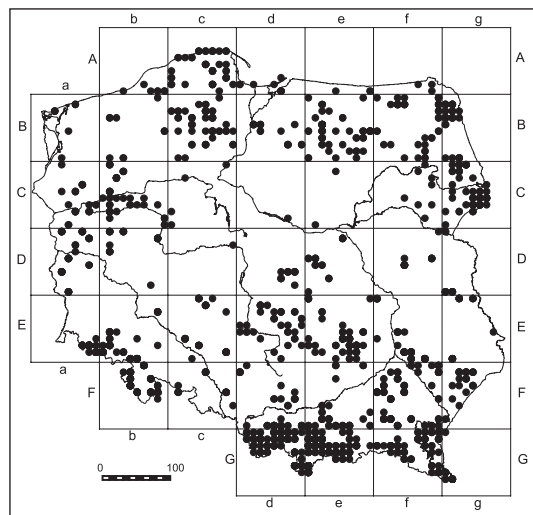
All Polish herbarium collections referable to *Micarea* housed in BDPA, BSG, GPN, KRA, KRAM, KRAP, KTC, LBL, LOD, OLS, OLTC, OPUN, TRN, UGDA, WA, WRSL and Hb. Kukwa, as well as in private, working herbaria (not as yet included in the main university collections): Hb. Izydorek, Hb. Kossowska, Hb. Kowalewska, Hb. Lipnicki, Hb. Staniaszek, Hb. Szczepańska, Hb. Wieczorek, have been examined, to which have been added information from Hb. M. R. D. Seaward and HBG. Selected type collections and exsiccatae coming from BP, E, Hb. Vězda, H, H-ACH, H-NYL, KRAM and WRSL have been revised and used as reference materials. In addition, European collections by Coppins (E) and Palice (PRA) have been examined for comparative purposes, some

of which are cited where necessary. More than half of all studied specimens cited in this work (especially in the case of formerly unknown or overlooked species) were recently collected by the author from different regions of Poland and a few other European countries and have been deposited in GPN. All of the ca 2500 Polish specimens examined are listed below.

## METHODS

In view of the major gaps in our knowledge of the Polish distribution of *Micarea* species and our increasing knowledge of the ecology of particular species, numerous field studies were made during 2002–2006, especially in Wielkopolskie Lakeland and Śląska Lowland in the western Polish lowlands, Kotlina Sandomierska basin, Polesie and Roztocze regions in eastern Poland, and over most parts of the Sudetes and Pogórze Sudeckie foothills which were more intensively explored. Moreover, many short-term excursions (as for example in several ranges of Western Beskidy Mts, Eastern Beskidy Mts, Tatra Mts and Baltic coast) were undertaken in order to check existing data as well as to add new records. It was not the author's intention to explore the whole of Poland, but to carry out more detailed studies of selected habitats based on a knowledge of the geographical ranges of the species. Since most *Micarea* species are clearly confined to woodlands, more attention was concentrated on forest environments, especially those of a natural or even ancient character. For this reason, localities in most forested national parks have been investigated.

Observations of morphological characters were made with a Stemi DV4 Zeiss stereomicroscope, and anatomical features and their measurements were investigated with a Axiostar plus Zeiss microscope equipped with a calibrated scale. A digital camera Canon PowerShot G2, with tubular adapters accommodated respectively to both microscopes, was employed for microphotography. All sections of thallus, pycnidia and apothecia were made by hand, then mounted in water, and where necessary followed by 10% KOH (K), domestic bleach (C), 50% HNO<sub>3</sub> or Lugol's iodine solution (J) after treatment with 10% KOH. Many microscopic measurements of anatomical features (conidia, ascospores, width of paraphyses, etc.) were made with a computer program MultiScan ver. 13.01 after transfer of a digital picture from camera to the computer. The thin-layer chromatography technique (TLC) was employed according to the method of Orange *et al.* (2001). Most of samples were analyzed by TLC in solvent C, but some of them also in the solvent A.



**Fig. 1.** ATPOL grid squares from which gatherings of Polish *Micarea* s.l. were examined.

Species are listed in alphabetical order and the nomenclature follows Coppins (2002), except *Helocarpon crassipes* Th. Fr. [= *Micarea crassipes* (Th. Fr.) Coppins], which is treated here as a member of the homotypic genus (see also Andersen 2004) and excluded from the Polish *Micarea* list. For each species, a list of valid synonyms in historical order is provided, mostly based on the work of Hedlund (1892), Vězda and Wirth (1976) and Coppins (1983, including typification). Completely new synonyms established during these studies are marked separately and usually supported by additional notes. Other synonyms and those referring to species not included by Coppins (1983) are taken from several modern taxonomic works or directly from internet version of *Index Fungorum* (Anonymous 2004).

Detailed, original descriptions are based only on those collections examined during the course of the studies.

The distribution of all species in Poland is presented on maps based on the modified ATPOL grid square system (Cieśliński & Fałtynowicz 1993) and corresponds to only analyzed materials (Fig. 1). Localities of these examined Polish specimens include geographical macro- and mezoregion according to Kondracki (1998). The list of revised specimens also contains those collections where *Micarea* species are found only as associated species. In those instances the phrase 'together with ...' is used to find the species in herbaria. The nomenclature for lichen species other than *Micarea* follow Fałtynowicz (2003), Redhead *et al.* (2002), Blanco *et al.* (2004), Lücking *et al.* (2004), Santesson *et al.*

(2004) and Veldkamp (2004). Abbreviations of journals according to Bridson and Smith (1991).

The nomenclature of Polish vascular plants follows Mirek *et al.* (2002).

#### GENERAL REMARKS ON THE GENUS *MICAREA*

Since Fries (1825) described the genus *Micarea*, its general outline is still changing, especially recently, when classical taxonomic studies can be supported by molecular analyses. During almost the whole of the 19th century this generic name was little used by lichenologists, except Körber (1855) who accepted, however, only one member of the genus, namely *M. prasina* Fr. Only Hedlund (1892) in his doctoral thesis emended the genus, including 20 species belonging previously to *Biatora*, *Bilimbia*, *Catillaria* and *Lecidea*. Following his concept, the genus should be comprised of species which are characterized above all by small-celled photobionts [4–8(–9) µm diam.], the presence of haustoria penetrating algal cells, immarginate, small, often tuberculate apothecia, an excipulum composed of paraphysis-like hyphae, as well as by thin, branched and anastomosing paraphyses. With the exception of the addition of *Micarea nitschkeana* (Lahm *ex* Rabenh.) Harm. in 1899, Hedlund's concept was unfortunately not accepted during the next few decades, the 'Zahlbruckner's era', the species being transferred again to different genera, mainly based on spore septation. At the beginning of the 20th century only once, in 1923, Du Rietz made a new combination within *Micarea*, moving *Biatora turfosa* A. Massal. to that genus. Since the 1960s, Hedlund's concept has returned and several new combinations have appeared [for example *Micarea micrococca* (Körb.) Gams, however invalidly, *M. prasina* var. *sordidescens* (Nyl.) Brodo, *M. ternaria* (Nyl.) Vězda, *M. tuberculata* (Sommerf.) R. Anderson and *M. leprosulata* (Th. Fr.) Coppins & A. Fletcher]. In 1976, Vězda and Wirth systematized our knowledge on the genus in Europe, giving many new combinations [among them *M. bauschiana* (Körb.) V. Wirth & Vězda], and publishing a 'new' species – *M. umbrosa* Vězda & V. Wirth (= *M. lutulata*), thus, extending

the concept of the genus *Micarea*. Since that time the necessity of small-celled, ‘micareic’ photobionts and thin-size, homogeneous paraphyses has been negated, resulting in several new taxa being moved into *Micarea*. While Vězda and Wirth (1976) verified the nomenclature of 31 species, Coppins (1983) showed there to be 45 European members of the genus, including 7 newly described species and 9 new combinations.

Currently, the genus *Micarea* is composed of almost 100 species worldwide, but only about 60 species are known in Europe. The recent concept of the genus will extend this number due to a more liberal treatment of previous assumptions. In a consequence, within *Micarea* now appear such species as *M. myriocarpa* V. Wirth & Vězda ex Coppins, having a mealy thallus, two types of paraphyses and differing from other members of the genus in possessing small-celled, but non-micareoid photobiont, *M. erratica* (Körb.) Hertel, Rambold & Pietschm. and *M. marginata* Coppins & Muhr with distinctly lecideoid apothecia (at least initially), a well-developed excipulum and mostly simple paraphyses, and *M. polycarpella* (Erichsen) Coppins & Palice with large-celled (sometimes more than 20 µm diam.) photobiont. The ascus type, recently promoted as one of the basic taxonomic features (Hafellner 1984), has also proved to be less diagnostic since although the genus is dominated by species with a characteristic *Micarea*-type ascus, taxa with asci of *Lecanora*-type as in *Micarea intrusa* (Th. Fr.) Coppins & H. Kilius (recently transferred to *Scoliciosporum*, as *S. intrusum* (Th. Fr.) Hafellner; Hafellner 2004) or *M. sylvicola* (Flot.) Vězda & V. Wirth and other members of *M. sylvicola*-group as well as *M. erratica* above-mentioned are characterized by their *Psora*-type ascus (see Ekman *et al.* 2004).

The phylogenetic work of Andersen (2004) has shown that the infrageneric relationships within *Micarea* are more complicated than previously suggested by Coppins (1983). Although these studies should be treated as preliminary (e.g. owing to insufficient support for several deep branches, or the limited number of sequences employed in statistical analyses), they do indi-

cate that many species already included within the genus need critical revision. Other studies show, however, incontrovertibly, that four species, *Micarea bauschiana*, *M. lutulata* (Nyl.) Coppins, *M. sylvicola* and *M. tuberculata*, forming a separate *M. sylvicola*-group should be excluded from *Micarea*, owing to their close relationship to the Psoraceae (Andersen & Ekman 2005). To date, however, no new taxonomic innovations have been made.

Accepting that molecular analyses lead to objective taxonomy based on genetic similarity and not on subjectively perceived morphological and anatomical features, the hitherto existing genus *Micarea* should be regarded as a non-monophyletic aggregation, and species of the *M. prasina*-group (that includes the type species for the genus) as comprising *Micarea* s.str. (thallus composed of goniocysts, photobiont micareoid, paraphyses branched and anastomosed of one type, asci ‘*Micarea*-type’, ascospores 0–1-septate; Fig. 2). Unfortunately, this would not provide a solution to this taxonomic problem when one considers the recent work by Andersen (2004) who concluded that the *M. prasina*-group includes, apart from those species composed of goniocysts, several species (e.g. *M. adnata*, *M. misella*, *M. elachista*) with a completely different thallus structure and others with different apothecial features such as the absence of ‘Sedifolia-grey’ pigment or having multiseptate, acicular ascospores (e.g. *M. adnata*, *M. pycnidiophora*, *M. stipitata*). There are good reasons for considering the genus *Micarea* according to the concept of Coppins (1983), excluding *Helocarpon crassipes* (also found in Poland), but in full consciousness, this should be modified in a nearest future.

#### NOTEWORTHY FEATURES

The complexity of particular lichen structures occurring in members of the genus *Micarea*, their variety within delimited groups of species, and their weight in practical taxonomy were detailed by Coppins (1983). He also noticed secondary lichen metabolites appearing in several species belonging to the genus and explained their role

and importance in a recognition of some of them (especially those morphologically similar) based on TLC analyses. In the light of this, the current researcher decided to systematize this and recent knowledge (on morphology, anatomy and ecology) in relation to the practical recognition of those *Micarea* species found in Poland to date, as an introduction to the main chapter containing their detailed description and taxonomic remarks.

#### THALLUS

There are several morphological types of thallus found in species related to *Micarea*. The thallus is composed of  $\pm$ continuous, more or less convex areolate warts in terricolous species and most of those occupying rough bark and twigs of trees. A thick, mostly cracked to scurfy granular thallus is usually observed in saxicolous species, especially those referred to the *Micarea sylvicola*-group. However, *M. myriocarpa*, another species usually occurring on rocks, has a very thin, mealy thallus resembling that found in *Psilolechia clavulifera*. An inconspicuous, very thin or even episubstratal thallus occurs in *M. anterior*, *M. deminuta*, *M. misella* and *M. nigella*, which are confined to more or less fully decayed wood. *Micarea turfosa* also forms a thin thallus, but its black colour, specific habitat and alpine distribution makes it distinctly different from other members of the genus and therefore easily identified even in the field, especially when fertile. Unfortunately, some species have a more variable thallus morphology according to the kind of habitat, exposure to light, moisture and competition with associated taxa. This variation presents problems when identifying more ecologically tolerant *Micarea* species found on different substrata and in different habitats. A good example of such a species is *M. denigrata*, which often forms an almost inconspicuous thallus (more developed only under pycnidia) when it occurs on hard wood in well-lit places in contrast to a thick, warted or even areolate thallus when it covers tree bark within woodlands. A few saxicolous specimens of *M. denigrata* with a well-developed, warted thallus have also been collected in Poland.

Two species, *M. leprosula* and *M. submilliaria*,

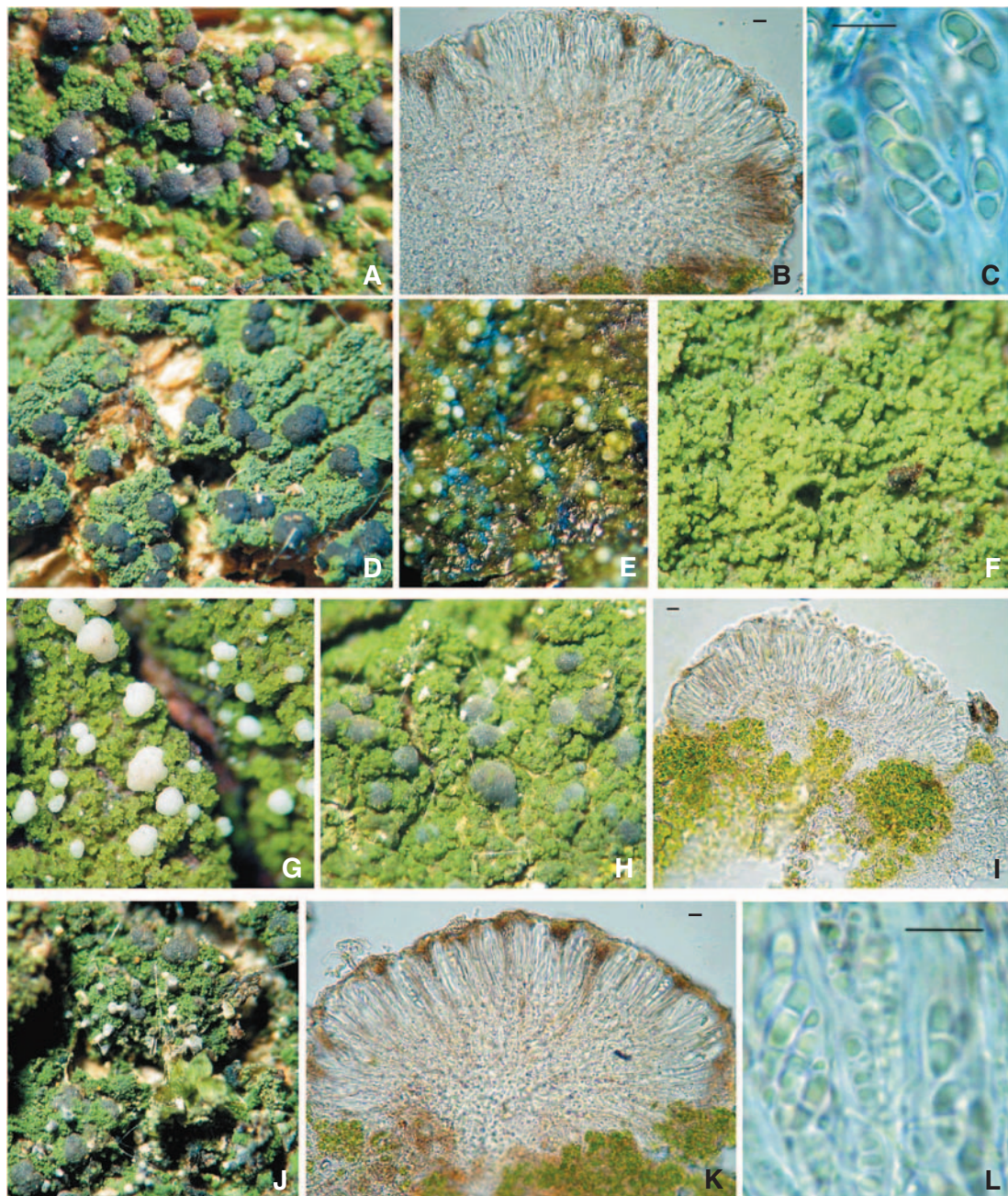
having an alpine distribution in Poland form specific, fragile thalli composed of dense, areolate warts, which often break down or erode to form sorediate patches with irregularly shaped sorediate granules. A typical sorediose thallus composed of regular 'goniocysts' is characteristic, however, for several species closely related to *M. prasina* s.str. (namely *M. hedlundii*, *M. micrococca*, *M. prasina*, *M. tomentosa*, *M. viridoleprosa*).

#### PHOTOBIONTS

The micareoid photobiont is considered to be a very important diagnostic feature in the identification of *Micarea* (Coppins 1983). A knowledge of the particular species of photobiont is not necessary, but the dimensions and shape of algal cells as well as the presence of haustorial penetration of the photobiont are important. Most members of *Micarea* have globose algae, 4–7(–8)  $\mu\text{m}$  diam., the same as those found in the type species (*M. prasina*), referred to the genera *Trebouxia* and *Myrmecia* (Coppins 1983). However, several species, *M. bauschiana*, *M. erratica*, *M. lutulata*, *M. polycarpella*, *M. sylvicola*, *M. tuberculata* and *M. lynceola*, found elsewhere in Europe, have large-celled photobionts. Molecular phylogenies of the former Miacreaceae and the genus *Micarea* made by Andersen (2004) and Andersen and Ekman (2005) indicate that the character of the photobiont can be one of those factors which determines the phylogenetic position of particular species. With the exception of those members of *M. sylvicola*-group mentioned previously, the remaining species having non-micareoid photobiont probably belong to the *Micarea* genus in its broad sense (see Andersen 2004; Andersen & Ekman 2005).

*Micarea incrassata* is the only one Polish *Micarea* having cyanobacteria as an additional photobiont. Based on the author's observation made in the High Tatra Mts, where the species was collected, may support the hypothesis that the species uses free-living, small colonies of *Nostoc*, found abundantly in soil, terricolous bryophytes and plant debris under these severe climatic conditions.





**Fig. 2.** Examples of sorediose members of the *Micarea prasina*-group. A–E – *M. prasina* Fr. s.str.: A – morphology (GPN 3513); B – apothecial section (GPN 3513); C – ascospores (leg. J. Kiszka, 5 Sept. 2001, KRAP); D – morphology (GPN 4057); E – pycnidia bearing mesoconidia (LOD 12171); F – thallus of *M. viridileprosa* Coppins & van den Boom (GPN 3869); G – morphology of *M. micrococca* (Körb.) Gams ex Coppins (GPN 3911); H & I – *M. micrococca* (GPN 3953): H – morphology; I – apothecial section; J–L – *M. hedlundii* Coppins (GPN 3556): J – morphology; K – apothecial section; L – ascospores. Scale bars = 10 µm.

## MORPHOLOGY OF APOTHECIA

Most species of *Micarea* form small, 0.1–0.5 (–1.2) mm wide, immarginate, convex to globose and dark pigmented apothecia. Some of them are very variable in colour and even in the same collection white, cream, grey, lead, blackish and piebald apothecia can be observed. However, several taxa are almost always found with pale fruit bodies,  $\pm$ translucent when wet. These morphological features can help to delimit *M. lithinella*, with pale to orange apothecia, from other *Micarea* species growing on rocks. According to Coppins (1983), it can also be confused with sheltered forms of *M. bauschiana*, but in Poland, even some pale collections of the later were observed, with an external, dilute bluish tinge. Sometimes pale apothecia are found in *M. peliocarpa* [especially those forms named formerly *Bacidia albicans* (Arnold) Lettau; see Nowak & Tobolewski 1975], but a simple C+ red reaction is sufficient to distinguish both species. Another saxicolous species with often pale apothecia is *M. myriocarpa*, but they are very small and mostly tuberculate as well as becoming brown in water, owing to the darkly pigmented hypothecium.

Of non-epilithic Polish species, only *M. adnata* and *M. viridileprosa* have persistently pale apothecia. Whitish or cream forms of *M. micrococca* referred to the type of *Biatora micrococca* Körb. are also frequently found, but the same species in other instances may have pale grey to olivaceous grey fruit bodies. Others, such as *M. anterior*, *M. cinerea*, *M. denigrata*, *M. prasina* and *M. tomentosa*, at least sometimes, are more (brownish, olivaceous or greyish) pigmented.

In contrast to the pale apothecia characteristic of the above species, *M. erratica*, *M. incrassata*, *M. lignaria*, *M. marginata*, *M. melaena*, *M. nigella*, *M. polycarpella* and *M. turfosa* have only black fruit bodies without any paler tinge.

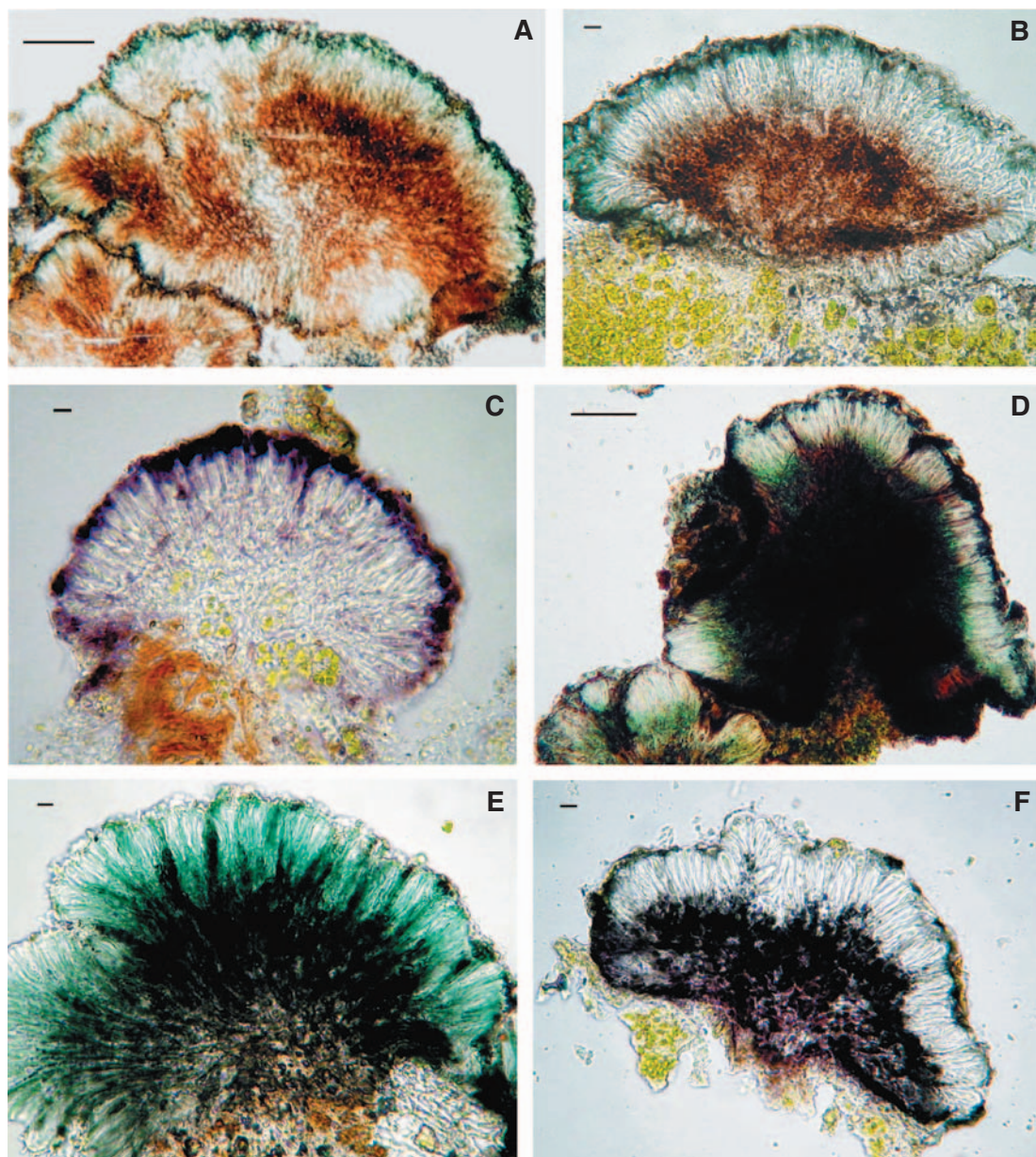
In a few epilithic species apothecia (at least when young) are lecideine with a well-defined margin develop. For this reason, *M. erratica*, *M. marginata* and *M. lapillicola* (still unrecorded in Poland), can easily be separated from other *Micarea* species, but they need detailed microscopical

examination to separate them from many other genera having lecideine apothecia. The above-mentioned species were included in the genus *Micarea* based on (among others) excipulum composed of radiating, branched, anastomosing hyphae, which are separable in KOH. A well developed excipulum, which is sometimes visible as slightly delimited, often paler than the disc, external margin, is also observed in *M. peliocarpa* and *M. cinerea*. In some piebald forms of *M. denigrata* and *M. nitschkeana* an apparent, whitish or greyish-white margin can also occur.

Apothecia of several species often have a snow-white rim, being in fact a loose structure of hyphae of the same lichenized fungus. This feature is very often found in *M. adnata* and almost all saxicolous species belonging to *M. sylvicola*-group. *Psilolechia clavulifera*, which often grows associated with some *Micarea* species, has a similar white rim.

## INTERNAL APOTHECIAL PIGMENTATION

Ascomatal pigments provide very important distinguishing features widely accepted in the identification of many lichen species. Within the genus *Micarea*, there are several differently coloured pigments (Fig. 3) and some colour changes with various chemical agents, such as NaOCl (C), KOH (K), HNO<sub>3</sub> (N) and HCl. Coppins (1983) recognized eight pigments confined to apothecia, pycnidia, thallus and other microscopic bodies within *Micarea*. Although the yellowish pigment reacting K<sup>+</sup> purple-violet in *M. hedlundii* is probably the same as that resulting in a pale yellowish-orange in *M. intrusa* (transferred in the meantime to the genus *Scoliciosporum*), there are still at least seven others named by him as 'pigments A–H' or later by, for example, Meyer and Printzen (2000) and Orange *et al.* (2001) who provided a more scientific 'nomenclatural system' for them (see Table 1) based on the 'type' species. The 'Arceutina-yellow' pigment, K<sup>+</sup> orange intensifying and N<sup>-</sup>, sometimes present in more colourful apothecia of *M. lithinella* was previously not classified within the genus, as was the 'Superba-brown', commonly found pigment considered previously in a large



**Fig. 3.** Vertical sections of apothecia of some *Micarea* s.l. A – *M. incrassata* Hedl. (leg. Z. Tobolewski, 10 Sept. 1958, POZ); B – *M. erratica* (Körb.) Hertel, Rambold & Pietschm. (KRAM-L 42370); C – *M. misella* (Nyl.) Hedl. after KOH (*Śliwa* 2898, KRAM); D – *M. marginata* Coppins & Muhr (GPN 3571); E – *M. tuberculata* (Sommerf.) R. A. Anderson (GPN 3516); F – *M. nigella* Coppins (*Czarnota* 4045, GPN). Scale bars: A & D = 100 µm, others = 10 µm.

group of not clearly identified brown pigments by Coppins (1983: 88, as pigment F).

The pigment ‘Sedifolia-grey’ (pigment D in Coppins 1983) appears to be closely confined to

the broad group of *M. prasina* sensu Andersen (2004) [*M. elachista* (mostly in pycnidia), *M. hedlundii*, *M. micrococca* (darker forms), *M. misella*, *M. prasina*, *M. synotheoides*] despite it is absent

**Table 1.** Ascomatal pigments found in Polish species of *Micarea* s.l. based on Meyer and Printzen (2000); pigment classification according to Coppins (1983) in squared brackets. Marks: <sup>1</sup> in darker forms; <sup>2</sup> above all in goniocysts; <sup>3</sup> in excipulum; <sup>4</sup> above all in pycnidial walls; <sup>5</sup> not found in ascomata, but present in pycnidial walls; <sup>6</sup> based on literature as apothecia were not found in Poland.

| List of species         | Ascomatal pigments |                                  |                                |                                 |                            |                              |                               |                                     |
|-------------------------|--------------------|----------------------------------|--------------------------------|---------------------------------|----------------------------|------------------------------|-------------------------------|-------------------------------------|
|                         | Arceutina-yellow   | Cinereorufa-green<br>[Pigment A] | Elachista-brown<br>[Pigment E] | Intrusa-yellow<br>Pigment G (H) | Melaena-red<br>[Pigment B] | Melaenida-red<br>[Pigment C] | Sedifolia-grey<br>[Pigment D] | Superba-brown<br>[within Pigment F] |
| <i>M. adnata</i>        |                    |                                  |                                |                                 |                            |                              |                               |                                     |
| <i>M. anterior</i>      |                    |                                  |                                |                                 |                            |                              |                               | ± <sup>1</sup>                      |
| <i>M. bauschiana</i>    |                    | +                                |                                |                                 |                            |                              |                               |                                     |
| <i>M. botryoides</i>    |                    | +                                |                                |                                 |                            |                              |                               | +                                   |
| <i>M. cinerea</i>       |                    | +                                |                                |                                 |                            |                              |                               |                                     |
| <i>M. diminuta</i>      |                    | +                                |                                |                                 |                            |                              |                               | +                                   |
| <i>M. denigrata</i>     |                    |                                  |                                |                                 |                            |                              | +                             |                                     |
| <i>M. elachista</i>     |                    |                                  | +                              |                                 |                            |                              |                               |                                     |
| <i>M. erratica</i>      |                    | +                                |                                |                                 |                            |                              |                               | +                                   |
| <i>M. globulosella</i>  |                    |                                  |                                |                                 |                            |                              | +                             |                                     |
| <i>M. hedlundii</i>     |                    |                                  |                                | + <sup>2</sup>                  |                            |                              | ± <sup>4</sup>                |                                     |
| <i>M. incrassata</i>    |                    | +                                |                                |                                 |                            |                              |                               | +                                   |
| <i>M. leprosula</i>     |                    | + <sup>6</sup>                   |                                |                                 |                            |                              |                               |                                     |
| <i>M. lignaria</i>      |                    | +                                |                                |                                 |                            |                              |                               |                                     |
| <i>M. lithinella</i>    | +                  |                                  |                                |                                 |                            |                              |                               |                                     |
| <i>M. lutulata</i>      |                    | +                                |                                |                                 |                            |                              |                               | +                                   |
| <i>M. marginata</i>     |                    | +                                |                                |                                 | + <sup>3</sup>             | +                            |                               |                                     |
| <i>M. melaena</i>       |                    | +                                |                                |                                 | +                          | ±                            |                               |                                     |
| <i>M. micrococca</i>    |                    |                                  |                                |                                 |                            |                              | ± <sup>1</sup>                |                                     |
| <i>M. misella</i>       |                    |                                  |                                |                                 |                            |                              | +                             |                                     |
| <i>M. myriocarpa</i>    |                    | +                                |                                |                                 |                            |                              |                               | +                                   |
| <i>M. nigella</i>       |                    | +                                |                                |                                 | +                          | ±                            |                               |                                     |
| <i>M. nitschkeana</i>   |                    |                                  |                                |                                 |                            |                              | +                             |                                     |
| <i>M. nowakii</i>       |                    |                                  |                                |                                 |                            |                              | +                             |                                     |
| <i>M. peliocarpa</i>    |                    | +                                |                                |                                 |                            |                              |                               |                                     |
| <i>M. polycarpella</i>  |                    | +                                |                                |                                 |                            |                              |                               |                                     |
| <i>M. prasina</i>       |                    |                                  |                                |                                 |                            |                              | ± <sup>1</sup>                |                                     |
| <i>M. submilliaria</i>  |                    | ± <sup>6</sup>                   |                                |                                 |                            |                              |                               |                                     |
| <i>M. sylvicola</i>     |                    | +                                |                                |                                 | +                          | ±                            |                               |                                     |
| <i>M. synotheoides</i>  |                    |                                  |                                |                                 |                            |                              | +                             |                                     |
| <i>M. tomentosa</i>     |                    |                                  |                                |                                 |                            |                              | ± <sup>5</sup>                |                                     |
| <i>M. tuberculata</i>   |                    | +                                |                                |                                 |                            |                              |                               |                                     |
| <i>M. turfosa</i>       |                    | +                                |                                |                                 |                            |                              |                               | +                                   |
| <i>M. viridileprosa</i> |                    |                                  |                                |                                 |                            |                              |                               |                                     |

in some members of this complex (in Poland only *M. adnata* and *M. viridileprosa*), probably because of its low concentration or from secondary decline in an evolutionary progression. However,

the same, olive, olive-brown to olive-grey pigment reacting K+ violet and C+ violet is characteristic of the group of *M. denigrata* sensu Coppins (1983) (*M. denigrata*, *M. globulosella*, *M. nitschkeana*)

for the South African *M. endoviolascens* Coppins (Coppins 1999), the hyperoceanic, Scottish *M. hypoviolascens* Czarnota & Coppins (Czarnota & Coppins 2005) and the arctic-alpine *M. paratropha* (Nyl.) Alstrup [Coppins 1983, as *M. subviolascens* (H. Magn.) Coppins]. It is known also in the two new species described here, *M. nowakii* and *M. tomentosa* (see below), which probably belong to the *M. prasina*-group. In the case of Polish *Micarea* species, the ‘Sedifolia-grey’ pigment is usually found in an upper part of their hymenium, but it is also observed in pycnidial walls and some thallus structures (in goniocysts and amorphic, external layer). Unfortunately, the same tinge of hymenium is characteristic of, for example, *Bacidia beckhausii* Körb. (Meyer & Printzen 2000), so careful examination of other diagnostic features (especially excipulum, structure of paraphyses, ascus type and size of the photobiont) is necessary.

The blue, blue-green, sordid green, olive-green to almost dark blackish-green ‘Cinereorufa-green’ pigment (pigment A in Coppins 1983) as well as the brown, fuscus- or orange-brown ‘Superbaw-brown’ pigment are the most frequently found pigments in Polish *Micarea* species, but they are also found outside the genus, especially the former which is present in a large number of species belonging to different genera (Coppins 1983; Meyer & Printzen 2000; Orange *et al.* 2001). Within the group of species related to *Micarea*, this ‘Cinereorufa-green’, K<sup>+</sup> green intensifying, N<sup>+</sup> purple pigment usually occurs in a highly concentrated form throughout most of the apothecial section of *M. melaena*, *M. nigella*, *M. sylvicola* and *M. tuberculata*, and in a less concentrated form within the hymenium of *M. erratica*, *M. incrassata*, *M. lignaria*, *M. polycarpella* and *M. turfosa*, and in darker forms of *M. bauschiana*, *M. cinerea* and *M. peliocarpa* it usually has a turquoise tinge. In some species, such as *M. botryoides*, *M. deminuta*, *M. lutulata* and *M. myriocarpa*, it is quite often found as a blackish-green tinge mostly confined to the gel-matrix surrounding the paraphyses (vertical streaks), but it is especially frequent within their pycnidial walls.

The ‘Melaenida-red’, K<sup>+</sup> purplish-red, N<sup>±</sup> in-

tensifying pigment, similar to that from the ‘type’ species, *Micarea melaenida* (Nyl.) Coppins, is distinctly visible only in the hypothecium of *M. marginata*. It is also usually found in the hypothecium of *M. melaena* and *M. nigella*, and sometimes in *M. sylvicola*, but predominating dense, blackish-green ‘Cinereorufa-green’ and purple-black ‘Melaenida-red’ pigments (both K<sup>+</sup> dull sordid green) mask its characteristic, intensive reactions. Often only a slightly K<sup>+</sup> purplish tinge of some parts of hypothecium indicates the presence of this ‘Melaenida-red’ pigment.

The dark violet-blue, K<sup>+</sup> aeruginose granules occasionally visible in the hymenium of *M. lignaria* (Coppins 1983), have not been found in Polish specimens, but sometimes their lower part of hymenium was brown, reacting K<sup>+</sup> green, N<sup>+</sup> purple-red, similar to the pigment ‘Cinereorufa-green’ which was abundantly present in the epithecium.

#### PYCNIDIA

Almost all Polish species of *Micarea* s.l. form one to four kinds of anamorphs; to date only *M. leprosula* and *M. submilliaria* have not been found with any conidial state. For this reason, this feature seems to be very important in species delimitation, the more so as some species, such as *M. botryoides*, *M. erratica* and *M. misella* frequently occur without apothecia, but have numerous pycnidia.

Only a few essential types of pycnidial states found in the genus *Micarea* could be distinguished (Fig. 4).

Sporodochia appear only in *M. adnata*. Essentially, they resemble small apothecia, because of the similar pigmentation, therefore cross-sections are necessary to determine their different anatomy. The big, ellipsoid macroconidia produced externally on sporodochia are unknown in any other member of the genus.

Macroscopically visible and most characteristic are stalked anamorphs, which are always abundant in such species as *M. botryoides*, *M. misella*, *M. nigella*, *M. hedlundii* and *M. tomentosa* (and several other occurring outside Poland, e.g. *M. stipitata* Coppins & P. James and *M. neostipitata* Cop-

pins & P. May). However, the pycnidial walls (including stalks) of the last two Polish species are covered with a distinctly white tomentum, while the stalks of the three previous species are black and  $\pm$ glossy. In *M. misella* they are usually one-module and stipitate, in contrast to *M. botryoides* and *M. nigella* which form small, barrel-like pycnidia more or less proliferating or arising on branched pycnidiophores. Stalked, simple pycnidia, but arising on pale pycnidiophores appear to be characteristic of *M. anterior* (poorly known in Poland), which is sometimes similar to young forms of *M. misella*, but differs from all species mentioned above in possessing dark brown pycnidial walls without any greenish tinge, unchanged in K. These stalked pycnidia in all instances are known to produce only cylindrical mesoconidia.

Another pycnidial state is that recognized as sessile; these small, spot-looking,  $\pm$ globose conidiomata, present in several members of the genus, produce mainly microconidia, but in *M. prasina* and *M. micrococca*, for example, they also occur with mesoconidia. In most instances they are more or less surrounded by thallus, so sometimes they could be macroscopically recognized as almost completely immersed. In *M. melaena* sessile, black pycnidia with macroconidia have also been observed (Coppins 1983), but not in Poland as yet.

Emergent pycnidia are well developed in *M. denigrata* (especially when the species grows on hard wood in well-lit places), *M. elachista* and sometimes *M. nitschkeana*, and *M. peliocarpa*, and the alpine *M. cinerea* f. *tenuispora* (D. Hawksw. & Poelt) Fryday. This anamorph state arises within larger thallus warts or areoles, but the pycnidia are usually widely gaping and bear a white to cream mass of mesoconidia (as in the two first-named species) or macroconidia (as in the later ones). Terricolous *M. cinerea* f. *tenuispora* appears to be only case within the genus *Micarea* where mature apothecia have not as yet been found (Fryday 2001), and the distinctive, emergent (C+ red in section) pycnidia having long, multiseptate, straight macroconidia, basic to its identification.

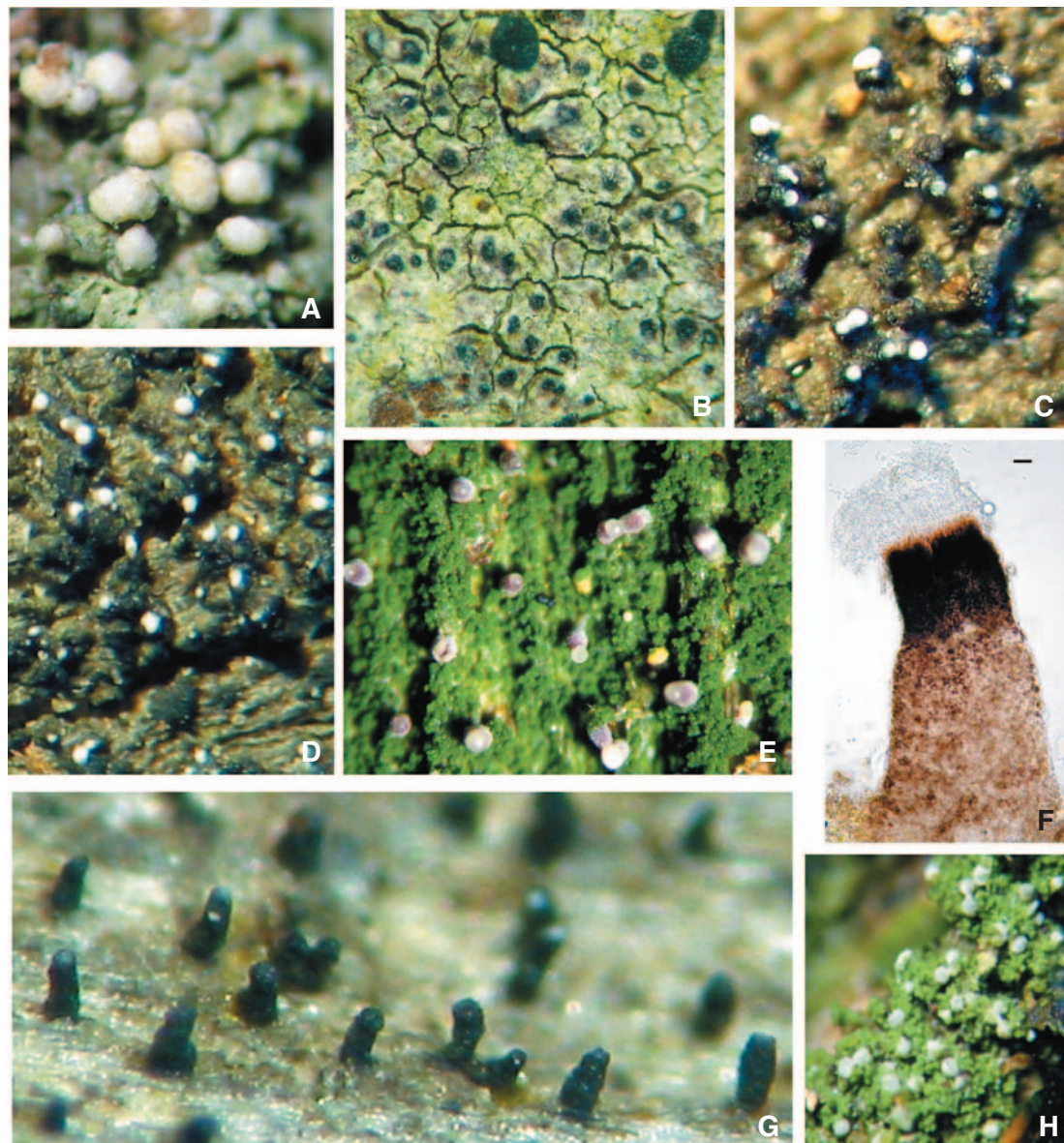
Immersed anamorphs appear to be most frequent in those *Micarea* with a well developed

thallus. They are usually found as small, globose pycnidia almost completely surrounded by thallial structures or visible as dark points with gaping ostioles. Often only the upper part of the pycnidium around the ostiolum is coloured, while the immersed part of the pycnidial wall is colourless. There is no general rule regarding which type of conidia is borne within, despite the presence of microconidia in many species (e.g. *M. denigrata*, *M. lignaria*, *M. lithinella*, *M. micrococca*, *M. nitschkeana*, *M. prasina*, *M. turfosa*); on the other hand, however, mesoconidia (as in *M. diminuta*, *M. erratica*, *M. lutulata*, *M. sylvicola*) and curved macroconidia (as in *M. denigrata*, *M. marginata*, *M. nitschkeana*, *M. peliocarpa*) are produced by immersed, usually bigger pycnidia, which are mostly widely gaping. In many cases, the pycnidial states are not clearly defined so conidiomata occurring in *M. nowakii*, *M. globulosella*, *M. synotheoides* and even *M. anterior*, *M. nigella* and *M. tomentosa* could be treated as shortly stalked, sessile or emergent.

#### CHEMISTRY

Simple K<sup>+</sup>, C<sup>+</sup> and Pd<sup>+</sup> colour reactions known and used for a long time for the identification of lichens species are insufficient in a modern taxonomy, but they can still be useful. Unfortunately, many lichens (including several species belonging to *Micarea*) produce some secondary metabolites which cannot be found without TLC. Employment of the above-mentioned chemical reactions is of value as a guide to the identification of many species of *Micarea* (Table 2). However, without a good knowledge of their ecological requirements and inexperience of the group, their final identification based on morphology and colour reactions alone could be incorrect.

A low concentration of the lichen secondary substances can hamper suitable interpretations of the reactions. Sometimes, as in the case of *M. leprosula* and *M. submilliaria*, the thallus reactions Pd<sup>+</sup> ginger and Pd<sup>+</sup> yellow respectively, which should definitely distinguish both these morphologically similar taxa are invisible or ambiguous; this is due to the dirty grey tinge of their thalli



**Fig. 4.** Types of pycnidia occurring in the genus *Micarea* s.l. A – sporodochia in *M. adnata* Coppins (leg. *M. Stanciaszek*, 18 Sept. 2004, Hb. *Stanciaszek*); B – immersed pycnidia in *M. sylvicola* (Flot.) Vězda & V. Wirth (*Czarnota 4730*, GPN); C – shortly stalked pycnidia in *M. nigella* Coppins (KRAM-L 15282); D – emergent pycnidia bearing mesoconidia in *M. denigrata* (Fr.) Hedl. (leg. *S. Cieśliński*, 27 Aug. 1991, KTC); E – tomentose, stalked pycnidia in *M. hedlundii* Coppins (GPN 3556); F – microscopic view of stalked pycnidia with pale pycnidiophore found in *M. anterior* (Nyl.) Hedl. (GPN 3526); G – stipitate pycnidia in *M. misella* (Nyl.) Hedl. (*Czarnota 4736*, GPN); H – sessile pycnidia bearing mesoconidia in *M. prasina* Fr. s.str. (*Czarnota 4606*, GPN). Scale bar = 10  $\mu$ m.

and a slow, very often inconspicuous Pd<sup>+</sup> reaction of argopsin in *M. leprosula*. The same problem with the correct Pd<sup>+</sup> reaction is often present in

*M. lignaria* which also contains argopsin, the correct ginger colour frequently appearing only after a while. In such cases, when other diagnostic

**Table 2.** Chemical content and corresponding thallus, and apothecial reactions of Polish species related to the genus *Micarea*. Marks: + – present; g – ginger; r – red; y – yellow; ? – apothecia unknown; (r) – in Polish specimens C+ red not observed, but from literature this reaction should be positive.

| List of species                  | alectorialic acid | argopsin | gyrophoric acid | methoxymycolic acid | micareic acid | Thallus reaction |    | Apothecia reaction |
|----------------------------------|-------------------|----------|-----------------|---------------------|---------------|------------------|----|--------------------|
|                                  |                   |          |                 |                     |               | C                | Pd | C                  |
| <i>M. cinerea</i>                |                   |          | +               |                     |               | r                |    | r                  |
| <i>M. denigrata</i>              |                   |          | +               |                     |               | r                |    | r                  |
| <i>M. globulosella</i>           |                   |          | +               |                     |               | r                |    | r                  |
| <i>M. leprosula</i>              |                   | +        | +               |                     |               | r                | g  | r                  |
| <i>M. leprosula</i> chemotype II |                   |          | +               |                     |               | r                |    | ?                  |
| <i>M. lignaria</i>               |                   | +        |                 |                     |               |                  | g  |                    |
| <i>M. melaena</i>                |                   |          | +               |                     |               | r                |    |                    |
| <i>M. micrococca</i>             |                   |          |                 | +                   |               |                  |    |                    |
| <i>M. nitschkeana</i>            |                   |          | +               |                     |               | r                |    | r                  |
| <i>M. nowakii</i>                |                   |          |                 |                     | +             |                  |    |                    |
| <i>M. peliocarpa</i>             |                   |          | +               |                     |               | r                |    | r                  |
| <i>M. prasina</i>                |                   |          |                 |                     | +             |                  |    |                    |
| <i>M. submilliaria</i>           | +                 |          |                 |                     |               | r                | y  |                    |
| <i>M. viridileprosa</i>          |                   |          | +               |                     |               | r                |    | (r)                |

characters are difficult to find, TLC examination is necessary.

When considering the presence of gyrophoric acid in many species referred to *Micarea*, their C+ red apothecia and thallus reactions should be checked. Furthermore, such simple tests are sometimes necessary to distinguish such species as *M. cinerea*, *M. denigrata*, *M. melaena*, *M. nitschkeana*, *M. peliocarpa* and *M. viridileprosa*. Positive results permits one to avoid mistakes with similar morphotypes of other members of the genus (*M. misella*, *M. micrococca*, *M. nowakii*, *M. prasina*) or even other species distantly related phylogenetically [e.g. *Bacidia beckhausii*, *Lecania hyalina* (Fr.) R. Sant., *L. naegelii* (Hepp) Diederich & van den Boom].

Macroscopic thallus reactions with K are unimportant in the case of Polish *Micarea* species because there are no lichen substances giving the positive result [cf. *M. lignaria* var. *endoleuca* (Leighton) Coppins which is the only European species reacting K+ yellow due to the presence of xanthenes; Coppins 1983]. However, in microscopic examination of anatomic structures

and ascomatal pigmentation, the employment of KOH is indispensable.

#### ECOLOGY

Although ecological data cannot be used for the direct identification of particular species, it can be useful for the preliminary recognition of a species in the field. Indeed, many species of *Micarea* s.l. show close ecological preferences to climatic conditions such as moisture, insolation and type of substratum. On the basis of this, all members of the genus found in Poland may be roughly segregated into several ecological groups (Table 3).

Thus, apart from those species having a large ecological plasticity and growing in different habitats (*M. botryoides*, *M. denigrata*, *M. lignaria*, *M. peliocarpa*), many *Micarea* species prefer only one kind of substratum or are found otherwise only occasionally. In Poland, *M. anterior*, *M. hedlundii* and *M. nigella* have only been found on wood to date, but the last two species were found only on soft wood of decaying stumps, usually of coniferous trees. *Micarea bauschiana*, *M. erratica*, *M. lithinella*, *M. lutulata*, *M. myriocarpa*,



**Table 3.** Ecological preferences of all species referred to *Micarea* known from Poland.

| List of species         | Ecological groups |                 |              |              |                 |                 |                     |                       |
|-------------------------|-------------------|-----------------|--------------|--------------|-----------------|-----------------|---------------------|-----------------------|
|                         | saxicolous        |                 | lignicolous  |              | terricolous     |                 | epiphytes           |                       |
|                         | on exposed rocks  | on shaded rocks | on hard wood | on soft wood | over bryophytes | on plant debris | on trunks and roots | on twigs and branches |
| <i>M. adnata</i>        |                   |                 |              | +            |                 |                 | +                   |                       |
| <i>M. anterior</i>      |                   |                 | ±            | +            |                 |                 |                     |                       |
| <i>M. bauschiana</i>    |                   | +               |              |              |                 |                 |                     |                       |
| <i>M. botryoides</i>    |                   | +               | +            | ±            | ±               |                 | +                   |                       |
| <i>M. cinerea</i>       |                   |                 | +            |              | +               |                 | +                   |                       |
| <i>M. deminata</i>      |                   |                 |              | +            | ±               |                 |                     |                       |
| <i>M. denigrata</i>     | ±                 |                 | +            | ±            | ±               |                 | +                   |                       |
| <i>M. elachista</i>     |                   |                 | +            |              |                 |                 | +                   |                       |
| <i>M. erratica</i>      | +                 |                 |              |              |                 |                 |                     |                       |
| <i>M. globulosella</i>  |                   |                 | +            |              |                 |                 | +                   |                       |
| <i>M. hedlundii</i>     |                   |                 |              | +            |                 |                 |                     |                       |
| <i>M. incrassata</i>    |                   |                 |              |              | +               |                 |                     |                       |
| <i>M. leprosula</i>     |                   |                 |              |              | +               | +               |                     |                       |
| <i>M. lignaria</i>      | ±                 | +               | +            |              | +               | +               | ±                   |                       |
| <i>M. lithinella</i>    | ±                 | +               |              |              |                 |                 |                     |                       |
| <i>M. lutulata</i>      |                   | +               |              |              |                 |                 |                     |                       |
| <i>M. marginata</i>     | +                 | +               |              |              |                 |                 |                     |                       |
| <i>M. melaena</i>       |                   |                 | +            | +            | ±               |                 | +                   |                       |
| <i>M. micrococca</i>    |                   |                 | +            |              |                 |                 | +                   | ±                     |
| <i>M. misella</i>       |                   |                 | +            | +            |                 |                 | ±                   |                       |
| <i>M. myriocarpa</i>    |                   | +               |              |              |                 |                 |                     |                       |
| <i>M. nigella</i>       |                   |                 |              | +            |                 |                 |                     |                       |
| <i>M. nitschkeana</i>   |                   |                 | ±            |              |                 |                 | ±                   | +                     |
| <i>M. nowakii</i>       |                   |                 | +            |              |                 |                 |                     |                       |
| <i>M. peliocarpa</i>    | ±                 | +               | +            |              | ±               |                 | +                   |                       |
| <i>M. polycarpella</i>  | +                 |                 |              |              |                 |                 |                     |                       |
| <i>M. prasina</i>       |                   |                 | ±            | +            | ±               |                 | ±                   |                       |
| <i>M. submilliaria</i>  |                   |                 |              |              | +               | +               |                     |                       |
| <i>M. sylvicola</i>     | ±                 | +               |              |              |                 |                 |                     |                       |
| <i>M. synotheoides</i>  |                   |                 |              |              |                 |                 | +                   |                       |
| <i>M. tomentosa</i>     |                   |                 |              | +            |                 |                 | +                   |                       |
| <i>M. tuberculata</i>   |                   | +               |              |              |                 |                 |                     |                       |
| <i>M. turfosa</i>       |                   |                 | ±            |              | +               |                 |                     |                       |
| <i>M. viridileprosa</i> |                   |                 |              | +            | +               |                 | +                   |                       |

*M. polycarpella*, *M. sylvicola* and *M. tuberculata* grow directly on acidic rocks, but *M. erratica* and *M. polycarpella* differ from the rest of the saxicolous species in requiring more light since almost all collections have been made from exposed rocks (mostly postglacial granite boulders and pebbles) in well-lit places within woodlands or open landscapes; both species are considered to be primary colonizers. Members of the *M. sylvi-*

*cola*-group are usually found on vertical walls of different siliceous rocks within shaded woodland valleys; only *M. sylvicola* (Flot.) Vězda & V. Wirth is more ecologically tolerant and therefore more widespread, while other members prefer mountain conditions.

A specific ecological group of alpine lichens is composed of *M. cinerea* f. *tenuispora*, *M. incrassata*, *M. leprosula*, *M. submilliaria* and *M. tur-*

*fosa*. The species (except an undescribed chemical variation of *M. leprosula* without argopsin) grow only in an alpine belt of the highest mountains in Poland. They cover terricolous bryophytes, grasses, decaying wood of dwarf shrubs and other plant debris in alpine meadows, or more rarely occur directly on soil or humus in rock crevices. Among this group, only *M. turfosa* needs a wetter environment, so it is found almost always as epibryophytic within or in the vicinity of upper mountain peat-bogs and near mountain pounds, streams and small, intermittent water basins, as well as in shaded places of prolonged snow cover.

Although there are almost no Polish *Micarea* species growing only as epiphytes (except *M. synotheoides* with only one national record), several species are found on tree bark, such as *M. elachista* which occurs mainly at the base of old pine trees within large, natural coniferous woodlands. *Micarea botryoides*, known in mountains as a classical epilithic species, occurs on the bases of trunks and underhang roots of different trees in lowland areas where there is a lack of natural acidic rocks. *Micarea micrococca*, sometimes collected from hard wood of fallen logs and stumps, is usually found as a widespread epiphyte growing in different forest conditions. *Micarea nitschkeana* is the only Polish *Micarea* species (except in rare instances, *M. micrococca*) which covers twigs and small branches of coniferous trees.

In general, all Polish species related to *Micarea*, independent of the type habitat, occur on acidic substrata, as concluded by Coppins (1983). However, occasionally *M. lignaria* and *M. peliocarpa* were also collected from more or less calcareous sandstones in the Beskidy Mts. Both these species and above all the new chemotype of *M. leprosula* have been found also on decaying bryophytes and plant debris covering calcareous soil or rocks in those parts of Poland where limestone geological formations predominate (with the exception of *M. lignaria* which is restricted to the West Tatra alpine belt). Similarly, in limestone Slovenian Julian Alps, the author has observed *M. lignaria* growing also on the previously-mentioned range of substrata. From Podilya Upland in Ukraine epibryophytic *M. prasina* growing on Silurian

limestones has also been surprisingly collected. According to Coppins (pers. comm.), who too has made such observations, in all those cases the *Micarea* is growing on a decalcified zone (N<sup>-</sup>), which may be only a millimeter or two in thickness – presumably the effect of leaching by rain, and enhanced in areas subject to ‘acid-rain’ pollution.

KEY FOR SPECIES OF THE GENUS *MICAREA* S.L.  
FOUND IN POLAND

1. Thallus or apothecia C+ red, photobiont ‘micareoid’ ..... 2
- 1\* Thallus and apothecia C- ..... 11
  2. Thallus ash-grey, fragile, granular areolate, often dissolving to form sorediate patches, Pd+ ginger or yellow; usually sterile, on decaying bryophytes in high mountains ..... 3
  - 2\* Thallus Pd-, only gyrophoric acid ..... 4
3. Thallus Pd+ yellow (alectorialic acid) .....
  - ..... *M. submilliaria*
- 3\* Thallus Pd+ ginger (gyrophoric acid and argopsin) .....
  - ..... *M. leprosula*
4. Thallus at least partially sorediate ..... 5
- 4\* Thallus never sorediate, mostly granular or forming small areolae ..... 6
5. Thallus bright green, ±leprosae ... *M. viridileprosa*
- 5\* Thallus ash-grey to straw-coloured composed of fragile granules dissolving to form sorediate patches; on terricolous bryophytes .....
  - ..... *M. leprosula* II chemotype
6. Hypothecium dark purplish-black, K+ black-green or sometimes with intensive purplish tinge .....
  - ..... *M. melaena*
- 6\* Hypothecium hyaline ..... 7
7. Excipulum well developed, upper part of hymenium never K+ violet ..... 8
- 7\* Excipulum indistinct or absent, epithecium K+ violet ..... 9
  8. Spores (1–)3-septate, macroconidia curved or sigmoid, to 50(60) µm length ... *M. peliocarpa*
  - 8\* Spores (3–)5–7-septate, macroconidia filiform, ±straight, up to 110 µm length ..... *M. cinerea*
9. Spores (0–)1-septate, oblong-ellipsoid, oblong-fusiform often slightly curved ..... *M. denigrata*
- 9\* Spores mostly 3-septate or more ..... 10
  10. Spores 0–3(–5)-septate, fusiform-acicular or rod-shaped, sometimes slightly sigmoid curved and up to 25 µm in length ..... *M. globulosella*

- 10.\* Spores (1–)3-septate, narrowly fusiform, often slightly sickle-shaped and up to 18 µm in length; usually on twigs and branches of young coniferous trees . . . . . *M. nitschkeana*
- 11. Thallus mostly superficially developed, Pd+ ginger (argopsin); spores 3–7-septate . . . . . *M. lignaria* var. *lignaria*
- 11.\* Thallus Pd– or thallus thin, inconspicuous or invisible . . . . . 12
- 12. Photobiont not ‘micareoid’, cells more than 10 µm wide; spores simple, ovoid or ellipsoid; on rocks . . . . . 13
- 12.\* Photobiont ‘micareoid’, cells 5–8 µm; on different substrate . . . . . 18
- 13. Hypothecium dark coloured . . . . . 14
- 13.\* Hypothecium hyaline . . . . . 17
- 14. Excipulum well developed, inner part of excipulum hyaline; apothecia at first plane, marginate, black; hypothecium dark brown . . . . . *M. erratica*
- 14.\* Excipulum not seen even in young apothecia, which are convex from the beginning . . . . . 15
- 15. Hypothecium dark brown, K+ brown intensifying . . . . . *M. lutulata*
- 15.\* Hypothecium dark aeruginose, sometimes with purplish tinge, K+ green intensifying . . . . . 16
- 16. Spores ovoid or ellipsoid, at least 3.0 µm wide . . . . . *M. sylvicola*
- 16.\* Spores oblong-ellipsoid or oblong-ovoid, 1.5–2.5 µm wide . . . . . *M. tuberculata*
- 17. Apothecia 0.2–0.5 mm wide, variable in colour; excipulum absent; upper hymenium hyaline or greenish . . . . . *M. bauschiana*
- 17.\* Apothecia black, very small, 0.1–0.2 mm wide; excipulum thin, but visible, grey; upper hymenium blue . . . . . *M. polycarpella*
- 18. Hypothecium dark coloured . . . . . 19
- 18.\* Hypothecium pale or hyaline . . . . . 25
- 19. Hypothecium dark purplish-brown or with aeruginose tinge, K+ blackish-green or purplish intensifying . . . . . 20
- 19.\* Hypothecium brown, K± intensifying; apothecia without visible excipulum . . . . . 21
- 20. Apothecia convex from the start; excipulum not visible even in young apothecia; spores simple; on lignum; pycnidia conspicuous, black, stalked . . . . . *M. nigella*
- 20.\* Apothecia at first marginate, often clustered; excipulum dark coloured, distinctly developed; spores 0–1(2)-septate; on rocks in high mountains; pycnidia inconspicuous, never stalked . . . . . *M. marginata*
- 21. Thallus of pale grey straw-coloured, convex granular-areolate, with intermixed brownish cephalodia containing cyanobacteria; spores 0–1(–2)-septate; in high mountains . . . . . *M. incrassata*
- 21.\* Thallus not granular-areolate, green, blackish or inconspicuous, never with cephalodia . . . . . 22
- 22. Pycnidia distinctly stalked, black; pycnidial walls dull olivaceous K± intensifying, fuscous at the base, K– or K± intensifying; thallus green to dull olive-green, continuous or scurfy granular, often without apothecia; ascospores 0–1-septate . . . . . *M. botryoides*
- 22.\* Pycnidia sessile or inconspicuous, if stalked than not distinctly . . . . . 23
- 23. Thallus mealy, bright to whitish-green; apothecia pale brown to brown-black, 0.1–0.2 µm wide and mostly tuberculate; ascospores small, oblong, up to 2.5 µm wide; usually on rocks . . . . . *M. myriocarpa*
- 23.\* Thallus not mealy; apothecia persistently black and ascospores wider than 3.0 µm . . . . . 24
- 24. Thallus inconspicuous, mostly endosubstratal; ascospores simple, up to 10(–11) µm in length; in high mountains . . . . . *M. deminuta*
- 24.\* Thallus blackish, ascospores simple or 1–3-septate, more than 10 µm length; on turf and exposed soil in high mountains . . . *M. turfosa*
- 25. Hymenium in upper part or vertical streaks inside hymenium dull olive-grey, olive-brown, or straw-brown, K+ violet, C+ violet, at least in darker apothecia . . . . . 26
- 25.\* Hymenium colourless without distinct epithecium, never K+ violet or upper part of hymenium brownish, K– dulling or dissolving . . . . . 31
- 26. Ascospores road-shaped, narrowly fusiform, 1–3(–5)-septate; thallus of dull grey-olivaceous discrete granular-areolae; no substances detected by TLC . . . . . *M. synotheoides*
- 26.\* Ascospores ovoid, ellipsoid-ovoid or oblong, simple or 1-septate . . . . . 27
- 27. Thallus endoxylic, inconspicuous or of greyish granular-areolae, never of small, green to dull olive-green goniocysts; epihymenium . . . . . 28
- 27.\* Thallus of green to dull olive-green goniocysts . . . . . 29
- 28. Thallus endoxylic or inconspicuous, visible as pale grey or olive-grey tinge of substrate, usually with stalked, black pycnidia; walls of pycnidia olive-grey or olive-brown, K+ violet; apothecia

- greyish-black to black but in many cases not developed; ascospores 0(–1)-septate, ovoid; no substances detected by TLC . . . . . *M. misella*
- 28.\* Thallus morphologically blackish, inconspicuous or of greyish granular-areolae; apothecia black; pycnidia often numerous, black, usually emergent, shortly stalked or sessile; ascospores narrowly ovoid and ellipsoid, (0–)1-septate; micareic acid present . . . . . *M. nowakii*
29. Pycnidia numerous, stalked, ±brown, whitish tomentose; walls K+ violet; goniocysts containing orange-brown droplets, K+ violet; apothecia brown, often tuberculate; no substances detected by TLC . . . . . *M. hedlundii*
- 29.\* Micareic or methoxymicareic acid present . . . 30
30. Micareic acid present; apothecia convex-hemispherical or subglobose, very variable in colour, whitish-grey, pale brown, brownish-grey, grey-black or black; pycnidia whitish, olive-black or black, sessile or immersed between goniocysts . . . . . *M. prasina*
- 30.\* Methoxymicareic acid present; thallus dull olive; apothecia shallow-convex, adnate, greyish . . . . . *M. micrococca*
31. Thallus of whitish-grey, convex to subglobose areolae; apothecia brown to brown-black, usually ±globose; epithecium brown in K dissolving and fading into solution . . . . . *M. elachista*
- 31.\* Thallus not composed of subglobose areolae, apothecia pale, brownish or orange-brown . . . . . 32
32. On acidic rocks; apothecia pale, hyaline inside, only in exposed localities yellowish-orange to orange-brown and then hypothecium orange-gold, K–; ascospores simple, ovoid . . . . . *M. lithinella*
- 32.\* Not on rocks . . . . . 33
33. Pycnidia stalked with whitish tomentum at least in lower part; walls brown K– or greyish K± violet; thallus of small, bright green granules; apothecia pale or pallid straw-brown, hyaline inside . . . . . *M. tomentosa*
- 33.\* Without tomentose pycnidia . . . . . 34
34. Thallus endoxylic or inconspicuous; apothecia pale orange, orange-brown; some parts of hymenium brownish, K± dulling; pycnidia shortly stalked, walls brown, K+ dulling . . . *M. anterior*
- 34.\* Thallus of pale to dull green goniocysts, or thallus grey-green, waxy in appearance . . . 35
35. Thallus ±continuous, waxy in appearance; apothecia pale straw-coloured, pale straw-brown, adnate to clustered, often with a white rim; sporodochia bearing macroconidia 6–9 × 2–3 µm diam. usually present . . . . . *M. adnata*
- 35.\* Thallus of goniocysts . . . . . 36
36. Methoxymicareic acid present; apothecia shallow-convex, pallid; usually with numerous, small, white, sessile and gaping pycnidia; paraphyses numerous; narrow excipulum usually present . . . . . *M. micrococca*
- 36.\* Micareic acid present; apothecia convex, hemispherical or subglobose, pallid; paraphyses rather scanty; excipulum never developed . . . . . *M. prasina*

#### CHARACTERISTICS OF TAXA

#### *Micareia adnata* Coppins (Figs 4A, 5 & 6)

Bull. Brit. Mus. (Nat. Hist.), Bot. **11**(2): 108, 109. 1983.  
 TYPE: Scotland, Caledonia, Argyll, Dunoon, Benmore, ad River Eachaig, ad corticem *Alni*, 18 Nov. 1977, B. J. Coppins 3256 (E – HOLOTYPE!).

Thallus of thin or more developed crust, continuous or usually on soft wood cracked or irregularly, sharply areolate or finely scurfy-granular, whitish green, often waxy in appearance (especially when infected by non-lichenized algae). Photobiont micareoid; algal cells 4–7 µm. Apothecia usually present, but sometimes only few, immarginate, but often with distinctly visible white rim of arachnoid hyphae, waxy pale straw-coloured to straw-brown, slightly convex to hemispherical, persistently adnate even when mature, dispersed or later usually coalescing to form large, irregular clusters increasing 1.5–2 mm diam.; individual apothecia 0.3–0.6(0.7) mm, C–. Hymenium hyaline or sometimes in thick sections slightly dilute straw-coloured, 40–55(–60) µm tall, without any pigmented epithecium, K–, C–. Asci clavate 40–45 × 10–12 µm, often rare or very poor developed. Ascospores ellipsoid, oblong to ovoid-oblong, 0–1-septate, (8–)9–13(–15) × 3–4.5 µm. Paraphyses numerous, branched and anastomosing, hyaline throughout, 1–1.5 µm wide, well separating in KOH; apices slightly widening to 2–2.5 µm. Hypothecium hyaline, 50–100 µm tall, composed of multiseptate, interwoven, hyaline hyphae scarcely wider than paraphyses, becoming vertically orientated towards the hymenium or

expanding into excipulum; algae often present within. Excipulum mostly indistinct, but in young apothecia developed as colourless, ca 20  $\mu\text{m}$  wide, more interwoven zone of hypothecial-like, transversely septate hyphae. Pycnidia not observed in Polish specimens, but found as bearing microconidia in several instances among other European examples (see Coppins 1983). Sporodochia numerous, convex or  $\pm$ globose, resembling small apothecia in colour or slightly paler to almost whitish, but without white rim, often constricted at the base, 0.1–0.3 mm diam. Macroconidia ellipsoid to oblong, (6–)7–9.5(–10)  $\times$  2–3  $\mu\text{m}$ .

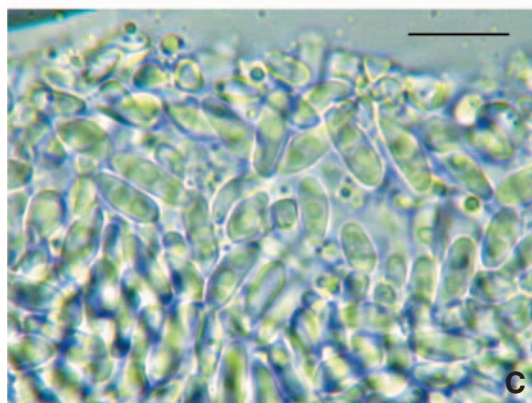
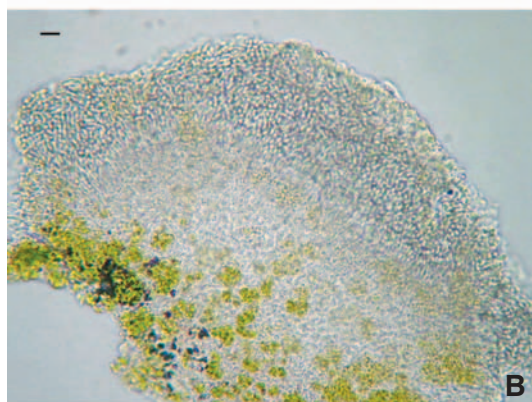
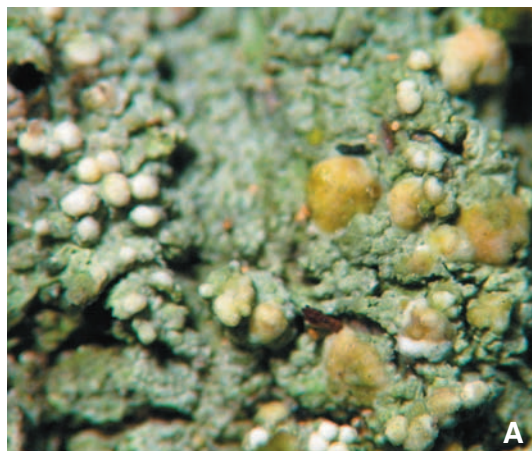
**CHEMISTRY.** Thallus and apothecia K–, C–, P–. No substances detected by TLC.

**NOTES.** This species is rather easy to identify owing to its characteristic and mostly abundant sporodochia bearing large, ellipsoid macroconidia which are never observed in other species of *Micarea*. These apothecia-like anamorphic stages are numerous in all Polish specimens while apothecia are usually rarely present, especially in material collected from tree bark; in contrast to sporodochia, they are only adnate and at least when young also surrounded by the white rim of fungal hyphae.

Despite the presence of those distinctive features and waxy thallus *M. adnata* appears to be closely related phylogenetically to species of the *M. prasina*-group (Andersen 2004; Andersen & Ekman 2005).

**HABITAT AND DISTRIBUTION IN POLAND.** To date, the species has been reported only from two regions in Poland, namely the Gorce Mts (Czarnota 1997a, 2000) and the Karkonosze Mts (Kossowska 2003a), but examination of lichen material housed in Polish herbaria shows that *M. adnata* has been collected since 1959 also in other mountain ranges of the country. Unfortunately, before 1983, this species was completely unknown (Coppins 1983), so some specimens collected during this period were incorrectly determined as *M. prasina*.

*Micarea adnata* is a rare species in Poland, found only in mountainous regions to the south. It has been found as an epiphyte on the bark of *Abies alba* and at the base of *Larix decidua* or epixylic



**Fig. 5.** *Micarea adnata* Coppins: A – morphology of sporodochia and apothecia, B – vertical section of sporodochium, C – macroconidia produced by sporodochia (leg. *M. Staniaszek*, 18 Sept. 2004, Hb. *Staniaszek*). Scale bars = 10  $\mu\text{m}$ .

on soft wood of decaying stumps within natural forest communities covering the lower parts of mountain ranges. It prefers stable ecological condi-

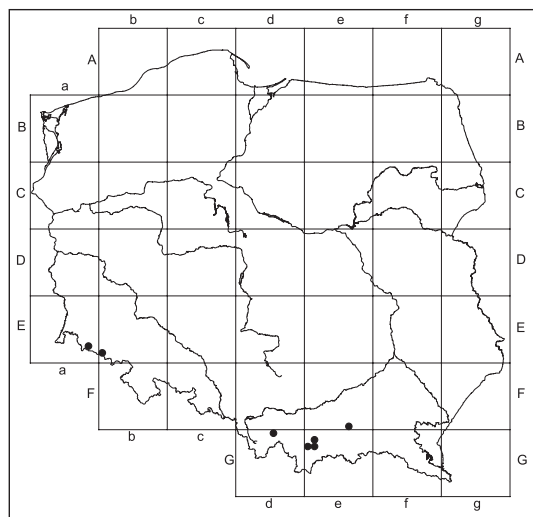


Fig. 6. Distribution map of *Micarea adnata* Coppins in Poland.

tions within deep valleys, especially in shady and moist niches near mountain streams. On lignum it is found together with *Micarea botryoides*, *M. prasina* s.str., *Trapeliopsis viridescens* and some unidentified bryophytes.

Only one specimen of *M. adnata*, collected more than 30 years ago, is known from the Carpathian foothills. Only small patches of the species have been recorded recently and mainly for this reason it has been listed as an endangered species in the Gorce Mts (Czarnota 2003a) and Polish Sudetes (Kossowska 2003b), although it should be noted that there are many potential habitats in different regions of the Carpathians and the Karkonosze Mts.

Considering the specific ecological requirements of *M. adnata* and its occurrence only within natural, old-growing parts of the Carpathian beech forest in Western Beskidy Mts as well as in the best preserved spruce or spruce-fir stands in Karkonosze Mts, the species could be used as an indicator of ecological continuity for woodlands of lower mountain belt in the Central Europe (whenever such a list is prepared). *Micarea adnata* has already been included to the main group of species used to established the native pinewood index of ecological continuity in

western and central Scotland (Coppins & Coppins 2002); it is also an epiphyte on deciduous trees in ancient broadleaf woodlands in the same region (Coppins 1983; Coppins & Coppins 2002; see also additional examined species).

WORLD DISTRIBUTION. New localities of *M. adnata* reported during the last decade from different parts of Europe and even other continent confirm Coppins's (1983) suggestion that its occurrence is connected with an oceanic climate characterized by the high precipitation and air humidity. Its known distribution in Europe is concentrated in those 'oceanic' areas and isolated, mainly mountainous, high rainfall regions in central and southern part of the continent. The Ukrainian locality in Eastern Carpathians close to Polish border currently delimits its eastern geographical limit in Europe, but it is very likely to be present further to the east in mountainous areas.

EUROPE: Austria (Palice 1999; Hafellner & Türk 2001); Czech Republic (Palice 1999; Vězda & Liška 1999); Denmark, vulnerable species (Søchting 1998; Søchting & Alstrup 2002); Germany (Scholz 2000) – Baden-Württemberg (Wirth 1995); Great Britain (Coppins 1983, 1992, 2002); Italy (Nimis & Martellos 2003); Madeira (Hafellner 1995); the Netherlands (Aptroot *et al.* 2004); Norway (Andersen & Ekman 2005); Portugal (van den Boom *et al.* 1990); Slovenia, Alps (Suppan *et al.* 2000); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993); Switzerland (Coppins 1992; Scheidegger *et al.* 2002); Ukraine – Eastern Carpathians (Kondratyuk *et al.* 1998). ASIA: Taiwan (Aptroot & Sparius 2003).

EXSICCATAE SEEN. Obermayer, *Lich. Graec. No.* 7 & 8 (E).

SPECIMENS EXAMINED. Grid square Ea-78 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park, near Wodospad Szklarki waterfall, 2000, *leg. M. Kossowska* (Hb. Kossowska); valley of Szklarka stream, by Droga pod Reglami road to Szklarska Poręba town [50°48.917'N/15°33.755'E] alt. 637 m, 18 Sept. 2004, *leg. M. Staniaszek* (Hb. Staniaszek); Eb-80 – KARKONOSZE MTS: Karkonoski National Park, Dolina Łomniczki valley, by hiking track [50°45'36"N/15°45'38"E] alt. ca 735 m, 7 July 2003, *leg. P. Czarnota* (GPN 3476); Fe-96 – POGÓRZE ŚRODKOWOBESKIDZKIE

FOOTHILLS, POGÓRZE ROŻNOWSKIE FOOTHILLS: valley of Wieprzyk stream below Bukowiec Mt. near Siekierzyna village, alt. 460 m, 23 June 1971, leg. R. Kozik (KRAM, as *Catillaria prasina*; GPN 3832); Gd-05 – WESTERN BESKIDY MTS, BESKID MAKOWSKI MTS: Pasma Pewelskie range, Ślemień village, Czarny Dział, alt. ca 670 m, 5 Aug. 1965, leg. J. Nowak (KRAM-L 4960), as *M. prasina*; Ge-11 – GORCE MTS: valley of Roztoka stream, at foot of N slope of Mostownica Mt., alt. 740 m, 17 Nov. 1992, leg. P. Czarnota (GPN 223); Ge-20 – GORCE MTS: Gorce National Park, ‘Turbacz’ nature reserve, valley of Olszowy Potok stream, alt. 860 m, 26 June 1996, leg. P. Czarnota (GPN 1109) and alt. 810 m, 5 July 1996, leg. P. Czarnota (GPN 882); Ge-21 – GORCE MTS: valley of Turbacz stream, alt. ca 1100 m, 6 Sept. 1959, leg. K. Glanc (KRAM-L 26419, as *Catillaria prasina*; GPN).

ADDITIONAL SPECIMENS EXAMINED. SCOTLAND, ARGYLL: Hell’s Glen Wood, ca 4.5 km N of Lochgoilhead village [56°12’23”N/4°54’59”W] alt. 50 m, on bark of *Quercus* sp., 13 Sept. 2003, leg. B. J. Coppins & P. Czarnota (GPN 3382) and [56°12’18”N/4°54’59”W] on soft wood of decaying stump within ancient deciduous forest, 13 Sept. 2003, leg. P. Czarnota (GPN 3410); Cormonachan Wood, by W shore of Loch Goil, alt. 5 m, on decaying terricolous bryophytes in underhang under root-system at the margin of ancient deciduous forest, 11 Sept. 2003, leg. P. Czarnota & B. J. Coppins (GPN 3375).

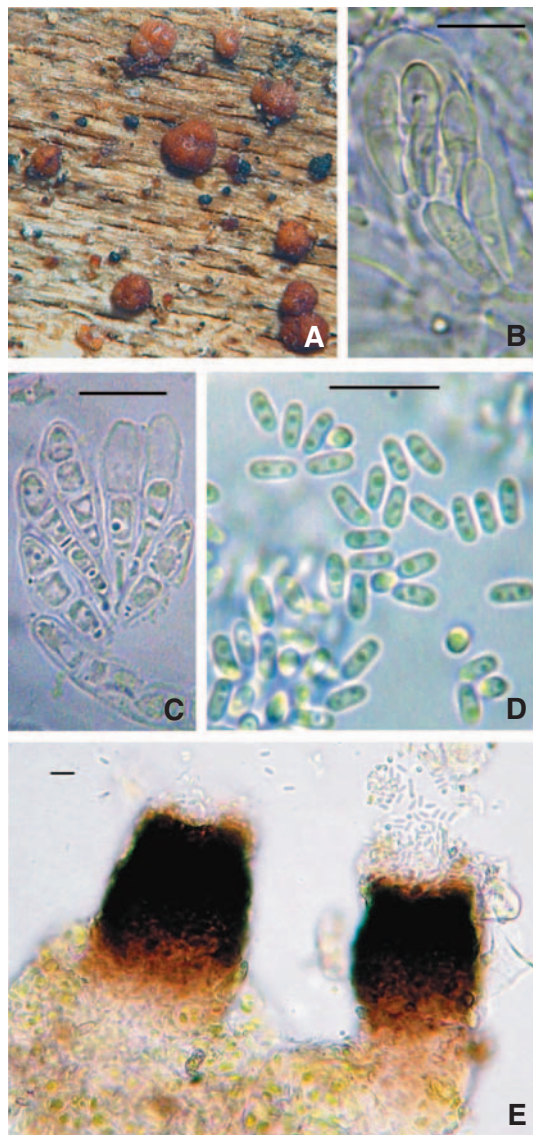
***Micarea anterior* (Nyl.) Hedl.** (Figs 4F, 7 & 8)

Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, 18(3): 76, 86. 1892.

*Lecidea anterior* Nyl., Flora 58: 299. 1875. – *Lecidea erysiboides* subsp. *anterior* (Nyl.) Nyl. in Hue, Rev. Bot. Bull. Mens. 5: 104. 1887. – *Catillaria anterior* (Nyl.) Zahlbr., Cat. Lich. Univ. 4: 29. 1926. TYPE: Finland, Tavastia australis, Asikkala, 1863, J. P. Norrlin (H-NYL 21655 – LECTOTYPE!; H – ISOLECTOTYPES!).

– *Micarea anterior* f. *diluta* Hedl., Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, 18(3): 76, 86. 1892. TYPE: Sweden (S – HOLOTYPE, *n.v.*; UPS – ISOTYPE, *n.v.*).

Thallus endoxylic or inconspicuous, greyish to dilute olivaceous grey, irregularly minutely verrucose, ±gelatinous, often lichenicolous or mixed with non-lichenized algae. Photobiont micareoid; algal cells 4–7 µm. Apothecia usually absent, rarely numerous (in only one case for Poland), orange-brown to dull brown, immarginate, sub-



**Fig. 7.** *Micarea anterior* (Nyl.) Hedl.: A – morphology, B – 1-septate ascospores, C – 2–3-septate ascospores (isolectotype of *Lecidea anterior* Nyl. [H]); D – mesoconidia, E – vertical section of pycnidia bearing mesoconidia (GPN 3526). Scale bars = 10 µm.

globose, simple or rarely tuberculate, 0.1–0.3 mm. Hymenium 35–45 µm tall, hyaline, but upper part distinctly yellow- to orange-brown, K– or K± persistently dulling, C–; sometimes slightly brownish in the middle due to some paraphyses coated by pigmented gel-matrix. Asci clavate to cylindrical

clavate, 35–40 × 12–15 µm. Ascospores oblong-ellipsoid, oblong-ovoid, ovoid, 0–1(–2)-septate, (6.5–)8–12(–12.5) × (2.7–)3–4(–4.8) µm. Paraphyses rather numerous, 1–1.5 µm wide, distinctly branched and anastomosing, hyaline or some of them wider in upper part, to 2.5–3 µm, with brown pigmented walls. Hypothecium hyaline, up to 100 µm high. Excipulum visible as an orange-brown reflexed zone to 10–15 µm wide, K–, C–; hyphae not separating in K, closely bound up with pigmented gel-matrix, likely to be in the epihymenium. Pycnidia of two types: (1) rare, very small, sessile (for example on apothecia), pycnidial walls brown, K± dulling; microconidia narrowly cylindrical, 3.5–4.5 × 0.8 µm; (2) usually numerous or few (but absent in the only specimen with developed apothecia), sessile to stalked with pallid to dilute brownish pycnidiophores and brown, K± intensifying walls, usually simple or sometimes branched, often bearing a white mass of conidia; mesoconidia cylindrical, biguttulate, 3.5–4.5 × 1.2–1.5 µm (slightly shorter than mesoconidia of *M. misella*).

CHEMISTRY. Material insufficient for TLC.

NOTES. Only one collection of *M. anterior* from Poland bears apothecia, and only shortly stipitate or sessile pycnidia arising from pale pycnidiophores are present. Accordingly, this lignicolous species could have been overlooked in the past, as exemplified by the two former collections made by Nowak and Kiszka (see below). Hence, *M. anterior* has only recently been reported from Poland for the first time (Czarnota 2004). A few collections, probably referring to *M. anterior*, growing as an epiphyte or covering other lichens and non-lichenized algae have also been found, some of them forming characteristic, stipitate pycnidia arising from mature apothecia of *M. prasina* and others with the same sessile and stipitate pycnidia appear, for example, on the thallus and apothecia of epiphytic *M. micrococca* (as in *P. Czarnota 4612*). Based on these observations, one may suppose that *M. anterior* has a greater ecological plasticity and is not so closely confined to lignum. Its known occurrence on other members of the genus *Micarea* may suggest it could also be sometimes treated as

a lichenicolous fungus, but this hypothesis can be supported only by more observations.

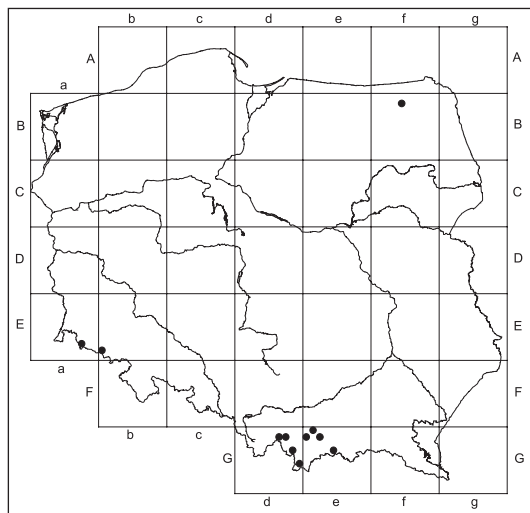
The single mature collection with apothecia (OLS-L 1368) was previously identified as discoloured *M. denigrata* because of the lack of a K+ violet reaction in the brown pigmented epihymenium. Further microscopical examination also shows that it differs in having no C+ red or C+ violet reaction in its apothecial sections and the presence of the orange-brown, reflexed, but persistent in K excipulum, ovoid spores, wider than in *M. denigrata*, and less numerous and pigmented above paraphyses. A collection similar to the Polish one was recently made also in Estonia (Aptroot *et al.* 2005). In the type material of *Lecidea anterior* Nyl. pale to slightly orange-brown apothecia predominate, but these dark coloured, similar to those in Polish specimen are found sporadically among others in *Lecidea erysiboides\* anterior* Nyl. (H-NYL 21654!; Finland, Hollola Hersala, 1874, *leg. Vainio*).

*Micarea anterior* could be confused with the poorly recorded in Poland *Catillaria erysiboides* (Nyl.) Th. Fr. Both species may have almost identical morphology and ecology, but *C. erysiboides* differs in its well developed excipulum, especially visible in young apothecia.

HABITAT AND DISTRIBUTION IN POLAND. Based on several collections from the mountainous, southern part of the country and one from NE Poland, as well as its known distribution in Fennoscandia, *M. anterior* should be treated as a boreal-mountain species. It appears to be widespread in coniferous forests, especially in the Carpathians, but considering its small pycnidia, frequent lack of apothecia and inconspicuous, endoxylic thallus, it is likely to be overlooked. Almost all Polish collections of *M. anterior* were made during microscopical investigations of other lignicolous species growing on the soft wood of decaying coniferous stumps.

*Micarea anterior* occurs in natural as well as managed coniferous forests of both mountain belts, ascending to 1320 m in the Babia Góra massif where it prefers shady spruce and fir-spruce stands littered with decaying wood of fallen logs





**Fig. 8.** Distribution map of *Micarea anterior* (Nyl.) Hedl. in Poland.

and stumps. Here it is associated with *Micarea botryoides*, *M. denigrata*, *M. hedlundii*, *M. misella*, *M. nigella*, *M. prasina* s.str., *Thelocarpon lichenicola*, *Placynthiella dasaea* and *P. icmalea*. Sporadically it has been collected from epiphytic *M. prasina* and *M. micrococca* on tree bases within shady fir-spruce mountain forests.

In its only lowland site in the Puszcza Borecka Forest, *M. anterior* occurs on a wooden fence in association with *Hypocenomyce scalaris*, *Hypogymnia physodes*, *Lecanora saligna* and *Trapeliopsis flexuosa* in an open area.

**WORLD DISTRIBUTION.** Since the revision of European *Micarea* species by Coppins (1983) the number of new localities of *M. anterior* only poorly increased. It was known previously from Fennoscandia and for this reason it appeared to be widespread in the boreal zone. Reports of its presence in the German Alps (Wirth 1995), Šumava Mts (Palice 1999) and Polish Carpathians (Czarnota 2004) suggest that it has a boreal-mountainous distribution in Europe. It is also likely to be more widespread to the east, along the Carpathians.

**EUROPE:** Czech Republic (Palice 1999; Vězda & Liška 1999); Estonia (Aptroot *et al.* 2005); Finland (Vitikainen *et al.* 1997); Germany (Kalb 1982; Wirth 1995); Russia – Komi Republic (Her-

mansson *et al.* 1998); Sweden (Santesson 1993); Switzerland (Coppins, pers. comm.).

**SPECIMENS EXAMINED.** Grid square Bf-14 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE ELCKIE LAKELAND: Puszcza Borecka Forest, Orłowo village [54°03'N/22°10'E] 16 July 1995, *leg. A. Zalewska* (OLS-L 1368), as *M. denigrata*; Eb-80 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park, Dolina Łomniczki valley, by hiking track ca 100 m below the shelter-house 'Nad Łomniczką', alt. 1015 m, 7 July 2003, *leg. P. Czarnota* (GPN 3526); Ea-77 – GÓRY IZERSKIE MTS: Dolina Izery valley, ca 1 km W of Orle settlement, in spruce stand on peat-bog [50°49.11'N/15°22.63'E] alt. ca 800 m, 9 July 2003, *leg. P. Czarnota* (GPN 3530); Gd-16 – WESTERN BESKIDY MTS, BABIA GÓRA RANGE: N slope of Babia Góra Mt., Babiogórski National Park, forest section no. 22a [49°34'45"N/19°31'22"E] alt. 1320 m, 9 June 2004, *leg. P. Czarnota 4105* (GPN, together with *M. prasina* s.str.); Gd-17 – BABIA GÓRA RANGE: Polica range, between Czrymić Mt. and Polica Mt., alt. 1250 m, 15 June 1965, *leg. J. Nowak* (KRAM-L 15109, together with *M. denigrata*); Naroże Mt., alt. 1000 m, 23 Oct. 1965, *leg. J. Nowak* (KRAM-L 17203), as *Catillaria p.*; Gd-38 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKO-NOWOTARSKA BASIN: a forest SE of Jablonka village, 2 Aug. 1999, *leg. J. Kiszka* (KRAP, together with *M. hedlundii*); Gd-59 – TATRA MTS, WEST TATRA MTS: Tatra National Park, Dolina Kościeliska valley near Kościeliski stream [49°15.42'N/19°52.11'E] 23 July 2002, *leg. P. Czarnota 2554* (GPN); Ge-01 – WESTERN BESKIDY MTS, BESKID WYSPOWY MTS: E slope of Lubogoszcz Mt., ca 1 km W of Kasina Wielka village, by hiking track, alt. 680 m, 23 Sept. 2001, *leg. P. Czarnota* (GPN 2070, together with *M. prasina* s.l.); Ge-10 – GORCE MTS: Gorce National Park, E slope of Tobiółów Mt. below a chair-lift, alt. 800 m, 23 Febr. 2002, *leg. P. Czarnota* (GPN 2729) and 29 Mar. 2004, *leg. P. Czarnota 4046* (GPN); Ge-10 – BESKID WYSPOWY MTS: NE slope of Luboń Wielki Mt. by red hiking track [49°39'N/19°59'E] alt. ca 920 m, 5 June 2003, *leg. P. Czarnota* (GPN 3248); Ge-12 – BESKID WYSPOWY MTS: W slope of Modyń Mt. [49°37'23"N/20°22'37"E] alt. 890 m, 2 July 2005, *leg. P. Czarnota 4612* (GPN); Ge-34 – BESKID SADECKI MTS: Radziejowa range, Piwniczna forest division, Roztoka Wielka forest district, forest section no. 182 above 'Baniska' nature reserve [49°26'50"N/20°36'41"E] alt. ca 1120 m, 4 Nov. 2004, *leg. P. Czarnota 4391* (GPN).

**ADDITIONAL SPECIMENS EXAMINED.** Material from the Czech Republic and Sweden has also been seen (see Czarnota 2004).

*Micarea bauschiana* (Körb.) V. Wirth & Vězda  
(Figs 9 & 10)

in Vězda & V. Wirth, Folia Geobot. Phytotax. **11**: 95. 1976.

*Biatora bauschiana* Körb., Parerga Lich.: 157. 1860.  
– *Lecidea bauschiana* (Körb.) Lettau, Hedwigia **55**: 28. 1914. TYPE: Germany, Baden-Württemberg, Baden-Baden, on the way to Yburg, on porphyry, 1859, *Bausch*, Rabenhorst, *Lich. Eur. No. 648* (M – LECTOTYPE, *n.v.*; M – ISOLECTOTYPE, *n.v.*; WRSL – ISOLECTOTYPE!, designated here); additional ISOLECTOTYPE distributed as Arnold, *Lich. Exs. No. 120* (hb. Vězda ex M!, designated here; BM *n.v.*).

– *Lecidea infidula* Nyl., Flora **51**: 475. 1868. TYPE: Jersey, *C. Larbalestier* (H-NYL *p.m.* 5413 – HOLOTYPE!).

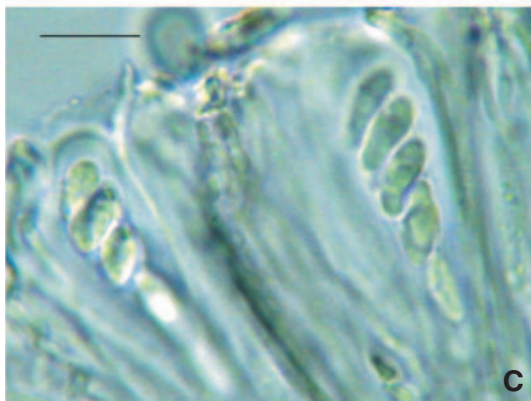
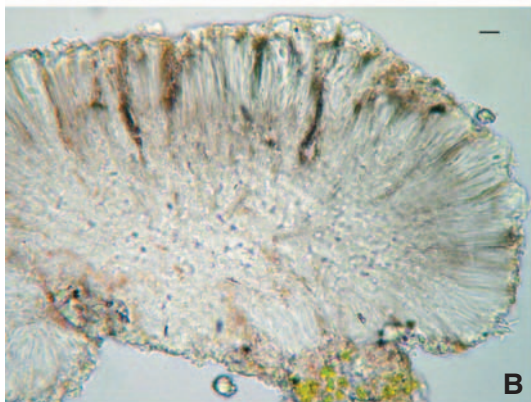
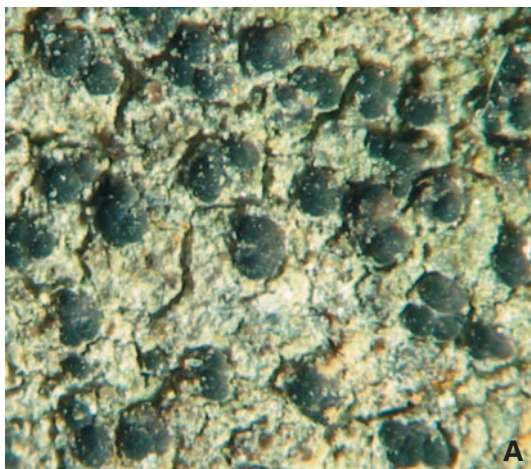
– *Lecidea semipallens* Nyl., Flora **59**: 234. 1876. TYPE: Ireland (H-NYL 19399 – LECTOTYPE, *n.v.*; ISOLECTOTYPES: BM ex K, H-NYL 19402, *n.v.*).

– *Lecidea dilutiuscula* Nyl., Flora **59**: 308. 1876. TYPE: England, South Devon, near Buckfastleigh, *H. B. Holl* (H-NYL 10754 – ISOLECTOTYPE!).

– *Lecidea rusticella* Nyl., Flora **61**: 245. 1878. TYPE: Ireland, West Galway, Connemara, Tullywee Bridge, 1876, *C. Larbalestier* (H-NYL 20206 – HOLOTYPE!).

– ? *Catillaria microspora* Maslova, Ukrayins'k. Bot. Zhurn. **30**(5): 665. 1973. TYPE: Ukraine (KW – HOLOTYPE, *n.v.*).

Thallus grey- to dull green, continuous or usually cracked or scurfy granular, quite thick and then sometimes forming distinctive, angular areolae in the middle part of the patches and sometimes with 'oxydated' upper part visible between cracks or rarely also with thick white medula. Photobiont not 'micareoid'; cells  $\pm$ globose, 5–12(–15)  $\mu$ m diam. Apothecia numerous, immarginate and convex-hemispherical from the beginning, later sometimes subglobose, usually simple or tuberculate, sessile, 0.2–0.5 mm diam., greyish-black, bluish-grey to almost black, some of them also pale grey, sometimes very variable in colour even in the same specimen, blackish when wet or shining in the case of paler apothecia. Hymenium 40–70  $\mu$ m almost hyaline, but usually in thick sections dilute bluish or olivaceous, K–. Ascospores ellipsoid or ovoid-ellipsoid, simple, (6–)7–11(–12)  $\times$  (3–)3.5–4.8  $\mu$ m. Paraphyses of two types, more visible in K: (1)



**Fig. 9.** *Micarea bauschiana* (Körb.) V. Wirth & Vězda: A – morphology; B – vertical section of apothecia; C – ascospores (GPN 3282). Scale bars = 10  $\mu$ m.

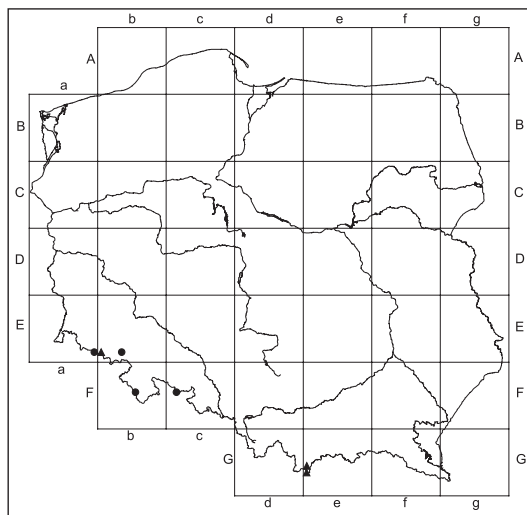
thin, *ca* 0.7–1.2  $\mu$ m, rather frequent, branched and anastomosing, not visibly septate, apical parts only occasionally widening to 1.8  $\mu$ m diam.; (2) thicker,

1.5–2 µm wide, simple or sparingly branched and concentrated in vertical streaks, covered by deeply pigmented gel-matrix. Hypothecium hyaline, but in darker apothecia usually dilute greenish or dilute bluish in upper part, K–. Excipulum not developed even in sections of young apothecia, but paraphyses in lower part of hymenium more frequent and branched. Pycnidia present, visible as small, blackish points immersed in the thallus, sometimes gaping; walls around ostiolae olive-grey, K± intensifying. Conidia (mesoconidia?) cylindrical, (4–)5–6(–7.5) × 1–1.2 µm.

**CHEMISTRY.** No substances detected by TLC.

**NOTES.** *Micarea bauschiana* morphologically resembles other species belonging to the *M. sylvicola*-group, with which it very often occurs. *Micarea lutulata*, *M. tuberculata* and *M. sylvicola* form the thallus and apothecia similar in an appearance to this species, so it is usually impossible to make correct identification without cross-sections of apothecia. Moreover, the ‘oxydated’ thallus visible in some specimens of *M. bauschiana* have also been recorded in the case of *M. lutulata*, and the white, thick medulla and white rim around apothecia present in specimens from Góry Kamienne Mts (see below) are also present in a very large number of specimens of *M. sylvicola*.

**HABITAT AND DISTRIBUTION IN POLAND.** *Micarea bauschiana* is a rarely recorded or overlooked saxicolous species in Poland, being known from only one locality prior to this work (Czarnota 2004). Material collected in the Bieszczady Mts (Eastern Polish Carpathians) and reported as *M. bauschiana* (Kiszka & Kościelniak 2001) is actually *Psilolechia clavulifera* as suggested by Czarnota (2004). *Micarea bauschiana* has recently been found in the Karkonosze Mts growing at the base of shaded vertical face of a granite boulder in a postglacial corrie above the timber-line. In the Bystrzyckie, Opawskie and Kamienne Mts it occurs at lower altitudes (400–600 m), on shaded, metamorphic and volcanic rocks forming vertical faces of gorges as well as in an abandoned quarry covered in different woody communities.



**Fig. 10.** Distribution map of *Micarea bauschiana* (Körb.) V. Wirth & Vězda (●) and *Micarea deminuta* Coppins (▲) in Poland.

It is probably more frequent in the Sudetes than the collections would suggest, but in the Polish Carpathians, except the High Tatra Mts, it may be absent. Associated species include *Lepraria* spp., *Micarea botryoides*, *M. peliocarpa* and *M. sylvicola*.

**WORLD DISTRIBUTION.** Based on known reports of *M. bauschiana* in Europe, particularly from the western part including British Isles, would suggest that it had an oceanic distribution. It is likely that it reaches the eastern edge of its range in Poland, but *Catillaria microspora* reported from Ukraine (Kondratyuk *et al.* 1998) and treated as a possible synonym of *M. bauschiana* needs further investigation.

**EUROPE:** Austria (Hafellner & Türk 2001); Belgium (Diederich & Sérusiaux 2000); Canary Islands (Hafellner 1995); Czech Republic (Vězda & Liška 1999); Denmark, rare (Søchting 1998; Søchting & Alstrup 2002); Finland (Vitikainen *et al.* 1997); France (*leg. Coppins s.n.*; E); Germany – Lower Saxony (Hauck 1996), Nordrhein-Westfalen (Heibel 1999); Great Britain and Ireland (Coppins 1983, 2002; Seaward 1994); Italy (Nimis & Martellos 2003); the Netherlands, very rare (Aptroot *et al.* 2004); Norway (Santesson 1993); Spain

(Llimona & Hladun 2001); Sweden (Santesson 1993). NORTH AMERICA: USA – Michigan (Fryday *et al.* 2001), New England (Greene 2005), New Hampshire (Wetmore unpubl.). ASIA: Hongkong (Aptroot & Seaward 1999).

*Micarea bauschiana* is also reported from Russia (North Osetia, NW Caucasus) by Blinkova and Urbanavichus (2005) on lignum, but this is doubtful when one considers its saxicolous and suboceanic preferences.

EXSICCATAE SEEN. Arnold, *Lich. Exs. No. 120* (hb. Vězda ex M), *No. 1233* (H-NYL, WRSL); Rabenhorst, *Lich. Eur. No. 648* (WRSL); Zwackh, *Lich. Exs. No. 279A* (H-NYL), *No. 594A, B* (H-NYL), *No. 595* (H-NYL).

SPECIMENS EXAMINED. Grid square Ea-89 – WESTERN SUDETES, KARKONOSZE MTS: N slope of Śnieżka Mt. in Kocioł Łomniczki glacial corrie [50°44.38'N/15°44.03'E] alt. 1300 m, 8 July 2003, *leg. P. Czarnota* (GPN 3282); Eb-83 – MIDDLE SUDETES, GÓRY KAMIENNE MTS: ca 2 km S of Boguszów Gorze town, worked-out quarry [50°44'40"N/16°10'33"E] alt. ca 500 m, 21 Apr. 2005, *leg. P. Czarnota 4461* (GPN); Fb-45 – GÓRY BYSTRZYCKIE MTS: by road between Poręba village and Spalone Pass [50°14'10"N/16°34'29"E] alt. ca 610 m, 20 Apr. 2005, *leg. P. Czarnota 4395* (GPN) and *leg. P. Czarnota 4399* (GPN, together with *M. sylvicola*); Fc-41 – EASTERN SUDETES, GÓRY OPAWSKIE MTS: valley of Bystry stream below Kopa Biskupia Mt., near Pokrzywna village [50°16'39"N/17°26'56"E] alt. 410 m, 19 Apr. 2005, *leg. P. Czarnota 4424* (GPN).

ADDITIONAL SPECIMENS EXAMINED. CZECH REPUBLIC, EASTERN SUDETES: Rychlebské hory Mts, near the border of Poland, S of Bilá Voda village, valley of Bilá Voda stream, vicinity of Šafařova skála outcrop [50°24'35"N/16°53'38"E] alt ca 500 m, 23 Apr. 2004, *leg. P. Czarnota 4166* (GPN). ENGLAND, SOUTH SOMERSET: Clatworthy Reservoir, Clatworthy Wood, on rock outcrop in woodland, alt. 250 m, 23 Apr. 1996, *leg. B. J. Coppins 16813* & *A. M. Coppins* (E).

### *Micarea botryoides* (Nyl.) Coppins

(Figs 11 & 12)

*in* D. Hawksw., P. James & Coppins, *Lichenologist* **12**: 107. 1980.

*Lecidea apochroeella* var. *botryoides* Nyl., *Flora* **50**: 373. 1867. – *Lecidea botryoides* (Nyl.) Zahlbr., *Cat. Lich. Univ.* **3**: 740. 1925. TYPE: Finland, Tavastia aus-

tralis, Lammi, Evo, Lapinkallio, 1866, *J. P. Norrlin 404* (H-NYL 20685 *p.p.* – LECTOTYPE!; H – ISOLECTOTYPE!); 1873, *J. P. Norrlin* (H – TOPOTYPE!, designated here).

Thallus thin, forming scurfy-granular (usually on rocks) to continuous (especially on bark of trees), dark green to dull olive-green crust, sometimes covered by a thin layer of non-lichenized algae, and then ±gelatinous when wet. Photobiont micareoid; algal cells ±globose to widely ellipsoid 4–7 µm. Apothecia usually absent or sometimes numerous (especially in epiphytic collections), brown to dark brown-black, immarginate, hemispherical to ±globose and constricted below, simple, 0.15–0.3 mm or more frequently tuberculate and then up to 0.5 mm wide. Hymenium 30–50 µm tall, hyaline or partially slightly olivaceous, K± dulling, in darker forms always with olivaceous-brown vertical streaks, K± dull olive. Asci cylindrical-clavate, 30–40 × 8–10 µm. Ascospores 0–1-septate, oblong-ovoid, oblong, oblong-ellipsoid, straight or sometimes slightly curved, (7–)10–11(–13) × (2.5–)3–4(–4.5) µm. Paraphyses multiseptate, branched mostly in upper part, of two types: (1) hyaline throughout, 1–1.5 µm wide, apices slightly widening to 2 µm; (2) stout, 2–2.5 µm and widening above up to 3(–3.5) µm, simple or concentrated into small fascicles, coated throughout by dull olive-brown pigment, K+ dull olive. Hypothecium 60–120 µm tall, composed of pigmented hyphae brown to dark fuscous-brown, K– or K± dulling, HNO<sub>3</sub>+ red, but sometimes olivaceous pigment also present and then hypothecium dark blackish-brown, K± dull olive-brown, HNO<sub>3</sub>+ purple-red, mostly transient. Excipulum indistinct. Pycnidia numerous, sessile or more usually stalked, brown (occasionally) to black, 50–400 µm tall (including pycnidiphore) with gaping ostioles very often covered by white conidial mass; stalks simple but mostly branched and bearing several pycnidia; pycnidial walls olive-brown (K± dulling) to dark green and then K+ green intensifying, HNO<sub>3</sub>± purple-red, but lower part with more brownish tinge, K–, HNO<sub>3</sub>+ red. Mesoconidia cylindrical, often, biguttulate, (3.2–)3.5–4.3(–4.5) × 1–1.4 µm.

CHEMISTRY. No substances detected by TLC.

NOTES. Based on Coppins's (1983) description of *M. botryoides*, one might imagine that although the species is very similar to few other members of *Micarea*, it is relatively easy to distinguish it. Unfortunately, it is very often found without apothecia, and the same type of stalked pycnidia present in *M. botryoides* also occurs in *M. nigella* and *M. melaeniza*, which make identification difficult at the anamorphic stages. Ecological differences between *M. botryoides* and *M. nigella* (Coppins 1983), which could lend some diagnostic support, have lost significance when one considers that *M. botryoides* is not only a saxicolous species in Poland, but it has often been collected from lignum, as preferred by *M. nigella*. Identification based on microscopic examination of pycnidia sections and their K<sup>+</sup> as well as N<sup>+</sup> reactions should be sufficient according to Coppins (1983) and Czarnota and Coppins (2000), but there are many cases, when the pycnidial walls of *M. botryoides* reacting N<sup>+</sup> red, red-violet or even purple within the same specimen. When its thallus is more developed, the concentration of the dark, fuscous-brown pigmentation at the base of pycnidia is less intensive than when thallus is inconspicuous. For this reason, 'pycnidial' reaction N ± purplish (characteristic of *M. nigella*) is observed more often in this part of specimens where the thallus is poor. The thickness of cross sections is also very important, because the stronger concentration of pycnidial and hypothecial pigment in *M. botryoides* can result in a N<sup>+</sup> red-purple reaction, at least transiently. Differences between dimensions of mesoconidia in *M. botryoides* and *M. nigella* are too small to be statistically significant. Considering the above facts, anamorphic stages of *M. botryoides* growing on lignum are often identified on the basis of a distinctively developed, dull olive-green thallus, in contrast to *M. nigella* which only has an endoxylic thallus. When apothecia are developed, *M. nigella* can also be distinguished by its non-septate ascospores and very intensive, dull purplish-black hypothecium.

According to Coppins (1983: 156), *M. melaeniza* is almost identical to *M. botryoides* with respect to apothecial and pycnidial pigmentation and structure, but differs mainly in its endoxylic

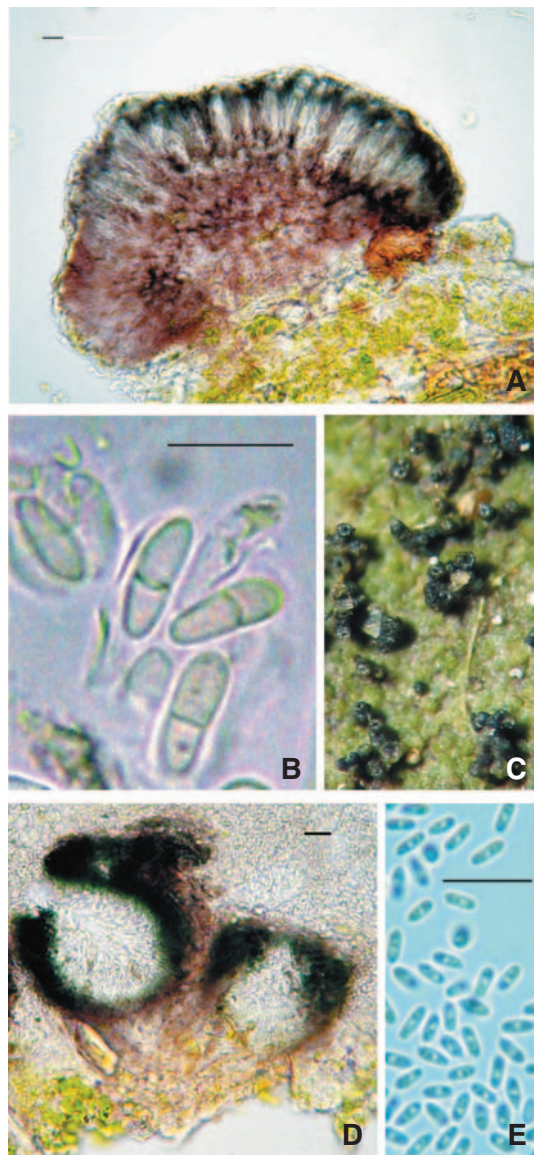


Fig. 11. *Micarea botryoides* (Nyl.) Coppins: A – apothecial section (Czarnota 4691, GPN); B – ascospores (Czarnota 4190, GPN); C – shortly stalked pycnidia, D – pycnidial section, E – mesoconidia (GPN 3249). Scale bars = 10  $\mu$ m.

or whitish, slightly areolate thallus and shorter mesoconidia. It is difficult to say if these features could be sufficient to delimit it as a separate species, when *M. botryoides* occurs on lignum or over lignicolous bryophytes, and when its thallus is often poorly developed (especially at edges).

On the other hand, the straw-whitish, surely becoming decolorized, thallus is present in the type specimen of *M. botryoides* (see below), so the same situation is possible in the case of *M. melaeniza*. Differences in conidial dimensions of both species are also problematic due to some variability in the morphology of mesoconidia sometimes observed in other *Micarea* species (see, for example under *M. misella*); however, in *M. botryoides* they are almost never shorter than 3.5  $\mu\text{m}$  in length, while *M. melaeniza* should have mesoconidia to 3.6  $\mu\text{m}$  length (Hedlund 1892; Coppins 1983). Several Polish specimens from Puszcza Borecka Forest (housed in OLS as *M. cf. melaeniza*) probably refer to *M. nigella* and *M. botryoides*; detailed microscopic measurements (by Multiscan program) show that mesoconidia of these collections are slightly longer than previously determined [3.5–4.2(–4.5)  $\mu\text{m}$  length] and despite their inconspicuous or endoxylic thallus, they cannot belong to *M. melaeniza*.

*Micarea botryoides* can also resemble darkish forms of *M. myriocarpa* with well developed, numerous and sometimes almost short-stalked pycnidia, the more so as both species occur in similar microhabitats on vertical rocky faces in dry underhangs. Darker collections of *M. lutulata* having a similar dark fuscous-brown or blackish-brown hypothecium and often slightly sordid green hymenium can also be confused with *M. botryoides*, but it never has stalked pycnidia and its photobiont is non-micareoid, but large-celled. For more distinguishing details of *M. botryoides*, see under other *Micarea* species with similar apothecial sections, such as *M. deminuta* and *M. turfosa*.

**HABITAT AND DISTRIBUTION IN POLAND.** Considering its common occurrence almost throughout Poland, it is incredible that *M. botryoides* was not reported from the country until the end of last century (Zalewska 1998).

It is especially frequent in mountains on acid rocks (granite, metamorphic and sandstone boulders and loose stones), particularly throughout the Sudetes and Carpathians, within coniferous forests where it grows in shaded and rather sheltered niches at the base of vertical rocky faces or covers

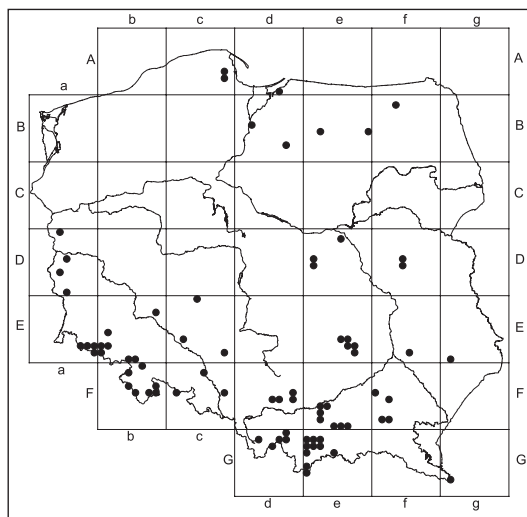


Fig. 12. Distribution map of *Micarea botryoides* (Nyl.) Coppins in Poland.

dry underhangs in larger outcrops, in association with *Lepraria* spp., *Micarea bauschiana*, *M. lignaria*, *M. myriocarpa*, *M. peliocarpa*, *M. sylvicola* and *Pseudosagedia chlorotica*. Occasionally, as in Rudawy Janowickie Mts, it is also associated on granite with *Micarea micrococca* and *Scolicosporium chlorococcum*. Although it prefers saxicolous substrata, *M. botryoides* is frequently found as an epiphyte within shady, spruce and fir-spruce forests in both mountain belts, more particularly acidic bark of *Picea abies* and *Abies alba*, but sometimes it has been recorded on *Pinus sylvestris* (particularly abundant in boggy forest of Bory Nowotarskie Wood), *Pinus cembra* and *Sorbus aucuparia* close to timber-line in the Tatras or on *Larix* sp. in, for example, the Karkonosze Mts. The species usually forms monolithic patches on tree bases, occasionally accompanied by *Coenogonium pineti*, *Lepraria jackii*, *Micarea adnata*, *M. melaena* and *M. micrococca*. Lignicolous records of *M. botryoides* are often frequent in the mountains, where it occurs, usually in an anamorphic stage, on decaying stumps or fallen logs in coniferous and mixed forests together with *Cladonia digitata*, *Lichenomphalia umbellifera*, *Micarea anterior*, *M. melaena*, *M. misella*, *M. nigella*, *M. prasina*, *Placynthiella dasaea* and

*P. icmalea*. Frequently it is also found as an epibryophyte over saxicolous as well as terricolous mosses in mountainous areas, as, for example, in forested peat-bogs in Góry Bystrzyckie Mts or Góry Izerskie Mts. In the Tatra Mts it has also been found on a mossy substratum in a shaded avalanche chute, at altitude 1790 m, in association with several alpine lichens, e.g. *Helocarpon crassipes*. A single specimen on underhang tree roots from Tatra's Roztoka Valley has also been recorded.

In the lowlands, *M. botryoides* is usually found as an epiphyte on the bark of different trees (e.g. *Picea abies*, *Pinus sylvestris*, *Alnus glutinosa*, *Abies alba*, *Quercus* sp.) in different stands, but it also occurs reasonably frequently on decaying wood of stumps and fallen decorticated trees or roots, mainly in association with *Micarea prasina* s.l. On living trees, associated species mainly include *Coenogonium pineti*, *Micarea micrococca* and *M. viridileprosa*, which occupy similar moist niches close to soil level. Only one saxicolous collection is known from the Polish lowlands, namely on a postglacial granite boulder in Pomerania (UGDA-L 5301), but it is probably overlooked in this kind of habitat.

Based on recent data, *M. botryoides* could be defined as an ecologically tolerant species, being found in both natural old-growth forests and young coniferous plantations of varying humidity. It is also reported from a contaminated area in the Upper Silesia and from strongly acidic habitats in the Sudetes, suggesting that it is also a toxictolerant species.

WORLD DISTRIBUTION. *Micarea botryoides* is probably a widespread species throughout Europe, but most reports of it come from the better explored parts which indicates that it is essentially oceanic. Based on Coppins (1983) and more recent ecological and distributional data, it would appear that it may exhibit a greater ecological plasticity, since it is found in both lowlands and high mountains, from oceanic islands and Iberian Peninsula, throughout the Central Europe and Scandinavia, to the Ukrainian Eastern Carpathians. It is obvious that the distribution of this mainly saxicolous

species depends on suitable rocky habitats concentrated in mountainous regions. However, many recent Polish records are from a lignum and tree bark indicating that its eastern distributional limit is connected with large woodlands and will be proved to be more easterly. Outside Europe it has been reported from Taiwan and North America.

EUROPE: Austria (Hafellner & Türk 2001); Azores (Hafellner 1995); Belgium, Luxembourg and France (Diederich & Sérusiaux 2000); Czech Republic (Kocourková-Horáková 1998; Palice 1999; Vězda & Liška 1999); Finland (Vitikainen *et al.* 1997); Germany – Lower Saxony (Hauck 1996), Nordrhein-Westfalen (Heibel 1999); Great Britain and Ireland (Coppins 1983, 2002; Seaward 1994); Italy (Nimis & Martellos 2003); Lithuania (Motiejūnaitė 1999); the Netherlands, (Aptroot *et al.* 2004); Portugal (van den Boom 1999); Norway (Santesson 1993); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993); Ukraine – Eastern Carpathians (Motiejūnaitė *et al.* 1999; Kondratyuk & Coppins 2000). ASIA: Taiwan (Aptroot & Sparrius 2003). NORTH AMERICA: USA – Oregon and Washington (McCune 1996), New York (Coppins & Fryday 2006).

EXSICCATAE SEEN. Leighton, *Lich. Brit. No.* 388 (E).

SPECIMENS EXAMINED. Grid square Ac-68 – POJEZIERZE WSCHODNIOPOMORSKIE LAKELAND, POJEZIERZE KASZUBSKIE LAKELAND: Trójmiejski Landscape Park, Gniewowo forest district, forest section no. 166b, ca 1.5 km NE of Gniewowo village, 29 Oct. 1995, *leg. W. Fatynowicz* (UGDA-L 5301), as saxicolous *M. denigrata*; Ac-78 – POJEZIERZE KASZUBSKIE LAKELAND: vicinity of Kamień village near S shore of Kamień Lake, 4 Aug. 2005, *leg. P. Czarnota* 4528 (GPN); Ad-96 – POBRZEŻE GDAŃSKIE COASTLAND, WYSOCZYŻNA ELBLĄSKA PLATEAU: valley of Grabianka River, Elbląg forest division, Górki forest district, forest section no. 215 [54°15'30"N/19°32'E] alt. 150 m, 5 Oct. 2002, *leg. R. Szymczyk* (OLS); Bd-42 – POJEZIERZE IŁAWSKIE LAKELAND, POJEZIERZE IŁAWSKIE LAKELAND: Kwidziń forest division, Lisewo forest district, forest section no. 197, 29 Sept. 2003, *leg. M. Kukwa* 2816 (UGDA), forest section no. 221, 1996, *leg. M. Kukwa* (Hb. Kukwa 111); Bd-77 – POJEZIERZE IŁAWSKIE LAKELAND: 'Żurawinowe Bagno' nature reserve, Smolniki village near Iława town, 29 July 1997, *leg. A. Zalewska* (OLS-L 1262); Be-52 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE

OLSZTYŃSKIE LAKELAND: Olsztyn town, by Kortowskie Lake, July 2001, *leg. D. Kubiak 1460* (OLTC); Be-59 – KRAINA WIELKICH JEZIOR MAZURSKICH LAKELAND: Puszcza Piska Forest, forest section no. 203, ca 4 km NE of Ukta village, 1987, *leg. S. Cieśliński* (GPN 2432); Bf-13 – POJEZIERZE ELCKIE LAKELAND: Puszcza Borecka Forest, 'Borki' nature reserve, Lipowo forest district, forest section no. 22 [54°07'N/22°06'E] 15 May 1996, *leg. A. Zalewska* (OLS-L 1285) and 15 May 1997, *leg. A. Zalewska* (OLS-L 1286); Puszcza Borecka Forest (sq. 79) [54°04'N/22°09'E] 8 July 1995, *leg. A. Zalewska* (OLS-L 1381), as *M. cf. melaeniza*; Da-04 – POJEZIERZE LUBUSKIE LAKELAND, RÓWNINA TORZYMSKA PLAIN: Puszcza Rzepińska Forest, ca 4 km S of Rzepin town, Nowy Młyn forest district [52°18'03"N/14°46'37"E] alt. 60 m, 8 Apr. 2006, *leg. P. Czarnota 4845* (GPN); Da-45 – WZNIESIENIA ZIELONOGÓRSKIE HEIGHTS, WZNIESIENIA GUBIŃSKIE HEIGHTS: by road between Krosno Odrzańskie and Gubin towns [51°59'24"N/14°58'29"E] 8 July 2005, *leg. P. Czarnota 4619* (GPN); Da-64 – OBNIŻENIE DOLNOŁUŻYCKIE DEPRESSION, KOTLINA ZASIECKA BASIN: Bory Zielonogórskie Forest, 2 km S of Brody village [51°46'06"N/14°48'14"E] 8 July 2005, *leg. P. Czarnota 4642* (GPN); Da-95 – NIZINA ŚLĄSKO-ŁUŻYCKA LOWLAND, BORY DOLNOŚLĄSKIE FOREST: a forest E of Lutynka village, along railway, 14 Sept. 2000, *leg. Śliwa 1361* (KRAM); Dd-68 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, WZNIESIENIA ŁÓDZKIE HEIGHTS: Wzniesienia Łódzkie Landscape Park, Brzeziny forest division, Poćwiardówka forest district, forest section no. 32j, 21 July 2004, *leg. M. Hachulka* (LOD 12066); De-15 – NIZINA ŚRODKOWOMAZOWIECKA LOWLAND, KOTLINA WARSZAWSKA BASIN: Puszcza Kampinoska Forest, Kampinoski National Park, 'Sieraków' nature reserve, Liszki forest district, forest section no. 72 [52°20'34"N/20°47'41"E] alt. ca 60 m, 27 Apr. 2004, *leg. P. Czarnota 3941* (GPN), forest section no. 92b [52°19'34"N/20°48'41"E] alt. ca 70 m, 26 Apr. 2004, *leg. P. Czarnota 4102* (GPN); De-41 – RÓWNINA ŁOWICKO-BŁOŃSKA PLAIN: Bolimowski Landscape Park, Skierniewice forest division, forest section no. 149, 21 July 1999, *leg. K. Czyżewska* (LOD 11968) and forest section no. 169f, 'Kopanicha' nature reserve, 10 July 1998, *leg. K. Czyżewska* (LOD 11601); De-51 – RÓWNINA ŁOWICKO-BŁOŃSKA PLAIN: Bolimowski Landscape Park, 'Ruda-Chlebacz' nature reserve, forest section no. 210, 22 July 1998, *leg. K. Czyżewska* (LOD 11859); Df-44 – NIZINA POŁUDNIOWOPODLASKA LOWLAND, RÓWNINA ŁUKOWSKA PLAIN: 'Jata' nature reserve [51°57'28"N/22°11'27"E] 21 June 2005, *leg. P. Czarnota 4594* (GPN); Df-45 – RÓWNINA ŁUKOWSKA PLAIN: near 'Jata' nature reserve,

in the vicinity of Żdźary village [51°57'11"N/22°11'53"E] 21 June 2005, *leg. P. Czarnota 4658* (GPN); Ea-77 – WESTERN SUDETES, GÓRY IZERSKIE MTS: Dolina Izery valley, ca 0.5 km W of Orle settlement, in spruce stand on peat-bog [50°49.16'N/15°22.77'E] alt. ca 800 m, 9 July 2003, *leg. P. Czarnota* (GPN 3551, 3685), 1 km W of Orle settlement near Izera River, alt. ca 800 m [50°49.11'N/15°22.63'E] 9 July 2003, *leg. P. Czarnota* (GPN 3549, 3530 together with *M. anterior*); Ea-78 – KARKONOSZE MTS: Szklarska Poręba town, 11 Nov. 1997, *leg. M. Ratajczak* (LOD 10781), as *M. denigrata*, 30 Nov. 1997, *leg. M. Ratajczak* (LOD 10800), as *M. denigrata*, 8 May 1999, *leg. Ratajczak* (LOD 10782), as *M. nigella*; Szklarska Poręba town, Mickiewicz street, 10 Apr. 1999, *leg. M. Ratajczak* (LOD 10900 together with *M. melaena*), as *M. nigella*; by Czeska Szosa road, 10 Apr. 1999, *leg. M. Ratajczak* (LOD 10654), as *M. nigella*; vicinity of Szklarska Poręba town by red hiking track, 1 May 1999, *leg. M. Ratajczak* (LOD 10899), as *M. nigella*; Karkonoski National Park: Wodospad Szklarki waterfall, 2000, *leg. M. Kossowska* (Hb. Kossowska); Wodospad Kamieńczyka waterfall, 2000, *leg. M. Kossowska* (Hb. Kossowska together with *M. peliocarpa*); Pogórze Karkonoskie foothills, ca 1.5 km NE of Michałowice village below Piechowicka Góra Mt. [50°50.40'N/15°34.45'E] alt. 550 m, 9 July 2003, *leg. P. Czarnota* (GPN 3519), ca 2 km NE of Michałowice village [50°50.45'N/15°35.19'E] alt. 550 m, 9 July 2003, *leg. P. Czarnota* (GPN 3520 together with *M. micrococca*), vicinity of Michałowice village, alt. 690 m, 2003, *leg. M. Staniaszek* (Hb. Staniaszek); Ea-79 – KARKONOSZE MTS: Chojnik Mt. near Jelenia Góra town, alt. 460 m, 2003, *leg. M. Staniaszek* (Hb. Staniaszek); Ea-89 – KARKONOSZE MTS: Karkonoski National Park: Wang forest district, 2000, *leg. M. Kossowska* (Hb. Kossowska together with *M. melaena*), Dolina Łomniczki valley, by hiking track [50°44.60'N/15°43.98'E] alt. 1200 m, 7 July 2003, *leg. P. Czarnota* (GPN 3450, 3452), N slope of Śnieżka Mt., Kocioł Łomniczki glacial corrie [50°44.38'N/15°44.03'E] alt. 1300 m, 8 July 2003, *leg. P. Czarnota* (GPN 3687); Turek Mt., alt. 870 m, 2003, *leg. M. Staniaszek* (Hb. Staniaszek); Eb-28 – WAŁ TRZEBNICKI RAMPART, WZGÓRZA TRZEBNICKIE HILLS: ca 3 km W of Oborniki Śląskie town [51°17'43"N/16°52'12"E] alt. ca 160 m, 30 Aug. 2004, *leg. P. Czarnota 4081* (GPN); ca 5 km SE of Oborniki Śląskie town [51°16'31"N/16°56'59"E] alt. ca 180 m, 30 Aug. 2004, *leg. P. Czarnota 4096* (GPN); Eb-51 – POGÓRZE ZACHODNIOSUDECKIE FOOTHILLS, POGÓRZE KACZAWSKIE FOOTHILLS: near Kamiennik stream, E of Świerzawa town [51°00'37"N/15°59'00"E] alt. ca 290 m, 22 Apr.



- 2005, *leg. P. Czarnota 4752* (GPN); Eb-70 – WESTERN SUDETES, RUDAWY JANOWICKIE MTS: Karpniki village, W slope of Płonica Mt., alt. ca 500 m, 26 Oct. 1999, *leg. G. Leśniański* (OPUN); Eb-71 – RUDAWY JANOWICKIE MTS: Wieściszowice village, worked-out quarry of pyrite named ‘Błękitne Jezioro’, alt. ca 650 m, 9 June 2000, *leg. G. Leśniański* (OPUN); S slope of Janowickie Garby range, the road between Rozdroże below Jańska Góra Mt. and Krowiarki in Dolina Janówki valley, ca 1.5 km of Rozdroże, alt. ca 540 m, 23 Sept. 1999, *leg. G. Leśniański* (OPUN); Eb-80 – KARKONOSZE MTS: Karkonoski National Park: Dolina Łomniczki valley, 2000, *leg. M. Kossowska* (Hb. Kossowska), Karpacz – Wilcza Poręba town, Dolina Łomniczki valley, by hiking track, alt. 700 m, 7 July 2003, *leg. P. Czarnota* (GPN 3538) and [50°45.81’N/15°45.32’E] alt. 710 m, 7 July 2003, *leg. P. Czarnota* (GPN 3285), Dolina Łomniczki valley, by hiking track [50°45.60’N/15°45.63’E] alt. ca 735 m, 7 July 2003, *leg. P. Czarnota* (GPN 3475) and [50°45.18’N/15°45.18’E] alt. 800 m, 7 July 2003, *leg. P. Czarnota* (GPN 3457 together with *M. prasina* s.str.), Sowia Dolina valley, alt. 1040 m, 2003, *leg. M. Staniaszek* (Hb. Staniaszek); Eb-94 – MIDDLE SUDETES, GÓRY KAMIENNE MTS: ca 1 km W of Grzmiąca village, by Rybnica stream [50°42’20”N/16°18’55”E] ca 480 m, 21 Apr. 2005, *leg. P. Czarnota 4471* (GPN); Eb-95 – GÓRY SOWIE MTS: S slope of Wielka Sowa Mt. above Sokolec village [50°39’50”N/16°29’16”E] alt. ca 690 m, 21 Apr. 2005, *leg. P. Czarnota 4699* (GPN), [50°39’55”N/16°29’30”E] alt. ca 700 m, 21 Apr. 2005, *leg. P. Czarnota 4691* (GPN) and below the top of Wielka Sowa Mt. in upper-mountain peat-bog [50°40’30”N/16°29’04”E] alt. ca 950 m, 21 Apr. 2005, *leg. P. Czarnota 4687* (GPN together with *M. prasina* s.str.); Ec-04 – OBNIŻENIE MILICKO-GŁOGOWSKIE DEPRESSION, KOTLINA MILICKA BASIN, S of Odolanów town [52°31’27”N/17°45’34”E] alt. 150 m, 4 July 2005, *leg. P. Czarnota 4526* (GPN); Ec-62 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA OLEŚNICKA PLAIN: Bory Namysłowskie Forest, ca 1 km N of Dobrzyń village, by road to Wojcice village [50°57’28”N/17°28’09”E] 23 Apr. 2005, *leg. P. Czarnota 4451* (GPN); Ec-88 – WYŻYNA WOŹNICKO-WIELUŃSKA UPLAND, PRÓG WOŹNICKI SCARP: 7 km S of Olesno town, by road between Dobrodzień and Olesno [50°48’31”N/18°24’30”E] alt. 265 m, 4 July 2005, *leg. P. Czarnota 4513, 4514* (GPN); Ee-65 – WYŻYNA KIELECKA UPLAND, GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, Dolina Wilkowska valley, Psary forest district, forest section no. 264, 23 Sept. 2000, *leg. A. Donica* (KTC); *ibid.*, forest section no. 266, 23 Sept. 2000, *leg. A. Donica* (KTC) and 13 July 2002, *leg. A. Łubek* (KTC); *ibid.*, forest section no. 267, 23 Sept. 2000, *leg. A. Donica* (KTC); Pasma Klonowskie range, S of Łączna village, Klonów forest district, forest section no. 220, 30 July 2001, *leg. A. Donica* (KTC); vicinity of Świętokrzyski National Park, Dolina Wilkowska valley, forest section no. 107 [50°56’N/20°48’E] 2 July 2001, *leg. A. Donica* (2 × KTC), ones as *M. melaena* and forest section no. 122, 2 July 2001, *leg. A. Donica* (KTC); Pasma Klonowskie range, near Łączna village, 30 July 2001, *leg. A. Donica* (KTC), forest sections no. 31/32, 5 July 2002, *leg. A. Łubek* (KTC); Ee-66 – GÓRY ŚWIĘTOKRZYSKIE MTS: Pasma Klonowskie range, Świętokrzyski National Park: Psary forest district, forest section no. 19 [50°56’N/20°54’E] 3 July 2002, *leg. A. Łubek* (KTC) and forest section no. 18, Góra Psarska Mt., 3 July 2000, *leg. D. Donica* (KTC), as *M. melaena*; Dolina Wilkowska valley, Dąbrowa forest district, forest section no. 40 [50°54’N/20°56’E] 16 July 2001, *leg. A. Donica* (KTC) and forest section no. 36, Chrusty Wood [50°55’N/20°58’E] 3 Aug. 2001, *leg. A. Donica* (KTC); Ee-76 – GÓRY ŚWIĘTOKRZYSKIE MTS: Łysogóry range, Świętokrzyski National Park: Jastrzębi Dół forest district, forest section no. 130 [50°53’N/20°58’E] 2 Aug. 2001, *leg. A. Donica* (KTC); Dąbrowa forest district, forest section no. 48, Chrusty Wood [50°54’N/20°58’E] 3 Aug. 2001, *leg. A. Donica* (KTC) and forest section no. 193, 5 Aug. 2000, *leg. A. Donica* (KTC); Dębno forest district, forest section no. 128, 19 July 2001, *leg. A. Donica* (KTC); Ee-77 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, Łysogóry range, Święty Krzyż forest district, forest section no. B-1 [50°51’N/21°02’E] 5 July 2002, *leg. A. Łubek* (KTC) and forest section no. 201b, S slope of Łysa Góra Mt. [50°51’36”N/21°02’43”E] alt. 580 m, 6 May 2004, *leg. P. Czarnota 3831, 3835* (GPN); Pasma Bielińskie range, forest section no. 12 [50°50’N/21°03’E] 5 July 2002, *leg. A. Łubek* (KTC) and forest section no. 26 [50°49’N/21°02’E] 2 July 2002, *leg. A. Łubek* (KTC); Łagów forest division, forest section no. 111 [50°50’N/21°03’E] 3 July 2001, *leg. A. Donica* (KTC); Ee-87 – GÓRY ŚWIĘTOKRZYSKIE MTS: Pasma Bielińskie range, Bieliny forest district, border of forest sections no. 131/132, 3 July 2001, *leg. A. Donica* (KTC together with *M. prasina* s.str.); Ef-85 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, near cross roads to Zaklików and Lipa villages, 8 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LOD 12327); ca 2 km S of Kolonia Łysaków village, 9 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LBL together with *M. viridileprosa*); Eg-91 – ROZTOCZE, MIDDLE

ROZTOCZE: Roztoczański National Park, Stogi forest district, forest section no. 178b [50°35'42"N/23°04'42"E] alt. ca 260 m, 28 Apr. 2004, *leg. P. Czarnota 3901* (GPN); Fb-06 – MIDDLE SUDETES, GÓRY SOWIE MTS: below the top of Gąsiorek Mt., ca 1.5 km NW of Srebrna Góra village [50°34'99"N/16°37'01"E] alt. 730 m, 22 Apr. 2004, *leg. P. Czarnota 3838* (GPN together with *M. micrococca*); ca 2 km N of Nowa Wieś Kłodzka village below Chochoł Wielki Mt. [50°34'54"N/16°37'22"E] 22 Apr. 2004, *leg. P. Czarnota 4150* (GPN); Fb-14 – GÓRY STOŁOWE MTS: Góry Stołowe National Park, ca 0.3 km NW of Batorówek settlement, by hiking track, alt. 675 m, 23 Apr. 2003, *leg. P. Czarnota* (GPN 3275, 3277, 3278); Fb-34 – GÓRY BYSTRZYCKIE MTS: 'Torfowisko pod Zieleńcem' nature reserve, peat-bog covered with *Pinus mugo* and *Pinus rhaetica* [50°20'48"N/16°24'38"E] alt. ca 700 m, 20 Apr. 2005, *leg. P. Czarnota 4484* (GPN) and in the vicinity of that reserve, by road to Duszniki Zdrój town [50°20'49"N/16°24'06"E] alt. 640 m, *leg. P. Czarnota 4743, 4744* (GPN); Fb-38 – EASTERN SUDETES, GÓRY ŻŁOTE MTS: near Łądek Zdrój town, towards Trolak Mt., 19 Oct. 1959, *leg. K. Glanc* (KRAM-L 26423 together with *M. prasina* s.str.); Fb-45 – MIDDLE SUDETES, GÓRY BYSTRZYCKIE MTS: by road between Poręba village and Spalone Pass [50°14'10"N/16°34'29"E] alt. ca 610 m, 20 Apr. 2005, *leg. P. Czarnota 4398, 4774* (GPN); Fb-47 – EASTERN SUDETES, ŚNIEŻNIK MASSIF: by hiking track between Puchaczówka Pass and Czarna Góra Mt., alt. 700 m, 19 Oct. 2002, *leg. K. Szczepańska* (Hb. Szczepańska) and alt. 860 m, 19 Oct. 2002, *leg. K. Szczepańska* (Hb. Szczepańska); Fb-48 – GÓRY ŻŁOTE MTS: Góry Bialskie Mts, 'Nowa Morawa' nature reserve, W slope of Solec Mt., alt. ca 900 m, Aug. 2003, *leg. K. Szczepańska* (Hb. Szczepańska); Góry Bialskie Mts, N slope of Jawornik Kamienny Mt., by hiking track between Bielice village and Puszcza Jaworowa Forest, alt. 800 m, 31 July 2003, *leg. K. Szczepańska* (Hb. Szczepańska); Fc-15 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA NIEMODLIŃSKA PLAIN: Bory Niemodlińskie Forest, W of Gwoździce village by road between Opole and Krapkowice towns [50°30'34"N/17°54'54"E] alt. ca 130 m, 23 Apr. 2005, *leg. P. Czarnota 4457* (GPN); Fc-41 – EASTERN SUDETES, GÓRY OPAWSKIE MTS: valley of Bystry stream below Kopa Biskupia Mt., near Pokrzywna village [50°16'39"N/17°26'56"E] alt. 410 m, 19 Apr. 2005, *leg. P. Czarnota 4425* (GPN) and [50°16'49"N/17°26'57"E] alt. 400 m, 19 Apr. 2005, *leg. P. Czarnota 4428* (GPN); Fc-48 – NIZINA ŚLĄSKA LOWLAND, KOTLINA RACIBORSKA BASIN: Lasy Raciborskie Forest, ca 1 km W of Goszyce village, by road between Gliwice and Kędzierzyn Koźle towns

[50°16'33"N/18°22'59"E] 18 Apr. 2005, *leg. P. Czarnota 4435* (GPN); Fd-48 – WYŻYNA KRAKOWSKO-CZEŚTOCHOWSKA UPLAND, WYŻYNA OLKUSKA UPLAND: Ojcowski National Park, a forest W of Pieskowa Skała castle, 20 Oct. 2004, *leg. J. Kiszka* (KRAP); Fd-55 – WYŻYNA ŚLĄSKA UPLAND, PAGÓRY JAWORZNICKIE HILLS: zinc-lead spoil in Balin – Sośnica village, N of Chrzanów town, 26 Oct. 2004, *leg. J. Kiszka* (KRAP); Fd-56 – WYŻYNA KRAKOWSKO-CZEŚTOCHOWSKA UPLAND, WYŻYNA OLKUSKA UPLAND: Galman hill, S of Płotki and Lgota villages near Trzebinia town, 8 Oct. 2004, *leg. J. Kiszka* (KRAP); Fd-58 – WYŻYNA OLKUSKA UPLAND: Dolina Będkowska valley, 9 km EEN of Krzeszowice town, alt. 400 m, 26 July 1986, *leg. J. Nowak* (KRAM-L 30351), as *Micareia* sp.; Wyżyna Ojcowska Upland, Ojcowski National Park, near Jaskinia Łokietka karst cave [50°12.04'N/16°49.12'E] alt. 340 m, 15 Apr. 2004, *leg. P. Czarnota 4135* (GPN), and Dolina Saspowska valley, 16 Aug. 2004, *leg. J. Kiszka* (KRAP); Fe-62 – KOTLINA SANDOMIERSKA BASIN, NIZINA NADWIŚLAŃSKA LOWLAND: Puszcza Niepołomska Forest, forest section no. 89, 3 Nov. 2000, *leg. J. Kiszka* (KRAP, GPN 2413); Fe-63 – NIZINA NADWIŚLAŃSKA LOWLAND: Puszcza Niepołomska Forest, forest section no. 36, 3 Nov. 2000, *leg. J. Kiszka* (KRAP, GPN 2414); Fe-72 – NIZINA NADWIŚLAŃSKA LOWLAND: Puszcza Niepołomska Forest, forest section no. 287, 22 Sept. 2000, *leg. J. Kiszka* (KRAP); Fe-82 – POGÓRZE ZACHODNIOBESKIDZKIE FOOTHILLS, POGÓRZE WIŚNICKIE FOOTHILLS: Cichawka village near the church, 8 May 1998, *leg. L. Śliwa 592* (KRAM); Fe-94 – POGÓRZE WIŚNICKIE FOOTHILLS: 'Bukowiec' nature reserve [49°49'50"N/20°35'00"E] alt. 430 – 460 m, 21 May 1999, *leg. L. Śliwa 1034 & B. Krzewicka* (KRA), as *M. denigrata*; Fe-95 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE ROŻNOWSKIE FOOTHILLS: valley of a stream below Mogiła hill, alt. 480 m, 22 June 1971, *leg. R. Kozik* (KRAP), as *Catillaria nigroclavata*; Fe-96 – POGÓRZE ROŻNOWSKIE FOOTHILLS: 'Diable Skały' nature reserve near Bukowiec vilage, alt. 500 m, *leg. R. Kozik* (GPN 4223); Ff-40 – KOTLINA SANDOMIERSKA BASIN, DOLINA DOLNEJ WISŁOKI VALLEY: Tuszyma forest division, Przacław forest district, forest section no. 110 near 'Bagno Przacławskie' nature reserve [50°11'29"N/21°25'18"E] alt. ca 150 m, 18 Apr. 2005, *leg. P. Czarnota 4554* (GPN); Ff-52 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: ca 2 km S of Przedbórz village by road to Sędziszów Małopolski town [50°09'02"N/21°45'31"E] 18 Apr. 2005, *leg. P. Czarnota 4539* (GPN); Ff-81 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE STRZYŻOWSKIE FOOTHILLS:

- Strzyżów forest division, Cieszyna forest district, W slope of Chełm Mt. [49°53'32"N/21°32'43"E] alt. 410 m, 17 Apr. 2005, *leg. P. Czarnota 4758* (GPN) and N slope of Chełm Mt. [49°53'31"N/21°33'39"E] alt. 425 m, 17 Apr. 2005, *leg. P. Czarnota 4762* (GPN); Ff-82 – POGÓRZE DYNOWSKIE FOOTHILLS, the pass below Krowia Góra Mt., by forest road between Kozłówek and Łęki Strzyżowskie villages [49°50'17"N/21°40'14"E] alt. 420 m, 17 Apr. 2005, *leg. P. Czarnota 4543* (GPN); Gd-07 – WESTERN BESKIDY MTS, BESKID ŻYWIECKI MTS: Pasma Jałowieckie range, Kiczora Mt., E slope, above Kalinka stream in Chrzaszczce-Topory settlement, ca 6 km SSW of Sucha Beskidzka, alt. 700 m, 15 July 1965, *leg. J. Nowak* (KRAM-L 15789 together with *M. misella*); Gd-13 – BESKID ŚLĄSKI MTS: E slope of Barania Góra Mt., valley of Bystra stream, Węgierska Górka forest division, Sikorzane forest district, forest section no. 199d, alt. ca 1000 m, 10 May 2002, *leg. P. Czarnota* (GPN 2793, 2794, 2802, 2805, 2806); Gd-16 – BABIA GÓRA RANGE: N slope of Babia Góra Mt. above Markowe Szczawiny shelter-house, Babiogórski National Park, forest section no. 24a [49°35'07"N/19°30'44"E] alt. ca 1200 m, 9 June 2004, *leg. P. Czarnota 4087* (GPN), forest section no. 22a [49°34'45"N/19°31'22"E] alt. ca 1320 m, 9 June 2004, *leg. P. Czarnota 4113* (GPN); Gd-17 – BABIA GÓRA RANGE: Polica range, N slope of Polica Mt., 'Klemensiewicz's' nature reserve, by hiking track, alt. ca 1250 m, 4 June 2004, *leg. P. Czarnota 3913, 3914* (GPN together with *M. prasina* s.str.); S slope of Polica Mt., by Zubrzyca stream, Nowy Targ forest division, Polica forest district, alt. ca 800 m, 4 June 2004, *leg. P. Czarnota 4093* (GPN); Gd-25 – BESKID ŻYWIECKI MTS: Pilsko range, valley of Cebula stream below Hala Mędralowa glade, 24 June 1966, *leg. J. Nowak* (GPN 2420); Ge-10 – BESKID WYSPOWY MTS: NE slope of Luboń Wielki Mt., by hiking track [49°39.49'N/20°00.04'E] alt. 750 m, 5 June 2003, *leg. P. Czarnota* (GPN 3252), [49°39.10'N/19°59.84'E] alt. 800 m, 5 June 2003, *leg. P. Czarnota* (GPN 3249); Ge-10 – GORCE MTS: Gorce National Park, E slope of Tobołów Mt. below a chair-lift, alt. 800 m, 23 Febr. 2002, *leg. P. Czarnota* (GPN 2729 together with *M. anterior*); E slope of Suhora Mt., valley of Olszowy stream, alt. 860 m, 23 Febr. 2002, *leg. P. Czarnota* (GPN 2725 together with *M. hedlundii*); Ge-11 – GORCE MTS: Gorce National Park: NE slope of Kudłoń Mt., Białe Skąły outcrops near Adamówka glade, alt. 1075 m, 15 Aug. 1967, *leg. J. Nowak* (KRAM-L 2698 together with *M. peliocarpa* and *M. lignaria*); valley of Gorcowy Potok stream below Jaworzynka Mt., alt. 890 m, 2 Dec. 1997, *leg. P. Czarnota* (GPN 1906/94, conf. by Coppins); valley of Turbacz stream, near Stara Huta clearing, alt. 760 m, 26 Oct. 1995, *leg. P. Czarnota* (GPN 393); valley of Konina stream, by forest road, alt. ca 720 m, 4 Oct. 2004, *leg. P. Czarnota 4019* (GPN); Ge-12 – BESKID WYSPOWY MTS: W slope of Modyń Mt. [49°37'23"N/20°22'37"E] alt. 890 m, 2 July 2005, *leg. P. Czarnota 4595* (GPN); Ge-20 – GORCE MTS: Gorce National Park, valley of Olszowy stream [49°33.64'N/20°05.66'E] alt. 800 m, 18 July 2003, *leg. P. Czarnota* (GPN 3305); Ge-21 – GORCE MTS: N slope of Jaworzyna Kamienicka Mt., Pod Jaworzyną forest area in valley of Kamienica stream, alt. 1060 m, 19 July 1999, *leg. P. Czarnota* (GPN 2199); below Kopieniec Mt. in valley of Turbacz stream, alt. 1000 m, 12 July 1993, *leg. P. Czarnota* (GPN 1007); Ge-22 – GORCE MTS: Lubań range, valley of Kudowski stream, by hiking track, alt. ca 650 m, 24 June 2004, *leg. P. Czarnota 4005 & A. Wojnarowicz* (GPN) and alt. ca 700 m, 24 June 2004, *leg. P. Czarnota 4007 & A. Wojnarowicz* (GPN); Ge-30 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKO-NOWOTARSKA BASIN: 'Bór na Czerwonem' nature reserve: [49°27'67" N/20°02'36"E] alt. ca 620 m, 4 June 2003, *leg. P. Czarnota 4180* (GPN), highmoore peat-bog with *Pinus mugo* [49°27'76"N/20°02'39"E] alt. ca 620 m, 4 June 2003, *leg. P. Czarnota 4190* (GPN), [49°27'73"N/20°02'36"E] alt. ca 620 m, 4 June 2003, *leg. P. Czarnota 4185* (GPN); Ge-34 – WESTERN BESKIDY MTS, BESKID SADECKI MTS: Radziejowa range, Piwniczna forest division, Roztoka Wielka forest district, forest section no. 182 above 'Baniska' nature reserve [49°26'51"N/20°36'44"E] alt. ca 1000 m, 4 Nov. 2004, *leg. P. Czarnota 4368* (GPN); Ge-50 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, RÓW PODTATRZAŃSKI DEPRESSION: near Małe Ciche village, Pańszczykowa Polana glade [49°17'40"N/20°03'29"E] alt. 920 m, 24 July 2004, *leg. L. Śliwa 3299* (KRAM); Ge-50 – TATRA MTS, WEST TATRA MTS: Tatra National Park, forest section no. 209f, Dolina Strążyska valley near the ground road by Strążyski Potok stream, alt. 940 m, 28 June 2002, *leg. P. Czarnota* (GPN 2821); Ge-50 – HIGH TATRA MTS: Tatra National Park, Dolina Roztoki valley near Wodogrzmoty Mickiewiczza waterfalls [49°13'N/20°04'E] alt. 1120 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3337); Ge-60 – HIGH TATRA MTS: Tatra National Park: Morskie Oko forest district, forest section no. 47c, NW slope of Zabia Czuba Mt. below Siedem Granatów ridge near the border of PL/SK, alt. 1500 m, 9 July 2002, *leg. P. Czarnota* (GPN 2893, 2895, 2903); Dolina Pięciu Stawów valley below Szpiglasowa Pass, Szpiglasowa Perć region by hiking track [49°12.11'N/20°02.04'E] alt. 1790 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3561 together with *Helocarpon crassipes*, GPN 3564, 3565 together with *M. lignaria*);

Dolina Roztoki valley below the shelter-home in Dolina Pięciu Stawów valley, by hiking track [49°12.50'N/20°03.08'E] alt. 1560 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3580 together with *Lichenomphalia hudsoniana*); Gg-71 – EASTERN BESKIDY MTS, WESTERN BIESZCZADY MTS: Bieszczadzki National Park, Sianki forest district, forest section no. 78i, 19 June 2002, *leg. P. Czarnota* (GPN 2848).

ADDITIONAL SPECIMENS EXAMINED. CZECH REPUBLIC, RYCHLEBSKÉ HORY: near the border of Poland, S of Bilá Voda village, valley of Bilá Voda stream, vicinity of Šafařova skála outcrop [50°24'35"N/16°53'38"E] alt. ca 500 m, on vertical walls of gneiss boulders within shady spruce mountain forest, 23 Apr. 2004, *leg. P. Czarnota 4167* (GPN); W of Bilá Voda village, vicinity of worked-out quarry of marble 'Kukačka' [50°26.30'N/16°53.24'E] alt. ca 360 m, on decaying wood of stump within aspen-spruce forest, 23 Apr. 2004, *leg. P. Czarnota 4159* (GPN). RUSSIA, KALININGRAD DISTRICT: Krasnyj Les (Romincka Forest), 1.5 km S of Marinowo Lake, alt. 160 m, on lignum of stump and other epixylic lichens in shaded humid place within hornbeam-oak-linden forest, 23 Apr. 2004, *leg. A. Zalewska & W. Faltynowicz* (OLS-L 1436). UKRAINE, ZAKARPATSKA OBLAST: vicinity of Kostrino village, on bark of dead beech within beech mountain forest, 26 May 1998, *leg. A. Zalewska* (OLS-L 1337).

***Micarea cinerea*** (Schaer.) Hedl. (Figs 13 & 14)

Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18**(3): 81, 93. 1892.

*Lecidea cinerea* Schaer., Lich. Helv. spic., sect. 3: 156. 1826. – *Bacidia cinerea* (Schaer.) Trevisan, Linnaea **28**: 293. 1856. – *Bilimbia cinerea* (Schaer.) Körb., Parerga Lich.: 164. 1860. TYPE: Switzerland (G – HOLOTYPE, *n.v.*; M – ?ISOTYPE, *n.v.*).

– *Lecidea sphaeroides* var. *albella* Schaer., Lich. Helv. spic. sect. 4–5: 165. 1833. TYPE: Switzerland (M – NEO-TYPE, *n.v.*).

– *Biatora delicatula* Körb., Denkschr. Feier ihres fünfzigjäh. Best. herausg. Schles. Ges. Vaterl. Kult., Breslau: 233. 1853. – *Bilimbia delicatula* (Körb.) Körb., Syst. Lich. Germ.: 212. 1855. TYPE: Switzerland (M – NEO-TYPE, *n.v.*; see note Coppins 1983: 122).

– *Bilimbia cinerea* f. *hypoleuca* Stizenb. ex Arnold, Flora **58**: 598. 1864. – *Micarea cinerea* f. *hypoleuca* (Stizenb. ex Arnold) Hedl., Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18**(3): 82, 93. 1892. TYPE: Germany (M – LECTOTYPE, *n.v.*).

– *Lecidea carneoalbans* Nyl., Flora **59**: 307. 1876. – *Bacidia carneoalbans* (Nyl.) A. L. Sm., Monogr. Brit. Lich. **2**: 155. 1911. TYPE: Ireland, West Galway, Connemara, Killary Bay, [on rock] in stream, 1875, *Larbaletier* (BM – ISOTYPE, *n.v.*; vide Coppins, pers. comm.).

Thallus warted or composed of usually shallow-convex to ±subglobose, often confluent areoles, sometimes almost continuous or partially endo-substratal (especially on lignum), whitish green to grey (when on moribund bryophytes in high mountains), C+ red. Photobiont micareoid; algal cells globose, 4–8 µm. Apothecia in epiphytic and lignicolous samples numerous, shallow-convex to hemispherical, often adnate, and confluent to small clusters, (0.1–)0.2–0.5 (–1.2) mm, very variable in colour (also in the same specimen), whitish, cream, bluish-white, greyish-straw, brownish-grey to lead, mostly piebald and usually with slightly paler (especially when immature), almost whitish margin, C+ orange-red. Hymenium 50–70 µm tall, hyaline; upper part slightly olive-grey to aeruginose, K ±intensifying; pigment confined to gel-matrix, C+ fleeting orange-red. Asci clavate, 45–65 × 12–18 µm. Ascospores fusiform to widely warm-shaped, straight or sometimes slightly curved, (3–)5–7-septate, (20–)26–40 × (3.5–)4–5(–5.5) µm. Paraphyses numerous, branched and anastomosing, hyaline throughout, 1.5–2 µm wide, above slightly increasing to 2.5 µm and sometimes coated by pigmented gel. Hypothecium 50–70 µm tall, hyaline. Excipulum well developed, hyaline to pale straw-coloured, composed of thick, 2–2.5 µm paraphysis-like hyphae. Pycnidia usually numerous, immersed within thallus areoles, often gaping; walls in upper part olivaceous to bluish-aeruginose, section C+ orange-red; macroconidia long, (45–)50–100 × 1–1.2 µm, straight or flexuose, filiform, multiseptate. Pycnidia bearing microconidia as those observed by Coppins (1983) have not been found yet in Polish materials.

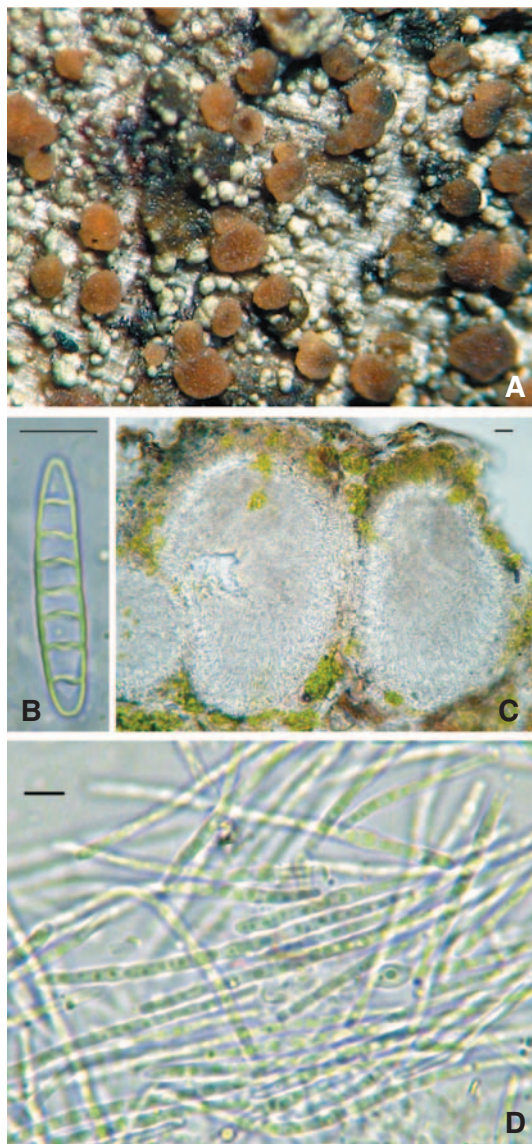
CHEMISTRY. TLC: gyrophoric acid.

NOTES. Based on mitochondrial rDNA sequences, Andersen and Ekman (2005) confirmed earlier Coppins's hypothesis that *M. cinerea* belongs to a small group of closely related species within the genus (Group C; Coppins 1983), and

furthermore that it forms together with *M. peliocarpa*, *M. alabastrites* (Nyl.) Coppins, *M. leprosula* and *M. coppinsii* Tønsberg the strongly supported, monophyletic group in the phylogenetic tree of *Micarea*. This '*M. peliocarpa*-group' has also been generated through phylogenetic analyses using some ITS sequences additional to the above-mentioned (Andersen 2004).

All members of this *M. peliocarpa*-group contain gyrophoric acid and have a similar morphology (for more details see Coppins 1983; Andersen & Ekman 2005), but *M. alabastrites* and *M. coppinsii* are strongly oceanic species and probably for this reason have never been observed in Poland. *Micarea leprosula* is found usually sterile in alpine habitats, sometimes even in the company of *M. cinerea*, but differs above all in its fragile, sorediose thallus. Moreover, in contrast to *M. cinerea*, no conidial stage of *M. leprosula* has yet been found. From a morphological and anatomical point of view, *M. cinerea* is almost identical to *M. peliocarpa* (especially in epiphytic or epixylic forms), but *M. cinerea* produces characteristic, straight, long macroconidia, unknown in other *Micarea* species, and its ascospores are longer and more-septate.

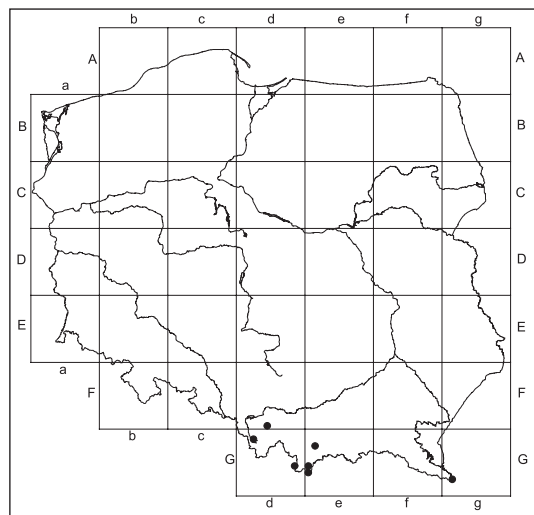
**HABITAT AND DISTRIBUTION IN POLAND.** *Micarea cinerea* is rarely reported in Poland; its occurrence confirmed only in the Carpathians, where it usually grows as an epiphyte on bark of coniferous (*Abies*, *Picea*) as well as deciduous (*Fagus*) trees in different forest communities of both mountain belts in association with *Lopadium disciforme* and *Thelotrema lepadinum*. In the Bieszczady Mts (Eastern Carpathians), it has been found together with *Lichenomphalia umbellifera* on a fallen, decorticated spruce trunk. A few anamorphic specimens of *M. cinerea* f. *tenuispora* also occur on terricolous bryophytes and plant debris in alpine meadows of the Tatra Mts at 1780–2140 m, the highest known localities in Poland. Here it is accompanied by several strongly alpine species such as *Helocarpon crassipes*, *Micarea leprosula*, *M. submilliaria*, *Porina mammosa*, *Protomicarea limosa*, *Protopannaria pezizoides*, *Thamnolia vermicularis* (and also *M. botryoides*



**Fig. 13.** *Micarea cinerea* (Schaer.) Hedl.: A – morphology, B – ascospore (leg. Z. Tobolewski, 15 Aug. 1960, POZ); C & D – *M. cinerea* f. *tenuispora* (D. Hawksw. & Poelt) Fryday: C – vertical section of pycnidia bearing macroconidia, D – macroconidia (GPN 3563). Scale bars = 10  $\mu$ m.

and *M. lignaria*), a similar lichen community to that noted in Scottish mountains (Fryday 2001).

*Micarea cinerea* was formerly reported also from the Polish lowlands (Fałtynowicz 1994; Grochowski 1998), but these specimens belong to *Bacidia beckhausii* and *M. denigrata* respectively.



**Fig. 14.** Distribution map of *Micarea cinerea* (Schaer.) Hedl. in Poland.

It is also incorrectly reported from the Carpathian foothills (Krzewicka & Śliwa 2000; Śliwa *et al.* 2001), those collections growing directly on sandstone outcrops referring to *M. peliocarpa*. First reports from the Pogórze Rożnowskie foothills (Kozik 1977) are also doubtful, but those cited specimens found on a bark of *Salix* sp. have not been retrieved in KRAP. Silesian records in Stein (1879: 183) ‘am Grunde und auf blossliegenden Wurzeln alter Fichten: Melzergarbe, Gehänge, Zackenwald’ and in Eitner (1901: 14) ‘Glatz, Höllengrund bei Altheide an beschatteten Sandsteinblöcken über Moosen’ cannot be substantiated as herbarium material is lacking. There are no modern Polish collections of *M. cinerea*, but it may still occur there since it had been reported from the Czech eastern Sudetes according to Coppins (1983: 123).

**WORLD DISTRIBUTION.** *Micarea cinerea* appears to be oceanic, being particularly frequent in humid or rainfall, ancient woodlands of the British Isles and Western Europe, but also found in several Baltic countries. In Central Europe it is mostly restricted to the Alps and Carpathians. There are also some records outside Europe.

**EUROPE:** Austria (Hafellner & Türk 2001); Czech Republic (Vězda & Liška 1999); Estonia

(Randlane & Saag 1999); France (van den Boom & Brand 2004); Germany (Scholz 2000); Great Britain and Ireland (Coppins 1983, 2002; Seward 1994); Hungary (Verseghy 1994); Iceland (Kristinsson & Heidmarsson 2006); Italy (Nimis & Martellos 2003); Lithuania (Motiejūnaitė 1999); Madeira (Hafellner 1995); the Netherlands, rare (Aptroot *et al.* 2004); Norway (Santesson 1993); Romania (Ciurchea 1998); Slovakia (Pišút *et al.* 1996); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993); Switzerland (Scheidegger *et al.* 2002); Ukraine – Volyn upland (Kondratyuk *et al.* 1998). **ASIA:** China – Yunnan (Aptroot *et al.* 2003); Taiwan (Aptroot & Sparrius 2003). **NORTH AMERICA:** USA – Washington; Canada – British Columbia (Coppins, pers. comm.). **CENTRAL AMERICA:** Costa Rica (Coppins, pers. comm.). **AUSTRALOCEANIA:** Tasmania (Jarman & Kantvilas 2001).

**SPECIMENS EXAMINED.** Grid square Fd-94 – WESTERN BESKIDY MTS, BESKID MAŁY MTS: valley of an anonymous stream on S slope of Wielki Cisownik Mt., alt. ca 650 m, 21 Mar., 1967, *leg. J. Nowak* (KRAM-L 5070); Gd-12 – BESKID ŚLĄSKI MTS: valley of Roztoczny stream, W? slope of Barania Góra Mt., alt. 960 m, 27 July 1965, *leg. J. Kiszka* (KRAP); W slope of Barania Góra Mt., valley of Biała Wisielka stream, alt. 950 m, 2 Oct. 1975, *leg. U. Bielczyk* (KRAM-L 44003); Gd-58 – TATRA MTS, WEST TATRA MTS: Dolina Starorobociańska valley, below Hala Starorobociańska Wyżnia glade, alt., ca 1300 m, 15 Aug. 1960, *leg. Z. Tobolewski* (POZ), as *Bacidia* sp.; Ge-21 – WESTERN BESKIDY MTS, GORCE MTS: Gorce National Park, SE slope of Turbacz Mt., valley of Łopuszna stream, alt. 1040 m, 5 May 1995, *leg. P. Czarnota* (GPN 1058); Ge-50 – TATRA MTS, WEST TATRA MTS: below the top of Krzesanica Mt., alt. 2130 m, 22 Aug. 1983, *leg. J. Kiszka* (KRAP) [only pycnidia]; Ge-50 – HIGH TATRA MTS: Wołoszyn Wielki Mt. near Krzyżne Pass [49°13.73'N/20°02.91'E] alt. 2140 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3590 together with *Helocarpon crassipes*) [only pycnidia]; Dolina Roztoki valley near Wodogrzmoty Mickiewicza waterfall [49°13'N/20°04'E] alt. 1120 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3336); Ge-60 – HIGH TATRA MTS: Dolina Pięciu Stawów valley below Szpiglasowa Pass, Szpiglasowa Perć region by hiking track [49°12.11'N/20°02.04'E] alt. 1790 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3563 together with *M. submilliaria*, GPN 3343 together with *Helocarpon*

*crassipes*; E ex GPN) [both only pycnidia]; N slope of Szpiglasowy Wierch Mt., below Szpiglasowa Pass [49°11'52"N/20°02'13"E] alt. 2030 m, 8 Oct. 2005, leg. P. Czarnota 4581 (GPN); Gg-71 – EASTERN BESKIDY MTS, WESTERN BIESZCZADY MTS: Bieszczadzki National Park, Sianki forest district, forest section no. 78i, 19 June 2002, leg. P. Czarnota (GPN 2843).

ADDITIONAL SPECIMENS EXAMINED. SCOTLAND, ARGYLL: Cormonachan Wood, ca 0.4 km W of bank of Loch Goil [56°07.73'N/4°54.65'W] alt. 60 m, on lignum of *Quercus* stump within ancient deciduous wood, 12 Sept. 2003, leg. P. Czarnota 3417 (GPN). UKRAINE, CZYWCZYN MTS: Albin Mt., alt. 1200 m, on bark of *Picea abies* in upper mountain spruce forest, 15 May 1935, leg. T. Sulma (UGDA).

*Micarea deminuta* Coppins (Figs 10 & 15)

Biblioth. Lichenol. **58**: 58. 1995. TYPE: Great Britain, Scotland, Stirlingshire (VC 86), Inversnaid, Pollochro Woods, on decaying log, 30 Apr. 1987, A. Orange 4928 (E – ISOTYPE!).

Thallus inconspicuous, thin and partially endo-substratal, visible as whitish-grey to greenish-white, continuous overcolouring of the substratum, usually covered by olivaceous, scarios and gelatinous colonies of non-lichenized algae. Photobiont micareoid, 4–8 µm diam.; algal cells concentrated into small groups, but do not form goniocysts. Apothecia immarginate, convex to hemispherical or sometimes ±globose (but slightly immersed into substratum), matt, black to dark brownish-black, mostly simple, 0.1–0.2(–0.3) mm. Hymenium 40–50 µm tall, hyaline to partially olivaceous in upper part with dull brown to brown-black vertical streaks, K– or usually K+ dull olive-grey, HNO<sub>3</sub>+ red; pigment in epihymenium confined to gel matrix. Asci cylindrical to cylindrical-clavate, 30–40 × (8–)11–15 µm diam. Ascospores ovoid to widely ellipsoid, (7.2–)8.2–11.3(–11.8) × (–4.1)4.4–5.5(–6.1) µm. Paraphyses of two types: (1) hyaline, scanty, scarcely branched, 0.8–1 µm wide; (2) thicker, (1–)1.2–2 µm wide with usually increasing apices up to 3 µm, simple or sometimes branched, especially in upper part, concentrated into small fascicles, coated throughout by dull brown pigment. Hypothecium 70–90 µm tall, brown-black, K– or in upper part

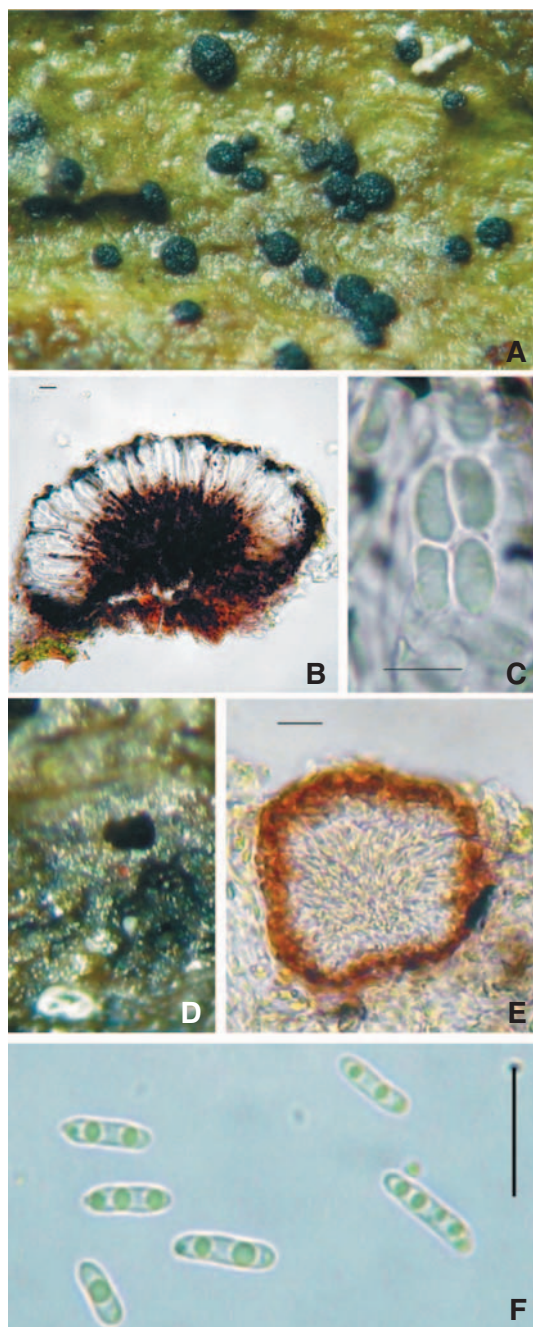


Fig. 15. *Micarea deminuta* Coppins: A – morphology (GPN 2923); B – vertical section of apothecia, C – ascospores (*Węgrzyn 2432*, KRA); D – immersed pycnidium bearing mesoconidia? (GPN 3492); E – cross section of pycnidium bearing microconidia (*Węgrzyn 2432*, KRA); F – mesoconidia (GPN 3492). Scale bars = 10 µm.

(subhymenium) olive and then  $K\pm$  dulling, composed of stout, up to 3  $\mu\text{m}$  wide, multiseptate hyphae with brown pigmented walls,  $\text{HNO}_3+$  red. Excipulum not developed. Pycnidia rare, inconspicuous, 50–100  $\mu\text{m}$ , pointed, immersed in the substratum, black-brown with usually gaping ostiole sometimes bearing white mass of conidia; pycnidial walls brown to olive-brown,  $K\pm$  dulling; mesoconidia? bacilliform, (4.9–)5.5–8(–8.1)  $\times$  1.5–1.8  $\mu\text{m}$ ; microconidia bacilliform, 4.5–5.7(–6.0)  $\times$  1.1–1.4(–1.5)  $\mu\text{m}$ .

CHEMISTRY. TLC: material not sufficient for analyses; thallus  $K-$ ,  $C-$ ,  $P-$ .

NOTES. *Micarea diminuta* morphologically resembles a few other epixylic species with indistinct external thallus and black apothecia, including *M. misella*, *M. nigella*, and sometimes even inconspicuous forms of *M. denigrata* and *M. nowakii*. Microscopic examination shows, however, that among the last four named species, only *M. nigella* has a dark hypothecium, which in contrast to *M. diminuta* is dull purple-black pigmented and reacting  $K+$  dark green and  $\text{HNO}_3+$  purple-red. Additionally, *M. diminuta* does not possess distinct,  $\pm$ stalked pycnidia which are always frequent in *M. misella* and *M. nigella*, as well as any emergent to sessile pycnidia like those observed in *M. denigrata* and *M. nowakii*.

Conidia found in two Polish specimens from the Tatra Mts differ in their dimensions as well as those described by Coppins (1995) as microconidia. The larger sized examples found in GPN 3492 (Fig. 15F) are classified here as mesoconidia, in contrast to the shorter and narrower ones found in *Węgrzyn 2432* (KRA), probably microconidia, but it is likely that all will prove to be a similar type of conidia, the size being much more variable than we supposed.

Some differences in apothecial pigmentation and size of ascospores between Polish and other European specimens examined by Coppins (1995) are discussed elsewhere (see Czarnota 2004).

HABITAT AND DISTRIBUTION IN POLAND. To date, only three collections of *M. diminuta* have been found in Poland, two of which have been

previously reported (Czarnota 2004). It occurs in the alpine and sub-alpine belts of the highest Polish mountain ranges. In the Sudetes (Karkonosze Mts), it grows on moribund, terricolous bryophytes among acid rocky stones (hornfels) in association with *M. turfosa*. In the High Tatra Mts, it was discovered near a timber line within an upper mountain spruce forest *Plagiothecio-Piceetum* (Szaf., Pawł. et Kulcz. 1932) Br.-Bl., Vlieg. et Siss. 1939 emend. J. Mat. 1978, where it occurred on soft wood of a decaying spruce log and on decaying bark of a dwarf *Pinus mugo* in an avalanche gully within a forested zone; in both these localities associated lichens included *Cladonia digitata*, *Lichenomphalia hudsoniana* and *Trapeliopsis glaucolepidea*.

WORLD DISTRIBUTION. There are only single reports and unpublished collections of *M. diminuta* in several, but widespread, localities in both Hemispheres. Despite its inconspicuous morphology and therefore possibly overlooked by lichenologists, the species appears to be rare elsewhere. Its frequent presence in the British Isles would suggest that it is oceanic, and in Central Europe is probably restricted to mountains.

EUROPE: Belgium, one site on moribund bryophytes (Coppins 1995); Czech Republic (Palice 1999); throughout Great Britain (Coppins 1995, 2002); the Netherlands (Aptroot et al. 2004). ASIA: Japan [Czarnota 2004; *G. Thor 11873 a!* (E)]. NORTH AMERICA: USA – California (Coppins, pers. comm.). AUSTRALOCEANIA: Tasmania (Czarnota 2004).

SPECIMENS EXAMINED. Grid square Eb-80 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park, N slope of Śnieżka Mt., a road below the top, alt. ca 1500 m, 8 July 2003, leg. P. Czarnota (GPN 3492); Ge-50 – TATRA MTS, HIGH TATRA MTS: Dolina Róztoki valley, by Róztoka stream [49°13'11"N/20°03'35"E] alt. 1350 m, 30 July 2005, leg. M. Węgrzyn 2432 (KRA); Ge-60 – HIGH TATRA MTS: NW slope of Żabia Czuba Mt. below Siedem Granatów ridge near the border of PL/SK, alt. ca 1550 m, 9 July 2002, leg. P. Czarnota (GPN 2923).

ADDITIONAL SPECIMENS EXAMINED. GREAT BRITAIN, SCOTLAND: (VC 87), Braco Pinewood, on *Pinus lignum*, decorticate log by stream, alt. 180 m,



2 Sept. 1982, leg. B. J. Coppins 9048 (E); (see also Czarnota 2004).

***Micarea denigrata* (Fr.) Hedl.**

(Figs 4D, 16 & 17)

Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18**(3): 78, 89. 1892.

*Biatora denigrata* Fr., Bih. Kongl. Svenska Vetensk.-Akad. Handl.: 265. 1822. – *Catillaria denigrata* (Fr.) Boistel, Nouv. Fl. Lich. **2**: 199. 1903. TYPE: Sweden (UPS – LECTOTYPE, *n.v.*).

– *Lecidea anomala* f. *pyrenothizans* Nyl., Lich. Scand.: 203. 1861. – *Micarea denigrata* f. *pyrenothizans* (Nyl.) Hedl., Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18**(3): 78, 89. 1892. TYPE: Finland, Nylandia, Ad Helsingfors (Helsinki), ‘*Lecidea denigrata* f. *pyrenothizans* Nyl.’, on lignum, 1860, W. Nylander (H-NYL 21665 – LECTOTYPE!).

– *Lecidea parissima* Nyl. in Cromb., J. Bot. **9**: 178. 1871. and J. Linn. Soc., Bot. **11**: 484. 1871. TYPE: England (H-NYL 21659 – HOLOTYPE, *n.v.*; ISOTYPES: BM, BM ex K, *n.v.*).

– *Lecidea spodiza* Nyl., Flora **57**: 9. 1874. TYPE: Scotland (H-NYL 21734 – LECTOTYPE, *n.v.*; BM – ISOLECTOTYPES, *n.v.*).

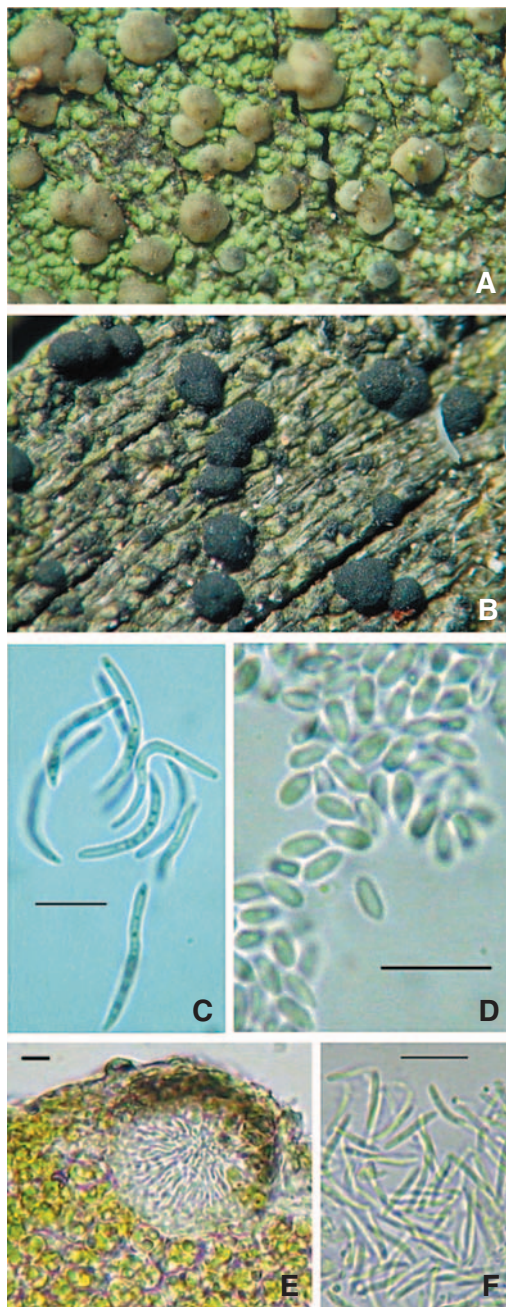
– *Lecidea hemipoliella* Nyl., Flora **58**: 11. 1875. – *Micarea denigrata* f. *hemipoliella* (Nyl.) Hedl., Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18**(3): 78, 89. 1892. – *Micarea hemipoliella* (Nyl.) Vězda in Vězda & V. Wirth, Folia Geobot. Phytotax. **11**: 100. 1976. TYPE: Finland, Tavastia australis, Evo, ad corticem alni, 1873, J. P. Norrlin 44 (H – LECTOTYPE!; H-NYL 21691 – ISOLECTOTYPE!).

– *Lecidea discretula* Nyl., Flora **58**: 444. 1875. TYPE: Romania, ‘Circa Thermas Herculis in Banatu (Hung.), supra Daedaleam in trunco quercino’, 1874, H. Lojka (H-NYL 21693 – HOLOTYPE!).

– *Lecidea aniptiza* Stirt., Rep. Trans. Glasgow Soc. Field Naturalists **4**: 85. 1876. TYPE: Scotland (GLAM – LECTOTYPE, *n.v.*; BM – ISOLECTOTYPE, *n.v.*).

– *Lecidea denigrata* var. *submisella* Nyl. in Vain., Meddeland. Soc. Fauna Fl. Fenn. **3**: 112. 1878. – *Catillaria synothea* f. *submisella* (Nyl.) Blomb. & Forss., Enum. Pl. Scand.: 92. 1880. TYPE: Finland (H-NYL 21661 – LECTOTYPE, *n.v.*).

– *Lecidea spodiza* f. *ecrustacea* Lamy, Bull. Soc. Bot. France **25**: 440. 1878. TYPE: France (H-NYL 21731 – LECTOTYPE, *n.v.*).



**Fig. 16.** *Micarea denigrata* (Fr.) Hedl.: A – collection from bark of coniferous trees with pale apothecia (Czarnota 4669, GPN); B – collection with black apothecia usually found on hard wood in well-lit places (Czarnota 4593, GPN); C – macroconidia (GPN 3553); D – mesoconidia (GPN 3529); E – pycnidium bearing microconidia (GPN 3553); F – microconidia (leg. I. Izydorek, 1 May 1992, Hb. Izydorek). Scale bars = 10  $\mu$ m.

– *Lecidea praeviridans* Nyl., Suppl. Lich. env. Paris: 5. 1879. – *Biatorina praeviridans* (Nyl.) Boistel, Nouv. Fl. Lich. 2: 194. 1903. – *Catillaria praeviridans* (Nyl.) Zahlbr., Cat. Lich. Univ. 4: 64. 1926. TYPE: France (H-NYL 19221 – LECTOTYPE, *n.v.*; BM – ISOLECTOTYPE, *n.v.*).

– *Lecidea denigrata* f. *sublivescens* Nyl., Flora 64: 539. 1881. TYPE: Romania (H-NYL 11663 – HOLOTYPE, *n.v.*).

– *Lecidea semipallida* Nyl. apud Knight, Trans. & Proc. New Zealand Inst. 12: 376, Tab. XIII, Fig. 39. 1880; Nyl., Lich. Nov. Zeland: 84. 1888. – *Patellaria semipallida* (Nyl.) Müll. Arg., Bull. Herb. Boissier 2: 62, appendix I. 1894. – *Biatorina semipallida* (Nyl.) Hellb., Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, 21(13): 108. 1896. – *Catillaria semipallida* (Nyl.) Zahlbr., Cat. Lich. Univ. 4: 70. 1927. TYPE: New Zealand, on lignum, 1867, Knight (H-NYL 19102 – LECTOTYPE, designated here). New synonym. NOTE. The lectotype of *Lecidea semipallida* is very similar to the lectotype of *L. hemipoliella* from Finland because of its piebald, pale-brown to pale-grey apothecia, intensive C+ red apothecial reaction and the lack of external thallus.

– *Lecidea denigrata* f. *pseudoglomerella* Harm, Bull. Séances Soc. Sci. Nancy II, 33: 58. 1899. – *Catillaria denigrata* var. *pseudoglomerella* (Harm.) Boistel, Nouv. Fl. Lich. 2: 199. 1903. TYPE: France (ANGUC – LECTOTYPE, *n.v.*; DUKE – ISOLECTOTYPE, *n.v.*).

–? *Lecidea kondaënsis* Vain., Ann. Acad. Sci. Fenn., Ser. A 27: 99. 1928. TYPE: Russia, Siberia (TUR-V 22930 – HOLOTYPE, *n.v.*; Printzen 1995: 188).

– *Lecidea cinereopallens* Vain., Acta Soc. Fauna Fl. Fenn. 57(2): 397. 1934. TYPE: Finland (H-NYL 19384 – HOLOTYPE, *n.v.*; Printzen 1995: 166).

– *Lecidea synochea* auct. non Ach. 1808. NOTE: see comments in Coppins (1983: 128).

Thallus small warted or often developed as convex to subglobose, effuse or concentrated, or adnate areolae, greenish-grey, whitish-green, but in insolated localities thallus usually endoxylic or darkish in morphology and developed under or only in the nearest vicinity of apothecia and in such cases also pycnidia immersed inside more or less developed greyish areolae. Areolae usually C+ reddish, especially when paler coloured. Photobiont micareoid, cells globose, 5–7(–8) µm diam. Apothecia very variable in colour, rarely white (in shaded localities), pallid, whitish-grey, more often

pale brown, greyish-brown, grey, greyish-black, black-brown or black, broadly convex, hemispherical, subglobose and sometimes tuberculate, C+ intensive red (especially paler apothecia), 0.1–0.5 mm diam. or up to 0.8 mm when tuberculate; young apothecia sometimes with an indistinct, slightly paler margin. Hymenium in upper part dilute olive-grey, brownish, olive-brown, dull grey without sharply delimited epithecium, lower part dilute; pigment confined to the gel-matrix, K+ violet, C+ red violet or reddish due to gyrophoric acid. Spores narrowly ellipsoid, oblong-ellipsoid or fusiform with rounded ends, often slightly curved, (0–)1-septate (very rarely also 2–3-septate, but in those cases always 1-septate are dominating), (6–)8–14(–18) × 2–3.5(–4) µm. Paraphyses numerous, branched and anastomosing especially in upper part, hyaline throughout, 1.2–1.7 µm wide, apices only slightly broader, easily separated in K. Hypothecium hyaline. Excipulum indistinct but especially in young apothecia more developed; hyphae resembling paraphyses. Pycnidia of three types, usually present and numerous, especially visible in endoxylic, darkish forms: (1) immersed within areolae, often with gaping olivaceous or dark olive ostioles, bearing curved, 1–3-septate macroconidia, 10–25 × ca 1.2 µm; (2) usually emergent from convex areolae, or olive-black, broad, almost shortly ±stalked with extruding white mass of mesoconidia; mesoconidia shortly-cylindrical or obovate, often sharply ended from one side, 3–4.2(–5) × 1.4–1.8(–2) µm; (3) immersed and usually visible in the cross section of areolae or emergent and sessile in endoxylic forms as blackish points bearing thin, fusiform or bacilliform microconidia 6.5–8 × 0.7–0.8 µm; walls of various types of pycnidia olivaceous or dull olive-grey, K+ violet, C+ red violet.

CHEMISTRY. TLC: gyrophoric acid.

NOTES. *Micarea denigrata* is morphologically highly variable, the structure of thallus and the pigmentation of apothecia depending mainly on ecological conditions and on intraspecific competition between thalli and other lichens or non-lichenized fungi and algae. The influence of strong insolation in exposed localities contributes to the

reduction of its thallus and to appearance of many wart-like pycnidia with white mass of mesoconidia. In these circumstances, apothecia are usually black or brown-black (and sometimes very rare or even absent), when the thallus and apothecia are usually infected by brown coloured, thicker and multiseptate hyphae of some saprophytic fungi, which stimulate production of the dark pigment within its epihymenium. A thick and pallid green thallus as well as paler apothecia usually appear on tree bark and on wood of less exposed fallen logs or stumps within forest communities. The pallid forms of *M. denigrata* are frequently observed within large complexes of pine monocultures (e.g. Puszcza Drawska Forest, Bory Dolnośląskie Forest, Bory Zielonogórskie Forest), where they abundantly cover bases of pine trunks. In such an environment, albinotic specimens completely devoid of the olive brown pigment within the epihymenium and having no reaction K<sup>+</sup> violet, are also collected.

Despite the wide variation in morphological forms, *M. denigrata* seems to be a rather easy species to identify. All less pigmented apothecia always reacting C<sup>+</sup> red and even when the apothecia are dark, this reaction can be observed on cross sections. The same intensive C<sup>+</sup> red reaction is visible on more developed thalli or at least around ostioles of the usually present pycnidia when the thallus is inconspicuous. Other characteristic features of *M. denigrata* include: upper part of hymenium and pycnidial walls reacting K<sup>+</sup> violet (apart from albinotic form); numerous branched paraphyses easily separating in K; mostly 1-septate, slightly curved, fusiform ascospores; strongly curved, transversely septate macroconidia and shortly cylindrical mesoconidia (up to 5 µm long), usually beaked from one side. All the above-mentioned characteristics should be determined in order to separate dark forms of *M. denigrata* from *M. misella* and *M. nowakii*, which share several morphological and anatomical similarities (see Table 5). Many examined specimens coming from different Polish herbaria previously recognized as *M. denigrata* actually belong to *M. misella* and vice-versa. *Micarea nowakii* is a newly described species, the delimitation of

which was not possible earlier, but most of the specimens referring to the species were treated previously as *M. denigrata*.

On many occasions less pigmented, epiphytic specimens of *M. denigrata* have been mistakenly identified as *M. prasina* (*Catillaria p.*) or sometimes *M. prasina* f. *byssacea* (*Catillaria p.* f. *byssacea*), which may suggest a great similarity between the two species. In most cases, the simple thallus or apothecia C<sup>+</sup> red reaction was sufficient reason not to consider them as *M. prasina*. However, the usually present granular thallus of *M. prasina* is sometimes inconspicuous (especially when infected by non-lichenized algae) and its darker pigmented epihymenium reacts C<sup>+</sup> red-violet. Unfortunately in these instances, it is necessary to examine the structure of the hamathecium. *Micarea denigrata* has numerous, thicker paraphyses, easily separating in K, while the paraphyses of *M. prasina* are rarer, thinner and usually stronger confined to the gel-matrix in K, and moreover its ascospores are broader, shorter and never curved.

Similar paraphyses to *M. denigrata* are found in *M. micrococca*, but even when it occurs in darker, leaden form, the structure of its small sorediate thallus is completely different from that of *M. denigrata*. Moreover, *M. micrococca* contains methoxymicareic acid (C<sup>-</sup>), which has never been determined in *M. denigrata*.

Some similar morphological as well as anatomical features to *M. denigrata* are found in *M. globulosella*, *M. nitschkeana* and *M. elachista*. *Micarea globulosella* and *M. nitschkeana* also produce gyrophoric acid, and in many respects can be almost identical to small forms of *M. denigrata*, but the three species differ mainly in the shape and septation of their ascospores. *Micarea denigrata* has (0–)1-septate and straight or only slightly curved spores, *M. nitschkeana* has more curved and 3-septate spores, and *M. globulosella* has spores, some worm-shaped, usually more than 1-septate. Coppins (1983) states that *M. denigrata* does not occur on twigs and branches of trees, this habitat very often being occupied by *M. nitschkeana*. Polish data can confirm these ecological differences between the two species in general, but *M. denigrata*

has also been collected occasionally from branches of spruces in the mountains. There are also several records of *M. nitschkeana* as a common member of the epiphytic lichen flora on young pine trees and sometimes as lignicolous on fallen logs (e.g. Czarnota 4465), standing, decorticated trunks (e.g. Czarnota 3011) or wooden poles and handrails (e.g. Czarnota 3454, 4481).

The structure of the hamathecium and ascospores of *M. elachista* are very similar to those observed in *M. denigrata*, but it is characterized by its brown epiphytenium which dissolves in K without any violet reaction and the lack of any secondary substances (C– reaction in the thallus and apothecia).

For more detailed differences between *M. denigrata* and other taxa, see Coppins (1983).

**HABITAT AND DISTRIBUTION IN POLAND.** In the 19th century *Micarea denigrata* was found in Silesia by Körber (1855: 199, as *Biatora denigrata* Fr.) and Stein (1879: 192, as *Biatorina synothesa* Ach.) who did not give detailed localities (except that by Körber from Złoty Stok in Karkonosze Mts ‘Seifenlehne’) but noted that it was not rare throughout the region. It was also reported without localities by Ohlert (1870: 17, as *Lecidea denigrata* Fr.) from ‘Preussen’ (within modern Poland) and also from ‘Angerburg’ (Węgorzewo) (Ohlert 1870: 17, as *Lecidea denigrata* Fr. f. *pyrenothizans* Nyl.), later repeated by Lettau (1912: 40, as *Catillaria synothesa* (Ach.) Th. Fr. f. *pyrenothizans* Nyl.). The species was probably common at that time, but most lichenologists considered it unworthy of species status. Unfortunately, none of these records are supported by material in WRSL, and others from elsewhere mostly refer to different taxa, e.g. *Catillaria nigroclavata* (Nyl.) Schuler or *Arthonia exilis* (Flörke) Anzi. Only one collection, by Stein (see below), previously identified as *Biatora assercolorum* (Ach.) Th. Fr., has been discovered there.

During the last 50 years, a very large number of reports of *M. denigrata* in Polish lichenological literature has been made, but many of them are unconfirmed in terms of the examination of specimens housed in Polish herbaria, or perhaps some

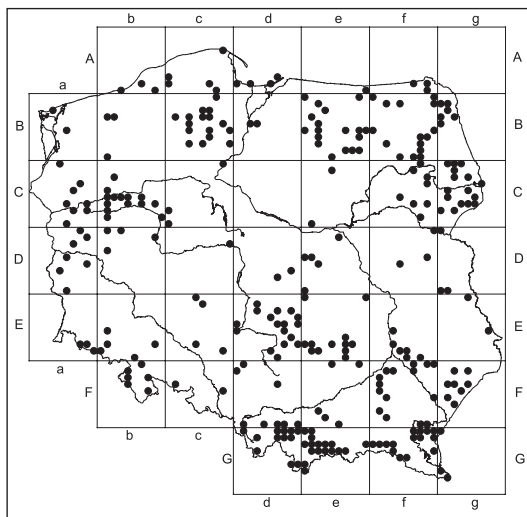


Fig. 17. Distribution map of *Micarea denigrata* (Fr.) Hedl. in Poland.

of them are not included within the main collections, so their detection and examination were not possible. On the other hand, it was often unusual for collectors to store common species and their reports are often based only on field observations. For these reasons, ca 170 specimens of *M. denigrata* reported previously from different regions of Poland could not be found, as in the case of the following localities found in almost all macroregions: Wyżyna Krakowsko-Częstochowska upland, Wyżyna Śląska upland, Brama Krakowska region (Kiszka & Betleja 1990; Kiszka 1993), Niecka Nidziańska basin (Kiszka 1997b), Kotlina Sandomierska basin (Kiszka & Betleja 1989), Pogórze Zachodniobeskidzkie foothills (Kiszka 1996), Pogórze Środkowobeskidzkie foothills (Kiszka & Piórecki 1991), Polesie (Bystrek & Górzyńska 1977), Pojezierze Litewskie lakeland (Cieśliński & Tobolewski 1988), Nizina Północnopodlaska lowland (Cieśliński & Zielińska 1994), a few Pomeranian regions (Fałtynowicz & Tobolewski 1989; Fałtynowicz & Miądlkowska 1990; Lipnicki & Tobolewski 1991–1992; Fałtynowicz 1997; Fałtynowicz & Kukwa 1999; Fałtynowicz & Królak 2001) and some others.

Even without those unconfirmed localities, *M. denigrata* is the commonest species within

the genus, widely distributed throughout Poland in natural forest communities where it occurs on bark, stumps, fallen logs and branches of coniferous trees or occasionally also on decaying terricolous bryophytes, as well as on older wooden constructions in woodlands, agriculture areas, human settlements or even big cities. It is particularly frequent within thinned out, mature pine forests in lowland (*Cladonio-Pinetum* Juraszek 1927, *Leucobrio-Pinetum* W. Mat. (1962) 1973, *Molinio-Pinetum* J. Mat. 1973), where it is locally found on the bases of almost all living trunks of *Pinus sylvestris*, as at sites in Puszcza Drawska Forest, Bory Tucholskie Forest, Bory Zielonogórskie Forest and Lasy Nowotomyskie Forest. In such places it is usually associated with only a few other epiphytes: *Cladonia coniocraea*, *C. digitata*, *Hypocenomyce scalaris*, *Hypogymnia physodes*, *Lecanora conizaeoides*, *Lepraria* sp., *Micarea micrococca* and *Trapeliopsis granulosa*, but sometimes it also occurs near to *Hypocenomyce antracophila*, *Imshaugia aleurites*, *Lecidea nylanderii*, *Micarea melaena*, *M. nitschkeana* and *Trapeliopsis flexuosa*. Birches (*Betula pendula*), occurring as an admixture within the pine forest communities are also often occupied by *M. denigrata*. In such cases the lichen mostly grows with *Cladonia* spp., *Hypocenomyce scalaris*, *Hypogymnia physodes*, *Lecanora conizaeoides*, *Micarea micrococca*, *Parmeliopsis ambigua*, *Platismatia glauca*, *Trapeliopsis flexuosa*, *T. granulosa* and *Tuckermannopsis chlorophylla*. In such conditions, *M. denigrata* frequently occurs also on hard wood of fallen, decorticated logs, thicker branches, timber and vertical surfaces of decaying pine stumps; associated species on this substratum include *Absoconditella lignicola*, *Calicium abietinum*, *Cladonia digitata*, *C. cenothea*, *Lecanora conizaeoides*, *L. sarcopidoides*, *L. symmicta*, *Micarea micrococca*, *M. misella*, *M. prasina*, *Ochrolechia* sp., *Parmeliopsis ambigua*, *Trapeliopsis granulosa* and *T. flexuosa*. In other forest communities, and especially within broadleaf woodlands, *M. denigrata* is rarely found on natural substrata, but it was almost always present on old wooden fences of forest nurseries and young plantations, gates, enclosures of ant-

hills, rails, picnic tables and seats more exposed to light. However, it has occasionally been recorded together with *Scoliciosporum chlorococcum* and *Stenocybe pullatula* on the bark of *Alnus glutinosa* at the edge of boggy black alder forest, as well as on the smooth bark of *Carpinus betulus* and *Corylus avellana* within hornbeam forest (e.g. in Puszcza Zielonka Wood).

Single records of *M. denigrata* have also been made on free-standing trees (e.g. *Aesculus hippocastanum*, *Fraxinus* sp., *Salix* sp., *Populus* sp.) in open agriculture landscapes, such as by cart tracks, on boundary strips, in pastures and in the vicinity of human settlements, where it is very often found as a primary colonizer of many kinds of untreated timber. In Pojezierze Krajeńskie lakeland it was growing, for example, on a wooden foot-bridge in association with other pioneer species, namely *Caloplaca* cf. *holocarpa*, *Candelariella vitellina*, *Hypogymnia physodes*, *Lecanora saligna*, *L.* cf. *persimilis* and *Phaeophyscia orbicularis*.

*Micarea denigrata* can also colonize acidic rocks, as observed on shaded sandstone in Great Britain (Coppins 1983) or bare granitic monuments in the Netherlands (Sparrius & Aptroot 2003), but only twice have saxicolous specimens (on post-glacial granite boulders in Pomerania, Hb. Kukwa 351 and Pojezierze Lubuskie lakeland, Czarnota 4850) been seen in Poland.

In the mountains, *M. denigrata* is more frequently reported as a lignicolous species than an epiphytic one, probably due to the dense and shady forest there. Moreover, *Pinus sylvestris*, which it prefers as a phorophyte in the lowlands, does not grow there in natural communities but is of anthropogenic origin, the natural or managed stand reconstruction resulting in a dense undergrowth or luxuriant grasses which influence light penetration. Epiphytic *M. denigrata*, rarely found in mountains, occurs on the bark of *Picea abies* by the forest roads, edge of clearings or loose stands in both forest belts. Only occasionally has it been recorded within the Carpathian beech forest in Western Beskidy Mts, where it occurs directly on bark of *Fagus sylvatica* and also on bark of *Pinus mugo* and rachitic spruces in the mountain-pine community in the Sudetes and

Tatras. Here it reaches its upper altitudinal limit of 1710 m. A few times in Karkonosze Mts it has been found on moribund, terricolous bryophytes by hiking tracks or crevices of granitic rocks, together with *M. leprosula*. It is also known from twigs of *Ledum palustre* from a mountain peat-bog in Bieszczady Mts. More frequently it has been observed on different kinds of timber, particularly on older, wooden constructions of shelters, cottages and sheperds' sheds. Lichens associated in such habitats include *Amandinea punctata*, *Hypogymnia physodes*, *Imshaugia aleurites*, *Lecanora conizaeoides*, *L. pulicaris*, *L. saligna*, *L. symmicta*, *L. varia*, *Parmeliopsis ambigua*, *Placynthiella dasaea*, *P. icmalea*, *Pseudevernia furfuracea*, *Pycnora sorophora*, *Strangospora moriformis*, *S. pinicola*, *Thelocarpon laureri*, *Thelomma ocellatum*, *Trapeliopsis flexuosa* and *T. granulosa*.

WORLD DISTRIBUTION. It is one of the commonest members of *Micarea*, known from almost all European countries, but more rarely recorded in other continents where it is probably more frequent, at least in the Asian part of Russia.

EUROPE: Austria (Hafellner & Türk 2001); Belgium and Luxembourg (Diederich & Sérusiaux 2000); Bulgaria (Popnikolov & Zhelezova 1964, as *Catillaria synothesa*); Czech Republic (Vězda & Liška 1999); Denmark (Søchting & Alstrup 2002); Estonia (Randlane & Saag 1999); Finland (Vitikainen *et al.* 1997); Germany – Lower Saxony (Hauck 1996), Nordrhein-Westfalen (Heibel 1999), Schleswig-Holstein (Jacobsen 1992); Greenland (Thomson 1997); Great Britain and Ireland (Coppins 1983, 2002; Seaward 1994); Hungary (Verseggy 1994); Iceland (Kristinsson & Heidmarsson 2006); Italy (Nimis & Martellos 2003); Latvia, rare (Piterāns 2001); Lithuania (Motiejūnaitė 1999); the Netherlands (Aptroot *et al.* 2004); Norway (Santesson 1993); Portugal (van den Boom & Giralt 1996); Romania (Ciurchea 1998); Russia – Leningrad Region (Zavarzin *et al.* 1999), Komi Republic (Hermansson *et al.* 1998); Slovakia (Pišút *et al.* 1996); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993); Switzerland (Scheidegger *et al.* 2002); Ukraine – Eastern

Carpathians and Pontic Steppe (Kondratyuk *et al.* 1998). NORTH AMERICA: Canada – Newfoundland (Thomson 1997); USA – e.g. Colorado (Shushan & Anderson 1969), Maine, Massachusetts (Greene 2005), Michigan (Fryday *et al.* 2001), Washington (Thomson 1997). AUSTRALIA: (McCarthy 2003). ASIA: Russia – Siberia, lower Ob River (Sedelnikova & Taran 2000); Taiwan (Aptroot & Sparrius 2003).

EXSICCATAE SEEN. Hepp, *Flecht. Eur. No. 14* (E); *Krypt. Exs. Vindob. No. 4858* (POZ); Migula, *Crypt. Germ. No. 132* (E; Hb. Vězda); Rabenhorst, *Lich. Eur. No. 626* (WRSL); Vězda, *Lich. Sel. Exs. No. 565* (KRAM), *No. 1430* (GPN); Weber, *Lich. Exs. No. 73* (POZ; E).

SPECIMENS EXAMINED. Grid square Ab-86 – POBRZEŻE KOSZALIŃSKIE COASTLAND, RÓWNINA ŚLAWIEŃSKA PLAIN: S of railway station Karwice near Karwice village, Apr. 1994, *leg. R. Kuligowski* (Hb. Izydorek); Ab-93 – WYBRZEŻE ŚLAWIEŃSKIE COAST: Mielno village near Koszalin town, 11 July 1986, *leg. W. Fałtynowicz* (UGDA-L 2833; KRAM-L 21873 ex UGDA); Ab-98 – RÓWNINA ŚLAWIEŃSKA PLAIN: 'Janiewickie Bagno' nature reserve, 26 Aug. 1987, *leg. W. Fałtynowicz & J. Miądlkowska* (UGDA-L 3508; KRAM-L 21830 ex UGDA); Ac-38 – WYBRZEŻE ŚLAWIEŃSKIE COAST: peat-bog Bielawskie Błota, 24 July 1981, *leg. W. Fałtynowicz* (UGDA-L 1386); Ac-70 – RÓWNINA ŚLAWIEŃSKA PLAIN: Słupsk town, 'Lasek Południowy' forest, forest section no. 595, 12 Febr. 1984, *leg. I. Izydorek* (hb. Izydorek), as *Catillaria prasina* for. *byssacea*; Ac-80 – POJEZIERZE ZACHODNIOPOMORSKIE LAKELAND, WYSOCYZNA POLANOWSKA PLATEAU: Leśny Dwór forest division, Podwilczyn forest district, forest section no. 212, 19 May 1979, *leg. I. Izydorek* (hb. Izydorek), as *Catillaria prasina* for. *byssacea*; Ac-86 – POJEZIERZE WSCHODNIOPOMORSKIE LAKELAND, POJEZIERZE KASZUBSKIE LAKELAND: Staniszewskie Błoto nature reserve near Staniszewo village, forest section no. 210, 7 July 1983, *leg. W. Fałtynowicz* (UGDA-L 1793) and forest section no. 209, 27 Sept. 1983, *leg. W. Fałtynowicz* (UGDA-L 1798); Ac-97 – POJEZIERZE KASZUBSKIE LAKELAND: Ostrzyca forest district, by the shore of Ostrzyckie Lake, 15 May 1972, *leg. Z. Tobolewski* (POZ), as *Catillaria* sp.; Ad-76 – POBRZEŻE GDAŃSKIE COASTLAND, MIERZEJA WIŚLANA SAND-BAR: Piaski settlement, on coastal sand-dune near forest section no. 9, 31 May 1981, *leg. E. Budzbon* (UGDA-L 1949); Ad-80 – POBRZEŻE KASZUBSKIE COASTLAND: Gdańsk – Brętowo town, Dolne Młyny

- street, 20 May 1984, *leg. W. Faltynowicz* (UGDA-L 2657); Ad-82 – MIERZEJA WIŚLANA SAND-BAR: Gdańsk – Świbno town, mouth of the Vistula River to the Baltic Sea, 23 Sept. 1983, *leg. W. Faltynowicz* (UGDA-L 2611); Gdańsk – Świbno town, Wyspa Sobieszewska Island, 22 Apr. 1995, *leg. M. Kukwa* (Hb. Kukwa); Ad-85 – MIERZEJA WIŚLANA SAND-BAR: Przebrno settlement, forest section no. 75, 8 Aug. 1982, *leg. E. Budzbon* (UGDA-L 1950) and forest section no. 76, 14 Oct. 1981, *leg. E. Budzbon* (UGDA-L 1951); Ae-99 – NIZINA STAROPRUSKA LOWLAND, RÓWNINA SĘPOLSKA PLAIN: ca 1.5 km SW of Wilczyny village, 4 May 1989, *leg. S. Cieśliński* (KTC); Af-86 – POJEZIERZE LITEWSKIE LAKELAND, POJEZIERZE WSCHODNIOSUWALSKIE LAKELAND: Puszcza Romincka Forest, ‘Dziki Ką’ nature reserve, 15 May 1985, *leg. S. Cieśliński & Z. Tobolewski* (KTC); Af-88 – POJEZIERZE WSCHODNIOSUWALSKIE LAKELAND: Suwalski Landscape Park, E shore of Jaczno Lake, S of Smolniki village [54°17'N/22°52'E] 11 July 2000, *K. Jando & M. Kukwa* (UGDA); Af-98 – POJEZIERZE WSCHODNIOSUWALSKIE LAKELAND: NW shore of Szurpiły Lake, 22 Sept. 1982, *leg. W. Faltynowicz* (UGDA-L 3466; Hb. MRDS 112069); Ba-23 – POBRZEŻE SZCZECIŃSKIE COASTLAND, UZNAM AND WOLIN ISLANDS: Wolin Island, Wiselka village, 6 May 1994, *leg. A. Wieczorek 60* (Hb. Wieczorek); Ba-55 – RÓWNINA GOLENIOWSKA PLAIN: Puszcza Goleniowska Forest, Bągiszcz village near Goleniów town, 28 Apr. 1987, *leg. W. Faltynowicz* (Hb. MRDS 112070; KRAM ex UGDA-L 3586); Bb-31 – RÓWNINA GRYFICKA PLAIN: Sidłowo village between Świdwin and Białogard towns, 18 Oct. 1987, *leg. W. Faltynowicz & J. Miądlkowska* (UGDA-L 3802); Bb-32 – RÓWNINA GRYFICKA PLAIN: between Podwilcze and Kobylica villages, near Białogard town, 19 Oct. 1987, *leg. W. Faltynowicz & J. Miądlkowska* (UGDA-L 3745); Bb-91 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, RÓWNINA DRAWSKA PLAIN: Drawsko Pomorskie forest division, forest section no. 39, the estuary of Prostyńka River to Drawa River, E of Strunowo Lake, 1 May 1992, *leg. I. Izydorek* (hb. Izydorek), as *M. prasina*; Bc-07 – POJEZIERZE WSCHODNIOPOMORSKIE LAKELAND, POJEZIERZE KASZUBSKIE LAKELAND: Wieżyca hill, ca 0.5 km NE of Szymbark, 23 May 1974, *leg. Z. Tobolewski* (POZ); Bc-25 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, BORY TUCHOLSKIE FOREST: S of Schodno village, 17 June 2002, *leg. A. Kowalewska* (UGDA); ca 0.5 km SW of Szludron village, 11 Sept. 2002, *leg. A. Kowalewska* (UGDA); Kościerzyna forest division, Grzybowski Młyn forest district, forest section no. 356m, SE of Loryniec village, 18 July 2002, *leg. A. Kowalewska* (UGDA) and forest section no. 366b, ca 0.5 km NE of Szludron village, 16 Sept. 2002, *leg. A. Kowalewska* (UGDA); Lipusz forest division, Joniny forest district, forest section no. 197c, ca 0.5 km SE of Słupinko village, 12 Sept. 2002, *leg. A. Kowalewska* (UGDA); Bc-26 – BORY TUCHOLSKIE FOREST: a peat-bog near Drzędno Lake, ?, *leg. W. Faltynowicz* (UGDA-L 1707); Bc-31 – RÓWNINA CHARZYKOWSKA PLAIN: ‘Bagnisko Niedźwiady’ nature reserve near Lipczynek village, 26 July 1987, *leg. W. Faltynowicz* (UGDA-L 3497 together with *M. melaena*); Bc-33 – RÓWNINA CHARZYKOWSKA PLAIN: Widno village, 8 July 1985, *leg. L. Lipnicki 925* (Hb. Lipnicki); Zaborski Landscape Park, Głuche Lake, ca 1 km N of Płęsno Lake, 9 July 1990, *leg. L. Lipnicki 965* (Hb. Lipnicki), as *M. prasina*; by the shore of Głuche Lake, 13 Sept. 2001, *leg. M. Ceynowa-Gieldoń* (TRN); near Zmarle Lake, 28 Sept. 2001, *leg. P. Czarnota* (GPN 2615) and 28 Sept. 2001, *leg. M. Kukwa* (GPN 2616); Bc-35 – BORY TUCHOLSKIE FOREST: Wdzydzki Landscape Park, vicinity of Kły Lake, 16 June 1991, *leg. L. Lipnicki* (Hb. Lipnicki) as *M. elachista*; ‘Bór chrobotkowy’ nature reserve in memory of prof. Z. Tobolewski, 27 Sept. 2001, *leg. P. Czarnota* (GPN 2623, 2738); Bc-36 – BORY TUCHOLSKIE FOREST: ‘Kamienne Kregi’ nature reserve, ca 2 km W of Odry village, 24 May 1986, *leg. W. Faltynowicz* (UGDA-L 2878); Bc-43 – RÓWNINA CHARZYKOWSKA PLAIN: Bory Tucholskie National Park: Bachorze settlement, 21 July 1998, *leg. L. Lipnicki 638* (Hb. Lipnicki), by the cross of forest sections no. 151/152/175/176, 23 June 1999, *leg. L. Lipnicki* (Hb. Lipnicki), by the border of forest sections no. 19/20, 23 June 1999, *leg. L. Lipnicki* (Hb. Lipnicki), as *M. prasina*, E shore of Gacno Wielkie Lake, 13 Sept. 2001, *leg. M. Ceynowa-Gieldoń* (TRN) and 7 Oct. 2001, *leg. M. Ceynowa-Gieldoń* (TRN); Bc-48 – BORY TUCHOLSKIE FOREST: Młynki settlement on the Wda River, 21 July 1984, *leg. W. Faltynowicz* (UGDA-L 755); Bc-53 – RÓWNINA CHARZYKOWSKA PLAIN: Bory Tucholskie National Park, by the cross of forest sections no. 221/222/241, 24 June 1999, *leg. L. Lipnicki* (Hb. Lipnicki); Bc-56 – BORY TUCHOLSKIE FOREST: Woziwoda forest division, Ustronie forest district, forest section no. 23j, 16 Aug. 2002, *leg. P. Czarnota* (GPN 3107); Woziwoda forest division, Dąbki forest district, forest section no. 48l, 16 Aug. 2002, *leg. P. Czarnota* (GPN 3062); Bc-59 – BORY TUCHOLSKIE FOREST: Wdecki Młyn settlement on the Wda River, July 1984, *leg. W. Faltynowicz* (UGDA-L 1869); Bc-66 – BORY TUCHOLSKIE FOREST: Woziwoda forest division, Biała forest district, forest section no. 129, ca 0.5 km E of Białe Lake, 16 Aug. 2002, *leg. P. Czarnota* (GPN 3075); Bc-73 – POJEZIERZE KRAJEŃSKIE LAKELAND: 0.5 km W of Duża Cerkwica

village, on the wooden bridge, 2 Aug. 2002, *leg. L. Lipnicki* (Hb. Lipnicki); Be-75 – DOLINA BRDY VALLEY: ‘Piekło nad Brdą’ nature reserve 27 Sept. 2001, *leg. P. Czarnota* (Ex GPN 2611 in Hb. Lipnicki); Be-79 – BORY TUCHOLSKIE FOREST: Dąbrowa forest division, Kwiatki forest district, forest section no. 39a, ca 13 km W of Warlubie village, 31 Aug. 2001, *leg. A. Kowalewska* (UGDA); Bd-42 – POJEZIERZE IŁAWSKIE LAKE-LAND, POJEZIERZE IŁAWSKIE LAKE-LAND: Kwidzyń forest division, Lisewo forest district, forest section no. 187, S of Nowa Wieś village, 4 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa 351); *ibid.*, forest section no. 187b, 3 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa 110); *ibid.*, forest section no. 201, ca 1 km NE of Ryjewo village, 3 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa 339); Kwidzyń forest division, Biały Dwór forest district, forest section no. 236, S of Ryjewo village, 23 Sept. 1996, *leg. M. Kukwa* (Hb. Kukwa 213); Bd-43 – POJEZIERZE IŁAWSKIE LAKE-LAND: ca 2 km W of Straszewo village, 11 Sept. 1996, *leg. M. Kukwa* (Hb. Kukwa 208); Kwidzyń forest division, Lisewo forest district, forest section no. 224a, 29 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa 217); Be-00 – NIZINA STAROPRUSKA LOWLAND, RÓWNINA ORNECKA PLAIN: nature reserve on the Walsza River, 27 Aug. 1993, *leg. S. Cieśliński* (KTC); Be-08 – RÓWNINA SEPOPOLSKA PLAIN: Dębiany village, 6 May 1989, *leg. J. Nowak* (KRAM-L 26336); Be-12 – RÓWNINA ORNECKA PLAIN: S edge of Łaniewo village, 11 May 1989, *leg. S. Cieśliński* (KTC); Be-23 – POJEZIERZE MAZURSKIE LAKE-LAND, POJEZIERZE OLSZTYŃSKIE LAKE-LAND: ca 1.5 km NNE of Międzyzlesie village, E of Dobre Miasto town, 14 Sept. 1989, *leg. S. Cieśliński* (KTC), as *Micarea* sp.; Be-31 – POJEZIERZE OLSZTYŃSKIE LAKE-LAND: ca 1 km NE of Różynka village, 14 Sept. 1989, *leg. S. Cieśliński* (KTC); Be-42 – POJEZIERZE OLSZTYŃSKIE LAKE-LAND: Olsztyn town, square OL-C-20, 2001, *leg. D. Kubiak* (OLTC); Be-50 – POJEZIERZE OLSZTYŃSKIE LAKE-LAND: Staszkowo village, ca 10 km E of Ostróda town, 10 May 1974, *leg. J. Nowak* (KRAM-L 19719); Be-52 – POJEZIERZE OLSZTYŃSKIE LAKE-LAND: Olsztyn town, square OL-Q-10, 2001, *leg. D. Kubiak* (OLTC); Be-56 – POJEZIERZE MRAĠOWSKIE LAKE-LAND: W edge of Chmielówka village, 9 May 1990, *leg. S. Cieśliński* (KTC); Be-58 – POJEZIERZE MRAĠOWSKIE LAKE-LAND: Puszcza Piska Forest, ‘Zakręt’ nature reserve, 2 Sept. 1987, *leg. S. Cieśliński* (KTC); Be-59 – POJEZIERZE MRAĠOWSKIE LAKE-LAND: Puszcza Piska Forest, ca 1.5 km S of Lipowo village, 31 Sept. 1987, *leg. S. Cieśliński* (KTC); N edge of Krutyń village, 31 Aug. 1987, *leg. S. Cieśliński* (KTC); Be-62 – POJEZIERZE OLSZTYŃSKIE LAKE-LAND: Nowe Ramuki forest division,

by the shore of Oczko Lake, May 2001, *leg. D. Kubiak* (OLTC); Be-68 – RÓWNINA MAZURSKA PLAIN: ca 0.5 km NNW of Spychowo village, near Zyzdrój Wielki Lake, 6 May 1990, *leg. S. Cieśliński* (KTC); Be-72 – POJEZIERZE OLSZTYŃSKIE LAKE-LAND: 1 km NNW of Swaderki village, 16 Sept. 1989, *leg. S. Cieśliński* (KTC); Be-86 – RÓWNINA MAZURSKA PLAIN: ca 5 km S of Szczytno town, near Nowiny village, 2 Aug. 1993, *leg. S. Cieśliński* (KTC; GPN 2077); Be-87 – RÓWNINA MAZURSKA PLAIN: 2.5 km SWW of Lipowiec village, 5 May 1990, *leg. S. Cieśliński* (KTC); Be-88 – RÓWNINA MAZURSKA PLAIN: ca 1 km NW of Rozogi village, by road to Szczytno town, 4 May 1990, *leg. S. Cieśliński* (KTC); Be-94 – RÓWNINA MAZURSKA PLAIN: ca 4 km E of Jagarzewo village, by road between Nidzica town and Wielbark village, 30 Apr. 1989, *leg. S. Cieśliński* (KTC); Bf-00 – KRAINA WIELKICH JEZIOR MAZURSKICH LAKE-LAND: Kirsajty village, between Mamry Lake and Dargin Lake, 198?, *leg. S. Cieśliński* (KTC); Bf-09 – POJEZIERZE LITEWSKIE LAKE-LAND, RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, Wigierski National Park, Wigry forest division, forest section no. 106A, 11 Sept. 1984, *leg. R. Kozik* (KRAP), as *Catillaria prasina*; Leszczewo – Kolonia village, 13 Sept. 1984, *leg. J. Nowak* (KRAM-L 26091); Bf-12 – POJEZIERZE MAZURSKIE LAKE-LAND, POJEZIERZE ELCKIE LAKE-LAND: Puszcza Borecka Forest, vicinity of forester’s lodge Diabla Góra, 19 May 1987, *leg. S. Cieśliński & Tobolewski* (KTC); Bf-14 – POJEZIERZE ELCKIE LAKE-LAND: Puszcza Borecka Forest, Zielonki forest district, forest section no. 223 [54°04’N/22°11’E] alt. 160 m, 14 July 1995, *leg. A. Zalewska* (OLS-L 1384), as *M. nitschkeana*; Bf-19 – POJEZIERZE LITEWSKIE LAKE-LAND, RÓWNINA AUGUSTOWSKA PLAIN: between Tartak and Stary Folwark villages, 12 Sept. 1984, *leg. K. Czyżewska & J. Nowak* (UGDA-L 4435); Puszcza Augustowska Forest, Wigierski National Park, Wigry forest division, forest section no. 210, by shore of Mały Sucharek Lake, 14 Sept. 1984, *leg. J. Kiszka* (KRAP), as *Catillaria prasina* for. *byssacea* and forest section no. 245A, 12 Sept. 1984, *leg. J. Kiszka* (KRAP), as *Catillaria prasina* for. *byssacea*; Wigierski National Park, the forester’s lodge Wasiliszi, by shore of Białe Wigierskie Lake, 30 Apr. 1995, *leg. M. Kukwa* (Hb. Kukwa); Bf-19 – POJEZIERZE WSCHODNIOSUWALSKIE LAKE-LAND: Wigry village, the bridge on Czarna Hańcza River, Aug. 1994, *leg. W. Fałtynowicz* (Hb. Kukwa); Bf-50 – POJEZIERZE MAZURSKIE LAKE-LAND, KRAINA WIELKICH JEZIOR MAZURSKICH LAKE-LAND: by shore of Smolak Duży Lake near Wierzby village, 8 Aug. 1978, *leg. J. Nowak* (KRAM-L 25010, 25008), as *Micarea* sp.; Bf-52 – KRAINA WIELKICH JEZIOR MAZURSKICH



- LAKELAND: ca 1 km E of Pilchy village, N shore of Roś Lake, 29 Aug. 1988, *leg. S. Cieśliński* (KTC); Bf-59 – NIZINA PÓLNOCPODLASKA LOWLAND, KOTLINA BIEBRZAŃSKA BASIN: 1 km E of Wrotki village, 1990, *leg. S. Cieśliński* (KTC); Bf-67 – KOTLINA BIEBRZAŃSKA BASIN: Biebrza Valley, Biebrzański National Park, SE of Kapice settlement, 18 June 2001, *leg. K. Kolanko* (Hb. Kolanko); Bf-68 – KOTLINA BIEBRZAŃSKA BASIN: Biebrzański National Park, peat-bog 'Czerwone Bagno' nature reserve, ca 5 km NNW of Dolistów Stary village, 24 Sept. 1986, *leg. S. Cieśliński* (KTC) and 29 Sept. 1999, *leg. K. Kolanko* (Hb. Kolanko); SE of Grzędy settlement, 29 Sept. 1999, 14 Mar. 2001 and 22 May 2001, *leg. K. Kolanko* (Hb. Kolanko); Bf-72 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE ELCKIE LAKELAND: 3 km S of Kumielski village, 29 Aug. 1988, *leg. S. Cieśliński* (KTC); Bf-77 – NIZINA PÓLNOCPODLASKA LOWLAND, KOTLINA BIEBRZAŃSKA BASIN: Biebrzański National Park, Osowiec village, 4 Apr. 2001, *leg. K. Kolanko* (Hb. Kolanko); by road to Osowiec, 29 Nov. 2000, *leg. K. Kolanko* (Hb. Kolanko); Bf-87 – KOTLINA BIEBRZAŃSKA BASIN: 1 km NW of Downary Plac village, 29 Aug. 1990, *leg. S. Cieśliński* (KTC), as *Micarea* sp., together with *M. nitschkeana*; Biebrzański National Park, Fort IV, SW of Goniądz town, 11 June 2001, *leg. K. Kolanko* (Hb. Kolanko); Bf-94 – WYSOCZYNA KOLNEŃSKA PLATEAU: 1.5 km S of Stawiski village, by road between Łomża and Grajewo towns, 21 June 1986, *leg. S. Cieśliński* (KTC); GPN 2076); Bf-96 – KOTLINA BIEBRZAŃSKA BASIN: Biebrzański National Park, 1.5 km E of Gugny village, 29 Aug. 1990, *leg. S. Cieśliński* (KTC); Zabudnik area, 25 May 2001, *leg. K. Kolanko* (Hb. Kolanko); Bf-97 – KOTLINA BIEBRZAŃSKA BASIN: Biebrzański National Park, 1.5 km E of Gugny village, 29 Aug. 1990, *leg. S. Cieśliński* (KTC); Bg-10 – POJEZIERZE LITEWSKIE LAKELAND, RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, Wigierski National Park, Wigry forest division, forest section no. 244, 11 Sept. 1984, *leg. J. Kiszka & J. Piórecki* (KRAP), as *Catillaria* cf. *elachista*; S part of Rosochaty Róg peninsula, 12 Sept. 1984, *leg. M. R. D. Seaward* (Hb. MRDS 104924); Bg-10 – POJEZIERZE WSCHODNIOŚWALSKIE LAKELAND: Puszcza Augustowska Forest, 0.5 km S of Mikołajewo village, 11 Sept. 1984, *leg. M. R. D. Seaward & E. Bylińska* (Hb. MRDS 104918); Mikołajewo village, 11 Sept. 1984, *leg. M. R. D. Seaward & E. Bylińska* (ex Hb. MRDS 69841 in WRSL); Bg-11 – POJEZIERZE WSCHODNIOŚWALSKIE LAKELAND: Puszcza Augustowska Forest, forest section no. 442, edge of the forest by road between Giby and Augustów towns, 20 Aug. 1986, *leg. S. Cieśliński* (KTC); KRAM-L 31898 ex KTC); Bg-21 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, forest section no. 916, N of Plaskie Lake, 10 July 1995, *leg. S. Cieśliński* (KTC together with *M. nitschkeana*; GPN 2078); Bg-30 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, the border of forest sections no. 227/228 and 235/236, 10 Sept. 1986, *leg. S. Cieśliński* (KTC); Bg-32 – NIZINA PÓLNOCPODLASKA LOWLAND, KOTLINA BIEBRZAŃSKA BASIN: Puszcza Augustowska Forest, forest section no. 260, ca 1 km N of Rubców village, 13 Sept. 1986, *leg. S. Cieśliński* (KTC); Bg-40 – KOTLINA BIEBRZAŃSKA BASIN: Puszcza Augustowska Forest, forest section no. 153, ca 1 km NE of Lebiezdin village, 21 Sept. 1986, *leg. S. Cieśliński* (KTC), as *Micarea* sp.; Ca-37 – POJEZIERZE ZACHODNIOPOMORSKIE LAKELAND, POJEZIERZE CHOSZCZEŃSKIE LAKELAND, ca 3 km NE of Barlinek town, valley of Płonia stream [53°00'50"N/15°16'00"E] 9 Apr. 2006, *leg. P. Czarnota 4817* (GPN); Ca-37 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, RÓWNINA GORZOWSKA PLAIN: Puszcza Barłnecka Forest, Barlinek forest division, forest sections no. 196/228, 30 July 1989, *leg. L. Lipnicki 1371* (Hb. Lipnicki), as *M. prasina* and forest section no. 227, 30 July 1989, *leg. L. Lipnicki 1353* (Hb. Lipnicki), as *M. prasina*; Krzyńka village, 3 Febr. 1990, *leg. L. Lipnicki 1404* (Hb. Lipnicki); Ca-46 – RÓWNINA GORZOWSKA PLAIN: ca 2 km SE of Trzcinnia village by road between Gorzów Wielkopolski and Myślibórz towns [52°52'14"N/15°00'35"E] alt. ca 60 m, 16 May 2004, *leg. P. Czarnota 4295* (GPN); Ca-65 – RÓWNINA GORZOWSKA PLAIN: by the shore of Stobno Lake, NW of Witnica town, 17 Apr. 1987, *leg. W. Faltynowicz* (UGDA-L 3229); Ca-68 – PRADOLINA TORUŃSKO-EBERSWALDZKA VALLEY, KOTLINA GORZOWSKA BASIN: Stare Polichno village, 1992, *leg. K. Glanc* (GPN 2654); Ca-76 – KOTLINA GORZOWSKA BASIN, Puszcza Rzepińska Forest, ca 1 km E of Krzeszyce village by road to Gorzów Wielkopolski town [52°34'55"N/15°03'19"E] 8 Apr. 2006, *leg. P. Czarnota 4811* (GPN); Ca-78 – POJEZIERZE LUBUSKIE LAKELAND, POJEZIERZE ŁAGOWSKIE LAKELAND: Puszcza Rzepińska Forest, ca 7 km W of Skwierzyzna town [52°35'25"N/15°19'41"E] 8 Apr. 2006, *leg. P. Czarnota 4798, 4799* (GPN); Ca-95 – POJEZIERZE ŁAGOWSKIE LAKELAND: 0.5 km N of Ośno Lubuskie town [52°27'35"N/14°53'13"E] alt. 60 m, 8 Apr. 2006, *leg. P. Czarnota 4850* (GPN); Cb-22 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, RÓWNINA DRAWSKA PLAIN: by road to 'Radęcin' nature reserve at the border of Drawieński National Park [53°05'38"N/15°53'52"E] 18 May 2004, *leg. P. Czarnota 4278* (GPN); Drawieński National Park, small clearing in forest section no. 248, near 'Radęcin' nature reserve

[53°05'47"N/15°53'39"E] 18 May 2004, *leg. P. Czarnota 4280* (GPN) and forest section no. 307k, ca 0.5 km W of Ostrowiec Lake [53°04'30"N/15°56'49"E] 18 May 2004, *leg. P. Czarnota 4284* (GPN); Cb-41 – POJEZIERZE DOBIEGNIIEWSKIE LAKELAND: Puszcza Drawska Forest, Smolarz forest division, 'Łubówko' nature reserve, ca 5 km N of Drezdenko town, 4 May 2001, *leg. L. Lipnicki* (Hb. Lipnicki), as *M. prasina* and ca 0.5 km N of Drezdenko town [52°51'19"N/15°50'40"E] 9 Apr. 2006, *leg. P. Czarnota 4831* (GPN); Cb-51 – PRADOLINA TORUŃSKO-EBERSWALDZKA VALLEY, KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, 5 km SE of Drezdenko, 3 June 1991, *leg. L. Lipnicki 1677* (Hb. Lipnicki); Cb-52 – KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, NE part of Karwin forest division, 6 Mar. 1991, *leg. W. Sapór & L. Lipnicki 1255* (Hb. Lipnicki); Cb-53 – KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, Łęknio settlement, by forest road, Oct. 1992, *leg. K. Glanc* (GPN 2649); Cb-54 – KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, Biała settlement, S of Rosko village, 9 Aug. 1988, *leg. K. Glanc* (KRAM-L 48416), as *Micarea* sp.; Puszcza Notecka Forest, between Miały and Rosko villages, 4 Nov. 1991, *leg. K. Glanc* (GPN 2652); Cb-56 – KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, Lubasz village near Czarnków town, 18 July 1968, *leg. K. Glanc* (GPN 2655); Cb-61 – KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, the edge of Lubiatów village, Nov. 1992, *leg. K. Glanc* (GPN 2657); Cb-64 – KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, by road between Mokrz and Rzecin villages, 3 Nov. 2001, *leg. K. Glanc* (GPN 2691); Cb-66 – KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, by road between Obrzycko town and Boruszyn village, 1993, *leg. K. Glanc* (GPN 2651); Cb-68 – KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, S of Dziewicza Struga village on Welna River, 22 Sept. 1991, *leg. K. Glanc* (GPN 2646); Cb-71 – KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, ca 3 km S of Sowią Góra settlement [52°40'12"N/15°50'55"E] 10 Apr. 2006, *leg. P. Czarnota 4806* (GPN); Cb-81 – KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, Zamyślin settlement near Wiejce village, 28 Sept. 2000, *leg. K. Glanc & W. Danielewicz* (GPN 2656); Cb-89 – POJEZIERZE WIELKOPOLSKO-KUJAWSKIE LAKELAND, POJEZIERZE GNIEŹNIENSKIE LAKELAND: Puszcza Zielonka Forest, Experimental Chief Forestry of Agriculture Academy in Poznań, forest section no. 4, 17 Nov. 1992, *leg. K. Glanc* (KRAM-L 39950), as *M. prasina*; Cc-08 – DOLINA DOLNEJ WISŁY VALLEY, DOLINA FORDOŃSKA VALLEY: Chrystkowo village on Vistula River [53°19'16"N/ 18°18'59"E] 10 Sept. 2004, *leg. P. Czarnota 4047* (GPN); near 'Zbocza Pułtowskie' nature reserve, ca 1 km SW of Kiełb village [53°17'35"N/ 18°22'45"E] 10 Sept. 2004, *leg. P. Czarnota 4131* (GPN); Cc-70 – POJEZIERZE WIELKOPOLSKO-KUJAWSKIE LAKELAND, POJEZIERZE GNIEŹNIENSKIE LAKELAND: Puszcza Zielonka Forest, near Łopuchowo village, Aug. 1994, *leg. K. Glanc* (KRAM-L 39967), as *Catillaria prasina*; Cc-90 – POJEZIERZE GNIEŹNIENSKIE LAKELAND: near Popielarze forester's lodge, 2.5 km E of Skorzęcin village, 1 Sept. 1984, *leg. Z. Tobolewski ?* (POZ); Ce-14 – NIZINA PÓLNOCNOMAZOWIECKA LOWLAND, WZNIESIENIA MŁAWSKIE HEIGHTS: ca 1 km E of Brzozowo Maje village, forest section no. 120, May 1999, *leg. M. Kolakowska* (UGDA); Ce-91 – WYSOCZYNA PŁOŃSKA PLATEAU: 1.5 km SE of Raszewo village, 29 Sept. 1985, *leg. ?* (POZ); Cf-07 – NIZINA PÓLNOCNOPODLASKA LOWLAND, KOTLINA BIEBRZAŃSKA BASIN: ca 0.5 km NW of Łaziuki village, 22 Aug. 1991, *leg. S. Cieśliński* (KTC); Cf-16 – WYSOCZYNA WYSOKOMAZOWIECKA PLATEAU: Chlebotki Nowe village, 30 Aug. 1990, *leg. S. Cieśliński* (KTC); Cf-28 – DOLINA GÓRNEJ NARWI VALLEY: Narwiański National Park, Kurowo village, 21 Oct. 2001, *leg. A. Mrozowska* (Hb. Kolanko); Cf-38 – WYSOCZYNA WYSOKOMAZOWIECKA PLATEAU: ca 0.5 km SEE of Roszki village, 27 Aug. 1991, *leg. S. Cieśliński* (KTC); Cf-54 – WYSOCZYNA WYSOKOMAZOWIECKA PLATEAU: S of Kowalówka village, 21 Aug. 1990, *leg. S. Cieśliński* (KTC); Cf-66 – WYSOCZYNA WYSOKOMAZOWIECKA PLATEAU: E of Tymianki settlement, by road between Nur village and Ciechanowiec town, 20 Aug. 1990, *leg. S. Cieśliński* (KTC); Cf-68 – RÓWNINA BIELSKA PLAIN: ca 2.5 km SW of Rudka village, 20 Aug. 1991, *leg. S. Cieśliński* (KTC); Cf-87 – WYSOCZYNA DROHICZYŃSKA PLATEAU: E edge of Obniże Duże village, 25 Aug. 1995, *leg. S. Cieśliński* (KTC), as *Micarea* sp.; Cg-01 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Podsupraśl village, 3 Aug. 1994, *leg. S. Cieśliński* (KTC); Cg-02 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, 'Budzisk' nature reserve, forest section no. 6k, 12 June 1999, *leg. K. Czyżewska* (LOD 11137); Cg-03 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, 'Góra Pieszczana' nature reserve, forest section no. 149, 8 ept. 1987, *leg. S. Cieśliński & J. Zielińska* (KTC together with *M. nitschkeana*); Cg-12 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, Królowy Most village, 19 Aug. 2000, *leg. K. Czyżewska* (LOD 11962); Cg-22 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: 5 km NE of Folwarki Małe village, 28 June 1991, *leg. S. Cieśliński* (KTC); Cg-24 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: 3 km W of Podozierany settlement from the side of Michałów

*nota 4047* (GPN); near 'Zbocza Pułtowskie' nature reserve, ca 1 km SW of Kiełb village [53°17'35"N/ 18°22'45"E] 10 Sept. 2004, *leg. P. Czarnota 4131* (GPN); Cc-70 – POJEZIERZE WIELKOPOLSKO-KUJAWSKIE LAKELAND, POJEZIERZE GNIEŹNIENSKIE LAKELAND: Puszcza Zielonka Forest, near Łopuchowo village, Aug. 1994, *leg. K. Glanc* (KRAM-L 39967), as *Catillaria prasina*; Cc-90 – POJEZIERZE GNIEŹNIENSKIE LAKELAND: near Popielarze forester's lodge, 2.5 km E of Skorzęcin village, 1 Sept. 1984, *leg. Z. Tobolewski ?* (POZ); Ce-14 – NIZINA PÓLNOCNOMAZOWIECKA LOWLAND, WZNIESIENIA MŁAWSKIE HEIGHTS: ca 1 km E of Brzozowo Maje village, forest section no. 120, May 1999, *leg. M. Kolakowska* (UGDA); Ce-91 – WYSOCZYNA PŁOŃSKA PLATEAU: 1.5 km SE of Raszewo village, 29 Sept. 1985, *leg. ?* (POZ); Cf-07 – NIZINA PÓLNOCNOPODLASKA LOWLAND, KOTLINA BIEBRZAŃSKA BASIN: ca 0.5 km NW of Łaziuki village, 22 Aug. 1991, *leg. S. Cieśliński* (KTC); Cf-16 – WYSOCZYNA WYSOKOMAZOWIECKA PLATEAU: Chlebotki Nowe village, 30 Aug. 1990, *leg. S. Cieśliński* (KTC); Cf-28 – DOLINA GÓRNEJ NARWI VALLEY: Narwiański National Park, Kurowo village, 21 Oct. 2001, *leg. A. Mrozowska* (Hb. Kolanko); Cf-38 – WYSOCZYNA WYSOKOMAZOWIECKA PLATEAU: ca 0.5 km SEE of Roszki village, 27 Aug. 1991, *leg. S. Cieśliński* (KTC); Cf-54 – WYSOCZYNA WYSOKOMAZOWIECKA PLATEAU: S of Kowalówka village, 21 Aug. 1990, *leg. S. Cieśliński* (KTC); Cf-66 – WYSOCZYNA WYSOKOMAZOWIECKA PLATEAU: E of Tymianki settlement, by road between Nur village and Ciechanowiec town, 20 Aug. 1990, *leg. S. Cieśliński* (KTC); Cf-68 – RÓWNINA BIELSKA PLAIN: ca 2.5 km SW of Rudka village, 20 Aug. 1991, *leg. S. Cieśliński* (KTC); Cf-87 – WYSOCZYNA DROHICZYŃSKA PLATEAU: E edge of Obniże Duże village, 25 Aug. 1995, *leg. S. Cieśliński* (KTC), as *Micarea* sp.; Cg-01 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Podsupraśl village, 3 Aug. 1994, *leg. S. Cieśliński* (KTC); Cg-02 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, 'Budzisk' nature reserve, forest section no. 6k, 12 June 1999, *leg. K. Czyżewska* (LOD 11137); Cg-03 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, 'Góra Pieszczana' nature reserve, forest section no. 149, 8 ept. 1987, *leg. S. Cieśliński & J. Zielińska* (KTC together with *M. nitschkeana*); Cg-12 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, Królowy Most village, 19 Aug. 2000, *leg. K. Czyżewska* (LOD 11962); Cg-22 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: 5 km NE of Folwarki Małe village, 28 June 1991, *leg. S. Cieśliński* (KTC); Cg-24 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: 3 km W of Podozierany settlement from the side of Michałów

- village, 22 May 1992, *leg. S. Cieśliński* (KTC; GPN 2075); 3 km E of Mieleszki village, 29 June 1991, *leg. S. Cieśliński* (KTC); Cg-36 – DOLINA GÓRNEJ NARWI VALLEY: Białowieża Primeval Forest, Browsk forest division, forest section no. 4A, loc. 117, 1982, *leg. S. Cieśliński & Z. Tobolewski* (KTC; POZ); Cg-41 – RÓWNINA BIELSKA PLAIN: 1 km W of Chraboły village, 13 Aug. 1992, *leg. S. Cieśliński* (KTC); Cg-44 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Browsk forest division, forest section no. 74B, loc. 8a, 1981–1984, *leg. S. Cieśliński & Z. Tobolewski* (POZ; BSG), as *Catillaria* sp.; Cg-51 – RÓWNINA BIELSKA PLAIN: Proniewiczze village near Bielsk Podlaski town, 1981, *leg. S. Cieśliński* (KTC); Cg-55 – RÓWNINA BIELSKA PLAIN: Pogorzelce village, 28 July 1981, *leg. M. R. D. Seaward & Z. Tobolewski* (Hb. MRDS 103950; POZ) and 1982, *leg. S. Cieśliński & Z. Tobolewski* (KTC); Białowieża Primeval Forest, Białowieża forest division, forest section no. 251A, loc. 164, 1982, *leg. S. Cieśliński & Z. Tobolewski* (POZ), as *Catillaria* sp.; Białowiecki National Park, forest section no. 255D, 1982, *leg. S. Cieśliński & Z. Tobolewski* (KTC) and forest section no. 256, 1989, *leg. S. Cieśliński, K. Czyżewska & K. Glanc* (KTC together with *M. elachista*); Cg-63 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Hajnówka forest division, forest section no. 459D, loc. 189, at edge of forest, 198?, *leg. S. Cieśliński* (BSG); Cg-64 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Hajnówka forest division, forest section no. 468A, 1981, *leg. S. Cieśliński & Z. Tobolewski* (KTC; BSG) and forest section no. 572A, ‘Michnówka’ nature reserve, loc. 93, 1982, *leg. S. Cieśliński & Z. Tobolewski* (BSG) and also 11 Aug. 2002, *leg. P. Czarnota* (GPN 2973); Cg-65 – RÓWNINA BIELSKA PLAIN: Białowieża village, palace garden, loc. 39, 198?, *leg. S. Cieśliński* (BSG); Białowieża Primeval Forest, Białowieża forest division, forest section no. 494C, 13 Aug. 2002, *leg. P. Czarnota* (GPN 3037); Cg-70 – RÓWNINA BIELSKA PLAIN: ca 3 km S of Boćki village, 30 Aug. 1991, *leg. S. Cieśliński* (KTC); Cg-72 – RÓWNINA BIELSKA PLAIN: 1 km WWS of Jelonka village, 1980, *leg. S. Cieśliński* (KTC); border of ‘Jelonka’ nature reserve, 27 Oct. 2003, *leg. K. Czyżewska* (LOD 11840), as *M. misella*; Da-04 – POJEZIERZE LUBUSKIE LAKELAND, RÓWNINA TORZYMSKA PLAIN: Puszcza Rzepińska Forest, ca 4 km S of Rzepin town, Nowy Młyn forest district [52°18'03"N/14°46'37"E] alt. 60 m, 8 Apr. 2006, *leg. P. Czarnota 4841, 4846* (GPN); Da-07 – POJEZIERZE ŁAGOWSKIE LAKELAND, Puszcza Rzepińska Forest, by the border of ‘Pawski Ług’ nature reserve, by road between Łągów village and Torzym town [52°18'44"N/15°15'27"E] 8 Apr. 2006, *leg. P. Czarnota 4802* (GPN); Da-18 – POJEZIERZE ŁAGOWSKIE LAKELAND: S of Mostki village [52°14'42"N/15°22'14"E] 8 July 2005, *leg. P. Czarnota 4634* (GPN); Da-26 – RÓWNINA TORZYMSKA PLAIN: by road between Bytnica village and Krosno Odrzańskie town [52°07'27"N/15°08'05"E] alt. 45 m, 8 July 2005, *leg. P. Czarnota 4649* (GPN); Da-45 – WZNIESIENIA ZIEŁONOGÓRSKIE HEIGHTS, WZNIESIENIA GUBIŃSKIE HEIGHTS: by road between Krosno Odrzańskie and Gubin towns [51°59'24"N/14°58'29"E] 8 July 2005, *leg. P. Czarnota 4616* (GPN); Da-58 – WAŁ ZIEŁONOGÓRSKI RAMPART: Zielona Góra town (Grünberg), 31 Mar. 1885, *leg. T. Hellwig* (WRSL), as *Biatorina globulosa*; Da-64 – OBNIŻENIE DOLNOŁUŻYCKIE DEPRESSION, KOTLINA ZASIECKA BASIN: Bory Zielonogórskie Forest, 2 km S of Brody village [51°46'06"N/14°48'14"E] 8 July 2005, *leg. P. Czarnota 4640* (GPN); Da-95 – NIZINA ŚLĄSKO-ŁUŻYCKA LOWLAND, BORY DOLNOŚLĄSKIE FOREST: S part of Lutyńka village, 14 Sept. 2000, *leg. Śliwa 1371, 1382* (KRAM); Db-01 – POJEZIERZE LUBUSKIE LAKELAND, BRUZDA ZBĄSZYŃSKA DEPRESSION: Pszczewski Landscape Park, ca 2 km N of Trzciel village, E of Wielkie Lake, 7 July 2005, *leg. P. Czarnota 4624, 4629* (GPN); Db-03 – POJEZIERZE WIELKOPOLSKO-KUJAWSKIE LAKELAND, POJEZIERZE POZNAŃSKIE LAKELAND, ca 0.5 km S of Bolewicko village near Nowy Tomyśl town, 7 July 2005, *leg. P. Czarnota 4669, 4673* (GPN); Db-18 – POZNAŃSKI PRZEŁOM WARTY: Wielkopolski National Park, near ‘Bór Nadwarciański’ nature reserve, ca 2 km N of Puszczykowo town, 7 July 2005, *leg. P. Czarnota 4630* (GPN); Db-31 – POJEZIERZE LUBUSKIE LAKELAND, BRUZDA ZBĄSZYŃSKA DEPRESSION: ca 4 km S of Babimost town by road to Kargowa village, 7 July 2005, *leg. P. Czarnota 4656* (GPN); Dc-29 – NIZINA POŁUDNIOWOWIELKOPOLSKA LOWLAND, WYSOCZYNA TURECKA PLATEAU: Gaj forest division, near Tury village, 6 Oct. 1981, *leg. K. Glanc* (GPN 2650); Dd-68 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, WZNIESIENIA ŁÓDZKIE HEIGHTS: Wzniesienia Łódzkie Landscape Park, Tadzín forest district, forest section no. 110, ca 1 km W of Tadzín village [51°49'39"N/19°44'33"E] ca 190 m, 14 July 2004, *leg. P. Czarnota 4178* (GPN) and forest section no. 118 [51°49'41"N/19°44'07"E] 14 July 2004, *leg. P. Czarnota 4175* (GPN); Dd-76 – WZNIESIENIA ŁÓDZKIE HEIGHTS: ‘Las Łągiewnicki’ nature reserve, forest section no. 24o, 30 Aug. 1996, *leg. B. Kośmider* (LOD 9519 together with *M. micrococca*) and 31 Aug. 1996, *leg. B. Kośmider* (LOD 9972), as *M. prasina*; De-15 – NIZINA ŚRODKOWOMAZOWIECKA LOWLAND, KOTLINA WARSZAWSKA BASIN: Puszcza Kampinoska Forest, Kampinoski National Park, ‘Sieraków’ nature reserve,

- Liszki forest district, forest section no. 72c [52°20'27"N/20°47'42"E] alt. ca 60 m, 27 Apr. 2004, *leg. P. Czarnota* 3947, 4043, 4097 (GPN); De-40 – RÓWNINA ŁOWICKO-BŁOŃSKA PLAIN: Bolimowski Landscape Park, Dzierżógów village, 12 Apr. 1999, *leg. K. Czyżewska* (LOD 10254), as *M. misella*; De-41 – RÓWNINA ŁOWICKO-BŁOŃSKA PLAIN: Bolimowski Landscape Park, Budy Grabskie village, 11 July 1998, *leg. K. Czyżewska* (LOD 11857); De-52 – RÓWNINA ŁOWICKO-BŁOŃSKA PLAIN: Bolimowski Landscape Park, near Jeruzal village, 24 May 1999, *leg. K. Czyżewska* (LOD 10641); De-90 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, RÓWNINA PIOTRKOWSKA PLAIN: Puszcza Pilicka Forest, Lubochnia forest division, forest section no. 239g, 1 Aug. 1975, *leg. K. Czyżewska* (LOD 4497); Df-09 – NIZINA PÓLNOCNOPODLASKA LOWLAND, WYSOCZYNA DROHICZYŃSKA PLATEAU: 2 km E of Ogrodniki village, 22 Aug. 1992, *leg. S. Ciesliński* (KTC); Df-48 – NIZINA POŁUDNIOWOPODLASKA LOWLAND, RÓWNINA ŁUKOWSKA PLAIN: by road between Łuków and Międzyrzec Podlaski towns [51°58'25"N/22°40'24"E] 21 June 2005, *leg. P. Czarnota* 4721 (GPN); Df-54 – RÓWNINA ŁUKOWSKA PLAIN: 'Jata' nature reserve, Łuków forest division, forest section no. 285 [51°57'21"N/22°11'25"E] 21 June 2005, *leg. P. Czarnota* 4713 (GPN); Dg-00 – WYSOCZYNA DROHICZYŃSKA PLATEAU: stone-pit in Mielnik village, 12 Aug. 1996, *leg. S. Ciesliński* (KTC); 2 km NW of Mielnik village, by road to Drohiczyn town, 12 Aug. 1996, *leg. S. Ciesliński* (KTC); Dg-90 – WESTERN POLESIE, RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Lasy Parczewskie Wood, Parczew forest division, forest section no. 70, 'Torfowisko przy Jeziorze Czarnym' nature reserve [51°31'05"N/23°02'15"E] 27 Oct. 2004, *leg. P. Czarnota* 4251 (GPN); Dg-91 – RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Lasy Parczewskie Wood, ca 2 km NE of Stary Orzechów village by road between Łęczna town and Sosnowica village [51°30'14"N/23°02'53"E] alt. ca 160 m, 27 Oct. 2004, *leg. P. Czarnota* 4227 (GPN); Ea-77 – WESTERN SUDETES, GÓRY IZERSKIE MTS: Dolina Izery valley, ca 1 km W of Orle settlement, in spruce stand on peat-bog [50°49.11'N/15°22.63'E] alt. ca 800 m, 9 July 2003, *leg. P. Czarnota* (GPN 3529); Ea-78 – KARKONOSZE MTS: Szklarska Poręba town by red hiking track, 1 May 1999, *leg. M. Ratajczak* (LOD 10899 together with *M. botryoides*); Pogórze Karkonoskie Foothills, ca 0.5 km NE of Michałowice village, below Piechowicka Góra Mt. [50°50.38'N/15°34.95'E] alt. 560 m, 9 July 2003, *leg. P. Czarnota* (GPN 3553); Ea-89 – KARKONOSZE MTS: Karkonoski National Park: Mały Staw glacial corrie, below hiking track [50°45.03'N/15°41.75'E] alt. 1360 m, 8 July 2003, *leg. P. Czarnota* (GPN 3543, 3544 together with *M. leprosula*), above Wielki Staw glacial corrie, by hiking track within dwarf pine community [50°45.29'N/15°41.58'E] alt. 1400 m, 8 July 2003, *leg. P. Czarnota* (GPN 3464), by waterfalls on Łomniczka stream [50°44.57'N/15°43.74'E] alt. 1320 m, 7 July 2003, *leg. P. Czarnota* (GPN 3469), between Kopa Mt. and Łomniczka stream within dwarf pine community [50°44.64'N/15°43.66'E] alt. 1350 m, 7 July 2003, *leg. P. Czarnota* (GPN 3467), Równia pod Śnieżką region, near the ruins of a military house, alt. 1430 m, 8 July 2003, *leg. P. Czarnota* (GPN 3495); Eb-51 – POGÓRZE ZACHODNIOSUDECKIE FOOTHILLS, POGÓRZE KACZAWSKIE FOOTHILLS: near Kamiennik stream, E of Świerzawa town [51°00'37"N/15°59'00"E] alt. ca 290 m, 22 Apr. 2005, *leg. P. Czarnota* 4748 (GPN); Eb-71 – WESTERN SUDETES, RUDAWY JANOWICKIE MTS: Miedzianka village, 23 Sept. 1999, *leg. G. Leśniński* (OPUN); Strużnica village, W of Czartówka Wood by forest road, alt. ca 600 m, 13 Oct. 1999, *leg. G. Leśniński* (OPUN); Eb-78 – PRZEDGÓRZE SUDECKIE FORELAND, ŚLĘŻA MASSIF: Sulistrowiczki village near Wrocław town, 7 Sept. 1984, *leg. M. R. D. Seaward, E. Bylińska & T. Kiss* (WRSL ex Hb. Seaward 69838); Eb-80 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park: Karpacz – Wilcza Poręba town, Dolina Łomniczki valley, by hiking track [50°45.81'N/15°45.32'E] alt. 710 m, 7 July 2003, *leg. P. Czarnota* (GPN 3459, 3472), Czarne Zbocze region in Sowa Dolina valley below Sowa Pass, alt. 1034 m, 2003, *leg. M. Staniaszek* (Hb. Staniaszek); Eb-95 – MIDDLE SUDETES, GÓRY SOWIE MTS: S slope of Wielka Sowa Mt. above Sokolec village [50°39'50"N/16°29'16"E] alt. ca 690 m, 21 Apr. 2005, *leg. P. Czarnota* 4698 (GPN); Ec-04 – OBNIŻENIE MILICKO-GŁOGOWSKIE DEPRESSION, KOTLINA MILICKA BASIN, S of Odolanów town [52°31'27"N/17°45'34"E] alt. 150 m, 4 July 2005, *leg. P. Czarnota* 4684 (GPN); Ec-15 – WAŁ TRZEBNICKI RAMPART, WZGÓRZA OSTRZESZOWSKIE HILLS: ca 2.5 km W of Ostrzeszów town [51°26'13"N/17°51'52"E] alt. 190 m, 4 July 2005, *leg. P. Czarnota* 4645 (GPN); Ec-74 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA OPOLSKA PLAIN: Bory Stobrawskie Forest, ca 2 km SE of Karłowice village [50°51'11"N/17°44'32"E] 24 Apr. 2005, *leg. P. Czarnota* 4429 (GPN); Ec-88 – WYŻYNA WOŹNICKO-WIELUŃSKA UPLAND, Próg Woźnicki: 7 km S of Olesno town, by road between Dobrodzień and Olesno [50°48'38"N/18°24'31"E] alt. 260 m, 4 July 2005, *leg. P. Czarnota* 4521 (GPN); Ed-13 – NIZINA POŁUDNIOWOWIELKOPOLSKA LOWLAND, KOTLINA SZCZERDOWSKA BASIN: Bełchatów Industrial Region, Magdalenów-Sarnów village, 11 Oct. 1984, *leg. K. Czyżewska* (LOD 7995, 7996 together with

- M. nitschkeana*); Ed-23 – KOTLINA SZCZERCOWSKA BASIN: Bełchatów Industrial Region, Szczerców village, by the bridge on Widawka River, 11 Oct. 1984, leg. K. Czyżewska (LOD 7993); Ed-26 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, WYSOCZYŻNA BĘLCHATOWSKA PLATEAU: Bełchatów Industrial Region, Słostowice forest district, forest section no. 206, 16 Sept. 1982, leg. K. Czyżewska (LOD 8690); Kmieczna village, 27 Sept. 1984, leg. K. Czyżewska (LOD 7813, 8747); Ed-28 – RÓWNINA PIOTRKOWSKA PLAIN: Lubień forest division, Lubień Wood, forest section no. 138, 7 July 1972, leg. K. Czyżewska (LOD 1902) and forest section no. 116g, 7 July 1972, leg. K. Czyżewska (LOD 1626), as *Bacidia nitschkeana*; Ed-35 – WYSOCZYŻNA BĘLCHATOWSKA PLATEAU: Bełchatów Industrial Region, Bełchatów forest division, Łuszczanowice Wood, forest section no. 166j, 13 July 1982, leg. K. Czyżewska (LOD 4621), as *M. nitschkeana*; Ed-39 – RÓWNINA PIOTRKOWSKA PLAIN: Trzymorgi village, 9 Oct. 1971, leg. K. Czyżewska (LOD 2871); Ed-40 – WYŻYNA WOŹNICKO-WIELUŃSKA UPLAND, WYŻYNA WIELUŃSKA UPLAND: Przycłapy village, 24 June 1964, leg. J. Nowak (KRAM-L 11972, 11973), the last one as *Catillaria* cf. *prasina*; Ed-46 – WYŻYNA PRZEDBORSKA UPLAND, WZGÓRZA RADOMSZCZAŃSKIE HILLS: Fryszlerka village, 28 Oct. 1969, leg. K. Czyżewska (LOD 1911), as *Catillaria prasina*; Radomsko forest division, Kocierzowy forest district, forest section no. 11, 22 Apr. 1970, leg. K. Czyżewska (LOD 1909), as *Catillaria prasina*; Ed-47 – WZGÓRZA RADOMSZCZAŃSKIE HILLS: Kobile Wielkie forest division, Kodrąb Wood, forest section no. 120, 29 Aug. 1972, leg. K. Czyżewska (LOD 1899); Ed-49 – WZGÓRZA RADOMSZCZAŃSKIE HILLS: Zbyłowice village, 14 Apr. 1971, leg. K. Czyżewska (LOD 1893, 1896); Ed-50 – WYŻYNA WOŹNICKO-WIELUŃSKA UPLAND, WYŻYNA WIELUŃSKA UPLAND: Kluski settlement near Dalachów village, 26 June 1964, leg. J. Nowak (KRAM-L 13153), as *Catillaria prasina*; Ed-57 – WYŻYNA PRZEDBORSKA UPLAND, WZGÓRZA RADOMSZCZAŃSKIE HILLS: Kobile Wielkie forest division, Wilkowie Wood, 29 Apr. 1970, leg. K. Czyżewska (LOD 1900), 26 Aug. 1971, leg. K. Czyżewska (LOD 1901) and 5 Oct. 1971, leg. K. Czyżewska (LOD 1903); ‘Kobile Wielkie’ nature reserve, forest section no. 178, 7 July 1971, leg. K. Czyżewska (LOD 1895); Kobile Wielkie forest division, forest section no. 158, 27 Oct. 1971, leg. K. Czyżewska (LOD 1898) and forest section no. 174, 11 Nov. 1971, leg. K. Czyżewska (LOD 1894); Ed-68 – NIECKA WŁOSZCZOWSKA BASIN: Silniczka forest division, Dębowiec Wood, forest section no. 160, 26 Aug. 1970, leg. K. Czyżewska (LOD 937) and 24 Sept. 1970, leg. K. Czyżewska (LOD 936) and forest section no. 163, 24 Sept. 1970, leg. K. Czyżewska (LOD 962); Ed-77 – NIECKA WŁOSZCZOWSKA BASIN: Gidle forest division, Żytno Wood, forest section no. 159, 7 Nov. 1972, leg. K. Czyżewska (LOD 1897); Łabędź village, 20 June 1969, leg. K. Czyżewska (LOD 2071), as *Catillaria prasina*; Ed-79 – NIECKA WŁOSZCZOWSKA BASIN: Kurzelów village, ca 7 km NW of Włoszczowa town, July 1987, leg. V. Rzódeczko & K. Toborowicz (KTC); Ed-85 – WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND, WYŻYNA CZĘSTOCHOWSKA UPLAND: near Ciecierzyn settlement between Janów and Olsztyn villages, SE of Częstochowa town, 2002, leg. M. Grzyb (OPUN); Ed-96 – WYŻYNA PRZEDBORSKA UPLAND, PRÓG LEŁOWSKI SCARP: vicinity of Bystrzanowice village, 17 Aug. 1987, leg. D. Kowalska (LOD 10120), as *M. prasina*; Ee-00 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, RÓWNINA PIOTRKOWSKA PLAIN: ‘Spała’ nature reserve, forest section no. 287, 24 Aug. 1970, leg. K. Czyżewska (LOD 454); Ee-09 – NIZINA ŚRODKOWOMAZOWIECKA LOWLAND, RÓWNINA KOZIENICKA PLAIN: Puszcza Kozienicka Forest, ca 0.85 km WNW of Wygwizdów village near Pionki town, 1978, leg. A. Anusiewicz & S. Cieśliński (KTC); ca 0.7 km NNW of Kamyk village near Pionki town, 1978, leg. A. Anusiewicz & S. Cieśliński (KTC); ca 1.5 km SE of Brzezinki village near Pionki town, 1978, leg. A. Anusiewicz & S. Cieśliński (KTC); Ee-66 – WYŻYNA KIELECKA UPLAND, GÓRY ŚWIĘTOKRZYSKIE MTS: Psary – Stara Wieś village, 3 July 2000, leg. A. Donica (KTC); Świętokrzyski National Park, Dąbrowa forest district, Plecionki Wood, forest section no. 12, 3 Aug. 2001, leg. A. Donica (KTC); Ee-70 – WYŻYNA PRZEDBORSKA UPLAND, PASMO PRZEDBORSKO-MAŁOGOSKIE RANGE: Sułków settlement near Krasocin village, July 1977, leg. U. Kruk & K. Toborowicz (KTC); Ee-71 – PASMO PRZEDBORSKO-MAŁOGOSKIE RANGE: Krasocin village, July 1977, leg. U. Kruk & K. Toborowicz (KTC); Ee-74 – WYŻYNA KIELECKA UPLAND, GÓRY ŚWIĘTOKRZYSKIE MTS: Kielce forest division, forest section no. 6, 1986, leg. Bidziński (KTC); Ee-76 – GÓRY ŚWIĘTOKRZYSKIE MTS: Łysogóry range, Winna settlement, 27 May 1981, leg. I. Wrocławska & K. Toborowicz (KTC), as *Catillaria micrococca*; Świętokrzyski National Park, Dolina Wilkowska valley, forest section no. 69, 29 May 1982, leg. S. Cieśliński (KTC); Ee-77 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park: Łysogóry range, N slope of Łysa Góra Mt., forest section no. 117, upper edge of field-block, 3 July 2000, leg. A. Donica (KTC), Święty Krzyż forest district, forest sections no. 196/197, field-block, 5 July 2001, leg. A. Donica (KTC); Łysogóry range, Szklana Huta settlement, by forest border of the Świętokrzyski National Park, W slope of Łysa

- Góra Mt., 22 Sept. 2000, *leg. A. Donica* (KTC); Świętokrzyski National Park, at foot of Chełmowa Góra Mt., near forester's lodge in Serwis village [50°53'00"N/21°05'25"E] 6 May 2004, *leg. P. Czarnota 3826* (GPN); Ee-81 – WYŻYNA PRZEDBORSKA UPLAND, PASMO PRZEDBORSKO-MALOGOSKIE RANGE: Wiśnicz village near Małogoszcz town, July 1977, *leg. Z. Kolenda & K. Toborowicz* (KTC); Ee-82 – WYŻYNA KIELECKA UPLAND, GÓRY ŚWIĘTOKRZYSKIE MTS: Wzgórza Chęcinańskie range, Góra Bocheńska Mt. (Czubatka Mt.) on the Łośna River near Bocheniec village, 17 Nov. 1974, *leg. K. Toborowicz* (KTC); Ee-86 – GÓRY ŚWIĘTOKRZYSKIE MTS: 'Białe Ługi' nature reserve near Cisów village, 15 Sept. 1999, *leg. S. Cieśliński* (KTC); Ee-96 – POGÓRZE KACZAWSKIE FOOTHILLS: Potok forest district, forest section no. 75, 22 Mar. 1977, *leg. K. Toborowicz* (KTC); Rudki settlement near Drugnia village, Drugnia forest district, forest section no. 105, 23 Sept. 1975, *leg. K. Toborowicz* (KTC 3560, 3615); Ef-53 – WYŻYNA LUBELSKA UPLAND, WZNIESIENIA URZĘDOWSKIE HEIGHTS: forest ca 1 km S of Mazanów village [50°59'09"N/21°54'49"E] 26 Oct. 2004, *leg. P. Czarnota 4255* (GPN); Ef-73 – WZNIESIENIA URZĘDOWSKIE HEIGHTS: Kopce settlement near Annopol village on the Vistula River, 1975, *leg. Z. Flisińska* (LBL), as *Bacidia trisepta*; Ef-84 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, ca 1.5 km NNE of Gielnia village, 9 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LOD 12329); Ef-85 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park: S edge of Maliniec village [50°42'10"N/22°11'30"E] 9 Sept. 1999, *leg. L. Śliwa & B. Krzewicka* (LBL; KRA), near Narożniki forester's lodge, ca 0.5 km SW of Kolonia Łysaków village, 8 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LOD s.n.); border of Lasy Janowskie Landscape Park, Kolonia Łysaków village, 8 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LBL; LOD 12322); Ef-95 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, complex of ponds near Maliniec village, 8 Sept. 1999, *leg. U. Bielczyk, R. Kozik, L. Lipnicki & H. Wójciak* (LBL); Ef-97 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park: 'Szklarnia' nature reserve [50°38'N/22°23'E] 7 Sept. 1999, *leg. K. Czyżewska* (LOD 10942; LBL), Janów Lubelski forest district, forest section no. 271 [50°37'N/22°28'E] 9 Sept. 1999, *leg. U. Bielczyk, R. Kozik, L. Lipnicki & H. Wójciak* (LBL together with *M. melaena*) and forest section no. 217, on the bridge [50°38'N/22°28'E] 8 Sept. 1999, *leg. U. Bielczyk, R. Kozik, L. Lipnicki & H. Wójciak* (LBL), Porytowe Wzgórze, ca 2.5 km S of Flisy village [50°37.80'N/22°27.99'E] alt. ca 220 m, 10 Oct. 2003, *leg. P. Czarnota* (GPN 3440); Eg-04 – WESTERN POLESIE, RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Lasy Sobiborskie Forest, near 'Żółtowie bagno' nature reserve [51°25'19"N/23°33'41"E] alt. 120 m, 22 June 2005, *leg. P. Czarnota 4584* (GPN); Eg-57 – POLESIE WOŁYŃSKIE, OBNIŻENIE DUBIENKI BASIN: Strzelecki Landscape Park, Strzelce forest division, forest section no. 124, 25 Oct. 1990, *leg. A. Dąbrowski* (LBL); Fb-06 – MIDDLE SUDETES, GÓRY SOWIE MTS: 1.5 km NW of Srebrna Góra village, below the top of Chochoł Wielki Mt. [50°34.90'N/16°37.37'E] 22 Apr. 2004, *leg. P. Czarnota 4155* (GPN); Fb-14 – GÓRY STOŁOWE MTS: by road between Karłów village and Kudowa town, alt. ca 790 m, 23 July 1951, *leg. Z. Tobolewski* (POZ); the top of Szczeliniec Wielki Mt., by hiking track [50°28'57"N/16°20'40"E] alt. 890 m, 17 Sept. 2004, *leg. P. Czarnota 4009* (GPN); Fb-24 – GÓRY STOŁOWE MTS: N edge of Batorów village near the border of Góry Stołowe National Park [50°26.56'N/16°25.28'E] alt. 600 m, 23 Apr. 2003, *leg. P. Czarnota* (GPN 3267); Fb-27 – EASTERN SUDETES, GÓRY ŻŁOTE MTS: near Różaniec Pass, by the border of PL/ČR [50°24'11"N/16°52'15"E] alt. 580 m, 19 Apr. 2005, *leg. P. Czarnota 4413* (GPN); ca 1.5 km S of Złoty Potok town, by road to Łądek Zdrój town [50°26'20"N/16°51'18"E] alt. 450 m, 19 Apr. 2005, *leg. P. Czarnota 4452* (GPN); Fb-34 – MIDDLE SUDETES, GÓRY BYSTRZYCKIE MTS: 'Torfowisko pod Zieleńcem' nature reserve, beat-bog covered by *Pinus mugo* and *Pinus rhaetica* [50°20'48"N/16°24'38"E] alt. ca 700 m, 20 Apr. 2005, *leg. P. Czarnota 4482* (GPN); Lasówka village close to border of PL/ČR [50°19'07"N/16°26'17"E] alt. 615 m, 20 Apr. 2005, *leg. P. Czarnota 4593* (GPN) and [50°19'06"N/16°26'23"E] alt. 625 m, 20 Apr. 2005, *leg. P. Czarnota 4739* (GPN); Fb-47 – EASTERN SUDETES, ŚNIEŻNIK MASSIF: ca 4 km W of Stronie Śląskie town [50°16'06"N/16°50'16"E] alt. ca 640 m, 19 Apr. 2005, *leg. P. Czarnota 4613* (GPN); Fc-31 – GÓRY OPAWSKIE MTS: above Jarmołtówek village [50°17'21"N/17°26'20"E] alt. ca 480 m, 19 Apr. 2005, *leg. P. Czarnota 4419* (GPN); Fc-48 – NIZINA ŚLĄSKA LOWLAND, KOTLINA RACIBORSKA BASIN: Lasy Raciborskie Forest, ca 1 km W of Goszyce village, by road between Gliwice and Kędzierzyn Koźle towns [50°16'33"N/18°22'59"E] 18 Apr. 2005, *leg. P. Czarnota 4444* (GPN); Fd-01 – RÓWNINA OPOLSKA PLAIN: Koszęcin village (Koschentin), 26 Dec. 1888, *leg. B. Stein* (WRSL), as *Biatora asserculorum*; Fd-10 – RÓWNINA OPOLSKA PLAIN: ca 2 km NE of Koty village, by road between Tworogi and Lubliniec town

- [50°33'44"N/18°42'54"E] alt. 220 m, 4 July 2005, *leg. P. Czarnota 4509* (GPN); Fd-36 – WYŻYNA ŚLĄSKA UPLAND, GARB TARNOGÓRSKI HUMMOCK: zinc-lead spoil by lead works near Bolesław village, N of Bukowno town, 22 June 2004, *leg. J. Kiszka* (KRAP), 23 June 2004, *leg. J. Kiszka* (KRAP), 16 July 2004, *leg. J. Kiszka* (KRAP) and 17 July 2004, *leg. J. Kiszka* (KRAP); Fd-91 – POGÓRZE ZACHODNIOBESKIDZKIE FOOTHILLS, POGÓRZE ŚLĄSKIE FOOTHILLS: Ogródzona village, Kamieniec Wood by road between Cieszyn and Bielsko-Biała towns, 6 Aug. 1998, *leg. G. Leśniński* (OPUN); Fd-94 – WESTERN BESKIDY MTS, BESKID MAŁY MTS: Nowy Świat settlement, W of Międzybrodzkie Lake, alt. ca 615 m, 13 Oct. 1966, *leg. J. Nowak* (KRAM-L 4146); Fd-96 – BESKID MAŁY MTS: Do Fiska settlement in Ponikiew village, the bridge on Ponikiewka stream, alt. 410 m, 13 Oct. 1966, *leg. J. Nowak* (KRAM-L 4122); Fd-97 – BESKID MAŁY MTS: Pustki settlement in Tarnawa Dolna village, alt. ca 320 m, 22 June 1995, *leg. U. Bielczyk & L. Śliwa* (KRAM-L 42063); Fd-99 – BESKID MAKOWSKI MTS: Jamrozówka settlement in Stróża village, alt. ca 370 m, 22 Aug. 1996, *leg. J. Nowak* (KRAM-L 42998); Janicki settlement in Zawadka village, alt. 660 m, 28 Apr. 1966, *leg. J. Nowak* (KRAM-L 17312); Fe-04 – WYŻYNA KIELECKA UPLAND, POGÓRZE SZYDŁOWSKIE FOOTHILLS: Włoszczowice village, near road between Kielce and Pinczów towns, 31 Aug. 1975, *leg. K. Toborowicz* (KTC); Fe-08 – POGÓRZE SZYDŁOWSKIE FOOTHILLS: Mostki forest district, forest section no. 130, at edge of Poręby village, 3 July 1986, *leg. M. Chyb* (KTC), as *Catillaria prasina*; Fe-08 – NIECKA NIDZIAŃSKA BASIN, NIECKA POLANIECKA BASIN: Oględów village near Staszów town, 4 Sept. 1990, *leg. J. Kiszka* (BDPA together with *M. prasina* s.str.); Fe-72 – KOTLINA SANDOMIERSKA BASIN, NIZINA NADWIŚLAŃSKA LOWLAND: Puszcza Niepołomska Forest, forest section no. 188, near cemetery from the Second World War, 22 Sept. 2000, *leg. J. Kiszka* (GPN 2415), forest section no. 253, 28 Oct. 2000, *leg. J. Kiszka* (KRAP) and forest section no. 138, 10 Oct. 2000, *leg. J. Kiszka* (KRAP); Fe-83 – POGÓRZE ZACHODNIOBESKIDZKIE FOOTHILLS, POGÓRZE WIŚNICKIE FOOTHILLS: Wiśnicko-Lipnicki Landscape Park, Stary Wiśnicz village, alt. 255 m, 24 Mar. 2000, *leg. P. Stolarczyk* (KRA); NW slope of Paprotna Mt., alt. 409 m, 7 May 2000, *leg. L. Śliwa 1097* (KRAM); Królówka-Uzbornia village, 2 June 1998, *leg. L. Śliwa 729b* (KRAM); Fe-95 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE RÓŻNOWSKIE FOOTHILLS: Borowa village, alt. 280 m, 20 June 1971, *leg. R. Kozik* (KRAP), as *Catillaria prasina*; Ff-06 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Forest, Zdziary village, 22 Oct. 1991, *leg. J. Kiszka* (BDPA), as *M. prasina*; Ff-08 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Forest, 'Kacze Błota' nature reserve [50°35'N/22°33'E] 9 Sept. 1999, *leg. I. Izydorek* (Hb. Izydorek; GPN 2688); Ff-09 – RÓWNINA BIŁGORAJSKA PLAIN: Gliniary forest nursery near Biłgoraj town, 29 Aug. 1987, *leg. J. Kiszka & J. Piórecki* (BDPA); Ff-12 – RÓWNINA TARNOBRZESKA PLAIN: Puszcza Sandomierska Forest, near Rozalin village, 22 Aug. 1988, *leg. J. Kiszka & J. Piórecki* (KRAP); Ff-13 – RÓWNINA TARNOBRZESKA PLAIN: Puszcza Sandomierska Forest, vicinity of Krawce village, 28 Aug. 1988, *leg. J. Kiszka & J. Piórecki* (BDPA); Ff-16 – PŁASKOWYŻ TARNOGRODZKI PLATEAU: Glinianka settlement near Ulanów village on San River, 29 Aug. 1987, *leg. J. Kiszka & J. Piórecki* (BDPA); Ff-21 – RÓWNINA TARNOBRZESKA PLAIN: Puszcza Sandomierska Forest, Durdy village near Baranów Sandomierski town, 22 June 1988, *leg. J. Kiszka & J. Piórecki* (BDPA); Ff-31 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: Puszcza Sandomierska Forest, W edge of Ostrowy Baranowskie village [50°20.92'N/21°38.44'E] alt. 110 m, 6 Aug. 2003, *leg. P. Czarnota* (GPN 3642); Ff-41 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: Przyłęk village, July 1956, *leg. J. Nowak* (KRAM-L 5316); Ff-52 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: ca 2 km S of Przedbórz village by road to Sędziszów Małopolski town [50°09'02"N/21°45'31"E] 18 Apr. 2005, *leg. P. Czarnota 4536* (GPN); Ff-59 – PŁASKOWYŻ TARNOGRODZKI PLATEAU: Radawa? village, 17 July 1984, *leg. J. Kiszka & J. Piórecki* (BDPA); Ff-71 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE STRZYŻÓWSKIE FOOTHILLS: ca 1 km NE of Brzeziny village [49°56'09"N/21°34'15"E] alt. ca 300 m, 17 Apr. 2005, *leg. P. Czarnota 4755* (GPN); Ff-82 – POGÓRZE DYNOWSKIE FOOTHILLS, the pass below Krowia Góra Mt., by forest road between Kozłówek and Łęki Strzyżowskie villages [49°50'17"N/21°40'14"E] alt. 420 m, 17 Apr. 2005, *leg. P. Czarnota 4545* (GPN); Ff-97 – POGÓRZE PRZEMYSKIE FOOTHILLS: Iskań village, 11 Dec. 1986, *leg. J. Kiszka & J. Piórecki* (BDPA); Ff-98 – POGÓRZE PRZEMYSKIE FOOTHILLS: Cisowa Dolna village, 29 Sept. 1983, *leg. J. Kiszka & J. Piórecki* (KRAM-L 29992); Reczpol village, on right side of San River, 23 June 1984, *leg. J. Kiszka & J. Piórecki* (BDPA), as *Catillaria prasina* for. *byssacea*; Fg-12 – ROZTOCZE, MIDDLE ROZTOCZE: Puszcza Solska Forest, Józefów forest division, Kalina forest district, 'Czartowe Pole' nature reserve near Hamernia village [50°26'25"N/23°06'30"E] alt. ca 250 m, 28 Oct. 2004, *leg. P. Czarnota 4235* (GPN); Fg-14 – MIDDLE ROZTOCZE, Żytki settlement [50°23'N/23°29'E] alt. 300 m, *leg. P. Czarnota*

*nota 4706* (GPN); Fg-31 – KOTLINA SANDOMIERSKA BASIN, PŁASKOWYŻ TARNOGRODZKI PLATEAU: Stary Dzików village, 24 July 1984, *leg. J. Kiszka & J. Piórecki* (BDPA), as *Catillaria elachista*; Fg-32 – PŁASKOWYŻ TARNOGRODZKI PLATEAU, by forest road between Nowy Lubliniec and Susiec villages [50°18'25"N/23°05'27"E] alt. 250 m, 18 June 2005, *leg. P. Czarnota 4702* (GPN); Fg-34 – ROZTOCZE, EASTERN ROZTOCZE: Puszcza Solska Forest, ca 3 km SW of Werchrata village [50°14'04"N/23°27'53"E] alt. ca 310 m, 18 June 2005, *leg. P. Czarnota 4728* (GPN); Fg-43 – KOTLINA SANDOMIERSKA BASIN, PŁASKOWYŻ TARNOGRODZKI PLATEAU: Basznia Dolna village, by a coart-road, 29 July 1984, *leg. J. Kiszka* (BDPA); Fg-51 – PŁASKOWYŻ TARNOGRODZKI PLATEAU: Sucha Wola village, 8 June 1986, *leg. J. Kiszka & J. Piórecki* (BDPA); Fg-62 – PŁASKOWYŻ TARNOGRODZKI PLATEAU: Młyny village, 24 July 1984, *leg. J. Kiszka & J. Piórecki* (BDPA); Gd-01 – POGÓRZE ZACHODNIOBESKIDZKIE FOOTHILLS, POGÓRZE ŚLĄSKIE FOOTHILLS: Wzgórza Goleszowskie hills, Cisownica village, by shelter-house, 24 June 1998, *leg. G. Leśniański* (OPUN); Gd-06 – WESTERN BESKIDY MTS, BESKID ŻYWIECKI MTS: Pasma Jałowieckie range, Roztoki settlement, S of Stryżawa village, alt. 600 m, 16 Aug. 1965, *leg. J. Nowak* (KRAM-L 15483); Stryżawa village, alt. ca 450 m, 23 July 1965, *leg. J. Nowak* (KRAM-L 15575); Gd-07 – BESKID ŻYWIECKI MTS: Pasma Jałowieckie range, Pasierbiaki settlement, SE of Sucha Beskidzka town, alt. 530 m, 6 Sept. 1965, *leg. J. Nowak* (KRAM-L 15420); Gd-08 – BABIA GÓRA RANGE: Polica range, valley of Cadyńka stream, alt. 600 m, 28 May 1965, *leg. J. Nowak* (KRAM-L 16253, 16257), both as *M. prasina*; Gd-09 – BESKID MAKOWSKI MTS: Łętownia village, U Zwiegadła settlement, alt. 520 m, 11 Oct. 1996, *leg. J. Nowak* (KRAM-L 43273); Pcim village, Wielkie Ulmany settlement, alt. 560 m, 22 Aug. 1996, *leg. J. Nowak* (KRAM-L 42986); Gd-13 – BESKID ŚLĄSKI MTS: E slope of Barania Góra Mt., valley of Bystra stream, alt. ca 1000 m, 10 May 2002, *leg. P. Czarnota* (GPN 2795); Gd-16 – BESKID ŻYWIECKI MTS: Pasma Jałowieckie range, Koszarawa village, valley of Bystra stream, alt. 600 m, 21 July 1965, *leg. J. Nowak* (KRAM-L 15824); Gd-17 – BABIA GÓRA RANGE: Polica range: Śmietanowa glade, alt. 1180 m, 15 June 1965, *leg. J. Nowak* (KRAM-L 17194), between Czarniec Mt. and Polica Mt., alt. 1250 m, 15 June 1965, *leg. J. Nowak* (KRAM-L 15109), as *Catillaria prasina*; Bienkowa glade, alt. 1000 m, 22 June 1965, *leg. J. Nowak* (KRAM-L 17128), as *Catillaria prasina*; Polica Mt., alt. 1340 m, 15 June 1965, *leg. J. Nowak* (KRAM-L 15084), as *Catillaria prasina*; Gd-18 – BABIA GÓRA RANGE: Polica range, Sidzina village, valley below

Staszowie (Rola Staszkowa) settlement, alt. 650 m, 27 June 1965, *leg. J. Nowak* (KRAM-L 16225), as *M. prasina*; Gd-33 – BESKID ŻYWIECKI MTS: Wielka Racza range, valley of Danielka stream, alt. 700 m, 8 Aug. 1964, *leg. J. Nowak* (KRAM-L 13807, 14190, 17131); Gd-58 – TATRA MTS, WEST TATRA MTS: Dolina Lejowa valley, Niżna Polana Kominiarska glade [49°15'12"N/19°50'54"E] alt. 1140 m, 15 June 2004, *leg. L. Śliwa 2144, 2223* (KRAM); Gd-59 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, POGÓRZE SPISKO-GUBAŁOWSKIE FOOTHILLS: Pogórze Gubałowskie foothills, valley of Głęboki stream, alt. 920 m, 15 Sept. 1964, *leg. J. Kiszka* (KRAP together with *M. peliocarpa*), as *Bacidia* sp.; Gd-59 – RÓW PODTATRZAŃSKI DEPRESSION: Nędzówka village, Polana Gronik glade [49°16'35"N/19°53'39"E] alt. 925 m, 14 July 2004, *leg. L. Śliwa 2977* (KRAM); Gd-59 – TATRA MTS, WEST TATRA MTS: Dolina Strażyska valley, E slope of Łysanki Mt., ca 1100 m, 15 Aug. 1958, *leg. Z. Tobolewski* (POZ); Dolina Kościeliska valley, Wyżnia Miętusia Polana glade [49°15'09"N/19°53'44"E] alt. 1160 m, 17 June 2004, *leg. L. Śliwa 2362* (KRAM); Dolina Chochołowska valley, Polana Przysłop Chochołowski glade [49°14'58"N/19°49'37"E] alt. 1200 m, 18 June 2004, *leg. L. Śliwa 2437* (KRAM); Ge-00 – WESTERN BESKIDY MTS, BESKID WYSPOWY MTS: Pcim village, Świątki settlement, alt. 380 m, 1 Oct. 1996, *leg. J. Nowak* (KRAM-L 43182, 43179); Ge-01 – BESKID WYSPOWY MTS: E slope of Lubogoszcz Mt., near the edge of forest, by hiking track from Kasina Wielka village, alt. 660 m, 6 Oct. 2001, *leg. P. Czarnota* (GPN 2715); Ge-11 – GORCE MTS: Turbaczyk glade, alt. 1020 m, 21 June 1993, *leg. P. Czarnota* (GPN 1029); Gorce National Park, the fence by Potasznia forester's lodge, valley of Konina stream, alt. 680 m, 23 Jan. 1993, *leg. P. Czarnota* (GPN 831) and alt. 720 m, 10 Jan. 1994, *leg. P. Czarnota* (GPN 565); Kopa glade, alt. 1000 m, 4 Nov. 1999, *leg. P. Czarnota* (GPN 2191); Ge-20 – GORCE MTS: Nowy Targ – Kowaniec town, the bridge on Kowaniec stream, alt. 630 m, 26 July 1968, *leg. K. Glanc* (KRAM-L 39975); above stone-pit in Klikuszowa village, alt. 740 m, 10 Aug. 1999, *leg. P. Czarnota* (GPN 2280); Ge-21 – GORCE MTS: Gorce National Park, SE slope of Turbacz Mt. in Dolina Łopusznej valley, alt. 1240 m, 10 Sept. 1969, *leg. K. Glanc* (KRAM-L 26410 together with *M. misella*), as *Catillaria prasina*; Hala Turbacz alpine meadow below the top of Turbacz Mt., alt. 1230 m, 16 May 1994, *leg. P. Czarnota* (GPN 620); Mostownica glade, alt. 1230 m, 8 May 1993, *leg. P. Czarnota* (GPN 361) and 10 Oct. 1995, *leg. P. Czarnota* (GPN 468); Podmostownica glade, alt. 940 m, 10 Oct. 1996, *leg. P. Czarnota* (GPN 1451); Gorce



National Park: Dolina Kamienicy valley, N slope of Kiczora Mt., Czerwony Groń forest area, alt. 1020 m, 19 July 1999, *leg. P. Czarnota* (GPN 2017), Dolina Kamienicy valley below Średniak glade, alt. 1000 m, 9 June 1997, *leg. P. Czarnota* (GPN 1644), Dolina Kamienicy valley, Znaki forest area below Bieniowe glade, alt. 1060 m, 26 May 1997, *leg. P. Czarnota* (GPN 1564) and alt. 1050 m, 19 June 2000, *leg. P. Czarnota* (GPN 2735); Ochotnica Dolna village, Dolina Jaszcze valley, 2 Sept. 2005, *leg. M. Węgrzyn 2672* (KRA); Ge-22 – GORCE MTS: S slope of Twarogi Mt. above Ochotnica Dolna village, alt. 580 m, 9 Sept. 1960, *leg. K. Glanc* (KRAM-L 26415, 26422), both as *Catillaria prasina*; E slope of Żdźzar Mt., above Kamienica village, alt. 580 m, 21 Aug. 1966, *leg. K. Glanc* (KRAM-L 39974); Lubań range, valley of Rolnicki stream, alt. 600 m, 18 Oct. 2004, *leg. P. Czarnota 4022 & A. Wojnarowicz* (GPN); estuary of Rolnicki stream to Ochotnica River [49°31'19"N/20°21'41"E] alt. 540 m, 18 Oct. 2004, *leg. P. Czarnota 4024 & A. Wojnarowicz* (GPN); Ge-23 – BESKID SADECKI MTS: Radziejowa range, Klempowa village, alt. 400 m, 15 Sept. 1967, *leg. M. Olech* (KRA); Gaboń forester's lodge, alt. 570 m, 4 May 1991, *leg. L. Śliwa* (KRA); Ge-24 – BESKID SADECKI MTS: Radziejowa range, valley of Jaworzynka stream, alt. ca 500 m, ?, *leg. J. Kiszka & J. Nowak* (KRAM-L 6925); Ge-29 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: Smerekowice village, the bridge on Krzywy stream, alt. 470 m, 26 Oct. 1971, *leg. M. Olech* (KRA); Ge-31 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKO-NOWOTARSKA BASIN: S of Frydman village, 4 Aug. 1968, *leg. J. Kiszka* (KRAP); Ge-32 – PIENINY MTS: Falsztyn village by road to Barwinkowa Góra Mt., 4 Sept. 1996, *leg. J. Kiszka* (KRAP); Ge-33 – WESTERN BESKIDY MTS, BESKID SADECKI MTS: Radziejowa range, Zakijowski stream, alt. 480 m, 13 June 1965, *leg. M. Olech* (KRA); Ge-34 – BESKID SADECKI MTS: Radziejowa range, valley of Zaczerczyk stream, alt. 480 m, 20 Feb. 1990, *leg. L. Śliwa* (KRA), as *M. prasina*; Radziejowa range, Piwniczna forest division, Roztoka Wielka forest district, forest section no. 182, near 'Baniska' nature reserve [49°26'54"N/20°36'37"E] alt. 1000 m, 4 Nov. 2004, *leg. P. Czarnota 4384* (GPN); Ge-35 – BESKID SADECKI MTS: Jaworzyna Krynicka range, valley of Łomniczanka stream, alt. 560 m, 23 Aug. 1967, *leg. M. Olech* (KRA); Ge-36 – BESKID SADECKI MTS: Jaworzyna Krynicka range, Łosie village, alt. 610 m, 14 Oct. 1967, *leg. M. Olech* (KRA); valley of Łosiański stream, alt. 680 m, 9 Apr. 1989, *leg. L. Śliwa* (KRA); Ge-50 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, RÓW PODTATRZAŃSKI DEPRESSION: near Małe Ciche village, Brza-

nówka glade [49°17'23"N/20°05'21"E] alt. 930 m, 24 July 2004, *leg. L. Śliwa 3347* (KRAM); Ge-50 – TATRA MTS, HIGH TATRA MTS: Dolina Suche Wody valley, by Sucha Woda stream, alt. 1170 m, 20 Sept. 1966, *leg. Z. Tobolewski* (POZ); Ge-60 – HIGH TATRA MTS: Dolina Roztoki valley below Krzyżne Pass, Rzędy Niżne region, by hiking track [49°13.14'N/20°02.51'E] alt. 1710 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3581 together with *M. misella*); Gf-06 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE PRZEMYSKIE FOOTHILLS: Dobra village on San River, 1 Sept. 1987, *leg. J. Kiszka & J. Piórecki* (BDPA); Gf-07 – POGÓRZE PRZEMYSKIE FOOTHILLS: Leszczawa Dolna village, 21 July 1984, *leg. J. Kiszka & J. Piórecki* (BDPA); Gf-08 – POGÓRZE PRZEMYSKIE FOOTHILLS, 'Kępak' nature reserve, by road between Bircza and Przemyśl town [49°42'09"N/22°31'55"E] alt. 370 m, 17 June 2005, *leg. P. Czarnota 4499* (GPN); Gf-09 – POGÓRZE PRZEMYSKIE FOOTHILLS: Huwniki village, 28 Sept. 1983, *leg. J. Kiszka & J. Piórecki* (BDPA); ca 1 km N of Makowa village near the cross road to Huwniki village [49°39'27"N/22°41'20"E] alt. ca 320 m, 17 June 2005, *leg. P. Czarnota 4715* (GPN); Gf-09 – EASTERN BESKIDY MTS, GÓRY SANOCKO-TURCZAŃSKIE MTS: Suchy Obycz range, Kalwaria Pałacowska village, 28 Sept. 1983, *leg. J. Kiszka* (BDPA) and 29 Sept. 1984, *leg. J. Kiszka & J. Piórecki* (BDPA); E slope of hill below Kalwaria Pałacowska village, 28 Sept. 1983, *leg. J. Kiszka* (BDPA together with *M. misella*), as *Catillaria prasina*; Gf-16 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE PRZEMYSKIE FOOTHILLS: Tyrawa Solna village, by Tyrawka stream, 28 Oct. 1987, *leg. J. Kiszka & J. Piórecki* (BDPA); Gf-16 – EASTERN BESKIDY MTS, GÓRY SANOCKO-TURCZAŃSKIE MTS: Góry Słonne Mts, Liszna village, below Orle Skałki outcrops, 11 July 1988, *leg. J. Kiszka & J. Piórecki* (BDPA); Gf-17 – GÓRY SANOCKO-TURCZAŃSKIE MTS: Góry Słonne Mts: Tyrawa Wołoska village, 3 Aug. 1988, *leg. J. Kiszka & J. Piórecki* (BDPA), Rozpucie village, 5 May 1987, *leg. J. Kiszka & J. Piórecki* (BDPA), by former road on N slope below the top of the main range of Góry Słonne Mts, 25 July 1985, *leg. J. Kiszka & J. Piórecki* (BDPA), as *Catillaria prasina* for. *byssacea*; Gf-19 – GÓRY SANOCKO-TURCZAŃSKIE MTS: Suchy Obycz range, Paportno village, 30 Oct. 1987, *leg. J. Kiszka & J. Piórecki* (BDPA); Gf-20 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: Nieznajowa village, 17 Oct. 1985, *leg. L. Lipnicki 1341* (Hb. Lipnicki); Gf-21 – BESKID NISKI MTS: Skarpoty settlement near Kremna village, valley of anonymous stream below Cyrła Mt., alt. ca 500 m, 24 Sept. 1979, *leg. J. Nowak* (KRAM-L 33339), as *Micarea* sp.; Gf-22

– BESKID NISKI MTS: S slope of Piotruś Mt., above Stasianie forester's lodge [49°28'11"N/21°44'57"E] alt. ca 670 m, 5 Aug. 2004, leg. P. Czarnota 4055 (GPN); Gf-23 – BESKID NISKI MTS: NE slope of Dział Mt., alt. 525 m, 18 Aug. 1974, leg. J. Kiszka (KRAP), as *Catillaria* sp.; Królik Wołoski village near Rymanów town, a valley of anonymous stream on E slope of Kamionka Mt., alt. ca 460 m, 11 Oct. 1974, leg. J. Nowak (KRAM-L 32905 together with *M. misella*); Gf-33 – BESKID NISKI MTS: Daliowa village, on wooden bridge on Jasiołka River, alt. ca 410 m, 25 Oct. 1974, leg. J. Nowak (KRAM-L 32307); Gf-39 – EASTERN BESKIDY MTS, GÓRY SANOCKO-TURCZAŃSKIE MTS: N edge of Bandrów Narodowy village, by Królówka stream, July 1991, leg. R. Kościelniak (KRAP); Rabe village, 29 Aug. 1991, leg. R. Kościelniak (KRAP); Gf-44 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: vicinity of Wiśtok Wielki Górny village, a ridge between Wiśtok and Janiska streams, alt. ca 725 m, 22 June 1974, leg. J. Nowak (KRAM-L 32830), as *Micarea* sp.; Gf-45 – BESKID NISKI MTS: Radoszyce village near Oslawica River, at foot of SE slope of Kowalówka Mt., alt. 520 m, 20 June 1974, leg. M. Olech (KRA); Gg-00 – POGÓRZE ŚRODKOWO-BESKIDZKIE FOOTHILLS, POGÓRZE PRZEMYSKIE FOOTHILLS: Nowe Sady village, 28 Sept. 1983, leg. J. Kiszka & J. Piórecki (BDPA); Gg-60 – EASTERN BESKIDY MTS, WESTERN BIESZCZADY MTS: Bieszczadzki National Park, Łokieć peat-bog, alt. 635 m, 12 July 2003, leg. J. Kiszka (KRAP); peat-bog near Tarnawa village on the San River, alt. 667 m, 6 July 2003, leg. J. Kiszka (KRAP), as *Micarea* sp.; Gg-71 – WESTERN BIESZCZADY MTS: Bieszczadzki National Park, Sianki forest district, forest section no.78i, 19 June 2002, leg. P. Czarnota (GPN 2880).

ADDITIONAL SPECIMEN EXAMINED: SWEDEN 'Suecia', on lignum (H-ACH 280), as *Lecidea synothesa* (two pieces together with *Scoliciosporum umbrinum*; see comments in Hedlund 1892: 91, and Coppins 1983: 128).

***Micarea elachista*** (Körb.) Coppins & R. Sant.  
(Figs 18 & 19)

in Coppins, Bull. Brit. Mus. (Nat. Hist.), Bot. 11(2): 131. 1983.

*Biatora elachista* Körb., Parerga Lich.: 159. 1860. – *Catillaria elachista* (Körb.) Vain., Acta Soc. Fauna Fl. Fenn. 57(2): 455. 1934. TYPE: Germany (L – LECTOTYPE and ISOLECTOTYPES, *n.v.*).

– *Lecidea anomala* subsp. *glomerella* Nyl., Lich. Scand.:

203. 1861. – *Biatorina glomerella* (Nyl.) Arnold, Flora 53: 474. 1870. – *Catillaria glomerella* (Nyl.) Th. Fr., Lich. Scand. 2: 578. 1874. – *Micarea glomerella* (Nyl.) Hedl., Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, 18(3): 75, 85. 1892. TYPE: Finland, Ostrobothnia australis, Botom, 1859, A. J. Malmgren (H-NYL 19123 – LECTOTYPE!).

– *Lecidea poliococca* Nyl., Lich. Scand.: 203. 1861. – *Catillaria denigrata* f. *poliococca* Vain., Acta Soc. Fauna Fl. Fenn. 57(2): 460. 1934. – *Catillaria synothesa* var. *poliococca* (Nyl.) Erichsen, Ann. Mycol. 41: 205. 1943. TYPE: Sweden, Uppland 'Upsalia, in silva 'Parken', ad pinos decorticatos', 1852, W. Nylander (H-NYL 19144 – HOLOTYPE!).

– *Lecidea sororians* Nyl., Flora 58: 445. 1875. – *Bacidia sororians* (Nyl.) H. Olivier, Bull. Géogr. Bot. 21: 168. 1911. TYPE: Finland (H-NYL 17234 – HOLOTYPE, *n.v.*).

– *Lecidea glomerella* f. *simplicata* Nyl. in Vain., Meddeland. Soc. Fauna Fl. Fenn. 10: 28. 1883. TYPE: Finland (H – LECTOTYPE, *n.v.*; ISOLECTOTYPES: BM, H, M, *n.v.*).

– *Lecidea glomerella* var. *poliococcoides* Vain., Meddeland. Soc. Fauna Fl. Fenn. 10: 29. 1883. TYPE: Finland (TUR-VAINIO 22326 – HOLOTYPE, *n.v.*).

– *Catillaria elachista* var. *carbonicola* Vain., Acta Soc. Fauna Fl. Fenn. 57(2): 458. 1934. TYPE: Finland (H-NYL 19143 – ISOTYPE, *n.v.*).

Thallus usually thick warted, effuse or composed of ±continuous, ±subglobose areolae, whitish-grey, greenish-white, matt; areolae with hyaline, amorphous cortex to 15–20 µm wide, K– or sometimes K+ slightly violet, when olivaceous pigment is presented; when the thallus is injured, areolae small or even thallus granular-warted. Photobiont micareoid; cells globose, 5–7(–8) µm diam. Apothecia immarginate, ±globose, constricted at the base or hemispherical, often becoming tuberculate, brown, dark brown to black-brown, 0.1–0.4(0.6) mm. Hymenium 30–50 µm tall, hyaline, sometimes dilute straw-coloured or colourless, but epithecium well defined, up to 15(–20) µm wide, brownish or dark brown, K+ dissolving and fading into solution, but sometimes later also with K+ slightly violet tinge; pigment concentrated into gel-matrix. Ascospores (0–)1(–3)-septate, narrowly fusiform, oblong-fusiform or ovoid-fusiform, mature usually slightly

curved, like spores of *M. denigrata*, (8–)10–18 (–20) × 2–3.5 µm diam. Paraphyses numerous, hyaline throughout, richly branched and anastomosing in upper part and there strongly concentrated with dense amorphous layer, 1.2–1.8 µm wide, slightly widening towards the apices to 2.0 µm. Hypothecium hyaline or dilute yellowish-brown, K–. Excipulum indistinct, but sometimes in more constricted apothecia the outer hymenial part under hypothecium concolourous to epithecium and consisting with more branched and anastomosing paraphyses. Pycnidia numerous, of two types, completely immersed within globose areolae or often emergent with widely gaping ostioles and sometimes white blobs of conidia; walls of pycnidia around ostiolae olive-brown, K+ violet, C+ violet; mesoconidia cylindrical or ± ovoid, 3.5–4.5 × 1.2–1.7 µm diam.; microconidia narrowly cylindrical, 4.5–6.5 × 0.7–1 µm.

NOTES. *Micarea elachista* is reasonably easy to identify. The ‘Elachista-brown’ pigment within the epithecium, and dissolving in K, is otherwise known within *Micarea* only in *M. perparvula* (Nyl.) Coppins & Printzen and *M. rhabdogena* (Norman) Hedl., neither of which has been found in Poland to date. The last two species have an endoxylic thallus and smaller, mostly simple, ascospores, while *M. elachista* forms distinctly ± globose areolae and fusiform, longer spores. These mentioned features characterizing *M. elachista* can often be referred to more developed, darker forms of *M. denigrata*, but the warted thallus and apothecia of *M. elachista* (even when paler) are never reacting C+ red in contrast to the previous species.

HABITAT AND DISTRIBUTION IN POLAND. *Micarea elachista* is a rare species restricted to natural, old, coniferous or mixed, pine-oak forests. Most of its recent records are concentrated in NE Poland, where large complexes of natural pine forests still occur. Here it grows on decaying wood of coniferous stumps and logs, as well as on the bark at the base of pine trunks within rather more humid and shaded niches, especially in boggy pine forests or at the edge of high peat-bogs covered by *Sphagnum* spp.,

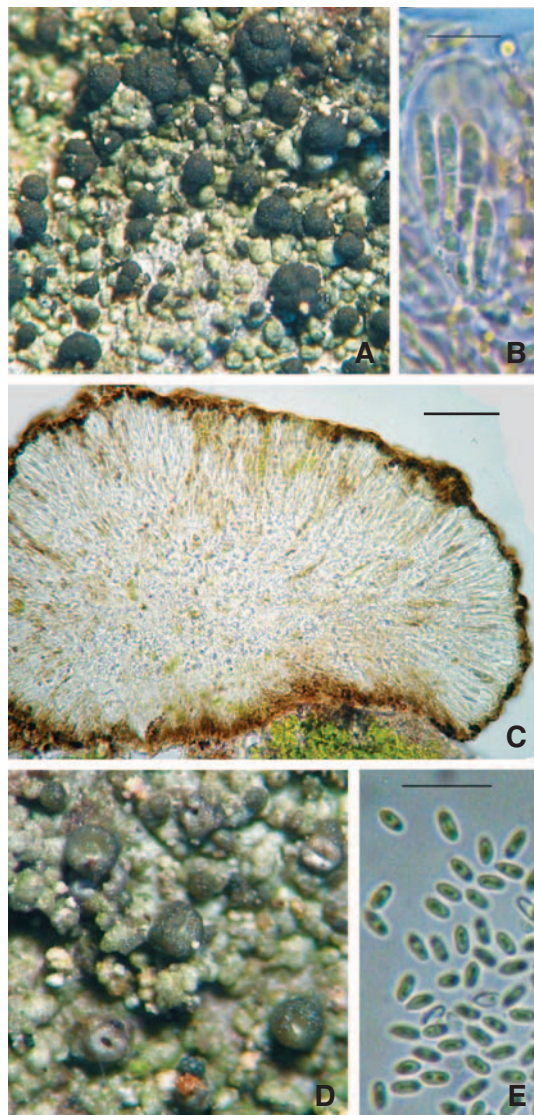


Fig. 18. *Micarea elachista* (Körb.) Coppins & R. Sant.: A – morphology, B – ascospores, C – vertical section of apothecia (GPN 2986); D – morphology of pycnidia bearing mesoconidia, E – mesoconidia (GPN 3034). Scale bars: B & E = 10 µm; C = 100 µm.

*Vaccinium uliginosum* and *Ledum palustre*; occasionally it is found on pine resin. Accompanied species include *Cladonia digitata*, *Hypogymnia physodes*, *Imshaugia aleurites*, *Lepraria* sp., *Micarea melaena*, *Mycocalicium subtile* and *Trapeliopsis flexuosa*.

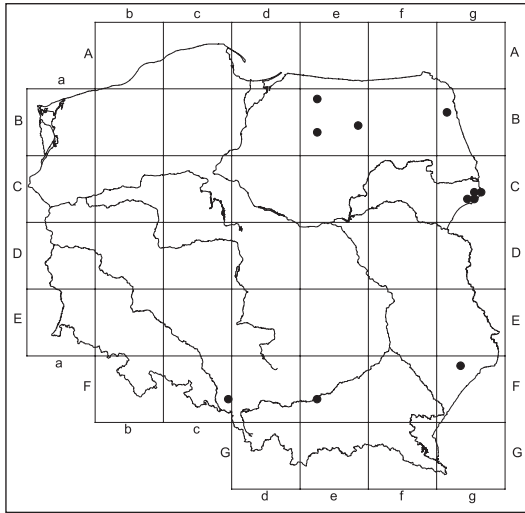


Fig. 19. Distribution map of *Micarea elachista* (Körb.) Coppins & R. Sant. in Poland.

Only one locality for *M. elachista* has recently been found in southern Poland (Puszcza Niepołomska Forest), in the natural reserve preserving an old pine stand within a large complex of the pine forests.

The specimen reported by Stein (1879: 207 – an entrindeten Tannenstrünken vor Goleow bei Rybnik, as *Biatora elachista* Körb.) from Kotlina Raciborska basin (E part of Lower Silesia) is not this taxon (see Coppins 1983). However, *M. elachista* was collected by Stein in the vicinity of Rybnik town (Jankowitz bei Rybnik) at that time, but he incorrectly identified it as *Bilimbia miliaria* Fr. *α lignaria* Ach. The name ‘Jankowitz’ may be Jankowice Rybnickie village, S of Rybnik town, but could also be Jankowice Rudzkie village, NW of Rybnik. Considering Stein’s note on the envelope of the specimen ‘Forstrevier Goleow’, the latter locality seems more probable. Unfortunately, the occurrence of *M. elachista* in this region has not been confirmed. It is probably extinct in these forests due to anthropogenic changes during the last century, caused among other things by the neighbourhood of the industrial Upper Silesia. However, in the area of Lower Silesia and western Poland there are still many potential localities for this species. *Micarea elachista* was also reported from Pomerania, but unfortunately the specimen

from Bory Tucholskie Forest (Lipnicki 1993) is *M. denigrata*. Probably *M. elachista* from the Baltic coast (Miądlikowska 1991) has also been mistakenly determined, but it could not be confirmed because this reported specimen disappeared.

Because the species is almost exclusive to native or natural pine forest in NE Poland, *M. elachista* has been considered an indicator of old-growth lowland forests (Czyżewska & Cieśliński 2003). Unfortunately, some of its localities, restricted to boggy or wet pine forests, are still decreasing area, suggesting that the species belongs to the group of endangered lichens in the country (Cieśliński *et al.* 2003).

WORLD DISTRIBUTION. According to Coppins (1983), *M. elachista* seems to be an oceanic species. Later reports on its distribution around the Baltic Sea and in the Mediterranean region would confirm this, since in Central Europe it has been recorded only from several localities in the Austrian Tirol and Moravia in the Czech Republic. In northern Europe it grows, as in most cases for Poland, on lignum of decaying stumps of conifers or directly on the bark at the base of trunks of *Pinus*. However, in western and southern parts of Europe it is often reported on decorticated trunks and bark of *Castanea sativa*.

EUROPE: Austria (Hafellner & Türk 2001); Czech Republic (Vězda & Liška 1999); Estonia (Jüriado *et al.* 2000); Finland (Vitikainen *et al.* 1997); Germany – Schleswig-Holstein (Jacobsen 1992, 1997), Hessen, Baden-Württemberg, Bavaria (Coppins 1983); Great Britain – Scotland (Coppins 2002); Italy (Nimis & Martellos 2003); Latvia (Piterâns 2001); Lithuania (Motiejūnaitė 1999); Norway (Coppins, pers. comm.); Portugal (van den Boom 2003); Russia – Leningrad Region (Zavarzin *et al.* 1999), Komi Republic (Hermansson *et al.* 1998); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993). ASIA: Russia – Russian Arctic: Yamal-Gydan area (Andreev *et al.* 1996). NORTH AMERICA: USA – Michigan (Coppins & Fryday 2006) [previous reports from Colorado by Weber and Wittmann (2000) refer to an *Arthonia* sp.; Coppins, pers. comm.].

EXSICCATAE SEEN. Arnold, *Lich. Exs. No. 1471* (WRSL); Vězda, *Lich. Sel. Exs. No. 1134* (KRAM).

SPECIMENS EXAMINED. Grid square Be-12 – NIZINA STAROPRUSKA LOWLAND, RÓWNINA ORNECKA PLAIN: ca 4 km NWW of Łaniewo village, edge of peat-bog, 1989, leg. S. Cieśliński (KTC; GPN 2435); Be-58 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE MRĄGOWSKIE LAKELAND: ‘Zakręt’ nature reserve, in boggy pine forest, 9 May 2000, leg. D. Kubiak (OLTC); Be-62 – POJEZIERZE OLSZTYŃSKIE LAKELAND: ‘Las Warmiński’ nature reserve, 1988, leg. S. Cieśliński (KTC; GPN 2430); Bg-31 – NIZINA PÓLNOCPODLASKA LOWLAND, KOTLINA BIEBRZAŃSKA BASIN: Puszcza Augustowska Forest, border of forest sections no. 198 and 199, ca 2 km S of Mały Borek forester’s lodge, 1986, leg. S. Cieśliński (KTC together with *M. melaena*); Cg-55 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowieża National Park, forest section no. 256A, 1982, leg. S. Cieśliński & Z. Tobolewski (KTC; POZ; BSG), 1984, leg. Z. Tobolewski & S. Cieśliński (UGDA-L 3846) and 1989, leg. S. Cieśliński, K. Czyżewska & K. Glanc (KTC); Cg-56 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowieża National Park, forest section no. 318B, D, 1985, leg. S. Cieśliński & Z. Tobolewski (KTC) and forest section no. 319D, 1981, leg. S. Cieśliński & Z. Tobolewski (KTC); Cg-64 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Hajnówka forest division, forest section no. 572A, ‘Michnówka’ nature reserve, 11 Aug. 2002, leg. P. Czarnota (GPN 2986, 3018); Cg-65 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowieża forest division, forest section no. 494C, 13 Aug. 2002, leg. P. Czarnota (GPN 3034); Fc-69 – WYŻYNA ŚLĄSKA UPLAND, PŁASKOWYŻ RYBNICKI PLATEAU: Jankowice village near Rybnik town (Jankowitz bei Rybnik), Febr. 1872, leg. B. Stein (WRSL), as *Bilimbia miliaria* α *lignaria*; Fe-62 – KOTLINA SANDOMIERSKA BASIN, NIZINA NADWIŚLAŃSKA LOWLAND: Puszcza Niepołomska Forest, ‘Poszyna’ nature reserve, forest section no. 52, 26 Oct. 2000, leg. J. Kiszka (KRAP); Fg-13 – ROZTOCZE, MIDDLE ROZTOCZE: near Rybica settlement, by road to Susiec village [50°24'25"N/23°13'22"E] alt. 300 m, 20 June 2005, leg. P. Czarnota 4707 (GPN).

ADDITIONAL SPECIMENS EXAMINED: CZECH REPUBLIC, TRĚBOŇ: nature reserve Stará řeka, on wood of *Pinus sylvestris*, 1 Apr. 1997, leg. Z. Palice s.n. (PRA). SCOTLAND, EASTERNNESS: Guisachan Forest, SW of Garve Bridge, E side of river at the base of large, standing, decorticate *Pinus*, alt. 230–250 m, 18 Sept. 1994, leg. B. J. Coppins et al. 16336 (E).

*Micarea erratica* (Körb.) Hertel, Rambold & Pietschm. (Figs 3B, 20 & 21)

in Rambold, *Biblioth. Lichenol.* **34**: 227. 1989.

*Lecidea erratica* Körb., *Parerga Lich.*: 223. 1861. – *Lecidea parasema* var. *erratica* (Körb.) Boistel., *Nouv. Fl. Lich.* **2**: 223. 1903. TYPE: (see Rambold 1989; vide protologue in Körber 1861).

– *Lecidea expansa* Nyl. apud Mudd, *Man. Brit. Lich.*: 208. 1861. – *Biatorina expansa* (Nyl.) Arnold, *Flora* **44**: 505. 1861. TYPE: England, near Battersby, Claveland, Yorkshire, Leighton, *Lich. Brit. No. 186* (E – ISOTYPE!; selected by Coppins).

– *Lecidea moestula* Nyl., *Flora* **51**: 344. 1868. – *Biatora moestula* (Nyl.) Arnold, *Flora* **53**: 475. 1870. TYPE: England, New Forest, 1867, *J. M. Crombie*, Crombie, *Lich. Brit. Exs. No. 85* (E – ISOLECTOTYPE!; selected by Coppins).

– *Lecidea dispansa* Nyl., *Not. Sällsk. Fauna Fl. Fenn. Förh.* **8**: 186. 1866.

– *Lecidea chalybeiza* Nyl., *Flora* **50**: 440. 1867. – *Micarea chalybeiza* (Nyl.) Hertel, *Beih. Nova Hedwigia* **79**: 455. 1984. (Rambold 1989).

– *Lecidea tephrizans* Leight., *Trans. Linn. Soc. London, Bot.* **1**: 237. 1878. (Rambold 1989).

– ? *Lecidea nigrescens* C. Knight, *Trans. Linn. Soc. London, Bot.* **1**: 276. 1878. (Rambold 1989).

– *Lecidea demarginata* Nyl., *Flora* **61**: 245. 1878.

– *Lecidea erratica* f. *demarginata* (Nyl.) Vain., *Lichenogr. Fenn.* **4**: 295. 1934.

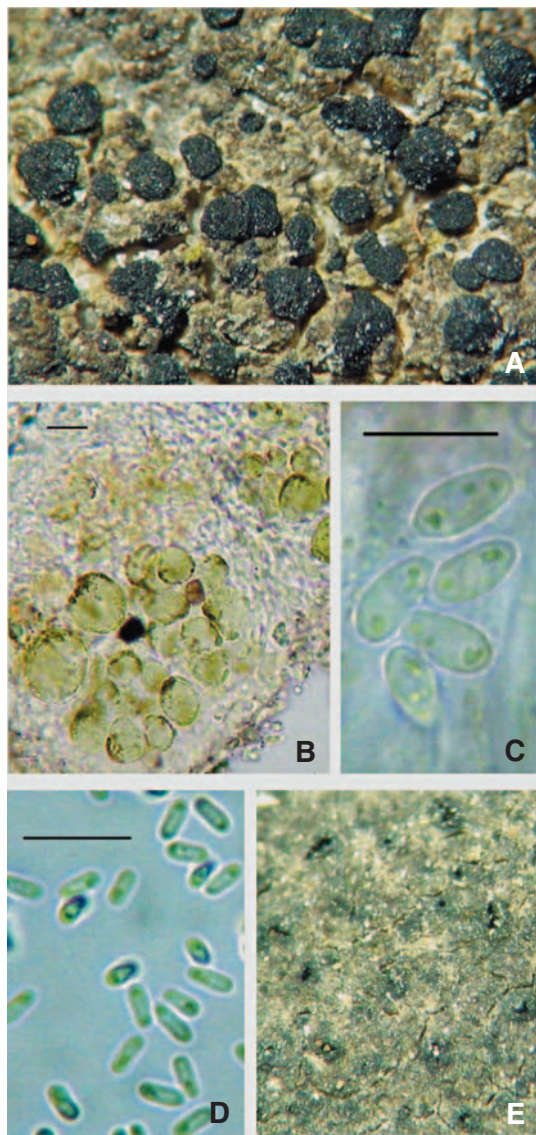
– *Lecidea planetica* Tuck. ex Willey apud Tuck., *Syn. N. Am. Lich.* **2**: 131. 1888. TYPE: USA, Pennsylvania (FH – LECTOTYPE, *n.v.*; MICH – ISOLECTOTYPE, *n.v.*). [designated in Fryday & Coppins 2006: 14].

– *Lecidea erratica* f. *deplanatula* Vain. *Lichenogr. Fenn.* **4**: 295. 1934.

– *Lecidea erratica* f. *dendroides* Erichsen, *Ann. Mycol.* **36**: 135. 1938.

– *Lecidea suberratica* J. Lowe, *Lloydia* **2**: 280. 1939. TYPE: USA, New York (MICH – HOLOTYPE, *n.v.*; UC 1459952 – ISOTYPE, *n.v.*).

Thallus grey, ash-grey or greenish-grey, continuous and only occasionally cracked when thin or composed of flat, adnate areolae or thallus sometimes warted or distinctly cracked and then almost shallow-areolate, usually with small, black dots of immersed pycnidia; prothallus sometimes developed, black. Photobiont not micareoid; cells



**Fig. 20.** *Micarea erratica* (Körb.) Hertel, Rambold & Pietshm.: A – morphology (KRAM-L 42370); B – large-celled photobiont (*leg. S. Cieśliński*, 1 May 1989, KTC); C – ascospores, D – mesoconidia (*leg. A. Kowalczyk & K. Toborowicz*, 1980, KTC); E – immersed pycnidia bearing mesoconidia (KRAM-L 12726). Scale bars = 10  $\mu$ m.

$\pm$ globose, (8–)10–15(–20)  $\mu$ m wide. Apothecia black or fuscous-black, usually lecideoid (at least when young) with distinct, black, raising margin, constricted at the base or later rarely convex and then margin finally excluded, usually simple or

aggregated into small groups, 0.15–0.4(–0.8) mm diam. Hymenium 35–50  $\mu$ m tall, in lower part colourless or brownish, epithecium 10–15  $\mu$ m wide, intensive bluish-green or blue, K+ intensifying blue-green; pigment confined to gel-matrix. Ascospores simple, ellipsoid or ovoid, (5–)6–8(–9)  $\times$  3–3.5(–4)  $\mu$ m diam. Paraphyses sparsely branched and anastomosing, (1.5–)2–2.5(–3)  $\mu$ m wide, multiseptate; walls hyaline throughout. Hypothecium dark brown, K–; walls of hyphae dark brown pigmented. Excipulum strongly developed, 20–40(–50)  $\mu$ m wide, hyaline inside but outer edge blue-black and inner part, directly under hypothecium brown, composed of thick, 2–3.5  $\mu$ m wide, branched hyphae. Pycnidia immersed, usually present and numerous, black with gaping ostioles; pycnidial walls dark blackish-blue, K+ blackish-green. Mesoconidia cylindrical, (3–)4–5(–5.5)  $\times$  1.1–1.5  $\mu$ m, usually biguttulate.

**CHEMISTRY.** Thallus and medulla K–, C–, Pd–. Substances not detected by TLC.

**NOTES.** *Micarea erratica* is a distinctive species within *Micarea* owing to its marginal, lecideoid apothecia and thick, strongly developed excipulum which is hyaline in the middle part. The features are clearly visible especially when apothecia are young, but even in mature apothecia with excluded margin the hyaline zone of the excipulum is still present. It is almost identical in morphology of apothecia and thallus with *M. lapillicola* (Vain.) Coppins & Muhr, therefore both need careful microscopic examination to be confirmed. The latter species is unknown in Poland, but its occurrence there is feasible considering its recent report from the Czech Republic (Palice 1999). *Micarea lapillicola* also forms a thick excipulum, hyaline within, but without the dark, black-blue outer edge and above all its photobiont consists of small, ‘micareoid’ cells, while *M. erratica* has non-micareoid photobiont with cells more than 10  $\mu$ m wide. For more details of the differences see Coppins and Muhr (1997). Actually, only the dimensions of the algal cells are a good diagnostic, anatomical character to separate both species, some of the Polish specimens of *M. erratica* have a very pale outer edge of the excipulum (*leg. Cieśliński s.n.* from

Równina Mazurska plain, loc. 452, KTC), as in *M. lapillicola*. Similarly, the greyish tinge of the apothecia usually present in the latter species has also been found in *M. erratica* (leg. Cieśliński s.n. from Równina Mazurska plain, loc. 451, KTC). It is possible that both names refer to only one taxon (Coppins, pers. comm.), but this hypothesis needs molecular support.

In the field, *M. erratica* can often be mistaken for other lichens with similar lecideoid, black apothecia as in some saxicolous species of *Lecidea* Ach., *Catillaria* A. Massal., *Buellia* De Not., *Porpidia* Körb. and above all *Buellia stigmatea* (Schaer.) Körb.

**HABITAT AND DISTRIBUTION IN POLAND.** *Micarea erratica* is a strongly siliceous species, rarely recorded but probably overlooked. It occurs in lowland areas, usually on postglacial granitic boulders, rocky mounds or pebbles in dry, well-lit places, e.g. by the cart-tracks, forest roads or clearings, in sand-dunes by rivers and sand grasses, and more rarely on brick walls. In the Góry Świętokrzyskie Mts, it covers boulders of quartzitic sandstones in boulder-fields of the main range, and in the limestone region of Chęciny hills it grows on small flint pebbles by roads. In the Sudetes it has been recorded on granite and metamorphic, non-calcareous rocks. Here it is probably more common in numerous worked-out granite quarries, located in the foreland of the mountain range. In the Carpathians, it occurs on exposed, siliceous sandstone dispersed on mountain glades or more often found in rocky mounds and roadside walls. It is one of the first lichen colonizers, often associated with *Acarospora fuscata*, *A. veronensis*, *Buellia stigmatea*, *Lecanora polytropa*, *Lecidea fuscoatra* and *Porpidia crustulata*.

Fałtynowicz (1991) suggests that *M. erratica* is a sub-Atlantic species, its main range of distribution in Poland disappearing east of the Vistula River. He based his opinion rather on historical reports by lichenologists who explored Silesia (e.g. Körber 1861: 223 from Miękinia village ‘an Granitgeröll eines Sandhügels bei Nimkau in Schlesien; sicherlich überall häufig und bisher

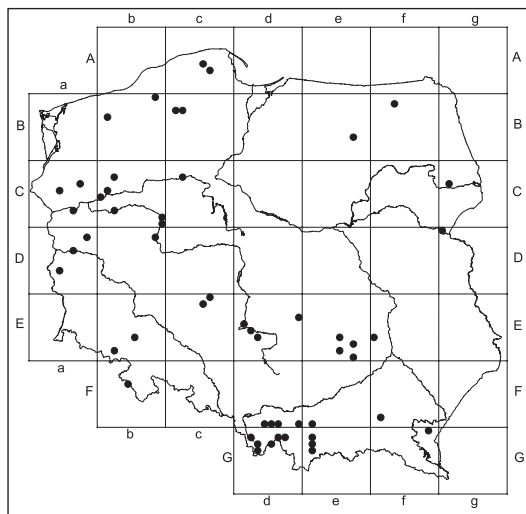


Fig. 21. Distribution map of *Micarea erratica* (Körb.) Hertel, Rambold & Pietschm. in Poland.

nur übersehen’ – note from protolog, Stein 1879: 254 from Zielona Góra town ‘des Telegraphenberges bei Grünberg’, near Żagań town ‘Sagan’ and from Miękinia village ‘Nimkau’ and Krawiec 1938: 202, 1955: 44 – 15 localities from eastern Pomerania and Wielkopolska region), as well as his own observation made in the Pomerania (Fałtynowicz 1992). Unfortunately, the old collections of *Lecidea erratica* in WRSL have disappeared, and several of Krawiec’s other collections in POZ represent other species (mostly *Lecidea variegatula* Nyl.). Regardless of the correctness of those remaining historical data, considering only recent records of *M. erratica*, Fałtynowicz’s hypothesis of the sub-Atlantic character of the species seems to be right. However, *M. erratica* is not restricted to the western part of the country, since it has also been recorded from single localities in east-northern Poland and Pogórze Przemyskie foothills. In the mountains, it occurs in the Sudetes, but in the Carpathians it has been recorded as yet only from the Western Beskidy Mts.

**WORLD DISTRIBUTION.** *Micarea erratica* is reasonably common in almost all lowland regions of western Europe; it is essentially an oceanic species, being rare (and possibly overlooked) in central and eastern Europe. It is probably more frequent

in eastern North America. It prefers rather warm localities exposed to light, but it has been collected from the tundra in Sweden,  $>62^\circ$  N (e.g. Hertel, *Lecid. Exs. No. 229*).

EUROPE: Austria (Hafellner & Türk 2001); Belgium and Luxemburg (Diederich & Sérusiaux 2000); Cyprus (Litterski & Mayrhofer 1998); Czech Republic (Vězda & Liška 1999); Denmark (Søchting & Alstrup 2002); Finland (Vitikainen *et al.* 1997); Germany – e.g. Lower Saxony (Hauck 1996), Mecklenburg-Vorpommern (Schiefelbein 2006), Nordrhein-Westfalen (Heibel 1999), Schleswig-Holstein (Jacobsen 1992, 1997); Great Britain (Coppins 2002); Ireland (Seaward 1994); the Netherlands (Aptroot *et al.* 2004); Norway (Santesson 1993); Romania (Ciurchea 1998); Russia – Leningrad Region (Zavarzin *et al.* 1999); Slovakia (Pišút *et al.* 1996); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993). NORTH AMERICA: East USA – e.g. Louisiana (Tucker 1981), Maryland (Skorepa *et al.* 1977, as *Lecidea erratica*), Michigan (Fryday *et al.* 2001), New York State (Brodo 1968, as *Lecidea erratica*; Harris 2004), Pennsylvania (Coppins & Fryday 2006), Vermont (Hinds *et al.* 2002); Pacific Northwest (McCune 2004). AUSTRALASIA: Australia (Rambold 1989; see also additional specimens examined); Indonesia – Java (Hertel 1977); New Zealand (Hertel 1977).

EXSICCATAE SEEN. Crombie, *Lich. Brit. No. 85* (E); Hertel, *Lecid. Exs. No. 229* (E), *No. 230* (E), *No. 273* (E); Leighton, *Lich. Brit. No. 186* (E); Mudd, *Lich. Brit. No. 196* (E).

SPECIMENS EXAMINED. Grid square Ac-55 – POBRZEŻE KOSZALIŃSKIE COASTLAND, WYSOCZYŻNA ŻARNOWIECKA PLATEAU: SW of Chrzanowo village, 10 Nov. 2001, *leg. E. Garska* (Hb. Izydorek); Ac-66 – POJEZIERZE WSCHODNIOPOMORSKIE LAKELAND, POJEZIERZE KASZUBSKIE LAKELAND: Borówka village near Lębork town, 22 July 1985, *leg. W. Faltynowicz* (UGDA-L 3170); Bb-08 – POJEZIERZE ZACHODNIOPOMORSKIE LAKELAND, WYSOCZYŻNA POLANOWSKA PLATEAU: S of Sławno town between Przelaz and Buszyno villages, 27 Aug. 1987, *leg. W. Faltynowicz & J. Miądlkowska* (UGDA-L 3715); Bb-31 – POBRZEŻE SZCZECIŃSKIE COASTLAND, RÓWNINA GRYFICKA PLAIN: Sidłowo village near Sławoborze village, W of Wilcza River, 18 Oct. 1987, *leg. W. Faltynowicz & J. Miądl-*

*kowska* (UGDA-L 3527; KRAM-L 21829 ex UGDA); Bc-21 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, RÓWNINA CHARZYKOWSKA PLAIN: by the shore of Wiejskie Lake, 1968, *leg. Z. Tobolewski ?* (POZ); between Prądzona and Borowy Młyn villages, by the shore of lake, 7 July 1968, *leg. Z. Tobolewski ?* (POZ); Bc-22 – RÓWNINA CHARZYKOWSKA PLAIN: SE shore of Trzebielsk Lake in the vicinity of Lipnica village, 7 Aug. 1968, *leg. Z. Tobolewski ?*, (POZ); Be-67 – POJEZIERZE MAZURSKIE LAKELAND, RÓWNINA MAZURSKA PLAIN: 1.5 km S of Powalczyn village, by road to Świętajno village, 1 May 1989, *leg. S. Cieśliński*, loc. 452 (KTC); 0.5 km NW of Marksewo village, 1 May 1989, *leg. S. Cieśliński*, loc. 451 (KTC); Bf-13 – POJEZIERZE ELCKIE LAKELAND: Puszcza Borecka Forest, forest section no. 23 [ $54^\circ 07' N / 22^\circ 05' E$ ] 15 May 1996, *leg. A. Zalewska* (OLS-L 1354; E ex OLS); Ca-37 – POJEZIERZE ZACHODNIOPOMORSKIE LAKELAND, POJEZIERZE CHOSZCZEŃSKIE LAKELAND, ca 3 km NE of Barlinek town, valley of Płonia stream [ $53^\circ 00' 50'' N / 15^\circ 16' 00'' E$ ] 9 Apr. 2006, *leg. P. Czarnota 4816* (GPN); Ca-44 – POJEZIERZE MYŚLIBORSKIE LAKELAND: vicinity of Chłopowo village, ca 12 km W of Mylibórz town, 2 June 1990, *leg. L. Lipnicki* (Hb. Lipnicki), as *Catillaria chalybeia*; Ca-76 – PRADOLINA TORUŃSKO-EBERSWALDZKA VALLEY, KOTLINA GORZOWSKA BASIN, Puszcza Rzepińska Forest, ca 1 km E of Krzeszyce village by road to Gorzów Wielkopolski town [ $52^\circ 34' 55'' N / 15^\circ 03' 19'' E$ ] 8 Apr. 2006, *leg. P. Czarnota 4813* (GPN); Cb-22 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, RÓWNINA DRAWSKA PLAIN: Puszcza Drawska Forest, basin of former lake near forest sections no. 307 and 308, ca 0.6 km W of Ostrowiec Lake, 18 May 2004, *leg. P. Czarnota 4215* (GPN); by road to 'Radęcin' nature reserve on the border of Drawieński National Park [ $53^\circ 05' 38'' N / 15^\circ 53' 52'' E$ ] 18 May 2004, *leg. P. Czarnota 4277* (GPN); Cb-41 – POJEZIERZE DOBIEGNIIEWSKIE LAKELAND: ca 0.5 km N of Drezdenko town [ $52^\circ 51' 19'' N / 15^\circ 50' 40'' E$ ] 9 Apr. 2006, *leg. P. Czarnota 4829* (GPN); ca 1 km N of Drezdenko town, forest by road to Zagórze village [ $52^\circ 52' 03'' N / 15^\circ 51' 16'' E$ ] 9 Apr. 2006, *leg. L. Lipnicki & P. Czarnota 4833* (GPN); Cb-50 – PRADOLINA TORUŃSKO-EBERSWALDZKA VALLEY, KOTLINA GORZOWSKA BASIN: 1 km E of Zwierzyń village by road to Drezdenko town [ $52^\circ 50' 36'' N / 15^\circ 36' 10'' E$ ] 9 Apr. 2006, *leg. P. Czarnota 4835* (GPN); Cb-72 – KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, Chorzepowo village, 11 Sept. 1995, *leg. J. Nowak* (KRAM-L 42370); Cb-89 – POJEZIERZE WIELKOPOLSKO-KUJAWSKIE LAKELAND, POJEZIERZE GNIEŹNIŃSKIE LAKELAND: Puszcza Zielonka Forest, Experimental Chief Forestry of Agriculture



Academy in Poznań: forest section no. 68a, near Trzaskowo village, 1962, *leg. K. Glanc* (UGDA-L 4093), border of forest section no. 86s, by road to Owińska village, 27 Aug. 1962, *leg. K. Glanc* (UGDA-L 4091); Cb-99 – POJEZIERZE GNIEŹNIENSKIE LAKE LAND: Owińska village, by road to Potasze village, on sandstone rock, 5 July 1930, *leg. F. Krawiec* (POZ); Dziewiczka Góra hill, 14 Apr. 1934, *leg. F. Krawiec* (POZ) and 29 Sept. 1934, *leg. F. Krawiec* (POZ); Cc-22 – PRADOLINA TORUŃSKO-EBERSWALDZKA VALLEY, KOTLINA ŚRODKOWEJ NOTECI BASIN: Kowalewko village, 27 Sept. 1932, *leg. F. Krawiec* (POZ); Cg-31 – NIZINA PÓLNOCPODLASKA LOWLAND, DOLINA GÓRNEJ NARWI VALLEY: 0.5 km E of Ryboły village, 28 Aug. 1991, *leg. S. Ciesliński* (KTC); Da-18 – POJEZIERZE LUBUSKIE LAKE LAND, POJEZIERZE ŁAGOWSKIE LAKE LAND: S of Mostki village [52°14'42"N/15°22'14"E] 8 July 2005, *leg. P. Czarnota 4633* (GPN); 0.5 km W of Przelazy village [52°13'56"N/15°22'07"E] 8 July 2005, *leg. P. Czarnota 4678* (GPN); Da-36 – RÓWNINA TORZYMSKA PLAIN: 0.5 km N of Krosno Odrzańskie town [52°03'54"N/15°07'00"E] 8 July 2005, *leg. P. Czarnota 4635* (GPN); Da-64 – OBNIŻENIE DOLNOŁUŻYCKIE DEPRESSION, KOTLINA ZASIECKA BASIN: Bory Zielonogórskie Forest, 2 km S of Brody village [51°46'06"N/14°48'14"E] 8 July 2005, *leg. P. Czarnota 4638* (GPN); Db-18 – POJEZIERZE WIELKOPOLSKIE LAKE LAND, POJEZIERZE POZNAŃSKIE LAKE LAND: by road to Skrzynka Lake near Ludwikowo village, 10. Nov. 1929, *leg. F. Krawiec* (POZ); by the shore of Skrzynka Lake, Mar. 1930, *leg. F. Krawiec* (POZ); Ludwikowo village near Poznań, 12 Apr. 1933, *leg. F. Krawiec* (POZ); Puszczykowo town, 1 Dec. 1929, *leg. F. Krawiec* (POZ); near Puszczykówko settlement, 8 Aug. 1935, *leg. F. Krawiec* (POZ); Dg-00 – NIZINA PÓLNOCPODLASKA LOWLAND, WYSOCZYNA DROHICZYŃSKA PLATEAU: 2 km NW of Mielnik, near the road to Drohiczyn town, 12 Aug. 1996, *leg. S. Ciesliński* (KTC); Eb-65 – PRZEDGÓRZE SUDECKIE FORELAND, RÓWNINA ŚWIDNICKA PLAIN: ca 4 km E of Żarów town [50°56.37'N/16°32.84'E] 13 Aug. 2003, *leg. P. Czarnota* (GPN 3288); Eb-82 – MIDDLE SUDETES, GÓRY KAMIENNE MTS: ca 2.5 km W of Boguszów-Gorce town, worked-out quarry of melaphyre [50°45'31"N/16°09'53"E] alt. 400 m, 21 Apr. 2005, *leg. P. Czarnota 4480* (GPN); Ec-06 – NIZINA POŁUDNIOWOWIELKOPOLSKA LOWLAND, KOTLINA GRABOWSKA BASIN: near Przedborów village, 9 Nov. 1935, *leg. F. Krawiec* (POZ); Ec-15 – WAŁ TRZEBNICKI RAMPART, WZGÓRZA OSTRZESZOWSKIE HILLS: Kochlówy village near Ostrzeszów town, 28 Mar. 1934 and 29 Mar. 1934, *leg. F. Krawiec* (POZ); Ed-39 – WZNIESIENIA POŁUDNIO-

WOMAZOWIECKIE HILLS, RÓWNINA PIOTRKOWSKA PLAIN: Trzymorgi village near Piotrków Trybunalski town, 18 Oct. 1971, *leg. K. Czyżewska & J. Nowak* (LOD 2053; UGDA-L 4455 ex LOD); Ed-41 – WYŻYNA WOŹNICKO-WIELUŃSKA UPLAND, WYŻYNA WIELUŃSKA UPLAND: Działoszyn village, 30 May 1963, *leg. J. Nowak* (KRAM-L 13024); Ed-52 – WYŻYNA WIELUŃSKA UPLAND: Wąsosz village, 4 June 1964, *leg. J. Nowak* (KRAM-L 12726); Ed-63 – WYŻYNA PRZEDBORSKA UPLAND, NIECKA WŁOSZCZOWSKA BASIN: Broniszew Stary village, 16 June 1964, *leg. J. Nowak* (KRAM-L 12539); Ee-65 – WYŻYNA KIELECKA UPLAND, GÓRY ŚWIĘTOKRZYSKIE MTS: Pasma Klonowskie range, Świętokrzyski National Park, Bukowa Góra Mt., 1960, *leg. M. Sroczyński* (KTC), as *M. sylvicola*; Klonów village, 1980, *leg. A. Kowalczyk & K. Toborowicz* (KTC); Pasma Masłowskie range, near Barcza village, the edge of forest, 20 July 1980, *leg. J. Haczek & K. Toborowicz* (KTC); Ee-77 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, Łysa Góra Mt., in field-block below the top [50°51'39"N/21°02'44"E] alt. ca 580 m, 6 May 2004, *leg. P. Czarnota 3820* (GPN); Ee-85 – GÓRY ŚWIĘTOKRZYSKIE MTS: Wzgórza Chęcińskie range, by road between Szczecno and Pierzchnica villages, 28 Sept. 1975, *leg. K. Toborowicz* (KTC); Ee-97 – POGÓRZE SZYDŁOWSKIE FOOTHILLS: sandy hills E of Raków village, 9 May 1975, *leg. K. Toborowicz* (KTC, as *Lecidea sylvicola*; GPN 2439); Ef-60 – PRZEDGÓRZE IŁŻECKIE FORELAND: Krzemionki village, 27 June 1978, *leg. A. Lech & K. Toborowicz* (KTC), as *Lecidea sylvicola*; Fb-34 – MIDDLE SUDETES, GÓRY BYSTRZYCKIE MTS: Lasówka village, by Orlica River [50°19'06"N/16°26'23"E] alt. 625 m, 20 Apr. 2005, *leg. P. Czarnota 4737* (GPN); Fd-94 – WESTERN BESKIDY MTS, BESKID MAŁY MTS: Maleckie Mt., alt. ca 800 m, 7 Aug. 1960, *leg. J. Nowak* (KRAM-L 6290); Fd-95 – BESKID MAŁY MTS: Potrójna Mt., alt. ca 850 m, 5 Aug. 1960, *leg. J. Nowak* (KRAM-L 6291); Fd-96 – BESKID MAŁY MTS: Krzeszowski hill below Leskowiec Mt., alt. 750 m, 10 May 1960, *leg. J. Nowak* (KRAM-L 7306); Fd-99 – BESKID MAKOWSKI MTS: Kotoń Mt., Tokarnia village, ca 840 m, 20 Apr. 1966, *leg. J. Nowak* (KRAM-L 17427); Fe-91 – BESKID WYSPOWY MTS: by Wierzbatica stream, below Cyrki Mt., alt. 575 m, 6 Oct. 1967, *leg. J. Nowak* (KRAM-L 17092), as *Micarea sylvicola*; Ff-81 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE STRZYŻOWSKIE FOOTHILLS: Chełm Mt., 'Chełm' nature reserve [49°53'17"N/21°33'36"E] alt. 450 m, 17 Apr. 2005, *leg. P. Czarnota 4766* (GPN); Gd-12 – WESTERN BESKIDY MTS, BESKID ŚLĄSKI MTS: Zieleńska glade, by hiking track, alt. 760 m, 8 Sept. 1962, *leg. J. Kiszka* (KRAP);

Gd-16 – BESKID ŻYWIECKI MTS: Pasma Jałowieckie range, Lachów Groń Mt. above Bystra settlement, alt. 1045 m, 14 July 1965, *leg. J. Nowak* (KRAM-L 15527); Gd-17 – BABIA GÓRA RANGE: Polica range, vicinity of Zawoja village, Składziska glade, alt. 1100 m, 22 June 1965, *leg. J. Nowak* (KRAM-L 17163); Gd-23 – BESKID ŻYWIECKI MTS: Pilsko range, Dziaski settlement, E of Rajcza village, alt. 735 m, 13 Aug. 1964, *leg. J. Nowak* (KRAM-L 13928); Gd-25 – BESKID ŻYWIECKI MTS: Pilsko range, Malarka glade, alt. 1050 m, 17 Sept. 1964, *leg. J. Nowak* (KRAM-L 16331, 16446); Hala Cudzi-chowa alpine meadow, alt. 1250 m, 25 Sept. 1964, *leg. J. Nowak* (KRAM-L 16297); Gd-33 – BESKID ŻYWIECKI MTS: Wielka Racza range, valley of Rycerski stream between Wielka Racza Mt. and Będoszka Wielka Mt., alt. 640 m, 27 Sept. 1986, *leg. J. Nowak* (KRAM-L 30407); Solański Groń Mt., alt. 705 m, 5 Aug. 1964, *leg. J. Nowak* (KRAM-L 14323); Ge-11 – GORCE MTS: Gorce National Park, Jaworzynka glade above Lubomierz-Rzeki settlement, alt. ca 900 m, 7 May 2003, *leg. P. Czarnota* 4323 (GPN); Ge-21 – GORCE MTS: Gorce National Park, SW slope of Kudłoń Mt. below Pustak glade [49°34.07'N/20°10.42'E] alt. 1130 m, 11 June 2003, *leg. P. Czarnota* (GPN 3261); Ge-31 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKO-NOWOTARSKA BASIN: Dębno vil-lage, mouth of Białka River to Dunajec River (now locality is flooded by water), 7 Aug. 1989, *leg. J. Kiszka* (KRAP); Gf-08 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE PRZEMYSKIE FOOTHILLS: 'Krępak' nature reserve, by road between Bireza and Przemysł town [49°42'09"N/22°31'55"E] alt. 370 m, 17 June 2005, *leg. P. Czarnota* 4498 (GPN).

ADDITIONAL SPECIMENS EXAMINED. AUSTRALIA, NEW SOUTH WALES: Castlereagh River, 8 km W of Coonabarabran [31°15'S/149°11'E] alt. 600 m, on scattered loose rocks in short Eucalyptus and Callitri's dominated forest, 26 Aug. 1979, *leg. H. Streimann* (KRAM ex CBG 7911612). GREAT BRITAIN, SCOTLAND (VC 104): North Ebudes, Eigg, Galmisdale near the 'Slip', on old wooden boat, 24 May 2000, *leg. B. J. Coppins* 19188 (E).

*Micarea globulosella* (Nyl.) Coppins

(Figs 22 & 23)

Bull. Brit. Mus. (Nat. Hist.), Bot. **11**(2): 134. 1983.

*Lecidea globulosella* Nyl., Lich. Jap.: 69. 1890. – *Bacidia globulosella* (Nyl.) Zahlbr., Cat. Lich. Univ. **4**: 202. 1926. TYPE: Japan, Yokohama, on bark, 1879,

*E. Almqvist* (S – LECTOTYPE and ISOLECTOTYPE, *n.v.*; H-NYL 17413 – ISOLECTOTYPE!).

Thallus of shallow convex areolae concentrated in small continuous patches or effuse, slightly warted, greenish-white or olive-grey, C± red (especially brighter areolae or visible only near ostioles of pycnidia). Photobiont micareoid, cells globose 5–7(–10) µm. Apothecia black, lead-black or rarely grey, convex, subglobose, immarginate or sometimes young apothecia with slightly paler, greyish margin, 0.1–0.3 mm diam., C+ red better visible in paler apothecia. Hymenium 35–45 µm, in upper part olive-brown, dull olive, olive-grey, K+ intensive violet, C+ red-violet at first, but later permanently violet, lower part hyaline; pigment confined to the gel-matrix. Ascospores rod-shaped, narrowly fusiform, sometimes slightly curved or ±sig-moid, non- or 1–3(–7)-septate, (10–)12–19(–24) × 2–2.5(–3) µm; in many cases mainly 1-septate and straight. Paraphyses numerous, branched and anastomosing, well separating in K, colourless, in shape and size resembling paraphyses of *M. deni-grata* or *M. nitschkeana*, 1.4–1.7(–1.8) µm wide with apices only slightly widening to 2.0 µm. Hypothecium colourless. Excipulum indistinct or thin to 10–15 µm wide, and then usually olive pigmented as the epithecium; hyphae similar to paraphyses, strongly branched and anastomosing. Pycnidia inconspicuous or sometimes distinct, in mountain specimens emergent to almost ±shortly stalked, walls olive or dilute olive-brown, K+ violet, C+ red-violet, especially around the ostioles; mesoconidia ±cylindrical, 3.5–4.5(–5) × 1.2–1.4 µm; macro- and microconidia not found.

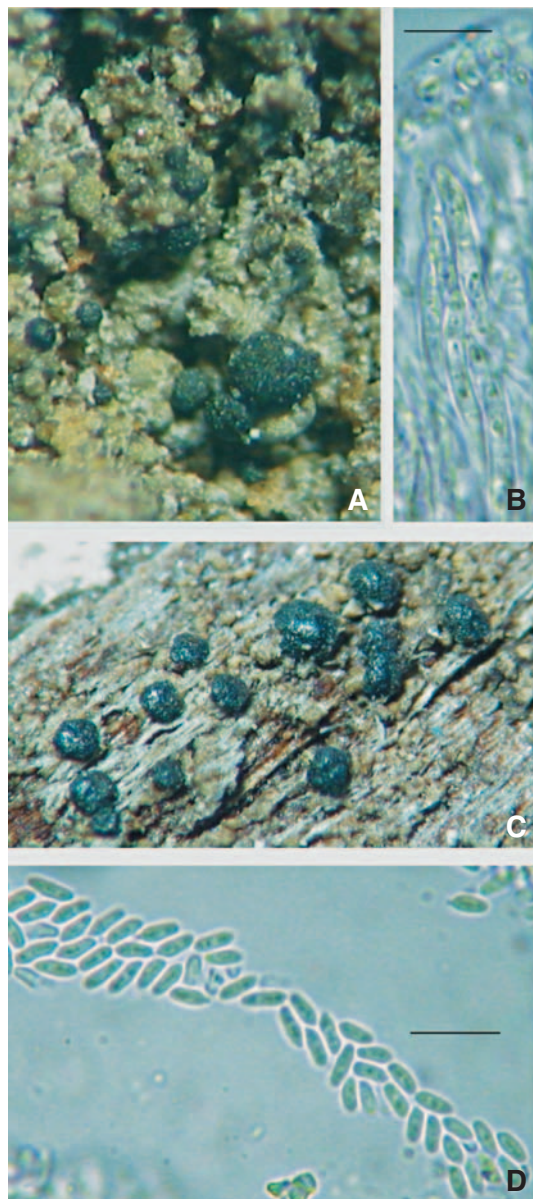
CHEMISTRY. TLC: gyrophoric acid.

NOTES. Specimens from Polish lowlands are slightly different in morphology than specimens from the Gorce Mts and seem to be more similar to the holotype, especially considering their effuse, small-warted, whitish-grey thallus, more intensively reacting C+ red. Thallus in mountain specimens are almost composed of fine shallow-convex areolae concentrated in small patches. Moreover, their reaction of C+ red is less distinct and sometimes restricted to more developed parts of the

thallus beneath pycnidia. Such emergent pycnidia have never been observed in Polish lowland specimens, but they appear in other mountain specimens from for example Slovak High Tatra (Hb. Věžda; det. B. J. Coppins), perhaps as an adaptation to more difficult ecological conditions. However, the above-mentioned morphological characters, less concentrated gyrophoric acid and the presence of shorter and only 0–3-septate ascospores in all analyzed specimens from mountains, are probably indicative of a new species related to *M. globulosella*. Unfortunately, collected material is still insufficient to support this hypothesis.

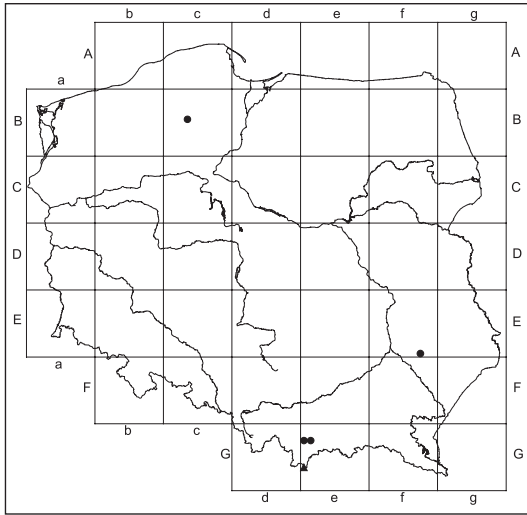
*Micarea globulosella* is macroscopically similar to the black, small, lignicolous form of *M. denigrata* owing to its thallus structure and the pigmentation of apothecia, as well as the kind of emergent,  $\pm$ shortly stalked pycnidia bearing mesoconidia. Both species have similar anatomical features to their apothecia, but *M. globulosella* can be distinguished by the  $\pm$ rod-shaped, more septated ascospores and slightly longer and narrower mesoconidia. More developed specimens of *M. nitschkeana*, especially those occurring on tree bark or on lignum of decorticated trunks, could also be mistakenly determined as *M. globulosella*, since they are similar in morphology, anatomy and chemistry, and moreover their ascospores can sometimes be 3-septate. However, in *M. nitschkeana* they are never sigmoid and rod-shaped, but slightly curved, wider and rather fusiform. Long, curved macroconidia, often found in *M. denigrata* and *M. nitschkeana*, have not been observed as yet in *M. globulosella*. The Polish mountain specimens are almost identical with specimen of *M. synotheoides* growing in the same mountain range as well as in other central European mountains, but the latter species has no lichen substances detected by TLC (see also under *M. synotheoides*).

**HABITAT AND DISTRIBUTION IN POLAND.** The species appears to be rather rare, as suggested by Coppins (1983). It was recently found in the Polish lowland growing in bark crevices of *Alnus glutinosa*, within black alder wet forest within Lasy Janowskie Forest, in association with *Fus-*



**Fig. 22.** *Micarea globulosella* (Nyl.) Coppins: A – morphology (leg. H. Wójciak & M. Różyło, 10 May 1999, LBL); B – morphology of lectotype (H-NYL 17413); C – ascospores, D – mesoconidia (KRAM-L 26416). Scale bars = 10  $\mu$ m.

*idea pusilla*, *Lecanora pulicaris*, *Scoliciosporum chlorococcum*, *Stenocybe pullatula* and on wood of *Pinus sylvestris*, within a large pine forest of Bory Tucholskie Forest, together with *M. denigrata* and



**Fig. 23.** Distribution map of *Micarea globulosella* (Nyl.) Coppins (●) and *Micarea incrassata* Hedl. (▲) in Poland.

*Hypogymnia physodes*. It has been observed only twice in mountainous areas, namely the Gorce Mts (Western Carpathians) on the bark of old *Abies alba* (in 1966) and on *Fagus sylvatica* (in 1994) within natural stands of the Carpathian beech forest in the same mountain valley. Associated species in these localities include *Hypogymnia physodes* and *Lepraria* spp.

**WORLD DISTRIBUTION.** *Micarea globulosella* is still a poorly reported worldwide, being known from only single localities from several, mainly boreal, oceanic and mountainous European countries, which would suggest its requirement for high precipitation within natural forest habitats. It has been occasionally reported outside Europe.

**EUROPE:** Finland (Vitikainen *et al.* 1997); France (Coppins 1983); Germany – Bavaria (Coppins 1983); Great Britain (Coppins 1983, 2002); Norway (Santesson 1993); Russia – Komi Republic (Hermansson *et al.* 1998); Slovakia – Tatra Mts (Coppins 1983); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993). **ASIA:** Japan (Coppins 1983). **NORTH AMERICA:** Canada – Quebec (Coppins 1983); USA – New England (Greene 2005).

**EXSICCATAE SEEN.** Räsänen, *Lich. Fenn. No. 426* (Hb. Vězda).

**SPECIMENS EXAMINED.** Grid square Bc-43 – POJEZIERZE POLUDNIOWOPOMORSKIE LAKELAND, RÓWNINA CHARZYKOWSKA PLAIN: Bory Tucholskie National Park, by the cross of forest sections no. 151/152/175/176, 23 June 1999, *leg. L. Lipnicki* (Hb. Lipnicki); Ef-97 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, ‘Szklarnia’ nature reserve, forest section no. 158, 10 May 1999, *leg. H. Wójciak & M. Różyło* (LBL); Ge-20 – WESTERN BESKIDY MTS, GORCE MTS: Gorce National Park, NE ridge of Obidowiec Mt. in valley of Olszowy stream, alt. 1120 m, 11 Sept. 1994, *leg. P. Czarnota* (GPN 673); Ge-21 – GORCE MTS: Gorce National Park, valley of Olszowy potok stream below Hala Turbacz alpine meadow, alt. 1070 m, 27 June 1966, *leg. K. Glanc* (KRAM-L 26416), as *Catillaria prasina*.

**ADDITIONAL SPECIMEN EXAMINED.** ENGLAND, HEREFORD: VC36, Croft Park, near Keepers Lodgg, on *Quercus log* (dead fallen branch), 15 May 1991, *leg. B. J. Coppins 14133 & A. M. O’Dare* (E).

### *Micarea hedlundii* Coppins

(Figs 2J–L, 4E & 24)

Bull. Brit. Mus. (Nat. Hist.), Bot. **11**(2): 135, 136. 1983. TYPE: Norway, Opplandia (UPS – HOLOTYPE, *n.v.*).

Thallus effuse, granular, sorediose, similar to that of *M. prasina*, but dull green, composed of goniocysts, 25–35 µm diam. with a gel-matrix contains ±orange, K+ violet, C+ violet oil droplets. Photobiont micareoid; algal cells 4–8 µm diam. Apothecia usually absent, sometimes numerous, convex to subglobose and mostly becoming tuberculate, usually semi-immersed within the thallus, immarginate, 0.2–0.4 mm diam. (or up to 1.0 mm diam. when tuberculate), brownish to dull brown. Hymenium 35–45 µm tall, hyaline; epithecium and sometimes irregular vertical streaks dilute straw-brown, K± violet, C± violet, pigment confined to gel-matrix. Asci cylindrical, 35–40 × 9–12 µm. Ascospores ellipsoid, oblong-ellipsoid, oblong-ovoid, 0–1-septate, (6.5–)7.5–9(–12) × (2.5–)3–4(–4.5) µm. Paraphyses of one type, rather scanty, hyaline, branched and anastomosing, 0.8–1.5 µm wide, apices only slightly widening. Hypothecium hyaline to light straw-coloured, 80–130 µm tall. Excipulum not developed. Pycnidia always present, numerous, stalked, 0.1–0.5 mm tall together with

pycnidiophores or up to 1 mm tall when proliferating, whole pale, pinkish to grey-brown, coated with white tomentum, usually gaping above and extruding white to white-cream mass of pycnidia; pycnidial walls brownish to pinkish, K+ violet, C+ violet; mesoconidia narrowly ellipsoid, 4–5(–5.5) × 1.2–1.7 μm.

CHEMISTRY. Substances not detected by TLC.

NOTES. *Micarea hedlundii* is frequently found growing with the similar *M. prasina* Fr., from which it can be distinguished in the field only by its numerous, tomentose and stalked pycnidia. Its dry, sorediose, dull olive-green thallus is darker than in *M. prasina*, and its goniocysts usually have smaller dimensions, but sometimes these features are not easily visible owing to the great, morphological variability of the latter species. *Micarea hedlundii* can be confirmed by careful, microscopical examination of the goniocysts, which contain orange droplets of an oily substance, reacting K+ purple-violet ('Intrusa-yellow' pigment). Coppins (1983) suggested the possible presence of some traces of micareic acid ('prasina unknown B') within the thallus of *M. hedlundii*, in consequence of its strong affinity to *M. prasina*. However, secondary substances have not been observed in several samples of *M. hedlundii* examined here by TLC, but molecular analyses by Andersen (2004) have confirmed that both species are closely related, forming a sister branch in the phylogenetic tree of the genus *Micarea*.

The dark form of *M. micrococca* (Körb.) Gams ex Coppins with an olive pigment inside goniocysts and apothecia can also be confused with *M. hedlundii*, especially when pycnidia of the latter are poorly developed. However, *M. micrococca* contains methoxymicareic acid, and its small pycnidia immersed within the thallus, or even when sessile, are never tomentose. Moreover, *M. micrococca* grows mainly on the bark of different trees, very often outside woodlands, while *M. hedlundii* has never been recorded on substrata other than soft lignum of decaying stump within forests.

Stalked, tomentose pycnidia have also been recently discovered in *M. tomentosa* Czarnota & Coppins, which also does not produce any sec-

ondary substances. However, this species differs from *M. hedlundii* in its paler, bright green thallus composed of thicker, almost scurfy granules and its paler apothecia (for more details see under *M. tomentosa*).

HABITAT AND DISTRIBUTION IN POLAND. *Micarea hedlundii* was reported in Poland for the first time in 1997 based on several localities in the Gorce Mts (Czarnota 1997b). During the next years it was reported from a few other localities in the eastern part of the country (Czyżewska *et al.* 2002, 2005; Cieśliński 2003c; Łubek 2003). As for Europe in general, it also appeared to be rare in Poland, but a revision of old specimens of *M. prasina* housed in Polish herbaria showed that it had been formerly collected in different regions before its description by Coppins (1983). It was also probably overlooked in the field and its characteristic tomentose pycnidia probably considered as belonging to a non-lichenized fungus.

*Micarea hedlundii* is strongly lignicolous, usually occurring on decaying stumps of coniferous trees within shady and wet forest communities, especially those dominated by *Abies alba* in mountains and by *Pinus sylvestris* or *Picea abies* in lowlands. It has also been found on decaying stumps of *Fagus sylvatica* within almost clear, old beech forest *Dentario glandulosae-Fagetum* in Wyżyna Krakowsko-Częstochowska upland. In mountains it is more frequently found in the lower belt between 600 and 800 m, in shaded valleys, but occasionally it also occurs in the upper spruce mountain forest at 1100 m or more (maximum 1410 m) as in Western Beskidy and Tatra Mts. Associated species include *Cladonia digitata*, *Lepraria* spp., *Micarea botryoides*, *M. melaena*, *M. prasina* s.str., *Lichenomphalia umbellifera*, cf. *Pertusaria pupillaris*, *Placynthiella dasaea* and *P. icmalea*.

The species has recently been accepted in Poland as an indicator of lowland old-growth forests (Czyżewska & Cieśliński 2003), owing to its occurrence only in old, natural forests or regenerated managed stands. New data presented here confirm this opinion and even extend this bioindicational role in Central Europe. Soft, decaying wood of

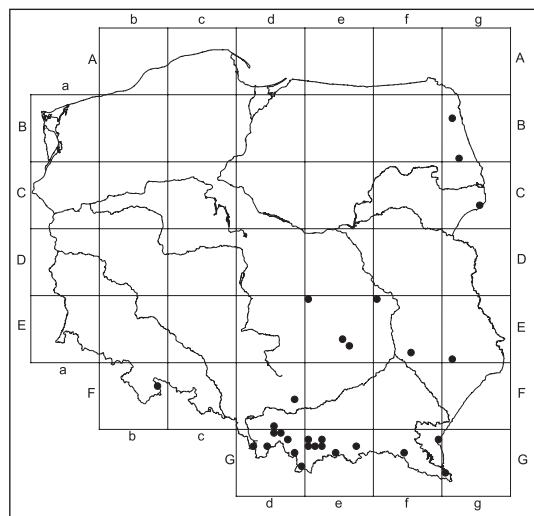


Fig. 24. Distribution map of *Micarea hedlundii* Coppins in Poland.

stumps or fallen trees seems to be the main requirement for *M. hedlundii*, hence it usually occurs in nature reserves or national parks where long-term protection is provided.

**WORLD DISTRIBUTION.** The European distribution of *M. hedlundii* is indicative of a mountain-boreal species. Almost certainly, the localities mentioned here in the Polish Eastern Carpathians do not delimit it to the east, as it occurs at least in the Ukrainian part of this mountain range and possibly in boreal regions of Russia. The species is also known from Central Africa, California in North America, and the temperate rainforests of southern Chile.

**EUROPE:** Austria (Palice 1999; Hafellner & Türk 2001); Luxembourg? (Diederich & Sérusiaux 2000 – this strongly lignicolous species reported here from sandstone rock); Czech Republic (Palice 1999; Vězda & Liška 1999); Estonia (Halonen *et al.* 2000; Jürriado *et al.* 2000); Finland (Vitikainen *et al.* 1997); France (Palice 1999); Germany (Palice 1999; Scholz 2000); Great Britain (Coppins 2002); Ireland (Seaward 1994); Lithuania (Motiejūnaitė *et al.* 2003); Norway (Santesson 1993); Russia – Komi Republic (Hermansson *et al.* 1998); Slovakia (Guttova & Palice 1999; Palice 1999; Palice *et al.* 1999); Sweden (Santesson

1993); Ukraine (Coppins, pers. comm.). **AFRICA:** Rwanda, Chaine des Birunga at 3040 m, 1974, *leg. Lambinon* (E, not seen; Coppins, pers. comm.). **NORTH AMERICA:** USA – California (Coppins, pers. comm.). **SOUTH AMERICA:** Chile (Coppins, pers. comm.).

**EXAMINED SPECIMENS.** Grid square Bg-31 – POJEZIERZE LITEWSKIE LAKELAND, RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, forest sections no. 143/144, ca 2 km SW of ‘Mały Borek’ nature reserve, 18 Sept. 1986, *leg. S. Cieśliński* (KTC together with *M. prasina* s.str.); Bg-92 – NIZINA PÓLNOCPODLASKA LOWLAND, WYSOCZYŻNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, Czarna Białostocka forest division, ‘Budzik’ nature reserve, forest section no. 124c, 12 June 1999, *leg. K. Czyżewska* (LOD 10884); Cg-65 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowieża forest division, forest section no. 494C, 13 Aug. 2002, *leg. P. Czarnota* (GPN 3026, 3029); Ee-00 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, RÓWNINA PIOTRKOWSKA PLAIN: ‘Spała’ nature reserve, forest section no. 285, 8 May 1970, *leg. K. Czyżewska* (LOD 11875), as *Catillaria denigrata*; Ee-65 – WYŻYNA KIELECKA UPLAND, GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, Dolina Wilkowska valley, Psary forest district, forest section no. 267, 23 Sept. 2000, *leg. A. Donica* (KTC); Ee-76 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, Dolina Wilkowska valley, Dąbrowa forest district, forest section no. 70, 11 Aug. 2000, *leg. A. Donica* (KTC; LOD 11159); Ef-00 – NIZINA ŚRODKOWOMAZOWIECKA LOWLAND, RÓWNINA KOZIENICKA PLAIN: Puszcza Kozienska Forest, ‘Zagożdżon’ nature reserve, 14 May 1999, *leg. S. Cieśliński* (KTC together with *M. prasina* s.str.; LOD ex KTC); Ef-85 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, ‘Łęka’ nature reserve, 8 Sept. 1999, *leg. S. Cieśliński* (LBL); Eg-91 – ROZTOCZE, MIDDLE ROZTOCZE: Roztoczański National Park, Stogi forest district, forest section no. 178b [50°35'42"N/23°04'42"E] alt. ca 260 m, 28 Apr. 2004, *leg. P. Czarnota* 3895, 3922 (GPN); Fb-38 – EASTERN SUDETES, GÓRY ŻŁOTE MTS: near Łądek Zdrój town, towards Trolak Mt., 19 Oct. 1959, *leg. K. Glanc* (KRAM-L 26423 together with *M. prasina* s.str.); Fd-58 – WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND, WYŻYNA OLKUSKA UPLAND: Wyżyna Ojcowska upland, Ojcowski National Park, Dolina Sąspowska valley, forest section no. 30a, 15 Apr. 2004, *leg. P. Czarnota* 3915 (GPN); Fd-95 – WESTERN BESKIDY MTS, BESKID MAŁY MTS: S slope of Beskid Mt., valley of

Cisowy stream, alt. 600 m, 12 Apr. 1961, *leg. J. Nowak* (KRAM-L 7024 together with *M. prasina* s.str.); Gd-05 – BESKID MAKOWSKI MTS: Pasma Pewelskie range, Pewel Wielka village, Plutowa Polana settlement, alt. ca 650 m, 22 July 1965, *leg. J. Nowak* (KRAM-L 13654), as *M. prasina*; Gd-06 – BESKID ŻYWIECKI MTS: Pasma Jałowieckie range, Stryczawa village, Siwcówka settlement, valley of Stryczawka stream, alt. ca 600 m, 16 Aug. 1965, *leg. J. Nowak* (KRAM-L 15487 together with *M. prasina* s.str.); Gd-17 – BABIA GÓRA RANGE: ca 500 m of Krowiarki pass, by hiking track to Sokolica Mt. [49°35'18"N/19°34'37"E] alt. 1010 m, 11. Nov. 2005, *leg. P. Czarnota* 4611 (GPN); Gd-22 – BESKID ŻYWIECKI MTS: Lastoczka settlement below Rachowiec Mt., alt. 710 m, 11 Aug. 1964, *leg. J. Nowak* (KRAM-L 14200, 14206), both together with *M. prasina* s.str.; Gd-24 – BESKID ŻYWIECKI MTS: Pilsko range, Sopotnia Wielka village, valley of W Ciemnym stream, alt. 830 m, 17 June 1966, *leg. J. Nowak* (KRAM-L 17070 together with *M. prasina* s.str.); Gd-38 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKO-NOWOTARSKA BASIN: forest SE of Jabłonka village, 2 Aug. 1999, *leg. J. Kiszka* (KRAP); Gd-59 – TATRA MTS, WEST TATRA MTS: S slope of Kominy Tylkowe Mt., between Iwanówka glade and Iwaniacka Pass, alt. 1226 m, 5 Sept. 1959, *leg. Z. Tobolewski* (POZ together with *M. prasina* s.str.) and alt. ca 1410 m, 13 Sept. 1958, *leg. Z. Tobolewski* (POZ), as *Catillaria prasina*; Ge-10 – WESTERN BESKIDY MTS, BESKID WYSPOWY MTS: NE slope of Luboń Wielki Mt. by hiking track, alt. 800 m, 5 June 2003, *leg. P. Czarnota* (GPN 3246); Ge-10 – GORCE MTS: Gorce National Park: valley of Olszowy stream at foot of Średnie Mt., alt. 720 m, 27 Oct. 1995, *leg. P. Czarnota* (GPN 478); E slope of Suhora Mt., valley of Olszowy stream, alt. 860 m, 23 Feb. 2002, *leg. P. Czarnota* (GPN 2725); valley of Olszowy stream, by the bank of stream, alt. 710 m, 28 Aug. 2003, *leg. P. Czarnota* (GPN 3308); Ge-12 – BESKID WYSPOWY MTS: W slope of Modyń Mt. [49°37'23"N/20°22'37"E] alt. 890 m, 2 July 2005, *leg. P. Czarnota* 4589 (GPN); Ge-20 – GORCE MTS: Gorce National Park, 'Turbacz' nature reserve, valley of Olszowy stream, alt. 780 m, 24 Oct. 1997, *leg. P. Czarnota & J. Kiszka* (GPN 1737), alt. 800 m, 18 July 2003, *leg. P. Czarnota* (GPN 3556); Ge-21 – GORCE MTS: Gorce National Park: 'Turbacz' nature reserve, valley of Olszowy stream, alt. 900 m, 26 June 1996, *leg. P. Czarnota* (GPN 1131); valley of Konina stream below Podmostownica glade, vicinity of Krowiarka clearing, alt. 900 m, 10 Oct. 1996, *leg. P. Czarnota* (GPN 1177); valley of Turbacz stream above Aniolka clearing, alt. 820 m, 22 May 1996, *leg. P. Czarnota* (GPN 1414);

valley of Kamienica stream below Średniak glade, alt. 900 m, 9 June 1997, *leg. P. Czarnota* (GPN 1604); valley of Kamienica stream, S slope of Przysłop Mt., alt. 1140 m, 8 Oct. 1996 (GPN 1167); N slope of Kiczora Mt., Czerwony Groń region in Dolina Kamienicy valley, alt. 1070 m, 10 May 1994, *leg. P. Czarnota* (GPN 915); near Kamienica stream below Mały Borek clearing, alt. 980 m, 2 Oct. 1996, *leg. P. Czarnota* (GPN 1220); valley of Kamienica stream near estuary of Stawieniec stream, alt. 860 m, 11 June 1996, *leg. P. Czarnota* (GPN 1225); valley of Jaszcz Duże stream below Szeligowa glade, alt. 980 m, 3 June 1997, *leg. P. Czarnota* (GPN 1571, 1572); valley of Jaszcz stream below Przysłop Górny glade, alt. 1080 m, 26 May 1997, *leg. P. Czarnota* (GPN 1570); upper part of valley of Forędówki stream below Jaworzyna Kamienicka Mt, alt. 1100 m and alt. 1180 m, 6 Nov. 1997, *leg. P. Czarnota* (GPN 1762, 1765); SSE slope of Kudłoń Mt., below Stawieniec glade, in valley of Stawieniec stream, alt. 1100 m, 5 Oct. 2000, *leg. P. Czarnota* (GPN 2183); valley of Roztoka stream, at foot of Mostownica Mt., alt. 800 m, 12 June 2000, *leg. P. Czarnota* (GPN 2319) and 25 May 2001, *leg. P. Czarnota* (GPN 2140); SE slope of Kudłoń Mt. above Stawieniec glade, in valley of Stawieniec stream, alt. 1100 m, 5 Oct. 2000, *leg. P. Czarnota* (GPN 2183); upper part of valley of Roztoka stream, below Koziniec forest area, alt. 1020 m, 13 Nov. 2000, *leg. P. Czarnota* (GPN 2373); Ge-22 – GORCE MTS: Lubań range, valley of Rolnicki stream [49°29'59"N/20°21'03"E] alt. 860 m, 18 Oct. 2004, *leg. P. Czarnota* 4020 & *A. Wojnarowicz* (GPN); Ge-27 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: E edge of Berest village by anonymous stream [49°30'56"N/20°59'00"E] 25 Sept. 2005, *leg. P. Czarnota* 4558 (GPN); Ge-34 – WESTERN BESKIDY MTS, BESKID SADECKI MTS: Radziejowa range, Piwniczna forest division, Roztoka Wielka forest district, forest section no. 182 above 'Baniska' nature reserve [49°26'54"N/20°36'37"E] alt. ca 1020 m, 4 Nov. 2004, *leg. P. Czarnota* 4362 (GPN); Gf-19 – EASTERN BESKIDY MTS, GÓRY SANOCKO-TURCZAŃSKIE MTS, ca 1 km N of Kwaszenina settlement by road to Arłamów village [49°33'52"N/22°38'35"E] alt. 460 m, 17 June 2005, *leg. P. Czarnota* 4495 (GPN); Gf-34 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: valley of Izwór stream near Wisłok Wielki village, alt. ca 580 m, 23 June 1974, *leg. J. Nowak* (KRAM-L 32817 together with *M. prasina* s.str.); Gg-60 – EASTERN BESKIDY MTS, WESTERN BIESZCZADY MTS: S of Stuposiany village, SE of former village Pszczeliny, alt. ca 650 m, 25 Sept. 1958, *leg. Z. Tobolewski* (POZ), as *Catillaria prasina* and 29 July 1959, *leg. Z. Tobolewski* (POZ), together with *Psilolechia clavulifera*, as *Catillaria prasina*.

ADDITIONAL SPECIMENS EXAMINED. CZECH REPUBLIC, ŠUMAVA MTS: Nová Pec, NE of the dam of Plešné jezero lake [48°46.61'N/13°52.42'E] alt. 1030–1050 m, on bark of dead *Picea* in cold depression among boulders, 26 June 2006, *leg. Z. Palice 10420* (GPN ex PRA). IRELAND, DONEGAL: Glenveagh National Park, valley above Glenveagh Castle, ca 300 ft., on stump just above garden wall, 17 July 1991, *leg. B. Coppins 14687* (E); TYRONE: ca 5 km E of Gortin, S side of Owen-killew River, Drumlea Wood, alt. 100 m, on old *Quercus* stump in clearing, 11 July 1991, *leg. B. Coppins 14389* & *A. M. O'Dare* (E). LITHUANIA, PRIENAI DISTRICT: Nemunas loops Regional Park, Balbieriškis Forest, forest section no. 50, on rotting stump in young mixed broad-leaf forest, 28 Sept. 2002, *leg. P. Czarnota* (GPN 3138). SLOVAKIA, SLOVENSKÝ RAJ NATIONAL PARK: Hrabušice, Veľký Kysel gorge [48°55'50"–56'00"N/20°24'15–30"E] alt. 800–850 m, on moribund wood of a stump, 12 June 1998, *leg. Z. Palice 925* (PRA, together with *M. tomentosa*).

***Micarea incrassata* Hedl.** (Figs 3A, 23 & 25)

Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18**(3): 82, 94. 1892. TYPE: Austria, Tirol (S – HOLOTYPE, *n.v.*).

– *Lecidea assimilata* var. *infuscata* Th. Fr., Lich. Scand. **2**: 522. 1874. – *Lecidea assimilata* f. *infuscata* (Th. Fr.) Vain., Meddeland. Soc. Fauna Fl. Fenn. **10**: 85. 1883. TYPE: Norway, Sör-Tröndelag, Oppdal hd., Dovre, Kongsvoll, Högsnyta, 17 Aug. 1863, *Th. M. Fries* (UPS – LECTOTYPE and ISOLECTOTYPE, *n.v.*; WRSL – ISOLECTOTYPE!).

Thallus composed of confluent, convex to ±hemispherical, straw- to dark yellowish-grey coloured warts or areoles, that are sometimes intermixed with brown, globose or irregular to ±flat structures containing cyanobacteria (*Stigonema* and *Nostoc*; Coppins 1983). Photobiont micareoid; algal cells globose, 5–7 µm diam.; haustoria strongly developed and easily visible in the photobiont. Apothecia black to black-brown, immarginate, adnate, convex to hemispherical, simple, 0.3–0.6 mm diam. or usually confluent into small groups and then up to 1.5 mm. Hymenium 40–50 µm tall, epithecium clearly visible, aeruginose to olivaceous, lower part hyaline to dilute olivaceous; pigment confined to gel matrix. Asci clavate, 40–45 × 10–13 µm. Ascospores ellip-

soid, ovoid-ellipsoid, 0–1(–2)-septate, but mostly simple, (8.5–)10–15(–18) × 3.5–4.5(–4.8) µm. Paraphyses multiseptate, 1.5–2 µm wide, branched and anastomosing mainly in epithecium, some of them with swollen to 3 µm, globose apices, hyaline, but closely surrounded by aeruginose gel-matrix. Hypothecium orange-brown (thin sections) to dark brown, K–. Excipulum indistinct. Pycnidia black, immersed or emergent with fissured ostioles and sometimes also a white mass of conidia, 0.2–0.25 mm diam.; pycnidial walls blue-green, K+ dulling. Macroconidia 30–55 × 1–1.3 µm, straight or slightly curved; microconidia observed by Coppins (1983) have not been found.

CHEMISTRY. No substances detected by TLC.

NOTES. Formerly *M. incrassata* was classified as a variety of *M. assimilata* owing to its similar morphology, anatomy and ecology (see also Coppins 1983 and literature cited therein), as well as its cephalodia which contain the cyanobacteria. This was sufficient for Coppins (1983) to regard both as members of the same infrageneric group, although *M. incrassata* has a brown hypothecium while *M. assimilata* and two next species (all not reported as yet from Poland) belonging here, namely *M. paratropha* (Nyl.) Alstrup [= *M. subviolascens* (H. Magn.) Coppins] and *M. melaenida* (Nyl.) Coppins, have purple-black pigmentation inside the apothecial section.

Recent molecular studies of *Micarea* suggest, however, that *M. incrassata* is located in another place of the phylogenetic tree (Andersen 2004), outside of the *M. assimilata* group proposed by Coppins (1983). Unfortunately its position differs significantly between the Bayesian consensus tree and the weighted maximum parsimony tree, and in both cases it is insufficiently supported. Considering this, the phylogenetic position of *M. incrassata* is still unclear.

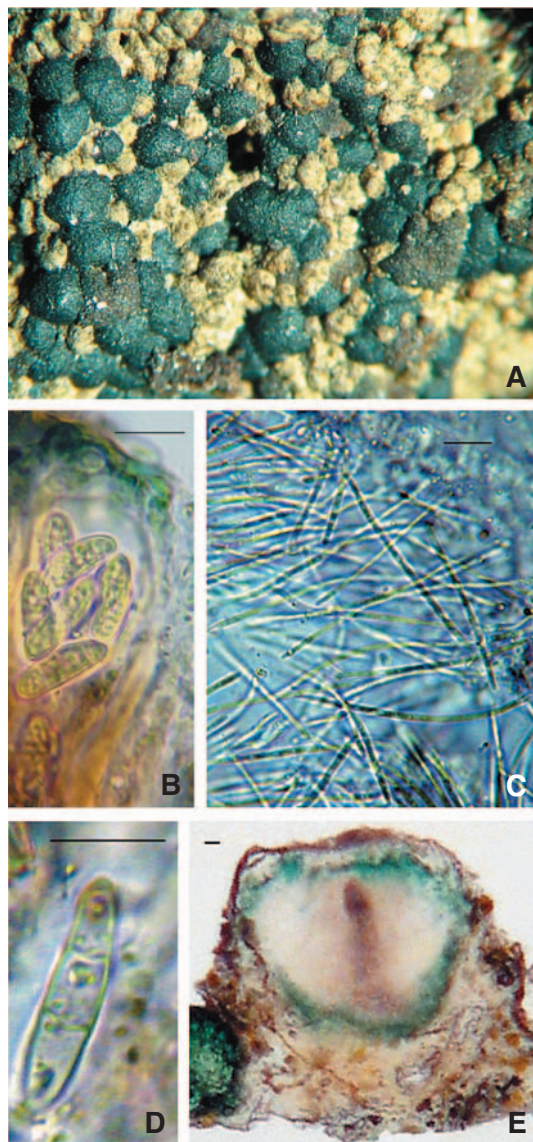
So far only short conidia, classified as ‘microconidia?’ were known in *M. incrassata* (Coppins 1983). Polish collections lack of those structures, but pycnidia bearing macroconidia have been found for the first time (Fig. 25C).

Several alpine species known from Polish



mountains, having similar morphology and inner apothecial pigmentation, share the same habitat as *M. incrassata* and may often be confused, as noted elsewhere (see below and also Coppins 1983). Differences between *M. incrassata* and *Protomicarea limosa* (Ach.) Hafellner, *Mycobilimbia hypnorum* (Lib.) Kalb & Hafellner and *Frutidella caesioatra* (Schaer.) Kalb. are presented by Coppins (1983) and Czarnota (2004). The last species was reported by Stein (1879: 246) from a few localities in the Polish Karkonosze Mts, and one of his specimens from ‘Riesengebirge, Klainer Taum, ?’ in WRSL named *L. arctica* Sommerf. (syn. *Frutidella caesioatra*) has been located. Although *F. caesioatra* has not been recorded in the Karkonosze Mts for many years, its continuing occurrence there is possible.

**HABITAT AND DISTRIBUTION IN POLAND.** Stein (1879: 246) reported this species as *Lecidea assimilata* Nyl.  $\beta$  *infuscata* Th. Fr. from a few places located in the Karkonosze Mts ‘auf dem Gipfel der Schneekoppe, im Aufstieg aus dem Melzergrunde, und an der Kesselkoppe’. His short description of these collections include some features of *M. incrassata* (e.g. apothecia black, immarginate, dull brown to blackish hypothecium, hymenium in upper part aeruginosae and grey brown thallus), which would suggest that the latter species may have occurred there. Unfortunately, those cited specimens from ‘Kesselkoppe’ (Sept. 1872, Stein, WRSL) and Śnieżka Mt. ‘Schneekoppe’ (Stein, WRSL) refer to *Helocarpon crassipes* Th. Fr. and his material from the Tirol (Aug. 1876, Stein, WRSL) belongs to *Mycobilimbia hypnorum*. Körber’s specimen from Śnieżka Mt., also cited by Stein (1879), has not been discovered in Polish or other herbaria. It is unclear why Stein mistakenly determined the taxon many times, since the type of the species was present in his herbarium (see below). Considering this, it is hard to say whether *M. incrassata* was correctly reported from the Sudetes, but *L. assimilata*  $\beta$  *infuscata* was noted by Eitner (1896) from the Czech part of the Karkonosze Mts based on his own and Körber’s collections. Unfortunately, there are no modern records



**Fig. 25.** *Micarea incrassata* Hedl.: A – morphology, B – simple ascospores, C – macroconidia, D – vertical section of pycnidium bearing macroconidia (leg. Z. Tobolewski, 10 Sept. 1958, POZ); E – 2-septate ascospore (*Flakus* 2887, KRAM). Scale bars = 10  $\mu$ m.

from the whole mountain range (see also Vězda & Liška 1999: 106).

Only two revised, Polish collections of *M. incrassata* growing on bryophytes covering thin, acid soil over crevices of granite rocks have been

collected; the first one almost 50 years ago (Czarnota 2004) and the second recently (*Flakus* 2887, KRAM; see below), both in the High Tatra Mts. Two recent explorations made by author failed to confirm its more frequent occurrence in that region, but it is very likely to be not so rare there.

WORLD DISTRIBUTION. *Micarea incrassata* is an arctic-alpine species with bipolar distribution (Coppins 1983), being distributed throughout the arctic region of the Northern Hemisphere. Within continents it occurs almost always in alpine belts of high mountains.

EUROPE: Austria – Tirol (Coppins 1983; Hafellner & Türk 2001); Denmark? (Coppins 1983), but now extinct according to Søchting and Alstrup (2002); Germany – Upper Bavaria (Coppins 1983); Great Britain and Ireland (Coppins 1983, 2002; Seaward 1994); Iceland (Kristinsson & Heidmarsson 2006); Norway (Santesson 1993) including Svalbard (Elvebakk & Hertel 1997; Czarnota 2004); Sweden (Santesson 1993); Switzerland (Coppins 1983); Ukraine – Eastern Carpathians (Konratyuk *et al.* 1998). NORTH AMERICA: Greenland (Thomson 1997; Alstrup *et al.* 2000; Hansen 2002); USA – Alaska (Thomson 1997), Colorado (Coppins 1983; Weber & Wittmann 2000). SOUTH AMERICA: Ecuador (Palice, pers. comm.). ASIA: Mongolia – Khangai (Biazrov 2005); Russia – Russian Arctic: Novaya Zemlya, Yamal-Gydan area, Severnaya Zemlya, Beringian Chukotka (Andreev *et al.* 1996; Zhurbenko 1996). SUBANTARCTIC: Kerguelen Island (Coppins 1983).

EXSICCATAE SEEN. Hertel, *Lecid. Exs. No. 152 p. min. p* (E).

SPECIMENS EXAMINED. Grid square Ge-60 – TATRA MTS, HIGH TATRA MTS: Szpiglasowa Pass, alt. ca 2110 m, 10 Sept. 1958, leg. Z. Tobolewski (POZ), as *Lecidea assimilata*; Ciemnosmreczyńska Przełęczka pass, mylonite area, subnival belt [49°11'21"N/20°02'59"E] alt. 2105 m, 24 July 2004, leg. A. Flakus 2887 (KRAM).

ADDITIONAL SPECIMENS EXAMINED. SCOTLAND, WESTER ROSS: Beinn Eighe NNR, Ruadh-stac Beag, alt. 840–860 m, moss heath at N and of summit plateau, 24 June 1990, leg. B. Coppins *et al.* 13763 (E). For others see Czarnota (2004).

*Micarea leprosula* (Th. Fr.) Coppins & A. Fletcher (Fig. 26)

in Fletcher, *Lichenologist* 7(2): 111. 1975.

*Bilimbia miliaria* γ *leprosula* Th. Fr., *Lich. Scand.* 2: 382. 1874. – *Micarea violacea* var. *leprosula* (Th. Fr.) Hedl., *Bih. Kongl. Svenska Vetensk.-Akad. Handl.* III, 18(3): 81, 92. 1892. – *Bilimbia leprosula* (Th. Fr.) H. Olivier, *Bull. Géogr. Bot.* 21: 179. 1911. – *Bacidia leprosula* (Th. Fr.) Lettau, *Hedwigia* 52: 133. 1912. TYPE: Sweden (UPS – LECTOTYPE, *n.v.*).

Thallus greenish-grey, grey or ash-grey, rarely brownish-grey, composed of warted or subglobose, ecorticated areoles, fragile and often easily breaking down with whitish, pale yellowish-green to slightly yellowish, loose, C+ intensive red medulla or eroding to form sorediate patches with greenish, greenish-grey or ash-grey soredial granules, especially frequent toward the centre (in shaded niches the green pigmentation more distinct). Areoles without amorphous covering layer, Pd+ rust red (sometimes the reaction only slightly visible) or Pd– in relation to second chemotype. Photobiont micareoid, algal cells 4–8 μm. Apothecia and pycnidia not seen in Polish specimens. For details see Coppins (1983).

CHEMISTRY. TLC: gyrophoric acid and argopsin; II chemotype – only gyrophoric acid.

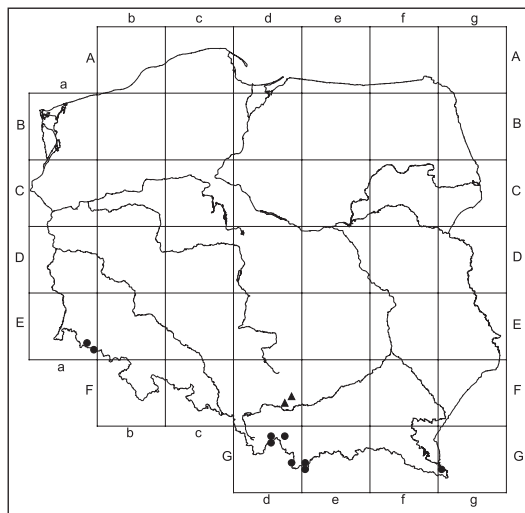
NOTES. *Micarea leprosula* is a distinctive species composed of characteristic, fragile, ash-grey areoles often dissolved to form sorediate patches, reacting C+ red. Unfortunately, most of the Polish specimens examined had no apothecia. In such cases, it is almost identical with sterile forms of *M. submilliaria* (Nyl.) Coppins and their separation could only be possible on the basis of colour reaction, or even chromatography since the concentration of argopsin within the thallus of *M. leprosula* is sometimes insufficient to give a distinct Pd+ rust red reaction. The thallus of *M. submilliaria* reacts Pd+ yellow owing to the presence of alectorialic acid and this colour is usually more visible than the previous one. Moreover, a microscopic examination shows the thallus of *M. submilliaria* is more frequently distinctly ash-grey, while the areoles of *M. leprosula* are mostly dark grey or greenish-grey,

and specimens growing in more shaded and moist niches are even green-grey.

In the field, *M. leprosula* can also resemble sterile forms of *Helocarpon crassipes* or even *M. lignaria*, which occupy the same habitats in subalpine and alpine belts. *Helocarpon crassipes* forms a similar, small warted or granular thallus, but it is not fragile and has no chemical reactions (C–, P–). Moreover it is usually fertile, and its apothecia are, at least when young, distinctly shortly-stalked and marginate. The areolate thallus of *M. lignaria* is covered by an amorphous layer and does not effuse into sorediose patches, and it gives a negative reaction C–. There are also differences in septation and size of ascospores, being in *M. lignaria* longer, widely fusiform and at least some of them 4–7-septate, and in *M. leprosula* shorter, oblong-ellipsoid and 3-septate at the outmost.

A second chemotype without argopsin has been discovered in two cases, but those specimens were also sterile, so differences in ascumatal characters between both chemotypes are unknown, but the thalli seemed to be more straw-coloured (or greenish when fresh?), in contrast to ash coloured thalli of the type form, and their soredia more abundant and diminutive owing to the more fragile thallus.

**HABITAT AND DISTRIBUTION IN POLAND.** Until the discovery of *M. leprosula* in 2003, it was only known in Poland from a single unpublished record, correctly identified as *Bacidia leprosula* (Th. Fr.) Lettau by Erichsen at the beginning the 20th century. Recently, although it has been collected many times, together with *M. lignaria*, by Polish lichenologists from Karkonosze Mts, Tatra Mts and Bieszczady Mts, it has been overlooked because of its sterile thallus (Czarnota 2004). The last report based on those reviewed and several new collections from the alpine belt of the high mountains (Czarnota 2004) and some data from Austria (Hafellner & Türk 2001) and Czech Republic (Vězda 1961) suggest that it is restricted to upper mountain climatic conditions in this part of Europe. Further revision of materials housed in KRAM confirms this opinion in general, but also



**Fig. 26.** Distribution map of *Micarea leprosula* (Th. Fr.) Cop-pins & A. Fletcher (●) and *Micarea leprosula* II chemotype (▲) in Poland.

shows that it occurs in lower mountain ranges as well, especially in Western Beskidy Mts, where it was collected at its lowest locality of ca 500 m. In most cases, *M. leprosula* is found on moribund bryophytes or debris of vascular plants (especially in high mountains), in association with *M. lignaria* (with which it is mostly confused) within alpine grass communities and dwarf mountain-pine scrub *Pinetum mughi carpaticum* Pawł. 1927; other associated species include *Helocarpon crassipes*, *M. submilliaria*, *Porina mammosa* (in Tatra Mts) and *Protomicarea limosa*. Although *M. leprosula* has been mainly reported in areas of acid geological formations, it seems to be more tolerant considering its presence in the limestone of West Tatras (e.g. KRAM-L 7383), but it may be buffered here by its substratum of decaying plants. Sometimes it grows on thin soil or humus covering crevices of exposed boulders or between them in field-boulders, but only among siliceous rocks. *Micarea leprosula* prefers rather open sites more or less exposed to light, but in cases of high insolation it usually grows in shaded niches.

The second chemotype of *M. leprosula* has probably different ecological requirements. It was found in the limestone region of Wyżyna Krakowsko-Częstochowska upland growing on

decaying terricolous bryophytes in close relationship with *M. peliocarpa* at altitudes less than 400 m. However, the limited number of specimens examined does not afford to any generalization.

WORLD DISTRIBUTION. *Micarea leprosula* seems to have an alpine-arctic distribution, but it is known also from lowland, especially oceanic, localities in Europe. In the British Isles it is rare in much of England and Wales, its main distribution being concentrated in mountainous, more climatically severe parts of Scotland (see Coppins 1983).

EUROPE: Austria (Hafellner & Türk 2001); Czech Republic (Vězda & Liška 1999); Denmark (Søchting & Alstrup 2002); Germany – Lower Saxony (Hauck 1996), Nordrhein-Westfalen (Heibel 1999), Schleswig-Holstein (Jacobsen 1992, 1997); Great Britain and Ireland (Coppins 1983, 2002; Seaward 1994); Iceland (Kristinsson & Heidmarsson 2006); the Netherlands, rare (Aptroot *et al.* 2004); Norway (Santesson 1993); Slovakia (Pišút *et al.* 1996); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993). ASIA: China – Yunnan (Aptroot *et al.* 2003). NORTH AMERICA: USA (Esslinger 1997) – e.g. New York (Harris 2004), Pacific Northwest (McCune 2004).

Data on the second chemotype of *M. leprosula* having only gyrophoric acid, also collected from a single locality in the British Isles (Coppins, pers. comm.), has not been published.

EXSICCATAE SEEN. Migula, *Crypt. Germ., Aust., Helv. No. 1 p. min. p.* (E); Tønsberg, *Lich. Isid. Sored. Crust. Exs. No. 44* (E).

SPECIMENS EXAMINED. Grid square Ea-78 – WESTERN SUDETES, KARKONOSZE MTS: between Śnieżne Kotły glacial corries, 2 Aug. 1907, *leg. C. F. E. Erichsen* (HBG), as *Bacidia leprosula*; Karkonoski National Park, above Wielki Śnieżny Kocioł glacial corrie, alt. ca 1420 m, 6 Oct. 1964, *leg. J. Nowak* (KRAM-L 29742 together with *M. lignaria*); Ea-89 – KARKONOSZE MTS: Karkonoski National Park: N slope of Śnieżka Mt. in Kocioł Łomniczy glacial corrie [50°44.38'N/15°44.03'E] alt. 1300 m, 8 July 2003, *leg. P. Czarnota* (GPN 3281), W slope of Śnieżka Mt., alt. 1520 m [50°44.18'N/15°44.18'E] 8 July 2003, *leg. P. Czarnota* (GPN 3555), above Mały Staw lake, near hiking track [50°45.03'N/15°41.75'E] alt. 1360 m, 8 July

2003, *leg. P. Czarnota* (GPN 3542, 3544, 3541 together with *M. lignaria*); Fd-58 – WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND, WYŻYNA OLKUSKA UPLAND: Kobyłańska Valley, alt. ca 400 m, 17 Oct. 1962, *leg. J. Nowak* (KRAM-L 10045) – II chemotype; Fd-67 – RÓW KRZESZOWSKI DEPRESSION: Nielepice village on Rudawa River, Chelm hill, 30 Sept. 1986, *leg. J. Nowak* (KRAM-L 30457) – II chemotype; Gd-15 – WESTERN BESKIDY MTS, BESKID MAKOWSKI MTS: Pasma Pewelskie range, Mutne village, alt. ca 500 m, 17 Sept. 1965, *leg. J. Nowak* (KRAM-L 13535 together with *M. lignaria*); Gd-17 – BABIA GÓRA RANGE: Polica range, Hala Śmietanowa glade, alt. 1220 m, 15 June 1965, *leg. J. Nowak* (KRAM-L 17175 together with *M. lignaria*); Gd-25 – BESKID ŻYWIECKI MTS: Pilsko range, Pilsko Mt., alt. 1450 m, 18 Sept. 1964, *leg. J. Nowak* (KRAM-L 16766 together with *M. lignaria*); Gd-58 – TATRA MTS, WEST TATRA MTS: NW slope of Jarzabczy Wierch Mt. above Dolina Jarzabcza valley, alt. ca 1680 m, 18 Aug. 1956, *leg. Z. Tobolewski* (POZ), as *Bacidia lignaria*; Ge-50 – WEST TATRA MTS: Kopa Magury Mt. from the side of Jaworzynka alpine meadow, 25 July 1961, *leg. J. Nowak* (KRAM-L 7383 together with *M. lignaria*); Ge-50 – HIGH TATRA MTS: Dolina Gąsienicowa valley, Kocioł Zmarzłego Stawu corrie, alt. 1860 m, 18 Sept. 1955, *leg. Z. Tobolewski* (GPN 3654); Dolina Pańszczyce valley, alt. ca 1600 m, 24 May 1963, *leg. J. Nowak* (KRAM-L 3522 together with *M. lignaria*); Dolina Waksmundzka valley, Za Popaski region below Turnia nad Dziadem Mt. [49°14.60'N/20°04.32'E] alt. 1650 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3576); Wołoszyn Wielki Mt. near Krzyżne Pass [49°13.73'N/20°02.91'E] alt. 2140 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3602) with apothecia; Dolina Waksmundzka valley below Wołoszyńska Wyżnia Pass [49°13.74'N/20°03.13'E] alt. 2050 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3294); Dolina Waksmundzka valley below the top of Pośredni Wołoszyn Mt. [49°13.79'N/20°03.23'E] alt. 2050 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3301); Wołoszyn range, Wierch nad Zagonnym Żlebem Mt., [49°14.21'N/20°04.17'E] alt. 1920 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3329); N slope of Żółta Turnia Mt., Łopata region [49°14'13"N/20°01'31"E] alt. 1870 m, 9 Oct. 2005, *leg. M. Węgrzyn 2639* (KRA); Ge-60 – HIGH TATRA MTS: Hala za Mnichem alpine meadow below Szpiglasowa Pass, alt. 1800 m, 6 June 1971, *leg. J. Nowak* (KRAM-L 23048 together with *M. lignaria*); Szpiglasowa Pass [49°11'52"N/20°02'31"E] alt. 2110 m, 8 Oct. 2005, *leg. P. Czarnota 4566* (GPN); Dolina Pięciu Stawów valley, Niżnie Solnisko region near W shore of Wielki Staw Lake [49°12.61'N/20°01.91'E] alt. 1750 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3565, 3583); Gg-60

– EASTERN BESKIDY MTS, WESTERN BIESZCZADY MTS: the top of Krzemień Mt., alt. 1330 m, 22 June 1956, *leg. Z. Tobolewski* (POZ, as *Bacidia l.* together with *M. lignaria*; GPN 3656), 26 Aug. 1957, *leg. K. Glanc* (KRAM-L 29108 together with *M. lignaria*) and 7 June 1960, *leg. J. Nowak* (KRAM-L 9025 together with *M. lignaria*); the ridge of Bukowe Berdo Mt., alt. 1200 m, 12 Aug. 1958, *leg. Z. Tobolewski* (GPN 3611); the ridge of Krzemień Mt., alt. 1300 m, 6 July 1960, *leg. K. Glanc* (KRAM-L 27644 together with *M. lignaria*); Tarnica Mt, alt. ca 1320 m, 7 June 1960, *leg. J. Nowak* (KRAM-L 8844 together with *M. lignaria*).

ADDITIONAL SPECIMENS EXAMINED. SCOTLAND, WESTER ROSS: Inverlael, Gleann na Squiab, ca 1000 ft., on soil or debris on side of trunk, 25 June 1984, *leg. B. Coppins 10529* (E). For others see Czarnota (2004).

***Micarea lignaria* (Ach.) Hedl. var. *lignaria***  
(Figs 27 & 28)

Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18**(3): 82, 93. 1892.

*Lecidea lignaria* Ach., Kongl. Svenska Vetensk. Akad. Handl. **1808**: 236. 1808. – *Bilimbia lignaria* (Ach.) Massal., Ric. Lich. Crost.: 121. 1852. – *Bacidia lignaria* (Ach.) Lettau, Hedwigia **52**: 132. 1912. TYPE: Sweden ‘Svecia’, on lignum (H-ACH 265 – LECTOTYPE!).

– *Lecidea miliaria* Fr., Kongl. Svenska Vetensk. Akad. Handl. **1822**: 255. 1822. TYPE: Sweden (UPS – LECTOTYPE, *n.v.*).

– *Lecidea geomaea* Taylor in Mackay, Fl. Hib. **2**: 124. 1836. TYPE: Ireland (BM – LECTOTYPE, *n.v.*; BM ex K – ISOLECTOTYPE, *n.v.*).

– *Bilimbia miliaria* var. *lignaria* f. *calamophila* Körb., Parerga Lich.: 171. 1860. TYPE: Germany (L – LECTOTYPE and ISOLECTOTYPES, *n.v.*).

– *Bilimbia miliaria* var. *saxicola* Körb., Parerga Lich.: 171. 1860. TYPE: Germany: ‘*Bilimbia trochiscus* Körb. prim, *B. miliaria* β. *saxicola* Kb.! an Extersteine’, on sandstone? *leg. Beckhaus* (WRS� – LECTOTYPE!).

– *Stereocauliscum gomphillaceum* Nyl., Flora **48**: 211. 1865. – *Bilimbia miliaria* f. *gomphillacea* (Nyl.) Blomb. & Forss., Enum. Pl. Scand.: 82. 1880. – *Micarea lignaria* [as ‘*lignaria*’] f. *gomphillacea* (Nyl.) Hedl., Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18**(3): 94. 1892. – *Micarea gomphillacea* (Nyl.) Vězda, Folia Geobot. Phytotax. **5**: 321. 1970. TYPE: Finland (H-NYL 40217 – LECTOTYPE; ISOLECTOTYPES: H-NYL 40214–40216, 40218 and *p.m.* 613, *n.v.*).

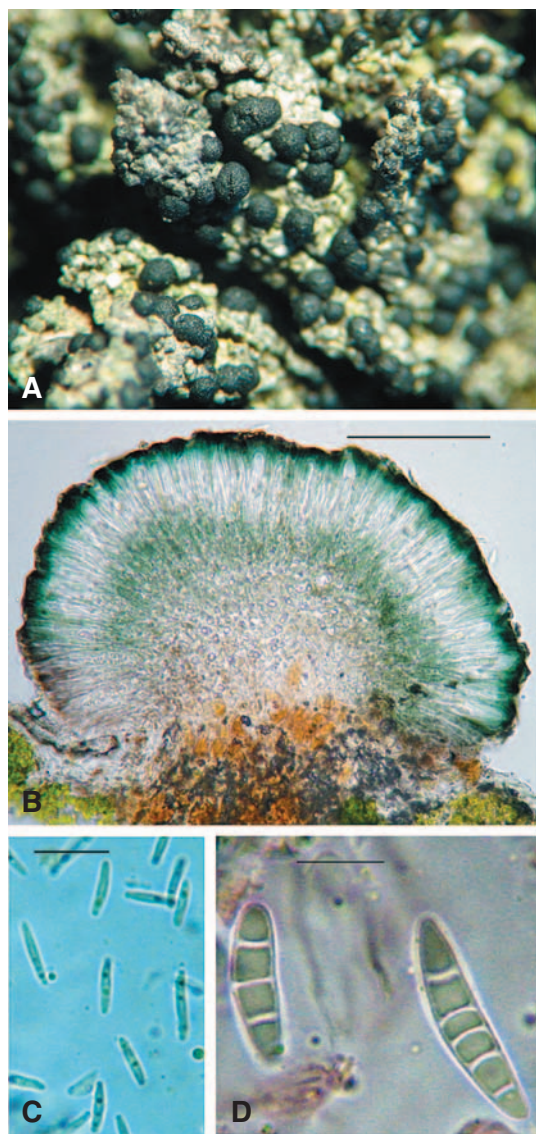
– *Lecidea sabuletorum* var. *miliaria* f. *nigrata* Nyl., Not. Sällsk. Fauna Fl. Fenn. Förh. **8**: 151. 1866. TYPE: Russia, Kola Peninsula (H – LECTO- and ISOLECTOTYPE, *n.v.*).

– *Lecidea miliaria* var. *triseptata* Nyl. in Lamy, Bull. Soc. Bot. France **25**: 441. 1878. – *Bilimbia triseptata* (Nyl.) Arnold, Flora **67**: 572. 1884, non *Bacidia triseptata* (Hepp in Zoll.) Zahlbr. TYPE: France (H-NYL 18367 – LECTOTYPE, *n.v.*).

– *Lecidea meizospora* Harm., Bull. Séances Soc. Sci. Nancy II, **33**: 63. 1899. – *Bacidia meizospora* (Harm.) Zahlbr., Cat. Lich. Univ. **4**: 122. 1926. TYPE: France (ANGUC – LECTOTYPE, *n.v.*).

– *Lecidea trisepta* var. *polytropoides* Vain., Ark. Bot. **8**(4): 106. 1909. TYPE: Russia, Siberia (TUR-VAINIO 21274 – LECTOTYPE, *n.v.*).

Thallus usually distinctively developed, thickly warted or composed of small, convex to subglobose, mostly coalescing areoles, whitish-grey, ash- to more or less intensive greenish-grey (especially on lignum or bark of trees), Pd+ ginger, C–. Sometimes areoles diffused or very rare, especially when it grows on vertical rocky walls within shady forest communities. Areoles with visible, thick, hyaline, amorphous covering layer up to 25(–30!) μm tall, K–. Photobiont micareoid, algal cells globose, 4–8 μm. Apothecia numerous, convex-hemispherical to globose, very often confluent, immarginate, black or grey-black (shade forms), 0.2–0.7(–0.9) mm diam. Hymenium 50–70 μm tall, in lower part hyaline or olivaceous, but towards the base of the apothecium this pigment is very often replaced by brownish to slightly violet-brown pigment, K– or K+ sordid green. Epithecium usually intensive aeruginose or olive-green, owing to the pigment present in the gel matrix and walls of paraphyses, K+ intensive sordid green. Asci clavate, 40–50 × 10–16 (–18) μm. Ascospores widely fusiform, straight or more rarely slightly curved, (0–)3–7 septate, (3.5–)4–5(–6) × (14–)16–30(–36) μm; ends ± rounded or sometimes cuspidate. Paraphyses numerous, branched (particularly in upper part) and sometimes anastomosing, especially towards the excipulum, 1.2–1.8 μm, but apices widening to 2.5–3 μm; walls hyaline in lower part, upper part within epithecium incrustated by sordid green pigment. Hypothecium to 300 μm tall, light, usu-



**Fig. 27.** *Micarea lignaria* (Ach.) Hedl. var. *lignaria*: A – morphology, B – vertical section of apothecia (Czarnota 3614, GPN); C – microconidia (GPN 3554); D – ascospores (GPN 3584). Scale bars: B = 100  $\mu$ m; C & D = 10  $\mu$ m.

ally slightly olivaceous in upper part and slightly brownish inside, but these colours can also be mixed or olive pigmentation predominating indivisibly in almost whole hypothecium (the pigmentation better visible in thick sections). Excipulum not distinctly delimited and sometimes in globose, mature apothecia strongly reduced or

absent, light brownish to brownish, composed of more branched, paraphysis-like hyphae. Pycnidia inconspicuous with dull green-black walls surrounding ostioles, immersed between thallus areoles, producing narrowly cylindrical microconidia,  $0.8\text{--}1.2 \times 5\text{--}8\text{--}(9)$   $\mu$ m diam. The two other types of pycnidia known from European specimens (see Coppins 1983) have not been discovered in Polish collections.

CHEMISTRY. TLC: argopsin.

NOTES. There are many cases when *M. lignaria* produces a very large number of mostly 0–3 septate ascospores (e.g. GPN 3270 and Czarnota 4466 from the Middle Sudetes) resembling several morphologically similar species. Ignorance of its other characteristic features meant that several specimens were previously misidentified as *M. peliocarpa* or even *M. melaena*. Indeed, some black, saxicolous forms of *M. peliocarpa* without a more developed thallus look like *M. lignaria*, but the simple reaction with C in cross sections of apothecia could be sufficient to separate them: the gyrophoric acid present in *M. peliocarpa* results in C+ orange-red in contrast to *M. lignaria* which only has argopsin in the thallus, resulting in C–, Pd+ ginger reactions. Mistakes connected with *M. melaena* refer only to specimens growing on bryophytes or plant debris in mountainous, postglacial peat-bogs and alpine meadows, but distinguishing between them would appear to be obvious when one considers the completely different pigmentation inside their apothecia (see description of *M. melaena*) and their different secondary metabolites.

The distinctive macroscopic Pd+ ginger thallus reaction of *M. lignaria* is, unfortunately, very often poor, especially when the specimen is covered by a net of brown, toruloid hyphae of a probably still undescribed lichenicolous fungus (see Coppins 1983: 143), which may belong to *Sphaerellothecium* or a related genus. In these instances, microscopic examination of the Pd+ reaction in the thallus sections should be used, and if still problematic, TLC could be necessary.

Within examined Polish specimens of *M. lignaria* there were no *M. lignaria* var. *endoleuca* (Leight.) Coppins (Coppins 1983), but mostly

in older samples the pale tinge of a C± orange thallus reaction may also be visible. It is impossible to know the reason of this reaction, since they are without any trace of xanthone(s) detected by TLC.

*Micarea lignaria* is characterized by the black, slightly glossy apothecia, but occasionally albinotic fruit-bodies can also occur, as in the specimen from Beskid Wyspowy Mts (GPN 3255).

Sometimes darkish forms of *Bilimbia sabuletorum* (Schreb.) Arnold [formerly known as *Bacidia accedens* (Arnold) Lettau] growing on decaying bryophytes or humus could be mistaken for *M. lignaria*, as in several cases from Pogórze Rożnowskie foothills (Kozik 1977: 234). Both species have similar (but in *B. sabuletorum* usually slightly wider) ascospores and general appearance of apothecia sections, but they differ in the structure of paraphyses and excipulum, by the presence of argopsin in the case of *M. lignaria*, and in having different photobionts.

In the alpine localities, when growing on plant debris, *M. lignaria* could be confused with *Helocarpon crassipes* Th. Fr. owing to its similar, thick warded thallus structure and black, but marginate apothecia (at least when young), or with, for example, *Bilimbia lobulata* (Sommerf.) Hafellner & Coppins. *Helocarpon crassipes* differs, above all, from *Micarea lignaria* in its completely different pigmentation of the apothecia sections, but some forms of *M. lignaria* having a more intensive, brown hypothecium can resemble those occurring in *Bilimbia lobulata*. In such instances, careful examination of the ascospores and the structure of the hamathecium is needed, since *B. lobulata* has only 3-septate spores and mostly simple, shortly moniliform paraphyses, and moreover it usually forms a minutely squamulose thallus.

For more observations on how to distinguish *M. lignaria* from, for example, *M. cinerea* and *M. ternaria*, see Coppins (1983).

**HABITAT AND DISTRIBUTION IN POLAND.** First record of *M. lignaria* in the Polish lowlands is attributed to Ohlert (1870: 18), who reported it as terricolous *Lecidea sabuletorum* Flk. var. *miliaria*

Fr. from Pałubice village 'Palubitz' in the Kaszuby Lakeland (Gdańsk Pomerania). Although this appears to refer to *Bilimbia sabuletorum*, Lettau (1912: 38) interpreted this record as *Bilimbia lignaria* Ach. This record is doubtful, since it cannot be confirmed if he examined the specimen, since no other specimens have been collected from the entire Polish lowlands to date, although there have been detailed explorations of granite postglacial boulders by Krawiec (1938) and Fałtynowicz (1997). However, its distribution around the Baltic Sea is well known.

Its occurrence in the mountains has been known for many years since lichenologists working in the 19th century in the Silesia region reported it as frequent in the higher parts of the Sudetes (e.g. Körber 1855; Stein 1879: 187 'Im HGb. über Pflanzenresten, Moosen und auf humoser Erde nicht selten, auch Altvater (Ploesel); nach Kbr. bis in's Hirschberger Thal (Fw.) herabsteiend'). From the Carpathians it was first reported in the Tatras by Lojka (1876: 111) and soon after by Rehman (1879: 42, as *Bilimbia miliaria* (Fr.) saxicola Körb.) 'przy jeziorze Ignacowem w Tatrach', and Boberski (1883) reported it as *B. miliaria* Fr. for the first time from Western Beskidy Mts. Only one specimen to support these records has been discovered, namely by Stein ('Riesengebirge, Kesselkope, 19 July 1865, (WRSL), as *B. miliaria*'), but it is not from the Polish part of the Karkonosze Mts.

Nowak and Tobolewski (1975) noted in their key to Polish lichens that *M. lignaria* is quite frequently found on mosses and plant debris in open localities, particularly at higher altitudes, and Nowak (1972) included it in a group of species with an alpine distribution in the Central Europe, suggesting that it may belong to the wider group of multizonal mountain species in view of its frequent occurrence in lower mountain belts.

Taxonomic revision of large numbers of specimens collected during the last 30 years, especially recent records, of *M. lignaria* provide greater detail on its distribution and ecology hitherto unavailable from Polish lichenological literature. Based on these data, it appears to be a mountain species, commonly occurring in alpine and subalpine belts

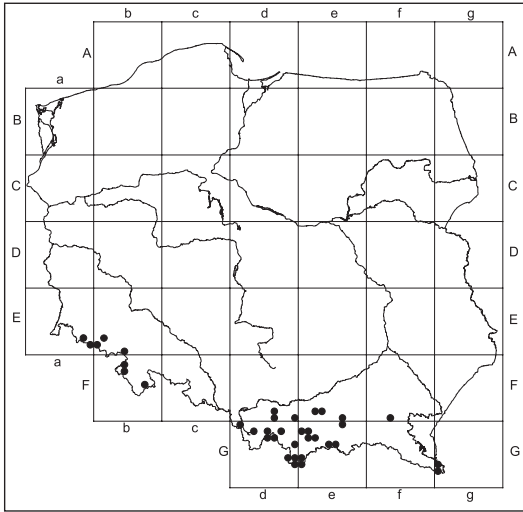


Fig. 28. Distribution map of *Micarea lignaria* (Ach.) Hedl. var. *lignaria* in Poland.

of the highest mountain ranges in the Sudetes and Carpathians; here it usually grows on moribund bryophytes and vascular plant debris in alpine meadows and rocky crevices to the highest altitudes of the mountains (1585 m on Śnieżka Mt. in Karkonosze, 2140 m on Wołoszyn Mt. in Tatra Mts, 1725 m on Babia Góra Mt. in Western Beskidy Mts, 1340 m on Tarnica in Bieszczady Mts). Associated species in these alpine localities include, for example, *Alectoria nigricans*, *A. ochroleuca*, *Caloplaca tirolensis*, *Cetraria ericetorum*, *C. nivalis*, *Helocarpon crassipes*, *Micarea leprosula*, *M. submilliaria*, *Mycobilimbia hypnorum*, *Pertusaria glomerata* and *Porina mammillosa*. As well as a common species growing in alpine climatic conditions, *M. lignaria* is also frequently found on lignum, different acid rocky substrata and as an epiphyte in mountain belts within shady forest communities or on saxicolous bryophytes over siliceous boulders. Its northern distribution limit in Poland more-or-less coincides with the boundary of the Mindel glaciation and covers, except the highest mountain ranges, also the large zone of sandstone Carpathian foothills. In these localities (e.g. in Pogórze Dynowskie and Pogórze Rożnowskie foothills) *M. lignaria* is found at altitudes between 360 and 500 m, but its lowest

occurrence in a deep valley in Beskid Mały Mts was at 300 m (KRAM-L 7932) where it mainly grows on moribund, terricolous or saxicolous bryophytes together with *Bilimbia sabuletorum*, *Cladonia caespiticia*, *Micarea botryoides* and *M. peliocarpa*, but in Pogórze Wiśnickie foothills it is found growing on the bark of *Betula pendula* in association with *M. denigrata*.

*Micarea lignaria* prefers acid substrata (e.g. Wirth 1995), but sometimes it is recorded on bryophytes over limestone, as in the West Tatras, in Homole Gorge (Pieniny Mts), or directly on slightly calcareous sandstone outcrops in the Gorce Mts. If it has a greater ecological tolerance to a higher pH is unclear, and the suggestion by Coppins (1983) that mats and moss-grown cushions on which it grows provide a buffer requires further study.

WORLD DISTRIBUTION. *Micarea lignaria* is widespread worldwide, being especially common in the Northern Hemisphere, where it has been reported from high mountains, uplands and post-glacial lowland regions from almost all of Europe and Macaronesia, in addition to the Russian Arctic, North America and Greenland. It is probably more frequent in the Southern Hemisphere than the records would suggest.

EUROPE: Austria (Hafellner & Türk 2001); Azores, Madeira and Canary Islands (Hafellner 1995); Belgium and Luxembourg (Diederich & Sérusiaux 2000); Czech Republic (Vězda & Liška 1999); Denmark, rare (Søchting 1998; Søchting & Alstrup 2002); Estonia (Randlane & Saag 1999); Finland (Vitikainen *et al.* 1997); France (Coppins 1983: 143; see synonyms); Germany (Hauck 1996; Jacobsen 1992, 1997; Heibel 1999; Scholz 2000); Great Britain and Ireland (Coppins 1983, 2002; Seaward 1994); Hungary (Verseghy 1994); Iceland (Kristinsson & Heidmarsson 2006); Italy (Nimis & Martellos 2003); Latvia, rare (Piterāns 2001); the Netherlands (Aptroot *et al.* 2004); Norway (Santesson 1993); Portugal (van den Boom *et al.* 1990; van den Boom 1999); Romania (Coppins 1983; Ciurchea 1998); Russia – Leningrad Region (Zavarzin *et al.* 1999), Kola Peninsula (Coppins 1983: 143; see synonyms), Komi Republic



(Hermansson *et al.* 1998); Slovakia (Pišút *et al.* 1996); Slovenia (Suppan *et al.* 2000); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993); Ukraine – Eastern Carpathians (Kondratyuk *et al.* 1998). NORTH AMERICA: Greenland (Hansen 1999); USA – Alaska, New York State (Thomson 1997; Harris 2004), Michigan (Fryday *et al.* 2001), New Hampshire (Coppins 1983; Thomson 1997), Vermont (Hinds *et al.* 2002). SOUTH AMERICA: Argentina (Calvelo & Liberatore 2002); Brazil (Coppins 1983; Aptroot 2002 – *M. cf. lignaria*). ASIA: Russia – Russian Arctic: Polar Ural, Anabara-Olenyok area, Continental Chukotka, Wrangel Island, Beringian Chukotka (Andreev *et al.* 1996), Magadan Oblast (Coppins 1983: 143; see synonyms) north coast of Western Siberia (Coppins 1983); Taiwan (Aptroot & Sparrius 2003). AUSTRALOCEANIA: Papua New Guinea (Aptroot *et al.* 1997). ANTARCTICA: King George Island, South Shetlands (Olech 2001).

EXSICCATAE SEEN. Bohler, *Lich. Brit. No.* 85 (E); Fries, *Lich. Suec. No.* 29 (E); Hertel, *Lecid. Exs. No.* 34 (E), *No.* 191 (E), *No.* 251 (E); Leighton, *Lich. Brit. No.* 238 (E), *No.* 386 (E); Moug. & Nestl., *Strip. Crypt. No.* 1430 (E); Mudd, *Lich. Brit. No.* 156 (E), *No.* 157 (E), *No.* 158 (E); Nowak, *Lich. Pol. Merid. Exs. No.* 139 (LBL); Schaerer, *Lich. Helv. No.* 196 p.p. (E); Vězda, *Lich. Bohem. No.* 133 (POZ).

SPECIMENS EXAMINED. Grid square. Ea-78 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park: above Wielki Śnieżny Kocioł glacial corrie, alt. ca 1420 m, 6 Oct. 1964, *leg. J. Nowak* (KRAM-L 29742); Mały Śnieżny Kocioł glacial corrie, alt. 1340 m, 20 July 1969, *leg. G. Wýkrota* (KRAP), as *Bacidia melaena* and alt. 1360 m, 20 Aug. 1969, *leg. G. Wýkrota* (KRAP), as *Bacidia trisepta*; Ea-89 – KARKONOSZE MTS: Karkonoski National Park: Śnieżka Mt., alt. 1585 m, 20 Aug. 1986, *leg. M. R. D. Seaward* (Hb. MRDS 105366), W slope of Śnieżka Mt., on the border of PL/ČR [50°44.18'N/15°44.18'E] alt. 1520 m, 8 July 2003, *leg. P. Czarnota* (GPN 3554), N slope of Śnieżka Mt. in the Kocioł Łomniczki glacial corrie [50°44.38'N/15°44.03'E] alt. 1300 m, 8 July 2003, *leg. P. Czarnota* (GPN 3688), [50°44.34'N/15°44.01'E] alt. 1350 m, 8 July 2003, *leg. P. Czarnota* (GPN 3491), above Mały Staw Lake, near hiking track [50°45.03'N/15°41.75'E] alt. 1360 m, 8 July 2003, *leg. P. Czarnota* (GPN 3541); Eb-71 – RUDAWY JANOWICKIE MTS: Wieściszowice village, worked-out quarry of pyrite named 'Błękitne

Jeziorko', alt. ca 650 m, 9 June 2000, *leg. G. Leśnianski* (OPUN); Strużnica village, W of Czartówka Wood by forest road, alt. ca 500 m, 13 Sept. 1999, *leg. G. Leśnianski* (OPUN together with *M. peliocarpa*); Eb-80 – KARKONOSZE MTS: Karkonoski National Park, Dolina Łomniczki valley, by hiking track [50°45.60'N/15°45.63'E] alt. ca 735 m, 7 July 2003, *leg. P. Czarnota* (GPN 3535) and [50°45.36'N/15°45.42'E] alt. 770 m, 7 July 2003, *leg. P. Czarnota* (GPN 3516); Eb-94 – MIDDLE SUDETES, GÓRY KAMIENNE MTS: ca 1 km W of Grzmiąca village, by Rybnica stream [50°42'20"N/16°18'55"E] ca 480 m, 21 Apr. 2005, *leg. P. Czarnota* 4466 (GPN); Eb-95 – GÓRY SOWIE MTS: S slope of Wielka Sowa Mt, by stream on N edge of Sokolec village [50°39'46"N/16°28'59"E] alt. ca 620 m, 21 Apr. 2005, *leg. P. Czarnota* 4402 (GPN); Fb-14 – GÓRY STOŁOWE MTS: S slope of Mały Spękany Wierch Mt., alt. ca 750 m, 6 Aug. 1960, *leg. Z. Tobolewski* (POZ); Fb-24 – GÓRY STOŁOWE MTS: N edge of Batorów village near the border of Góry Stołowe National Park [50°26.56'N/16°25.28'E] alt. 600 m, 23 Apr. 2003, *leg. P. Czarnota* (GPN 3270); Fb-47 – EASTERN SUDETES, ŚNIEŻNIK MASSIF: field-block on Goworek Mt., alt. 1320 m, 9 July 2003, *leg. K. Szczepańska* (Hb. Szczepańska); Fd-86 – WESTERN BESKIDY MTS, BESKID MAŁY MTS: Czartak settlement, S of Wadowice town, by estuary of Ponikiewka stream, alt. ca 300 m, 28 Aug. 1961, *leg. J. Nowak* (KRAM-L 7923), as *Bacidia trisepta* for. *saxicola*; Fd-96 – BESKID MAŁY MTS: Żurawica Mt., alt. ca 710 m, 25 Aug. 1962, *leg. J. Nowak* (KRAM-L 9775), as *Bacidia trisepta* for. *saxicola*; Żurawica Mt., valley of Mikowy stream, alt. 440 m, 5 May 1967, *leg. J. Nowak* (KRAM-L 5102); Fd-99 – BESKID MAKOWSKI MTS: Kotoń Mt., Jugi settlement, E of Zawadka village, 20 Apr. 1966, *leg. J. Nowak* (KRAM-L 17447); Kotoń range, Żabicki stream near Struża village, alt. ca 350 m, 5 Sept. 1969, *leg. J. Nowak* (KRAM-L 19105); forest above Górna Wieś settlement near Myślenice town, alt. ca 360 m, 30 May 1967, *leg. J. Nowak* (KRAM-L 5532); Fe-82 – POGÓRZE ZACHODNIOBESKIDZKIE FOOTHILLS, POGÓRZE WIŚNICKIE FOOTHILLS: Cichawka village near the church, 8 May 1998, *leg. L. Śliwa* 577 (KRAM); Fe-83 – POGÓRZE WIŚNICKIE FOOTHILLS: NW slope of Paprotna Mt., alt. 409 m, 7 May 2000, *leg. L. Śliwa* 1102 (KRAM); Fe-96 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE ROŻNOWSKIE FOOTHILLS: 'Bukowiec' nature reserve, alt. 500 m, 18 Aug. 1968, *leg. R. Kozik* (KRAP); Jamna hill, alt. 400 m, 25 June 1971, *leg. R. Kozik* (KRAP); Ff-93 – POGÓRZE DYNOWSKIE FOOTHILLS: 'Prządki' nature reserve near Czarnorzeki village, ca 8 km N of Krosno town [49°44'30"N/21°48'40"E] alt. 460–520 m,

- 5 May 1999, *leg. L. Śliwa & B. Krzewicka* (KRA); Gd-01 – WESTERN BESKIDY MTS, BESKID ŚLĄSKI MTS: valley of Poniwiec stream below Mała Czantoria Mt., alt. 580 m, 4 Aug. 1964, *leg. J. Kiszka* (KRAP); Gd-13 – BESKID ŚLĄSKI MTS: W slope of Barania Góra Mt., alt. 1190 m, 21 July 1965, *leg. J. Kiszka* (KRAP), as *Bacidia* sp.; Gd-15 – BESKID MAKOWSKI MTS: Pasma Pewelskie range, Mutne village, alt. ca 500 m, 17 Sept. 1965, *leg. J. Nowak* (KRAM-L 13535); Gd-17 – BABIA GÓRA RANGE: Polica range, valley of Rotnia stream, alt. 670 m, 23 Oct. 1965, *leg. J. Nowak* (KRAM-L 15976); Las Za Łysiną Wood, outcrops above valley of Skawica Sołtysia stream, alt. ca 850 m, 19 June 1965, *leg. J. Nowak* (KRAM-L 15128), alt. 1100 m, 24 Oct. 1965, *leg. J. Nowak* (KRAM-L 17192) and alt. 1150 m, 24 Oct. 1965, *leg. J. Nowak* (KRAM-L 17183); Okraglica Mt., alt. 1200 m, 18 Oct. 1965, *leg. J. Nowak* (KRAM-L 17202, 17178) and alt. 1240 m, 9 May 1965, *leg. J. Nowak* (KRAM-L 16144); Hala Śmietanowa glade, alt. 1220 m, 15 June 1965, *leg. J. Nowak* (KRAM-L 17175); Polica Mt., alt. 1300 m, 25 June 1965, *leg. J. Nowak* (KRAM-L 17130); NE slope of Polica Mt. below Hala Krupowa glade, Sucha Beskidzka forest division, Skawica forest district, forest section no. 45 [49°37'53"N/19°38'38"E] alt. ca 1070 m, 4 June 2004, *leg. P. Czarnota* 3929 (GPN); Gd-25 – BESKID ŻYWIECKI MTS: Piłsko range, Szczawinka Mt., alt. 1315 m, 10 Sept. 1964, *leg. J. Nowak* (KRAM-L 16498); Piłsko Mt., alt. 1400 m, 18 Sept. 1964, *leg. J. Nowak* (KRAM-L 16323) and alt. 1450 m, 18 Sept. 1964, *leg. J. Nowak* (KRAM-L 16766); Gd-26 – BABIA GÓRA RANGE: Babia Góra Mt., alt. 1550 m, 29 Sept. 1970, *leg. J. Nowak* (LBL); Akademicka Perć region, alt. 1555 m, 22 June 1961, *leg. J. Nowak* (KRAM-L 8788, 8778 together with *Helocarpon crassipes*), 6 Sept. 1967, *leg. J. Nowak* (KRAM-L 1356); the top of Babia Góra Mt., alt. 1725 m, 6 Sept. 1967, *leg. J. Nowak* (KRAM-L 1244); NW slope of Babia Góra Mt., Kościółki region, alt. 1580 m, 9 Sept. 1967, *leg. J. Nowak* (KRAM-L 1589, 1591); Diablak Mt., alt. 1660 and alt. 1710 m, 6 Sept. 1967, *leg. J. Nowak* (KRAM-L 1542); Gd-39 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKO-NOWOTARSKA BASIN: Rzepków settlement, alt. 680 m, 4 Aug. 1968, *leg. J. Kiszka* (KRAP-10480), as *Bacidia melaena*; Gd-58 – TATRA MTS, WEST TATRA MTS: Dolina Chochołowska valley, Mnichy Chochołowskie ridge, alt. 1550 m, 6 June 1961, *leg. Z. Tobolewski* (POZ); Dolina Starorobociańska valley, below Hala Starorobociańska Wyżnia glade, alt. ca 1300 m, 15 Aug. 1960, *leg. Z. Tobolewski* (POZ); Dolina Chochołowska valley, Chochołowska glade, [49°14'16"N/19°47'47"E] alt. 1105 m, 16 July 2004, *leg. L. Śliwa* 3067 (KRAM); Gd-59 – WEST TATRA MTS: NW slope of Kominy Tylkowe Mt. (= Kominiarski Wierch Mt.), below the top, alt. 1810 m, 20 Aug. 1956, *leg. Z. Tobolewski* (POZ); S slope of Kominy Tylkowe Mt., alt. 1770 m, 20 Aug. 1956, *leg. Z. Tobolewski* (POZ); Dolina Strążyska valley by track to Wielka Rówień region below Giewont Mt., alt. 1150 m, 18 Aug. 1959, *leg. Z. Tobolewski* (POZ); Kominiarski Wierch Mt. above Iwanówka glade, alt. 1750 m, 26 Aug. 1974, *leg. M. Olech* (KRA); Czerwone Wierchy range, alt. 1820 m, 16 Sept. 1975, *leg. M. Olech* (KRA); Kopa Kondracka Mt., alt. 1980 m, 3 Sept. 1975, *leg. M. Olech* (KRA); Kopa Kondracka Mt. from the side of Hala Kondratowa alpine meadow, alt. 1700 m, 3 Sept. 1975, *leg. M. Olech* (KRA); between Małołączniak Mt. and Wielka Świstówka Mt., alt. 1770 m, 18 Sept. 1975, *leg. M. Olech* (KRA); Rzędy region below Ciemniak Mt., alt. 1780 m, 30 Aug. 1974, *leg. M. Olech* (KRA), alt. 1790 m, 22 June 1977, *leg. M. Olech* (KRA) and alt. 1870 m, 24 June 1971, *leg. M. Olech* (KRA); Małołączniak Mt., alt. 1960 m, 11 Sept. 1955, *leg. Z. Tobolewski* (POZ), alt. 2040 m, 3 Sept. 1980, *leg. M. Olech* (KRA), 5 Sept. 1980, *leg. M. Olech* (KRA), Małołączka Przełęcz pass, alt. 1900 m, 19 Sept. 1975, *leg. M. Olech* (KRA); Kozi Grzbiet Mt. between Dolina Litworowa valley and Dolina Mułowa valley, alt. ca 1900 m, 3 Oct. 1964, *leg. Z. Tobolewski* (POZ); Ciemniak Mt., alt. 1980 m, 31 Aug. 1974, *leg. M. Olech* (KRA); Litworowa Przełęcz pass, alt. 2000 m, 20 Sept. 1975, *leg. M. Olech* (KRA); Suche Czuby Mt., alt. ca 1750 m, 21 June 1998, *leg. U. Bielczyk* (KRAM-L 44420), as *M. melaena*; Gd-68 – WEST TATRA MTS: Jarząbczy Wierch Mt., NW slope above Dolina Jarząbcza valley, alt. 1680 m, 18 Aug. 1956, *leg. Z. Tobolewski* (POZ) and alt. 1710 m, 2 Sept. 1959, *leg. Z. Tobolewski* (POZ); Gd-69 – WEST TATRA MTS: Dolina Kościeliska valley, by the track to Pyszna Pass, alt. 1730 m, 29 Aug. 1959, *leg. Z. Tobolewski* (POZ); below Pyszna Pass, 12 June 1963, *leg. J. Nowak* (KRAM-L 3031); Ge-06 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE ROŻNOWSKIE FOOTHILLS: Górowa village, alt. 360 m, 5 Sept. 1969, *leg. R. Kozik* (KRAP) and alt. 380 m, 20 June 1971, *leg. R. Kozik* (KRAP); Ge-10 – WESTERN BESKIDY MTS, BESKID WYSPOWY MTS: NE slope of Luboń Wielki Mt., by hiking track [49°39.10'N/19°59.84'E] alt. 800 m, 5 June 2003, *leg. P. Czarnota* (GPN 3250); S slope of Luboń Wielki Mt., 'Luboń Wielki' nature reserve [49°39.04'N/19°59.70'E] alt. 930 m, 5 June 2003, *leg. P. Czarnota* (GPN 3255); Ge-11 – GORCE MTS: Gorce National Park: NE slope of Kudłoń Mt., Białe Skąły outcrops near Adamówka glade, alt. ca 1100 m, 24 Aug. 1967, *leg. K. Glanc*

- (KRAM-L 29117; GPN 2565), 7 May 2003, *leg. P. Czarnota* (GPN 3311, 3314) and alt. 1075 m, 15 Aug. 1967, *leg. J. Nowak* (KRAM-L 2698 together with *M. peliocarpa* and *M. botryoides*); N slope of Kudłoń Mt., 'Kudłoński Baca' sandstone outcrop below the top of the mountain, alt. 1120 m, 20 Sept. 1995, *leg. P. Czarnota* (GPN 1722); the top of Kudłoń Mt., alt. 1260 m, 6 Nov. 2001, *leg. P. Czarnota* (GPN 2685); river-bed of Za Palacem stream below Gębowa Góra Mt., alt. 660 m, 22 Oct. 1997, *leg. P. Czarnota* (GPN 1751); outcrops below Figurki Średnie glade in valley of Za Palacem stream, alt. 1080 m, 12 July 2000, *leg. P. Czarnota* (GPN 2330); Ge-21 – GORCE MTS: the top of Czoło Mt., alt. 1250 m, 18 Aug. 1988, *leg. J. Nowak* (KRAM-L 34317); W slope of Kudłoń Mt., sources area of Za Palacem stream, alt. 1100 m, 15 June 2000, *leg. P. Czarnota* (GPN 2333); Ge-22 – GORCE MTS: Lubań range, valley of Kudowski stream, by hiking track, alt. ca 700 m, 24 June 2004, *leg. P. Czarnota* 3998 & A. Wojnarowicz (GPN); Ge-34 – OBNIŻENIE ORAWSKO-PODHAŁAŃSKIE DEPRESSION, PIENINY MTS: Homole Gorge near Jaworki village, alt. 680 m, 17 Aug. 1955, *leg. Z. Tobolewski* (POZ); Ge-35 – WESTERN BESKIDY MTS, BESKID SADECKI MTS: Jaworzyna Krynicka range, the hill of '1076 m' near Hala Krajnia glade, alt. 1040 m, 24 Aug. 1966, *leg. M. Olech* (KRA); Ge-50 – TATRA MTS, WEST TATRA MTS: Skupniów Uplaz Mt., alt. 1400 m, 29 Aug. 1956, *leg. Z. Tobolewski* (POZ); Kopa Magury Mt. from the side of Jaworzynka alpine meadow, alt. 1680 m, 21 July 1961, *leg. J. Nowak* (KRAM-L 8640), 25 July 1961, *leg. J. Nowak* (KRAM-L 7383), 23 May 1963, *leg. J. Nowak* (KRAM-L 3846); Kopa Magury Mt., alt. 1690 m, 17 July 1981, *leg. M. Olech* (KRA) and alt. 1700 m, 12 June 1964, *leg. M. Olech* (KRA) and 6 June 1968, *leg. J. Kiszka* (KRAP 10035); Żleb Trzynastu progów area above Wąwóz Kraków gorge, alt. 1200 m, 23 July 2002, *leg. P. Czarnota* (GPN 2938); Ge-50 – HIGH TATRA MTS: N slope of Żółta Turnia Mt., Dubrawiska region, near Żółty Potok stream, alt. 1700 m, 6 Sept. 1958, *leg. Z. Tobolewski* (POZ); Dolina Gąsienicowa valley, Kocioł Zmarzłego Stawu glacial corrie, alt. 1860 m, 18 Sept. 1955, *leg. Z. Tobolewski* (POZ) and alt. ca 1650 m, 7 Sept. 1958, *leg. Z. Tobolewski* (POZ); Dolina Gąsienicowa valley, by hiking track between Czerwone Stawki lakes and Przełęcz Karb pass, alt. ca 1740 m, 7 Sept. 1958, *leg. Z. Tobolewski* (POZ); Dolina Suche Wody valley, ca 1 km from shelter-house on Hala Gąsienicowa alpine meadow, alt. 1440 m, 22 Aug. 1959, *leg. Z. Tobolewski* (POZ); Dolina Pańszczyca valley, alt. ca 1600 m, 24 May 1963, *leg. J. Nowak* (KRAM-L 3522); Skrajna Turnia Mt., alt. 2075 m, 4 Sept. 1980, *leg. M. R. D. Seaward* & *E. Bylińska* (Hb. MRDS 103499); Dolina Waksmundzka valley, Za Popaski region below Turnia nad Dziadem Mt. [49°14.60'N/20°04.34'E] alt. 1650 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3575); Wołoszyn Wielki Mt. near Krzyżne Pass [49°13.73'N/20°02.91'E] alt. 2140 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3590 together with *Helocarpon crassipes*, GPN 3604); Dolina Waksmundzka valley below Wołoszyńska Wyżnia Pass [49°13.74'N/20°03.13'E] alt. 2050 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3293, GPN 3294 together with *M. leprosula*, GPN 3655 together with *M. submilliaria*); Dolina Waksmundzka valley, by Waksmundzki stream [49°14'48"N/20°04'07"E] alt. 1380 m, 12 Sept. 2004, *leg. M. Węgrzyn* 2208 (KRA); Ge-60 – HIGH TATRA MTS: NE shore of Czarny Staw Lake above Morskie Oko Lake, alt. 1630 m, 14 Sept. 1966, *leg. Z. Tobolewski* (POZ); Kocioł Czarnego Stawu glacial corrie above Morskie Oko Lake, by hiking track to Mięgoszowiecka Pass, alt. ca 1670 m, 16 Sept. 1966, *leg. Z. Tobolewski* (POZ); Hala za Mnichem alpine meadow below Szpiglasowa Pass, alt. 1800 m, 6 June 1971, *leg. J. Nowak* (KRAM-L 23048); Szpiglasowa Pass, alt. 2110 m, 28 Aug. 1956, *leg. Z. Tobolewski* (POZ); Dolina Pięciu Stawów valley, between former shelter-home and Sikława waterfall, alt. 1675 m, 25 Aug. 1959, *leg. Z. Tobolewski* (POZ); Dolina Pięciu Stawów valley below Szpiglasowa Pass, Szpiglasowa Peré region by hiking track, alt. ca 1800 m, 9 Sept. 1959, *leg. Z. Tobolewski* (POZ) and [49°12.11'N/20°02.04'E] alt. 1790 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3564, 3565); Dolina Pięciu Stawów valley below Niżni Liptowski Kostur Mt. [49°12.23'N/20°01.85'E] alt. 1750 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3614); Dolina Rybiego Potoku valley, NW slope of Żabia Czuba Mt. below Siedem Granatów ridge, alt. 1350 m, 9 July 2002, *leg. P. Czarnota* (GPN 2888, 2901); Żabia Czuba Mt. near the border of PL/SK, alt. 1500 m, 9 July 2002, *leg. P. Czarnota* (GPN 2898, 2911, 2918); Gg-60 – EASTERN BESKIDY MTS, WESTERN BIESZCZADY MTS: Bieszczadzki National Park: Bukowe Berdo range, on the ridge, alt. 1200 m, 12 Aug. 1958, *leg. Z. Tobolewski* (POZ; GPN 3611 together with *M. leprosula*), 15 Aug. 1958, *leg. K. Glanc* (KRAM-L 29698) and alt. 1240 m, 22 June 1957, *leg. K. Glanc* (KRAM-L 29110); the top of Krzemień Mt., alt. 1330 m, 26 Aug. 1957, *leg. Z. Tobolewski* (KRAM-L 29108, 29116, 29118; POZ) and 12 Aug. 1958, *leg. K. Glanc* (KRAM-L 29114), as *Bacidia* sp., 6 July 1960, *leg. K. Glanc* (KRAM-L 27643), 7 June 1960, *leg. J. Nowak* (KRAM-L 9025); the ridge of Krzemień Mt., alt. 1250 m, 12 Aug. 1958, *leg. K. Glanc* (KRAM-L 29115) and alt. 1300 m, 6 July 1960, *leg. K. Glanc* (KRAM-L 27644); Tarnica Mt., alt.

1340 m, 25 Aug. 1957, *leg. K. Glanc* (KRAM-L 29112), 7 June 1960, *leg. J. Nowak* (KRAM-L 8844); Gg-70 – WESTERN BIESZCZADY MTS: Bieszczadzki National Park: Kińczyk Bukowski Mt., alt. 1150–1345 m, 9. Sept. 1955, *leg. K. Glanc* (KRAM-L 29113); Rozsypaniec Mt., 9 July 1960, *leg. K. Glanc* (KRAM-L 27640); S slope of Halicz Mt., by hiking track, alt. 1263 m, 10 July 2003, *leg. J. Kiszka* (KRAP).

ADDITIONAL SPECIMENS EXAMINED. CZECH REPUBLIC, LUŽICKÉ HORY: ca 0.5 km W of Studeny village [50°50.60'N/14°27.16'E] on sandstone boulders near stream in broadleaf forest, 26 Apr. 2003, *leg. P. Czarnota* (GPN 3318). BULGARIA, WITOSZ MASSIF: Czrny Wrh, alt. ca 2500 m, on plant debris in rocky crevices, 25 July 1962, *leg. J. Nowak* (KRAM-L 10906). SLOVAKIA, BELANSKÉ TATRY MTS: NE slope of Ždiarska Vidla Mt., alt. 2050 m, on plant debris and decaying bryophytes in crevices of rocks, 19 July 1956, *leg. Z. Tobolewski* (POZ; GPN), and alt. 2070 m, 8 July 1957, *leg. Z. Tobolewski* (POZ); NE ridge of Bujačí Wrch Mt., by hiking track, alt. 1800 m, on plant debris on the ground, 18 July 1956, *leg. Z. Tobolewski* (POZ).

*Micarea lithinella* (Nyl.) Hedl. (Figs 29 & 30)

Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18**(3): 78, 97. 1892.

*Lecidea lithinella* Nyl., *Flora* **63**: 390. 1880. TYPE: Germany, Bayern, 'Sandsteinblocke am Waldwege von Banz nach Altenbanz in Oberfranken', Sept. 1860, *F. Arnold* 957 (M – LECTOTYPE, *n.v.*; H-NYL 19192 – ISOLECTOTYPE!; fragment).

– *Lecidea meiocarpoides* Nyl., *Flora* **65**: 453. 1882. – *Biatora meiocarpoides* (Nyl.) Arnold, *Flora* **67**: 430. 1884. TYPE: Switzerland, Zug, *Hegetschweiler*, *n.v.* New synonym? NOTES. During revision of materials housed in WRSL, microscopic examination of one specimen named *Biatora meiocarpoides* Nyl. distributed by Arnold (*Lich. Exs. No. 1173*) has shown that the specimen should be referred to *M. lithinella* and may be its unpublished synonym. However, Nylander's type specimen of *B. meiocarpoides* has not been analyzed, but a short description of it by Eitner (1911), almost 20 years after its original diagnosis, could confirm, that both *Lecidea lithinella* Nyl. and *Biatora meiocarpoides* have the same anatomical and morphological features, and should therefore be considered as synonyms of *M. lithinella*. Unfortunately, Eitner's specimen of *B. meiocarpoides* has not been found in WRSL.

– *Lecidea lauenburgensis* Erichsen, *Hedwigia* **70**: 216.

1930. TYPE: Germany, Schleswig-Holstein, Lauenburg, an einem Geröllhaufen an einem Wege im 'Sachsen Wald' beim Forsthaus 'Im Viens', 14 Apr. 1925, *C. F. E. Erichsen* (E ex Hb. Degelius 53 – ISOTYPE!).

– *Lecidea holsatica* Erichsen, *Ann. Mycol.* **38**: 316. 1940. TYPE: Germany (HBG – HOLOTYPE, *n.v.*; Jacobsen & Coppins 1989).

Thallus whitish-green or more greenish in shaded localities, effuse, usually as a thin crust, more or less cracked and often covered by non-lichenized, gelatinous algae, but sometimes thicker and deeply cracked resembling flat to convex irregular, scurfy-granular areolae. Photobiont micareoid, cells globose, often quite small, 3.5–6(–6.5)  $\mu\text{m}$ . Apothecia immarginate, adnate, usually whitish, pallid, straw-coloured or pale orange, only occasionally in more insolated localities even orange-brown, simple or rarely aggregated, convex or convex-hemispherical, 0.1–0.3(–0.4) mm diam. Hymenium 30–50  $\mu\text{m}$  tall, mostly hyaline, colourless, but in darker apothecia gold straw-coloured in upper part. Spores simple, ovoid or ellipsoid, sometimes quite short and often almost globose, 5–7(–8.5)  $\times$  2.5–3.5 (–4)  $\mu\text{m}$ . Paraphyses of two types: (1) scanty, sparingly branched, mainly in upper part, thin 0.7–1  $\mu\text{m}$  wide, hyaline throughout and non-septate; (2) more rarely, thick, 3–3.5  $\mu\text{m}$  wide, moniliform, distinctly septate, passing as simple hyphae from hypothecium, occasionally forked, hyaline. Hypothecium usually hyaline or pale straw-coloured, only sometimes in orange apothecia with orange gold tinge, K–; pigment confined to gel-matrix; hyphae thick, hyaline, (3–)4–4.5  $\mu\text{m}$  wide. Excipulum absent or weakly developed in young apothecia. Pycnidia rare, inconspicuous, immersed and sometimes visible as whitish, flat dots with gaping ostioles; pycnidial walls hyaline. Conidia (mesoconidia?) narrowly cylindrical, 4–5.5  $\times$  1–1.3  $\mu\text{m}$ .

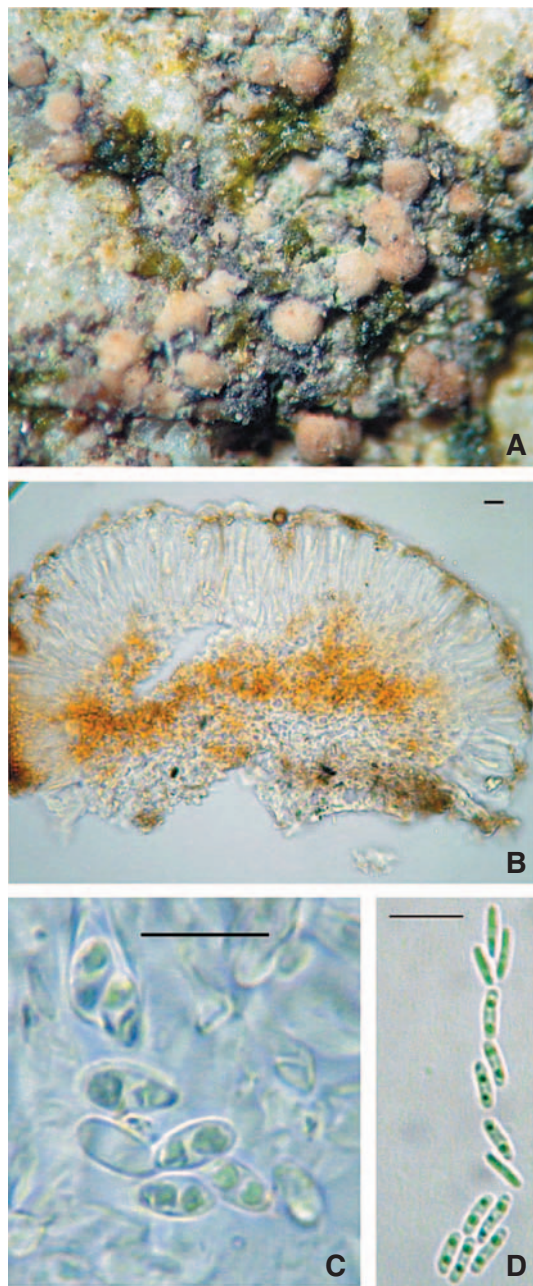
CHEMISTRY. No substances detected by TLC.

NOTES. *Micarea lithinella* is easily recognized by its pallid apothecia, which are absent in most saxicolous Polish members of *Micarea*. However, there are rare cases, caused by the influence of microhabitat, when for example *M. bauschiana*, *M. myriocarpa* and *M. lutulata* occur as pale

forms. Whitish apothecia of *M. lithinella* (very frequent among those recorded in Poland) usually have a colourless hypothecium, similar to many specimens of *M. bauschiana*, but they never have a bluish or greyish tinge. These two species can be separated by careful examination of the photobiont, which is micareoid in *M. lithinella*, but in *M. bauschiana* has large cells, more than 10 µm diam.

In localities more exposed to light *M. lithinella* forms orange or orange-brown apothecia and a slightly orange hypothecium (as in the specimen from Pogórze Spiskie foothills, *Kiszka s.n.*, KRAP). As such, it can resemble both *M. myriocarpa* and *M. lutulata*, especially when they grow in shaded niches. The first could be particularly problematic since it is sometimes associated with *M. lithinella*. However, apothecia of *M. myriocarpa* are smaller and tuberculate, the hypothecium is brown, the ascospores are narrow and usually 1-septate, and an olive pigment is sometimes present within the hymenium. Although *M. lutulata* occasionally has paler apothecia, they are ±brownish, and darkish in water, owing to the dark brown and thick hypothecium. It differs from *M. lithinella* also in the non-micareoid photobiont.

**HABITAT AND DISTRIBUTION IN POLAND.** *Micarea lithinella* was first reported from Poland under this name in 1998 (Czarnota 1998). However, the report of *Biatora meiocarpoides* Nyl. from Silesia by Eitner (1911) had not been taken into consideration at that time, since the name was not considered as a synonym of *M. lithinella*. Eitner provided a few localities for it (Olesno ‘Rosenberg OS’, Dzierżoniów ‘Reichenbach i. Schl.’, Bolków ‘Bolkenhain’, ? ‘Charlottenberg’), but specimens to support these records could not be located. Only his own description of a species which can be referred to *M. lithinella* can support the truthfulness of these data. Some confirmation of its former presence in Silesia can be found on the basis that it is still found there. Several other records of *M. lithinella* were made in different parts of Poland at the end of the last century, but unfortunately they were misidentified as *Lecidea fallax* (Hepp) Linds. (Fałtynowicz 1997: 37) or



**Fig. 29.** *Micarea lithinella* (Nyl.) Hedl.: A – morphology of pale, mostly found form (leg. J. Kiszka, 23 July 2002, KRAP); B – vertical section of more coloured apothecia with well defined, orange-straw coloured hypothecium (leg. J. Kiszka, 22 June 1998, KRAP); C – ascospores (Czarnota 4540, GPN); D – mesoconidia? (leg. J. Kiszka, 9 July 2003, KRAP). Scale bars = 10 µm.

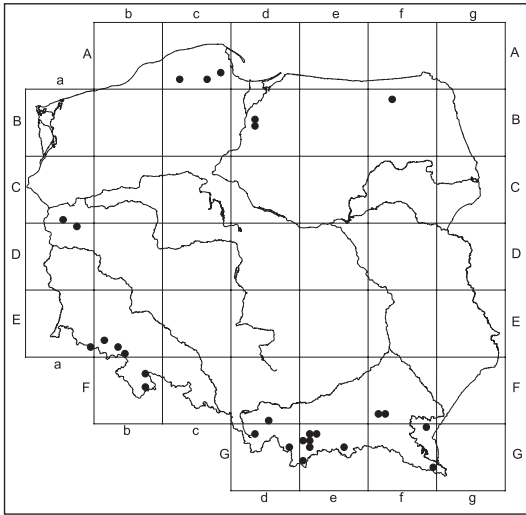


Fig. 30. Distribution map of *Micarea lithinella* (Nyl.) Hedl. in Poland.

remained undetermined. Since Czarnota (1998), its discovery rapidly increased, indicating not only how common it is in Poland but how it was most probably overlooked.

*Micarea lithinella* occurs on different acidic rocks, usually on small pebbles by forest roads, but also on larger boulders by mountain streams (as in Gorce Mts) or on vertical faces of cracked metamorphic outcrops (as in Góry Kamienne Mts). Coppins (1983) suggested its relation to humid situations, but now, based on more information from Poland and other countries (e.g. from the Czech Republic – Palice 1997), it would appear that it is more tolerant of light as it is also found in various forest communities, often preferring rather more exposed slopes of forest roads and small clearings. However, frequently it is found on shaded sandstones in mountain valleys in the Carpathians or on granite boulders within shady woodlands in the northern Poland. The origin of stands does not weigh here, considering its occurrence in natural, managed or even secondary mountain forest.

*Micarea lithinella* is a pioneer colonizer of saxicolous substrata, often associated with: *Bacidina chlorotricula*, *Baeomyces rufus*, *Lecanora polytropa*, *Micarea myriocarpa*, *M. sylvicola*, *Porpidia crustulata*, *P. soredizodes*, *Trapelia coarctata*, *T. involuta* and *T. placodioides*.

Although in Poland it is recorded almost entirely on rocks, it has once been found on roots encrusted by sandy soil (from Świętokrzyskie Mts, *Donica s.n.*, KTC). There are also European examples of it growing on such substrata (Palice 1997) and directly on soil together with, for example, *Geisleria sychnogonoides* Nitschke (Germany, Ernst 2890, E) and *Micarea confusa* Coppins & van den Boom (Belgium, *P. van den Boom* 7781, E).

WORLD DISTRIBUTION. This inconspicuous species, which seemed to be rare in Europe 20 years ago (Coppins 1983), is widespread today and reported from almost all climatic regions, occurring in mountainous areas as well as in lowlands, from Scandinavia to the Mediterranean area and from British Islands to the Baltic part of Russia and the Ukrainian Carpathians to the east. It is very likely to be present throughout much of Russia and other Asiatic countries, which could possibly account for its single record from Taiwan.

EUROPE: Austria (Hafellner & Türk 2001); Belgium and Luxembourg (Diederich & Sérusiaux 2000); Czech Republic (Vězda & Liška 1999); Denmark (Søchting & Alstrup 2002); Finland (Vitikainen *et al.* 1997); Germany (Scholz 2000) – e.g. Baden Württemberg (Wirth 1995), Lower Saxony (Hauck 1996), Nordrhein-Westfalen (Heibel 1999), Schleswig-Holstein (Jacobsen & Coppins 1989; Jacobsen 1992, 1997); Great Britain (Coppins 1983, 2002); Greece – Ikaria Island (Sipman *et al.* 2005); Ireland (Seaward 1994); Hungary (Verseghy 1994); the Netherlands, rare (Aptroot *et al.* 2004); Norway (Santesson 1993); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993); Ukraine – Eastern Carpathians (Motiejūnaite *et al.* 1999; Kondratyuk & Coppins 2000). ASIA: China – Yunnan (Aptroot *et al.* 2003); Taiwan (Aptroot & Sparrius 2003). NORTH AMERICA: USA (Esslinger & Egan 1995) – e.g. New York State (Harris 2004), Ohio (Coppins & Fryday 2006).

EXSICCATAE SEEN. Arnold, *Lich. Exs. No. 1173* (WRSL); Hertel, *Lecid. Exs. No. 231* (E); Malme, *Lich. Suec. Exs. No. 125* (Hb. Vězda); Zwackh, *Lich. Exs. No. 590* (H-NYL *p.m.* 5404).

SPECIMENS EXAMINED. Grid square. Ac-78 – POJE-

ZIERZE WSCHODNIOPOMORSKIE LAKELAND, POJEZIERZE KASZUBSKIE LAKELAND: vicinity of Kamień village near S shore of Kamień Lake, 4 Aug. 2005, *leg. P. Czarnota 4530* (GPN); Ac-82 – POJEZIERZE ZACHODNIOPOMORSKIE LAKELAND, WYSOCZYNA POLANOWSKA PLATEAU: 2 km NE of Kotowo village, Leśny Dwór forest division, Międzyzylas forest district, forest section no. 669, 30 Oct. 1979, *leg. I. Izydorek* (Hb. Izydorek); Ac-86 – POJEZIERZE WSCHODNIOPOMORSKIE LAKELAND, POJEZIERZE KASZUBSKIE LAKELAND: N of Okuniewko Lake, Mirachowo forest district, forest section no. 54f, 14 Nov. 1995, *leg. W. Faltynowicz* (UGDA-L 5322), as *Lecidea fallax*; Bd-43 – POJEZIERZE IŁAWSKIE LAKELAND, POJEZIERZE IŁAWSKIE LAKELAND: Kwizdyń forest division, Lisewo forest district, forest section no. 187a, S of Nowa Wieś village, 27.07.1996, *leg. M. Kukwa* (UGDA-L 10540), as *Scoliciosporum umbrinum*; Bd-53 – POJEZIERZE IŁAWSKIE LAKELAND: valley of Liwa River, E of Szadowa village [53°46'20"N/19°03'41"E] 12 Apr. 2004, *leg. M. Kukwa 3077* (UGDA); Bf-13 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE ELCKIE LAKELAND: Puszcza Borecka Forest, Czerwony Dwór forest division, Lipowo forest district, 'Lipowy Jar' nature reserve, forest section no. 225 [54°07'N/22°09'E] 21 Apr. 1996, *leg. P. Rutkowski & A. Zalewska* (OLS-L 1358); Ca-95 – POJEZIERZE LUBUSKIE LAKELAND, POJEZIERZE ŁAGOWSKIE LAKELAND: 0.5 km N of Osno Lubuskie town [52°27'35"N/14°53'13"E] alt. 60 m, 8 Apr. 2006, *leg. P. Czarnota 4792* (GPN); Da-07 – POJEZIERZE LUBUSKIE LAKELAND, POJEZIERZE ŁAGOWSKIE LAKELAND, Puszcza Rzepińska Forest, by the border of 'Pawski Ług' nature reserve, by road between Łagów village and Torzym town [52°18'44"N/15°15'27"E] 8 Apr. 2006, *leg. P. Czarnota 4804* (GPN); Eb-83 – MIDDLE SUDETES, GÓRY KAMIENNE MTS: ca 2 km S of Boguszów Gorce town, worked-out quarry of melaphyre [50°44'36"N/16°10'18"E] alt. ca 500 m, 21 Apr. 2005, *leg. P. Czarnota 4476* (GPN); Fb-27 – EASTERN SUDETES, GÓRY ŻŁOTE MTS: near Różaniec Pass, by the border of PL/ČR [50°24'11"N/16°52'15"E] alt. 580 m, 19 Apr. 2005, *leg. P. Czarnota 4407, 4411* (GPN); Fb-47 – ŚNIEŻNIK MASSIF: hiking track between Puchaczówka Pass and Czarna Góra Mt., alt. 700 m, 19 Oct. 2002, *leg. K. Szczepańska* (Hb. Szczepańska); Ea-89 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park, NW slope above glacial lake Mały Staw, on avalanche track overhanging stone, alt. 1250–1300 m, 18 Sept. 2002, *leg. Z. Palice* (PRA); Eb-71 – RUDAWY JANOWICKIE MTS: S slope of Janowicka Garby range, road between Rozdroże below Jańska Góra Mt. and Krowiarki in Dolina Janówki valley, ca 1.5 km of Rozdroże, alt. ca 540 m, 23 Sept.

1999, *leg. G. Leśniński* (OPUN), as *Micarea* sp.; Eb-94 – MIDDLE SUDETES, GÓRY KAMIENNE MTS: ca 1 km W of Grzmiąca village, by Rybnica stream [50°42'20"N/16°18'55"E] ca 480 m, 21 Apr. 2005, *leg. P. Czarnota 4467* (GPN); Fd-95 – WESTERN BESKIDY MTS, BESKID MAŁY MTS: Potrójna Mt., alt. 850 m, 5 Aug. 1960, *leg. J. Nowak* (KRAM-L 6291 together with *M. erratica*); Ff-81 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE STRZYŻOWSKIE FOOTHILLS: Strzyżów forest division, Cieszyna forest district, N slope of Chełm Mt. [49°53'31"N/21°33'39"E] alt. 425 m, 17 Apr. 2005, *leg. P. Czarnota 4761* (GPN); Ff-82 – POGÓRZE DYNOWSKIE FOOTHILLS, the pass below Krowia Góra Mt., by forest road between Kozłówek and Łęki Strzyżowskie villages [49°50'17"N/21°40'14"E] alt. 420 m, 17 Apr. 2005, *leg. P. Czarnota 4540* (GPN); Gd-13 – WESTERN BESKIDY MTS, BESKID ŚLĄSKI MTS: Węgierska Górka forest division, Sikorczone forest district, forest section no. 199d, E slope of Barania Góra Mt., valley of Bystra stream, alt. ca 1000 m, 10 May 2002, *leg. P. Czarnota* (GPN 2800); Gd-38 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKO-NOWOTARSKA BASIN: Jabłonka – Guzówka settlement, 23 July 2002, *leg. J. Kiszka* (KRAP); Ge-11 – WESTERN BESKIDY MTS, GORCE MTS: Gorce National Park, valley of Turbacz stream, alt. 760 m, 22 May 1996, *leg. P. Czarnota* (GPN 1385); Ge-12 – BESKID WYSPOWY MTS: W slope of Modyń Mt., 0.5 km E of Zalesie village [49°37'44"N/20°22'38"E] alt. 760 m, 2 July 2005, *leg. P. Czarnota 4603* (GPN) and ca 1 km E of Zalesie village [49°37'30"N/20°22'40"E] alt. 850 m, 2 July 2005, *leg. P. Czarnota 4608* (GPN); Ge-20 – GORCE MTS: Gorce National Park: a small periodic stream below the top of Obidowiec Mt. in Poręba stream basin, alt. 1100 m, 16 May 1995, *leg. P. Czarnota* (GPN 1473), 'Turbacz' nature reserve, valley of Olszowy stream, Łocha Wood, alt. 1100 m, 9 Nov. 1994, *leg. P. Czarnota* (GPN 1335), 'Turbacz' nature reserve, valley of Olszowy stream, alt. 820 m, 26 June 1996, *leg. P. Czarnota* (GPN 1346), forest section no. 66, near Olszowy stream, near the border of 'Turbacz' nature reserve [49°33.82'N/20°05.40'E] alt. 770 m, 18 July 2003, *leg. P. Czarnota* (GPN 3303, 3509); Ge-21 – GORCE MTS: Gorce National Park: 'Turbacz' nature reserve, in river-bed of Turbacz stream, Na Piaski forest area, alt. 940 m, 30 May 1996, *leg. P. Czarnota* (GPN 2100), in river-bed of Kamienica stream below Bieniowe glade, alt. 820 m, 1 July 1999, *leg. P. Czarnota* (GPN 1982); Ge-31 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, POGÓRZE SPISKIE FOOTHILLS, N of Trybsz village by coart-road, 22 June 1998, *leg. J. Kiszka* (KRAP); Ge-36

– WESTERN BESKIDY MTS, BESKID SADECKI MTS: Jaworzyna Krynicka range, ‘Żebracze’ nature reserve, alt. 720 m, 5 July 2001, *leg. P. Czarnota* (GPN 2591, 2593 together with *M. myriocarpa*) and alt. 820 m, 5 July 2001, *leg. P. Czarnota* (GPN 2501); Ge-50 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, RÓW PODTARZAŃSKI DEPRESSION: near Małe Ciche village, Pańszczykowa Polana glade [49°17'36"N/20°03'36"E] alt. 925 m, 13 July 2004, *leg. L. Śliwa 2907a* (KRAM); Gf-08 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE PRZEMYSKIE FOOTHILLS: ‘Krepek’ nature reserve, by road between Bircza and Przemyśl town [49°42'09"N/22°31'55"E] alt. 370 m, 17 June 2005, *leg. P. Czarnota 4500* (GPN); Gf-69 – EASTERN BESKIDY MTS, WESTERN BIESZCZADY MTS: Bieszczadzki National Park, valley of Rzeczycza stream, alt. 797 m, 9 July 2003, *leg. J. Kiszka* (KRAP), as *M. peliocarpa*.

ADDITIONAL SPECIMENS EXAMINED. CZECH REPUBLIC, TŘEBOŇSKO: Hajnice settlement near Mirochov village, on small, granite pebble, 12 Apr. 2002, *leg. P. Czarnota* (GPN 2786); LUŽICKE HORY: ca 0.5 km W of Studeny village [50°50.60'N/14°27.16'E] on basalt pebbles near stream in broadleaf forest, 26 Apr. 2003, *leg. P. Czarnota* (GPN 3321); RYCHLEBSKÉ HORY: valley of Bilá Voda stream, S of Bilá Voda village, vicinity of Šafářova skála outcrop [50°24'35"N/16°53'38"E] alt. ca 500 m alt., on gneiss boulder within spruce mountain forest, 23 Apr. 2004, *leg. P. Czarnota 4216, 4276* (GPN). RUSSIA, SANKT-PETERSBURG REGION: Lodejnopolsky district, ca 2 km NW of the Lahta, along the road [60°40'41"N/33°01'05"E] on brick within young pine forest, 23 Aug. 2001, *leg. E. S. Kuznetsova & D. E. Himelbrant* (LECB, GPN ex LECB).

*Micarea lutulata* (Nyl.) Coppins (Figs 31 & 32) in D. Hawksw., P. James & Coppins, *Lichenologist* **12**: 107. 1980.

*Lecidea lutulata* Nyl., *Flora* **56**: 297. 1873. TYPE: Channel Islands, Jersey, Rozel meadow, bases of rocks, July 1873, *C. Lorbalestier* (H-NYL 10696 – LECTOTYPE!; BM ISOLECTOTYPE, *n.v.*).

– *Lecidea botryiza* Nyl. ex Stirr., *Flora* **56**: 10. 1873. TYPE: Scotland, Ben Vörlich, 1871, *Stirton* (H-NYL 20688 – HOLOTYPE!).

– *Lecidea poliodes* Nyl., *Flora* **58**: 10. 1875. – *Micarea poliodes* (Nyl.) Vězda in Vězda & V. Wirth, *Folia Geobot. Phytotax.* **11**: 99. 1976. TYPE: Finland (H-NYL 20683 – HOLOTYPE, *n.v.*).

– *Lecidea laxula* Nyl., *Flora* **58**: 11. 1875. – *Biatora laxula* (Nyl.) Räsänen, *Ann. Bot. Soc. Zool.-Bot. Fenn.*

*Vanamo* **18**(1): 88. 1943. TYPE: Finland, Tavastia australis, Luhanka, Hietala, 1874, *E. A. Lang [Vainio]* 303 (H-NYL 20689 – LECTOTYPE!; H – ISOLECTOTYPE, *n.v.*).

– *Lecidea antrophila* Larb. ex Leight., *Trans. Linn. Soc. London, Bot. II*, **1**: 242. 1876. TYPE: Ireland (BM ex K – LECTOTYPE, *n.v.*; BM, BM ex K – ISOLECTOTYPES, *n.v.*).

– *Lecidea paucula* Nyl., *Flora* **59**: 573. 1876. TYPE: Ireland, West Galway, ‘Montagnes de Maam’ [Maumturk Mountains], Mar. 1876, *C. Lorbalestier* (H-NYL 20090 – HOLOTYPE!).

– ?*Lecidea amnicaulensis* J. Lowe, *Lloydia* **2**: 281. 1939. TYPE: USA, New York, Adirondack Region, ‘Marcy Brook below Indian Falls’, *J. L. Lowe 6404*; material not located (Coppins & Fryday 2006).

– *Micarea umbrosa* Vězda & V. Wirth, *Folia Geobot. Phytotax.* **11**: 93. 1976. TYPE: Germany (Hb. Wirth 1609 – HOLOTYPE, *n.v.*).

Thallus effuse, thin and ±continuous or cracked or usually becoming thicker (especially under apothecia) and finally, scurfy-granular or even composed of small, sharply delimited areoles, pale green to olive- or grey-green. Photobiont non-micareoid; algal cells ±globose 5–12(–14) µm diam. Apothecia numerous, hemispherical to ±globose, immarginate, simple or sometimes tuberculate, pale grey-brown, fuscous-brown to almost dull brown-black or blackish, 0.2–0.4 mm diam. or up to 0.8–1.0 mm when tuberculate; those paler always turning blackish in water. Hymenium hyaline, dilute brownish or usually in upper part olive, olive-grey or sometimes aeruginose, K– or K+ greenish intensifying, 30–40(–50) µm tall; pigment confined to gel matrix and partially to fasciculate, stout paraphyses. Asci cylindrical, 30–40 × 8–12 µm. Ascospores ovoid to ellipsoid, simple, (5–)6–7(–9) × 2–3(–3.5) µm. Paraphyses rather scanty, of two types: (1) hyaline throughout, simple or scarcely forked above and sometimes branched, 1–1.5 µm wide; apices only slightly widening to 1.8–2 µm; (2) stout, 1.5–2 µm wide with swollen up to 3 µm and pigmented apices, multiseptate, forked, simple, or sometimes concentrated in small vertical streaks. Hypothecium dark red-brown to fuscous-brown (thicker sections black-brown), K– or K+ intensifying. Excipulum



not developed, but hymenium very often reflexed below the hypothecium and forming excipulum-like, hyaline zone. Pycnidia rather rare, inconspicuous, immersed or sometimes with gaping ostioles and extruding white mass of conidia, brown to blackish; pycnidial walls brown, but sometimes outer part blackish-green or blackish-blue (especially when more developed and ostioles protruding over the thallus), K<sup>-</sup>. Conidia (mesoconidia) narrowly cylindrical, (4.0–)5.0–5.5(–6.5) × 1.1–1.3 μm.

CHEMISTRY. No substances detected by TLC.

NOTES. Darkish forms of *M. lutulata* were formerly confused with *M. sylvicola* by some Polish lichenologists, which would suggest a large similarity in the morphology of both species, but their apothecial sections and especially hypothecial pigmentation are very different. *Micarea lutulata* has a dark brown hypothecium, never reacting K<sup>+</sup> greenish-black or purplish-black as in *M. sylvicola*. The hymenium of *M. lutulata* is usually without any blue tinge in contrast to *M. sylvicola* (but the lectotype of *Lecidea lutulata* Nyl., as well as e.g. *Czarnota 4392* from Pogórze Kaczawskie foothills, has at least an olive-blue hymenium containing ‘Cinereorufa-green’ pigment, HNO<sub>3</sub> + violaceous). The ascospores of *M. lutulata* are also slightly smaller than those of *M. sylvicola*.

In the field, blackish specimens of *M. lutulata* could be confused above all with saxicolous forms of *M. lignaria* or *Psilolechia clavulifera* (Nyl.) Coppins, as well as with *M. tuberculata* and *M. bauschiana*, which often share the same rocky habitat. However, none of these species has a brown hypothecium like *M. lutulata*. Nevertheless, pale, brownish and tuberculate forms of *M. lutulata*, previously described as *M. poliodes* (Nyl.) Vězda (see synonyms), can resemble *M. myriocarpa*. The latter species also has a brown hypothecium and sometimes an olive, or olivaceous-brown hymenium, but differs above all from *M. lutulata* in having smaller, usually 1-septate ascospores, sessile pycnidia, shorter mesoconidia and a different photobiont, which is never large-celled.

Mesoconidia found in Polish specimens of

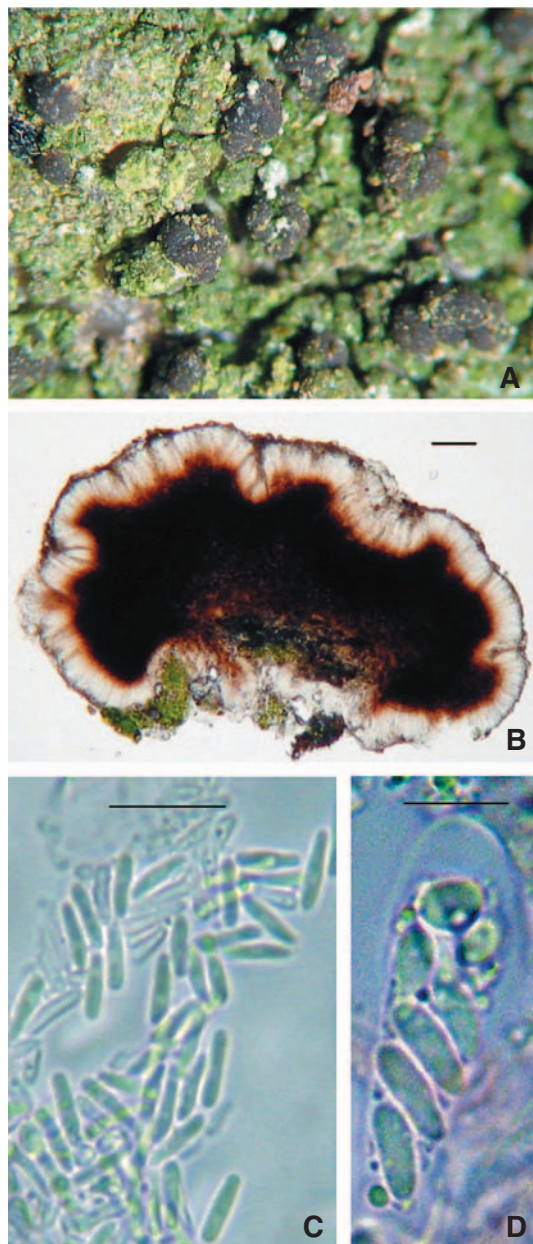


Fig. 31. *Micarea lutulata* (Nyl.) Coppins: A – morphology, B – vertical section of apothecia (GPN 3292); C – mesoconidia, D – ascospores (*Czarnota 4392*, GPN). Scale bars: B = 100 μm; C & D = 10 μm.

*M. lutulata* (e.g. *Czarnota 4392*; see Fig. 31C) are slightly longer than those described by Coppins (1983: 149) and pycnidial walls, as well being

brown pigmented (Coppins 1983), are often, at least partially, dark blackish-blue or blackish-green.

Recent phylogenetic analyses based on mitochondrial rDNA sequences have shown that probably the whole *Micarea sylvicola*-group (Coppins 1983) composed of, among other taxa, *M. lutulata*, form a highly supported group together with *Psora decipiens* (Hedw.) Hoffm. and seem to be near to the Psoraceae Zahlbr. (Andersen & Ekman 2005). Indeed, the non-micareoid photobiont, *Psora*-type ascus and two kinds of paraphyses distinguish the species from many other species of *Micarea*, but here it is regarded as a *Micarea* species sensu Coppins (1983).

**HABITAT AND DISTRIBUTION IN POLAND.** Old reports of *M. lutulata* from Poland are scarce and based mainly on material incorrectly identified as *M. sylvicola* (Czarnota 2003b). The suggestion that it is probably widely distributed in southern, mountainous parts of Poland (Czarnota 2003b) has been partially proven during the recent explorations. Apart from the confirmation of its occurrence in the Western Beskidy Mts, it has also been found in different ranges of the Sudetes, from where it was reported only once before (Szczepańska 2004). *Micarea lutulata* usually grows on vertical faces of various acid rocks: on granite, metamorphic or sandstone outcrops and boulders within different forest communities covering lower mountain belts. Its locality in the Polica Mt. (Western Beskidy Mts) at an altitude of 1100 m is the highest one known at present in Poland. It prefers mainly shaded and sheltered rocky underhangs and niches under trees, often located in places with high air humidity, such as by streams or in deep forested valleys, and also by forest roads and on shaded overgrown field boulders. In mountainous localities it is usually found in the community *Micareetum sylvicolae* James *et al.* (1977) composed of *Micarea lignaria*, *M. myriocarpa*, *M. sylvicola*, *M. tuberculata* and *Psilolechia clavulifera*.

It is known from only one locality in northern Poland (Czarnota 2003b), where it was found on a post-glacial granite boulder without accompanying species.

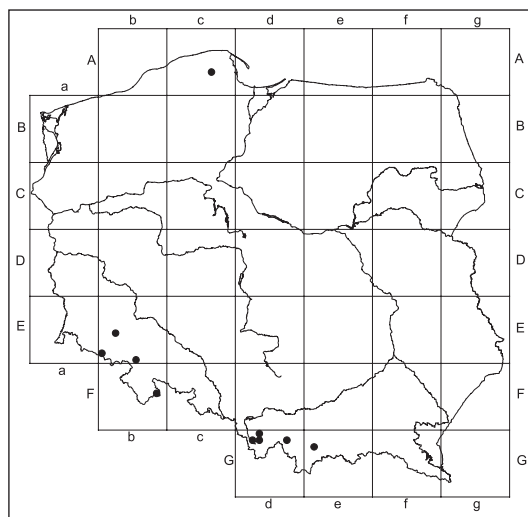


Fig. 32. Distribution map of *Micarea lutulata* (Nyl.) Coppins in Poland.

**WORLD DISTRIBUTION.** *Micarea lutulata* is a widespread species in Europe, frequently reported in the Great Britain (Coppins 1983) and on the mainland found mainly in boreal, post-glacial regions of Fennoscandia and mountainous regions of the Central Europe (mainly Alps, Pyrenees, Western Carpathians, Sudetes). Its rather oceanic and submontane distribution suggests that it prefers humid areas, but it usually avoids direct precipitation, occupying dry niches in underhangs or vertical rocky faces.

**EUROPE:** Austria (Hafellner & Türk 2001); Belgium, France and Luxembourg (Diederich & Sérusiaux 2000); Czech Republic (Vězda & Liška 1999); Denmark, rare (Söchting 1998; Söchting & Alstrup 2002); Estonia (Aptroot *et al.* 2005); Finland (Vitikainen *et al.* 1997); Germany (Vězda & Wirth 1976, as *M. umbrosa*; Coppins 1983; Wirth 1995; Hauck 1996; Heibel 1999; Scholz 2000); Great Britain and Ireland (Coppins 1983, 2002; Seaward 1994); Italy (Nimis & Martellos 2003); the Netherlands, very rare (Aptroot *et al.* 2004); Norway (Santesson 1993); Slovakia (Vězda & Wirth 1976, as *M. umbrosa*; Pišút *et al.* 1996); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993). **ASIA:** China – Yunnan (Aptroot *et al.* 2003); Hongkong (Ap-

troot & Seaward 1999). NORTH AMERICA: USA – Maine (Greene 2005).

EXSICCATAE SEEN. Arnold, *Lich. Exs. No. 409B* (WRS�), No. 1233 (H-NYL *p.m.* 5411 with *M. bauschiana*).

SPECIMENS EXAMINED. Grid square Ac-66 – POJEZIERZE WSCHODNIOPOMORSKIE LAKELAND, POJEZIERZE KASZUBSKIE LAKELAND: Porzecze settlement near Strzebielino village on Łeba River, 25 July 1985, *leg. W. Faltynowicz* (UGDA-L 3427); Eb-52 – POGÓRZE ZACHODNIOSUDECKIE FOOTHILLS, POGÓRZE KACZAWSKIE FOOTHILLS, ‘Wąwóz Mysliborski’ nature reserve, W of Jawor town [51°01'13"N/16°06'35"E] alt. ca 280 m, 22 Apr. 2005, *leg. P. Czarnota* 4392 (GPN); Eb-80 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park, Dolina Łomniczki valley near Betonowy Most bridge, in bed-rock of Łomniczka stream [50°45.52'N/15°45.62'E] alt. 750 m, 7 July 2003, *leg. P. Czarnota* (GPN 3692); Eb-95 – MIDDLE SUDETES, GÓRY SOWIE MTS: S slope of Wielka Sowa Mt, by stream on N edge of Sokolec village [50°39'46"N/16°28'59"E] alt. ca 620 m, 21 Apr. 2005, *leg. P. Czarnota* 4401 (GPN); Fb-48 – EASTERN SUDETES, GÓRY ŻŁOTE MTS: Góry Białskie Mts, ‘Nowa Morawa’ nature reserve, W slope of Solec Mt., alt. ca 900 m, Aug. 2003, *leg. K. Szczepańska* (Hb. Szczepańska); Gd-03 – WESTERN BESKIDY MTS, BESKID ŚLĄSKI MTS: Hala Jaškowa glade, alt. 720 m, 4 Aug. 1965, *leg. J. Kiszka* (KRAP; GPN 2411); Gd-12 – BESKID ŚLĄSKI MTS: by bank of Czarna Wiselka stream, alt. 735 m, 22 July 1965, *leg. J. Kiszka* (KRAP; GPN 4212); Gd-13 – BESKID ŚLĄSKI MTS: valley of Radziechowcy stream, alt. 590 m, 18 May 1964, *leg. J. Kiszka* (KRAP; GPN 2409) and alt. 810 m, 18 May 1964, *leg. J. Kiszka* (KRAP; GPN 2410); Gd-17 – BESKID ŻYWIECKI MTS: Polica range, alt. 1100 m, 22 May 1965, *leg. J. Nowak* (KRAM-L 16269); NE slope of Polica Mt. below Hala Krupowa glade, Sucha Beskidzka forest division, Skawica forest district, forest section no. 45 [49°37'53"N/19°38'38"E] alt. ca 1070 m, 4 June 2004, *leg. P. Czarnota* 3929 (GPN); Ge-21 – GORCE MTS: Gorce National Park, Dolina Kamieniczy valley below Bieniowe glade, alt. 840 m, 1 July 1999, *leg. P. Czarnota* (GPN 1981).

ADDITIONAL SPECIMENS EXAMINED. CZECH REPUBLIC, RYCHLEBSKÉ HORY: S of Bilá Voda village near the border of Poland, valley of Bilá Voda stream, vicinity of Šafařova skála outcrop [50°24'35"N/16°53'38"E] alt. ca 500 m alt., 23 Apr. 2004, *leg. P. Czarnota* 4170 (GPN). ENGLAND, SOUTH SOMERSET: Shirocombe Brake (EWS 638), S side of Shi-

rocombe Rocks, on sheltered rock face under trees, alt. ca 270 m, 21 July 2002, *leg. B. J. Coppins* 20617 & *A. M. Coppins* (E). SCOTLAND, ARGYLL: Cormonachan Wood, ca 0.5 km W of bank of Loch Goil [56°07'44"N/4°54'40"W] alt. 70 m, on bark of underhanged roots under coniferous tree, 12 Sept. 2003, *leg. P. Czarnota* (GPN 3419). UKRAINE, ZAKARPATSKA OBLAST: Eastern Carpathians, Ust'-Čorna, ca 7 km N of Unharskaja Mt., along Turbat river, on sandstone underhangs by narrow forest railway leading, 14 Oct. 1994, *leg. Z. Palice* (PRA).

### *Micarea marginata* Coppins & Muhr

(Figs 3D, 33 & 34)

*in* Coppins, Notes Roy. Bot. Gard. Edinburgh **45**: 164. 1988. TYPE: Sweden, Värmland, Norra Finnskoga par., ca 400 m SE of Brännknölen, by the small stream Fiskhusbäcken, on boulder by the stream, shaded habitat [60°57'N/14°41'E] alt. 500 m, 1 Apr. 1984, *L.-E. Muhr* 7014 (E – HOLOTYPE!; E – TOPOTYPE!, 19 July 1983).

Thallus mostly thin and effuse, or sometimes more developed, thicker and cracked into small, irregular, sharply delimited, continuous to scurfy areoles, greenish-grey to brownish-grey, often covered with a layer of non-lichenized algae and then ±gelatinous when wet. Photobiont micareoid; algal cells 5–8 µm diam. Apothecia black, at first plane and thinly marginate, small, 0.1–0.3 mm, later convex with disappearing margin, often adnate themselves and forming small clusters up to 0.5(–0.8) mm diam. (sometimes surrounding by non-lichenized algae increasing their morphological dimensions). Hymenium in upper part (epithecium) olive-brown, middle part hyaline, usually with olive-brown vertical streaks, lower part usually aeruginose to greenish-blue; all parts K+ dark olive, or subhymenium sometimes with permanent greenish tinge. Asci clavate, 30–45 × 10–13 µm. Ascospores mostly ellipsoid, oblong, oblong-ovoid or oblong-ellipsoid, 0–1-septate, rarely 2–3-septate, (9–)10–13(–15) × 3–4.5 µm. Paraphyses numerous, hyaline throughout, 1.2–1.5 µm wide, not widening or only slightly above, simple or more frequently scarcely branched; branches short, often hooked. Hypothecium ca 75 µm tall when apothecia plane, up to 180 µm in old, tuberculate apothecia, variously coloured (in thick sections

mostly dark); the hue composed of mixed purple-brown 'Melaenida-red', green and blue-green 'Cinereorufa-green' pigments confined to gel-matrix, K+ purple intensifying or K+ green intensifying respectively (the main reaction with K depends from dominant tinge), HNO<sub>3</sub>+ purple-red. Excipulum distinct and thick in young apothecia, up to 20 µm wide, later reflexed to inconspicuous, but always visible as purple-black-brown zone, K+ purple-black intensifying or sometimes K+ green-black. Pycnidia immersed to emergent, black, sometimes with gaping ostioles bearing whitish mass of conidia; walls green-brown to green-black, K+ green dulling. Conidia (macroconidia) distinctly sigmoid or curved, 15–22(–25) × 1.2–1.4 µm.

CHEMISTRY. No substances detected by TLC.

NOTES. Macroscopically *M. marginata* can resemble *M. erratica* and *M. lynceola*, as well as many species of *Lecidea* s.l. with a well-developed excipulum or even to ±brown coloured species belonging to the genus *Rhizocarpon* Ramond ex DC. (e.g. *Rh. distinctum* Th. Fr.), at least when its apothecia are plane (young). In particular, *M. erratica* may be confused with *M. marginata* owing to it sometimes having at first sight a similar pigmentation in its apothecial sections. However, *M. marginata* has a uniformly dark excipulum, ascospores which are often sparsely septate, elongate conidia and a micareoid photobiont, while the inner part of the excipulum in *M. erratica* is hyaline, its ascospores are smaller, ovoid and only simple, its conidia are short-cylindrical and its algal cells are up to 15 µm diam. Moreover, both species differ in ecological preferences. *Micarea erratica* avoids wet and shaded localities and usually grows in lowlands, never in high mountains, in contrast to *M. marginata* which, in Poland, is found only in high mountains.

Young stages of *M. marginata* may also morphologically resemble *M. lynceola* (not, as yet, found in Poland, but feasible), owing to its black apothecia and well-developed margin. However, the apothecial anatomy of both species is very different, the strongly developed excipulum of *M. lynceola* being hyaline and its hypothecium having only a slightly olivaceous pigmentation.

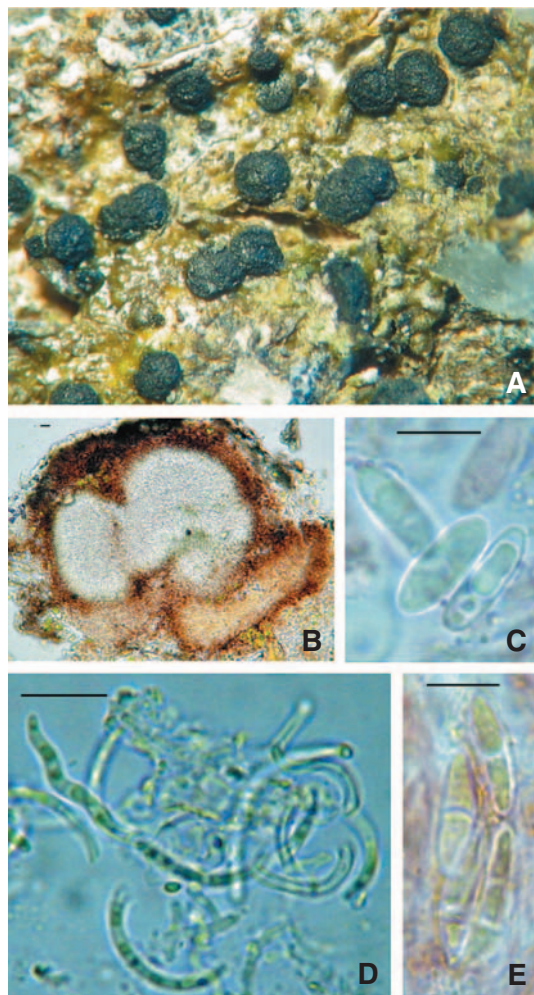


Fig. 33. *Micarea marginata* Coppins & Muhr: A – morphology (GPN 3340); B – vertical section of pycnidia bearing macroconidia, C – macroconidia (GPN 3579); D – simple ascospores, E – 1–2-septate ascospores (GPN 3565). Scale bars = 10 µm.

Other morphological and anatomical details of *M. marginata*, differences and similarities to several members of *Micarea* are presented by Coppins (1988).

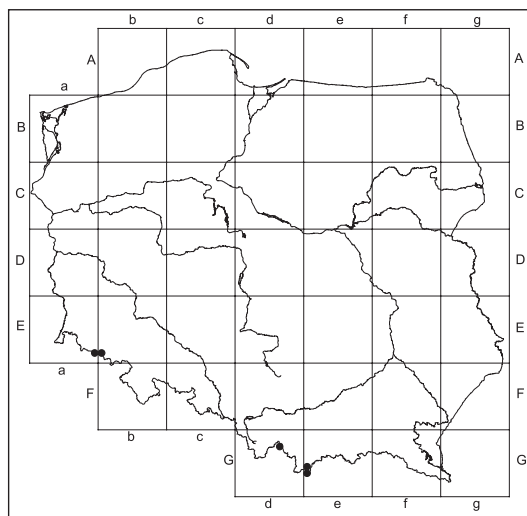
HABITAT AND DISTRIBUTION IN POLAND. Several recent records of *M. marginata* have been made since Czarnota (2004) first reported it from Poland. It is found on vertical and horizontal faces of granite or metamorphic (hornfels) boulders, mostly in alpine and dwarf mountain pine

belts above 1250 m in the Sudetes and 1350 m in the Tatras. It occurs there usually in postglacial kettles or shaded gullies, as well as in small, peaty hollows within the dwarf pine community. Rarely it has been recorded also in lower belts (at 750 m in the Sudetes and 1160 m in the Tatras) on granite rocks in river-beds of streams crossing deep valleys covered in upper mountain spruce forest. At the new locality from the N slope of Babia Góra Massif (the highest mountain in Western Beskidy Mts), the first for the Polish Flysch Carpathians, it grew on a small sandstone field-boulder by the upper border of the dwarf pine zone; here it was associated with, for example, the epilithic lichens *Lecanora intricata*, *L. polytropha*, *Lecideia* sp., *Micarea lignaria*, *Protoparmelia badia*, *Rhizocarpon geographicum* and several species, which are tercolous or growing on plant debris and moribund bryophytes adjacent to stones, such as *Alectoria nigricans*, *Cetraria islandica*, *Cladonia* spp., *Micarea leprosula*, *M. lignaria* and *Placynthiella uliginosa*. In the Sudetes and Tatras, *M. marginata* is also found in association with some additional species: *Micarea bauschiana*, *M. submilliaria*, *M. sylvicola* and *Protothelenella sphinctrinoides*. The ecological preference of *M. marginata* to occupy sites with prolonged snow cover was noted by Czarnota (2004).

**WORLD DISTRIBUTION.** *Micarea marginata* is a rare but widespread mountain or even alpine species known so far from only a few European countries, but overlooked; it is probably distributed at least in non-limestone parts of the Alps, Pyrenees and Southern Carpathians.

**EUROPE:** Czech Republic (Palice 1999; Věžda & Liška 1999; Czarnota 2004); Great Britain (Coppins 2002; Czarnota 2004 from Scotland); Ukraine – East Carpathians (Palice 1999; Czarnota 2004); Sweden (Coppins 1988; Santesson 1993).

**SPECIMENS EXAMINED.** Grid square Ea-89 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park: N slope of Śnieżka Mt. in Kocioł Łomniczki corrie [50°44.38'N/15°44.03'E] alt. 1300 m, 8 July 2003, leg. P. Czarnota (GPN 3280), alt. 1320 m, 8 July 2003, leg. P. Czarnota (GPN 3488) and by waterfalls of Łomniczka stream [50°44.56'N/15°43.88'E] alt. 1250 m, 7 July 2003, leg. P. Czarnota (GPN 3462);



**Fig. 34.** Distribution map of *Micarea marginata* Coppins & Muhr in Poland.

Eb-80 – KARKONOSZE MTS: Karkonoski National Park, Dolina Łomniczki valley near Betonowy Most bridge, in the bedrock of Łomniczka stream [50°45.52'N/15°45.62'E] alt. 750 m, 7 July 2003, leg. P. Czarnota (GPN 3693); Gd-26 – WESTERN BESKIDY MTS, BABIA GÓRA RANGE: Kępa Mt, by tourist track [49°34'39"N/19°33'04"E] alt. 1540 m, 11 Nov. 2005, leg. P. Czarnota 4601 (GPN); Ge-50 – TATRA MTS, HIGH TATRA MTS: Tatra National Park, Dolina Rostoki valley, by Rostoka stream, alt. 1160 m, 8 Aug. 2003, leg. P. Czarnota (GPN 3302); Dolina Rostoki valley, by Rostoka stream [49°13'11"N/20°03'35"E] alt. 1350 m, 30 July 2005, leg. M. Węgrzyn 2419 (KRA); Dolina Waksmundzka valley below the top of Pośredni Wołoszyn Mt. [49°13.79'N/20°03.23'E] alt. 2050 m, 9 Aug. 2003, leg. P. Czarnota (GPN 3300); Dolina Waksmundzka valley, near Waksmundzki Potok stream [49°14.91'N/20°04.33'E] alt. 1340 m, 9 Aug. 2003, leg. P. Czarnota (GPN 3587); Dolina Waksmundzka valley, near stream flowing out from Turnia nad Dziadem Mt. in Wołoszyn range, alt. ca 1500 m, 9 Aug. 2003, leg. P. Czarnota (GPN 3630); N slope of Żółta Turnia Mt., Łopata region [49°14'13"N/20°01'31"E] alt. 1870 m, 9 Oct. 2005, leg. M. Węgrzyn 2596 (KRA); Ge-60 – HIGH TATRA MTS: Tatra National Park, Dolina Rostoki valley below shelter-house in Dolina Pięciu Stawów valley, periodic stream below Niżnia Kopa Mt. [49°13.08'N/20°03.08'E] alt. 1480 m, 8 Aug. 2003, leg. P. Czarnota (GPN 3579); Dolina Pięciu Stawów valley below Szpiglasowa Pass, Szpiglasowa Perc region by hiking track [49°12.11'N/

20°02.04'E] alt. 1790 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3664); Dolina Pięciu Stawów valley, SE shore of Czarny Staw Polski Lake [49°12.32'N/20°01.83'E] alt. 1720 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3571); Dolina Gąsienicowa valley below Pośrednia Turnia Mt. [49°13.01'N/20°00.35'E] alt. 1950 m, 20 Sept. 2003, *leg. P. Czarnota* (GPN 3340); Dolina Rybiego Potoku valley, Żleb Żandarmerii gully [49°12'26"N/20°04'05"E] alt. 1640 m, 19 June 2004, *leg. M. Węgrzyn 2033* (KRA).

ADDITIONAL SPECIMENS EXAMINED. SCOTLAND, ARGYLL: (VC 98), Beinn an Dothuidh, alt. 1000 m, pebble in ±bare soil of summit heath, 28 Feb. 1992, *leg. A. Fryday 3067* (E). See also Czarnota (2004).

*Micarea melaena* (Nyl.) Hedl. (Figs 35 & 36)

Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18** (3): 82, 96. 1892.

*Lecidea melaena* Nyl., Bot. Not. **1853**: 182. 1853. – *Lecidea vernalis* var. *melaena* (Nyl.) Nyl., Mém. Soc. Sci. Nat. Cherbourg **3**: 182. 1855. – *Bacidia melaena* (Nyl.) Zahlbr., Ann. Mycol. **7**: 474. 1909. TYPE: Sweden, on lignum, E. M. Fries, *Lich. Suec. Exs. No. 212B* (UPS – LECTOTYPE, *n.v.*; ISOLECTOTYPES: C, M, *n.v.*, H-NYL *p.m.* 4778! 'fragment in very bed condition').

– *Lecidea miliaria* var. *turfosa* Fr., Nov. Sched. Crit. **8**: 7. 1826, non *Biatora turfosa* A. Massal. TYPE: Sweden (UPS – LECTOTYPE, *n.v.*; ISOLECTOTYPES: C, M, *n.v.*).

– *Biatora stizenbergeri* Hepp, *Flecht. Eur.* 504. 1860. TYPE: Switzerland, Rifferschweil, on dry plant debris amongst roots in peat moor, *Hegetschweiler* (BM – LECTOTYPE, *n.v.*; ISOLECTOTYPES: E!, BM, WRSL, *n.v.*).

– *Lecidea ilyophora* Stirt., Scott. Naturalist **5**: 220. 1879. TYPE: Scotland (BM – LECTOTYPE, *n.v.*).

– *Lecidea melaena* f. *catillarioides* Vain., Meddeland. Soc. Fauna Fl. Fenn. **10**: 12. 1883. – *Micarea melaena* f. *catillarioides* (Vain.) Hedl., Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18** (3): 83, 96. 1892. TYPE: Finland (TUR-VAINIO 21478 – HOLOTYPE, *n.v.*).

– *Lecidea melaena* f. *endocyanea* Vain., Meddeland. Soc. Fauna Fl. Fenn. **10**: 12. 1883. – *Micarea melaena* f. *endocyanea* (Vain.) Hedl., Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18** (3): 83, 96. 1892. TYPE: Russia, Karelia (TUR-VAINIO 21476 – HOLOTYPE, *n.v.*).

– *Bilimbia melaena* f. *aeruginosa* Vain., Acta Soc. Fauna Fl. Fenn. **53**(1): 254. 1922. TYPE: Finland (TUR-VAINIO 21461 – LECTOTYPE, *n.v.*).

– *Bilimbia melaena* f. *epiphaeotera* Vain., Acta Soc. Fauna Fl. Fenn. **53**(1): 255. 1922. TYPE: Finland (TUR-VAINIO 21472 – LECTOTYPE, *n.v.*).

Thallus of effuse or mostly confluent granules, sometimes distinctly warted and thick, pale green to dark olive-green (usually on decaying wood in wet and shaded niches), C+ red. Photobiont micareoid; cells 5–8 µm. Apothecia numerous, black, immarginate, hemispherical to ±globose, simple or often clustered into small groups or tuberculate, 0.1–0.5 mm diam. Hymenium 30–40 µm tall, aeruginose black or blackish purple-green and light purplish or blackish-purple in lower part under hypothecium, K+ aeruginose intensifying in all parts; pigment(s) usually more frequent in upper part, but does not form a delimited epithecium, confined to gel-matrix and more dense around paraphyses, thus appearing as a dark coat. Asci clavate 30–40 × 10–15 µm. Ascospores oblong, ovoid-oblong with rounded ends, (1–)3-septate, 12–20 × 4–5.5 µm. Paraphyses numerous, branched and anastomosing (but sparsely branched in its middle part; better visible after C), 1–1.2 µm wide with apices only slightly increasing to 1.5 µm, hyaline throughout but surrounded by a coat of the dark pigmented gel-matrix. Hypothecium dull purplish-black, K– or K+ intensifying and K+ green black; the walls of hyphae being coated with dense dark pigment. Excipulum absent or indistinct in young apothecia, pigmented like hymenium and consisting of more branched and anastomosing paraphysis-like hyphae. Pycnidia rare, of two types: (1) sessile 100–140 µm diam.; walls green-black or purple-blackish, K+ intensive green; macroconidia curved and hamate, 0–7-septate, 18–33 × 1–1.5 µm (never seen in Polish specimens); (2) immersed or sessile, smaller, 40–60 µm; walls dull green, especially in the part around ostiolae, K+ intensifying; microconidia stright, fusiform-cylindrical, 6–7(–8) × 0.9–1.2 µm.

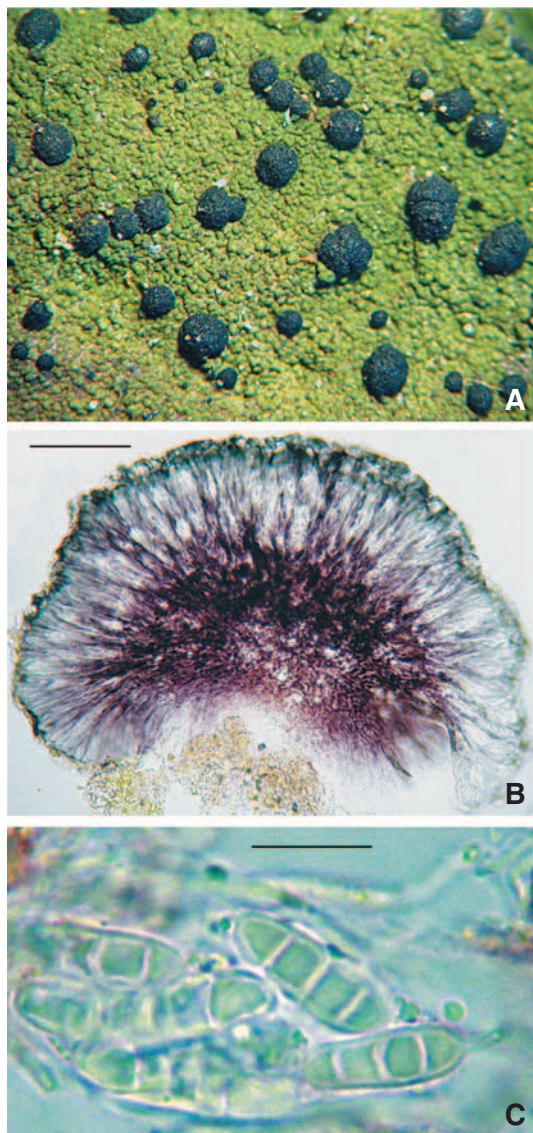
CHEMISTRY. TLC: gyrophoric acid in the thallus.

NOTES. *Micarea melaena* is easily identified by the characteristic pigmentation within its apothecia and the presence of gyrophoric acid giving a C+ red thallus reaction. All other members of *Micarea* do not have the same combination of these features. From a morphological and ecological point of view, *M. melaena* is most similar to lignicolous

or epiphytic forms of *M. lignaria* or specimens of *M. botryoides* with a large number of apothecia, but rare stipitate pycnidia. *Micarea lignaria* differs, however, in apothecia sections with a pale colour (lacking purple pigment within hypothecium and hymenium), its mature ascospores are larger and more transversely septate, and the thallus has no gyrophoric acid. Epiphytic *M. botryoides* growing in wet and shady niches on the bases of coniferous tree trunks can sometimes produce a tinge of red-purple pigment confined to the hypothecium (visible especially in thick sections), but after KOH the structure is rather more intensive brown than purple. Moreover, *M. botryoides* has smaller, only 0–1(–2)-septate ascospores, scanty paraphyses of two types, a rather continuous, dull olive thallus without gyrophoric acid, and smaller conidia.

*Micarea melaena* can sometimes resemble well-developed specimens of *M. denigrata* with a thick warty, pale green thallus also containing gyrophoric acid, particularly as both species often occur together in the same lowland pine forest communities, covering the bases of *Pinus sylvestris* trunks. However, in this case, *M. denigrata* usually has distinctively paler, sometimes even whitish, apothecia and prefers niches which are rather dry and more exposed to light. *Micarea elachista* is ecologically very similar to *M. melaena*, but it develops a thallus composed of pale grey, globose areoles, not reacting with C, its apothecia are dark brown and above all the colouration inside apothecia is completely different.

Often *M. melaena* forms many incompletely developed, only 1-septate ascospores, and if it grows on soil or terricolous bryophytes its identification can be problematic, suggesting that such specimens refer to *M. melaenida* in the lowlands or to *M. assimilata* and *Helocarpon crassipes* in high mountains. Whereas *M. melaenida* contains, in contrast to *M. melaena*, only one apothecial ‘Melaenida-red’, K+ intensive purple pigment, the two next species have a similar combination of the aeruginose and purple pigment within the apothecium, giving the same K+ dull green, and mainly in the hypothecium K+ intensive purple reactions. *Micarea melaena* further differs from those species in the presence of gyrophoric acid in



**Fig. 35.** *Micarea melaena* (Nyl.) Hedl.: A – morphology, B – vertical section of apothecia, C – ascospores (Czarnota 4445, GPN). Scale bars = 10 µm.

the thallus, giving a C+ red reaction, and above all none of them are lignicolous or epiphytic and do not occur within woodlands as *M. melaena* often does. Moreover, the terricolous *M. melaenida* has not, as yet, been found in Poland.

**HABITAT AND DISTRIBUTION IN POLAND.** Until recently, *M. melaena* was regarded as a rare spe-

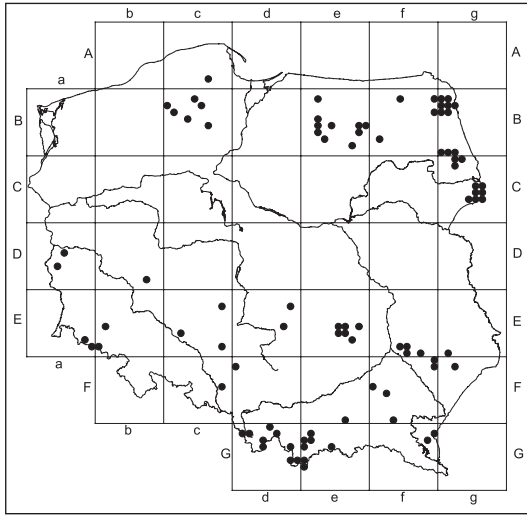


Fig. 36. Distribution map of *Micarea melaena* (Nyl.) Hedl. in Poland.

cies in Poland, occurring mainly in the southern part of the country, in the Carpathians (Nowak & Tobolewski 1975; Kozik 1977; Fałtynowicz 1996). The last revision of herbarium materials and recapitulation of its records (Czarnota 2002), new findings in different lowland regions of NE Poland reported recently by Cieśliński (2003c) and new localities presented here from the rest of the country suggest that *M. melaena* is a reasonably common species in large woodlands. Despite its ecological tolerance to humidity and light exposure, its distribution is not continuous, even within the same forest complex, but restricted in the lowlands mainly to older, humid (*Molinio-Pinetum* J. Mat. 1973) and drained marshy coniferous forests (*Vaccinio uliginosi-Pinetum* Kleist 1929), as well as the borders of forested peat-bogs and fresh pine forest (*Leucobrio-Pinetum* W. Mat. 1973) with a thick, wet coat of terricolous bryophytes. It grows there usually as an epiphyte on the bases of *Pinus sylvestris* trunks or on soft wood of decaying coniferous stumps and fallen decorticated logs in wet places; more rarely it covers cracked bark of older *Betula pendula* growing in the same coniferous communities. *Micarea melaena* has also been recorded on bark of *Fagus sylvatica* in a mixed forest in Pojezierze Bytowski lakeland

and on a burnt stump in Lasy Janowskie Forest. Lichens associated with *M. melaena* on lignum and bark in the Polish lowlands include *Absonditella lignicola*, *Cladonia coniocraea*, *C. digitata*, *Lepraria incana*, *Lepraria* sp., *Hypocenyomyce scalaris*, *Hypogymnia physodes*, *Micarea denigrata*, *M. hedlundii*, *M. micrococca*, *M. prasina* and *Trapeliopsis flexuosa*.

In upland and mountainous parts of Poland where woodlands are more varied, because of different climatic conditions, *M. melaena* is more tolerant and occurs in almost all natural forest communities dominated by coniferous species, as well as within Carpathian beech forests composed of beech, fir and spruce. It prefers, however, shady valleys near streams or local land depressions with high ground humidity, growing there usually on bark of *Abies alba*, *Larix* sp., *Picea abies* and *Pinus sylvestris* or frequently on soft wood of stumps in association with the same lichen species listed above. In the mountains, *M. melaena* belongs to that group of lichen species permanently found in both forest belts, coming up to the upper timber line (1500 m) in the High Tatra Mts where it grows abundantly, on decaying stumps and on the bark of roots and trunks of *Pinus cembra* and *Picea abies*, in association with *Bryoria* sp., *Cladonia digitata*, *Imshaugia aleurites*, *Lepraria* cf. *jackii*, *Lichenomphalia umbellifera*, *Micarea botryoides*, *M. lignaria*, *Mycoblastus sanguinarius*, *Ochrolechia androgyna*, *Parmelia omphalodes*, *Parmeliopsis ambigua*, *Platismatia glauca* and *Pseudevernia furfuracea*.

It has occasionally been collected on bark at the base of deciduous trees, such as *Alnus glutinosa* in 'Dalejów' nature reserve in Wyżyna Kielecka upland and *Quercus* sp. within mixed spruce-oak forest in Pogórze Kaczawskie foothills, and on plant debris in crevices of sandstone boulders in Pogórze Rożnowskie foothills, as well as on decaying peat mosses in Kotlina Nowotarska basin.

Although *M. melaena* does not grow directly on soil in Poland, there are examples of it occurring on this substratum in other part of Europe, especially in northern Scandinavia.

In the first edition of the 'Red list of threatened lichenized fungi in Poland' (Cieśliński *et al.* 1992),



*M. melaena* was classified as a vulnerable species. After recent investigations on its distribution and status, when one considers the large number of new localities, it was moved to the category near threatened (NT) in the second edition of the 'Red list' (Cieśliński *et al.* 2003). Despite this, in different local red lists of lichens, *M. melaena* is still regarded as belonging to the group of threatened species, even in those areas which cover large complexes of natural coniferous woodlands such as in Bory Tucholskie Forest (Lipnicki 2003), Puszcza Pilicka Forest (Czyżewska 2003) and Puszcza Kozienicka Forest (Cieśliński 2003a, b) in the lowlands, as well as in the Polish Sudetes (Kossowska 2003b).

The occurrences of *M. melaena* in specific forest habitats, almost always within natural, large, old growth forests was a reason for its acceptance in Poland as a good indicator of ecological continuity for lowland woodland habitats or more importantly an indicator of ancient forests (Czyżewska & Cieśliński 2003). Although in general this holds true, some records outside woodlands and others from managed and polluted forests (e.g. Lasy Raciborskie Forest and Lasy Lublinieckie Forest in the vicinity of industrial region of Upper Silesia) may suggest that *M. melaena* is a more ecologically tolerant lichen (Coppins 1983).

WORLD DISTRIBUTION. *Micarea melaena* has a bipolar distribution and is common in the boreal zone throughout the Holarctic region, where it also frequently occurs in forested upland areas and mountains. It is reported from most parts of Europe, and is particularly common in Fennoscandia (Coppins 1983). It has also been recorded a few times from the Antarctica region.

EUROPE: Austria (Hafellner & Türk 2001); Azores and Madeira (Hafellner 1995); Belgium and Luxembourg (Diederich & Sérusiaux 2000); Czech Republic (Vězda & Liška 1999); Denmark, vulnerable (Søchting 1998; Søchting & Alstrup 2002); Estonia (Randlane & Saag 1999; Jüriado *et al.* 2000); Finland (Vitikainen *et al.* 1997); Germany – Baden-Württemberg (Wirth 1995), Lower Saxony (Hauck 1996), Nordrhein-West-

falen (Heibel 1999), Schleswig-Holstein (Jacobsen 1992, 1997); Great Britain and Ireland (Coppins 1983, 2002; Seaward 1994); Hungary (Verseggy 1994); Italy (Nimis & Martellos 2003); Latvia, rare (Piterâns 2001); Lithuania (Motiejūnaitė 1999); the Netherlands, rare (Aptroot *et al.* 2004); Norway (Santesson 1993); Romania (Ciurchea 1998); Russia – Leningrad Region (Zavarzin *et al.* 1999), Komi Republic (Hermansson *et al.* 1998); Slovakia (Pišút *et al.* 1996); Slovenia (Suppan *et al.* 2000); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993); Switzerland (Scheidegger *et al.* 2002); Ukraine – Eastern Carpathians (Kondratyuk *et al.* 1998). NORTH AMERICA: Greenland (Thomson 1997); Canada – Alberta, Quebec, Manitoba, Newfoundland, New Brunswick, Ontario, Yukon (Thomson 1997); USA – Alaska, Connecticut, Minnesota, New York State (Thomson 1997; Harris 2004), Pacific Northwest – Columbia River Basin (McCune 1994), Louisiana (Tucker 1981), Michigan (Fryday *et al.* 2001), Vermont (Hinds *et al.* 2002). ASIA: China – Fujian (Wei 1991); Kazakhstan (Andreeva 1983); Mongolia (Biazrov 2005); Russia – Siberia: lower Ob River (Sedelnikova & Taran 2000), Putorana Plateau (Zhurbenko 1996), Russian Arctic: Yamal-Gydan area, Taimyr, Anabara-Olenyok area, Yana-Kolyma area, Continental Chukotka, Beringian Chukotka (Andreev *et al.* 1996). AUSTRALOCEANIA: Australia – Tasmania (Coppins, pers. comm.). ANTARCTICA: King George Island, South Shetlands (Olech 2001).

EXSICCATAE SEEN. Arnold, *Lich. Exs. No. 332b, c* (H-NYL); Fries, *Lich. Suec. Exs. No. 212B* (H-NYL).

SPECIMENS EXAMINED. Grid square Ac-86 – POJEZIERZE WSCHODNIOPOMORSKIE LAKELAND, POJEZIERZE KASZUBSKIE LAKELAND: 'Staniszewskie Błoto' nature reserve, near Staniszewo village, forest sections no. 210/228, 7 July 1983, *leg. W. Fałtynowicz* (UGDA-L 1746); Bc-14 – POJEZIERZE POLUDNIOWOPOMORSKIE LAKELAND, RÓWNINA CHARZYKOWSKA PLAIN: ca 2.5 km NE of Skwierawy village, 10 Aug. 1974, *leg. Z. Tobolewski* (POZ); Bc-20 – POJEZIERZE ZACHODNIOPOMORSKIE LAKELAND, POJEZIERZE BYTOWSKIE LAKELAND: W of Dolsko village near Miastko town, Miastko forest division, forest section no. 61, 23 Sept. 1993, *leg. K. Sulkowski & I. Izydorek* (Hb. Izydorek; GPN 2687); Bc-25 – POJEZIERZE POLUDNIOWOPOMORSKIE LAKE-

- LAND, BORY TUCHOLSKIE FOREST: Wdzydzki Landscape Park, Kościerzyna forest division, Grzybowski Młyn forest district, forest section no. 366b, ca 0.5 km NE of Szludron village, 16 Sept. 2002, *leg. A. Kowalewska* (UGDA); Bc-31 – RÓWNINA CHARZYKOWSKA PLAIN: ‘Bagnisko Niedźwiady’ nature reserve near Lipczynek village, 26 July 1987, *leg. W. Fałtynowicz* (UGDA-L 3497, 3498); Bc-43 – RÓWNINA CHARZYKOWSKA PLAIN: Klosnowo forest division, ‘Struga Siedmiu Jezior’ nature reserve, Kocioł lake, 7 July 1990, *leg. L. Lipnicki 704* (Hb. Lipnicki); Bc-56 – BORY TUCHOLSKIE FOREST: Woziwoda forest division, Dąbki forest district, forest section no. 481, 15 Aug. 2002, *leg. P. Czarnota* (GPN 3063) and Ustronie forest district, forest section no. 23j, 16 Aug. 2002, *leg. P. Czarnota* (GPN 3098); Be-12 – NIZINA STAROPRUSKA LOWLAND, RÓWNINA ORNECKA PLAIN: ca 4 km NWW of Łaniewo village, at the ridge of peat-bog, 1989, *leg. S. Cieśliński* (KTC together with *M. elachista*); Be-42 – POJEZIERZE MAZURSKIE LAKE-LAND, POJEZIERZE OLSZTYŃSKIE LAKE-LAND: ‘Mszew’ nature reserve within area of Olsztyn town, 14 May 2000, *leg. D. Kubiak* (OLTC); Las Miejski Wood in Olsztyn town, 12 May 1998, *leg. D. Kubiak* (OLTC); Be-52 – POJEZIERZE OLSZTYŃSKIE LAKE-LAND: near Ukiel Lake in Olsztyn town, July 2001, *leg. D. Kubiak* (OLTC); Be-58 – POJEZIERZE MRĄGOWSKIE LAKE-LAND: Puszcza Piska Forest, ‘Zakręt’ nature reserve, 1987, *leg. S. Cieśliński* (KTC; GPN 2428); Be-59 – KRAINA WIELKICH JEZIOR MAZURSKICH LAKE-LAND: Puszcza Piska Forest: forest section no. 203, ca 4 km NE of Ukta village, 1987, *leg. S. Cieśliński* (KTC), ca 1.5 km NW of Onufryjewo village, 1988, *leg. S. Cieśliński* (KTC), Strzałowo forest division, forest section no. 97, 19 July 1998, *leg. D. Kubiak* (OLTC), Kołoin forest district, 1.5 km SW of Bobrówka settlement, 9 Nov. 1998, *leg. D. Kubiak* (OLTC); Be-62 – POJEZIERZE OLSZTYŃSKIE LAKE-LAND: ‘Las Warmiński’ nature reserve, 1988, *leg. S. Cieśliński* (KTC); 0.5 km N of Łańskie Lake, 19 July 1988, *leg. S. Cieśliński* (KTC; KRA ex KTC); Nowe Ramuki forest division, forest section no. 713 near Dłużek Lake, 2 May 2001, *leg. D. Kubiak* (OLTC); Be-64 – POJEZIERZE OLSZTYŃSKIE LAKE-LAND: forest section no. 365, along tforest road between Marcinkowo and Butryny villages, 1988, *leg. S. Cieśliński* (KTC); Be-68 – RÓWNINA MAZURSKA PLAIN: ca 2.5 km SSE of Zyzdrojowy Piecek village, 1990, *leg. S. Cieśliński* (KTC); Be-73 – POJEZIERZE OLSZTYŃSKIE LAKE-LAND: Nowe Ramuki forest division, forest section no. 358, May 1997, *leg. D. Kubiak* (OLTC); Be-87 – RÓWNINA MAZURSKA PLAIN: 2.5 km SWW of Lipowiec village, 1990, *leg. S. Cieśliński* (KTC); Bf-14 – POJEZIERZE ELCKIE LAKE-LAND: Puszcza Borecka Forest, Borki forest division, Zielonki forest district, forest section no. 185c [54°05'N/22°11'E] 14 July 1995, *leg. A. Zalewska s.n.* (OLS) and forest section no. 189c [54°05'N/22°11'E] 25 June 1996, *leg. A. Zalewska s.n.* (OLS); Bf-19 – POJEZIERZE LITEWSKIE LAKE-LAND, RÓWNINA AUGUSTOWSKA PLAIN: Wigierski National Park: Wigry forest division, N shore of Sucharek Wielki Lake, forest section no. 221, 14 Sept. 1984, *leg. J. Kiszka* (UGDA-L 3921), forest section no. 229, 14 Sept. 1984, *leg. J. Kiszka* (KRAP), E shore of Sucharek Wielki Lake, forest section no. 231, 14 Sept. 1984, *leg. J. Kiszka* (KRAP; LBL); Bf-39 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, on the border of forest sections no. 112 and 134, by road between Augustów and Sejny towns, 24 May 1985, *leg. S. Cieśliński & Z. Tobolewski* (KTC); Bf-71 – POJEZIERZE MAZURSKIE LAKE-LAND, RÓWNINA MAZURSKA PLAIN: ca 0.5 km of Wielki Las village, 1990, *leg. S. Cieśliński* (KTC; GPN 2431); Bg-10 – POJEZIERZE LITEWSKIE LAKE-LAND, RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, Wigierski National Park, Maćkowa Ruda forest division, forest section no. 62i near Czerwony Krzyż village, Sept. 1984, *leg. K. Taborowicz* (UGDA-L 2698) and near Sernetki settlement, 9 Aug. 1993, *leg. J. Bystrek, A. Matwiejuk & A. Przepiórkowska* (Hb. Kolanko); Bg-11 – POJEZIERZE WSCHODNIOSUWAŁSKIE LAKE-LAND: Puszcza Augustowska Forest, forest section no. 312, ca 3.5 km W of Giby village, 1995, *leg. S. Cieśliński* (KTC); Bg-20 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, forest section no. 269, by road between Suche Doły and Strzelcowizna villages, 20 Sept. 1986, *leg. S. Cieśliński* (KTC; KRAM-L 31821 ex KTC) and forest section no. 317, 21 Sept. 1998, *leg. W. Fałtynowicz* (UGDA); Bg-21 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, forest section no. 916, N of Płaskie Lake, 1995, *leg. S. Cieśliński* (KTC); Bg-22 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, forest section no. 1072, S of Szlamy lake, 1995, *leg. S. Cieśliński* (KTC); Bg-30 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest: ca 1.5 km S of Serwy village, 1995, *leg. S. Cieśliński* (KTC; GPN 2434), by the border of forest sections no. 39/63, ca 4.5 km N of Przewięź village, 1986, *leg. S. Cieśliński* (KTC); Bg-30 – NIZINA PÓLNOCCNOPODŁASKA LOWLAND, KOTLINA BIEBRZAŃSKA BASIN: Puszcza Augustowska Forest, forest section no. 34, ca 3 km NW of ‘Kozi Rynek’ nature reserve, 21 Sept. 1986, *leg. S. Cieśliński* (KTC; KRAM-L 31903 ex KTC); Bg-31 – POJEZIERZE LITEWSKIE LAKE-LAND, RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, ‘Mały Borek’ nature reserve, 18 Sept. 1986, *leg. S. Cieśliński*

(KTC); on the border of forest sections no. 125/126 and 143/144, ca 2 km SW of 'Mały Borek' nature reserve, 18 Sept. 1986, *leg. S. Cieśliński* (KTC); Bg-31 – NIZINA PÓLNOCPODLASKA LOWLAND, KOTLINA BIEBRZAŃSKA BASIN: Puszcza Augustowska Forest, on the border of forest sections no. 198/199, ca 2 km S of Mały Borek forester's lodge, 1986, *leg. S. Cieśliński* (KTC); Bg-90 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, 'Karcznisko' nature reserve, 1991, *leg. S. Cieśliński* (KTC); Bg-91 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, 2 km SE of Czarna Białostocka, 8 Sept. 1987, *leg. W. Fałtynowicz & J. Miądlkowska* (UGDA-L 3573) and 8 Sept. 1987, *leg. W. Fałtynowicz* (UGDA-L 4245); Bg-92 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, ca 3.5 km SSE of Lipina village, 1991, *leg. S. Cieśliński* (KTC); Cg-02 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, 5 km NEE of Supraśl town, forest section no. 137, 8 Sept. 1987, *leg. I. Toborowicz & K. Toborowicz* (KTC); Cg-03 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, 'Stare Biele' nature reserve, 19 Mar. 1999, *leg. K. Kolanko* (Hb. Kolanko); Cg-12 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: ca 1 km E of Izoby forester's lodge, 1991, *leg. S. Cieśliński* (KTC; GPN 2433); Cg-45 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Browsk forest division, forest section no. 16D, loc. 118, 198?, *leg. S. Cieśliński* (BSG) and forest section no. 153, 13 June 1999, *leg. K. Czyżewska* (LOD 11114); Cg-46 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Browsk forest division, forest section no. 27C, 1982, *leg. S. Cieśliński & Z. Tobolewski* (KTC); Cg-55 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest: Białowiecki National Park, forest section no. 256A, loc. 86, 1982, *leg. S. Cieśliński & Z. Tobolewski* (POZ; BSG), forest sections no. 341C and 373, 1982, *leg. S. Cieśliński & Z. Tobolewski* (KTC) and forest section no. 256, 1997, *leg. S. Cieśliński* (KTC) and 14 June 1999, *leg. K. Czyżewska* (LOD 11111); Cg-56 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest: Browsk forest division, forest section no. 196C, loc. 109, 1982 ?, *leg. S. Cieśliński & Z. Tobolewski* (POZ), Białowiecki National Park, forest section no. 318D, 1985, *leg. S. Cieśliński & Z. Tobolewski* (KTC; GPN 2429); Cg-64 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest: Białowieża forest division, forest section no. 520B, 2 July 1969, *leg. J. Zielińska* (WA), Hajnówka forest division, forest section no. 543, 3 July 1969, *leg. J. Zielińska* (WA) and forest section no. 572A, 'Michnówka' nature reserve, 1982, *leg. S. Cieśliński & Z. Tobolewski* (KTC) and also 11 Aug. 2002, *leg. P. Czarnota* (GPN 2971, 2973 together with *M. deni-*

*grata*, 2976, 2983, 2988); Cg-65 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest: Białowieża forest division, forest section no. 474C, loc. 3, 1981, *leg. S. Cieśliński & Z. Tobolewski* (KTC; POZ) and forest section no. 494C, 13 Aug. 2002, *leg. P. Czarnota* (GPN 3043); Cg-66 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowieża forest division, forest section no. 429C, loc. 125, 198?, *leg. S. Cieśliński* (BSG); Da-45 – WZNIESIENIA ZIELONOGÓRSKIE HEIGHTS, WZNIESIENIA GUBIŃSKIE HEIGHTS: by road between Krosno Odrzańskie and Gubin towns [51°59'24"N/14°58'29"E] 8 July 2005, *leg. P. Czarnota* 4618 (GPN); Da-64 – OBNIŻENIE DOLNOŁUŻYCKIE DEPRESSION, KOTLINA ZASIECKA BASIN: Bory Zielonogórskie Forest, ca 1.5 km S of Proszów settlement [51°45'02"N/14°49'25"E] alt. ca 90 m, 8 July 2005, *leg. P. Czarnota* 4504 (GPN); Da-95 – NIZINA ŚLĄSKO-ŁUŻYCKA LOWLAND, BORY DOLNOŚLĄSKIE FOREST: Wymiarki forest district, forest section no. 69, 14 Sept. 2000, *leg. K. Czyżewska* (LOD 11171); Db-87 – NIZINA POŁUDNIOWOWIELKOPOLSKA LOWLAND, WYSOCZYNA LESZCZYŃSKA PLATEAU: Dębno forest district, 'Dębno' nature reserve, ca 4 km NW of Rawicz town, 17 Oct. 1998, *leg. D. Kubiak* (OLTC); Ea-78 – WESTERN SUDETES, KARKONOSZE MTS: Szklarska Poręba town, Wysoka street, 29 June 1998, *leg. M. Ratajczak* (LOD 10799); Szklarska Poręba town, Mickiewicz street, 10 Apr. 1999, *leg. M. Ratajczak* (LOD 10900); by Czeska Szosa road, 10 Apr. 1999, *leg. M. Ratajczak* (LOD 10622); Karkonoski National Park, Wodospad Szklarki waterfall, 2000, *leg. M. Kossowska* (Hb. Kossowska); Pogórze Karkonoskie foothills, ca 0.5 km NE of Michałowice village, below Piechowicka Góra Mt. [50°50.38'N/15°34.95'E] alt. 560 m, 9 July 2003, *leg. P. Czarnota* (GPN 3552, 3558); valley of Szklarka stream, by Droga pod Regłami road to Szklarska Poręba town [50°49.515'N/15°33.820'E] alt. 606 m, 12 July 2004, *leg. M. Staniaszek* (Hb. Staniaszek); Ea-89 – KARKONOSZE MTS: Karkonoski National Park, Wang forest district, 2000, *leg. M. Kossowska* (Hb. Kossowska); Eb-51 – POGÓRZE ZACHODNIOSUDECKIE FOOTHILLS, POGÓRZE KACZAWSKIE FOOTHILLS: near Kamiennik stream, E of Świerżawa town [51°00'37"N/15°59'00"E] alt. ca 290 m, 22 Apr. 2005, *leg. P. Czarnota* 4745 (GPN); Eb-80 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park, Dolina Łomniczki valley, by hiking track [50°45.60'N/15°45.63'E] alt. ca 735 m, 7 July 2003, *leg. P. Czarnota* (GPN 3474); Karpacz – Wilcza Poręba town [50°45.698'N/15°45.808'E] alt. 722 m, 30 July 2004, *leg. M. Staniaszek* (Hb. Staniaszek); Ec-28 – NIZINA POŁUDNIOWOWIELKOPOLSKA LOWLAND, KOTLINA

- GRABOWSKA BASIN: Szustry Wood near Szustry village, 5 July 1976, *leg. J. Kamińska* (LOD 5063), as *Catillaria denigrata*; Ec-62 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA OLEŚNICKA PLAIN: Bory Namysłowskie Forest, ca 1 km N of Dobrzyń village, by road to Wojcice village [50°57'28"N/17°28'09"E] 23 Apr. 2005, *leg. P. Czarnota 4445, 4446* (GPN); Ec-88 – WYŻYNA WOŹNICKO-WIELUŃSKA UPLAND, PRÓG WOŹNICKI SCARP: 7 km S of Olesno town, by road between Dobrodzień and Olesno [50°48'31"N/18°24'30"E] alt. 265 m, 4 July 2005, *leg. P. Czarnota 4510, 4511* (GPN); Ed-28 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, RÓWNINA PIOTRKOWSKA PLAIN: ca 14 km SSE of Piotrków Trybunalski town, Lubień forest division, Lubień Wood, forest section no. 71d, 15 June 1988, *leg. J. Nowak* (KRAM-L 22259); Ed-57 – WYŻYNA PRZEDBORSKA UPLAND, WZGÓRZA RADOMSZCZAŃSKIE HILLS: Kobile Wielkie forest division, 'Kobile Wielkie' nature reserve 23 Apr. 1970, *leg. K. Czyżewska* (LOD 1624); Ee-55 – WYŻYNA KIELECKA UPLAND, PŁASKOWYŻ SUCHEDNIOWSKI PLATEAU: near road between Bliżyn village and 'Świnia Góra' nature reserve, 14 Sept. 1962, *leg. S. Cieśliński* (KTC); Suchedniów forest division, forest section no. 91, ca 5 km SW of Bliżyn village, July 1989, *leg. I. Pańczyk* (KTC; GPN 2427); Ee-56 – PŁASKOWYŻ SUCHEDNIOWSKI PLATEAU: ca 4 km S of Bliżyn village, Suchedniów forest division, 'Dalejów' nature reserve, forest section no. 130, July 1989, *leg. I. Pańczyk* (KTC) and forest section no. 131, July 1989, *leg. I. Pańczyk* (KTC); Ee-58 – PRZEDGÓRZE IŁŻECKIE FORELAND: Starachowice forest division, 'Rosochacz' nature reserve, forest section no. 103d, 11 Mar. 2003, *leg. A. Spadło* (LOD 11483); Ee-65 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, Psary forest district, forest section no. 30, 'Mokry Bór' nature reserve, 1 July 2000, *leg. A. Donica* (KTC); Ee-66 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park: Wzorki forest district, forest section no. 31, 1 July 2000, *leg. A. Donica* (KTC; LOD); Podgórze forest district, forest section no. 15, S slope of Miejsza Góra hill, 5 Sept. 1999, *leg. A. Donica* (KTC), Dolina Wilkowska valley, Podgórze forest district, forest section no. 41, 'Czarny Las' nature reserve, 14 July 2001, *leg. A. Donica* (KTC), Psary forest district, forest section no. 31, 'Mokry Bór' nature reserve, 1 July 2000, *leg. A. Donica* (KTC); Ee-77 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, forest section no. 117, N slope of Łysa Góra Mt. near the field-block, 3 July 2000, *leg. A. Donica* (KTC; GPN 4224); Ef-84 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, ca 1 km N of Gielnia village in peat-bog near ponds, 9 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LBL; LOD 12332); Ef-85 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park: near cross roads to Zaklików and Lipa villages, 8 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LBL), ca 2 km S of Kolonia Łysaków village, 9 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LBL), Łęczne Góry settlement, W of border of 'Łęka' nature reserve, 9 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LBL), 'Łęka' nature reserve, 8 Sept. 1999, *leg. S. Cieśliński*, 8 Sept. 1999 (LBL); Ef-95 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park: within the complex of ponds near Maliniec village, 8 Sept. 1999, *leg. U. Bielczyk, R. Kozik, L. Lipnicki & H. Wójciak* (LBL; KRAM), 'Kacze Błota' nature reserve [50°35'N/22°33'E] 9 Sept. 1999, *leg. I. Izydorek* (LBL; Hb. Izydorek); Ef-97 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park: 'Szkłarnia' nature reserve forest section no. 160, 6 Nov. 1999, *leg. H. Wójciak & M. Różyło* (LBL), Janów Lubelski forest district, forest section no. 271 [50°37'N/22°28'E] 9 Sept. 1999, *leg. U. Bielczyk, R. Kozik, L. Lipnicki & H. Wójciak* (KRAM-L 44972; LBL; GPN 2425), at edge of meadow by Branew River near Porytowe Wzgórze region [50°37'N/22°27'E] 9 Sept. 1999, *leg. U. Bielczyk, R. Kozik, L. Lipnicki & H. Wójciak* (LBL), Porytowe Wzgórze region, ca 2.5 km S of Flisy village [50°37.80'N/22°27.99'E] alt. ca 220 m, 10 Oct. 2003, *leg. P. Czarnota* (GPN 3441, 3442); Eg-91 – ROZTOCZE, MIDDLE ROZTOCZE: Roztoczański National Park, Stogi forest district, forest section no. 179d [50°35'36"N/23°04'36"E] alt. ca 260 m, 28 Apr. 2004, *leg. P. Czarnota 3810* (GPN); Fc-48 – NIZINA ŚLĄSKA LOWLAND, KOTLINA RACIBORSKA BASIN: Lasy Raciborskie Forest, ca 1 km W of Goszyce village, by road between Gliwice and Kędzierzyn Koźle towns [50°16'33"N/18°22'59"E] 18 Apr. 2005, *leg. P. Czarnota 4440* (GPN); Fd-10 – RÓWNINA OPOLSKA PLAIN, ca 2 km NE of Koty village, by road between Tworogi and Lubliniec town [50°33'44"N/18°42'54"E] alt. 220 m, 4 July 2005, *leg. P. Czarnota 4507* (GPN); Fe-96 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE ROŹNOWSKIE FOOTHILLS: 'Diable Skaly' nature reserve near Bukowiec village, alt. 500 m, 23 June 1971, *leg. R. Kozik* (KRAP; GPN 4222); Ff-09 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Puszcza Solska Forest, ca 2 km N of Biłgoraj town, 'Obary' nature reserve [50°35'27"N/22°40'52"E] 28 Oct. 2004, *leg. P. Czarnota 4244* (GPN); Ff-19 – RÓWNINA BIŁGORAJSKA PLAIN: Puszcza Solska Forest, ca 0.5 km E of Smółsko Duże

village, by road between Biłgoraj and Józefów towns [50°28'47"N/22°47'42"E] alt. 210 m, 28 Oct. 2004, *leg. P. Czarnota 4268* (GPN); Ff-40 – DOLINA DOLNEJ WISŁOKI VALLEY: Tuszymia forest division, Przaclaw forest district, forest section no. 115, 'Bagno Przaclawskie' nature reserve [50°11'16"N/21°25'27"E] alt. ca 150 m, 18 Apr. 2005, *leg. P. Czarnota 4549* (GPN); Ff-52 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: ca 2 km S of Przedbórz village by road to Sędziszów Małopolski town [50°09'02"N/21°45'31"E] 18 Apr. 2005, *leg. P. Czarnota 4538* (GPN); Ff-93 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE DYNOWSKIE FOOTHILLS: 'Prządki' nature reserve near Czarnorzeki village, ca 8 km N of Krosno town [49°44'30"N/21°48'40"E] alt. 460–520 m, 5 May 1999, *leg. L. Śliwa & B. Krzewicka*, loc. 2 (KRA), as *M. denigrata*; Fg-12 – ROZTOCZE, MIDDLE ROZTOCZE: Puszcza Solska Forest, Józefów forest division, Kalina forest district, 'Czartowe Pole' nature reserve near Hamernia village [50°26'25"N/23°06'30"E] alt. ca 250 m, 28 Oct. 2004, *leg. P. Czarnota 4234* (GPN); Gd-05 – WESTERN BESKIDY MTS, BESKID MAŁY MTS: Madohora ridge, Pod Borem thorp near Ślemień village, alt. 740 m, 1967, *leg. J. Nowak* (KRAM-L-5084); Gd-11 – BESKID ŚLĄSKI MTS: N slope of Kiczora Mt., alt. 920 m, 24 Aug. 1966, *leg. J. Kiszka* (KRAP), as *Bacidia* sp.; Stożek Wielki Mt., alt. 820 m, 10 Oct. 1965, *leg. J. Kiszka* (KRAP; GPN 4220); Gd-12 – BESKID ŚLĄSKI MTS: below the top of Przysłop Mt., alt. 1020 m, 1 Aug. 1962, *leg. J. Kiszka* (KRAP; GPN 4221); Gd-16 – BABIA GÓRA RANGE: N slope of Babia Góra, in the vicinity of Markowe Szczawiny shelterhouse, 11 Oct. 1964, *leg. Z. Tobolewski* (POZ); Babia Góra Mt., alt. 1350 m, 26 June 1974, *leg. U. Bielczyk* (KRAM-L 44004); Babiogórski National Park, forest section no. 24a, above Markowe Szczawiny shelterhouse [49°35'07"N/19°30'44"E] alt. ca 1200 m, 9 June 2004, *leg. P. Czarnota 4082* (GPN); Gd-24 – BESKID ŻYWIECKI MTS: Pilsko range, valley of Szyndzielny stream, SW slope of Lipowska Mt., 18 July 1966, *leg. J. Nowak* (KRAM-L 17725); Gd-34 – BESKID ŻYWIECKI MTS: Wielka Racza range, Bednarów Beskid Mts, ca 8 km S of Ujsoły village, 4 Sept. 1964, *leg. J. Nowak* (KRAM-L 14728); Gd-38 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKO-NOWOTARSKA BASIN: Pustać Rękowieńska peat-bog near Baligówka settlement, alt. 650 m, 5 Aug. 1986, *leg. J. Kiszka* (KRAP 10614; GPN 4219); Gd-58 – TATRA MTS, WEST TATRA MTS: Dolina Chochołowska Wyżnia valley, N slope of Czerwony Wierch Mt., alt. ca 1350 m, 6 Aug. 1961, *leg. Z. Tobolewski* (POZ); Dolina Jarząbca valley below Jarząbca Wyżnia alpine meadow, alt. 1290 m, 16 Aug. 1960, *leg. Z. Tobolewski*

(POZ); Dolina Starorobociańska valley, below Hala Starorobociańska glade, alt., ca 1290 m, 15 Aug. 1960, *leg. Z. Tobolewski* (POZ); Gd-59 – WEST TATRA MTS: Dolina Miętusia valley, Wantule region, alt. ca 1190 m, 4 Oct. 1964, *leg. Z. Tobolewski* (POZ); Ge-11 – WESTERN BESKIDY MTS, GORCE MTS: Gorce National Park: valley of Konina stream near Hucisko clearing, alt. 760 m, 24 Oct. 1992, *leg. P. Czarnota* (GPN 236), valley of Rosocha stream, alt. 780 m, 5 Dec. 1994, *leg. P. Czarnota* (GPN 671), N slope of Mostownica Mt., valley of Roztoka stream, alt. 740 m, 17 Nov. 1992, *leg. P. Czarnota* (GPN 224), valley of Turbacz stream near Stara Huta clearing, alt. 760 m, 26 Oct. 1995, *leg. P. Czarnota* (GPN 563), valley of Konina stream below Podmostownica glade, alt. 720 m, 2 Dec. 1992, *leg. P. Czarnota* (GPN 198); Ge-20 – GORCE MTS: Gorce National Park, valley of Olszowy stream below Szałasisko glade, alt. 700 m, 7 May 1993, *leg. P. Czarnota* (GPN 301); Ge-21 – GORCE MTS: Gorce National Park: valley of Forędówki stream below Jaworzyna Kamienicka Mt., alt. 1150 m, 2 Apr. 1959, *leg. K. Glanc* (KRAM-L 29131; GPN 2424), NW slope of Gorc Kamienicki Mt., alt. 860 m, 8 Sept. 1959, *leg. K. Glanc* (KRAM-L 29132), W slope of Gorc Kamienicki Mt. below Ustępne glade, alt. 880 m, 20 Febr. 1995, *leg. P. Czarnota* (GPN 238), E slope of Mostownica Mt. above Borek Pass, alt. 1040 m, 20 Oct. 1997, *leg. P. Czarnota* (GPN 1729), Dolina Kamienicy valley, Czerwony Groń region, alt. 1050 m, 10 May 1994, *leg. P. Czarnota* (GPN 911); Ge-30 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKO-NOWOTARSKA BASIN: 'Bór na Czerwonem' nature reserve [49°26'–49°28'N/20°02'–20°04'E] alt. ca 630 m, 15 Nov. 2000, *leg. U. Bielczyk* (KRAM-L 46499) and [49°27'73"N/20°02'36"E] 4 June 2003, *leg. P. Czarnota 4184* (GPN); Ge-34 – WESTERN BESKIDY MTS, BESKID SADECKI MTS: Radziejowa range, Piwniczna forest division, Roztoka Wielka forest district, forest section no. 182 above 'Baniska' nature reserve [49°26'N/20°36'E] alt. 1100 m, 4 Nov. 2004, *leg. P. Czarnota 4335* (GPN); Ge-50 – TATRA MTS, HIGH TATRA MTS: Dolina Sucheje Wody valley by Sucha Woda stream, alt. 1170 m, 20 Sept. 1966, *leg. Z. Tobolewski* (POZ); Dolina Filipka valley below Filipeczańska glade, alt. 1080 m, 18 Sept. 1966, *leg. Z. Tobolewski* (POZ); Dolina Sucheje Wody valley between Psia Trawka region and Hala Gąsienicowa alpine meadow, alt. 1400 m, 18 June 1998, *leg. U. Bielczyk* (KRAM-L 44417); Dolina Waksmundzka valley, by Waksmundzki Potok stream [49°15.16'N/20°04.81'E] alt. 1220 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3574); Ge-60 – HIGH TATRA MTS: NW slope of Żabia Czuba Mt. below Siedem Granatów ridge near the border of

PL/SK, alt. 1500 m, 9 July 2002, *leg. P. Czarnota* (GPN 2906, 2912); Gf-19 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE PRZEMYSKIE FOOTHILLS: vicinity of Kalwaria Paławska village, 28 Sept. 1983, *leg. J. Kiszka* (BDPA); Gf-28 – EASTERN BESKIDY MTS, GÓRY SANOCKO-TURCZAŃSKIE MTS: Góry Słonne Mts, upper part of stream below Berdo Mt., 1988 ?, *leg. J. Kiszka & J. Piórecki* (BDPA).

ADDITIONAL SPECIMENS EXAMINED. LITHUANIA, PRIENAI DISTRICT: Nemunas loops Regional Park, Drubengis botanical reserve, forest section no. 68, valley of Drubengis stream, on bark of *Pinus sylvestris* in spruce-pine forest, 29 Sept. 2002, *leg. P. Czarnota* (GPN 3170, 3172); Gojaus Forest, Stakliškės forestry lot, forest section no. 23, 27 Sept. 2002, *leg. P. Czarnota* (GPN 3151). NORWAY, RÖRÅS: Skårhammerdal, S. Trøndelag, on sandy earth, 27 July 1939, *leg. A. H. Magnusson 3687* (POZ), *ver. B. J. Coppins*.

***Micarea micrococca*** (Körb.) Gams *ex* Coppins  
(Figs 2G–I & 37)

*in* Coppins, Checklist of Lichens of Great Britain and Ireland: 86. 2002.

*Biatora micrococca* Körb., *Parerga Lich.*: 155. 1860. – *Catillaria micrococca* (Körb.) Th. Fr., *Lich. Scand.* 2: 571. 1874. – *Lecidea micrococca* (Körb.) Crombie, *J. Bot.* 14: 361. 1875. – *Biatorina micrococca* (Körb.) Arnold, *Flora* 67: 565. 1884. – *Micarea prasina* f. *micrococca* (Körb.) Hedl. *Bih. Kongl. Svenska Vetensk.-Akad. Handl. III*, 18(3): 77, 87. 1892. – *Micarea micrococca* (Körb.) Gams, *Kleine Kryptfl.* 3: 67. 1967., *comb. inval.* (Art. 33.2). TYPE: Germany, Baden-Württemberg, 'Württemberg', on *Pinus* bark, *K. A. Kemmler* (L – NEOTYPE, *n.v.*; WRS� – SYNTYPE!), possibly part of the original gathering. See notes (ii) in Coppins (1983: 174).

– ? *Lecidea prasinella* Müll. Arg., *Flora* 55: 484. 1872. TYPE: Switzerland, *n.v.*

– *Lecidea prasiniza* var. *prasinoleuca* Nyl., *Flora* 64: 7. 1881. TYPE: Germany, Baden-Württemberg, Heidelberg, Königstuhle, on *Picea abies*, 1880, Zwackh, *Lich. Exs. No. 593A* (H-NYL 21601 – LECTOTYPE!). NOTES. (i) Zwackh issued a few exsiccatae from this locality, among them no. 591 under the name *Lecidea prasiniza* var. *prasinoleuca* Nyl. containing methoxymicareic acid and having anatomical and morphological characters agreeing with Körber's *Biatora micrococca*. From the same locality and the same time [Heidelberg, an Fichten auf dem Koenigstuhle, August, 1880] specimens of *Lecidea prasiniza* Nyl. were also collected by

Zwackh and distributed by Lojka as *Lichenogr. Univ. No. 29*, and also by Zwackh in *Lich. Exs. No. 592C*; both contain methoxymicareic acid as does another Zwackh's specimen of *Lecidea prasiniza* Nyl. (= '*Biatora byssacea*') (H-NYL 21618). The usage of several different names referable to the same collections made by Zwackh suggests that the names were accepted as synonyms of *Lecidea prasiniza* at that time, and that it was recognized as a distinct species from *Biatora micrococca*. Other Zwackh's specimens from Heidelberg, 1880 (H-NYL 21694), identified as '*Lecidea micrococca* Körb. et immixta *L. prasiniza* Nyl.' would have confirmed this hypothesis, but unfortunately, both taxa analyzed by TLC contain methoxymicareic acid, and should be referred to different forms of *M. micrococca*. The specimen selected by Coppins (1983) as the lectotype of *Lecidea prasiniza*, despite its similarity to the darker forms of *M. micrococca*, named formerly often as '*byssacea*', contains micareic acid and should be treated as a synonym of *M. prasina* s.str. (see under *M. prasina*).

– ? *Catillaria micrococca* var. *discrepans* Erichsen, *Ann. Mycol.* 36: 139. 1938. TYPE: Denmark (HBG – HOLOTYPE, *n.v.*).

– ? *Catillaria prasina* var. *occulta* Erichsen, *Ann. Mycol.* 36: 140. 1938. TYPE: Germany (HBG – HOLOTYPE, *n.v.*).

– ? *Lecidea abdita* Erichsen, *Mitt. Inst. Allg. Bot. Hamburg* 10: 407. 1939. TYPE: Germany (HBG – HOLOTYPE, *n.v.*; see also Printzen 1995: 155).

Thallus effuse, usually granular, composed of bright green to olive-green separated or more cemented goniocysts giving the thallus a slightly isidiose appearance; very often mixed with non-lichenized algae and then even warted to almost crustaceous, composed of small and cracked areoles, but in cross section goniocysts distinctly visible. Sometimes in the darker thallus the goniocysts are surrounded by olivaceous, K± violet pigment. Photobiont micareoid; algal cells 4–7 µm. Apothecia usually numerous, variously shaped and coloured, plane, convex to hemispherical, at first simple, 0.1–0.2(–0.4) mm wide to finally adnate into small clusters or tuberculate and then sometimes up to 0.3–0.5 mm wide, pale, whitish-cream, cream, whitish lead, greyish, olive-grey to piebald, immarginate or sometimes with paler outer part of fruit-bodies in darker pigmented

forms. Hymenium 30–50(–55)  $\mu\text{m}$  tall, hyaline, straw-coloured in vertical streaks or in those darker forms dilute olivaceous, K $\pm$  violet in upper part; pigment confined to gel matrix. Asci clavate, (20–)25–30(–45)  $\times$  8–11(–13)  $\mu\text{m}$ . Ascospores ovoid, oblong-ovoid to ellipsoid, 0–1(–3 sporadically)-septate, 9.6–12(–16)  $\times$  (2–)3–4(4.5)  $\mu\text{m}$ . Paraphyses numerous, branched and anastomosed, hyaline throughout or sometimes surrounded by slightly straw-coloured gel-matrix that can resemble pale pigmented vertical streaks, 0.8–1.2  $\mu\text{m}$  wide, slightly widening in apices to 1.5–1.8  $\mu\text{m}$ . Hypothecium hyaline, 40–120  $\mu\text{m}$  tall. Excipulum indistinct, sometimes (especially when apothecia immature) evident as a reflexed hyaline zone composed of more branched and anastomosing paraphysis-like hyphae. Pycnidia usually numerous, but often inconspicuous, immersed between goniocysts and often scarcely become visible on a slide to  $\pm$ sessile, 50–130  $\mu\text{m}$  wide, whitish, cream to olive-grey, often with gaping ostioles or bearing white blobs of conidial mass; pycnidial walls hyaline to olivaceous (K $\pm$  violet) around ostioles; mesoconidia (3.8–)4.5–5.5  $\times$  1.2–1.5  $\mu\text{m}$ , cylindrical, microconidia 5–7.5(–8)  $\times$  0.8–1  $\mu\text{m}$  narrowly cylindrical or fusiform.

CHEMISTRY. TLC: methoxymicareic acid; 128 specimens were analyzed.

NOTES. The morphological similarity between *M. micrococca* and *M. prasina* was for a long time one of the reasons why the species were misunderstood, and in consequence synonymized. *Micarea micrococca* was originally described on the basis of a form having pale, white-cream, small apothecia and olive-green, granular thallus, composed of goniocysts, which is usually characteristic of those specimens growing on the bark of coniferous trees (e.g. pine or spruce) in lowland coniferous forest communities. All collections with piebald, whitish lead, pale olive-grey or darker apothecia were classified to other taxa and finally to *M. prasina* s.l. (see synonyms of *M. prasina* in Coppins 1983). They were often delimited as different morphological forms of *M. prasina* (e.g. forma *bysseea* Th. Fr., as in the case of specimens issued by Malme, *Lich. Suec. Exs. No. 24*, from

Sweden). Another form with pale,  $\pm$ plane, adnate apothecia, known as *Catillaria prasina*  $\alpha$  *laeta* Th. Fr. (1874) and later as *M. prasina* Fr. f. *laeta* Th. Fr. (see Hedlund 1892: 77, 87 and Coppins 1983: 174) has also been distinguished (and issued for example by Malme, *Lich. Suec. Exs. No. 23*, from Sweden); hence *M. micrococca* lost its morphological distinctiveness, and was perhaps the reason why Hedlund decided to reduce its rank to *M. prasina* f. *micrococca* (Körb.) Hedl. Later exsiccatae similar to the *laeta* form were among those distributed as *M. prasina* (e.g. Rabenhorst, *Lich. Eur. No. 676*; TLC methoxymicareic acid). Although Gams (1967) reinstated it to species level (unfortunately invalidly; see Coppins 1983: 173), distinguishing *M. micrococca* from *M. prasina* has been achieved only after determination of their secondary metabolites (Coppins 1983; Elix *et al.* 1984). It is possible by detailed morphological examination to identify typical, pale forms of *M. micrococca* (as that in the type collection), but specimens from hard wood of tree trunks or when they are overgrown by non-lichenized algae require TLC.

The large morphological variation in *M. micrococca* could be only partially explained by the influence of different ecological conditions or different chemical properties of the substratum. There are some cases where in the same collection, and therefore under the same ecological conditions (e.g. insolation), sharply separated, pale (typical) and dark forms of the species (both containing methoxymicareic acid, e.g. Zwackh H-NYL 21694) occur together [as in Cieśliński 1982 (KTC) from 'Surowe' nature reserve]. Perhaps, two separate taxa exist, but their delimitation and taxonomical rank may be possible only after molecular analyses. First attempts to know the position of *M. micrococca* in the phylogenetic tree of *Micarea* and its relationship to other members of the genus have recently been made (Andersen 2004; Andersen & Ekman 2005). They show that the relationship between *M. micrococca* and *M. prasina* is less than was previously supposed based on their morphology and anatomy. Indeed, analyses of mtSSU sequences indicate that there is probably a stronger relationship between *M. mi-*

*crococca* and *M. xanthonica* Coppins & Tønsberg, a strongly oceanic species (not found in Poland) which produces xanthonones [xanthonones known also in *M. lignaria* var. *endolueca* (Leighton) Coppins and *M. isabellina* Coppins & Kantvilas]. *Micarea prasina*, however, forms a sister pair with *M. hedlundii* (Andersen 2004).

**HABITAT AND DISTRIBUTION IN POLAND.** The first record of *M. micrococca* from Poland was reported by Eitner (1896: 14) from Silesia (the vicinity of Zielona Góra town 'auf der Schwedenschanze bei Grünberg') as *Biatorina micrococca* Körb. Unfortunately, this collection has disappeared from WRSB, but considering the fact that the original Kemmler material (selected by Körber as the type of *Biatora micrococca*) was stored in the same herbarium, would support Eitner's correct identification of the species. It was later reported a few times in Polish lichenological literature under the name *Catillaria micrococca* (Körb.) Th. Fr. (Glanc 1967; Nowak & Tobolewski 1975; Czyżewska 1978; Toborowicz 1983; Kiszka 1987; Cieśliński & Tobolewski 1988), but only the two last reports have been confirmed by the revision of material housed in KTC, and collections by the other aforementioned lichenologists assigned to the correct synonym of *M. micrococca*, as well as under *M. prasina* (= *Catillaria p.*), have not been located in any herbaria. Although in their key to Polish lichens Nowak and Tobolewski (1975: 612) gave a short, morphological and anatomical description of the species, it seemed to be still misunderstood; unfortunately they did not provide distributional details, other than that it was dispersed in the Polish lowlands and grew on the bark of coniferous and deciduous trees. Except those reports mentioned above from Białowieża Primeval Forest, Wyżyna Kielecka upland, Niecka Nidziańska basin and Pilica River basin, no further reports of *M. micrococca* have been made. However, during the revision of *Micarea* material housed in Polish herbaria, several other specimens of *M. micrococca* (as *Catillaria micrococca*) have been discovered (e.g. from Wzgórza Opoczyńskie hills, *leg. Kurczyńska & Toborowicz*, KTC and from Góry Słonne Mts, *leg. Kiszka & Piórecki*,

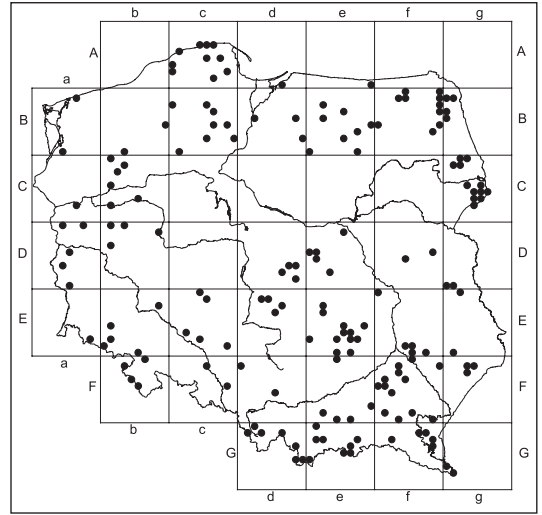


Fig. 37. Distribution map of *Micarea micrococca* (Körb.) Gams ex Coppins in Poland.

BDPA) and some of them had been included under *M. prasina* and published as that species (see for example Kiszka & Piórecki 1992: 58). Generally, collections referring to *M. micrococca* were almost always treated by Polish lichenologists as *M. prasina* (similarly by most European scientists up to 2002). In the present study, based on the presence of methoxymicareic acid, the species has been finally separated and reported as *M. micrococca* for the first time in Poland.

*Micarea micrococca* is a one of the commonest members of the genus, usually growing epiphytically on bark at the base of different trees and as an epixylic lichen on hard wood of fallen logs, stumps, and dry twigs and branches in different forest communities, and also more rarely outside woodlands. It is especially frequent in lowland coniferous monocultures, and in all pine and spruce communities belonging to the class *Vaccinio-Piceetea* Br.-Bl. 1939, where it occupies many trunks of *Pinus sylvestris* and *Picea abies* close to a ground or in the vicinity of a wet coat of terricolous bryophytes; it also occurs on other admixtures of tree species, for example on *Betula pendula* and *Quercus* sp., in which the pale form of *M. micrococca* is usually found. Forms with darker apothecia and more



intensive olivaceous thallus are found mainly in broadleaf woodlands, where it grows on the bark of *Acer platanoides*, *Alnus glutinosa*, *Carpinus betulus*, *Fraxinus excelsior*, *Quercus* sp., *Sorbus* sp., *Tilia* sp. and *Ulmus* sp. (e.g. in oak-linden-hornbeam forest *Tilio-Carpinetum* Tracz. 1962, ash-alder forest *Circeo-Alnetum* Oberd. 1953 and boggy alder forest *Carici elongatae-Alnetum* Koch 1930). *Micarea micrococca* has also been collected from shoots of different dwarf shrubs e.g. *Vaccinium myrtillus* and *V. uliginosum* growing in boggy pine and spruce forests, from undergrowth *Juniperus communis* within pine plantations and also covering inland sandy dunes, and occasionally from decaying terricolous bryophytes and humus in the same pine forests. Some collections have been made from several kinds of *Populus* growing in the vicinity of human settlements or directly within villages or by roads.

In mountains, *M. micrococca* is generally less frequent, but recorded in almost all main ranges along southern Poland. It seems to be especially frequent in spruce plantations covering the Sudetes and Western Beskidy Mts (e.g. Beskid Śląski Mts) in both forested mountain belts, but it also grows on the bark of deciduous and other coniferous trees. It is similarly found on a variety of phorophytes in Góry Świętokrzyskie Mts in central Poland. In Babia Góra Massif it occurs at an altitude 1320 m, so far the highest locality of *M. micrococca* in Poland. A saxicolous collection has been made from the Beskid Śląski Mts.

Despite the species preference for managed stands, there are many records from natural, ancient forest associations, such as those from upper mountain spruce forest *Plagiothecio-Piceetum* in Babia Góra Mt. and High Tatras or different pine forests in Białowieża Primeval Forest and Puszcza Solska Forest, indicative of its ecological plasticity. Associated lichen species in those collections from the bark of coniferous trees include: *Cladonia coniocraea*, *Coenogonium pineti*, *Hypogymnia physodes*, *Lecanora conizaeoides*, *Micarea botryoides*, *M. denigrata*, *Placynthiella dasaea* and *Scoliciosporum chlorococcum*, and on other phorophytes and habitats: *Arthonia spadicea*, *Bacidia hemipolia*, *Buellia griseovirens*, *Chaenotheca xy-*

*loxa*, *Chaenothecopsis pusilla*, *Fellhanera gyrophorica*, *F. subtilis*, *Graphis scripta*, *Lecanora carpinea*, *L. chlorotera*, *Lecidella elaeochroma*, *Lepraria elobata*, *L. rigidula*, *Loxospora elatina*, *Melanelixia fuliginosa*, *Micarea hedlundii*, *M. melaena*, *M. nitschkeana*, *M. peliocarpa*, *M. prasina* s.str., *Mycoblastus fucatus*, *Ochrolechia androgyna*, *Opegrapha* sp., *Parmelia saxatilis*, *P. sulcata*, *Pertusaria* cf. *albescens*, *Phlyctis argena*, *Scoliciosporum sarothamni*, *Rinodina efflorescens*, *Ropalospora viridis* and *Stenocybe pullatula* (on bark of *Alnus* sp.).

WORLD DISTRIBUTION. Although *Micarea micrococca* is probably a very common species in Europe and other continents, at least in the Holarctic, recent reports under this name are very few since the species was formerly considered as a synonym of *M. prasina* (see Coppins 1983). See also distribution of *M. prasina* s.l. under *M. prasina*.

EUROPE: Czech Republic (Moravia – Věžda, *Lich. Sel. Exs. No. 90, 1467*; see also additional specimens examined); Estonia (Aptroot *et al.* 2005); Finland (e.g. Räsänen, *Lich. Fenn. No. 652, 653*); Germany (e.g. Arnold, *Lich. Exs. No. 243, 1472*; Rabenhorst, *Lich. Eur. No. 733*; Zwackh, *Lich. Exs. No. 416, 592B*); Great Britain and Ireland (Coppins 1983, as *M. prasina* containing substance A; Coppins 2002); Lithuania (see under additional specimens); the Netherlands, very common (Aptroot *et al.* 2004); Norway (Tønsberg, pers. comm.), very common; Sweden (e.g. Magnusson, *Lich. Sel. Scand. No. 134*; Malme, *Lich. Suec. Exs. No. 23, 24*); Switzerland (Arnold, *Lich. Exs. No. 1122*). ASIA: Taiwan (Aptroot & Sparrius 2003).

EXSICCATAE SEEN. Arnold, *Lich. Exs. No. 279* (H-NYL, H, WRSL), *No. 1122* (H-NYL, WRSL), *No. 1427* (WRSL), *No. 1472* (WRSL); Arnold, *Lich. Mon. No. 243* (H); Larbalestier, *Exs. Brit. No. 139* (H); Lojka, *Lichenogr. Univ. No. 29* (H), *No. 30* (H); Magnusson, *Lich. Sel. Scand. No. 134* (H) [not tested by TLC]; Malme, *Lich. Suec. Exs. No. 23* (H), *No. 24* (H); Rabenhorst, *Lich. Eur. No. 676* (WRSL), *No. 733* (H, WRSL); Räsänen, *Lich. Fenn. No. 651* (H), *No. 652* (H), *No. 653* (H); Věžda, *Lich. Sel. Exs. No. 90* (H), *No. 1467* (H); Zwackh, *Lich. Exs. No. 168* (H-NYL), *No.*

416 (H-NYL), No. 591B (H-NYL), No. 592B (H-NYL), No. 592C (H-NYL).

SPECIMENS EXAMINED. Grid square. Ac-34 – POBRZEŻE KOSZALIŃSKIE COASTLAND, WYBRZEŻE SŁOWIŃSKIE COAST: ‘Mierzeja Sarbska’ nature reserve near Leba town, forest section no. 10, 10 Oct. 1987, *leg. J. Miądlkowska* (UGDA-L 4312), as *M. prasina*; Ac-35 – WYBRZEŻE SŁOWIŃSKIE COAST: Choczewo forest division, Szklana Huta forest district, forest section no. 165d, ca 4 km SW of Białogóra village, 19 Sept. 2000, *leg. A. Kowalewska* (UGDA); Ac-36 – WYBRZEŻE SŁOWIŃSKIE COAST: Choczewo forest division, Białogóra forest district, forest section no. 91d, ca 3 km W of Białogóra village, 28 Aug. 2000, *leg. A. Kowalewska* (UGDA), 31 Aug. 2000, *leg. A. Kowalewska* (UGDA) and forest section no. 87b, 1 km SW of Białogóra village, 21 Sept. 2000, *leg. A. Kowalewska* (UGDA); Ac-41 – WYBRZEŻE SŁOWIŃSKIE COAST: Słowiński National Park, forest sections no. 52, 56 and 57, 17 Nov. 1989, *leg. M. Truchan* (Hb. Izydorek); Ac-55 – WYSOCZYNA ŻARNOWIECKA PLATEAU: between Kisewo and Brzeźno Lęborskie villages near Kisewska Struga river, 25 Oct. 2001, *leg. E. Garska* (Hb. Izydorek), as *M. prasina*; Ac-57 – WYSOCZYNA ŻARNOWIECKA PLATEAU: near Wejherowo town, Piaśnica forest district, forest section no. 133, 7 Sept. 1997, *leg. M. Kukwa* (UGDA-L 7816), as *M. prasina*; Ac-60 – RÓWNIINA SŁAWIENSKA PLAIN: Słupsk town, ‘Lasek Północny’ Wood, forest section no. 2p, 27 May 2004, *leg. I. Izydorek* (hb. Izydorek); Ac-70 – RÓWNIINA SŁAWIENSKA PLAIN: near Słupsk town, Leśny Dwór forest division, forest section no. 598a, 4 Nov. 2002, *leg. A. Krupska & I. Izydorek* (hb. Izydorek), as *M. prasina* and forest section no. 582d, 16 Oct. 2002, *leg. A. Krupska & I. Izydorek* (hb. Izydorek), as *M. prasina*; Słupsk town, ‘Lasek Południowy’ Wood, 16 Oct. 2002, *leg. A. Krupska & I. Izydorek* (hb. Izydorek), as *M. prasina*; Ac-78 – POJEZIERZE WSCHODNIOPOMORSKIE LAKELAND, POJEZIERZE KASZUBSKIE LAKELAND: vicinity of Kamień village near S shore of Kamień Lake, 4 Aug. 2005, *leg. P. Czarnota 4530* (GPN); Ac-86 – POJEZIERZE KASZUBSKIE LAKELAND: ‘Kurze Grzędy’ nature reserve, forest section no. 100, 5 May 2005, *leg. M. Kukwa 3998, 3999* (UGDA), forest section no. 119, 5 May 2005, *leg. M. Kukwa 4047* (UGDA) and forest section no. 133b, 5 May 2005, *leg. M. Kukwa 4021* (UGDA); Ad-96 – POBRZEŻE GDAŃSKIE COASTLAND, WYSOCZYNA ELBLĄSKA PLATEAU: valley of Grabianka River, Elbląg forest division, Górki forest district, forest section no. 206 [54°16'10"N/19°31'50"E] alt. 130 m and alt. 140 m, 23 Aug. 2003, *leg. R. Szymczyk* (OLS)

and forest section no. 193 [54°16'30"N/19°31'20"E] alt. 120 m, 23 Aug. 2003, *leg. R. Szymczyk* (OLS); Ae-99 – POJEZIERZE MAZURSKIE LAKELAND, KRAINA WIELKICH JEZIOR MAZURSKICH LAKELAND: Puszcza Romincka Forest, forest section no. 20, ca 2 km E of Wilczyny village, 4 May 1989, *leg. S. Cieśliński* (KTC); ca 2.5 km NE of Wilczyny village, 4 May 1989, *leg. J. Nowak* (KRAM-L 26299), as *M. prasina*; Ba-16 – POBRZEŻE SZCZECIŃSKIE COASTLAND, WYBRZEŻE TRZEBIATOWSKIE COAST: between Łukęcin and Pobierowo villages, 13 June 1986, *leg. W. Fałtynowicz* (UGDA-L 3702); between Łukęcin and Dziwnówek villages, 14 June 1986, *leg. W. Fałtynowicz* (UGDA-L 3420); Ba-94 – WZGÓRZA BUKOWE HILLS: Puszcza Bukowa Forest, Szczeciński Landscape Park, 15 May 1999, *leg. A. Wieczorek* (Hb. Wieczorek); Bb-59 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, DOLINA GWDY VALLEY: ‘Cisy w Czarnem’ nature reserve [53°44'15"N/16°58'45"E] 13 Nov. 2004, *leg. M. Kukwa 3700, 3701, 3720, 3721* (UGDA); Bb-93 – POJEZIERZE WAŁECKIE LAKELAND: by road between Mirosławiec and Tuczno towns [53°19'50"N/16°07'04"E] alt. 170 m, 9 Apr. 2006, *leg. P. Czarnota 4825* (GPN); Bc-20 – POJEZIERZE ZACHODNIOPOMORSKIE LAKELAND, POJEZIERZE BYTOWSKIE LAKELAND: W of Dolsko village near Miastko town, Miastko forest division, forest section no. 37, 2 Aug. 1993, *leg. K. Sułkowski* (Hb. Izydorek); Bc-25 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, BORY TUCHOLSKIE FOREST: Wdzydzki Landscape Park: ca 1 km S of Schodno village, 18 June 2002, *leg. A. Kowalewska* (UGDA) and 17 June 2002, *leg. A. Kowalewska* (UGDA); ca 0.5 km S of Słupinko village, Lipusz forest division, Joniny forest district, forest section no. 198a, 14 Sept. 2002, *leg. A. Kowalewska* (UGDA); ca 0.5 km N of Szludron village, 19 June 2002, *leg. A. Kowalewska* (UGDA); SE of Loryniec village, Kościerzyna forest division, Grzybowski Młyn forest district, forest section no. 356m, 18 July 2002, *leg. A. Kowalewska* (UGDA); Bc-36 – BORY TUCHOLSKIE FOREST: ‘Kamienne Kęgi’ nature reserve, ca 2 km W of Odry village, 7 Jan. 2001, *leg. K. Czyżewska* (LOD 11967); Bc-56 – BORY TUCHOLSKIE FOREST: Woziwoda forest division, Ustronie forest district, forest section no. 23j, 16 Aug. 2002, *leg. P. Czarnota* (GPN 3101) and Dąbki forest district, forest section no. 48l, 15 Aug. 2002, *leg. P. Czarnota* (GPN 3064); Bc-58 – BORY TUCHOLSKIE FOREST: Wda Valley, ca 0.75 km SW of Łuby village [53°42'N/18°22'E] 15 July 2003, *leg. M. Kukwa 2023, 2025* (UGDA); Bc-75 – DOLINA BRDY VALLEY: Kwiatki village near Tuchola town, 5 Sept. 1981, *leg. W. Fałtynowicz* (UGDA-L 4015), as *M. pra-*

- sina*; Tucholski Landscape Park, 'Piekło nad Brdą' nature reserve, 27 Sept. 2001, *leg. P. Czarnota* (GPN 2626); Bc-79 – BORY TUCHOLSKIE FOREST: Dąbrowa forest division, Kotówka forest district, forest section no. 166g, ca 5 km N of Jeżewo village, 26 Oct. 2001, *leg. A. Kowalewska* (UGDA) and forest section no. 111c, ca 8 km N of Jeżewo village, 26 Aug. 2002, *leg. A. Kowalewska* (UGDA); Kwiatki forest district, forest section no. 39a, ca 13 km W of Warlubie village, 31 Aug. 2001, *leg. A. Kowalewska* (UGDA); Bc-91 – POJEZIERZE KRAJEŃSKIE LAKELAND: Lutówko forest division, forest section no. 193g, valley of Łobżonka River, 27 July 2001, *leg. L. Lipnicki* (Hb. Lipnicki); Bd-42 – POJEZIERZE IŁAWSKIE LAKELAND, POJEZIERZE IŁAWSKIE LAKELAND: Kwidzyń forest division, 'Lisewo' forest district, forest section no. 190, 21 Apr. 2003, *leg. M. Kukwa 1796* (UGDA), forest section no. 197, 29 Sept. 2003, *leg. M. Kukwa 2817* (UGDA), forest section no. 198, between Ryjewo and Małki villages, 4 Aug. 1996, *leg. M. Kukwa* (UGDA-L 7814), as *M. prasina*, forest section no. 192, N of Ryjewo village, 9 Aug. 1996, *leg. M. Kukwa* (UGDA-L 7808), as *M. prasina*, forest section no. 211, S shore of Małki Lake [53°10'30"N/18°59'50"E] 2 Nov. 2003, *leg. M. Kukwa 2838* (UGDA) and forest section no. 220, 27 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa 150), as *M. prasina*; Kwidzyń forest division, Biały Dwór forest district, forest section no. 226, between Ryjewo and Straszewo villages, 28 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa 210), forest section no. 229, between Ryjewo and Klecewko villages, 31 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa 116 together with *M. nitschkeana*), forest section no. 232, 19 Sept. 1996, *leg. M. Kukwa* (Hb. Kukwa 118 together with *M. nitschkeana*); Bd-68 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, BORY TUCHOLSKIE FOREST: ca 2.5 km W of Stara Rzeka village, by Łąka Cieściernicka meadow [53°39'22"N/18°16'40"E] 14 June 2004, *leg. M. Kukwa 3319* (UGDA); Bd-79 – POJEZIERZE CHEŁMIŃSKO-DOBZYŃSKIE LAKELAND, GARB LUBAWSKI HUMMOCK: Wzgórza Dylewskie Landscape Park, forest section no. 199a, 13 Sept. 2002, *leg. P. Czarnota* (GPN 3235), forest section no. 99a, 12 Sept. 2002, *leg. P. Czarnota* (GPN 3239) and forest section no. 97c, 11 Sept. 2002, *leg. P. Czarnota* (GPN 3179); Be-22 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE OLSZTYŃSKIE LAKELAND: 3 km NE of Dobre Miasto town, loc. 277, 14 Sept. 1989, *leg. S. Cieśliński* (KTC), as *M. prasina*; Be-35 – POJEZIERZE OLSZTYŃSKIE LAKELAND: ca 1.5 km SSW of Zebruń village, loc. 619, 17 Sept. 1989, *leg. S. Cieśliński* (KTC), as *M. prasina*; Be-42 – POJEZIERZE OLSZTYŃSKIE LAKELAND: Olsztyn – Dajtki town, by shore of Ukiel Lake, square OL-L-9, July 2001, *leg. D. Kubiak* (OLTC); Las Miejski Wood in Olsztyn town, square OL-H-14, Sept. 2001, *leg. D. Kubiak* (OLTC together with *M. prasina* s.str.) and 12 May 1998, *leg. D. Kubiak* (OLTC together with *M. melaena*); Be-59 – POJEZIERZE MRAĞOWSKIE LAKELAND: Puszcza Piska Forest, forest section no. 38, near Klimunt Lake, loc. 266, 31 Aug 1987, *leg. S. Cieśliński* (KTC), as *M. prasina*; ca 1.5 km E of Krutyń village, by road between Iwanów and Ukta villages, loc. 277, 2 Sept. 1987, *leg. S. Cieśliński* (KTC), as *M. prasina*; Be-67 – POJEZIERZE MRAĞOWSKIE LAKELAND: Puszcza Piska Forest, Kulkanka Wood, by road between Marksoby Lake and Babięta village, 1 May 1989, *leg. J. Nowak* (KRAM-L 26217), as *M. prasina*; Be-75 – RÓWNINA MAZURSKA PLAIN: ca 3 km SW of Szczytno town toward Sędzińskie Lake, loc. 1211, 23 Aug. 1993, *leg. S. Cieśliński* (KTC), as *M. prasina*; Be-90 – POJEZIERZE CHEŁMIŃSKO-DOBZYŃSKIE LAKELAND, GARB LUBAWSKI HUMMOCK: Wzgórza Dylewskie Landscape Park, rest centre 'Interpiast' in Kalbornia village near Dąbrowa Wielka Lake, 10 Sept. 2002, *leg. P. Czarnota* (GPN 3237); Be-97 – NIZINA PÓLNOCNOMAZOWIECKA LOWLAND, RÓWNINA KURPIOWSKA PLAIN: Puszcza Kurpiowska Forest, 'Surowe' nature reserve near Myszyniec village, 1982, *leg. S. Cieśliński* (KTC), as *M. prasina*; Bf-04 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE ELCKIE LAKELAND: Puszcza Borecka Forest, Olszanka forest district, forest section no. 125 [54°09'N/22°14'E] alt. 163 m, 13 May 1997, *leg. A. Zalewska* (OLS-L 1279), as *M. nitschkeana*; Bf-09 – POJEZIERZE LITEWSKIE LAKELAND, RÓWNINA AUGUSTOWSKA PLAIN: Wigierski National Park, Wigry forest division, forest section no. 112A, by shore of Pierty Lake, 11 Sept. 1984, *leg. R. Kozik* (KRAP), as *Bacidia albescens* and forest section no. 103, 15 Sept. 1984, *leg. R. Kozik* (KRAP), as *Catillaria prasina*; Bf-13 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE ELCKIE LAKELAND: Puszcza Borecka Forest, forest section no. 41, 20 May 1987, *leg. S. Cieśliński & Z. Tobolewski* (KTC), as *M. prasina*; by stream near Knieja Kuczańska forest district (sq. 56), 16 May 1997, *leg. A. Zalewska* (OLS-L 34), as *M. prasina*; Czerwony Dwór forest division, Lipowo forest district, 'Lipowy Jar' nature reserve, forest section no. 225 [54°07'N/22°09'E] 22 Apr. 1996, *leg. A. Zalewska* (OLS-L 1360 together with *M. misella*); Bf-14 – POJEZIERZE ELCKIE LAKELAND: Puszcza Borecka Forest: Borki forest division, Zielonki forest district, forest section no. 185c [54°05'N/22°11'E] alt. 140 m, 14 July 1995, *leg. A. Zalewska s.n.* (OLS together with *M. melaena*); Bf-19 – POJEZIERZE LITEWSKIE LAKELAND, RÓWNINA AUGUSTOWSKA PLAIN: Wigierski National Park, Wigry forest division, forest section no.

- 229, 14 Sept. 1984, *leg. J. Kiszka* (KRAP together with *M. melaena*), forest section no. 228, W shore of Wigry Lake, 12 Sept. 1984, *leg. J. Kiszka & H. Wójcicki* (UGDA-L 2716), as *M. prasina* for. *laeta* and forest section no. 236, W shore of Białe Wigierskie Lake, 11 July 1995, *leg. M. Kukwa* (Hb. Kukwa); Bf-19 – POJEZIERZE WSCHODNIOSUWALSKIE LAKE LAND: Wigierski National Park, peat-bog in valley of Czarna Hańcza River, 4 May 2002, *leg. K. Szczepańska* (Hb. Szczepańska); Bf-29 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, forest sections no. 139/159, 1.5 km E of road between Augustów and Suwałki towns, loc. 111, 19 Sept. 1986, *leg. S. Cieśliński* (KTC), as *M. prasina*; Bf-39 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, forest section no. 20, ca 2.5 km of Augustów town, by road between Augustów and Sejny towns, 19 Sept. 1986, *leg. S. Cieśliński* (KTC); Bf-50 – POJEZIERZE MAZURSKIE LAKE LAND, KRAINA WIELKICH JEZIOR MAZURSKICH LAKE LAND: Puszcza Piska Forest, 1.5 km NW of Onufryjewo village, loc. 436, 7 Sept. 1988, *leg. S. Cieśliński* (KTC), as *M. prasina*; Bf-59 – NIZINA PÓLNOCPODLASKA LOWLAND, KOTLINA BIEBRZAŃSKA BASIN: 1 km E of Wrotki village, loc. 812, 1990, *leg. S. Cieśliński* (KTC together with *M. denigrata*); Bf-68 – KOTLINA BIEBRZAŃSKA BASIN: Biebrza Valley, ‘Czerwone Bagno’ nature reserve, ca 5 km NNW of Dolistów Stary village, loc. 143, 24 Sept. 1986, *leg. S. Cieśliński* (KTC together with *M. denigrata*); ca 1.5 km N of ‘Czerwone Bagno’ nature reserve, loc. 145, 24 Sept. 1986, *leg. S. Cieśliński* (KTC), as *M. prasina*; Bg-10 – POJEZIERZE LITEWSKIE LAKE LAND, RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, Wigierski National Park, Maćkowa Ruda forest division, forest section no. 18b, ca 3.5 km SE of Mikołajewo village, Sept. 1984, *leg. K. Toborowicz* (UGDA-L 9227); Bg-11 – POJEZIERZE WSCHODNIOSUWALSKIE LAKE LAND: Puszcza Augustowska Forest, forest section no. 465, ca 1 km SE of Giby village, loc. 82, 12 Sept. 1986, *leg. S. Cieśliński* (KTC), as *M. prasina*; Bg-30 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, ca 1.5 km S of Serwy village, loc. 1263, 28 Aug. 1995, *leg. S. Cieśliński* (KTC), as *M. prasina*, border of forest sections no. 199/200, W of Sucha Rzeczka village, 11 Sept. 1986, *leg. S. Cieśliński* (KTC; KRAM-L 31861 ex KTC), as *M. prasina* and border of forest sections no. 201/202 and 226/227, ca 6 km E of Sajenek village, loc. 132, 22 Sept. 1986, *leg. S. Cieśliński* (KTC), as *M. prasina*; Bg-40 – NIZINA PÓLNOCPODLASKA LOWLAND, KOTLINA BIEBRZAŃSKA BASIN: Puszcza Augustowska Forest, forest section no. 153, ca 1 km NE of Lebedzin village, 21 Sept. 1986, *leg. S. Cieśliński* (KTC together with *M. denigrata*), as *Micareia* sp.; Ca-76 – PRADOLINA TORUŃSKO-EBERSWALDZKA VALLEY, KOTLINA GORZOWSKA BASIN, Puszcza Rzepińska Forest, ca 1 km E of Krzeszyce village by road to Gorzów Wielkopolski town [52°34'55"N/15°03'19"E] 8 Apr. 2006, *leg. P. Czarnota 4810* (GPN); Cb-01 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKE LAND, RÓWNINA DRAWSKA PLAIN: Puszcza Drawska Forest, between Recz and Kalisz Pomorski towns, 9 Apr. 2006, *leg. P. Czarnota 4820* (GPN); Cb-13 – POJEZIERZE WALECKIE LAKE LAND: Puszcza Drawska Forest, by road between Tuczo and Człopa towns [53°09'24"N/16°07'46"E] alt. 130 m, 9 Apr. 2006, *leg. P. Czarnota 4823* (GPN); Cb-22 – RÓWNINA DRAWSKA PLAIN: Puszcza Drawska Forest, Drawieński National Park, forest section no. 307k, ca 0.5 km W of Ostrowiec Lake, 18 May 2004, *leg. P. Czarnota 4291* (GPN) and forest section no. 308g, 18 May 2004, *leg. P. Czarnota 4281* (GPN); Cb-41 – POJEZIERZE DOBIEGNIIEWSKIE LAKE LAND: Puszcza Drawska Forest, Smolarz forest division, ‘Lubówko’ nature reserve, ca 5 km N of Drezdenko town [52°52'55"N/15°49'55"E] 9 Apr. 2006, *leg. P. Czarnota 4827* (GPN) and ca 0.5 km N of Drezdenko town [52°51'19"N/15°50'40"E] 9 Apr. 2006, *leg. P. Czarnota 4832* (GPN); Cb-65 – PRADOLINA TORUŃSKO-EBERSWALDZKA VALLEY, KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, Annogóra settlement near Piotrowo village, 3 Nov. 1992, *leg. K. Glanc* (GPN 2648); Cb-71 – KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, ca 3 km S of Sowia Góra settlement [52°40'12"N/15°50'55"E] 10 Apr. 2006, *leg. P. Czarnota 4807* (GPN); Cg-02 – NIZINA PÓLNOCPODLASKA LOWLAND, WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest: border of forest sections no. 106/123, 8 Sept. 1987, *leg. I. & K. Toborowicz* (KTC), as *Catillaria prasina* and ca 4 km SW of Sokółda village, forest section no. 120, loc. 1227, 4 Aug. 1984, *leg. S. Cieśliński* (KTC), as *M. prasina*; ‘Budzisk’ nature reserve, forest section no. 6k, 12 June 1999, *leg. K. Czyżewska* (LOD 11137 together with *M. denigrata*); Cg-03 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, ‘Stare Biele’ nature reserve, 19 Mar. 1999, *leg. K. Kolanko* (Hb. Kolanko); Cg-11 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Sowłany village near Białystok town, 17 Aug. 2000, *leg. K. Czyżewska* (LOD 11964); Cg-12 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, ca 3.5 km SE of Ciasne village, by Krasna Rzeczka stream, loc. 887, 30 June 1991, *leg. S. Cieśliński* (KTC), as *M. prasina*; Cg-43 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Brownsk forest division, border of forest sections no. 747B and 748A, loc. 200, 198?, *leg. S. Cieśliński* (BSG); Cg-45

- RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, 0.6 km SE of Podlewkowie village, Browsk forest division, forest section no. 23B, loc. 211, 1983, *leg. S. Cieśliński & Z. Tobolewski* (KTC) and forest section no. 153, 13 June 1999, *leg. K. Czyżewska* (LOD 11120), as *M. adnata*; Cg-54 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Hajnówka forest division, cross of forest sections no. 243A, B, C, D, loc. 194, 1983, *leg. S. Cieśliński & Z. Tobolewski* (KTC), as *Catillaria prasina*, forest section no. 246B, D, loc. 261, 1984, *leg. S. Cieśliński & Z. Tobolewski* (KTC) and forest section no. 329A, loc. 63, 1982, *leg. S. Cieśliński & Z. Tobolewski* (KTC); Cg-55 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Browsk forest division, cross of forest sections no. 183D, 184C, 215B, 216A, loc. 169, 1983, *leg. S. Cieśliński & Z. Tobolewski* (KTC), as *Catillaria prasina* and Białowieża National Park, forest section no. 398A, loc. 43, 1982, *leg. S. Cieśliński & Z. Tobolewski* (POZ); Cg-56 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowiecki National Park, forest section no. 256, 1990, *leg. S. Cieśliński* (KTC), as *M. prasina* and forest section 320 B, D, loc. 262, 1985, *leg. S. Cieśliński & Z. Tobolewski* (KTC), as *Catillaria prasina*; Cg-64 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Hajnówka forest division, forest section no. 439A, loc. 65, 1982?, *leg. S. Cieśliński & Z. Tobolewski* (POZ) and forest section no. 572A, ‘Michnówka’ nature reserve, 11 Aug. 2002, *leg. P. Czarnota* (GPN 2981, 3003, 3013); Cg-65 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowieża forest division, forest section no. 494, 13 Aug. 2002, *leg. P. Czarnota* (GPN 3032, 3033); Cg-74 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Hajnówka forest division, forest section no. 696D, loc. 139, 198?, *leg. S. Cieśliński* (BSG); Da-04 – POJEZIERZE LUBUSKIE LAKE LAND, RÓWNINA TORZYMSKA PLAIN: Puszcza Rzepińska Forest, ca 4 km S of Rzepin town, Nowy Młyn forest district [52°18'03"N/14°46'37"E] alt. 60 m, 8 Apr. 2006, *leg. P. Czarnota* 4848 (GPN); Da-07 – POJEZIERZE ŁAGOWSKIE LAKE LAND: Łągów village by Ciecz Lake, 8 Apr. 2006, *leg. P. Czarnota* 4828 (GPN); Da-45 – WZNIESIENIA ZIELONOGÓRSKIE HEIGHTS, WZNIESIENIA GUBIŃSKIE HEIGHTS: by road between Krosno Odrzańskie and Gubin towns [51°59'24"N/14°58'29"E] 8 July 2005, *leg. P. Czarnota* 4623 (GPN); Da-64 – OBNIŻENIE DOLNO-ŁUŻYCKIE DEPRESSION, KOTLINA ZASIECKA BASIN: Bory Zielonogórskie Forest, ca 1.5 km S of Proszów settlement [51°45'02"N/14°49'25"E] alt. ca 90 m, 8 July 2005, *leg. P. Czarnota* 4505 (GPN); Bory Zielonogórskie Forest, 2 km S of Brody village [51°46'06"N/14°48'14"E] 8 July 2005, *leg. P. Czarnota* 4641 (GPN);
- Da-95 – NIZINA ŚLĄSKO-ŁUŻYCKA LOWLAND, BORY DOLNOŚLĄSKIE FOREST: Wymiarki forest division, Spalone forest district, forest section no. 109, 14 Sept. 2000, *leg. B. Krzewicka* 1382 & *A. Ryś* (KRAM-L 46135), as *M. prasina*; Db-01 – POJEZIERZE LUBUSKIE LAKE LAND, BRUZDA ZBĄSZYŃSKA DEPRESSION: Pszczewski Landscape Park, ca 2 km N of Trzciel village, E of Wielkie Lake, 7 July 2005, *leg. P. Czarnota* 4625 (GPN); Db-03 – POJEZIERZE WIELKOPOLSKO-KUJAWSKIE LAKE LAND, POJEZIERZE POZNAŃSKIE LAKE LAND, ca 0.5 km S of Bolewicko village near Nowy Tomyśl town, 7 July 2005, *leg. P. Czarnota* 4670 (GPN); Db-18 – POJEZIERZE POZNAŃSKIE LAKE LAND: Stęszewskie Lakeland, Wielkopolski National Park, Wiry forest district, forest section no. 46f [52°17'54"N/16°49'36"E] 19 May 2004, *leg. P. Czarnota* 3911 (GPN); Db-31 – POJEZIERZE LUBUSKIE LAKE LAND, BRUZDA ZBĄSZYŃSKA DEPRESSION: ca 4 km S of Babimost town by road to Kargowa village, 7 July 2005, *leg. P. Czarnota* 4653 (GPN); Dd-67 – WZNIESIENIA POLUDNIOWOMAZOWIECKIE HEIGHTS, WZNIESIENIA ŁÓDZKIE HEIGHTS: Wzniesienia Łódzkie Landscape Park, ‘Struga Dobieszkowska’ nature reserve [51°50'40"N/19°35'11"E] alt. ca 180 m, 14 July 2004, *leg. P. Czarnota* 4174 (GPN); Dd-68 – WZNIESIENIA ŁÓDZKIE HEIGHTS: Wzniesienia Łódzkie Landscape Park, vicinity of Tadzín village, 13 June 2004, *leg. M. Hachulka* (LOD 11892 together with *M. viridileprosa*) and Tadzín forest district, forest section no. 110, ca 1 km W of Tadzín village [51°49'39"N/19°44'33"E] 14 July 2004, *leg. P. Czarnota* 4179 (GPN); Dd-76 – WZNIESIENIA ŁÓDZKIE HEIGHTS: ‘Las Łągiewnicki’ nature reserve, forest section no. 10i, 22 Aug. 1996, *leg. B. Kośmider* (LOD 9508), as *M. prasina*, forest section no. 13f, 28 July 1997, *leg. B. Kośmider* (LOD 9969), as *M. prasina* and forest section no. 24o, 30 Aug. 1996, *leg. B. Kośmider* (LOD 9519), as *M. prasina*; Dd-88 – RÓWNINA PIOTRKOWSKA PLAIN: Brzeziny forest division, ‘Łaznów’ nature reserve, forest section no. 333d [51°40'N/19°46'E] 7 Nov. 1996, *leg. K. Czyżewska* (LOD 12064); De-15 – NIZINA ŚRODKOWOMAZOWIECKA LOWLAND, KOTLINA WARSZAWSKA BASIN: Puszcza Kampinowska Forest, Kampinoski National Park, ‘Sieraków’ nature reserve, Liszki forest district, forest section no. 72 [52°20'34"N/20°47'41"E] alt. ca 60 m, 27 Apr. 2004, *leg. P. Czarnota* 3937, 3939 (GPN), [52°20'27"N/20°47'42"E] 27 Apr. 2004, *leg. P. Czarnota* 3945 (GPN) and forest section no. 92b, [52°19'34"N/20°48'41"E] alt. ca 60 m, 26 Apr. 2004, *leg. P. Czarnota* 4101 (GPN); De-40 – RÓWNINA ŁOWICKO-BŁONSKA PLAIN: Bolimowski Landscape Park, Skierniewice forest division, forest section no. 9a, 12 Oct. 1998, *leg. K. Czyżewska* (LOD 10285); Dzierz-

gów village, 12 Apr. 1999, *leg. K. Czyżewska* (LOD 10253); De-41 – RÓWNINA ŁOWICKO-BŁOŃSKA PLAIN: Bolimowski Landscape Park, Radziwiłłów forest division, Bolimów Wood, forest section no. 24a, 18 May 1982, *leg. K. Czyżewska* (LOD 6289) and ‘Kopanicha’ nature reserve, forest section no. 144, 10 July 1998, *leg. K. Czyżewska* (LOD 11854), as *M. prasina*; Skierniewice forest division, Mokra Wood, forest section no. 192c, 17 Sept. 1982, *leg. K. Czyżewska* (LOD 6544); De-51 – RÓWNINA ŁOWICKO-BŁOŃSKA PLAIN: Bolimowski Landscape Park, ‘Ruda-Chlebacz’ nature reserve, forest section no. 210, 22 July 1998, *leg. K. Czyżewska* (LOD 11859 together with *M. botryoides*); De-73 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, WYSOCZYNA RAWSKA PLATEAU: ‘Trębaczew’ nature reserve, forest section no. 89b, 16 May 1995, *leg. K. Czyżewska* (LOD together with *Bacidia hemipolia*); Df-48 – NIZINA POŁUDNIOWOPODLASKA LOWLAND, RÓWNINA ŁUKOWSKA PLAIN: by road between Łuków and Międzyrzec Podlaski towns [51°58'25"N/22°40'24"E] 21 June 2005, *leg. P. Czarnota 4721* (GPN); Df-54 – RÓWNINA ŁUKOWSKA PLAIN: near ‘Jata’ nature reserve in the vicinity of Żdzary village [51°57'11"N/22°11'53"E] 21 June 2005, *leg. P. Czarnota 4657* (GPN); Dg-90 – WESTERN POLESIE, RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Lasy Parczewskie Wood, Parczew forest division, forest section no. 70, ‘Torfowisko przy Jeziorze Czarnym’ nature reserve [51°31'05"N/23°02'15"E] 27 Oct. 2004, *leg. P. Czarnota 4249* (GPN); Dg-91 – RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Lasy Parczewskie Wood, ca 2 km NE of Stary Orzechów village by road between Łęczna town and Sosnowica village [51°30'14"N/23°02'53"E] alt. ca 160 m, 27 Oct. 2004, *leg. P. Czarnota 4220, 4226* (GPN); Ea-78 – WESTERN SUDETES, KARKONOSZE MTS: Szklarska Poręba town, 30 Nov. 1997, *leg. M. Ratajczak* (LOD 10800 together with *M. botryoides*, 10803, 10805), all as *M. prasina*; vicinity of Michałowice village, alt. 890 m, 2003, *leg. M. Staniaszek* (Hb. Staniaszek); Karkonoski National Park, near Szklarka waterfall [50°49.922'N/15°33.575'E] alt. 540 m, 26 July 2003, *leg. M. Staniaszek* (Hb. Staniaszek); Eb-28 – WAŁ TRZEBNICKI RAMPART, WZGÓRZA TRZEBNICKIE HILLS: ca 3 km W of Oborniki Śląskie town [51°17'43"N/16°52'12"E] alt. ca 160 m, 30 Aug. 2004, *leg. P. Czarnota 4079* (GPN); ca 5 km SE of Oborniki Śląskie town [51°16'31"N/16°56'59"E] alt. ca 180 m, 30 Aug. 2004, *leg. P. Czarnota 4332* (GPN); Eb-51 – POGÓRZE ZACHODNIOSUDECKIE FOOTHILLS, POGÓRZE KACZAWSKIE FOOTHILLS: near Kamiennik stream, E of Świerżawa town [51°00'37"N/15°59'00"E] alt. ca 290 m, 22 Apr. 2005, *leg. P. Czarnota 4751* (GPN); Eb-71 – WESTERN

SUDETES, RUDAWY JANOWICKIE MTS: Wieściszowice village, worked-out quarry of pyrite named ‘Błękitne Jezioro’, alt. ca 650 m, 9 June 2000, *leg. G. Leśniński* (OPUN); Eb-80 – KARKONOSZE MTS: Karkonoski National Park, Dolina Łomniczki valley, by hiking track [50°45.60'N/15°45.63'E] alt. ca 735 m, 7 July 2003, *leg. P. Czarnota* (GPN 3476 together with *M. adnata*); Sowie Dolina valley, alt. 1040 m, 2003, *leg. M. Staniaszek* (Hb. Staniaszek); N slope of Czarny Grzbiet range [50°44.810'N/15°46.716'E] alt. 1044 m, 31 Aug. 2003, *leg. M. Staniaszek* (Hb. Staniaszek); Kowarski Grzbiet range, near Krukowa Skała outcrop [50°45.519'N/15°46.997'E] alt. 1046 m, 23 Sept. 2003, *leg. M. Staniaszek* (Hb. Staniaszek); Eb-95 – MIDDLE SUDETES, GÓRY SOWIE MTS: S slope of Wielka Sowa Mt. above Sokolec village [50°39'55"N/16°29'30"E] alt. ca 700 m, 21 Apr. 2005, *leg. P. Czarnota 4689* (GPN); Ec-04 – OBNIŻENIE MILICKO-GŁOGOWSKIE DEPRESSION, KOTLINA MILICKA BASIN, S of Odolanów town [52°31'27"N/17°45'34"E] alt. 150 m, 4 July 2005, *leg. P. Czarnota 4681* (GPN); Ec-15 – WAŁ TRZEBNICKI RAMPART, WZGÓRZA OSTRZESZOWSKIE HILLS: ca 2.5 km W of Ostrzeszów town [51°26'13"N/17°51'52"E] alt. 190 m, 4 July 2005, *leg. P. Czarnota 4647* (GPN); Ec-62 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA OLEŚNICKA PLAIN: Bory Namysłowskie Forest, ca 1 km N of Dobrzyń village, by road to Wojcice village [50°57'28"N/17°28'09"E] 23 Apr. 2005, *leg. P. Czarnota 4450* (GPN); Ec-74 – RÓWNINA OPOLSKA PLAIN: Bory Stobrawskie Forest, ca 2 km SE of Karłowice village [50°51'11"N/17°44'32"E] 24 Apr. 2005, *leg. P. Czarnota 4430* (GPN); Ec-88 – WYŻYNA WOŹNICKO-WIELUŃSKA UPLAND, PRÓG WOŹNICKI SCARP: 7 km S of Olesno town, by road between Dobrodzień and Olesno [50°48'38"N/18°24'31"E] alt. 260 m, 4 July 2005, *leg. P. Czarnota 4520* (GPN); Ed-13 – NIZINA POŁUDNIOWOWIELKOPOLSKA LOWLAND, KOTLINA SZCZERCOWSKA BASIN: Bełchatów Industrial Region, Święte Ługi Wood near Lubiec village, 29 Oct. 2000, *leg. K. Czyżewska* (LOD 11866); Ed-14 – KOTLINA SZCZERCOWSKA BASIN: Bełchatów Industrial Region, Parzno forest district, forest section no. 53, 15 Apr. 1985, *leg. K. Czyżewska* (LOD 8026), as *M. prasina*; Ed-26 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, WYSOCZYNA BEŁCHATOWSKA PLATEAU: Bełchatów Industrial Region, Bełchatów forest division, Pytowice Wood, forest section no. 1991, 25 June 1982, *leg. K. Czyżewska* (LOD 7886, 7887), as *M. cf. prasina* and forest section no. 208, 25 June 1982, *leg. K. Czyżewska* (LOD 7879), as *M. prasina*; Ed-35 – WYSOCZYNA BEŁCHATOWSKA PLATEAU: Bełchatów Industrial Region, Bełchatów forest division, Łuszczanowice Wood, forest section no.

- 167d, 13 July 1982, *leg. K. Czyżewska* (LOD 4889), as *M. prasina*; Ee-22 – WYŻYNA PRZEDBORSKA UPLAND, WZGÓRZA OPOCZYŃSKIE HILLS: Opoczno forest division, Białaczów forest district, forest section no. 101i, ‘Białaczów’ nature reserve, 20 Apr. 2002, *leg. K. Czyżewska* (LOD 11352, 11370); Ee-32 – WZGÓRZA OPOCZYŃSKIE HILLS: Trzemoszna forest district, 21 July 1979, *leg. Z. Kurczyńska & K. Toborowicz* (KTC); Ee-55 – WYŻYNA KIELECKA UPLAND, PŁASKOWYŻ SUCHEDNIEWSKI PLATEAU: Suchedniów forest division, forest section no. 91, ca 5 km SW of Bliżyn village, July 1989, *leg. I. Pańczyk* (KTC); Ee-58 – PRZEDGÓRZE ILŻECKIE FORELAND: Starachowice forest division, ‘Rosochacz’ nature reserve, forest section no. 103b, 4 May 2003, *leg. A. Spadło* (LOD 11485); Ee-65 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park: Dolina Wilkowska valley, forest section no. 100, loc. 23, 4 July 1998, *leg. S. Cieśliński & A. Donica* (KTC), Psary forest district, forest section no. 226, 13 July 2002, *leg. A. Łubek* (KTC), forest section no. 264, 23 Sept. 2000, *leg. A. Donica* (KTC), forest section no. 268, 16 Aug. 2000, *leg. A. Donica* (KTC); near the Świętokrzyski National Park, forest section no. 107, loc. 165, 2 July 2001, *leg. A. Donica* (KTC), forest section no. 121, 2 July 2001, *leg. A. Donica* (KTC) and forest section no. 122, 2 July 2001, *leg. A. Donica* (KTC together with *M. botryoides*); Ee-66 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park: Dolina Wilkowska valley, Dąbrowa forest district, forest section no. 40 [50°54'N/20°56'E] 16 July 2001, *leg. A. Donica* (KTC together with *M. botryoides*), Chrusty Wood, forest section no. 36, 3 Aug. 2001, *leg. A. Donica* (KTC together with *M. botryoides*), Dolina Wilkowska valley, forest section no. 77, 6 Nov. 1998, *leg. S. Cieśliński & A. Donica* (KTC) and forest section no. 100, 6 Nov. 1998, *leg. S. Cieśliński & A. Donica* (KTC), Podgórze forest district, forest section no. 43, 14 July 2001, *leg. A. Donica* (KTC), forest sections no. 8/13, Miejska Góra Mt., loc. 205, 16 July 2001, *leg. A. Donica* (KTC) and forest sections no. 59/60, ‘Czarny Las’ nature reserve, loc. 40, 5 Sept. 1999, *leg. A. Donica* (KTC); Pasma Klonowskie range, Psary forest district, forest section no. 17, E slope of Góra Psarska Mt., 5 Sept. 1999, *leg. A. Donica* (KTC); Ee-70 – WYŻYNA PRZEDBORSKA UPLAND, PASMO PRZEDBORSKO-MALOGOSKIE RANGE: Sułków settlement near Krasocin village, July 1977, *leg. U. Kruk & K. Toborowicz* (KTC 62 together with *M. denigrata*); Ee-74 – WYŻYNA KIELECKA UPLAND, GÓRY ŚWIĘTOKRZYSKIE MTS: Kielce forest division, forest section no. 6, 1986, *leg. Bidziński* (KTC), as *M. prasina* and forest section no. 67, 1986, *leg. Bidziński* (KTC), as *M. prasina*; Ee-76 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park: Dąbrowa forest district, Chrusty Wood, forest section no. 48, loc. 252 [50°54'N/20°58'E] 3 Aug. 2001, *leg. A. Donica* (KTC), Łysogóry range, S slope of Łysica Mt., Święta Katarzyna forest district, forest section no. 191, loc. 82, 5 Aug. 2000, *leg. A. Donica* (KTC) and forest section no. 195, loc. 76, 6 July 2000, *leg. A. Donica* (KTC); Ee-77 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park: Łysogóry range, Święty Krzyż forest district, forest section no. 79, loc. 316, 15 July 2002, *leg. A. Łubek* (KTC), forest section no. 201b, S slope of Łysa Góra Mt. [50°51'36"N/21°02'43"E] alt. 580 m, 6 May 2004, *leg. P. Czarnota 3830* (GPN), Chełmowa Góra Mt., forest section no. A2, loc. 137, 27 July 2001, *leg. A. Donica* (KTC); Ee-94 – POGÓRZE SZYDŁOWSKIE FOOTHILLS: Pasma Zbrzańskie range, N of Zbrza village, 25 Oct. 1975, *leg. K. Toborowicz* (KTC 4264), as *Catillaria prasina*; Ee-96 – POGÓRZE SZYDŁOWSKIE FOOTHILLS: Potok forest district, forest section no. 73, 22 Mar. 1977, *leg. K. Toborowicz* (KTC 7983); Ef-00 – NIZINA ŚRODKOWOMAZOWIECKA LOWLAND, RÓWNINA KOZIENICKA PLAIN: Puszcza Kozienska Forest, ‘Zagożdżon’ nature reserve, 31 Sept. 1968, *leg. S. Cieśliński* (KTC), as *Catillaria prasina*; Ef-84 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, ca 1 km N of Gielnia village, peat-bog near ponds, 9 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LOD 12331); Puszcza Solska Forest, ca 0.7 km W of Łążek settlement near Zaklików village, N of Sanna River [50°46'25"N/22°00'02"E] alt. ca 170 m, 26 Oct. 2004, *leg. P. Czarnota 4073* (GPN); Ef-85 – RÓWNINA BIŁGORAJSKA PLAIN: Kolonia Łysaków village, 8 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LBL together with *M. viridileprosa*); Lasy Janowskie Landscape Park, near Narożniki forester’s lodge, ca 0.5 km SW of Kolonia Łysaków village, 8 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LOD 12323); Ef-95 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, complex of ponds near Maliniec village, 8 Sept. 1999, *leg. U. Bielczyk, R. Kozik, L. Lipnicki & H. Wójciak* (LBL together with *M. denigrata*); Ef-97 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, ‘Szklarnia’ nature reserve, forest section no. 93, 28 Mar. 2000, *leg. H. Wójciak & M. Różyło* (LBL together with *M. peliocarpa*); Porytowe Wzgórze region, ca 2.5 km S of Flisy village [50°37.97'N/22°28.20'E] ca 220 m, 10 Oct. 2003, *leg. P. Czarnota 4602* (GPN, GPN 3434 together with *M. viridileprosa*) and [50°37.80'N/22°27.99'E] 10. Oct. 2003, *leg. P. Czarnota* (GPN

3446); Eg-02 – WESTERN POLESIE, RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Poleski National Park, forest section no. 111b [51°27'25"N/23°13'43"E] ca 170 m, 27 Apr. 2004, *leg. P. Czarnota 3861* (GPN) and forest section no. 192b [51°25'37"N/23°10'51"E] 27 Apr. 2004, *leg. P. Czarnota 3872, 3887* (GPN); Eg-91 – ROZTOCZE, MIDDLE ROZTOCZE: Roztoczański National Park, Stogi forest district, forest section no. 179d [50°35'36"N/23°04'36"E] ca 260 m, 28 Apr. 2004, *leg. P. Czarnota 3811* (GPN); Fb-06 – MIDDLE SUDETES, GÓRY SOWIE MTS: below the top of Gašiorek Mt., ca 1.5 km NW of Srebrna Góra village [50°34.99'N/16°37.01'E] alt. 730 m, 22 Apr. 2004, *leg. P. Czarnota 3838* (GPN); Fb-13 – GÓRY STOŁOWE MTS: Góry Stołowe National Park, 'Błędne Skały' nature reserve, alt. ca 830 m, 3 May 2000, *leg. P. Czarnota* (GPN 2737); Fb-34 – GÓRY BYSTRZYCKIE MTS: 'Torfowisko pod Zieleńcem' nature reserve, peat-bog covered with *Pinus mugo* and *Pinus rhaetica* [50°20'48"N/16°24'38"E] alt. ca 700 m, 20 Apr. 2005, *leg. P. Czarnota 4488* (GPN); Fb-45 – GÓRY BYSTRZYCKIE MTS: by road between Poręba village and Spalone Pass [50°14'10"N/16°34'29"E] alt. ca 610 m, 20 Apr. 2005, *leg. P. Czarnota 4774* (GPN together with *M. botryoides*); Fc-15 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA NIEMODLIŃSKA PLAIN: Bory Niemodlińskie Forest, W of Gwoździce village by road between Opole and Krapkowiec towns [50°30'34"N/17°54'54"E] alt. ca 130 m, 23 Apr. 2005, *leg. P. Czarnota 4456* (GPN); Fc-48 – KOTLINA RACIBORSKA BASIN: Lasy Raciborskie Forest, ca 1 km W of Goszyce village, by road between Gliwice and Kędzierzyn Koźle towns [50°16'33"N/18°22'59"E] 18 Apr. 2005, *leg. P. Czarnota 4442* (GPN); Fd-10 – RÓWNINA OPOLSKA PLAIN: ca 2 km NE of Koty village, by road between Tworogi and Lubliniec town [50°33'44"N/18°42'54"E] alt. 220 m, 4 July 2005, *leg. P. Czarnota 4508, 4637* (GPN); Fd-55 – WYŻYNA ŚLĄSKA UPLAND, PAGÓRY JAWORZNICKIE HUMMOCKS: zinc-lead spoil in Balin – Sośnica village, N of Chranów town, 26 Oct. 2004, *leg. J. Kiszka* (KRAP together with *M. botryoides*); Fe-04 – WYŻYNA KIELECKA UPLAND, POGÓRZE SZYDLÓWSKIE FOOTHILLS: Włoszczowice village, near the road between Kielce and Pinczów towns, 31 Aug. 1975, *leg. K. Toborowicz* (KTC together with *M. denigrata*); Fe-79 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE STRYZÓWSKIE FOOTHILLS: Jaworze Dolne village, alt. 300 m, 16 June 1971, *leg. R. Kozik* (KRAP), as *Catillaria prasina*; Fe-82 – POGÓRZE ZACHODNIOBESKIDZKIE FOOTHILLS, POGÓRZE WIŚNICKIE FOOTHILLS: Cichawka stream, well-head, 19 May 1998, *leg. L. Śliwa 639c* (KRAM); Fe-94 – POGÓRZE WIŚNICKIE FOOTHILLS: 'Bukowiec' nature reserve [49°49'50"N/20°35'00"E]

alt. 430–460 m, 21 May 1999, *leg. L. Śliwa 1033c & B. Krzewicka* (KRA together with *M. viridileprosa*), as *M. prasina* and 22 Sept. 1999, *leg. B. Krzewicka* (KRAM-L 46227), as *M. prasina*; Fe-96 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE ROŹNOWSKIE FOOTHILLS: valley of stream below Bukowiec hill toward Siekierczyna village, alt. 400 m, 23 June 1971, *leg. R. Kozik* (KRAP), as *Catillaria prasina*; Ff-05 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Forest, 1 km SW of Żdżary village, by road between Nisko and Janów Lubelski towns [50°33'14"N/22°14'03"E] alt. ca 180 m, 25 Oct. 2004, *leg. P. Czarnota 4240* (GPN); Ff-13 – RÓWNINA TARNOBRZESKA PLAIN: Puszcza Sandomierska Forest, Krawce village near Grębów town, 28 June 1988, *leg. J. Kiszka & J. Piórecki* (BDPA), as *M. prasina*; Ff-19 – RÓWNINA BIŁGORAJSKA PLAIN: Puszcza Solska Forest, ca 0.5 km E of Smółsko Duże village, by road between Biłgoraj and Józefów towns [50°28'47"N/22°47'42"E] alt. 210 m, 28 Oct. 2004, *leg. P. Czarnota 4264, 4265* (GPN); Ff-23 – RÓWNINA TARNOBRZESKA PLAIN: near the road between Nowa Dęba town and Bojanów village [50°24.86'N/21°50.92'E] 6 Aug. 2003, *leg. P. Czarnota* (GPN 3638 together with *M. viridileprosa*); Ff-31 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: W edge of Ostrowy Baranowskie village [50°20.92'N/21°38.44'E] alt. 110 m, 6 Aug. 2003, *leg. P. Czarnota* (GPN 3645); Ff-34 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: ca 2 km SE of Wilcza Wola village [50°19.69'N/21°58.23'E] alt. 120 m, 6 Aug. 2003, *leg. P. Czarnota* (GPN 3632); Ff-40 – DOLINA DOLNEJ WISŁOKI VALLEY: Tuszyma forest division, Przacław forest district, forest section no. 110 near 'Bagno Przacławskie' nature reserve [50°11'29"N/21°25'18"E] alt. ca 150 m, 18 Apr. 2005, *leg. P. Czarnota 4553* (GPN); Ff-41 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: Tuszym forest division, 'Buczyna' nature reserve, ca 0.5 km S of Przyłęk village [50°15.32'N/21°36.05'E] 6 Aug. 2003, *leg. P. Czarnota* (GPN 3636); Ff-52 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: ca 2 km S of Przedbórz village by road to Sędziszów Małopolski town [50°09'02"N/21°45'31"E] 18 Apr. 2005, *leg. P. Czarnota 4537* (GPN); Ff-81 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE STRYZÓWSKIE FOOTHILLS: Strzyżów forest division, Cieszyna forest district, W slope of Chełm Mt. [49°53'22"N/21°33'09"E] alt. 470 m, 17 Apr. 2005, *leg. P. Czarnota 4759* (GPN); Ff-85 – POGÓRZE DYNOWSKIE FOOTHILLS: ca 2 km NNE of Barycz village, near Kąkolówka settlement, 20 Mar. 2003, *leg. P. Czarnota* (GPN 3193); Ff-93 – POGÓRZE DYNOWSKIE FOOTHILLS: 'Prządki' nature reserve near Czarnorzeki village, ca 8 km N of Krosno town [49°44'30"N/21°48'40"E] alt.



460–520 m, loc. 3, 7 and 10, 5 May 1999, *leg. L. Śliwa & B. Krzewicka* (KRA), all as *M. prasina*; Ff-98 – PO-GÓRZE PRZEMYSKIE FOOTHILLS: Panieński Czub hill (Boguszówka settlement), 7 Oct. 1983, *leg. J. Kiszka & J. Piórecki* (BDPA), as *Catillaria prasina* for. *laeta*; Fg-13 – ROZTOCZE, MIDDLE ROZTOCZE: near Rybica settlement, by road to Susiec village [50°24'25"N/23°13'22"E] alt. 300 m, 20 June 2005, *leg. P. Czarnota 4709* (GPN); Fg-14 – MIDDLE ROZTOCZE, near Żytki settlement [50°23'23"N/23°29'47"E] alt. 300 m, *leg. P. Czarnota 4703* (GPN); Fg-23 – EASTERN ROZTOCZE: Puszcza Solska Forest, near Paary village [50°23'37"N/23°14'45"E] alt. ca 310 m, 18 June 2005, *leg. P. Czarnota 4725* (GPN); Gd-02 – WESTERN BESKIDY MTS, BESKID ŚLĄSKI MTS: valley of Wapienica stream, S of Bielsko-Biała town, 26 Apr. 2000, *leg. G. Leśniński* (OPUN); Gd-11 – BESKID ŚLĄSKI MTS: N slope of Kiczora Mt., alt. 920 m, 24 Aug. 1966, *leg. J. Kiszka* (KRAP together with *Micarea melaena*), as *Bacidia* sp.; Gd-13 – BESKID ŚLĄSKI MTS: Węgierska Górka forest division, Sikorczone forest district, forest section no. 199d, E slope of Barania Góra Mt., valley of Bystra stream, alt. ca 1000 m, 10 May 2002, *leg. P. Czarnota* (GPN 2804, 2811); Gd-16 – BABIA GÓRA RANGE: N slope of Babia Góra Mt., Babiogórski National Park, forest section no. 22a, above Markowe Szczawiny shelter-house [49°34'45"N/19°31'22"E] alt. 1320 m, 9 June 2004, *leg. P. Czarnota 4112* (GPN); Gd-38 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKO-NOWOTARSKA BASIN: ‘Las Łakociowski’ Wood, E of Chyżne village, 5 Aug. 1999, *leg. J. Kiszka* (KRAP together with *M. viridileprosa*); Gd-58 – TATRA MTS, WEST TATRA MTS: Dolina Chochołowska valley, between Huciska and Jamy glades [49°15'24"N/19°49'20"E] alt. 1060 m, 18 June 2004, *leg. L. Śliwa 2450, 2471* (KRAM); Gd-59 – WEST TATRA MTS: Dolina Kościeliska valley, Stare Kościeliska glade [49°15'31"N/19°52'08"E] alt. 965 m, 7 July 2004, *leg. L. Śliwa 2642* (KRAM); Ge-01 – WESTERN BESKIDY MTS, BESKID WYSPOWY MTS: E slope of Lubogoszcz Mt. by hiking track above Kasina Wielka village, alt. 650 m, 23 Sept. 2001, *leg. P. Czarnota* (GPN 2713); Ge-21 – GORCE MTS: Gorce National Park, valley of Kamienica stream, Zapadłe forest area, by hiking track, alt. 1100 m, 13 Oct. 2000, *leg. P. Armatys* (GPN 2358); by road near Konina stream below Borek Pass, alt. 870 m, 3 Oct. 1994, *leg. P. Czarnota* (GPN 724); Ge-22 – GORCE MTS: Lubań range, near Jaworzyna Ochotnicka glade, by hiking track, alt. ca 1025 m, 24 June 2004, *leg. P. Czarnota 4004 & A. Wojnarowicz* (GPN); valley of Kudowski stream, by hiking track, alt. ca 650 m, 24 June 2004, *leg. P. Czarnota 4001 & A. Wojnarowicz* (GPN); valley

of Rolnicki stream, alt. 660 m, 18 Oct. 2004, *leg. P. Czarnota 4029* (GPN); Ge-27 – MIDDLE BESKIDY MTS, BESKID NISKI MTS, Experimental Forest of Agriculture Academy in Kraków, vicinity of Krzyżówka settlement by road to Tylicz village [49°29'03"N/20°56'57"E] 25 Sept. 2005, *leg. P. Czarnota 4563* (GPN); Ge-36 – WESTERN BESKIDY MTS, BESKID SADECKI MTS: Jaworzyna Krynicka range, Runek Mt., alt. 1020 m, 8 Sept. 1989, *leg. L. Śliwa* (KRA), as *M. prasina*; Ge-45 – BESKID SADECKI MTS: Jaworzyna Krynicka range, Trzy Kopce Mt., alt. 730 m, 7 July 1989, *leg. L. Śliwa* (KRA), as *M. prasina*; Ge-46 – BESKID SADECKI MTS: Jaworzyna Krynicka range, the hill ‘834 m’ between Muszyna town and the top of Jaworzyna Krynicka Mt., alt. 840 m, 25 May 1989, *leg. L. Śliwa* (KRA), as *M. prasina*; Ge-50 – TATRA MTS, HIGH TATRA MTS: Tatra National Park, Dolina Roztoki valley near Wodogrzmoty Mickiewicza waterfall [49°13'N/20°04'E] alt. 1120 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3337 together with *M. botryoides*); Gf-16 – EASTERN BESKIDY MTS, GÓRY SANOCKO-TURCZAŃSKIE MTS: Góry Słonne Mts, Tyrawa Solna village, 28 Oct. 1987, *leg. J. Kiszka & J. Piórecki* (BDPA), as *Catillaria prasina*; Gf-17 – GÓRY SANOCKO-TURCZAŃSKIE MTS: Góry Słonne Mts, E of Tyrawa Wołoska village, 3 Aug. 1988, *leg. J. Kiszka & J. Piórecki* (BDPA); Gf-22 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: SW slope of Piotruś Mt., above Stasianie forester’s lodge in valley of Jasiołka River [49°28'02"N/21°44'20"E] alt. ca 500 m, 5 Aug. 2004, *leg. P. Czarnota 4059* (GPN); Gf-28 – EASTERN BESKIDY MTS, GÓRY SANOCKO-TURCZAŃSKIE MTS: Góry Słonne Mts, slope above Serebnica stream, 5 May 1990, *leg. J. Kiszka* (BDPA); anonymous valley of stream below the hill ‘644.2 m’, ‘Garb Dzików’, loc. 127, 6 May 1990, *leg. J. Kiszka* (BDPA); Gf-38 – GÓRY SANOCKO-TURCZAŃSKIE MTS: Żuków range, SW slope of Żuków Mt., 11 Aug. 1990, *leg. R. Kościelniak* (KRAP) and 12 Aug. 1990, *leg. R. Kościelniak* (KRAP), both as *Catillaria prasina*; N slope of Michałowice Mt., 10 Aug. 1990, *leg. R. Kościelniak* (KRAP), as *Catillaria prasina*; Gg-60 – WESTERN BIESZCZADY MTS: Bieszczadzki National Park, under the hill of Widełki Mt., by hiking track, 15 July 2001, *leg. J. Kiszka* (KRAP); Gg-71 – WESTERN BIESZCZADY MTS: Bieszczadzki National Park, Sianki former village, by road to Użocka Pass, alt. 825 m, 23 Aug. 1999, *leg. R. Kościelniak* (KRAP), as *M. prasina*.

ADDITIONAL SPECIMENS EXAMINED. CZECH REPUBLIC, RYCHLEBSKÉ HORY: near the border of Poland, valley of Bilá Voda stream, S of Bilá Voda village, vicinity of Šafářova skála outcrop [50°24'35"N/

16°53'38"E] alt. ca 500 m alt., on hard wood of decaying root of fallen spruce within shaded spruce mountain forest, 23 Apr. 2004, *leg. P. Czarnota 4211* (GPN). ESTONIA, JÕGEVAMAA COUNTY: Endla Nature Reserve, Männikjärve Bog, by shore of Männikjärve Lake [58°52'21"N/26°14'56"E] on bark of *Pinus sylvestris* in boggy pine forest, 22 Aug. 2004, *leg. P. Czarnota 3963* (GPN). LITHUANIA, PRIENAI DISTRICT: Nemunas loops Regional Park, Balbieriškis Forest, forest section no. 50, on bark of young *Fraxinus excelsior* in deciduous forest, 28 Sept. 2002, *leg. P. Czarnota 3146* (GPN); *ibid.*, valley of Drubengis River, Drubengis botanical preserve, forest section no. 68, on bark of *Pinus sylvestris*, 29 Sept. 2002, *leg. P. Czarnota 3169* (GPN). the NETHERLANDS, PROV. DRENTE: Dwingelo, Lheederzand, on sloping moss-covered trunk of *Quercus* in dense wood, 18 Aug. 1954, *leg. R. A. Geesteranus 10.042* (POZ ex Herbario Lugduno-Batavo).

***Micarea misella*** (Nyl.) Hedl.

(Figs 3C, 4G, 38 & 39)

Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18** (3): 78, 88. 1892.

*Lecidea anomala* f. *misella* Nyl., Lich. Scand.: 202. 1861. – *Lecidea misella* (Nyl.) Nyl., Not. Sällsk. Fauna Fl. Fenn. Förh. **8**: 177. 1866. TYPE: Finland, Nylandia, Ad Helsingfors (Helsinki) ‘*Lecidea vernalis* var. *anomala* (forma dominuta) f. *misella* Nyl.’, on lignum, 1858, *W. Nylander* (H – LECTOTYPE!).

– *Lecidea resiniae* subsp. *globularis* Nyl., Lich. Scand.: 213. 1861. – *Lecidea globularis* (Nyl.) Lamy in Bull. Soc. Bot. France **25**: 435. 1878. – *Micarea globularis* (Nyl.) Hedl., Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18** (3): 78, 88. 1892. TYPE: Sweden, ‘*Arthonia turgida* var.  $\gamma$  *globularis* Svecia 112°’, on lignum (H-ACH 52 – HOLOTYPE!).

– *Lecidea melanochroza* Leight. ex Crombie, J. Bot. **9**: 178. 1871. TYPE: Scotland (BM – LECTOTYPE, *n.v.*).

– *Lecidea misella* f. *brasiliiana* Vain., Acta Soc. Fauna Fl. Fenn. **7**(2): 57. 1890. TYPE: Brasil (BM ex K – LECTOTYPE, *n.v.*; M – ISOLECTOTYPE, *n.v.*).

– *Bilimbia melaena* f. *decrustata* Vain., Acta Soc. Fauna Fl. Fenn. **53**(1): 255. 1922. TYPE: Finland (TURVAINIO 21480 – LECTOTYPE, *n.v.*).

– *Lecidea asserculorum* sensu Th. Fr., Lich. Scand. **2**: 473. 1874, non Ach. 1810. See annotation by Coppins (1983: 158).

Thallus lignicolous, endoxylic or inconspicuous, very thin and membranous, visible as

olive, grey or olive-grey tinge of the substratum,  $\pm$ gelatinous when wet. Photobiont micareoid; cells globose, 4–7  $\mu$ m diam. Apothecia usually few or absent, black, grey-black or black-brown, immarginate from the start, subglobose or hemispherical, simple, 0.1–0.3(–0.4) mm diam. or rarely tuberculate and than 0.6 mm diam. Hymenium 25–45  $\mu$ m tall; epithecium well defined, dull olive, dark olive-grey or olive-brown, K+ intensive violet, C+ intensive and permanent red-violet; pigment confined to the gel-matrix; lower part of the hymenium hyaline. Ascospores ovoid, oblong-ovoid, ellipsoid, simple or more rarely 1-septate, (2–)2.5–3.5(–4)  $\times$  6–9(–10)  $\mu$ m. Paraphyses scanty or sometimes more numerous, branched especially in upper part and anastomosing, (0.8–)1–1.2(–1.5)  $\mu$ m, in K narrower and not distinctly separate as those of *M. denigrata* but closely glued together with gel-matrix (check after squash); apices not or only slightly widening to 1.5(–1.8)  $\mu$ m. Hypothecium hyaline. Excipulum absent or visible as thin zone concoloured with epithecium and composed of more branched paraphysis-like hyphae. Pycnidia of two types: (1) numerous, simple, stalked and usually subulate, black, glossy to 300  $\mu$ m tall (including pycnidio-phores) often with whitish blobs of mesoconidia or older with sometimes gaping ostioles; walls olive, olive-brown, K+ violet, C+ violet; mesoconidia cylindrical, 3.5–5(–6.5)  $\times$  1.2–1.4(–1.7)  $\mu$ m; (2) small, black, immersed in the substratum and bearing narrowly cylindrical microconidia 3.5–6  $\times$  0.7  $\mu$ m diam.

CHEMISTRY. No substances detected by TLC; several specimens with more developed thallus were analyzed.

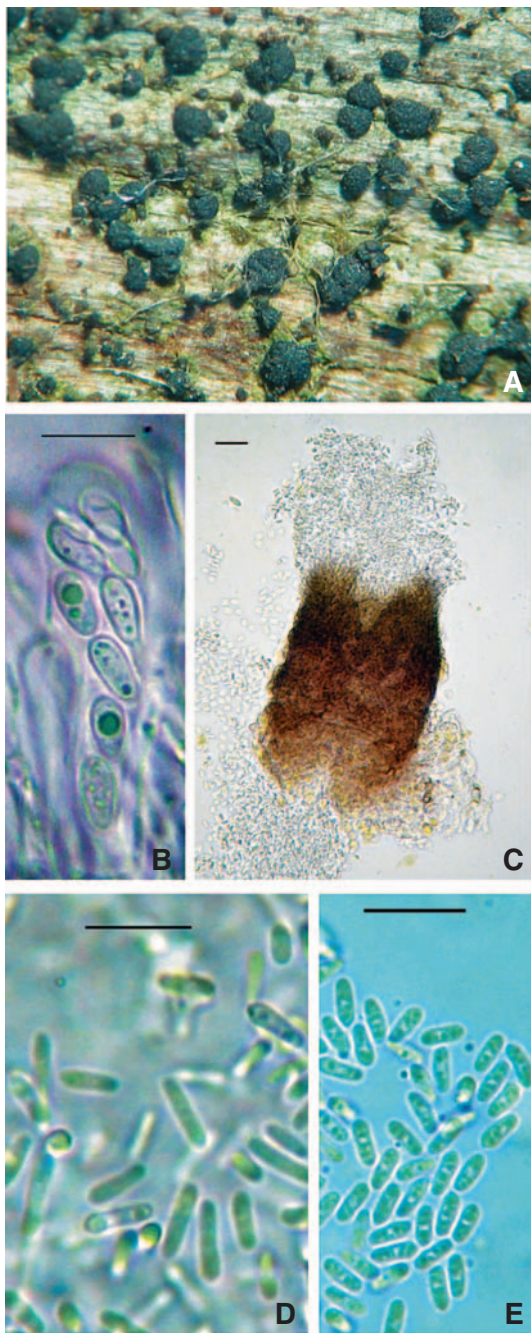
NOTES. Coppins (1983) suggests that more developed thalli of *M. misella* give C $\pm$  red reaction, due to a trace of gyrophoric acid, but in Polish specimens this reaction was not observed. It is highly possible that the positive reaction observed by Coppins came from adjacent or overgrown thallus fragments of an accompanying species (e.g. *Placynthiella dasaea*, *P. icmalea*, *Trapeliopsis granulosa*, *T. flexuosa* and also *Micarea denigrata*). Nevertheless, a C+ reddish tinge is some-

times visible in cross sections of pycnidial walls or upper part of the hymenium, but this is caused by the presence of the pigment ‘Sedifolia-grey’, and not by gyrophoric acid [compare reactions in, e.g. *M. denigrata* (which has both ‘Sedifolia-grey’ and gyrophoric acid) and *M. peliocarpa*].

Sometimes the concentration of the olive pigment (‘Sedifolia-grey’) is so low that the K+ violet, C+ red-violet reactions are almost invisible or give only a slightly greyish tinge, as for example in specimens from Olsztyn town (OLTC). The intensity of pigmentation depends on habitats, ecological conditions and probably also on relationships to other associated fungi and non-lichenized algae.

*Micarea misella* usually forms subulate pycnidia, but sometimes they are quite short, flattened and widened around ostiole, thus resembling well-developed, blackish pycnidia of *M. denigrata* (e.g. specimen from Beskid Niski Mts, *Kiszka s.n.*, KRAP or *Czarnota 4441* from Silesia), surely resulting from a struggle with unfavourable ecological conditions, as well as from strong intraspecific competition; additionally in this second case, the influence of considerable contamination from the neighboring industrial region appears to be one of the most significant factors determining the morphology of the species. *Micarea misella* can be distinguished from *M. denigrata* by its longer [to 5(–5.5–6)  $\mu\text{m}$ ] and slightly thinner (to 1.4  $\mu\text{m}$ ) mesoconidia, while the mesoconidia of the latter species are short cylindrical or obovate, and never exceed 4.5  $\mu\text{m}$  in length.

The inconspicuous, mostly epixylic thallus and stalked, dark pycnidia resembling those formed by *M. misella* are present also in several other lignicolous members of *Micarea*, such as *M. anterior*, *M. nigella* and *M. nowakii*. The first two species usually occur only in the anamorphic stage as does *M. misella*, but simple, microscopic observation of pycnidial walls in K should be enough to separate *M. misella* from them. The brown walls of *M. anterior* and sordid green of *M. nigella* only dulling in K (while walls of *M. misella* react K+ violet) are diagnostic. *Micarea nowakii* is more problematic since it has similar anatomic features and gives the same K+ violet reactions in cross-sections of



**Fig. 38.** *Micarea misella* (Nyl.) Hedl.: A – morphology (*Czarnota 4757*, GPN); B – ascospores (*Czarnota 4592*, GPN); C – pycnidium bearing mesoconidia (*Śliwa 2898*, KRAM); D – longer mesoconidia are sometimes present (leg. *J. Kiszka*, 13 July 2003, KRAP); E – mesoconidia mostly found in all specimens (GPN 3834). Scale bars = 10  $\mu\text{m}$ .

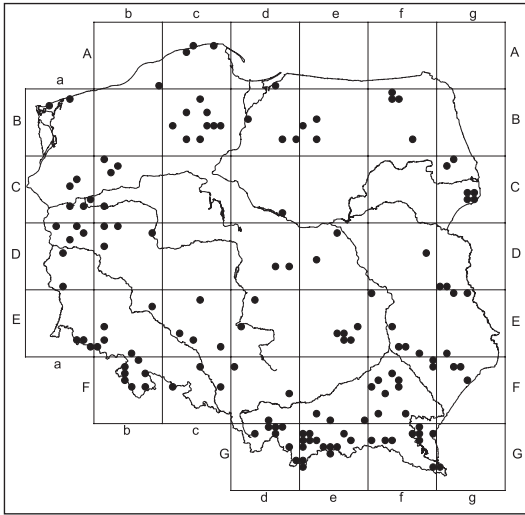


Fig. 39. Distribution map of *Micarea misella* (Nyl.) Hedl. in Poland.

apothecia and pycnidia as *M. misella*; apart from microscopic examination, TLC analysis could be helpful since *M. nowakii* contains micareic acid. For more distinguishing characters see Table 5.

**HABITAT AND DISTRIBUTION IN POLAND.** *Micarea misella* is a very common, ecologically tolerant, endoxylic lichen found in natural or secondary woodlands in almost every type of forest community, from dry pine forest (*Cladonio-Pinetum*) to peat-bog spruce mountain forest, from sea coast up to the alpine mountain belt covered by *Pinus mugo* in the Tatra Mts and Sudetes. It is particularly frequent on decaying wood of fallen branches and stumps, as well as on fallen decorticated logs, and also more rarely on wooden fences and poles. Despite this ecological plasticity, *M. misella* seems to prefer rather moist and shaded niches. It is also occasionally found on the bark of *Betula pendula* and *Pinus sylvestris* within large pine woodlands in the lowlands. Associated species include other epixylic forest lichens: *Absoconditella lignicola*, *A. sphagnum* (in drying out highmoor), *Calicium glaucellum*, *Chaenotheca xyloxena*, *Chaenothecopsis pusilla*, *Elixia flexella*, *Micarea anterior*, *M. denigrata*, *M. hedlundii*, *M. micrococca*, *M. nigella*, *M. prasina*, *Placynthiella dasaea*, *P. icmalea*, *Strangospora moriformis*, *Thelo-*

*carpon intermediellum*, *Trapeliopsis* cf. *granulosa* and *Xylographa parallela*. Only once, on a small wooden bridge in Pojezierze Krajeńskie lakeland, has *M. misella* been found in association with other types of lichens: *Caloplaca* sp., *Candelariella vitellina*, *Hypogymnia physodes*, *Lecanora saligna*, *L. cf. persimilis* and *Phaeophyscia orbicularis*.

**WORLD DISTRIBUTION.** *Micarea misella* is a widespread, common, lignicolous species reported in almost all European countries and several regions of North America and Asia, in different climatic conditions. To date, there are no many reports from the European part of Russia, but considering its occurrence in the Baltic countries and Ural Mts, no doubt it also widespread there in coniferous woodlands, and probably even further to the east, but overlooked.

**EUROPE:** Austria (Hafellner & Türk 2001); Belgium and Luxembourg (Diederich & Sérusiaux 2000); Crete (Grube *et al.* 2001); Cyprus (Litterski & Mayrhofer 1998); Czech Republic (Vězda & Liška 1999); Denmark, rare (Søchting 1998; Søchting & Alstrup 2002); Estonia (Randlane & Saag 1999; Jüriado *et al.* 2000); Finland (Vitikainen *et al.* 1997); Germany (Hauck 1996; Jacobsen 1992, 1997; Scholz 2000); Great Britain (Coppins 1983, 2002); Hungary (Verseghy 1994); Iceland (Kristinsson & Heidmarsson 2006); Italy (Nimis & Martellos 2003); Lithuania (Motiejūnaitė 1999); the Netherlands, rare (Aptroot *et al.* 2004); Norway (Santesson 1993); Romania (Ciurchea 1998); Russia – Leningrad Region (Zavarzin *et al.* 1999), Komi Republic (Hermansson *et al.* 1998); Slovakia (Pišút *et al.* 1996); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993); Ukraine – Eastern Carpathians (Konratyuk *et al.* 1998). **NORTH AMERICA:** USA – Colorado (Weber & Wittmann 2000), Maine (Greene 2005), Michigan (Fryday *et al.* 2001), New York State (Harris 2004). **ASIA:** Bhutan (Aptroot & Feijen 2002); China – Yunnan (Aptroot *et al.* 2003); Japan (Coppins, pers. comm.); Russia – Polar Ural (Andreev *et al.* 1996); Taiwan (Aptroot & Sparrius 2003).

**EXSICCATAE SEEN.** Arnold, *Lich. Exs. No. 626* (WRSL).

SPECIMENS EXAMINED. Grid square Ab-99 – POBRZEŻE KOSZALIŃSKIE COASTLAND, RÓWNINA ŚLAWIEŃSKA PLAIN: SW shore of Łętowo Lake, W of Kępice town, 17 July 1983, *leg. I. Izydorek* (Hb. Izydorek); Ac-34 – WYBRZEŻE SŁOWIŃSKIE COAST, ‘Mierzeja Sarbska’ nature reserve near Leba town, forest section no. 3, 1986, *leg. J. Miądlikowska* (UGDA-L 4166 together with *M. prasina* s.l.); Ac-37 – WYBRZEŻE SŁOWIŃSKIE COAST: sea coast near Białogóra village, 19 Sept. 1998, *leg. P. Czarnota* (OLS-L 1378); Ac-43 – WYBRZEŻE SŁOWIŃSKIE COAST: Słowiński National Park, ca 1.5 km NW of Rąbka village, Oct. 2002, *leg. M. Kukwa* (GPN 3243); Ad-96 – POBRZEŻE GDAŃSKIE COASTLAND, WYSOCZYNA ELBLĄSKA PLATEAU: valley of Grabianka river, Elbląg forest division, Górki forest district: forest section no. 206 [54°16'20"N/19°31'40"E] alt. 135 m, 23 Aug. 2003, *leg. R. Szymczyk* (OLS) and forest section no. 213 [54°15'40"N/19°32'20"E] alt. 130 m, 4 Aug. 2002, *leg. R. Szymczyk* (OLS), forest section no. 194 [54°16'30"N/19°31'40"E] alt. 145 m, 23 Sept. 2003, *leg. R. Szymczyk* (OLS), forest section no. 215 [54°15'30"N/19°32'20"E] alt. 120 m, 6 Oct. 2002, *leg. R. Szymczyk* (OLS); Ba-16 – POBRZEŻE SZCZECIŃSKIE COASTLAND, WYBRZEŻE TRZEBIATOWSKIE COAST: between Łukęcino and Pobierowo villages, 13 June 1986, *leg. W. Fałtynowicz* (UGDA-L 3920); Ba-23 – UZNAM AND WOLIN ISLANDS: Wolin Island, Wiselka village, 6 May 1994, *leg. A. Wieczorek* 60 (Hb. Wieczorek); Wolin Island, Woliński National Park, Wiselka forest district, ‘Grodno’ rest-centre by forest section no. 10Aj [53°58'02"N/14°31'48"E] alt. ca 40 m, 17 May 2004, *leg. P. Czarnota* 4302 (GPN); Wolin Island, coastal beach in Międzyzdroje town near the border of Woliński National Park [53°56'26"N/14°27'47"E], 16 May 2004, *leg. P. Czarnota* 4304 (GPN); Bc-15 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, BORY TUCHOLSKIE FOREST: Wdzydzki Landscape Park, ca 0.5 km E of Wyrówno Lake, W bank of Wda river, 17 June 2003, *leg. M. Kukwa* (GPN 3653); Bc-33 – RÓWNINA CHARZYKOWSKA PLAIN: Zaborski Landscape Park, near Zmarłe Lake, 28 Sept. 2001, *leg. P. Czarnota* (GPN 2612, 2614); Bc-36 – BORY TUCHOLSKIE FOREST: ‘Kamienne Kręgi’ nature reserve, ca 2 km W of Odry village, 27 Sept. 2001, *leg. A. Zalewska* (GPN 2621); Bc-51 – POJEZIERZE KRAJEŃSKIE LAKELAND: W of Pawłótkowo village, forest section no. 1, 25 Aug. 1999, *leg. A. Winkowska* (UGDA); Bc-56 – BORY TUCHOLSKIE FOREST: Woziwoda forest division, Dąbki forest district, forest section no. 481, 15 Aug. 2002, *leg. P. Czarnota* (GPN 3060, 3065); Ustronie forest district, forest section no. 23j, 16 Aug. 2002, *leg. P. Czarnota* (GPN 3100, 3102, 3104); Biała forest

district, forest section no. 129, 16 Aug. 2002, *leg. P. Czarnota* (GPN 3085); Bc-57 – BORY TUCHOLSKIE FOREST: ca 1 km N of Śliwice village near Czersk town, 24 May 1986, *leg. W. Fałtynowicz* (UGDA-L 3913 together with *M. prasina*); Bc-58 – BORY TUCHOLSKIE FOREST: valley of Wda river, ca 0.75 km SW of Łuby village [53°42'N/18°22'E] 15 July 2003, *leg. M. Kukwa* 2022 (UGDA); Bc-73 – POJEZIERZE KRAJEŃSKIE LAKELAND: 0.5 km W of Duża Cerkwica village, on wooden bridge, 2 Aug. 2002, *leg. L. Lipnicki* (Hb. Lipnicki together with *M. denigrata*); Bc-75 – DOLINA BRDY VALLEY: Tucholski Landscape Park, ‘Piekło nad Brdą’ nature reserve, 27 Sept. 2001, *leg. P. Czarnota* (GPN 2627); Bd-42 – POJEZIERZE IŁAWSKIE LAKELAND, POJEZIERZE IŁAWSKIE LAKELAND: Kwidzyń forest division, Lisewo forest district: forest section no. 188, W of Nowa Wieś village [53°51'51"N/18°58'53"E] 19 Aug. 2002, *leg. M. Kukwa* (GPN 3178), forest section no. 197, 11 May 2003, *leg. M. Kukwa* 1809 (UGDA), forest section no. 205, between Mątki and Ryjewo villages, 26 Dec. 2003, *leg. M. Kukwa* 2878 (UGDA together with *Thelocarpon intermediellum*), forest section no. 218, 28 Aug. 1996, *leg. M. Kukwa* (UGDA-L 7811 together with *M. prasina* s.str.), forest section no. 219, between Ryjewo and Klecewko villages, 27 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa s.n. together with *M. prasina*), forest section no. 221, 1.5 km E of Ryjewo village [53°49'N/18°58'E] 27 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa 111 together with *M. botryoides*); Kwidzyń forest division, Biały Dwór forest district: forest section no. 231, S of Ryjewo village, 19 Sept. 1996, *leg. M. Kukwa* (Hb. Kukwa 336), forest section no. 232, 19 Sept. 1996, *leg. M. Kukwa* (Hb. Kukwa 124 together with *M. nitschkeana*); Bd-77 – POJEZIERZE IŁAWSKIE LAKELAND: ‘Żurawinowe Bagno’ nature reserve, Smolniki village near Iława town [53°32'N/19°37'E] 7 July 1996, *leg. A. Zalewska* (OLS-L 1260, 1261) and 29 July 1997, *leg. A. Zalewska* (OLS-L 1265); Bd-79 – POJEZIERZE CHELMIŃSKO-DOBRYŃSKIE LAKELAND, GARB LUBAWSKI HUMMOCK: Wzgórze Dylewskie Landscape Park, Ostróda forest division, forest section no. 104, 11 Sept. 2002, *leg. I. Prigodina* (GPN 3207) and forest section no. 106, 11 Sept. 2002, *leg. P. Czarnota* s.n. (GPN); Be-42 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE OLSZTYŃSKIE LAKELAND: Olsztyn town, Las Miejski Wood, 6 Oct. 2000, *leg. D. Kubiak* (OLTC); Olsztyn – Dajtki town, 30 Sept. 2002, *leg. D. Kubiak* (OLTC); Olsztyn – Dajtki town, near Ukiel Lake, July 2001, *leg. D. Kubiak* (OLTC); Olsztyn town on Wadąg River, 2000, *leg. D. Kubiak* (OLTC); Be-50 – POJEZIERZE OLSZTYŃSKIE LAKELAND: Staszkowo village, ca 10 km E of Ostróda town, 10 May 1974, *leg. J. Nowak*

- (KRAM-L 19719 together with *M. denigrata*); Be-72 – POJEZIERZE OLSZTYŃSKIE LAKELAND: 2 km NNE of railway station Waplewo, 9 Sept. 1996, *leg. S. Cieśliński* (GPN 2071); Bf-03 – POJEZIERZE ELCKIE LAKELAND: Puszcza Borecka Forest, Diabla Góra forest district, forest section no. 87 [54°08'N/22°03'E] 1997, *leg. A. Zalewska* (OLS-L 1379); Bf-13 – POJEZIERZE ELCKIE LAKELAND: Puszcza Borecka Forest, Czerwony Dwór forest division, Lipowo forest district, 'Lipowy Jar' nature reserve, forest section no. 225 [54°07'N/22°09'E] 22 Apr. 1996, *leg. A. Zalewska* (OLS-L 1360); Bf-14 – POJEZIERZE ELCKIE LAKELAND: Puszcza Borecka Forest, Zielonki forest district, forest section no. 233 [54°04'N/22°13'E] 12 July 1995, *leg. A. Zalewska* (OLS-L 1380); Bf-76 – NIZINA PÓLNOCPODLASKA LOWLAND, WYSOCZYNA KOLNEŃSKA PLATEAU: Tabory settlement near Sojczyn Borowy village, 25 June 1990, *leg. S. Cieśliński* (KTC; GPN 2072); Ca-46 – POJEZIERZE POLUDNIOWOPOMORSKIE LAKELAND, RÓWNINA GORZOWSKA PLAIN: ca 2 km SE of Trzcinna village by road between Gorzów Wielkopolski and Myślibórz towns [52°52'14"N/15°00'35"E] alt. ca 60 m, 16 May 2004, *leg. P. Czarnota 4294* (GPN); Ca-69 – PRADOLINA TORUŃSKO-EBERSWALDZKA VALLEY, KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, ca 1 km N of Dobrojewo village [52°42'49"N/15°28'40"E] 8 Apr. 2006, *leg. P. Czarnota 4838* (GPN); Ca-76 – KOTLINA GORZOWSKA BASIN, Puszcza Rzepińska Forest, ca 1 km E of Krzeszyce village by road to Gorzów Wielkopolski town [52°34'55"N/15°03'19"E] 8 Apr. 2006, *leg. P. Czarnota 4815* (GPN); Ca-78 – POJEZIERZE LUBUSKIE LAKELAND, POJEZIERZE ŁAGOWSKIE LAKELAND: Puszcza Rzepińska Forest, ca 7 km W of Skwierzyna town [52°35'25"N/15°19'41"E] 8 Apr. 2006, *leg. P. Czarnota 4797* (GPN); Cb-01 – POJEZIERZE POLUDNIOWOPOMORSKIE LAKELAND, RÓWNINA DRAWSKA PLAIN: Puszcza Drawska Forest, between Recz and Kalisz Pomorski towns, 9 Apr. 2006, *leg. P. Czarnota 4819* (GPN); Cb-13 – POJEZIERZE WAŁECKIE LAKELAND: Puszcza Drawska Forest, by road between Tuczno and Człopa towns [53°09'24"N/16°07'46"E] alt. 130 m, 9 Apr. 2006, *leg. P. Czarnota 4821* (GPN); Cb-22 – RÓWNINA DRAWSKA PLAIN: Puszcza Drawska Forest, Drawieński National Park, forest section no. 307k, ca 0.5 km W of Ostrowiec Lake, 18 May 2004, *leg. P. Czarnota 4286* (GPN); Cb-71 – PRADOLINA TORUŃSKO-EBERSWALDZKA VALLEY, KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, ca 3 km S of Sowią Góra settlement [52°40'12"N/15°50'55"E] 10 Apr. 2006, *leg. P. Czarnota 4808* (GPN); Cd-87 – POJEZIERZE CHELMIŃSKO-DOBRYŃSKIE LAKELAND, POJEZIERZE DOBRZYŃSKIE LAKELAND: Płock – Borowiczki town, 20 July 2002, *leg. I. Sochocka* (LOD 11862); Cg-02 – NIZINA PÓLNOCPODLASKA LOWLAND, WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, 'Budżisk' nature reserve, forest section no. 7o, 12 June 1999, *leg. K. Czyżewska* (LOD 10896) and border of forest sections no. 121/122 and 137/138, 08 Sept. 1987, *leg. S. Cieśliński* (KTC); Cg-11 – WYSOCZYNA BIAŁOSTOCKA PLATEAU: Sowłany village near Białystok town, 17 Aug. 2000, *leg. K. Czyżewska* (LOD 11877); Cg-54 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowieża forest division, forest section no. 392, 13 June 1999, *leg. K. Czyżewska* (LOD 11115), as *M. denigrata*; Cg-55 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowiecki National Park, forest section no. 340A, 12 Aug. 2002, *leg. P. Czarnota* (GPN 2948); Cg-64 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Hajnówka forest division, forest section no. 572A, 'Michnówka' nature reserve, 1982, *leg. S. Cieśliński & Z. Tobolewski* (KTC together with *M. prasina* s.l.) and 11 Aug. 2002, *leg. P. Czarnota* (GPN 2974, 2992); Cg-65 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, forest section no. 498, near Grudki settlement, Sept. 1987, *leg. K. Czyżewska & S. Cieśliński* (KTC); Da-04 – POJEZIERZE LUBUSKIE LAKELAND, RÓWNINA TORZYMSKA PLAIN: Puszcza Rzepińska Forest, ca 4 km S of Rzepin town, Nowy Młyn forest district [52°18'03"N/14°46'37"E] alt. 60 m, 8 Apr. 2006, *leg. P. Czarnota 4842* (GPN); Da-07 – POJEZIERZE ŁAGOWSKIE LAKELAND, Puszcza Rzepińska Forest, by the border of 'Pawski Ług' nature reserve, by road between Łągów village and Torzym town [52°18'44"N/15°15'27"E] 8 Apr. 2006, *leg. P. Czarnota 4800* (GPN); Da-18 – POJEZIERZE ŁAGOWSKIE LAKELAND: S of Mostki village [52°14'42"N/15°22'14"E] 8 July 2005, *leg. P. Czarnota 4634* (GPN together with *M. denigrata*); 0.5 km W of Przelazy village [52°13'56"N/15°22'07"E] 8 July 2005, *leg. P. Czarnota 4679* (GPN); Da-26 – RÓWNINA TORZYMSKA PLAIN: by road between Bytnica village and Krosno Odrzańskie town [52°07'27"N/15°08'05"E] alt. 45 m, 8 July 2005, *leg. P. Czarnota 4650* (GPN); Da-45 – WZNIESIENIA ZIELONOGÓRSKIE HEIGHTS, WZNIESIENIA GUBIŃSKIE HEIGHTS: by road between Krosno Odrzańskie and Gubin towns [51°59'24"N/14°58'29"E] 8 July 2005, *leg. P. Czarnota 4621* (GPN); Da-95 – NIZINA ŚLĄSKO-ŁUŻYCKA LOWLAND, BORY DOLNOŚLĄSKIE FOREST: forest E of Lutynka village, along railway, 14 Sept. 2000, *leg. Śliwa 1362* (KRAM); Db-01 – POJEZIERZE LUBUSKIE LAKELAND, BRUZDA ZBAŚZYŃSKA DEPRESSION: Puszczewski Landscape Park, ca 2 km N of Trzciel village, E of Wielkie Lake, 7 July 2005, *leg. P. Czarnota 4626* (GPN); Db-03 – POJEZIERZE WIELKOPOLSKO-KUJAWSKIE LAKELAND,

POJEZIERZE POZNAŃSKIE LAKELAND, ca 0.5 km S of Bolewicko village near Nowy Tomyśl town, 7 July 2005, leg. P. Czarnota 4671 (GPN); Db-18 – POJEZIERZE POZNAŃSKIE LAKELAND: Pojezierze Stęszewskie lake-land, Wielkopolski National Park, Wiry forest district, forest section no. 42 [52°17'56"N/16°49'36"E] 19 May 2004, leg. P. Czarnota 3905 (GPN) and forest section no. 46f [52°17'54"N/16°49'36"E] 19 May 2004, leg. P. Czarnota 3910 (GPN); Db-31 – POJEZIERZE LUBUSKIE LAKELAND, BRUZDA ZBĄSZYŃSKA DEPRESSION: ca 4 km S of Babimost town by road to Kargowa vil-lage, 7 July 2005, leg. P. Czarnota 4652 (GPN); Dd-66 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, WZNIESIENIA ŁÓDZKIE HEIGHTS: Wzniesienia Łódzkie Landscape Park, 'Struga Dobieszkowska' nature reserve, forest section no. 66b, 17 Aug. 2004, leg. M. Hachulka (LOD 12167); Dd-68 – WZNIESIENIA ŁÓDZKIE HEIGHTS: Wzniesienia Łódzkie Landscape Park, near Tadzín vil-lage, 29 Apr. 2004, leg. M. Hachulka (LOD 11874); Tadzín forest district, forest section no. 118, ca 1 km W of Tadzín village [51°49'38"N/19°44'14"E] alt. ca 190 m, 14 July 2004, leg. P. Czarnota 4176 (GPN); Tadzín forest district, near Henrykowo village, 3 May 2004, leg. M. Hachulka (LOD 11863); vicinity of Pieńki Henrykowskie village, forest section no. 103, 3 May 2004, leg. M. Hachulka (LOD 11893); De-15 – NIZINA ŚRODKOWOMAZOWIECKA LOWLAND, KOTLINA WARSZA-WSKA BASIN: Puszcza Kampinowska Forest, Kampinoski National Park, 'Sieraków' nature reserve, Liszki forest district: forest section no. 92b [52°19'34"N/20°48'41"E] alt. ca 70 m, 26 Apr. 2004, leg. P. Czarnota 3815 (GPN), forest section no. 72 [52°20'34"N/20°47'41"E] alt. ca 60 m, 27 Apr. 2004, leg. P. Czarnota 3937 (GPN together with *M. micrococca*), forest section no. 72c [52°20'27"N/20°47'42"E] 27 Apr. 2004, leg. P. Czarnota 4095 (GPN); De-52 – RÓWNINA ŁOWICKO-BŁOŃSKA PLAIN: Bolimowski Landscape Park, near Jeruzal vil-lage, 2 June 1999, leg. K. Czyżewska (LOD 11966); Df-54 – NIZINA POŁUDNIOWOPÓDLASKA LOWLAND, RÓWNINA ŁUKOWSKA PLAIN, 'Jata' nature reserve, Łuków forest division, forest section no. 285 [51°57'21"N/22°11'25"E] 21 June 2005, leg. P. Czarnota 4714 (GPN); Dg-90 – WESTERN POLESIE, RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Lasy Parczewskie Wood, Parczew forest division, forest section no. 70, 'Torfowisko przy Jeziorze Czarnym' nature reserve [51°31'05"N/23°02'15"E] 27 Oct. 2004, leg. P. Czarnota 4250 (GPN); Dg-91 – RÓWNINA ŁĘCZYŃSKO-WŁODAW-SKA PLAIN: Lasy Parczewskie Wood, ca 2 km NE of Stary Orzechów village by road between Łęczna town and Sosnowica village [51°30'14"N/23°02'53"E] alt. ca 160 m, 27 Oct. 2004, leg. P. Czarnota 4219 (GPN);

Ea-77 – WESTERN SUDETES, GÓRY IZERSKIE MTS: Dolina Izery valley, ca 1 km W of Orle settlement, in spruce stand on peat-bog [50°49.11'N/15°22.63'E] alt. ca 800 m, 9 July 2003, leg. P. Czarnota (GPN 3529 together with *M. denigrata*); Ea-78 – KARKONOSZE MTS: Szklarska Poręba town, 3 May 1999, leg. M. Ratajczak (LOD 10609); Ea-89 – KARKONOSZE MTS: Karkonoski National Park, Równia pod Śnieżką region near ruins of watch-tower, alt. 1430 m, 8 July 2003, leg. P. Czarnota (GPN 3495 together with *M. denigrata*); above Kocioł Wielkiego Stawu glacial corrie, by hiking track within pine dwarf community [50°45.29'N/15°41.58'E] alt. 1400 m, 8 July 2003, leg. P. Czarnota (GPN 3465); Eb-28 – WAŁ TRZEBNICKI RAMPART, WZGÓRZA TRZEBNICKIE HILLS: ca 3 km W of Oborniki Śląskie town [51°17'43"N/16°52'12"E] alt. ca 160 m, 30 Aug. 2004, leg. P. Czarnota 4080 (GPN); Eb-51 – POGÓRZE ZA-CHODNIOSUDECKIE FOOTHILLS, POGÓRZE KACZAWSKIE FOOTHILLS: near Kamiennik stream, E of Świerzawa town [51°00'37"N/15°59'00"E] alt. ca 290 m, 22 Apr. 2005, leg. P. Czarnota 4750 (GPN); Eb-71 – WESTERN SUDETES, RUDAWY JANOWICKIE MTS: Strużnica village, W of Czartówka Wood by forest road, alt. ca 600 m, 13 Oct. 1999, leg. G. Leśniński (OPUN); Eb-80 – KAR-KONOSZE MTS: Karkonoski National Park: Dolina Łomniczki valley, by hiking track [50°45.81'N/15°45.32'E] alt. 710 m, 7 July 2003, leg. P. Czarnota (GPN 3458), by hiking track ca 100 m below the shelter-house 'Nad Łomniczką', alt. 1015 m, 7 July 2003, leg. P. Czarnota (GPN 3526 together with *M. anterior*), Sowa Dolina valley, alt. 1060 m, 2003, leg. M. Staniaszek (Hb. Staniaszek), Czarne Zboczce region in Sowa Dolina valley below Przełęcz Sowa pass, alt. 1034 m, 2003, leg. M. Staniaszek (Hb. Staniaszek); Eb-95 – MIDDLE SUDETES, GÓRY SOWIE MTS: S slope of Wielka Sowa Mt. above Sokolec village [50°39'55"N/16°29'30"E] alt. ca 700 m, 21 Apr. 2005, leg. P. Czarnota 4692 (GPN); Ec-15 – WAŁ TRZEBNICKI RAMPART, WZGÓRZA OSTRZESZOWSKIE HILLS: ca 2.5 km W of Ostrzeszów town [51°26'13"N/17°51'52"E] alt. 190 m, 4 July 2005, leg. P. Czarnota 4646 (GPN); Ec-62 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA OLEŚNICKA PLAIN: Bory Namysłowskie Forest, ca 1 km N of Dobrzyń village, by road to Wojcice village [50°57'28"N/17°28'09"E] 23 Apr. 2005, leg. P. Czarnota 4447 (GPN); Ec-74 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA OPOLSKA PLAIN: Bory Stobrawskie Forest, ca 2 km SE of Karłowice village [50°51'11"N/17°44'32"E] 24 Apr. 2005, leg. P. Czarnota 4431 (GPN); Ec-88 – WYŻYNA WOŹNICKO-WIELNICKO UPLAND, PRÓG WOŹNICKI SCARP: 7 km S of Olesno town, by road between Dobrodzień and Olesno [50°48'31"N/18°24'30"E] alt.

- 265 m, 4 July 2005, *leg. P. Czarnota 4512* (GPN); Ed-13 – NIZINA POŁUDNIOWOWIELKOPOLSKA LOWLAND, KOTLINA SZCZERCOWSKA BASIN: Belchatów Industrial Region, Kluki forest division: Restarzew Wood, forest section no. 355, 3 May 1985, *leg. K. Czyżewska* (LOD 8464), Święte Ługi Wood near Lubiec village, 29 Oct. 2000, *leg. K. Czyżewska* (LOD 11961); Ed-51 – WYŻYNA WOŹNICKO-WIELUŃSKA UPLAND, WYŻYNA WIELUŃSKA UPLAND: Załęczański Landscape Park, ca 0.5 km S of ‘Węże’ nature reserve, 17 Sept. 1997, *leg. E. Adamska, P. Czarnota, M. Kukwa, G. Leśniński, L. Śliwa* (LOD 10062); Ee-58 – WYŻYNA KIELECKA UPLAND, PRZEDGÓRZE IŁŻECKIE FORELAND: Starachowice forest division, ‘Rosochacz’ nature reserve, forest section no. 102c, 27 Apr. 2003, *leg. A. Spadło* (LOD 11484); Ee-65 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, forest section no. 83, base of Pasma Klonowskie range, 4 July 1998, *leg. S. Cieśliński & A. Donica* (KTC together with *M. prasina* s.str.); Pasma Klonowskie range, forest section no. 17 [50°58’N/20°49’E] 30 July 2001, *leg. A. Donica* (KTC); Pasma Klonowskie range, S of Łączna village, forest sections no. 31/32, 5 July 2002, *leg. A. Łubek* (KTC together with *M. botryoides*); Ee-66 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park: Psary forest district, forest section no. 18, Góra Psarska Mt., 3 July 2000, *leg. A. Donica* (KTC), Pasma Klonowskie range, Psary forest district, forest section no. 54, 6 Nov. 1998, *leg. S. Cieśliński* (KTC), Pasma Klonowskie range, forest section no. 222, near Psary – Kały village, 22 July 1997, *leg. S. Cieśliński & A. Donica* (KTC); Dolina Wilkowska valley, Dąbrowa forest district, forest section no. 40 [50°54’N/20°56’E] 16 July 2001, *leg. A. Donica* (KTC); ‘Czarny Las’ nature reserve, border of forest sections no. 42/43 [50°54’N/20°55’E] 5 Sept. 1999, *leg. A. Donica* (KTC); Ee-76 – GÓRY ŚWIĘTOKRZYSKIE MTS: Dolina Wilkowska valley, forest section no. 69, 29 May 1982, *leg. S. Cieśliński* (KTC together with *M. denigrata*); Podgórze forest district, forest section no. 110, 5 Sept. 1999, *leg. A. Donica* (KTC); Świętokrzyski National Park, N of Wilków village, 6 July 2000, *leg. A. Donica* (KTC together with *M. prasina* s.str.); Łysogóry range, Świętokrzyski National Park: Dębno forest district, forest section no. 128 [50°52’N/20°58’E] 19 July 2001, *leg. A. Donica* (KTC) and forest section no. 129, 2 Aug. 2001, *leg. A. Donica* (KTC together with *M. prasina* s.str.), Święta Katarzyna forest district: Łysica block-field, 5 Sept. 1999, *leg. A. Donica* (KTC), as *M. denigrata*, Agata block-field, forest section no. C-1, 25 Sept. 2000, *leg. A. Donica* (KTC), forest sections no. 146/147, 5 Sept. 1999, *leg. A. Donica* (KTC), forest section no. 173, 6 July 2000, *leg. A. Donica* (KTC), Jastrzębi Dół forest district, forest section no. 186, 5 Aug. 2000, *leg. A. Donica* (KTC together with *M. prasina* s.l.); Ee-77 – GÓRY ŚWIĘTOKRZYSKIE MTS: Łysogóry range, Świętokrzyski National Park: Święty Krzyż forest district, N slope of Łysa Góra Mt., forest section no. 117, upper edge of field-block, 3 July 2000, *leg. A. Donica* (KTC together with *M. denigrata*), forest section no. 118, 3 July 2000, *leg. A. Donica* (KTC), as *M. botryoides*, forest sections no. 196/197 [50°51’N/21°03’E] on the field-block, 5 July 2001, *leg. A. Donica* (KTC), forest section no. 205 [50°50’N/21°03’E] 27 June 2001, *leg. A. Donica* (KTC), forest section no. 209 [50°50’N/21°02’E] 3 July 2001, *leg. A. Donica* (KTC), forest section no. 201b, S slope of Łysa Góra Mt. [50°51’37”N/21°02’43”E] alt. 580 m, 6 May 2004, *leg. P. Czarnota 3834* (GPN); Łysogóry range, Jastrzębi Dół forest district, forest section no. 150, 6 Aug. 2000, *leg. A. Donica* (KTC together with *M. prasina* s.str.); Ef-00 – NIZINA ŚRODKOWOMAZOWIECKA LOWLAND, RÓWNINA KOZIENICKA PLAIN: Puszcza Koziennicka Forest, ‘Zagożdżon’ nature reserve, 14 May 1999, *leg. S. Cieśliński* (KTC; LOD ex KTC); Ef-53 – WYŻYNA LUBELSKA UPLAND, WZNIESIENIA URZĘDOWSKIE HEIGHTS: forest ca 1 km S of Mazanów village [50°59’09”N/21°54’49”E] 26 Oct. 2004, *leg. P. Czarnota 4256* (GPN) and [50°59’01”N/21°54’57”E] 26 Oct. 2004, *leg. P. Czarnota 4266* (GPN); Ef-84 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, ca 1.5 km NNE of Gielnia village, 9 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LOD 12170); Puszcza Solska Forest, ca 0.7 km W of Łązek settlement near Zaklików village, N of Sanna River [50°46’16”N/21°59’50”E] alt. ca 170 m, 26 Oct. 2004, *leg. P. Czarnota 4070* (GPN); Ef-85 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park: forest to N of Łukawica stream [50°44’10”N/22°14’05”E] 9 Sept. 1999, *leg. L. Śliwa & B. Krzewicka* (KRA), road between Świdry settlement to ‘Jastkowiec’ nature reserve, 9 Sept. 1999, *leg. L. Śliwa & B. Krzewicka* (LBL), ‘Łęka’ nature reserve, 8 Sept. 1999, *leg. S. Cieśliński* (LBL), Łęczne Góry settlement, W of the border of ‘Łęka’ nature reserve, 9 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LOD 12326); border of Lasy Janowskie Landscape Park, vicinity of Majdan Łysakowski village, 8 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LBL together with *M. prasina* s.str.; LOD 12325, 12328); Ef-97 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, Janów Lubelski forest division, forest section no. 217 [50°38’N/22°28’E] 8 Sept. 1999, *leg. U. Bielczyk,*



- R. Kozik, L. Lipnicki & H. Wójciak* (KRAM-L 44927), as *M. denigrata*; Porytowe Wzgórze region, ca 2.5 km S of Flisy village [50°37.97'N/22°28.20'E] alt. ca 220 m, 10 Oct. 2003, leg. *P. Czarnota* (GPN 3432); Eg-02 – WESTERN POLESIE, RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Poleski National Park: forest section no. 111b [51°27'25"N/23°13'43"E] alt. ca 170 m, 27 Apr. 2004, leg. *P. Czarnota* 3858 (GPN), forest section no. 192b [51°25'37"N/23°10'51"E] 27 Apr. 2004, leg. *P. Czarnota* 3877 (GPN); Eg-04 – RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Lasy Sobiborskie Forest, near 'Żółtowie bagno' nature reserve [51°25'19"N/23°33'41"E] alt. 120 m, 22 June 2005, leg. *P. Czarnota* 4585 (GPN); Eg-91 – ROZTOCZE, MIDDLE ROZTOCZE: Roztoczański National Park, Stogi forest district: forest section no. 178b [50°35'42"N/23°04'42"E] alt. ca 260 m, 28 Apr. 2004, leg. *P. Czarnota* 3897 (GPN), forest section no. 179d [50°35'36"N/23°04'36"E] alt. ca 250 m, 28 Apr. 2004, leg. *P. Czarnota* 3891 (GPN), forest section no. 12g [50°39'15"N/23°02'41"E] alt. ca 290 m, 28 Apr. 2004, leg. *P. Czarnota* 3918 (GPN); Fb-06 – MIDDLE SUDETES, GÓRY SOWIE MTS: SE slope of Chochoł Wielki Mt., ca 1 km NW of Srebrna Góra village [50°34.66'N/16°37.66'E] alt. 730 m, 22 Apr. 2004, leg. *P. Czarnota* 3836 (GPN); below the top of Gąsiorek Mt., ruins of former shelter-home, ca 1.5 km NW of Srebrna Góra village [50°34.99'N/16°37.01'E] alt. 730 m, 22 Apr. 2004, leg. *P. Czarnota* 3840 (GPN); below the top of Chochoł Wielki Mt. [50°34.90'N/16°37.37'E] 22 Apr. 2004, leg. *P. Czarnota* 4154 (GPN); S slope of Chochoł Wielki Mt., ca 1.5 km NW of Srebrna Góra village [50°34.43'N/16°37.85'E] 22 Apr. 2004, leg. *P. Czarnota* 4147 (GPN); Fb-14 – GÓRY STOŁOWE MTS: Góry Stołowe National Park, ca 0.3 km NW of Batorówek settlement, by hiking track, alt. 675 m, 23 Apr. 2003, leg. *P. Czarnota* (GPN 3274); Fb-24 – GÓRY STOŁOWE MTS: N edge of Batorów village near the border of Góry Stołowe National Park [50°26.56'N/16°25.28'E] alt. 600 m, 23 Apr. 2003, leg. *P. Czarnota* (GPN 3272); Fb-27 – EASTERN SUDETES, GÓRY ZŁOTE MTS: ca 1.5 km S of Złoty Potok town, by road to Łądek Zdrój town [50°26'20"N/16°51'18"E] alt. 450 m, 19 Apr. 2005, leg. *P. Czarnota* 4453 (GPN); Fb-34 – MIDDLE SUDETES, GÓRY BYSTRZYCKIE MTS: 'Torfowisko pod Zieleńcem' nature reserve, beat-bog covered with *Pinus mugo* and *Pinus rhaetica* [50°20'48"N/16°24'38"E] alt. ca 700 m, 20 Apr. 2005, leg. *P. Czarnota* 4486 (GPN); Lasówka village, by Orlica River [50°19'06"N/16°26'23"E] alt. 625 m, 20 Apr. 2005, leg. *P. Czarnota* 4736 (GPN); Fb-45 – GÓRY BYSTRZYCKIE MTS: by road between Poreba village and Spalone Pass [50°14'10"N/16°34'29"E] alt. 610 m, 20 Apr. 2005, leg. *P. Czarnota* 4775 (GPN); Fb-47 – EASTERN SUDETES, ŚNIEŻNIK MASSIF: hiking track between Puchaczówka Pass and Czarna Góra Mt., alt. 860 m, 19 Oct. 2002, leg. *K. Szczepańska*, (Hb. Szczepańska); ca 4 km W of Stronie Śląskie town [50°16'06"N/16°50'16"E] alt. ca 640 m, 19 Apr. 2005, leg. *P. Czarnota* 4614 (GPN); Fc-15 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA NIEMODLIŃSKA PLAIN: Bory Niemodlińskiej Forest, W of Gwoździec village by road between Opole and Krapkowice towns [50°30'34"N/17°54'54"E] alt. ca 130 m, 23 Apr. 2005, leg. *P. Czarnota* 4459 (GPN); Fc-41 – EASTERN SUDETES, GÓRY OPAWSKIE MTS: valley of Bystry stream below Kopa Biskupia Mt., near Pokrzywna village [50°16'39"N/17°26'56"E] alt. 410 m, 19 Apr. 2005, leg. *P. Czarnota* 4426 (GPN); Fc-48 – NIZINA ŚLĄSKA LOWLAND, KOTLINA RACIBORSKA BASIN: Lasy Raciborskie Forest, ca 1 km W of Goszyce village, by road between Gliwice and Kędzierzyn Koźle towns [50°16'33"N/18°22'59"E] 18 Apr. 2005, leg. *P. Czarnota* 4441 (GPN); Fd-10 – RÓWNINA OPOLSKA PLAIN: ca 2 km NE of Koty village, by road between Tworogi and Lubliniec town [50°33'51"N/18°42'48"E] alt. 220 m, 4 July 2005, leg. *P. Czarnota* 4631, 4636 (GPN); Fd-58 – WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND, WYŻYNA OLKUSKA UPLAND: Wyżyna Ojcowska Upland, Ojcowski National Park, near Jaskinia Łokietka karst cave [50°12.04'N/16°49.12'E] alt. 340 m, 15 Apr. 2004, leg. *P. Czarnota* 4138 (GPN); Fd-95 – WESTERN BESKIDY MTS, BESKID MAŁY MTS: Bukowina Mt. (Wielka Bukowa Mt.), alt. 740 m, 1960, leg. *J. Nowak* (KRAM-L 6381), as *Catillaria denigrata*; Wielka Góra Mt., alt. 830 m, 7 Aug. 1960, leg. *J. Nowak* (KRAM-L 6380), as *Catillaria denigrata*; Fe-82 – POGÓRZE ZACHODNIO-BESKIDZKIE FOOTHILLS, POGÓRZE WIŚNICKIE FOOTHILLS: forest S of Sobolów village, 2 June 2000, leg. *L. Śliwa* 1182 (KRAM); Wichraź village near Zagrody, 20 June 2000, leg. *L. Śliwa* 1197b (KRAM); Fe-94 – POGÓRZE WIŚNICKIE FOOTHILLS: 'Bukowiec' nature reserve [49°49'50"N/20°35'00"E] alt. 430–460 m, 21 May 1999, leg. *L. Śliwa* 1041 & *B. Krzewicka* (KRA); Fe-99 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE CIĘŻKOWICKIE FOOTHILLS: Liwocz Mt., above Wróblowa village, alt. 400 m, 30 June 1972, leg. *R. Kozik* (KRAP together with *M. prasina* s.str.), as *Catillaria p.*; Ff-09 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Puszcza Solska Forest, ca 2 km N of Biłgoraj town, 'Obary' nature reserve [50°35'27"N/22°40'52"E] 28 Oct. 2004, leg. *P. Czarnota* 4017 (GPN); Ff-19 – RÓWNINA BIŁGORAJSKA PLAIN: Puszcza Solska Forest, ca 0.5 km E of Smólsko Duże village, by road between Biłgoraj and Józefów towns [50°28'47"N/22°47'42"E] alt. 210 m, 28 Oct. 2004, leg. *P. Czarnota*

4263 (GPN); Ff-23 – RÓWNIINA TARNOBRZESKA PLAIN: near the road between Nowa Dęba town and Bojanów village [50°24.86'N/21°50.92'E] 6 Aug. 2003, *leg. P. Czarnota* (GPN 3637); Ff-31 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: W edge of Ostrowy Baranowskie village [50°20.92'N/21°38.44'E] alt. 110 m, 6 Aug. 2003, *leg. P. Czarnota* (GPN 3643, 3644); Ff-34 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: ca 2 km SE of Wilcza Wola village [50°19.69'N/21°58.23'E] alt. 120 m, 6 Aug. 2003, *leg. P. Czarnota* (GPN 3633); Ff-40 – DOLINA DOLNEJ WISŁOKI VALLEY: Tuszyn forest division, Przacław forest district, forest section no. 116 near 'Bagno Przacławskie' nature reserve [50°11'16"N/21°25'08"E] alt. ca 150 m, 18 Apr. 2005, *leg. P. Czarnota* 4547 (GPN); Ff-44 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: ca 2 km E of Przewrotno village, near Hucisko settlement, 29 Aug. 2002, *leg. P. Czarnota* (GPN 2930, 2931); Ff-52 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: ca 2 km S of Przedbórz village by road to Sędziszów Małopolski town [50°09'02"N/21°45'31"E] 18 Apr. 2005, *leg. P. Czarnota* 4535 (GPN); Ff-81 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE STRYZŹOWSKIE FOOTHILLS: Strzyżów forest division, Cieszyna forest district, Bardo Mt. [49°53'15"N/21°32'26"E] alt. 520 m, 17 Apr. 2005, *leg. P. Czarnota* 4592 (GPN); S slope of Chełm Mt. [49°53'22"N/21°33'09"E] alt. 470 m, 17 Apr. 2005, *leg. P. Czarnota* 4757 (GPN); Ff-82 – POGÓRZE DYNOWSKIE FOOTHILLS, pass below Krowia Góra Mt., by forest road between Kozłówek and Łęki Strzyżowskie villages [49°50'17"N/21°40'14"E] alt. 420 m, 17 Apr. 2005, *leg. P. Czarnota* 4542 (GPN); Ff-85 – POGÓRZE DYNOWSKIE FOOTHILLS: ca 2 km NNE of Barycz village near Kąkolówka village, 20 Mar. 2003, *leg. P. Czarnota* (GPN 3189, 3197, 3200); Fg-12 – ROZTOCZE, MIDDLE ROZTOCZE: Puszcza Solska Forest, Józefów forest division, Kalina forest district, 'Czartowe Pole' nature reserve near Hamernia village [50°26'25"N/23°06'30"E] alt. ca 250 m, 28 Oct. 2004, *leg. P. Czarnota* 4230 (GPN); Fg-13 – MIDDLE ROZTOCZE: near Rybica settlement, by road to Susiec village [50°24'25"N/23°13'22"E] alt. 300 m, 20 June 2005, *leg. P. Czarnota* 4710 (GPN); Fg-34 – EASTERN ROZTOCZE: Puszcza Solska Forest, ca 3 km SW of Werchrata village [50°14'04"N/23°27'53"E] alt. ca 310 m, 18 June 2005, *leg. P. Czarnota* 4722 (GPN); Gd-05 – WESTERN BESKIDY MTS, BESKID MAKOWSKI MTS: Pasma Pewelskie range, Janikowa Grapa hill, alt. ca 650 m, 17 Sept. 1965, *leg. J. Nowak* (KRAM-L 13549), as *M. denigrata*; Pasma Pewelskie range, Ślemień village, the end of Czarny Dział valley, alt. ca 530 m, 5 Aug. 1965, *leg. J. Nowak* (KRAM-L 5053 together with *M. prasina* s.str.); Gd-06 – BESKID ŻYWIECKI MTS: Pasma Jałowiec-

kie range, Stryszawa village, valley of Czerna stream, alt. ca 500 m, 5 Sept. 1965, *leg. J. Nowak* (KRAM-L 15821), as *M. denigrata*; Gd-07 – BESKID ŻYWIECKI MTS: Pasma Jałowiec range, Zawoja village, E slope of Kiczora Mt., valley of Kalinka stream, Chrząszcze-Topory settlement, alt. 700 m, 15 July 1965, *leg. J. Nowak* (KRAM-L 15789, 15790 together with *M. prasina* s.str.); Kowalówka settlement near Grzechynia village, below Ostra Góra Mt., alt. ca 570 m, 3 Sept. 1965, *leg. J. Nowak* (KRAM-L 15432), as *M. denigrata*; Gd-13 – BESKID ŚLĄSKI MTS: E slope of Barania Góra Mt., valley of Bystra stream, Węgierska Górka forest division, Sikorzane forest district, forest section no. 199d, alt. ca 1000 m, 10 May 2002, *leg. P. Czarnota* (GPN 2803); Gd-16 – BABIA GÓRA RANGE: N slope of Babia Góra Mt. above Markowe Szczawiny shelterhouse, Babiogórski National Park, forest section no. 24a [49°35'07"N/19°30'44"E] alt. ca 1200 m, 9 June 2004, *leg. P. Czarnota* 4083 (GPN); Pasma Jałowiec range, Zlatne settlement, NE of Koszarawa village, alt. 680 m, 23 July 1965, *leg. J. Nowak* (KRAM-L 15601), as *M. denigrata*; Gd-38 – OBNIŻENIE ORAWSKO-PODHAŁAŃSKIE DEPRESSION, KOTLINA ORAWSKO-NOWOTARSKA BASIN: forest SE of Jabłonka village, 2 Aug. 1999, *leg. J. Kiszka* (KRAP together with *M. hedlundii*); Gd-59 – TATRA MTS, WEST TATRA MTS: Tatra National Park, Dolina Kościeliska valley by Kościeliski Potok stream [49°15.42'N/19°52.11'E] alt. 980 m, 23 July 2002, *leg. P. Czarnota* (GPN 3266); Dolina Kościeliska valley, Stare Kościeliska glade [49°15'31"N/19°52'08"E] alt. 965 m, 7 July 2004, *leg. L. Śliwa* 2637, 2719, 2720 (KRAM); Ge-10 – WESTERN BESKIDY MTS, BESKID WYSPOWY MTS: NE slope of Luboń Wielki Mt., by hiking track [49°39.20'N/19°59.74'E] alt. 950 m, 5 June 2003, *leg. P. Czarnota* (GPN 3247); Ge-10 – GORCE MTS: Gorce National Park, E slope of Tobołów Mt. below chair-lift, alt. 740 m, 23 Febr. 2002, *leg. P. Czarnota* (GPN 2723 together with *Placynthiella dasaea*); Burcane Mt., W slope above settlement Poręba Górna – Buchole, alt. ca 650 m, 4 Oct. 2003, *leg. P. Czarnota* (GPN 3436 together with *M. viridileprosa*); Ge-11 – GORCE MTS: valley of Kamienica stream, by hiking track below Magorzycza Mt., alt. 820 m, 12 July 1999, *leg. P. Czarnota* (GPN 2004); Gorce National Park: N slope of Gorc Troszacki Mt. below Adamówka glade, alt. 980 m, 20 Dec. 2000, *leg. P. Czarnota* (GPN 2695, 2696), N slope of Turbaczyk Mt., sources of Domagałów stream in Pasieka Wood, alt. 950 m, 10 May 2000, *leg. P. Czarnota* (GPN 2297), W slope of Gorc Kamienicki Mt. below Spaleniec clearing, alt. 940 m, 27 Mar. 2002, *leg. P. Czarnota* (GPN 2790); Ge-16 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE ROŻNOW-

- SKIE FOOTHILLS: Rosochatka Mt., alt. 750 m, 15 Jan. 1973, *leg. R. Kozik* (KRAP), as *Catillaria prasina* (GPN 3833); Ge-20 – WESTERN BESKIDY MTS, GORCE MTS: SW slope of Bukowina Waksmundzka Mt. in Dolina Kowańca valley, alt. 770 m, 26 July 1968, *leg. K. Glanc* (KRAM-L 39542); NW slope of Matejowa Mt., alt. 820 m, 3 Aug. 1968, *leg. K. Glanc* (KRAM-L 39973), as *M. denigrata*; Gorce National Park, ‘Turbacz’ nature reserve, valley of Olszowy stream, alt. 780 m, 18 July 2003, *leg. P. Czarnota* (GPN 3514); Ge-21 – GORCE MTS: Gorce National Park: the top of Kiczora Mt., alt. 1270 m, 23 Aug. 1966, *leg. K. Glanc* (KRAM-L 28511 together with *Calicium trabinellum*), N slope of Mostownica Mt., alt. 1200 m, ?, *leg. K. Glanc* (KRAM-L 36833; GPN 2465), SE slope of Turbacz Mt. in Dolina Łopusznej valley, alt. 1240 m, 10 Sept. 1969, *leg. K. Glanc* (KRAM-L 26410), as *M. denigrata*, S slope of Jaworzyna Kamienicka Mt., valley of Forędówki stream [49°34'N/20°08'E] alt. 1220 m, 7 Oct. 1997, *leg. P. Czarnota* (GPN 1710), Dolina Kamienicy valley [49°34'N/20°10'E] alt. 810 m, 11 June 1996, *leg. P. Czarnota* (GPN 1454), Dolina Kamienicy valley, N slope of Jaworzyna Kamienicka Mt. [49°34'N/20°10'E] alt. 1100 m, 10 Oct. 1995, *leg. P. Czarnota* (GPN 1846 together with *M. prasina*), valley of Łopuszanka stream below Hala Młyńska glade [49°33'N/20°10'E] alt. 1260 m, 6 Nov. 1997, *leg. P. Czarnota* (GPN 1813), Hala Długa glade below Turbacz Mt. [49°34'N/20°14'E] alt. 1220 m, 6 July 1995, *leg. P. Czarnota* (GPN 1874), valley of Ustępný Potok stream [49°34'N/20°15'E] alt. 880 m, 20 Febr. 1995, *leg. P. Czarnota* (GPN 297 together with *M. nigella*); Ge-22 – GORCE MTS: Lubań range, valley of Kudowski stream, by hiking track, alt. ca 650 m, 24 June 2004, *leg. P. Czarnota 4002 & A. Wojnarowicz* (GPN); Ge-27 – MIDDLE BESKIDY MTS, BESKID NISKI MTS, Experimental Forest of Agriculture Academy in Kraków, vicinity of Krzyżówka settlement by road to Tylicz village [49°29'03"N/20°56'57"E] 25 Sept. 2005, *leg. P. Czarnota 4561* (GPN); Ge-30 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKO-NOWOTARSKA BASIN: ‘Bór na Czerwonem’ nature reserve [49°27'57"N/20°02'22"E] alt. 620 m, 4 June 2003, *leg. P. Czarnota 4181* (GPN) and [49°27'84"N/20°02'35"E] alt. 620 m, 4 June 2003, *leg. P. Czarnota 4189* (GPN); Ge-32 – PIENINY MTS: Skalice Spiskie range, Barwinkowa Góra Mt., by hiking track, 6 Sept. 1996, *leg. J. Kiszka* (KRAP); Ge-33 – WESTERN BESKIDY MTS, BESKID SADECKI MTS: Radziejowa range, valley of Obidzki Potok stream, alt. 690 m, 1 Sept. 1990, *leg. L. Śliwa* (KRA), as *M. denigrata*; valley of Biały stream, alt. 670 m, 6 June 1991, *leg. L. Śliwa* (KRA), as *M. denigrata*; Ge-33 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, PIENINY MTS: Pieniński National Park, Ociemne Mt. [49°25'47"N/20°25'38"E] alt. ca 570 m, 13 May 2004, *leg. P. Czarnota 3849* (GPN); Ge-34 – WESTERN BESKIDY MTS, BESKID SADECKI MTS: Radziejowa range, the hill ‘966’ above Mała Roztoka stream, alt. 500 m, 19 Aug. 1966, *leg. M. Olech* (KRA), as *Catillaria prasina*; valley of Młodowski Potok stream, alt. 560 m, 20 July 1990, *leg. L. Śliwa* (KRA); Prehyba Mt., by hiking track, alt. 1140 m, 13 Aug. 1967, *leg. M. Olech* (KRA), as *M. denigrata*; Ge-35 – BESKID SADECKI MTS: Jaworzyna Krynicka range, ‘Skala nad Kokuszką’ hill, alt. 720 m, 16 June 1990, *leg. L. Śliwa* (KRA), as *M. denigrata*; ‘Łabowiec’ nature reserve, alt. 920 m, 13 Oct. 2001, *leg. M. Węgrzyn 490* (KRA together with *M. prasina*); between Hala Łabowska glade and Łomniczanka stream, alt. 900 m, 13 Oct. 2001, *leg. M. Węgrzyn* (KRA; GPN 2963); Ge-44 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, PIENINY MTS: Małe Pieniny range, N border of ‘Wysokie Skalki’ nature reserve, 24 Sept. 2002, *leg. J. Kiszka* (KRAP), as *Micarea* sp.; Ge-50 – RÓW PODATRZAŃSKI DEPRESSION: [49°17'36"N/20°03'36"E] alt. 920 m, 13 July 2004, *leg. L. Śliwa 2898* (KRAM); Ge-60 – TATRA MOUNTAINS, HIGH TATRA MTS: Dolina Roztoki valley below Krzyżne Pass, Rzędy Niżne region, by hiking track [49°13.14'N/20°02.51'E] alt. 1710 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN3581); Gf-07 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE PRZEMYSKIE FOOTHILLS: between Kuźmina village and Kopań Mt., alt. 547 m, 5 May 1987, *leg. J. Kiszka & J. Piórecki* (BDPA), as *M. cf. prasina*; Gf-16 – EASTERN BESKIDY MTS, GÓRY SANOCKO-TURCZAŃSKIE MTS: Góry Słonne Mts, by stream near Załuż village, 28 May 1990, *leg. J. Kiszka* (BDPA), as *Catillaria prasina* for. *byssacea*; Gf-17 – GÓRY SANOCKO-TURCZAŃSKIE MTS: forest by road between Sanok and Przemyśl towns [49°34'03"N/22°19'50"E] alt. ca 590 m, 16 June 2005, *leg. P. Czarnota 4717* (GPN); Gf-19 – GÓRY SANOCKO-TURCZAŃSKIE MTS, ca 1 km N of Kwaszenina settlement by road to Arłamów village [49°33'52"N/22°38'35"E] alt. 460 m, 17 June 2005, *leg. P. Czarnota 4497* (GPN); Gf-20 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: Nieznajowa village, by the bank of Wisłok River, alt. 470 m, 4 Oct. 1979, *leg. J. Nowak* (KRAM-L 32351), as *M. denigrata*; Gf-22 – BESKID NISKI MTS: E of Zawadka Rymanowska village, valley of Tereścieński stream, alt. 470 m, 12 Sept. 1974, *leg. J. Kiszka* (KRAP), as *Catillaria denigrata*; ca 4 km SE of Dukla town, ‘Rezerwat Tysiąclecia na Cergowej Górze’ nature reserve above Nowa Wieś village, alt. 425 m, 12 Sept. 1974, *leg. J. Kiszka* (KRAP),

as *Catillaria denigrata* and [49°32'07"N/21°41'51"E] alt. ca 380 m, 5 Aug. 2004, leg. P. Czarnota 4049 (GPN); Gf-23 – BESKID NISKI MTS: Królik Wołoski village near Rymanów town, valley of anonymous stream on E slope of Kamionka Mt., alt. ca 460 m, 11 Oct. 1974, leg. J. Nowak (KRAM-L 32905), as *Micarea* sp.; Gf-27 – EASTERN BESKIDY MTS, GÓRY SANOCKO-TURCZAŃSKIE MTS: the main ridge of Góry Słonne Mts (loc. 54), 29 May 1990, leg. J. Kiszka (BDPA), as *Catillaria prasina*; Gf-69 – WESTERN BIESZCZADY MTS: Bieszczadzki National Park, near Brzegi Dolne settlement, alt. 790 m, 13 July 2003, leg. J. Kiszka (KRAP); Gg-60 – WESTERN BIESZCZADY MTS: S of Stuposiany village, SE of former village Pszczeliny, alt. ca 650 m, 29 July 1959, leg. Z. Tobolewski (POZ together with *M. prasina*); Bieszczadzki National Park, peat-bog near Tarnawa village on San River, alt. 667 m, 6 July 2003, leg. J. Kiszka (KRAP).

ADDITIONAL SPECIMEN EXAMINED. LITHUANIA, PRIENAI DISTRICT: Nemunas loops Regional Park, Drubengis botanical preserve, forest section no. 68, valley of Drubengis stream [54°36'N/23°57'E] on wood of conifer tree in spruce-pine forest, 29 Sept. 2002, leg. P. Czarnota (GPN 3167).

*Micarea myriocarpa* V. Wirth & Vězda  
ex Coppins (Figs 40 & 41)

in Coppins, Bull. Brit. Mus. (Nat. Hist.), Bot. 11(2): 161–162. 1983. TYPE: Germany, Nordschwarzwald (Hb. V. Wirth 6085 – HOLOTYPE, *n.v.*).

Thallus farinose-granular, whitish-green or green, thin, effuse or sometimes thicker and ±cracked. Photobiont not micareoid, cells ±globose or ellipsoid, (3–)4–7 × 3–5 μm; shape of some cells as in *Stichococcus*. Apothecia numerous or few, immarginate, hemispherical, globose, constricted at the base, very small, rarely simple, 0.1–0.15 μm diam. but mostly tuberculate and then to 0.25 μm, pale brown, olive-brown, grey-brown to blackish-brown or almost grey-black. Hymenium 25–35 μm tall, hyaline, dilute brownish or partly olive-brown and dull olive, K– or K+ intensifying (especially when olive pigment present), but usually with darker coloured vertical streaks, owing to pigmented walls of paraphyses. Ascospores narrowly ellipsoid, ovoid or oblong, straight or some of them slightly curved, 0–1-septate, (5–)6–8(–9) × 1.3–2.5 μm. Paraphyses of two types: (1) colour-

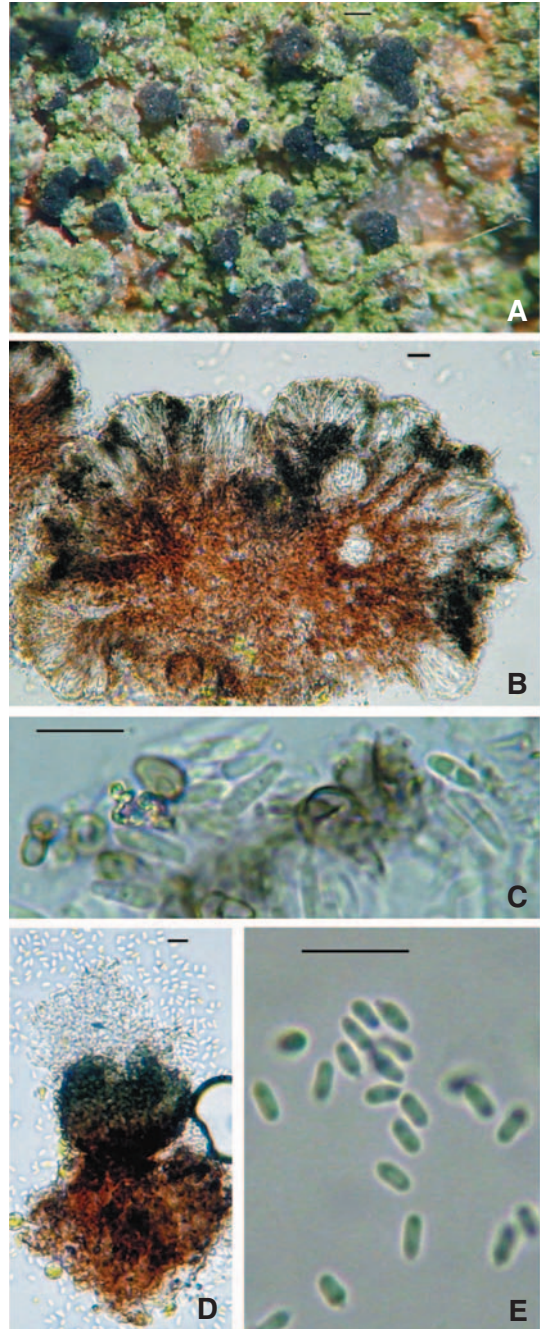


Fig. 40. *Micarea myriocarpa* V. Wirth & Vězda ex Coppins: A – morphology (GPN 2471); B – vertical section of dark apothecia with ‘Cinereorufa-green’ hymenial pigment, C – ascospores, D – sessile, barrel-like pycnidia bearing mesoconidia, E – mesoconidia (Czarnota 4104, GPN). Scale bars: A = 100 μm; B–E = 10 μm.

less, scanty or more frequent, 1.0–1.4  $\mu\text{m}$  wide, branched and anastomosing especially in upper part and here usually widening up to 1.8  $\mu\text{m}$ ; (2) thick, 2–3  $\mu\text{m}$  wide, transversely septate, compacted with small, vertical, fasciculate clusters arising from hypothecium; walls incrustated by fuscous, olive-brown or olive pigment. Hypothecium 35–70  $\mu\text{m}$  tall, pale brown to fuscous-brown, K–; sometimes also with olive tinge but in K  $\pm$  brownish intensifying. Excipulum not developed, but in darker apothecia upper, pigmented part of hymenium tucked under hypothecium as brown or olive-brown reflexed zone. Pycnidia usually numerous, brownish, dark brown or black-brown, matt or sometimes with very subtle whitish or greyish tomentum, globose or spherical, often with white blobs of conidia, small, 40–50(60)  $\mu\text{m}$  tall, sessile, but also very often shortly stalked due to the presence of short paler pycnidiophores, simple or conglomerated and sometimes arising on older ones; walls brown and in upper part mostly olive, K $\pm$  intensifying or brown only at the base. Mesoconidia? shortly cylindrical, 2.5–3.5(–3.8)  $\times$  (0.8–)1.0–1.3  $\mu\text{m}$ , biguttulate.

CHEMISTRY. No substances detected by TLC.

NOTES. Some Polish specimens of *M. myriocarpa*, apart from normally developed pale brownish or brownish apothecia, also have darkish, black-brown apothecia with olive, K+ intensifying pigment within the hymenium as well as pycnidia with dark olive pigmented walls. According to Coppins (1983), the olive tinge is characteristic of *Psilolechia clavulifera* and also, for example, of *M. botryoides* and it should not be observed in *M. myriocarpa* at all. It is difficult to say why the differences exist, but probably more or less concentrations of the dark pigment and also the abundance of dull incrustated paraphyses depend mainly on different ecological conditions within particular microhabitats (e.g. direct exposure to light or precipitation) and competition with accompanying lichens and free-living algae. Both *Psilolechia clavulifera* and *M. botryoides* can occur in similar habitats or even be confused with *M. myriocarpa*. However, *P. clavulifera* can be distinguished by its hyaline hypothecium, one

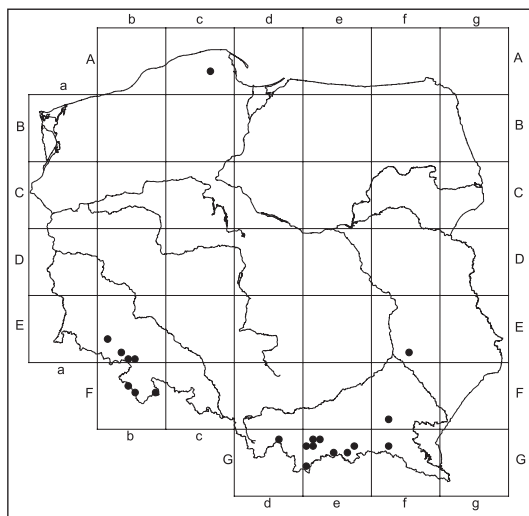


Fig. 41. Distribution map of *Micarea myriocarpa* V. Wirth & Vězda ex Coppins in Poland.

type of thick, very numerous paraphyses, non-septate ascospores and complete lack of any pycnidial stages; usually it grows on soil and root-systems of fallen trees and less frequently directly on rocks. *Micarea botryoides* can also resemble darker forms of *M. myriocarpa* having olive-pigmented vertical streaks within the hymenium and fuscous-brown hypothecium, but it differs in having larger, more than 3  $\mu\text{m}$  wide, ascospores, usually a  $\pm$  continuous or warted-granular, dull olive thallus, and above all in possessing numerous distinctly stalked, black and taller pycnidia bearing longer mesoconidia.

HABITAT AND DISTRIBUTION IN POLAND. *Micarea myriocarpa* is probably a quite frequent, but overlooked, saxicolous species recorded mainly in mountains, from the Sudetes through to the Western Carpathians, where it grows on different kinds of siliceous rocks (granite, gneiss, melaphyre, schist, sandstone). It appears mainly at the base of shaded boulders or vertical faces of outcrops in niches shielded from direct rain within different forest communities of the two belts, to an altitude of 1320 m on the slopes of Babia Góra Mt. Accompanying species on rocks include *Leprosaria* spp., *Micarea bauschiana*, *M. botryoides*, *M. lithinella*, *M. peliocarpa*, *M. sylvicola*, *Opegrapha gyrocarpa*, *Pseudosagedia chlorotica*

and *Psilolechia clavulifera*. *Micarea myriocarpa* can also grow directly on clayey soil, roots and small sandstone pebbles in dry underhangs beneath standing trees and in root-systems of fallen spruces, as in the Tatra Mts and Gorce Mts, in association with *Psilolechia clavulifera*, *Micarea botryoides* and *M. micrococca*. It has been found twice in the Polish lowlands, but it seems to be rare there because of a lack of natural siliceous habitats. Nevertheless, in Pomerania, *M. myriocarpa* has been collected from a granite postglacial boulder, so it could possibly be more frequent in that region as well as in the Masuria region. In the second lowland locality, in the strongly forested region of the Lasy Janowskie Wood, it was recorded on bark at the base of *Pinus sylvestris* within deciduous forest. Its discovery in this area, where there is an almost complete lack of natural outcrops or erratic boulders, was surprising; in the light of this, it seems possible that the species has a greater ecological tolerance than previously supposed, but this hypothesis needs further investigation.

**DISTRIBUTION IN THE WORLD.** EUROPE: Austria (Palice 1999; Hafellner & Türk 2001); Belgium and Luxembourg (Diederich & Sérusiaux 2000); Czech Republic (Palice 1999; Vězda & Liška 1999); Germany (Palice 1999); Great Britain and Ireland (Coppins 1983, 2002; Seaward 1994); the Netherlands, very rare (Aptroot *et al.* 2004); Norway (Santesson 1993); Sweden (Santesson 1993); Turkey (John 1996). NORTH AMERICA: USA – Washington (Tønsberg 1999).

**SPECIMENS EXAMINED.** Grid square Ac-66 – POJEZIERZE WSCHODNIOPOMORSKIE LAKELAND, POJEZIERZE KASZUBSKIE LAKELAND: 0.5 km W of Tepecz village, 24 July 1985, *leg. W. Fałtynowicz* (UGDA–L 3182), as *Micarea sylvicola*; Eb-61 – WESTERN SUDETES, GÓRY KACZAWSKIE MTS: N slope of Baraniec Mt, ca 2 km N of Radomierz village [50°56'52"N/15°53'07"E] alt. ca 550 m, 22 Apr. 2005, *leg. P. Czarnota 4472* (GPN); Eb-83 – MIDDLE SUDETES, GÓRY KAMIENNE MTS: ca 2 km S of Boguszów Gorce town, worked-out quarry of melaphyre [50°44'36"N/16°10'18"E] alt. ca 500 m, 21 Apr. 2005, *leg. P. Czarnota 4477* (GPN); Eb-94 – GÓRY KAMIENNE MTS: ca 1 km W of Grzmiąca village, by Rybnica stream [50°42'20"N/16°18'55"E] ca 480 m, 21 Apr. 2005, *leg. P. Czarnota 4462* (GPN); Eb-95 –

GÓRY SOWIE MTS: S slope of Wielka Sowa Mt, by stream on N edge of Sokolec village [50°39'46"N/16°28'59"E] alt. ca 620 m, 21 Apr. 2005, *leg. P. Czarnota 4408* (GPN) and above Sokolec village [50°39'55"N/16°29'30"E] alt. ca 700 m, 21 Apr. 2005, *leg. P. Czarnota 4690* (GPN); Ef-85 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, near cross roads to Zaklików and Lipa villages, 8 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LOD 12324); Fb-34 – MIDDLE SUDETES, GÓRY BYSTRZYCKIE MTS: vicinity of 'Torfowisko pod Zieleńcem' nature reserve, by road to Duszniki Zdrój town [50°20'49"N/16°24'06"E] alt. 640 m, *leg. P. Czarnota 4742* (GPN); Fb-45 – GÓRY BYSTRZYCKIE MTS: by road between Poręba village and Spalone Pass [50°14'10"N/16°34'29"E] alt. 610 m, 20 Apr. 2005, *leg. P. Czarnota 4771, 4772* (GPN); Fb-48 – EASTERN SUDETES, GÓRY ŻŁOTE MTS: Góry Białskie Mts, 'Nowa Morawa' nature reserve, W slope of Solec Mt., alt. ca 900 m, Aug. 2003, *leg. K. Szczepańska* (Hb. Szczepańska); Ff-82 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE DYNOWSKIE FOOTHILLS: 'Herby' nature reserve, S of Jazowa village [49°50'34"N/21°39'58"E] alt. 440 m, 17 Apr. 2005, *leg. P. Czarnota 4490* (GPN); Gd-16 – WESTERN BESKIDY MTS, BABIA GÓRA RANGE: N slope of Babia Góra Mt. above Markowe Szczawiny shelter-house, Babiogórski National Park, forest section no. 22a [49°34'45"N/19°31'22"E] alt. ca 1320 m, 9 June 2004, *leg. P. Czarnota 4104* (GPN); Ge-11 – GORCE MTS: Gorce National Park, outcrops by hiking track below Figurki Dolne glade, alt. 1100 m, 4 Nov. 1999, *leg. P. Czarnota* (GPN 2252); Ge-12 – BESKID WYSPOWY MTS: W slope of Modyń Mt. [49°37'23"N/20°22'37"E] alt. 890 m, 2 July 2005, *leg. P. Czarnota 4590* (GPN) and [49°37'21"N/20°22'32"E] alt. 900 m, 2 July 2005, *leg. P. Czarnota 4591* (GPN); Ge-20 – GORCE MTS: Gorce National Park, valley of Olszowy stream [49°33.64'N/20°05.66'E] alt. 800 m, 18 July 2003, *leg. P. Czarnota* (GPN 3304); Ge-21 – GORCE MTS: Gorce National Park: valley of Jaszczę stream, S slope of Jaworzyna Kamienicka Mt., alt. 1140 m, 5 Nov. 1997, *leg. P. Czarnota* (GPN 1766), Dolina Kamienicy valley below Bieniowe glade, alt. 820 m, 1 July 1999, *leg. P. Czarnota* (GPN 1964, 1966), Dolina Kamienicy valley, N slope of Jaworzyna Kamienicka Mt., alt. 1060 m, 19 July 1999, *leg. P. Czarnota* (GPN 2022), between the hill of Kudłoń Mt. and Pustak glade, 6 Nov. 2001, *leg. P. Czarnota* (GPN 2682); Ge-27 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: E edge of Berest village by anonymous stream [49°30'56"N/20°59'00"E] 25 Sept. 2005, *leg. P. Czarnota 4557* (GPN); Ge-34 – WESTERN BESKIDY

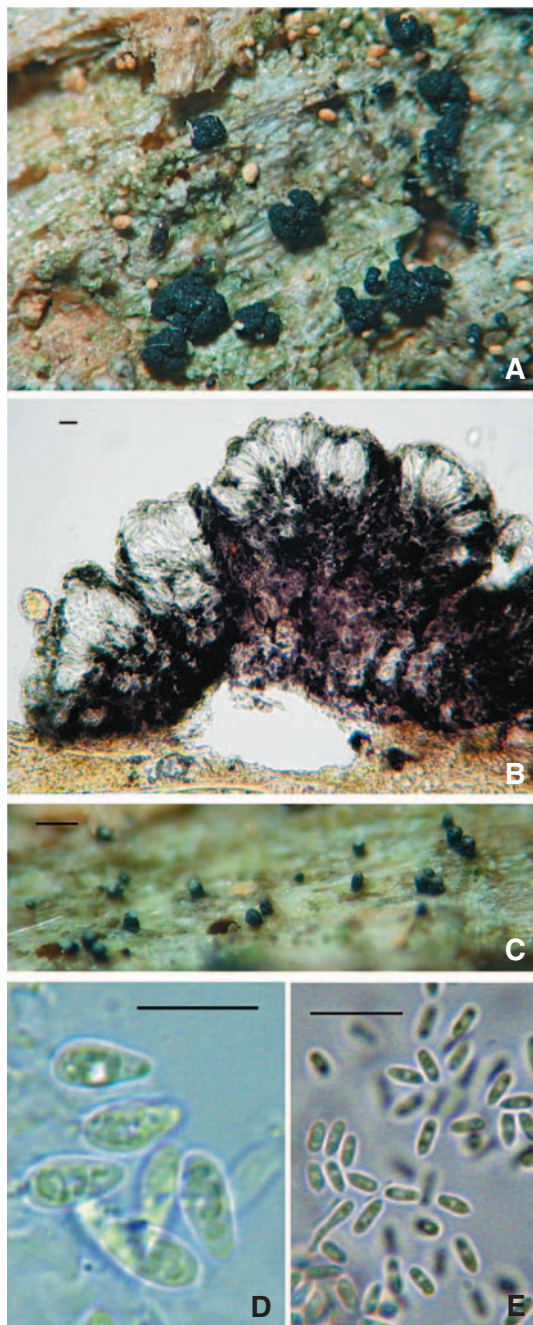
MTS, BESKID SADECKI MTS: Radziejowa range, Piwniczna forest division, Roztoka Wielka forest district, forest section no. 182 above 'Baniska' nature reserve [49°26'51"N/20°36'44"E] alt. 1040 m, 4 Nov. 2004, leg. P. Czarnota 4337 (GPN) and alt. ca 1060 m, 4 Nov. 2004, leg. P. Czarnota 4325, 4378 (GPN); Ge-36 – BESKID SADECKI MTS: Jaworzyna Krynicka range, 'Żebracze' nature reserve, alt. 730 m, 5 July 2001, leg. P. Czarnota (GPN 2471, 2557, 2593) and alt. 870 m, 5 July 2001, leg. P. Czarnota (GPN 2576); Ge-50 – TATRA MTS, HIGH TATRA MTS: Tatra National Park, Dolina Roztoki valley near Wodogrzmoty Mickiewicza waterfall [49°13'N/20°04'E] alt. 1120 m, 6 Aug. 2003, leg. P. Czarnota (GPN 3333); Gf-22 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: S slope of Piotruś Mt., above Stasianie forester's lodge [49°28'11"N/21°44'57"E] alt. ca 670 m, 5 Aug. 2004, leg. P. Czarnota 4052 (GPN).

ADDITIONAL SPECIMENS EXAMINED. CZECH REPUBLIC, RYCHLEBSKÉ HORY: near the border of Poland, S of Bilá Voda village, valley of Bilá Voda stream, vicinity of Šafářova skála outcrop [50°24'35"N/16°53'38"E] alt. ca 500 m, on vertical walls of gneiss boulders in underhangs within shaded spruce mountain forest, 23 Apr. 2004, leg. P. Czarnota 4214 (GPN). IRELAND, ANTRIM: Breen Wood, on small rock underhang in valley, 19 Oct. 1992, leg. B. J. Coppins 15458 (E). SCOTLAND, NORTH EBUDES: Eigg, near (just N of) the Lodge, alt. 45 m, on thin roots in underhang, 25 May 2000, leg. B. J. Coppins 19214 (E).

***Micarea nigella* Coppins (Figs 3F, 4C, 42 & 43)**

Bull. Brit. Mus. (Nat. Hist.), Bot. **11**(2): 163. 1983. TYPE: Denmark, Jyllandia, ca 16 km septentriones e Hobro, Rold Skov, Torstedlund Skov, ad truncum decorticatum vetustum coniferrarum in sylva mixta, 8 Aug. 1979, B. J. Coppins 4429 (E – HOLOTYPE!).

Thallus endosubstratal or visible as a slightly whitish-green or greyish tinge of the lignum. Photobiont micareaoid; algal cells 4–8 µm. Apothecia usually absent or few, black, immarginate from the start, hemispherical to subglobose, simple, 0.1–0.2 mm wide or tuberculate and then to 0.3 mm. Hymenium 25–30 µm tall, hyaline throughout or often with dull olive-black vertical streaks, sometimes with purple tinge towards hypothecium; epihymenium irregular, similarly dark olivaceous-black pigmented; pigment confined to gel-matrix, K+ dull blackish-green. Asci clavate, 20–28 × 8–11 µm. Ascospores ovoid, ovoid-ellipsoid,



**Fig. 42.** *Micarea nigella* Coppins: A – morphology (leg. J. Kiszka, 19 July 2001, KRAP); B – vertical section of tuberculate apothecia (KRAM-L 15954); C – stalked pycnidia bearing mesoconidia (leg. J. Kiszka, 19 July 2001, KRAP); D – ascospores, E – mesoconidia (GPN 4045). Scale bars: B, D & E = 10 µm, C = 100 µm.

simple, (5.7–)7.2–9.6 × (2.4–)2.6–3.9(–4.2) μm diam. Paraphyses rather sparse of two types: (1) hyaline, scarcely branched, thin, *ca* 1 μm wide, above slightly increasing; (2) rarer, stout, up to 2.5–3 μm wide, usually concentrated into dark pigmented, small, vertical streaks; walls pigmented at least near hypothecium. Hypothecium 60–120 μm tall, purple-black, dark purple-brown or sometimes with dull olive-blackish tinge, composed of dark coated, stout hyphae, K<sup>+</sup> dull black-green or here and there K<sup>+</sup> purple-black, HNO<sub>3</sub><sup>+</sup> purple-red. Excipulum thin, usually visible as a reflexed, external, dark zone bordering the hymenium. Pycnidia numerous, black, glossy, short-stalked, often sessile or almost emergent from the substratum, 60–200 μm tall together with pale pycnidiohores, simple or often concentrated into small clusters, ostioles often gaping and extruding whitish mass of conidia; pycnidial walls dark green-black, but lower part paler with ±purple tinge, K<sup>+</sup> dull green and sometimes K<sup>+</sup> purplish, HNO<sub>3</sub><sup>+</sup> purple-red; mesoconidia (3.0–)3.3–3.9(–4.3) × 1.3–1.6 μm diam., ellipsoid to cylindrical, sometimes biguttulate.

NOTES. Considering the original description of *M. nigella* made by Coppins (1983), it would seem to be easily identified by its characteristic, dark, ±purple pigmented hypothecium or concolorous lower part of pycnidial walls, turning K<sup>+</sup> black-green and HNO<sub>3</sub><sup>+</sup> purple-red, as well as a lack of an external thallus. Unfortunately, most collections from Poland have no apothecia and their identification was based on known pigmentation within pycnidia and the colour reactions mentioned above. It was sometimes very problematic owing to the abundance of the purple pigment, which is probably variable and likely to be dependent on ecological conditions, particularly the kind of substratum, and the relationship with associated fungi and plants. In the pycnidial stage, *M. nigella* can be easily confused with *M. melaeniza* and lignicolous forms of *M. botryoides* forming ±stalked or ±emergent pycnidia, an inconspicuous thallus and sometimes also black apothecia. Remarks on *M. nigella* and *M. botryoides* are mentioned earlier (see under *M. botryoides*).

Although there is a large similarity between *M. nigella* and *M. botryoides* (in endoxylic instances), results of phylogenetic analyses of DNA sequences (ITS) show that they really belong to different infrageneric groups. This is in contrast to the pair of *M. nigella* and *M. melaeniza* (Andersen 2004). Both these species are very closely related, forming a sister pair of taxa and should perhaps be even treated as synonyms. According to Coppins (1983: 156, 164), they mainly differ in the hypothecial and pycnidial pigmentation, as well as in the size of mesoconidia. It is hard to say whether the purple tinge of the pigmentation is a persistent feature of *M. nigella*, but there are some data to suppose that the ‘fresh’ holotype of *M. melaeniza* may have had some purplish tinge in the hypothecium, reacting K<sup>+</sup>purple-black as in *M. nigella* (Hedlund 1892: 97; *M. melaeniza*: ‘hypothecium rubricosum vel nigro-fusca, K saepissime atropurpurea, raro nigro-fusca’). Unfortunately, the type specimens of *M. melaeniza* have not been analyzed here. According to Coppins (1983), *M. melaeniza* is characterized by a ‘hypothecium dark brown, sometimes with a faint reddish (never purplish) tinge, K– or dulling’, but the differences may arise in the examination of old material. It is also known that smaller mesoconidia are characteristic of *M. melaeniza*, but is this sufficient reason to delimit the species? Two Polish specimens recognized first as *M. cf. melaeniza* (see below) on the basis of the size of mesoconidia appear to be *M. nigella* with conidia more than 3.3 μm long (up to 3.9 μm), like most examined collections of *M. nigella*; however, some produced slightly shorter conidia, as in KRAM-L 15954.

Despite the above taxonomical doubts, *M. nigella* is treated here as a separate species, but more modern European material identified as *M. melaeniza* needs further study to resolve the problem of this possible synonymy.

Differences and similarities to other lignicolous members of the genus *Micarea* forming black, stipitate pycnidia (*M. misella*), immarginate, subglobose, dark apothecia and inconspicuous thallus [*M. contexta* Hedl., *M. eximia* Hedl., *M. olivacea* Coppins, *M. rhabdogena* (Norman) Hedl.] are provided by Coppins (1983).



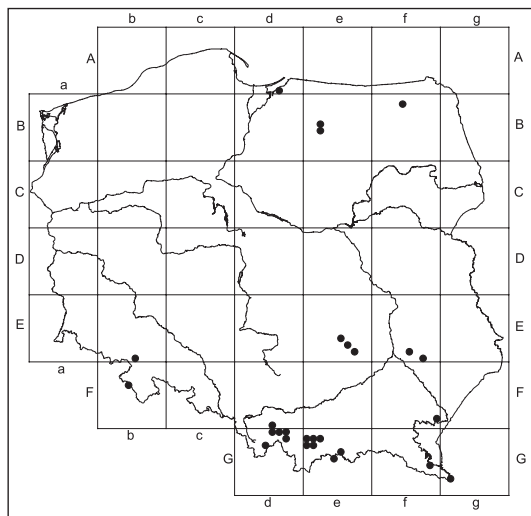


Fig. 43. Distribution map of *Micarea nigella* Coppins in Poland.

**CHEMISTRY.** Material insufficient for analysis by TLC.

**HABITAT AND DISTRIBUTION IN POLAND.** The Polish distribution of *M. nigella* is much more widespread than previously known (Fałtynowicz 2003 and literature cited therein). Microscopic examination of several old collections of lignicolous *Micarea* taxa from Polish herbaria show that it could have been included in the national checklist as early as 1959, being fortuitously collected, usually with *Micarea prasina*, and sometimes with *M. misella* and *M. hedlundii*, from a few Carpathian ranges. Not only was *M. nigella* undescribed at that time, but its black,  $\pm$ stalked pycnidia were overlooked or considered to be autonomic fungi.

This mostly lignicolous species occurs within different forest communities both in the lowlands and mountains. Although, it is found also in secondary spruce stands in the Gorce Mts or in mixed forest within the border of Olsztyn town (Mazurian Lakeland), it mainly prefers large, old-growth woodlands with a huge number of standing or lying decorticated trunks, stumps and logs. It is predominately lignicolous, growing almost always in rather moist, shaded niches on soft wood, in association with *M. prasina*, and

occasionally *Absconditella lignicola*, *Micarea anterior*, *M. botryoides*, *M. misella*, *M. viridileprosa*, *Placynthiella dasaea*, *P. icmalea*, *Trapelia corticola* and *Trapeliopsis granulosa*. Only sporadically it is observed on moribund bryophytes covering this kind of substrate (stumps and fallen logs, e.g. in the peat-bog 'Pod Zieleńcem' in Góry Bystrzyckie Mts). *Micarea nigella* has also been reported from coniferous (pine, spruce-fir), as well as mixed deciduous/coniferous woodlands. Most mountain records come from the belt covered in the beech-spruce-fir forest belonging to the association *Dentario glandulosae-Fagetum*, but it can grow also in the upper mountain spruce forest, as in the Gorce Mts at an altitude of 1160 m, the highest known locality of *M. nigella* in Poland.

**WORLD DISTRIBUTION.** *Micarea nigella* is poorly known, and generally overlooked during field explorations, no doubt because of its usually anamorphic stage which resembles some non-lichenized fungus. Until now, it has been reported from few European countries, but it probably occurs more numerous in boreal and mountainous regions of the Continent.

**EUROPE:** Belgium (Diederich & Sérusiaux 2000); Czech Republic (Palice 1999; Vězda & Liška 1999); Denmark, vulnerable (Søchting 1998; Søchting & Alstrup 2002); Great Britain (Coppins 1983, 2002); Lithuania (Motiejūnaitė *et al.* 2003); Norway (Coppins, pers. comm.); Slovakia (Palice *et al.* 1999); Sweden (Santesson 1993); Switzerland (Palice 1999).

**EXAMINED SPECIMENS.** Grid square Ad-96 – POBRZEŻE GDAŃSKIE COASTLAND, WYSOCZYNA ELBLĄSKA PLATEAU: valley of Grabianka river, Elbląg forest division, Górki forest district, forest section no. 193 [54°16'30"N/19°31'40"E] alt. 90 m, 23 Aug. 2003, *leg. R. Szymczyk* (OLS); Be-42 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE OLSZTYŃSKIE LAKELAND: Olsztyn, Las Miejski Wood in Olsztyn town, 6 Oct. 2000, *leg. D. Kubiak* (OLTC) and 21 Oct. 2000, *leg. D. Kubiak* (OLTC); Olsztyn – Dajtki town, 30 Sept. 2002, *leg. D. Kubiak* (OLTC); Be-52 – POJEZIERZE OLSZTYŃSKIE LAKELAND: Olsztyn town, 2001, *leg. D. Kubiak* (OLTC); Bf-14 – POJEZIERZE ELCKIE LAKELAND: Puszcza Borecka Forest (sq. 53) [50°08'N/22°14'E] 5 June 1996, *leg. A. Zalewska* (OLS-L 1350,

as *M. cf. melaeniza*) and Zielonki forest district, forest section no. 233 (sq. 81) [54°04'N/22°13'E] 12 July 1995, *leg. A. Zalewska* (OLS-L 1380, as *M. cf. melaeniza*, together with *M. misella*); Eb-95 – MIDDLE SUDETES, GÓRY SOWIE MTS: S slope of Wielka Sowa Mt. above Sokolec village [50°39'55"N/16°29'30"E] alt. ca 700 m, 21 Apr. 2005, *leg. P. Czarnota* 4696 (GPN); Ee-65 – WYŻYNA KIELECKA UPLAND, GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park: forest section no. 83, base of Pasma Klonowskie range, 4 July 1998, *leg. S. Cieśliński & A. Donica*, loc. 19 (KTC); Ee-76 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park: Łysogóry range, S slope of Łysica Mt., Święta Katarzyna forest district, forest section no. 195, 6 July 2000, *leg. A. Donica* (KTC), Dębno forest district, forest section no. 129, 2 Aug. 2001, *leg. A. Donica* (KTC together with *M. prasina* s.str.); Ee-87 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, Pasma Bielińskie range, border of forest sections no. 131/132, 3 July 2001, *leg. A. Donica* (KTC); Ef-85 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, forest N of Łukawica stream [50°44'10"N/22°14'05"E] 9 Sept. 1999, *leg. L. Śliwa & B. Krzewicka* (KRA together with *M. misella*); near Narozniki forester's lodge, ca 0.5 km SW of Kolonia Łysaków village, 8 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LOD 12330); Ef-97 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, Porytowe Wzgórze region, ca 2.5 km S of Flisy village [50°37.97'N/22°28.20'E] alt. ca 220 m, 10 Oct. 2003, *leg. P. Czarnota* (GPN 3435); Fb-34 – MIDDLE SUDETES, GÓRY BYSTRZYCKIE MTS: 'Torfowisko pod Zieleńcem' nature reserve, peat-bog covered with *Pinus mugo* and *Pinus rhaetica* [50°20'48"N/16°24'38"E] alt. ca 700 m, 20 Apr. 2005, *leg. P. Czarnota* 4487 (GPN); Fd-95 – WESTERN BESKIDY MTS, BESKID MAŁY MTS: S slope of Beskid Mt., valley of Cisowy stream, alt. 600 m, 12 Apr. 1961, *leg. J. Nowak* (KRAM-L 7024 together with *M. prasina* s.str.); Ff-89 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE DYNOWSKIE FOOTHILLS: Hofubla settlement, 27 Sept. 1983, *leg. J. Kiszka* (BDPA together with *M. prasina* s.str.); Gd-05 – WESTERN BESKIDY MTS, BESKID MAKOWSKI MTS: Pasma Pewelskie range, valley of Wierchowacina stream, alt. 650 m, 23 Aug. 1965, *leg. J. Nowak* (KRAM-L 15282 together with *M. prasina* s.str.), Gd-06 – BESKID ŻYWIECKI MTS: Pasma Jałowieckie range, Lachowice village, Adamy settlement, alt. ca 690 m, 25 July 1965, *leg. J. Nowak* (KRAM-L 15612 together with *M. prasina* s.str.); Gd-07 – BESKID ŻYWIECKI MTS: Pasma Jałowieckie range, Zawoja village, valley of Kalinka stream, Chrząszcze-

Topory settlement, ca 6 km SSW of Sucha Beskidzka, alt. 700 m, 15 July 1965, *leg. J. Nowak* (KRAM-L 15790 together with *M. prasina* s.str.); Gd-17 – BABIA GÓRA RANGE: Polica range, Sucha Góra Mt. near Ska-wica village, alt. 700 m, 23 Oct. 1965, *leg. J. Nowak* (KRAM-L 15954 together with *M. prasina* s.str.); Gd-24 – BESKID ŻYWIECKI MTS: Pilsko range, Sopotnia Wielka village, valley of W Ciemnym stream, alt. 830 m, 17 June 1966, *leg. J. Nowak* (KRAM-L 17070 together with *M. prasina* s.str.); Ge-10 – GORCE MTS: Burcane Mt., W slope above Poręba Górna – Buchole settlement, alt. ca 650 m, 4 Oct. 2003, *leg. P. Czarnota* (GPN 3436 together with *M. viridileprosa*, 3437); Gorce National Park, E slope of Tobołów Mt. below chair-lift, alt. 800 m, 23 Febr. 2002, *leg. P. Czarnota* (GPN 2729 together with *M. anterior*), 29 Mar. 2004, *leg. P. Czarnota* 4045 (GPN); Ge-11 – GORCE MTS: Gorce National Park: NW slope of Gorce Kamienicki Mt. in Dolina Kamiency valley, alt. 1020 m, 8 Sept. 1959, *leg. K. Glanc* (GPN 2559), NE slope of Kudłoń Mt., sources area of Rosocha stream, alt. 1160 m, 9 Oct. 2000, *leg. P. Czarnota* (GPN 2394), NE slope of Tur-baczyk Mt., Pasięka Wood in Domagałów Potok stream, alt. 950 m, 10 May 2000, *leg. P. Czarnota* (GPN 2296); Ge-12 – BESKID WYSPOWY MTS: W slope of Modyń Mt., 0.5 km E of Zalesie village [49°37'44"N/20°22'38"E] alt. 760 m, 2 July 2005, *leg. P. Czarnota* 4663 (GPN); Ge-20 – GORCE MTS: Gorce National Park, valley of Olszowy stream, at foot of Średnie Mt., 27 Oct. 1995, *leg. P. Czarnota* 4397 (GPN); Ge-21 – GORCE MTS: Gorce National Park: E slope of Mostownica Mt. in Dolina Kamiency valley, alt. 1065 m, 4 Mar. 1959, *leg. K. Glanc* (GPN 2561), valley of Ustępnny stream, alt. 800 m, 20 Febr. 1995, *leg. P. Czarnota* (GPN 297) and alt. 880 m, 20 Febr. 1995, *leg. P. Czarnota* 4396 (GPN), NE slope of Przysłoppek Mt., valley of Z Popod Figurek stream, alt. 820 m, 15 Mar. 1997, *leg. P. Czarnota* (GPN 1556 together with *M. prasina* s.str.), Ge-35 – BESKID SADECKI MTS: Jaworzyna Krynicka range, 'Łabowiec' nature reserve, alt. 820 m, 23 Aug. 1966, *leg. M. Olech* (KRA together with *M. prasina* s.str.); Ge-44 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESION, PIENINY MTS: Małe Pieniny range, N border of 'Wysokie Skalki' nature reserve, 24 Sept. 2002, *leg. J. Kiszka* (KRAP together with *M. misella*), as *Micareia* sp.; Gf-58 – EASTERN BESKIDY MTS, WESTERN BIESZCZADY MTS: Bieszczadzki National Park, N slope of Połonina Wetlińska in valley of Bardo stream, 5 Sept. 2001, *leg. J. Kiszka* (KRAP together with *M. prasina* s.str.); Gg-71 – WESTERN BIESZCZADY MTS: Bieszczadzki National Park, by Syhłowaty stream, 19 July 2001, *leg. J. Kiszka* (KRAP).

ADDITIONAL SPECIMENS EXAMINED. LITHUANIA, PRIENAI DISTRICT: Nemunas loops Regional Park, Balbieriškis Forest, forest section no. 50, on rotting deciduous stump in young mixed broadleaf forest, 28 Sept. 2002, leg. P. Czarnota (GPN 3138 together with *M. hedlundii*). SCOTLAND, EAST SUTHERLAND: N side of Dornoch Firth, Spinningdale, Migdale Woods, on *Pinus* stump by stream, alt. 30 m, 1 June 2001, leg. B. J. & A. M. Coppins 20062 (E); TYRONE: ca 5 km E of Gortin, S side of Owenkillew River, Drumlea Wood, on old *Quercus* stump in clearing, alt. 100 m, 11 July 1991, leg. B. J. Coppins 14393 & A. M. O'Dare (E).

***Micarea nitschkeana*** (Lahm ex Rabenh.) Harm.  
(Figs 44 & 45)

Bull. Séances Soc. Sci. Nancy II, **33**: 64. 1899.

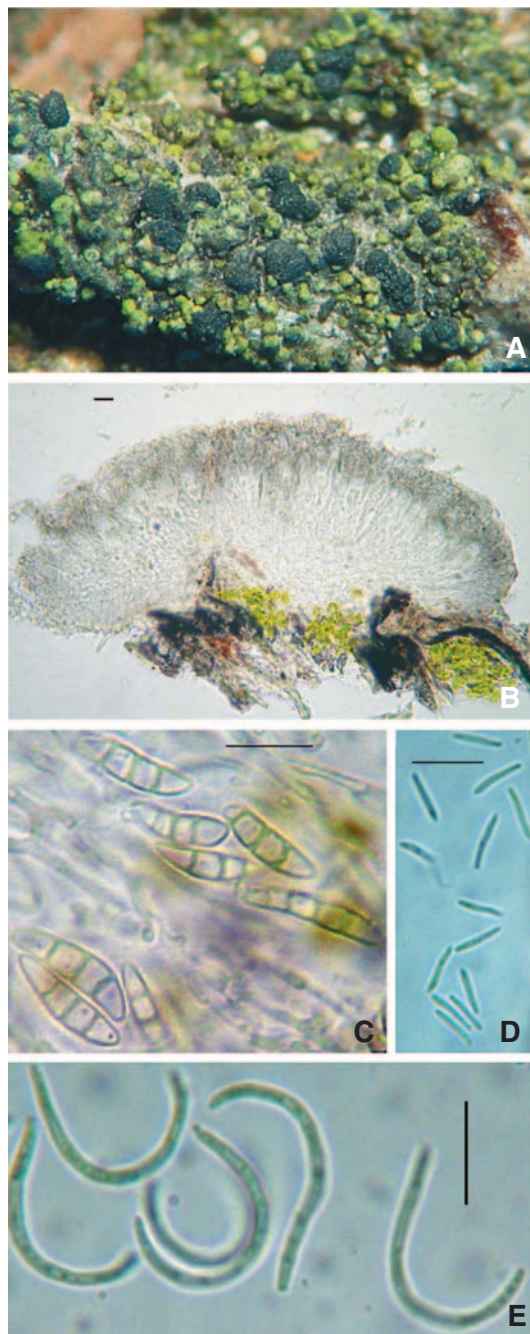
*Bilimbia nitschkeana* Lahm ex Rabenh., *Lich. Eur. No.* 583. 1861. – *Lecidea nitschkeana* (Lahm ex Rabenh.) Stizenb., *Nova Acta Leop.-Carol.* **34**(2): 70. 1867. – *Micarea denigrata* var. *nitschkeana* (Lahm ex Rabenh.) Hedl., *Bih. Kongl. Svenska Vetensk.-Akad. Handl.* III, **18**(3): 79, 90. 1892. – *Bacidia nitschkeana* (Lahm ex Rabenh.) Zahlbr., *Ann. Naturhist. Mus. Wien* **22**: 342. 1905. TYPE: Germany (M – LECTOTYPE, *n.v.*; ISOLECTOTYPES: BM, BM ex K, M, *n.v.*).

– *Lecidea spododes* Nyl., *Flora* **52**: 410. 1869. – *Bilimbia spododes* (Nyl.) Arnold, *Flora* **53**: 473. 1870. – *Micarea denigrata* var. *friesiana* f. *spododes* (Nyl.) Hedl., *Bih. Kongl. Svenska Vetensk.-Akad. Handl.* III, **18**(3): 79, 90. 1892. – *Bacidia spododes* (Nyl.) Zahlbr., *Cat. Lich. Univ.* **4**: 151. 1926. TYPE: England, Hampshire, Lyndhurst, New Forest, old pales, 1869, J. M. Crombie (H-NYL 18819 – LECTOTYPE!; H-NYL 18820 – ISOLECTOTYPE!).

– *Lecidea amaura* Stirt., *Rep. Trans. Glasgow Soc. Field Naturalists* **1**: 22. 1873. TYPE: New Zealand, near Wellington, on palings, J. Buchanan (BM – HOLOTYPE, *n.v.*; Coppins, pers. comm.).

– *Bacidia nitschkeana* f. *microcarpa* Erichsen, *Verh. Bot. Vereins Prov. Brandenburg* **71**: 97. 1929. TYPE: Germany (HBG – HOLOTYPE, *n.v.*).

Thallus usually forming small patches of slightly warted, clustered or sometimes effuse, convex areolae, especially under apothecia or in places with well-developed pycnidia. Areolae whitish-green to pale greenish-grey, C+ slightly red (more visible in cross section), with thin, hyaline, amorphous covering layer, K± slightly violet. Photobiont micareoid, cells globose



**Fig. 44.** *Micarea nitschkeana* (Lahm ex Rabenh.) Harm.: A – morphology (Czarnota 4668, GPN); B – vertical section of apothecia (GPN 3454); C – ascospores (Czarnota 4682, GPN); D – microconidia (leg. S. Cieśliński, 31 Aug. 1987, KTC); E – macroconidia (leg. A. Donica, 1 July 2000, KTC). Scale bars = 10  $\mu$ m.

4–8  $\mu\text{m}$ . Apothecia usually numerous, but rarer or absent when pycnidia well developed, pale grey, leaden, greyish-black or black, sometimes in young apothecia with an indistinct, whitish or occasionally even white margin, shallow-convex, subglobose, single or more often confluent, adnate or rarely tuberculate, 0.1–0.35(–0.5!) mm diam., C+ red. Hymenium hyaline but in the upper part olive-grey, K+ violet, C+ red-violet or sometimes more reddish due to the presence of gyrophoric acid; pigment confined to gel-matrix. Ascospores fusiform, usually slightly curved or straight and then often narrowly ellipsoid, (1–2)–3-septate, (8–)10–16(–20)  $\times$  2–3.5(–4)  $\mu\text{m}$ , apices rounded. Paraphyses of one type, numerous, branched and anastomosed, (1.2–)1.4–1.7  $\mu\text{m}$  wide, distinctly separating in KOH. Excipulum slightly developed, particularly present in young apothecia, visible as more concentrated paraphysis-like hyphae; sometimes in  $\pm$ globose apothecia absent. Pycnidia of three types usually present, but immersed within thallus areolae and scarcely visible or distinct with widely gaping ostioles; walls hyaline or only around the ostiole sometimes olivaceous, K+ violet. Macroconidia curved, or hamate, 1–3-septate, (12–)20–30(–40)  $\times$  1–1.2  $\mu\text{m}$ ; mesoconidia short-cylindrical, (3.5)4–5.5(6)  $\times$  1–1.6  $\mu\text{m}$ ; microconidia narrowly fusiform, 0.7–0.8  $\times$  6–7(–9)  $\mu\text{m}$ .

CHEMISTRY. TLC: gyrophoric acid.

NOTES. *Micarea nitschkeana* is almost identical in many respects with *M. denigrata*, which was the reason for formerly treating this taxon as only a variety of the latter species (Hedlund 1892). Owing to this similarity and the presence of gyrophoric acid, Coppins (1983) included both species in the same infrageneric group together with *M. globulosella*, concluding that ‘These three species appear to show a good example of an evolutionary progression: they are morphologically and chemically  $\pm$ identical except for the length and septation of spores’ (Coppins 1983: 99). Differences between *M. nitschkeana*, *M. denigrata* and *M. globulosella* are presented in Table 4.

Recent studies on the molecular phylogeny of the family Micareaceae Vězda ex Hafellner and the genus *Micareea* based on mitochondrial

SSU rDNA have shown that *M. nitschkeana* is very closely related to *M. denigrata* (Andersen & Ekman 2005). Further analysis using mitochondrial small subunit rDNA, as nuclear ITS rDNA region and  $\beta$ -tubulin sequences as well suggest that *M. nitschkeana* forms a monophyletic group with *M. melaeniza* and *M. nigella* (Andersen 2004). However, the strong phylogenetic relationship of *M. nitschkeana* with the both, morphologically and anatomically different species seems to be impossible. One of the possible explanations would be that the sequences used for phylogenetic analyses did not come from *M. nitschkeana*. It is obvious that this hypothesis requires further investigation based on the analysis of a larger number of specimens.

Verification of Polish specimens referred to *M. nitschkeana* shows that the collections from tree bark are often confused with *M. denigrata* and *M. peliocarpa*, as well as lichens not belonging to the genus *Micareea*, such as *Arthonia mediella* Nyl., *Bacidia beckhausii* Kőr. and *Lecania naegelii* (Hepp) Diederich & van den Boom. *Micareea peliocarpa* differs above all these in its lack of K+ violet reaction of the olive or olive-grey epithecium, its well-developed excipulum and slightly larger, up to 5  $\mu\text{m}$  wide, ascospores. Other, aforementioned taxa may be distinguished from *M. nitschkeana*, among other characteristics, by the absence of gyrophoric acid and C– thallus and apothecial reactions.

HABITAT AND DISTRIBUTION IN POLAND. At the end of the last century, *M. nitschkeana* seemed to be a quite common, but probably overlooked, and for this reason rarely reported in Poland (Kukwa *et al.* 2000); there are several old records (Stein 1879: 188, vicinity of Żagań town ‘am Waldhause bei Sagan’; Eitner 1896: 13, Wólczyn and Wrocław – Leśnica towns ‘bei Constadt O.-S. und im Muckerauer Wald bei Lissa’, 1911: 36, Skoroszów village and vicinity of Piława Górna town ‘Katholisch Hammer und Diersdorfer Wald bei Gnadenfrei’) and several modern reports (see Fałtynowicz 2003: 191), some of which are based on misidentifications (e.g. Czyżewska 1981, 1998 – specimens refer to *M. denigrata* and *Lecania*

**Table 4.** The most important features of *Micarea nitschkeana* (Lahm ex Rabenh.) Harm., *M. denigrata* (Fr.) Hedl. and *M. globulosella* (Nyl.) Coppins.

| Features / Species    | <i>M. nitschkeana</i>   | <i>M. denigrata</i>  | <i>M. globulosella</i>  |
|-----------------------|---|--|---|
| Apothecia size (mm)   | 0.1–0.35(–0.5 sporadically)   | 0.1–0.5(–0.8)  | 0.1–0.3   |
| Thallus type          | warted to areolate  | warted to areolate; in exposed localities usually partly endoxylic   | warted to areolate  |
| Spore septation       | (1–2–)3   | 0–1(2–3 sporadically)  | (0–)1–3(–7 rarely)  |
| Spore shape           | fusiform or narrowly ellipsoid, mostly slightly curved and sometimes straight   | narrowly ellipsoid, oblong-ellipsoid or fusiform, straight or sometimes slightly curved  | rod-shape, narrowly fusiform, sometimes slightly curved or ±sigmoid   |
| Spore dimensions (µm) | (8–)10–16(–20) × 2–3.5(–4)  | (6–)8–14(–18) × 2–3.5(–4)  | (10–)12–19(–24) × 2–2.5(–3)   |
| Macroconidia (µm)     | (12–)20–30(–40) × 1–1.2; 1–3-septate, strongly curved   | 10–25 × 1.2; 1–3-septate, strongly curved  | unknown   |
| Mesoconidia (µm)      | (3.5)4–5.5(6) × 1–1.6; cylindrical  | 3–4.2(–5) × 1.4–1.8(–2); short-cylindrical or obovate  | 3.5–4.5(–5) × 1.2–1.4; cylindrical                                    |
| Microconidia (µm)     | 6–7(–9) × 0.7–0.8   | 6.5–8 × 0.7–0.8  | 3.8–5 × 0.8–1 (follows Coppins 1983); not found in Polish specimens   |
| Pycnidia (meso–)      | immersed within thallus areoles   | immersed within areoles to emergent and often visible as broadly short ±stalked forms with white blobs of mesoconidia                              | immersed within areoles to emergent and often almost ±shortly stalked |
| Habitat               | usually on twigs, and small branches of coniferous trees or stems of forest dwarf shrubs; rarely on wood or bark of trees; in woodlands | on wooden constructions and hard wood of fallen logs and stumps in well-lit places or bark of trees (especially coniferous); not only in woodlands | on bark of trees, rarely on wood; in woodlands                        |

*naegelii*). Other findings reported, for example, by Toborowicz (1976), Miądlikowska (1991, 1997) and Fałtynowicz and Miądlikowska (1990), as well as the abovementioned older records cannot be verified since they are not supported by herbarium material. Later, *M. nitschkeana* proved to be much more frequent in Poland, but concentrated mainly in the north of the country (e.g. Kukwa 2000; Kubiak 2002; Cieśliński 2003c). More recently, unpublished collections of the author from other parts of the country have shown it to be one of the commonest members of the genus *Micarea*, particularly in different kind of coniferous forest. In the lowlands, it is usually found as an epiphyte on twigs, thin branches and trunks of the young trees of *Pinus sylvestris* and *Picea abies* in dry to more or less humid or even boggy forest communities belonging to the order *Dicrano-Pinion*

Libb. 1933 (Matuszkiewicz 2001); accompanying species on this particular substratum include only few other lichens, namely *Lecanora conizaeoides*, *Micarea micrococca* and *Scoliciosporum chlorococcum*. In most, larger pine complexes, such as Bory Tucholskie, Puszcza Notecka and Puszcza Drawska Forests (N Poland) and Puszcza Solska Forest (E Poland), it grows moreover, but more rarely, on dead branches and bark of mature pine trees, and on hard wood of fallen logs or occasionally on trunks of *Betula pendula* and *Quercus* sp. in association with *Imshaugia aleurites*, *Hypogymnia physodes*, *Lecanora conizaeoides*, *Micarea denigrata*, *M. micrococca*, *Mycoblastus fucatus*, *Pycnora sorophora* and *Scoliciosporum chlorococcum*. One collection of *M. nitschkeana* from ‘Jelonka’ nature reserve (leg. Cieśliński, 1996; KTC) was collected from the bark of

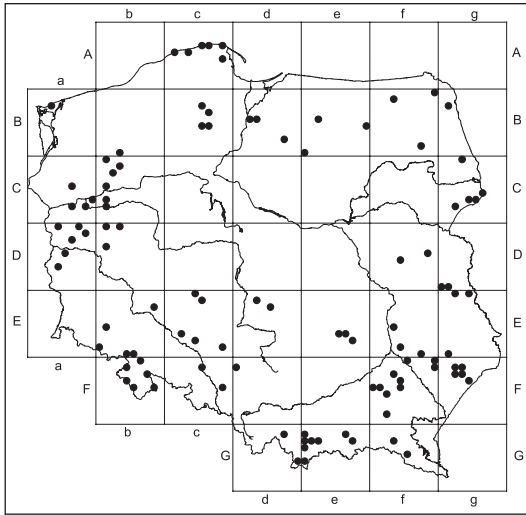


Fig. 45. Distribution map of *Micarea nitschkeana* (Lahm ex Rabenh.) Harm. in Poland.

*Populus tremula* in a non-forest community on post-glacial sandy dunes, together with *Juniperus communis*. Sometimes it is recorded on stems of *Calluna vulgaris* within large pine forests (e.g. in the Bory Tucholskie Forest, GPN 2628).

In the southern, mountainous part of Poland, *M. nitschkeana* was hardly ever reported previously, and unfortunately those records cited by Kuziel (1964), Nowak (1967) and Kiszka and Kościelniak (2001) cannot be confirmed due to the lack of supporting herbarium material. Czarnota (2000) provides some records from the Gorce Mts, but these in fact refer to *Arthonia mediella*. Nevertheless, recent exploration of this mountain range, as well as other parts of the Carpathians and also Sudetes, show that *M. nitschkeana* is quite frequent there. Several earlier collections from the Tatras and Western Beskidy Mts were unfortunately incorrectly determined or overlooked. In the light of the above, all mountain localities presented here (except several from Góry Świętokrzyskie Mts – see Łubek 2003) are new to this part of Poland. *Micarea nitschkeana* is mainly found there on twigs of *Picea abies* or *Abies alba* within natural or secondary coniferous forest communities in both forested mountain belts. It prefers, however, lower altitudes, but can probably go up to

the upper timber limit, although its highest Polish locality is 1220 m in the Tatra Mts (cf. 1250 m in the Nízke Tatry of Slovakia – Coppins 1983). It is especially frequent on young trees growing along streams, forest roads and woodland edges, in rather moist places, but exposed to light. Several mountain specimens of *M. nitschkeana* have also been collected from the bark of young trees of *Salix caprea* and *Prunus* sp., from the wood of fallen logs or stumps and handrails of tourist constructions, and in the Góry Świętokrzyskie Mts it was found on a fallen trunk of *Sorbus aucuparia* and standing trees of *Pinus sylvestris* within coniferous forest and on *Alnus glutinosa* in young, boggy alder forest. *Micarea nitschkeana* seems to be particularly frequent in the Sudetes, where it is known from almost every mountain range, often locally abundantly, as in boggy spruce forest in the Góry Izerskie Mts. Towards the east it is not so common and the single record from the Bieszczady Mts (Kiszka & Kościelniak 2001) could not be confirmed, but it may grow there in secondary spruce forests, since has been collected in the Ukrainian part of the Carpathians close to Polish border (Coppins *et al.* 1998).

WORLD DISTRIBUTION. *Micarea nitschkeana* is widely distributed through most of Europe from the boreal regions of Fennoscandia and Baltic countries, British Isles, mountainous areas of the central part of the Continent to Mediterranean regions including the Canary Islands. There is highly probably that it also occurs in Belarus and throughout the European, boreal part of Russia. In North America it is probably more common than suggested by published reports. In the Southern Hemisphere it is known on worked timber from New Zealand and Tasmania.

EUROPE: Austria (Hafellner & Türk 2001); Belgium and Luxembourg (Diederich & Sérusiaux 2000); Bulgaria (Popnikolov & Zhelezova 1964, as *Bacidia nitschkeana*); Canary Islands (Hafellner 1995); Czech Republic (Vězda & Liška 1999); Denmark (Søchting & Alstrup 2002); Estonia (Randlane & Saag 1999; Aptroot *et al.* 2005); Finland (Vitikainen *et al.* 1997); France (Coppins 1983); Germany (Scholz 2000) – Lower

Saxony (Hauck 1996), Nordrhein-Westfalen (Heibel 1999), Schleswig-Holstein (Jacobsen 1992); Great Britain and Ireland (Coppins 1983, 2002; Seaward 1994); Italy (Nimis & Martellos 2003); Lithuania (Motiejūnaitė 1999); the Netherlands, common (Aptroot *et al.* 2004); Norway (Santesson 1993); Portugal (van den Boom *et al.* 1990); Romania (Ciurchea 1998); Russia – Leningrad Region (Zavarzin *et al.* 1999), Komi Republic (Hermansson *et al.* 1998); Slovakia (Pišút *et al.* 1996); Slovenia (Suppan *et al.* 2000); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993); Switzerland (Scheidegger *et al.* 2002); Ukraine – Eastern Carpathians (Coppins *et al.* 1998), Leftbank-Pridnieper: Cherkasy oblast (Kondratyuk *et al.* 1998). NORTH AMERICA: USA – California (Coppins 1983), Maine (Sullivan 1990; Greene 2005). AUSTRALOCEANIA: Australia – Tasmania, *leg. Kantvilas* (Coppins, pers. comm.), New Zealand (type of *Lecidea amaura*; Coppins, pers. comm.).

EXSICCATAE SEEN. Arnold, *Lich. Exs. No. 503C* (E); Hepp., *Flecht. Eur. No. 20* (E) and *No. 21 p.p.* (E); Lojka, *Lich. Hung. No. 305* (E); Magnusson, *Lich. Sel. Scand. No. 340* (POZ).

SPECIMENS EXAMINED. Grid square Ac-35 – POBRZEŻE KOSZALIŃSKIE COASTLAND, WYBRZEŻE SŁOWIŃSKIE COAST: Choczewo forest division, Szklana Huta forest district, forest section no. 109f, ca 3.5 km W of Białogóra village, 9 Oct. 2000, *leg. A. Kowalewska s.n.* (UGDA); Ac-36 – WYBRZEŻE SŁOWIŃSKIE COAST: ‘Białogóra’ nature reserve, 28 July 1982, *leg. W. Faltynowicz* (UGDA-L 1468), as *Catillaria denigrata*; Ac-38 – WYBRZEŻE SŁOWIŃSKIE COAST: Bielawskie Błota peat-bog, 24 July 1981, *leg. W. Faltynowicz* (POZ; UGDA-L 1015), as *Bacidia trisepta*; coastal pine forest between Jastrzębia Góra and Karwia villages, 8 Aug. 2002, *leg. P. Czarnota* (GPN 2934); Ac-41 – WYBRZEŻE SŁOWIŃSKIE COAST: Słowiński National Park, forest sections no. 22 and 24c, 17 Nov. 1989, *leg. M. Truchan* (Hb. Izydorek); Ac-43 – WYBRZEŻE SŁOWIŃSKIE COAST: Słowiński National Park, 1 km NW of Rąbka village [54°39'N/17°33'E] 24 Oct. 1999, *leg. M. Kukwa s.n.* (OLS); Ac-58 – POBRZEŻE GDAŃSKIE COASTLAND, POBRZEŻE KASZUBSKIE COASTLAND: Puszcza Darżłubska Forest, by shore of Sztobor Lake, 18 Sept. 1998, *leg. P. Czarnota* (GPN 480) and *leg. M. Kukwa* (Hb. Kukwa 277); Ba-23 – POBRZEŻE SZCZECIŃSKIE COASTLAND, UZNAM AND WOLIN IS-

LANDS: Wolin Island, Woliński National Park, Wiselka forest district, ‘Grodno’ rest-centre by forest section no. 10Aj [53°58'02"N/14°31'38"E] alt. ca 40 m, 17 May 2004, *leg. P. Czarnota 4305* (GPN); Bb-93 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, POJEZIERZE WAŁECKIE LAKELAND: by road between Mirosławiec and Tuczno towns [53°19'50"N/16°07'04"E] alt. 170 m, 9 Apr. 2006, *leg. P. Czarnota 4824* (GPN); Bc-25 – BORY TUCHOLSKIE FOREST: Wdzydzki Landscape Park, S of Schodno village, 17 June 2002, *leg. A. Kowalewska s.n.* (UGDA); SE of Loryniec village, Kościerzyna forest division, Grzybowski Młyn forest district, forest section no. 356m, 18 July 2002, *leg. A. Kowalewska s.n.* (UGDA); Bc-36 – BORY TUCHOLSKIE FOREST, ‘Kamienne Kręgi’ nature reserve, ca 2 km W of Odry village, 27 Sept. 2001, *leg. P. Czarnota* (GPN 2628, 2629, 2630); Bc-55 – BORY TUCHOLSKIE FOREST: 0.5 km SW of Łosiny village, 16 Aug. 2002, *leg. P. Czarnota* (GPN 3096); Bc-56 – BORY TUCHOLSKIE FOREST: Woziwoda forest division: Dąbki forest district, forest section no. 48l, 15 Aug. 2002, *leg. P. Czarnota* (GPN 3059), Ustronie forest district, forest section no. 23j, 16 Aug. 2002, *leg. P. Czarnota* (GPN 3099, 3105, 3108) and Biała forest district, forest section no. 129, 16 Aug. 2002, *leg. P. Czarnota* (GPN 3073, 3074, 3084); Bd-42 – POJEZIERZE IŁAWSKIE LAKELAND, POJEZIERZE IŁAWSKIE LAKELAND: Kwidzyń forest division, Lisewo forest district: forest section no. 187b, ca 1 km SW of Nowa Wieś village, 3 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa 108), forest section no. 197, NW of Małki village, 26 Dec. 2003, *leg. M. Kukwa 2877* (UGDA), forest section no. 198, ca 0.5 km W of Małki village, 30 Dec. 1994, *leg. M. Kukwa* (Hb. Kukwa 36), forest section no. 211, ca 1 km N of Małki village, 31 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa 119), forest section no. 212, E of Ryjewo village, 21 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa 107), forest section no. 217, W of Klecewko village, 1 Sept. 1996, *leg. M. Kukwa* (Hb. Kukwa 109); Kwidzyń forest division, Biały Dwór forest district: forest section no. 229, between Ryjewo and Klecewko villages, 31 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa 116), forest section no. 227, 31 Aug. 1996, *leg. M. Kukwa* (Hb. Kukwa 106), forest section no. 232, 19 Sept. 1996, *leg. M. Kukwa* (Hb. Kukwa 118, 124), forest section no. 239, 23 Sept. 1996, *leg. M. Kukwa* (Hb. Kukwa 115, 117), forest section no. 250, near Brachlewo village, 3 Aug. 1997, *leg. M. Kukwa* (Hb. Kukwa 113); Bd-43 – POJEZIERZE IŁAWSKIE LAKELAND: 2 km S of Nowa Wieś village, 19 Sept. 1995, *leg. M. Kukwa* (Hb. Kukwa 114); Bd-77 – POJEZIERZE IŁAWSKIE LAKELAND: ‘Żurawinowe Bagno’ nature reserve, near Smolniki village [53°32'N/19°37'E] 7 July

1996, *leg. A. Zalewska* (OLS-L 1259) and 29 Aug. 1997, *leg. A. Zalewska* (OLS-L 1278); Be-42 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE OLSZTYŃSKIE LAKELAND: Olsztyn town, Las Miejski forest, loc. OL-E-19, June 2001, *leg. D. Kubiak 1461* (OLTC); Olsztyn town, ‘Redykajny’ nature reserve, loc. OL-G-12, 3 Aug. 2000, *leg. D. Kubiak 1462* (OLTC); Be-59 – POJEZIERZE MRAGOWSKIE LAKELAND: Puszcza Piska Forest, ca 1.5 km S of Lipowo village, 31 Aug. 1987, *leg. S. Cieśliński* (KTC together with *M. denigrata*); Be-90 – POJEZIERZE CHEŁMIŃSKO-DOBZYŃSKIE LAKELAND, GARB LUBAWSKI HUMMOCK: Wzgórza Dylewskie Landscape Park, rest centre ‘Inter-Piast’ in Kalbornia village near Dąbrowa Wielka Lake, 10 Sept. 2002, *leg. P. Czarnota* (GPN 3236); Bf-09 – POJEZIERZE LITEWSKIE LAKELAND, RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, Leszczewo – Kolonia village, 13 Sept. 1984, *leg. J. Nowak* (KRAM-L 26092); Bf-13 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE ELCKIE LAKELAND: Puszcza Borecka Forest: Zielonki forest district, forest section no. 197 [54°04'N/22°09'E] alt. 155 m, 8 July 1995, *leg. A. Zalewska* (OLS-L 1383), Knieja forest district, forest section no. 70 [54°06'N/22°03'E] alt. 165 m, 8 June 1995, *leg. A. Zalewska* (OLS-L 1382); Bf-87 – NIZINA PÓLNOCPODLASKA LOWLAND, KOTLINA BIEBRZAŃSKA BASIN: 1 km NW of Downary Plac village, 29 Aug. 1990, *leg. S. Cieśliński* (KTC), as *Micarea* sp.; Bg-21 – POJEZIERZE LITEWSKIE LAKELAND, RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, forest section no. 916, N of Płaskie Lake, 1995, *leg. S. Cieśliński* (KTC); Ca-37 – POJEZIERZE ZACHODNIOPOMORSKIE LAKELAND, POJEZIERZE CHOSZCZEŃSKIE LAKELAND: ca 3 km N of Barlinek town, valley of Płonia stream [53°00'49"N/15°15'53"E] 9 Apr. 2006, *leg. P. Czarnota 4826* (GPN); Ca-46 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, RÓWNINA GORZOWSKA PLAIN: ca 2 km SE of Trzcinnia village by road between Gorzów Wielkopolski and Myślibórz towns [52°52'14"N/15°00'35"E] alt. ca 60 m, 16 May 2004, *leg. P. Czarnota 4292, 4293* (GPN); Ca-69 – PRADOLINA TORUŃSKO-EBERSWALDZKA VALLEY, KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, ca 1 km N of Dobrojewo village [52°42'49"N/15°28'40"E] 8 Apr. 2006, *leg. P. Czarnota 4839* (GPN); Ca-76 – KOTLINA GORZOWSKA BASIN, Puszcza Rzepińska Forest, ca 1 km E of Krzeszyce village by road to Gorzów Wielkopolski town [52°34'55"N/15°03'19"E] 8 Apr. 2006, *leg. P. Czarnota 4814* (GPN); Ca-78 – POJEZIERZE LUBUSKIE LAKELAND, POJEZIERZE ŁAGOWSKIE LAKELAND: Puszcza Rzepińska Forest, ca 7 km W of Skwierzyzna town [52°35'25"N/15°19'41"E] 8 Apr. 2006, *leg. P. Czarnota 4796* (GPN); Cb-01 – PO-

JEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, RÓWNINA DRAWSKA PLAIN: Puszcza Drawska Forest, between Recz and Kalisz Pomorski towns, 9 Apr. 2006, *leg. P. Czarnota 4818* (GPN); Cb-13 – POJEZIERZE WAŁECKIE LAKELAND: Puszcza Drawska Forest, by road between Tuczo and Człopa towns [53°09'24"N/16°07'46"E] alt. 130 m, 9 Apr. 2006, *leg. P. Czarnota 4822* (GPN); Cb-22 – RÓWNINA DRAWSKA PLAIN: Puszcza Drawska Forest, Drawieński National Park: on border of forest sections no. 307 and 308 [53°04'30"N/15°56'49"E] alt. ca 70 m, 18 May 2004, *leg. P. Czarnota 4282* (GPN), forest section no. 307k, ca 0.5 km W of Ostrowiec Lake, 18 May 2004, *leg. P. Czarnota 4290* (GPN), small clearing in forest section no. 248 near ‘Radęcin’ nature reserve [53°05'47"N/15°53'39"E] 18 May 2004, *leg. P. Czarnota 4279* (GPN); Cb-41 – POJEZIERZE DOBIEGIEWSKIE LAKELAND: ca 0.5 km N of Drezdenko town [52°51'19"N/15°50'40"E] 9 Apr. 2006, *leg. P. Czarnota 4830* (GPN); ca 1 km N of Drezdenko town, forest by road to Zagórze village [52°52'03"N/15°51'16"E] 9 Apr. 2006, *P. Czarnota 4834* (GPN); Cb-61 – PRADOLINA TORUŃSKO-EBERSWALDZKA VALLEY, KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, ca 0.5 km E of Sowią Góra settlement [52°42'18"N/15°50'57"E] 10 Apr. 2006, *leg. P. Czarnota 4849* (GPN); Cb-71 – KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, ca 3 km S of Sowią Góra settlement [52°40'12"N/15°50'55"E] 10 Apr. 2006, *leg. P. Czarnota 4805* (GPN); Cg-03 – NIZINA PÓLNOCPODLASKA LOWLAND, WYSOCZYŻNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, ‘Góra Pieszcza-na’ forest reserve, forest section no. 149, 8 Sept. 1987, *leg. S. Cieśliński & I. Zielińska* (KTC); Cg-56 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowiecki National Park, forest section no. 371 [52°45'N/23°55'E] 2 May 1998, *leg. A. Zalewska* (OLS-L 1385); Cg-64 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Hajnówka forest division, forest section no. 572, ‘Michnówka’ nature reserve, 11 Aug. 2002, *leg. P. Czarnota* (GPN 3011); Cg-65 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowieża forest division, forest section no. 494, 13 Aug. 2002, *leg. P. Czarnota* (GPN 3025); Cg-72 – RÓWNINA BIELSKA PLAIN: ‘Jelonka’ nature reserve, ca 2.5 km E of Kleszczele town, 1996, *leg. S. Cieśliński* (KTC), as *M. peliocarpa*; Da-04 – POJEZIERZE LUBUSKIE LAKELAND, RÓWNINA TORZYMSKA PLAIN: Puszcza Rzepińska Forest, ca 4 km S of Rzepin town, Nowy Młyn forest district [52°18'03"N/14°46'37"E] alt. 60 m, 8 Apr. 2006, *leg. P. Czarnota 4840* (GPN); Da-07 – POJEZIERZE ŁAGOWSKIE LAKELAND, Puszcza Rzepińska Forest, by the border of ‘Pawski Ług’ nature reserve,



- by road between Łągów village and Torzym town [52°18'44"N/15°15'27"E] 8 Apr. 2006, *leg. P. Czarnota 4803* (GPN); Da-18 – POJEZIERZE ŁAGOWSKIE LAKE-LAND: 0.5 km W of Przelazy village [52°13'56"N/15°22'07"E] 8 July 2005, *leg. P. Czarnota 4680* (GPN); Da-26 – RÓWNINA TORZYMSKA PLAIN: by road between Bytnica village and Krosno Odrzańskie town [52°07'27"N/15°08'05"E] alt. 45 m, 8 July 2005, *leg. P. Czarnota 4648* (GPN); Da-45 – WZNIESIENIA ZIELONOGÓRSKIE HEIGHTS, WZNIESIENIA GUBIŃSKIE HEIGHTS: by road between Krosno Odrzańskie and Gubin towns [51°59'24"N/14°58'29"E] 8 July 2005, *leg. P. Czarnota 4617* (GPN); Da-64 – OBNIŻENIE DOLNOŁUŻYCKIE DEPRESSION, KOTLINA ZASIECKA BASIN: Bory Zielonogórskie Forest, 2 km S of Brody village [51°46'06"N/14°48'14"E] 8 July 2005, *leg. P. Czarnota 4639* (GPN); Db-01 – POJEZIERZE LUBUSKIE LAKE-LAND, BRUZDA ZBĄSZYŃSKA DEPRESSION: Pszczewski Landscape Park, ca 2 km N of Trzciel village, E of Wielkie Lake, 7 July 2005, *leg. P. Czarnota 4627* (GPN); Db-03 – POJEZIERZE WIELKOPOLSKO-KUJAWSKIE LAKE-LAND, POJEZIERZE POZNAŃSKIE LAKE-LAND, ca 0.5 km S of Bolewicko village near Nowy Tomyśl town, 7 July 2005, *leg. P. Czarnota 4667, 4674* (GPN); Db-31 – POJEZIERZE LUBUSKIE LAKE-LAND, BRUZDA ZBĄSZYŃSKA DEPRESSION: ca 4 km S of Babimost town by road to Kargowa village, 7 July 2005, *leg. P. Czarnota 4654, 4655* (GPN); Df-48 – NIZINA POŁUDNIOWOPODLASKA LOWLAND, RÓWNINA ŁUKOWSKA PLAIN: by road between Łuków and Międzyrzec Podlaski towns [51°58'25"N/22°40'24"E] 21 June 2005, *leg. P. Czarnota 4721* (GPN); Df-54 – RÓWNINA ŁUKOWSKA PLAIN: 'Jata' nature reserve, Łuków forest division, forest section no. 285 [51°57'21"N/22°11'25"E] 21 June 2005, *leg. P. Czarnota 4712* (GPN); Dg-90 – WESTERN POLESIE, RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Lasy Parczewskie Wood, Parczew forest division, forest section no. 70, 'Torfowisko przy Jeziorze Czarnym' nature reserve [51°31'05"N/23°02'15"E] 27 Oct. 2004, *leg. P. Czarnota 4247, 4248* (GPN); Dg-91 – RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Lasy Parczewskie Wood, ca 2 km NE of Stary Orzechów village by road between Łęczna town and Sosnowica village [51°30'14"N/23°02'53"E] alt. ca 160 m, 27 Oct. 2004, *leg. P. Czarnota 4222, 4225* (GPN); Ea-77 – WESTERN SUDETES, GÓRY IZERSKIE MTS: Dolina Izery valley, ca 0.5 km W of Orle settlement, in spruce stand on peat-bog [50°49.16'N/15°22.77'E] alt. ca 800 m, 9 July 2003, *leg. P. Czarnota* (GPN 3306); Eb-28 – WAŁ TRZEBNICKI RAMPART, WZGÓRZA TRZEBNICKIE HILLS: ca 3 km W of Oborniki Śląskie town [51°17'43"N/16°52'12"E] alt. ca 160 m, 30 Aug. 2004, *leg. P. Czarnota 4078* (GPN); Eb-51 – POGÓRZE ZACHODNIOSUDECKIE FOOTHILLS, POGÓRZE KACZAWSKIE FOOTHILLS: near Kamiennik stream, E of Świerzawa town [51°00'37"N/15°59'00"E] alt. ca 290 m, 22 Apr. 2005, *leg. P. Czarnota 4749* (GPN); Eb-80 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park: Dolina Łomniczki valley [50°45.74'N/15°45.48'E] alt. 730 m, 7 July 2003, *leg. P. Czarnota* (GPN 3477), [50°45.36'N/15°45.42'E] alt. 770 m, 7 July 2003, *leg. P. Czarnota* (GPN 3518) and [50°45.18'N/15°45.18'E] alt. 800 m, 7 July 2003, *leg. P. Czarnota* (GPN 3454); Eb-94 – MIDDLE SUDETES, GÓRY KAMIENNE MTS: ca 1 km W of Grzmiąca village, by Rybnica stream [50°42'20"N/16°18'55"E] alt. ca 480 m, 21 Apr. 2005, *leg. P. Czarnota 4465* (GPN); Eb-95 – GÓRY SOWIE MTS: S slope of Wielka Sowa Mt. above Sokolec village [50°39'50"N/16°29'16"E] alt. ca 690 m, 21 Apr. 2005, *leg. P. Czarnota 4668* (GPN) and [50°39'55"N/16°29'30"E] alt. ca 700 m, 21 Apr. 2005, *leg. P. Czarnota 4694* (GPN); Ec-04 – OBNIŻENIE MILICKO-GŁOGOWSKIE DEPRESSION, KOTLINA MILICKA BASIN, S of Odolanów town [52°31'27"N/17°45'34"E] alt. 150 m, 4 July 2005, *leg. P. Czarnota 4682, 4683* (GPN); Ec-15 – WAŁ TRZEBNICKI RAMPART, WZGÓRZA OSTRZESZOWSKIE HILLS: ca 2.5 km W of Ostrzeszów town [51°26'13"N/17°51'52"E] alt. 190 m, 4 July 2005, *leg. P. Czarnota 4644* (GPN); Ec-62 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA OLEŚNICKA PLAIN: Bory Namysłowskie Forest, ca 1 km N of Dobrzyń village, by road to Wojcice village [50°57'28"N/17°28'09"E] 23 Apr. 2005, *leg. P. Czarnota 4448* (GPN); Ec-74 – RÓWNINA OPOLSKA PLAIN: Bory Stobrawskie Forest, ca 2 km SE of Karłowice village [50°51'11"N/17°44'32"E] 24 Apr. 2005, *leg. P. Czarnota 4438* (GPN); Ec-88 – WYŻYNA WOŹNICKO-WIELUŃSKA UPLAND, PRÓG WOŹNICKI SCARP: 7 km S of Olesno town, by road between Dobrodzień and Olesno [50°48'31"N/18°24'30"E] alt. 265 m, 4 July 2005, *leg. P. Czarnota 4515* (GPN) and [50°48'38"N/18°24'31"E] alt. 260 m, 4 July 2005, *leg. P. Czarnota 4517* (GPN); Ed-13 – NIZINA POŁUDNIOWOWIELKOPOLSKA LOWLAND, KOTLINA SZCZERCOWSKA BASIN: Bełchatów Industrial Region, Magdalenów-Sarnów village, 11 Oct. 1984, *leg. K. Czyżewska* (LOD 7996), as *Catillaria denigrata*; Ed-25 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, WYSOCZYNA BEŁCHATOWSKA PLATEAU: Bełchatów Industrial Region, Czarny Ług forest district, forest section no. 129, 21 Sept. 1982, *leg. K. Czyżewska* (LOD 6326), as *M. denigrata*; Ee-65 – WYŻYNA KIELECKA UPLAND, GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, Dolina Wilkowska valley, Psary forest district, forest section no. 264, 23 Sept. 2000, *leg. A. Donica* (KTC; GPN 2603); near Świętokrzyski National Park,

Dolina Wilkowska valley, forest section no. 121, 2 July 2001, *leg. A. Donica* (KTC together with *M. micrococca*); Ee-66 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park: Podgórze forest district, forest section no. 41, ‘Czarny Las’ nature reserve [50°54'N/20°55'E] 14 July 2001, *leg. A. Donica* (KTC), Psary forest district, forest section no. 30, ‘Czarny Las’ nature reserve, 1 July 2000, *leg. A. Donica* (KTC), as *M. denigrata*, Wzorki forest district, ‘Mokry Bór’ nature reserve, forest section no. 31, 1 July 2000, *leg. A. Donica* (KTC), as *M. peliocarpa* and 1 July 2000, *leg. A. Donica* (KTC together with *M. prasina* s.str.), Dąbrowa forest district, forest section no. 27, Chrusty Wood, 3 Aug. 2001, *leg. A. Donica* (KTC), as *M. melaena*; Ee-77 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, Łysogóry range, N slope of Łysa Góra Mt., forest section no. 117, upper edge of field-block, 3 July 2000, *leg. A. Donica* (KTC together with *M. denigrata*); Ef-53 – WYŻYNA LUBELSKA UPLAND, WZNIESIENIA URZĘDOWSKIE HEIGHTS: ca 1 km S of Mazanów village [50°59'09"N/21°54'49"E], 26 Oct. 2004, *leg. P. Czarnota 4254* (GPN); Ef-84 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, ca 1 km N of Gielnia village in peat-bog near ponds, 9 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LOD 12333); Puszcza Solska Forest, ca 0.7 km W of Łążek settlement near Zaklików village, N of Sanna River [50°46'21"N/21°59'51"E] alt. ca 170 m, 26 Oct. 2004, *leg. P. Czarnota 4075, 4076* (GPN); Ef-97 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, Porytowe Wzgórze, ca 2.5 km S of Flisy village [50°37.97'N/22°28.20'E] alt. ca 220 m, 10 Oct. 2003, *leg. P. Czarnota* (GPN 3433); Eg-02 – WESTERN POLESIE, RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Poleski National Park, forest section no. 111b [51°27'25"N/23°13'43"E] alt. ca 170 m, 27 Apr. 2004, *leg. P. Czarnota 3863* (GPN) and forest section no. 192b [51°25'35"N/23°10'49"E] 27 Apr. 2004, *leg. P. Czarnota 3888* (GPN); Eg-04 – RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Lasy Sobiborskie Forest, near ‘Żółtowie bagno’ nature reserve [51°25'19"N/23°33'41"E] alt. 120 m, 22 June 2005, *leg. P. Czarnota 4587* (GPN); Eg-91 – ROZTOCZE, MIDDLE ROZTOCZE: Roztoczański National Park, Stogi forest district, forest section no. 179d [50°35'36"N/23°04'36"E] alt. ca 250 m, 28 Apr. 2004, *leg. P. Czarnota 3892* (GPN); Fb-06 – MIDDLE SUDETES, GÓRY SOWIE MTS: below the top of Gąsiorek Mt., ca 1.5 km NW of Srebrna Góra village [50°34'99"N/16°37'01"E] alt. 730 m, 22 Apr. 2004, *leg. P. Czarnota 3839* (GPN); Fb-14 – GÓRY STOŁOWE MTS: Góry Stołowe National Park, ca 0.3 km NW of Batorówek

settlement, by hiking track, alt. 675 m, 23 Apr. 2003, *leg. P. Czarnota* (GPN 3279); Fb-27 – EASTERN SUDETES, GÓRY ŻŁOTE MTS: near Różaniec Pass, by the border of PL/ČR [50°24'11"N/16°52'15"E] alt. 580 m, 19 Apr. 2005, *leg. P. Czarnota 4410* (GPN); Fb-34 – MIDDLE SUDETES, GÓRY BYSTRZYCKIE MTS: ‘Torfowisko pod Zieleńcem’ nature reserve, peat-bog covered with *Pinus mugo* and *Pinus rhaetica* [50°20'48"N/16°24'38"E] alt. ca 700 m, 20 Apr. 2005, *leg. P. Czarnota 4481, 4483* (GPN); Mostowice village [50°17'03"N/16°28'19"E] alt. 580 m, 20 Apr. 2005, *leg. P. Czarnota 4731* (GPN); Fb-45 – GÓRY BYSTRZYCKIE MTS: by road between Poręba village and Spalone Pass, alt. ca 610 m, 20 Apr. 2005, *leg. P. Czarnota 4412* (GPN); Fb-48 – EASTERN SUDETES, GÓRY ŻŁOTE MTS: Góry Białskie Mts, S slope of Jawornik Kobylczny Mt., Dukt Działcowy region, alt. 900 m, 1 Aug. 2003, *leg. K. Szczepańska* (Hb. Szczepańska); Fc-15 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA NIEMODLIŃSKA PLAIN: Bory Niemodlińskie Forest, W of Gwoźdźce village by road between Opole and Krapkowice towns [50°30'34"N/17°54'54"E] alt. ca 130 m, 23 Apr. 2005, *leg. P. Czarnota 4458* (GPN); Fc-48 – KOTLINA RACIBORSKA BASIN: Lasy Raciborskie Forest, ca 1 km W of Goszyce village, by road between Gliwice and Kędzierzyn Koźle towns [50°16'33"N/18°22'59"E] 18 Apr. 2005, *leg. P. Czarnota 4436* (GPN); Fd-10 – RÓWNINA OPOLSKA PLAIN: ca 2 km NE of Koty village, by road between Tworogi and Lubliniec town [50°33'51"N/18°42'48"E] alt. 220 m, 4 July 2005, *leg. P. Czarnota 4632* (GPN); Ff-05 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Forest, 1 km SW of Żdżary village, by road between Nisko and Janów Lubelski towns [50°33'14"N/22°14'03"E] alt. ca 180 m, 25 Oct. 2004, *leg. P. Czarnota 4241* (GPN); Ff-09 – RÓWNINA BIŁGORAJSKA PLAIN: Puszcza Solska Forest, ca 2 km N of Biłgoraj town, near ‘Obary’ nature reserve [50°35'27"N/22°40'52"E] 28 Oct. 2004, *leg. P. Czarnota 4245, 4271* (GPN); Ff-19 – RÓWNINA BIŁGORAJSKA PLAIN: Puszcza Solska Forest, ca 0.5 km E of Smólsko Duże village, by road between Biłgoraj and Józefów towns [50°28'47"N/22°47'42"E] alt. 210 m, 28 Oct. 2004, *leg. P. Czarnota 4262, 4270* (GPN); Ff-23 – RÓWNINA TARNOBRZESKA PLAIN: near road between Nowa Dęba town and Bojanów village [50°24.86'N/21°50.92'E] 6 Aug. 2003, *leg. P. Czarnota* (GPN 3639); Ff-34 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: ca 2 km SE of Wilcza Wola village [50°19.69'N/21°58.23'E] alt. 120 m, 6 Aug. 2003, *leg. P. Czarnota* (GPN 3631); Ff-40 – DOLINA DOLNEJ WISŁOKI VALLEY: Tuszyma forest division, Przacław forest district, forest section no. 115, ‘Bagno Przacławskie’ nature reserve [50°11'16"N/

21°25'27"E] alt. ca 150 m, 18 Apr. 2005, *leg. P. Czarnota 4550* (GPN); Ff-41 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: S edge of Przyłek village, by forester's lodge [50°15.29'N/21°35.53'E] 6 Aug. 2003, *leg. P. Czarnota* (GPN 3641); Ff-44 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: ca 2 km E of Przewrotne village, near Hucisko settlement, 29 Aug. 2002, *leg. P. Czarnota* (GPN 2933); Ff-52 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: ca 2 km S of Przedbórz village by road to Sędziszów Małopolski town [50°09'02"N/21°45'31"E] 18 Apr. 2005, *leg. P. Czarnota 4534* (GPN); Ff-82 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE DYNOWSKIE FOOTHILLS: 'Herby' nature reserve, S of Jazowa village [49°50'34"N/21°39'58"E] alt. 440 m, 17 Apr. 2005, *leg. P. Czarnota 4664* (GPN); Fg-12 – ROZTOCZE, MIDDLE ROZTOCZE: Puszcza Solska Forest, Józefów forest division, Kalina forest district, 'Czartowe Pole' nature reserve near Hamernia village [50°26'25"N/23°06'30"E] alt. ca 250 m, 28 Oct. 2004, *leg. P. Czarnota 4232, 4233* (GPN); Fg-13 – ROZTOCZE, MIDDLE ROZTOCZE: near Rybica settlement, by road to Susiec village [50°24'25"N/23°13'22"E] alt. 300 m, 20 June 2005, *leg. P. Czarnota 4711* (GPN); Fg-22 – KOTLINA SANDOMIERSKA BASIN, PŁASKOWYŻ TARNOGRODZKI PLATEAU: by forest road between Nowy Lubliniec and Susiec villages [50°19'27"N/23°06'16"E] alt. 260 m, 18 June 2005, *leg. P. Czarnota 4701* (GPN); Fg-23 – ROZTOCZE, EASTERN ROZTOCZE: Puszcza Solska Forest, near Paary village [50°23'37"N/23°14'45"E] alt. ca 310 m, 18 June 2005, *leg. P. Czarnota 4724* (GPN); Fg-34 – EASTERN ROZTOCZE: Puszcza Solska Forest, ca 3 km SW of Werchrata village [50°14'04"N/23°27'53"E] alt. ca 310 m, 18 June 2005, *leg. P. Czarnota 4729* (GPN); Gd-17 – WESTERN BESKIDY MTS, BABIA GÓRA RANGE: Polica range, W edge of Hala Krupowa glade, Sucha Góra Mt. [49°37'38"N/19°38'32"E] alt. ca 1150 m, 4 June 2004, *leg. P. Czarnota 3936* (GPN); Gd-59 – TATRA MTS, WEST TATRA MTS: Dolina Strażyska valley by forest track to Wielka Rówień pod Giewontem region, alt. 1150 m, 18 Aug. 1959, *leg. Z. Tobolewski* (POZ together with *M. lignaria*); Ge-10 – WESTERN BESKIDY MTS, GORCE MTS: Gorce National Park, border of forest section no. 47, near Hucisko forester's lodge, alt. 680 m, 7 June 2006, *leg. P. Czarnota 4795* (GPN); Ge-16 – BABIA GÓRA RANGE: N slope of Babia Góra Mt. above Markowe Szczawiny shelter-house, Babiogórski National Park, forest section no. 24a [49°35'07"N/19°30'44"E] alt. ca 1200 m, 9 June 2004, *leg. P. Czarnota 4086* (GPN); Ge-20 – GORCE MTS: Gorce National Park, forest section no. 66b, by Olszowy stream, near border of 'Turbacz' nature reserve [49°33.82'N/20°05.40'E] alt. 770 m, 18 July 2003, *leg.*

*P. Czarnota* (GPN 3511); Ge-21 – GORCE MTS: Gorce National Park, Dolina Kamienicy valley, by Kamienica stream in Mały Borek region [49°33.66'N/20°09.84'E] alt. 980 m, 21 Aug. 2003, *leg. P. Czarnota* (GPN 3307); Ge-22 – GORCE MTS: Lubań range, valley of Kudowski stream, by hiking track, alt. ca 700 m, 24 June 2004, *leg. P. Czarnota 3999 & A. Wojnarowicz* (GPN); Lubań range, valley of Rolnicki stream, alt. 740 m, 18 Oct. 2004, *leg. P. Czarnota 4021 & A. Wojnarowicz* (GPN); Ge-27 – MIDDLE BESKIDY MTS, BESKID NISKI MTS, Experimental Forest of Agriculture Academy in Kraków, vicinity of Krzyżówka settlement by road to Tylicz village [49°29'03"N/20°56'57"E] 25 Sept. 2005, *leg. P. Czarnota 4559* (GPN); Ge-30 – OBNIZENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKONOWOTARSKA BASIN: 'Bór na Czerwonem' nature reserve [49°27'44"N/20°02'07"E] alt. ca 620 m, 4 June 2003, *leg. P. Czarnota 4198* (GPN); Puścizna peat-bog, near Wróblówka village [49°28'30"N/20°01'55"E] alt. ca 600 m, 23 Nov. 2003, *leg. M. Węgrzyn 1522* (KRA); Ge-50 – TATRA MTS, HIGH TATRA MTS: Dolina Waksmundzka valley, by Waksmundzki stream [49°15.16'N/20°04.81'E] alt. 1220 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3626); Dolina Waksmundzka valley, by the Waksmundzki stream [49°14'48"N/20°04'07"E] alt. 1380 m, 12 Sept. 2004, *leg. M. Węgrzyn 2209* (KRA); by Żółty Potok stream in Dolina Pańszczyca valley [49°14'37"N/20°01'25"E] alt. 1550 m, 10 June 2004, *leg. M. Węgrzyn 1757* (KRA); Gf-23 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: Jawornik range, valley of stream below Dział Mt. and Putyska Mt., alt. ca 465 m, 22 Aug. 1974, *leg. J. Nowak* (KRAM-L 32381), as *Micarea* sp.; Gf-45 – BESKID NISKI MTS: Radoszyce village near Osławica, SE foot of Kowalówka Mt., alt. 520 m, 20 June 1974, *leg. M. Olech* (KRA), as *M. denigrata*.

ADDITIONAL SPECIMENS EXAMINED. ESTONIA, JÖGEVAMAA COUNTY, Endla Nature Reserve, Männikjärve Bog, by shore of Männikjärve Lake [58°52'21"N/26°14'56"E] on wood of fallen pine log within boggy pine forest, 22 Aug. 2004, *leg. P. Czarnota 3966* (GPN). LITHUANIA, PRIENAI DISTRICT: Nemunas loops Regional Park, Drubengis botanical reserve, forest section no. 68, on decayed branches of *Picea abies* in mixed pine-spruce forest, 29 Sept. 2002, *leg. P. Czarnota* (GPN 3123, 3142). CZECH REPUBLIC, EASTERN SUDETES: Rychlebské hory, valley of Bilá Voda stream, S of Bilá Voda village, vicinity of Šafařova skála outcrop [50°24'35"N/16°53'38"E] alt. ca 500 m, on branches in crown of fallen spruce within shaded spruce mountain forest, 23 Apr. 2004, *leg. P. Czarnota 4213* (GPN); TŘEBOŇSKO: Hajnice near Mirochov village, on stems

of *Vaccinium myrtillus* in mixed spruce-pine forest, 11 Apr. 2002, leg. P. Czarnota (GPN 2758) and on twigs of young *Pinus sylvestris* within pine forest, 12 Apr. 2002, leg. P. Czarnota (GPN 2768).

***Micarea nowakii* Czarnota & Coppins sp. nov.**  
(Figs 46 & 47)

*Species haec* Micareae misellae (Nyl.) Hedl. *similis sed differt thallo effuso areolato, acidum micareicum contentis, pycnidiiis conspicuis sessilibus vel breviter stipitatis, simplicibus vel ramosis, mesoconidiis brevioribus, 3.5–4 × 1.5–1.8 μm, eis in Micaream denigratam (Fr.) Hedl. similibus.*

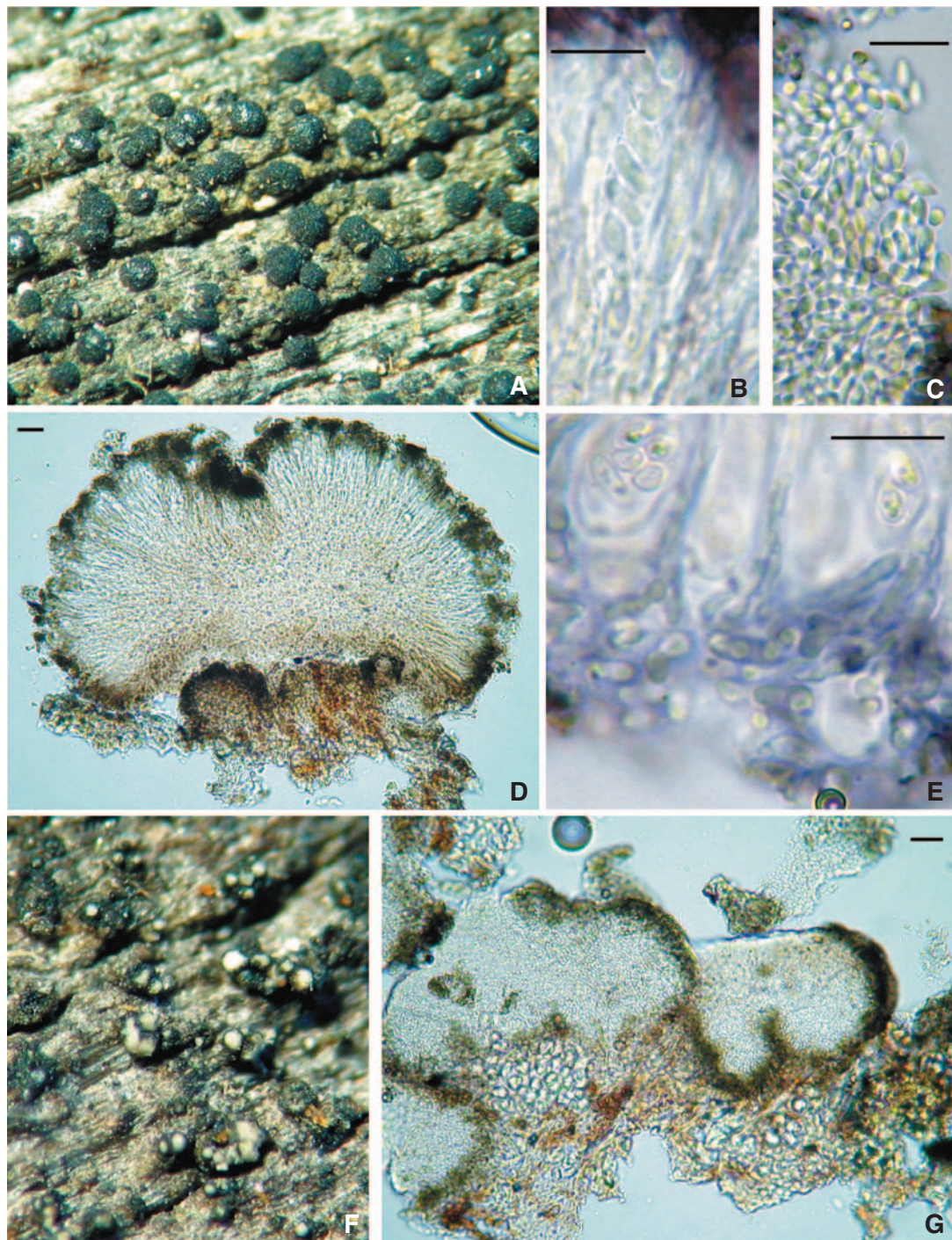
TYPUS: POLAND, CARPATHIANS, Western Beskidy Mts, Gorce Mts, NW slope of Turbacz Mt, by hiking track in upper mountain spruce forest, alt. ca 1200 m, on hard wood of decorticated log of *Picea abies*, 7 Sept. 1964, leg. K. Glanc (KRAM-L 39972 – HOLOTYPE; GPN – ISOTYPE).

Thallus morphologically variable, sometimes endoxylic, but usually effuse, finely warted, or thicker, developing especially in the vicinity of apothecia as small, simple and subglobose or larger, irregularly warted areoles, as in *M. denigrata* or *M. nitschkeana*. Areoles ash-grey (in the herbarium also straw-grey), matt, 70–150(–170) μm diam.; in cross section without or only with a thin amorphous covering layer consisting of slightly olive pigmented gel-matrix, K+ violet, C+ violet. Photobiont micareoid, algal cells globose, 5–8 μm diam. Apothecia, convex to subglobose, 0.1–0.25 mm diam., simple or sometimes compacted into small groups, but not tuberculate, black or rarely in part slightly greyish, immarginate or with a very thin margin concolorous with the disc. Hymenium 35–50 μm tall, hyaline, but epithecium distinctly delimited, 10–15 μm wide, dark olive-black or olive-brown, K+ purple-violet, C+ intensive red-violet; pigment confined to the gel-matrix and usually closely bound up with apical walls of paraphyses. Asci clavate, ‘*Micarea* type’, 30–40 × 6–8 μm. Ascospores ellipsoid, ovoid-ellipsoid or oblong-ovoid, 0(–1)-septate, 6–8(–8.5) × 2–3(–3.2) μm. Paraphyses rather scanty, branched especially in upper part, rarely transversely septate and anastomosing, 1.2–1.5 μm

wide, rarely hyaline throughout, but usually with apices thickened to 2–2.5 μm and dull olive pigmented; in KOH paraphyses not separating owing to the gel-matrix which does not dissolve in KOH. Hypothecium 80–100 μm tall, hyaline. Excipulum indistinct, but usually developed as pale brownish zone ca 15 μm wide, coming down under the hypothecium and composed of strongly branched and anastomosing hyphae. Pycnidia numerous when apothecia rare, but scarce and simple when the thallus more developed and apothecia frequent, black to olive black, emergent (as in *M. denigrata*) or rarely ±shortly stalked (as in *M. misella*), often with widely gaping, crater-like ostioles covered by white mass of conidia; pycnidial walls dull olive, K+ violet, C+ violet. Conidia (mesoconidia) short cylindrical, 3.5–4 × 1.5–1.8 μm diam. (as in *M. denigrata*).

CHEMISTRY. Thallus K–, C–, Pd–; cross section of the thallus (amorphous layer) K+ slightly violet, C+ slightly violet; epithecium K+ deep violet, C+ deep red-violet. TLC: micareic acid (in all specimens examined).

NOTES. Considering its black, subglobose apothecia and short-stalked pycnidia, *M. nowakii* resembles *M. misella*, but the more developed thallus and often sessile, emergent, olive-black and gaping pycnidia are reminiscent of dark forms of *M. denigrata*. For the last reason, all specimens of *M. nowakii* were previously determined as *M. denigrata*. However, the new species differs morphologically from *M. denigrata* in the absence of a C+ red reaction in the thallus and anatomically in the clearly visible olive-black epithecium, not dissolving gel-matrix, smaller, mainly simple and narrowly ovoid ascospores, and less numerous paraphyses with pigment adhering to walls of apices. The last anatomical characters of *M. nowakii* are almost identical with those of *M. misella* and sometimes, especially endoxylic forms of *M. nowakii*, can hardly be distinguished on the basis of morphology and anatomy. However, *M. nowakii* contains micareic acid (as does *M. prasina* s.str.), while *M. denigrata* has only gyrophoric acid and *M. misella* has no substances detected by TLC (at least in Polish specimens).



**Fig. 46.** *Micarea nowakii* Czarnota & Coppins *sp. nov.*: A – morphology, B – ascospores, C – mesoconidia, D – vertical section of apothecia, E – paraphyses coated with dull olive-grey, K<sup>+</sup> violet pigment, F – morphology of pycnidia, G – vertical section of emergent pycnidia bearing mesoconidia (KRAM-L 39972 – holotype). Scale bars = 10 μm.

**Table 5.** Diagnostic features for the separation of lignicolous collections of some *Micarea* species resembling *M. nowakii* Czarnota & Coppins.

| Feature / Species            | <i>M. denigrata</i>   | <i>M. misella</i>  | <i>M. nowakii</i>   | <i>M. prasina</i>   |
|------------------------------|---|--|---|---|
| Thallus                      | inconspicuous to convex areolate  | endoxylic to inconspicuous, and than usually $\pm$ gelatinous when wet | inconspicuous to convex areolate, especially below apothecia and pycnidia | granular (goniocysts) to indistinct, $\pm$ crustaceous (because of the algal, $\pm$ gelatinous layer) |
| Colour of the thallus        | pale ash-green, greenish white to dark olive black (especially when infected) | pale greenish tinge  | straw to ash-grey   | bright green, whitish green to dark olive green   |
| Lichen substances            | gyrophoric acid   | no substances  | micareic acid   | micareic acid   |
| External colour reactions    | apothecia and thallus (when paler and more developed) C+ red                  | no reactions   | sometimes apothecia C+ dull purple-violet                                 | no reactions  |
| Apothecia colour             | pallid, grey, brown, piebald, grey, to black (in well-lit places)             | blackish to black  | black   | pallid to grey (translucent when wet), rarely blackish  |
| Apothecial pigments          | Sedifolia-grey, K+ violet, C+ violet  | Sedifolia-grey, K+ deep violet, C+ violet to red-violet                | Sedifolia-grey, K+ deep violet, C+ deep red-violet                        | Sedifolia-grey, K+ violet, C+ violet (in relation to darker apothecia)                                |
| Spore septation              | (0)–1   | 0(–1)  | 0–1   | (0)–1   |
| Spore dimensions ( $\mu$ m)  | (6–)8–14(–18) $\times$ 2–3.5(–4)  | 6–9(–10) $\times$ (2–)2.5–3.5(–4)                                      | 6–8(–8.5) $\times$ 2–3(–3.2)  | (6–)8–12(–14) $\times$ (2.5–)3–4(–5.5)  |
| Pycnidia bearing mesoconidia | olive to black, immersed to usually emergent                                  | black to grey black, shortly stalked to stipitate                      | black, emergent to shortly stalked; pycnidioophores usually branched      | white, whitish grey or sometimes dark olive, sessile to immersed between goniocysts                   |
| Mesoconidia ( $\mu$ m)       | short-cylindrical to obovate<br>3–4.2(–5) $\times$ 1.4–1.8(–2)                | cylindrical<br>3.5–5(–6.5) $\times$ 1.2–1.4(–1.7)                      | short-cylindrical<br>3.5–4 $\times$ 1.5–1.8                               | cylindrical, cylindrical-fusiform,<br>4–5.5(–6) $\times$ 1–1.2(–1.5)                                  |
| Macroconidia ( $\mu$ m)      | curved,<br>10–25 $\times$ 1.2 diam.   | unknown  | unknown   | unknown   |

The black form of *M. prasina* previously called *M. melanobola* (Nyl.) Coppins could also resemble the new species, but despite both species having micareic acid, the thallus of *M. prasina* is composed of dull olive granules (goniocysts) and it is never warted or areolate and ash-grey coloured as in *M. nowakii*. Moreover, the numerous, black, emergent pycnidia have never been reported in *M. prasina*. More diagnostic features for the separation of *M. nowakii* from three similar species are presented in Table 5.

**ETYMOLOGY.** This new species is named in honour of Professor Janusz Nowak (1930–2004) in recognition of his taxonomic works of dif-

ferent lichen genera and contribution for Polish lichenology.

**HABITAT AND DISTRIBUTION IN POLAND.** *Micarea nowakii* was collected in the southern, mountainous part of Poland in Western Beskidy Mts (Beskid Mały Mts and Gorce Mts), part of the Western Carpathians. This lignicolous species has been found on hard wood of fallen spruce trunk and horizontal surfaces of cut stumps of coniferous trees, probably only within coniferous (spruce) forests of the two mountain belts between the 600 to 1200 m contours. It is hard to say something about its ecological demands, owing to the limited information provided on labels, but considering accompanying

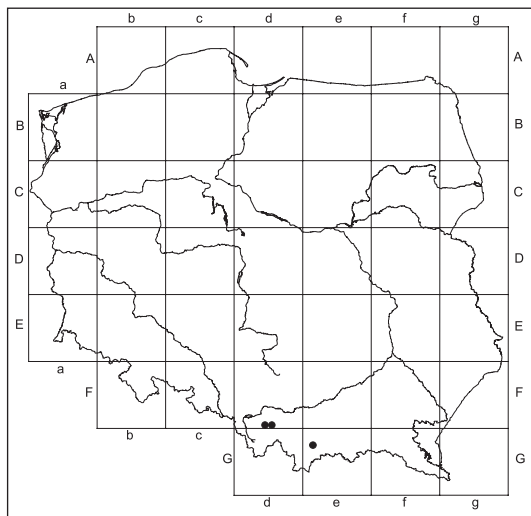


Fig. 47. Distribution map of *Micarea nowakii* Czarnota & Coppins in Poland.

species, *Hypocenomyce scalaris* and *Placynthiella uliginosa*, it probably needs localities exposed to light, e.g. insolated clearings or loose, managed stands. It seems to be an early colonizer of different worked timber, and is rather widespread at least in other mountainous regions of the country.

WORLD DISTRIBUTION. The new species is known only from the few localities in Poland presented here. However, specimens may have been collected in the other European countries, but they were probably dismissed as representing *M. misella* or black forms of *M. denigrata*; herbarium specimens of *M. denigrata* without C+ red reaction in the thallus and specimens of *M. misella* with a well-developed thallus should be examined by TLC to confirm this.

ADDITIONAL SPECIMENS EXAMINED. POLAND, CARPATHIANS: Fd-94 – WESTERN BESKIDY MTS, BESKID MAŁY MTS: anonymous glade on E slope of Czupel Mt., alt. ca 900 m, on hard wood of stump of *Picea abies* (horizontal surface), 15 Oct. 1966, leg. J. Nowak (KRAM-L 3704); Nowy Świat settlement, alt. ca 615 m, on hard wood of cut stump of *Picea abies* (horizontal surface), 13 Oct. 1966, leg. J. Nowak (KRAM-L 4146); Fd-95 – BESKID MAŁY MTS: near Zakocierz village, alt. ca 600 m, on vertical wall of stump of coniferous tree (probably *Picea abies*), 10 Aug. 1960, leg. J. Nowak (KRAM-L 6379).

*Micarea peliocarpa* (Anzi) Coppins & R. Sant.  
(Figs 48 & 49)

in Coppins & P. James, *Lichenologist* **11**: 155. 1979.

*Bilimbia peliocarpa* Anzi, *Atti Soc. Ital. Sci. Nat.* **9**: 250. 1866. – *Bacidia peliocarpa* (Anzi) Lettau, *Hedwigia* **52**: 133. 1912. TYPE: Italy (UPS – ISOTYPE?, *n.v.*; see note in Coppins 1983: 169).

– *Biatora lignaria* var. *conglomerata* Hepp, *Flecht. Eur.*, fasc. 5, no. 284. 1857. – *Micarea violacea* f. *conglomerata* (Hepp) Hedl., *Bih. Kongl. Svenska Vetensk.-Akad. Handl. III*, **18**(3): 81, 92. 1892. TYPE: Switzerland, 'bei Rifferschweil', on *Pinus* bark, Hegetschweiler, Hepp, *Flecht. Eur. No. 284* (E – LECTOTYPE!; M – ISOLECTOTYPE, *n.v.*).

– *Biatora lignaria* var. *saxigena* Hepp., *Flecht. Eur.* fasc. 9, no. 510. 1860. TYPE: Germany, Hessen, 'auf Sandsteinfelsen bei Marburg', W. Uloth, Hepp, *Flecht. Eur. No. 510* (E – LECTOTYPE!; M – ISOLECTOTYPE, *n.v.*).

– *Bilimbia miliaria* var. *lignaria* f. *livida* Körb., *Parerga Lich.*: 171. 1860. TYPE: same as *Biatora lignaria* var. *conglomerata* Hepp.

– *Lecidea violacea* P. Crouan & H. Crouan ex Nyl., *Flora* **45**: 464. 1862. – *Bilimbia violacea* (Crouan ex Nyl.) Arnold, *Flora* **53**: 473. 1870. – *Micarea violacea* (Crouan ex Nyl.) Hedl., *Bih. Kongl. Svenska Vetensk.-Akad. Handl. III*, **18**(3): 80, 91. 1892. TYPE: France, Fenistère, Brest, on gneiss, Crouan (H-NYL 18716 – ISOTYPE!).

– *Lecidea sphaeroides* var. *leucococca* Nyl. in Stizenb., *Nova Acta Leop.-Carol.* **34**(2): 18, t. 1, f. D, 47–51. 1867. TYPE: Finland, Tavastia australis, Evois [Evo], on lignum, 1865, J. P. Norrlin (H-NYL 18377 – LECTOTYPE!; H – ISOLECTOTYPE, *n.v.*).

– *Bilimbia trisepta* Hellb., *Nerikes Lafflora*: 77. 1871. – *Bacidia trisepta* (Hellb.) Zahlbr. in Engler & Prantl, *Nat. Pflanzenfam.* **1**(1\*): 135. 1905. – *Micarea trisepta* (Hellb.) Wetmore, *Pub. Mus. Mich. St. Univ. Biol.* **3**: 284. 1968. TYPE: Germany (E – NEOTYPE, *n.v.*; M – ISONEOTYPE, *n.v.*).

– *Lecidea hemipolioides* Nyl., *Flora* **56**: 294. 1873. – *Micarea violacea* f. *hemipolioides* (Nyl.) Hedl., *Bih. Kongl. Svenska Vetensk.-Akad. Handl. III*, **18**(3): 80, 91. 1892. – *Bilimbia hemipolioides* (Nyl.) A. L. Sm., *Monogr. Br. Lich.* **2**: 141. 1911. – *Bacidia hemipolioides* (Nyl.) Zahlbr., *Cat. Lich. Univ.* **4**: 114. 1926. TYPE: Channel Islands, Jersey, Rozel meadow, on rocks, 1873, C. L. Darbishire (H-NYL 18713 – LECTOTYPE!; H-NYL *p.m.* 4613 – ISOLECTOTYPE!).

– *Bilimbia naegelii* f. *lapiseda* Th. Fr., Lich. Scand. **2**: 379. 1874. TYPE: Sweden (UPS – LECTOTYPE, *n.v.*).

– *Bilimbia milliaria* f. *livescens* Th. Fr., Lich. Scand. **2**: 383. 1874. TYPE: Sweden (UPS – LECTOTYPE, *n.v.*).

– *Lecidea albidolivens* Nyl., Flora **57**: 10. 1874. – *Bilimbia albidolivens* (Nyl.) Blomb. & Forss., Enum. Pl. Scand.: 82. 1880. TYPE: Finland, Tavastia australis, Padasjoki, Nyystölä, on lignum, 1872, *E. A. Lang* [Vainio] (H-NYL 18775 – LECTOTYPE!; H – ISOLECTOTYPE, *n.v.*).

– *Lecidea fraterculans* Nyl., Flora **58**: 11. 1875. TYPE: Finland (H-NYL 18704a – LECTOTYPE; H-NYL 18704 – ISOLECTOTYPE, *n.v.*).

– *Lecidea triseptatula* Nyl., Flora **58**: 361. 1875. TYPE: Finland (H-NYL 18709 – LECTOTYPE; ISOLECTOTYPES: H-NYL 18710, H, *n.v.*).

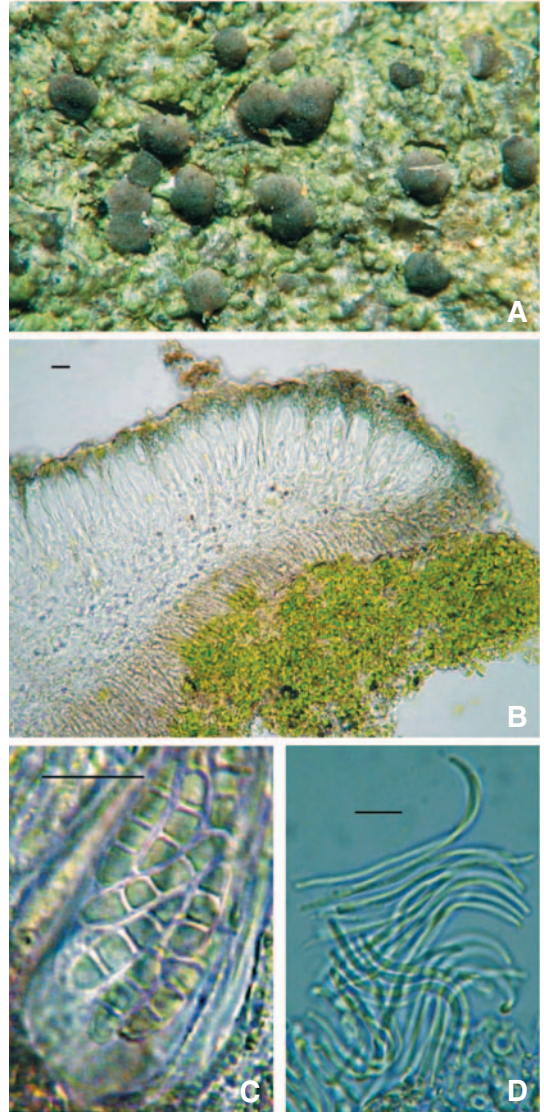
– *Bilimbia albicans* Arnold, Flora **65**: 140. 1882. – *Bacidia albicans* (Arnold) Lettau, Hedwigia **52**: 131. 1912. TYPE: Germany, Arnold, Lich. Exs. No. 837 (BM – LECTOTYPE, *n.v.*).

– *Lecidea arthonizella* Nyl., Lich. Jap.: 107. 1890. – *Bacidia arthonizella* (Nyl.) Zahlbr., Cat. Lich. Univ. **4**: 101. 1926. TYPE: Sweden (H-NYL 18461 – HOLOTYPE, *n.v.*; Coppins, pers. comm.; see also Printzen 1995: 160).

– *Micarea violacea* f. *cupreola* Hedl., Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, **18**(3): 80, 91. 1892. TYPE: Sweden (S – HOLOTYPE, *n.v.*).

– *Lecidea triseptatuloides* Harm., Bull. Séances Soc. Sci. Nancy II, **33**: 64. 1899. – *Bacidia triseptatuloides* (Harm.) Zahlbr., Cat. Lich. Univ. **4**: 161. 1926. TYPE: France (ANGUC – HOLOTYPE, *n.v.*).

Thallus variable, inconspicuous or effuse (especially on rocks) or warted, warted-granular, thick and composed of convex or shallow-convex areoles or almost continuous but more or less cracked, greenish-white or greyish-green, C+ red. Photobiot micareoid; algal cells globose, 4–8 µm diam. Apothecia plane to convex, sometimes ±globose or becoming tuberculate, variously coloured, from completely whitish and pale to greyish, leaden, grey-brown, blackish or black, or often piebald or bluish tinged, at first usually with slightly paler margin, but later mostly immarginate, 0.15–0.6(–0.8) mm diam., C+ red. Hymenium 40–55 µm tall, hyaline, but in upper part slightly olivaceous straw-coloured, greyish-green to aeruginose in darker apothecia,



**Fig. 48.** *Micarea peliocarpa* (Anzi) Coppins & R. Sant.: A – morphology (GPN 3256); B – vertical section of apothecia (GPN 3494); C – ascospores, D – macroconidia (leg. J. Kiszka, 19 Sept. 1964, KRAP). Scale bars = 10 µm.

K± greenish intensifying, C+ fleeting orange-red; sometimes also a middle part of hymenium partially slightly straw-coloured to greyish-green owing to the concentration of gel-matrix resembling vertical streaks. Ascospores finger-shape or oblong-fusiform, with rounded ends, straight or sometimes slightly curved (1–)3(–4)-septate,



(12–)14–20(–24) × (3.5–)4–5(–5.5) μm. Asci clavate (25–)35–45(–50) × 12–15 μm. Paraphyses numerous, branched and anastomosing, 1.2–1.7 μm wide, usually slightly widening above, in epihymenium more densely branched and entangled, bound by pigmented gel-matrix and sometimes some of them also with aeruginose pigmented walls, up to 2.5 μm wide. Hypothecium hyaline to yellowish, 50–70 μm tall. Excipulum strongly developed, up to 50(–60) μm wide, hyaline to straw-coloured, composed of densely branched and anastomosing, 1.8–2.5 μm wide, paraphysis-like hyphae. Pycnidia often present, of two types: (1) small, 30–70 μm wide, immersed to ±sessile, whitish to dark olivaceous-green, sometimes gaping; microconidia filiform to narrowly bacilliform, 5–7.5(–8) × 0.4–0.7(–0.9) μm; (2) immersed within thallus areoles, 120–150 μm, often widely gaping, concoloured with thallus around ostioles or greenish; macroconidia usually strongly curved, sometimes sigmoid, rarely also straight, mostly 3-septate, 16–38(–50) × (1–)1.2–1.5(–1.7) μm; pycnidial walls C+ fleeting orange red, K– or K+ intensifying green when pigmented.

CHEMISTRY. TLC: gyrophoric acid.

NOTES. For many years this species has provided taxonomic problems (see also Coppins 1983), including the publication of invalid nomenclature in the 19th century (e.g. Stein 1879; Eitner 1896, 1901) and also more recently (e.g. Nowak 1967; Olech 1972; Nowak & Tobolewski 1975); it was many times called using the epithet 'trisepta Naeg.' For explanation see Coppins (1983: 171).

A very variable species and thereby problematic in its correct identification. Many morphological forms result from its wide ecological tolerance: in dry and more insolated localities specimens of *M. peliocarpa* usually have dark apothecia, while those growing in shaded and moist niches are usually paler or piebald. The blackish forms have been observed almost always only on rocky substrata and pale specimens have been collected mostly from the bark of trees or lignum. Sometimes, pale, saxicolous forms of *M. peliocarpa* were formerly identified by Polish lichenologists as a separate species, *Bacidia albicans* (Arnold) Lett. (Kiszka

1967a; Nowak & Tobolewski 1975; Kiszka & Piórecki 1991). The taxon should differ in the absence of any olive or greyish-green pigment inside cross sections of apothecia and in slightly smaller, oblong ascospores. Unfortunately, in the basic Polish lichen key (Nowak & Tobolewski 1975), the characteristic C+ red reaction in the thallus, as well as apothecia and the structure of excipulum and hamathecium have been ignored completely.

Many saxicolous or epibryophytic specimens of *M. peliocarpa* housed in Polish herbaria were incorrectly determined as *M. lignaria* and *vice versa*, which would suggest a strong relationship between them. Indeed, when *M. peliocarpa* occurs in the black form, both species could be morphologically almost identical, but the simple C+ red reaction can separate the latter species. Moreover, *M. peliocarpa* has a strongly developed excipulum, sometimes visible as a wide, paler margin, especially in young apothecia.

Occasionally, specimens of *M. peliocarpa* growing on terricolous mosses have been identified as *Bacidia fusca* (A. Massal.) Du Rietz. and *Bacidia sphaeroides* (Dicks.) Zahlbr. (cf. Nowak & Tobolewski 1975). However, these names refer to species of *Mycobilimbia* (or *Biatora* in a broader sense) and they both, except for the septation of the ascospores, have a completely different anatomy and do not contain gyrophoric acid.

However, most misidentifications occur in respect of corticolous specimens, many of those collected from deciduous, free-standing trees (e.g. *Populus* sp.), being determined previously as *M. peliocarpa* refer in fact to *Lecania naegelii* (Hepp) Diederich & van den Boom. Both species may be superficially similar in their morphology, as well as anatomy, but *L. naegelii* does not contain gyrophoric acid, and careful microscopic examination reveals larger cells of a non-'micareoid' photobiont, usually simple paraphyses with wide apices and different to *M. peliocarpa* structure of hyphae composing the excipulum. *Micarea peliocarpa*, moreover, despite its ecological plasticity, has never been observed on nutrient-rich bark in *Xanthorion* communities as preferred by *L. naegelii*.

Epiphytic and epixylic forms of *M. peliocarpa* can also resemble *M. denigrata* and *M. nitschkeana*, sharing a warted, greenish thallus and often piebald or pale, inconspicuous marginal apothecia, reacting C+ red, as well as the sometimes present, similar, curved macroconidia. Both *M. denigrata* and *M. nitschkeana* differ in the K+ violet reaction in the epithecium, but in pale specimens without any pigmentation this feature is not expressed. *Micarea denigrata* can be distinguished, however, by only (0–)1-septate ascospores and a less developed excipulum. Although *M. nitschkeana* also has 3-septate spores as *M. peliocarpa*, they are smaller and more curved, and its excipulum is usually reduced.

Considering morphological and anatomical features, *M. peliocarpa* is most closely related to *M. cinerea* (Schaer.) Hedl. and *M. alabastrites* (Nyl.) Coppins, forming a separate group within the genus *Micarea* as distinguished by Coppins (1983). Strongly supported relationships between them have recently been confirmed by phylogenetic analyses (Andersen 2004). Besides the three species mentioned above, the ‘*Micarea peliocarpa*-group’ consists also of *M. coppinsii* Tønsberg and *M. leprosula* (Th. Fr.) Coppins & A. Fletcher. *Micarea alabastrites* and *M. coppinsii* are strongly oceanic, and for this reason they have not been reported from Poland. In almost all respects *M. cinerea* resembles *M. peliocarpa*, but the size and septation of ascospores permits one to distinguish them (see details under *M. cinerea*). *Micarea leprosula* is an alpine species in Poland growing on plant debris and terricolous bryophytes, but never on rocks and other substrata preferred by *M. peliocarpa*; however, there are a few cases where both species grow together on mossy ground. Careful examination of the usually sterile, fragile thallus (which easily breaks at the touch of a needle), and the simple P+ ginger reaction should be sufficient to identify *M. leprosula*, but unfortunately some samples do not contain argopsin. For more details see under *M. leprosula*.

**HABITAT AND DISTRIBUTION IN POLAND.** *Micarea peliocarpa* was first reported from Poland by Stein (1879) as *Bilimbia trisepta* (Naeg. 1860)

*α lignaria* Kbr. (non Ach.) and *B. trisepta* (Naeg. 1860) *β saprophylla* Kbr., but the ecological notes are not supported by details of the localities of the two taxa, although the author suggests that the species was not rare in the Silesia region and was even more frequent in the mountains. *Bilimbia trisepta α lignaria* is noted as occurring on the bark of old coniferous trees (particularly pines) and more rarely on deciduous trees or on wood ‘in der Hgl. und Bg. verbreitet’ and *B. trisepta β saprophylla* occurred on fallen logs and timber here and there ‘in der Bg. und dem HGb.’. During revision of 19th century collections, only two of Stein’s specimens referring to *M. peliocarpa* have been discovered in WRSL, but they were both collected in 1883 and 1890 (i.e. after his 1879 publication). The first collection was misinterpreted by Stein owing to its confusion with *Helocarpon crassipes*, the original label referring only to ‘*Lecidea (Helocarpon) crassipes* Th. Fr. for. *pulverula* Th. Fr.’.

Eitner (1896) provides several more detailed localities in different regions of Silesia for *Bilimbia trisepta* Naeg. f. *saxicola* and *B. trisepta*, as well as *B. trisepta* f. *saxatilis* (Eitner 1901; the epithet *saxatilis* probably mistakenly used for *saxicola*), but, unfortunately no material to support these collections has been discovered in WRSL; without such material, his reports of *M. peliocarpa* from the vicinity of Oborniki town ‘Jaekeler Wald bei Obornik’, Piekielna Dolina valley near Polanica Zdrój town ‘Höllenthal bei Althaide’, Kłodzko town ‘Graftschaft Glatz’ (Eitner 1896) and Niemcza town ‘Dirsdorfer Wald bei Nimptsch’, area between Bolesławiec and Lwówek Śląski towns ‘zwischen Bunzlau und Löwenberg’, Olesno ‘Rosenberg O.S.’, as well as Szczawno Zdrój town ‘Bad Saltzbrunn, Wilhelmshöhe’ cannot be fully accepted, although it is very likely it have occurred there since it is commonly recorded in that region today.

*Micarea peliocarpa* is a very tolerant species growing in a very wide range of habitats, but it prefers more or less acidic rocks, as well as acidic bark and wood of coniferous trees; for this reason, most reports of it are concentrated in the southern, mountainous part of Poland, particu-

larly in lower mountain belts of the Sudetes and Carpathians, where it grows on different rocky substrata (e.g. sandstones, granite, metamorphic rocks), mainly within shady forest communities in deep valleys and river-beds; it is also recorded on loose boulders, rocky mounds and walls in open environments, exposed to light (but rather close to woodlands), but it usually prefers more shaded and moist niches. Associated species on acidic rocks include above all *Baeomyces rufus*, *Micarea botryoides*, *M. lignaria*, *Porpidia soredizodes*, *P. tuberculosa*, *Trapelia coarctata*, *T. involuta* and *T. placodioides*. Saxicolous *M. peliocarpa*, however, is not only connected with this kind of substratum, being found also on slightly calcareous rocky surfaces such as on vertical faces of sandstone and conglomerate outcrops of 'Białe Skały' in the Gorce Mts (KRAM-L 2698; GPN 3313) or on others located on a slope of Żurawica Mt in the Beskid Mały Mts (KRAM-L 9775) in the company of *M. lignaria*.

More rarely, it occurs on terricolous bryophytes on clayey, acidic soil along forest roads or mountain streams and on moribund mosses covering rocky crevices and stone rubble. In the last habitat it has been found in the alpine belt of the High Tatra Mts on the top of Wołoszyn Mt. at an altitude of 2140 m (GPN 3605), its highest locality in Poland, where it was associated with, for example, *Alectoria ochroleuca*, *Helocarpon crassipes*, *Micarea lignaria*, *M. leprosula* and *Flavocetraria nivalis*. Occasionally *M. peliocarpa* has also been collected from bryophytes growing on limestone or from calcareous soil in crevices of limestone outcrops in the Jura Krakowsko-Częstochowska upland (KRAM-L 42587, 10045, 30457); in both last cases it is close associated with an as yet not published chemical form of *M. leprosula* (II chemotype; see under this species) without argopsin. Such occurrence of *M. peliocarpa* directly on the ground and humus is also recorded in the gypsum area of 'Skorocice' nature reserve (Cieśliński s.n., KTC) and several times in different parts of the Carpathians, e.g. in the Gorce Mts (Czarnota 2447, GPN), where it grows among (and over) terricolous bryophytes occupied by *Bryophagus*

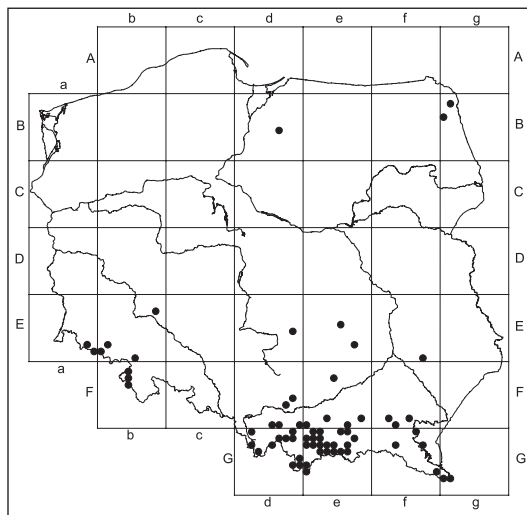


Fig. 49. Distribution map of *Micarea peliocarpa* (Anzi) Cop-pins & R. Sant. in Poland.

*gleocapsa*, as well as in the Beskid Mały Mts (KRAM-L 7895).

*Micarea peliocarpa* is epiphytically less frequently found. In the Polish lowland (exactly N Poland) it is very rare in general, being collected only on the bark of *Alnus glutinosa* in boggy black alder forests (Cieśliński s.n., KTC; Prelewska s.n., OLS). Other lowland localities of *M. peliocarpa* cited in the literature have been excluded since they have either been misidentified or no herbarium material exists to support the record; similarly records from Pomerania by Fałtynowicz and Miądlikowska (1985), Fałtynowicz (1992) and Lipnicki (1993) await confirmation. Thus, *M. peliocarpa* appears to be absent from this region, but it could occur there on, for example, locally frequent granite postglacial boulders, although detailed exploration of this kind of habitat by Fałtynowicz (1997) did not show its presence there. Other cited reports from eastern Poland are probably confused, since some revised material needs to be referred to *Lecania naegelia*, *Bacidia beckhausii* or *Micarea nitschkeana*. Moreover, the occurrence of *M. peliocarpa* on the bark of *Populus tremula* and *Salix* sp. (e.g. Bystrek & Górzyńska 1977; Bystrek & Flisińska 1981), *Alnus glutinosa* (Bystrek & Górzyńska 1981)

and wooden fences (Wójciak 1991) in open and anthropogenic landscapes seems highly unlikely and probably refer in most instances to *Lecania naegeliai*. The most recent report of *M. peliocarpa* is from the Białowieża Forest (Sparrus 2003).

In the Polish Sudetes and Carpathians epiphytic specimens of *M. peliocarpa* are commonly found growing on *Abies alba*, *Picea abies*, *Fagus sylvatica*, *Acer pseudoplatanus* and *Alnus incana*, mainly in lower mountain belts within different, coniferous or mixed forest communities. Its occurrence in this kind of habitat is mostly dispersed, but sometimes, as for example in old spruce plantations in the Tatras, it can appear as a dominant member of generally poor epiphytic lichen flora composed of *Cladonia coniocraea*, *C. digitata*, *Coenogonium pineti*, *Hypogymnia physodes*, *Hypocenomyce caradocensis*, *Lecanora conizaeoides* and *Lepraria jackii* found in rather moist and shaded niches at the base of trunks or covering more exposed and corticated roots.

Lignicolous forms of *M. peliocarpa* are also widespread in the mountains, where they are especially frequent on decaying logs and stumps of coniferous trees within shady, spruce or fir-spruce associations, e.g. *Abieti-Piceetum* and *Plagiothecio-Piceetum*, as in the Sudetes (in the vicinity of 'Torfowisko Pod Zieleńcem' in Góry Bystrzyckie Mts) and in the Carpathians, where it is locally frequent (as in the Gorce Mts or Beskid Sądecki Mts).

In general, the distribution line of the abundant occurrence of *M. peliocarpa* courses along forelands and foothills bordering southern, mountainous regions of Poland except the siliceous range of Góry Świętokrzyskie Mts in central Poland, where it also grows abundantly.

WORLD DISTRIBUTION. *Micarea peliocarpa* is common and widespread in almost all European countries and is also reported from other continents, which would suggest an universal distribution.

EUROPE: Austria (Hafellner & Türk 2001); Azores, Madeira and Canary Islands (Hafellner 1995); Belgium and Luxembourg (Diederich

& Sérusiaux 2000); Czech Republic (Vězda & Liška 1999); Denmark, vulnerable (Søchting 1998; Søchting & Alstrup 2002); Estonia (Randlane & Saag 1999; Jüriado *et al.* 2000); Finland (Vitikainen *et al.* 1997); Germany (Hauck 1996; Jacobsen 1992, 1997; Heibel 1999; Scholz 2000); Great Britain and Ireland (Coppins 1983, 2002; Seaward 1994); Hungary (Verseggy 1994); Iceland (Kristinsson & Heidmarsson 2006); Italy (Nimis & Martellos 2003); Lithuania (Motiejūnaitė 1999); the Netherlands, rare (Aptroot *et al.* 2004); Norway (Santesson 1993); Portugal (van den Boom *et al.* 1990; Carvalho 1998); Romania (Ciurchea 1998); Russia – Leningrad Region (Zavarzin *et al.* 1999), Komi Republic (Hermansson *et al.* 1998), North Osetia, NW Caucasus (Blinkova & Urbanavichus 2005); Slovakia (Pišút *et al.* 1996); Slovenia (Suppan *et al.* 2000); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993); Switzerland (Scheidegger *et al.* 2002); Ukraine – Eastern Carpathians (Kondratyuk *et al.* 1998). AFRICA: Madagascar (Coppins, pers. comm.). NORTH AMERICA: USA – e.g. Michigan (Fryday *et al.* 2001), New York State (Brodo 1968, as *Bacidia trisepta*; Harris 2004), Vermont (Hinds *et al.* 2002). SOUTH AMERICA: Argentina (Calvelo & Liberatore 2002); Brazil (Aptroot 2002). ASIA: Russia – Taimyr Peninsula (Andreev *et al.* 1996; Zhurbenko 1996); China – Yunnan (Aptroot *et al.* 2003); Hongkong (Aptroot & Seaward 1999); Japan (Coppins, pers. comm.); Taiwan (Aptroot & Sparrus 2003); Turkey (Yildiz *et al.* 2002). AUSTRALOCEANIA: New Zealand (Galloway 1985).

EXSICCATAE SEEN. Arnold, *Lich. Exs. No. 167B* (H-NYL); No. 1051 (KRAM); Hepp, *Flecht. Eur. No. 284* (E); No. 510 (E; H-NYL); Lojka, *Lich. Hung. No. 24* (H-NYL); Zwackh, *Lich. Exs. No. 276* (H-NYL).

SPECIMENS EXAMINED. Grid square Bd-56 – POJEZIERZE IŁAWSKIE LAKELAND, POJEZIERZE IŁAWSKIE LAKELAND: vicinity of Piotrowskie Lake, Szwałewo forest district, forest section no. 230e [53°44'N/19°30'E] alt 115 m, 21 Aug. 2002, leg. A. Prelewska (OLS-L 1417); Bg-11 – POJEZIERZE LITEWSKIE LAKELAND, POJEZIERZE WSCHODNIOSUWALSKIE LAKELAND: Puszcza Augustowska Forest, forest section no. 465, ca 1 km SE of Giby village, 12 Sept. 1986, leg. S. Cieślinski,

- loc. 82 (KTC), as *M. prasina*; Bg-30 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, border of forest sections no. 201/202, ca 6 km E of Sajenki village, 1986, leg. S. Ciesliński (KTC; GPN 2443); Ea-78 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park, Mały Śnieżny Kocioł glacial corrie ('am Fuswege am Linnaeaflleck'), 1883, leg. B. Stein (WRSL together with *Helocarpon crassipes*); Wodospad Kamieńczyk waterfall, 2000, leg. M. Kossowska (Hb. Kossowska); Pogórze Karkonoskie foothills, ca 0.5 km NE of Michałowice village, below Piechowicka Góra Mt. [50°50.38'N/15°34.95'E] alt. 560 m, 9 July 2003, leg. P. Czarnota (GPN 3494); ca 1.5 km NE of Michałowice village below Piechowicka Góra Mt. [50°50.40'N/15°34.45'E] alt. 550 m, 9 July 2003, leg. P. Czarnota (GPN 3523); Ea-89 – KARKONOSZE MTS: Karkonoski National Park, Kocioł Łomniczki glacial corrie, waterfalls on Łomniczka stream [50°44.57'N/15°43.74'E] alt. 1320 m, 7 July 2003, leg. P. Czarnota (GPN 3532); Turek Mt., alt. 870 m, 2003, leg. M. Staniaszek (Hb. Staniaszek); Eb-28 – WAŁ TRZEBNICKI RAMPART, WZGÓRZA TRZEBNICKIE HILLS: vicinity of Oborniki Śląskie town, 05.1890, leg. B. Stein (WRSL), as *Bilimbia trisepta* f. *saxicola*; Eb-71 – WESTERN SUDETES, RUDAWY JANOWICKIE MTS: Strużnica village, W of Czartówka Wood by forest road, alt. ca 500 m, 13 Sept. 1999, leg. G. Leśniński (OPUN); Eb-80 – KARKONOSZE MTS: Karkonoski National Park, Karpacz – Wilcza Poręba town, Dolina Łomniczki valley, by hiking track [50°46.05'N/15°45.64'E] alt. 680 m, 7 July 2003, leg. P. Czarnota (GPN 3470), alt. 700 m, 7 July 2003, leg. P. Czarnota (GPN 3539) and [50°45.60'N/15°45.63'E] alt. ca 735 m, 7 July 2003, leg. P. Czarnota (GPN 3456); Sowia Dolina valley, alt. 1040 m, 2003, leg. M. Staniaszek (Hb. Staniaszek); Eb-95 – MIDDLE SUDETES, GÓRY SOWIE MTS: S slope of Wielka Sowa Mt. above Sokolec village [50°39'50"N/16°29'16"E] alt. ca 690 m, 21 Apr. 2005, leg. P. Czarnota 4697 (GPN); Ed-58 – WYŻYNA PRZEDBORSKA UPLAND, WZGÓRZA RADOMSZCZAŃSKIE HILLS: 'Góra Chełmo' nature reserve, Kobiełe Wielkie forest division, 13 Apr. 1970, leg. K. Czyżewska (LOD 1634); Ea-45 – WYŻYNA KIELECKA UPLAND, PŁASKOWYŻ SUCHEDNIOWSKI PLATEAU: near Bliżyn village, alt. ca 310 m, 5 May 1959, leg. J. Nowak (KRAM-L 5416), as *Bacidia trisepta* for. *saxicola*; Ea-77 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, Święty Krzyż forest district, forest section no. 115/116, on field-block, 5 July 2001, leg. A. Donica (KTC) and Łysa Góra Mt. [50°51'39"N/21°02'44"E] alt. 580 m, 6 May 2004, leg. P. Czarnota 3821 (GPN); Ef-97 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, 'Szklarnia' nature reserve, forest section no. 93, 28 Mar. 2000, leg. H. Wójciak & M. Różyło (LBL); Fb-14 – MIDDLE SUDETES, GÓRY STOŁOWE MTS: Góry Stołowe National Park, ca 0.3 km NW of Batorówek settlement by hiking track, alt. 675 m, 23 Apr. 2003, leg. P. Czarnota (GPN 3275 together with *M. botryoides*); Fb-24 – GÓRY STOŁOWE MTS: N edge of Batorów village near the border of Góry Stołowe National Park [50°26.56'N/16°25.28'E] alt. 600 m, 23 Apr. 2003, leg. P. Czarnota (GPN 3268); Fb-34 – GÓRY BYSTRZYCKIE MTS: 'Torfowisko pod Zieleńcem' nature reserve, peat-bog covered with *Pinus mugo* and *Pinus rhaetica* [50°20'48"N/16°24'38"E] alt. ca 700 m, 20 Apr. 2005, leg. P. Czarnota 4485 (GPN); Fd-58 – WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND, GARB TENCZYŃSKI HUMMOCK: Dolina Brzoskwinki valley, alt. ca 280 m, 1962, leg. J. Nowak (KRAM-L 42587), as *Bacidia lignaria*; Fd-58 – WYŻYNA OLKUSKA UPLAND: Dolina Kobylańska valley, alt. ca 400 m, 17 Oct. 1962, leg. J. Nowak (KRAM-L 10045 together with *M. leprosula* without argopsin); Fd-67 – GARB TENCZYŃSKI HUMMOCK: Nielepice village near Rudawa river, Chełm hill, 6 km EES of Krzeszowice town, alt. 280 m, 30 Sept. 1986, leg. J. Nowak (KRAM-L 30457 together with *M. leprosula* without argopsin); Fd-95 – WESTERN BESKIDY MTS, BESKID MAŁY MTS: Zakocierska Skalka outcrop above Zakocierz settlement, alt. ca 800 m, 27 Sept. 1969, leg. J. Nowak (KRAM-L 19073), as *Bacidia albicans*; Fd-96 – BESKID MAŁY MTS: Żurawnica Mt., alt. ca 710 m, 25 Aug. 1962, leg. J. Nowak (KRAM-L 9775 together with *M. lignaria*), as *Bacidia trisepta* for. *saxicola*; Jaszczurowa – Dudówka settlement, alt. 500 m, 29 Aug. 1961, leg. J. Nowak (KRAM-L 7895), as *Bacidia lignaria*; Fd-99 – BESKID MAKOWSKI MTS: Dział settlement near Struża village, alt. ca 375 m, 30 May 1967, leg. J. Nowak (KRAM-L 5533), as *Bacidia trisepta* for. *saxicola*; Kotoń range, Żabicki stream near Struża village, alt. ca 350 m, 5 Sept. 1969, leg. J. Nowak (KRAM-L 19105 together with *M. lignaria*); Fe-24 – NIECKA NIDZIAŃSKA BASIN, NIECKA SOLECKA BASIN: 'Skorocice' nature reserve, SW of Busko Zdrój town, 1977, leg. S. Ciesliński (KTC; GPN 2442) and 1978, leg. S. Ciesliński (KTC); Fe-83 – POGÓRZE ZACHODNIOBESKIDZKIE FOOTHILLS, POGÓRZE WIŚNICKIE FOOTHILLS: Wiśnicko-Lipnicki Landscape Park, 'Kamień Grzyb' nature reserve, NE slope of Bukowiec hill near Połom Duży village, alt. 360 m, 12 Oct. 1998, leg. L. Śliwa & A. Sosin (KRA); 'Kamienie Brodzińskiego' nature reserve, Paprotna range near Lipnica Górna village, alt. 430 m. 12 Oct. 1998, leg. L. Śliwa & A. Sosin (KRA); Fe-88 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE

CIEŻKOWICKIE FOOTHILLS: Ryglice village, alt. 300 m, 19 May 1973, *leg. R. Kozik* (KRAP), as *Bacidia lignaria*; Fe-90 – WESTERN BESKIDY MTS, BESKID WYSPOWY MTS: Kamiennik Mt., alt. 725 m, 14 Apr. 1966, *leg. J. Nowak* (GPN 2418); Fe-96 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE ROŹNOWSKIE FOOTHILLS: 'Bukowiec' nature reserve, alt. 500 m, 17 Aug. 1968, *leg. R. Kozik* (KRAP), as *Bacidia lignaria* and 23 June 1971, *leg. R. Kozik* (KRAP); valley of Wieprzyk stream below Bukowiec Mt. near Siekierzyna village, alt. 460 m, 23 June 1972, *leg. R. Kozik* (KRAP); Ff-82 – POGÓRZE DYNOWSKIE FOOTHILLS: 'Herby' nature reserve, S of Jazowa village [49°50'34"N/21°39'58"E] alt. 440 m, 17 Apr. 2005, *leg. P. Czarnota 4491* (GPN); pass below Krowia Góra Mt., by forest road between Kozłówek and Łęki Strzyżowskie villages [49°50'17"N/21°40'14"E] alt. 420 m, 17 Apr. 2005, *leg. P. Czarnota 4541* (GPN); Ff-85 – POGÓRZE DYNOWSKIE FOOTHILLS: ca 2 km NNE of Barycz village near Kąkolówka settlement, 20 Mar. 2003, *leg. P. Czarnota* (GPN 3196); Ff-93 – POGÓRZE DYNOWSKIE FOOTHILLS: 'Prządki' nature reserve near Czarnorzeki village, ca 8 km N of Krosno town [49°44'30"N/21°48'40"E] alt. 460–520 m, loc. 3, 5 May 1999, *leg. L. Śliwa & B. Krzewicka* (KRA), as *M. cinerea*; *ibid.*, loc. 8, 5 May 1999, *leg. L. Śliwa & B. Krzewicka* (KRA); *ibid.*, loc. 11, 5 May 1999, *leg. L. Śliwa & B. Krzewicka*, (KRA) and loc. 16, 5 May 1999, *leg. L. Śliwa & B. Krzewicka* (KRA), as *M. lignaria*; Gd-02 – WESTERN BESKIDY MTS, BESKID ŚLĄSKI MTS: meadow below the top of Orłowa Mt., alt. 766 m, 4 Aug. 1964, *leg. J. Kiszka* (KRAP; GPN 4216); Gd-08 – BESKID MAKOWSKI MTS: Dudkówka settlement near Osielec village, alt. 520 m, 3 June 1966, *leg. J. Nowak* (KRAM-L 17323); Gd-14 – BESKID ŻYWIECKI MTS: Pilsko range, valley of Sopotnia Mała stream, alt. 700 m, 20 Sept. 1964, *leg. J. Nowak* (GPN 2419); Gd-16 – BABIA GÓRA RANGE: N slope of Babia Góra Mt., Babiogórski National Park, forest section no. 22, by Szumiaca Woda stream, alt. ca 1270 m, 9 June 2004, *leg. P. Czarnota 4108* (GPN); Gd-17 – BABIA GÓRA RANGE: Polica range, valley of Rotnia stream, alt. 670 m, 23 Oct. 1965, *leg. J. Nowak* (KRAM-L 15976 together with *M. lignaria*); Policzne settlement, by Jaworzynka stream, 07.1974, *leg. J. Nowak* (KRAM-L 29460); N slope of Polica Mt., 'Klemensiewicz's' nature reserve, by hiking track, alt. ca 1250 m, 4 June 2004, *leg. P. Czarnota 3883* (GPN); below Hala Krupowa glade, Sucha Beskidzka forest division, Skawica forest district, forest section no. 45 [49°38'03"N/19°38'43"E] alt. 900 m, 4 June 2004, *leg. P. Czarnota 3925* (GPN) and forest section no. 23 [49°38'22"N/19°38'51"E] alt. ca 720 m, 4 June 2004,

*leg. P. Czarnota 3933* (GPN); Gd-18 – BABIA GÓRA RANGE: Polica range, valley of stream by Malinowa settlement, alt. ca 650 m, 27 May 1965, *leg. J. Nowak* (KRAM-L 16293), as *Bacidia trisepta* for. *saxicola*; Gd-22 – BESKID ŚLĄSKI MTS: valley of the Olza River, alt. 510 m, 31 Aug. 1965, *leg. J. Kiszka* (KRAP), as *Bacidia albicans*; Gd-25 – BESKID ŻYWIECKI MTS: Pilsko range, Skalka Mt. above valley of Cebula stream, alt. 1195 m, 23 June 1966, *leg. J. Nowak* (KRAM-L 17044), as *Bacidia albicans*; Gd-33 – BESKID ŻYWIECKI MTS: Wielka Racza range, valley of Rycerka stream between Wielka Racza Mt. and Będoszka Wielka Mt., alt. 640 m, 27 Sept. 1986, *leg. J. Nowak* (KRAM-L 30402); Gd-49 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, POGÓRZE SPISKO-GUBAŁOWSKIE FOOTHILLS: Pogórze Gubałowskie Foothills, Ratułów village by Bystry stream, alt. 740 m, 19 Sept. 1964, *leg. J. Kiszka* (KRAP), as *Bacidia* sp.; Gd-58 – TATRA MTS, WEST TATRA MTS: Dolina Chochołowska valley, between Huciska and Jamy glades [49°15'24"N/19°49'20"E] alt. 1060 m, 18 June 2004, *leg. L. Śliwa 2473, 2498* (KRAM) and Huciska glade [49°15'28"N/19°49'19"E] alt. 1025 m, 19 June 2004, *leg. L. Śliwa 2623* (KRAM); Gd-59 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, POGÓRZE SPISKO-GUBAŁOWSKIE FOOTHILLS: Pogórze Gubałowskie foothills, valley of Głębokki stream, alt. 920 m, 15 Sept. 1964, *leg. J. Kiszka* (KRAP), as *Bacidia* sp.; Ge-01 – WESTERN BESKIDY MTS, BESKID WYSPOWY MTS: E slope of Lubogoszcz Mt. by hiking track above Kasina Wielka village, alt. 650 m, 23 Sept. 2001, *leg. P. Czarnota* (GPN 2713 together with *M. micrococca*); Ge-02 – BESKID WYSPOWY MTS: at foot of Łopień Mt., near Łączyska settlement, alt. 560 m, 6 Aug. 1966, *leg. J. Nowak* (KRAM-L 5922), as *Bacidia trisepta* for. *saxicola*; Ge-05 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE ROŹNOWSKIE FOOTHILLS: Gródek village by the Rożnowskie reservoir, alt. 380 m, 21 Aug. 1968, *leg. R. Kozik* (KRAP; GPN 4217); Ge-06 – POGÓRZE ROŹNOWSKIE FOOTHILLS: by road in Górowa village, alt. 380 m, 20 June 1971, *leg. R. Kozik* (KRAP together with *M. lignaria*), as *Bacidia lignaria*; Ge-10 – WESTERN BESKIDY MTS, BESKID WYSPOWY MTS: NE slope of Luboń Wielki Mt., by hiking track [49°39.10'N/19°59.84'E] alt. 800 m, 5 June 2003, *leg. P. Czarnota* (GPN 3250 together with *M. lignaria*) and [49°39.31'N/19°59.82'E] alt. 890 m, 5 June 2003, *leg. P. Czarnota* (GPN 3251); S slope of Luboń Wielki Mt., 'Luboń Wielki' nature reserve [49°39.04'N/19°59.70'E] alt. 930 m, 5 June 2003, *leg. P. Czarnota* (GPN 3256); Ge-10 – GORCE MTS: by coart-road in Jasionów settlement, below Jaworzyna Ponicka Mt., alt. 750 m, 26 June 1999, *leg. P. Czarnota* (GPN 2239); Poręba Wielka –

Koninki village, at foot of ski trail near forester's lodge in Koninki settlement, alt. 680 m, 6 June 2001, *leg. P. Czarnota* 2447 (GPN together with *Bryophagus gloeocapsa*); Ge-11 – GORCE MTS: Gorce National Park: Białe Skały outcrops near Adamówka glade on NE slope of Kudłoń Mt., alt. 1075 m, 15 Aug. 1967, *leg. J. Nowak* (KRAM-L 2698 together with *M. lignaria* and *M. botryoides*) and alt. ca 1100 m, 7 May 2003, *leg. P. Czarnota* (GPN 3313), NW slope of Kudłoń Mt., below Figurki Dolne glade in valley of Z Popod Figurek stream, alt. 1 Nov. 1992, *leg. P. Czarnota* (GPN 369), valley of Roztoka stream, edge of Potasznia glade, alt. 700 m, 27 Apr. 1993, *leg. P. Czarnota* (GPN 265), N slope of Turbaczyk Mt., Pasieka Wood below Satanowa glade, alt. 940 m, 2 July 1996, *leg. P. Czarnota* (GPN 1464), valley of Turbacz stream, Stara Huta clearing, alt. 750 m, 26 Oct. 1995, *leg. P. Czarnota* (GPN 554), alt. 760 m, 26 Oct. 1995, *leg. P. Czarnota* (GPN 567) and 22 May 1996, *leg. P. Czarnota* (GPN 1386), valley of Paciepnica stream below Suchy Groń region, alt. 910 m, 18 June 1996, *leg. P. Czarnota* (GPN 1402), Suchy Groń region, alt. 950 m, 18 June 1996, *leg. P. Czarnota* (GPN 1254); Ge-12 – BESKID WYSPOWY MTS: W slope of Modyń Mt., ca 1 km E of Zalesie village [49°37'30"N/20°22'40"E] alt. 850 m, 2 July 2005, *leg. P. Czarnota* 4607 (GPN); Ge-17 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: Kałowa village near Grybów town, 16 Aug. 1924, *leg. J. Motyka* (LBL), as *Bacidia* sp.; Ge-20 – WESTERN BESKIDY MTS, GORCE MTS: Dolina Kowańca valley below Czarnotówka Pass, alt. 720 m, 29 June 1967, *leg. K. Glanc* (KRAM-L 29702), as *Bacidia sphaeroides*; SE slope of Obidowa Mt., alt. 790 m, 4 Sept. 1973, *leg. K. Glanc* (KRAM-L 28430), as *Bacidia fusca*; Gorce National Park: below Suhora Mt. in valley of Olszowy stream, alt. 800 m, 25 May 1995, *leg. P. Czarnota* (GPN 509), W slope of Suhora Mt., by Poza Wyżnie stream, alt. 780 m, 31 July 1995, *leg. P. Czarnota* (GPN 1861), river-bed of Olszowy stream, alt. 710 m, 27 Oct. 1995, *leg. P. Czarnota* (GPN 486), valley of Olszowy stream, near the border of 'Turbacz' nature reserve, alt. 830 m, 26 June 1996, *leg. P. Czarnota* (GPN 1322), 'Turbacz' nature reserve, valley of Olszowy stream, alt. 780 m, 21 June 1996, *leg. P. Czarnota* (GPN 1273) and alt. 820 m, below Średnie glade, 21 June 1996, *leg. P. Czarnota* (GPN 1275); Klikuszowa village, above stone-pit, alt. 730 m, 10 Aug. 1999, *leg. P. Czarnota* (GPN 2049); Ge-21 – GORCE MTS: Gorce National Park: valley of Roztoka stream below Solnisko glade, alt. 820 m, 24 Nov. 1992, *leg. P. Czarnota* (GPN 366), valley of Konina stream, Hucisko clearing, alt. 760 m, 10 Mar. 1994, *leg. P. Czarnota* (GPN 728) and above Hycisko clearing, alt. 810 m, 10 Mar. 1994, *leg. P. Czarnota* (GPN 723), 'Turbacz' nature reserve below Czoło alpine meadow in valley of Olszowy stream, alt. 1020 m, 20 Aug. 1996, *leg. P. Czarnota* (GPN 1313), valley of Jaszcze stream below Średniak glade, alt. 1080 m, 3 Sept. 1997, *leg. P. Czarnota* (GPN 1623), river-bed of Łopuszanka stream near Żubrowisko glade, alt. 850 m, 5 May 1995, *leg. P. Czarnota* (GPN 1474), by Łopuszanka stream near Gajówka Mikołaja forester's lodge, alt. 820 m, 5 May 1995, *leg. P. Czarnota* (GPN 1057), valley of Łopuszanka stream below Kolasikowa glade, alt. 820 m, 1 May 1999, *leg. P. Czarnota* & *M. Kukwa* (GPN 2121), valley of Kamienica stream below Średniak glade, by forest road, alt. 1020 m, 5 July 1999, *leg. P. Czarnota* (GPN 1975), bottom of Dolina Kamienicy valley below Bieniowe glade, alt. 820 m, 1 July 1999, *leg. P. Czarnota* (GPN 1968); Ge-22 – GORCE MTS: N slope of Lubań Mt., valley of Kudowski Potok stream, alt. 640 m, 3 July 1967, *leg. K. Glanc* (KRAM-L 28431), as *Bacidia fusca*; Lubań range, valley of Kudowski stream, by hiking track, alt. ca 600 m, 24 June 2004, *leg. P. Czarnota* 4006 & *A. Wojnarowicz* (GPN) and alt. ca 700 m, 24 June 2004, *leg. P. Czarnota* 3997 & *A. Wojnarowicz* (GPN); Ge-23 – GORCE MTS: Baszta outcrops below Makowica Mt., NE slope of Lubań Mt., alt. 490 m, 11 July 1966, *leg. K. Glanc* (KRAM-L 28434), as *Bacidia fusca*; Ge-24 – BESKID SADECKI MTS: Radziejowa range, valley of Jaworzynka stream, alt. 700 m, 4 May 1991, *leg. L. Śliwa* (KRA); Ge-26 – BESKID SADECKI MTS: Jaworzyna Krynicka range, valley of Łabowszczański Potok stream, alt. 670 m, 12 July 1989, *leg. L. Śliwa* (KRA); Ge-32 – GORCE MTS: Mrażnica glade, SE slope of Lubań, alt. 1010 m, 10 Aug. 1968, *leg. K. Glanc* (KRAM-L 28421); Ge-33 – BESKID SADECKI MTS: Radziejowa range, between Stajkowa Góra Mt. and Dzwonkówka Mt., alt. 750 m, 13 June 1965, *leg. M. Olech* (KRA); Ge-34 – BESKID SADECKI MTS: Radziejowa range, Kotelnicy stream, alt. 800 m, 31 Aug. 1990, *leg. L. Śliwa* (KRA); Radziejowa range, Piwniczna forest division, Roztoka Wielka forest district, forest section no. 182 above 'Baniska' nature reserve [49°26'51"N/20°36'44"E] alt. ca 1020 m, 4 Nov. 2004, *leg. P. Czarnota* 4381 (GPN) and alt. 1100 m, 4 Nov. 2004, *leg. P. Czarnota* 4336 (GPN); Ge-35 – BESKID SADECKI MTS: Jaworzyna Krynicka range, Jaworzynka stream, alt. 610 m, 16 Aug. 1989, *leg. L. Śliwa* (KRA); anonymous glade near Łomnicka stream, alt. 820 m, 4 Aug. 1989, *leg. L. Śliwa* (KRA); Ge-36 – BESKID SADECKI MTS: Jaworzyna Krynicka range: shelter-house 'Nad Wierchomlą', alt. 800 m, 4 Sept. 1989, *leg. L. Śliwa* (KRA); 'Żebracze' nature reserve, alt. 750 m, 5 July 2001, *leg. P. Czarnota* (GPN 2568), alt. 790 m,

5 July 2001, *leg. P. Czarnota* (GPN 2514) and alt. 820 m, 5 July 2001, *leg. P. Czarnota* (GPN 2502); Gf-06 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE PRZEMYSKIE FOOTHILLS: Dobra village on San River, 2 Aug. 1988, *leg. J. Kiszka & J. Piórecki* (BDPA), as *Bacidia albicans*; Ge-50 – TATRA MTS, WEST TATRA MTS: Tatra National Park, forest section no. 231a, over the 'Droga pod reglami' ground road, alt. ca 1000 m, 28 June 2002, *leg. P. Czarnota* (GPN 2830, 2833) and forest section no. 209f, Dolina Strażyska valley near the ground road on Strażyski Potok stream, alt. 940 m, 28 June 2002, *leg. P. Czarnota* (GPN 2820); Ge-50 – HIGH TATRA MTS: Dolina Waksmundzka valley, by Waksmundzki Potok stream [49°14.97'N/20°04.45'E] alt. 1310 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3572, 3575) and [49°14'48"N/20°04'07"E] alt. 1380 m, 12 Sept. 2004, *leg. M. Węgrzyn 2193* (KRA); Wołoszyn Wielki Mt. near Krzyżne Pass [49°13.73'N/20°02.91'E] alt. 2140 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3605); Ge-60 – HIGH TATRA MTS: NW slope of Żabia Czuba Mt. below Siedem Granatów ridge near the border of PL/SK, alt. 1500 m, 9 July 2002, *leg. P. Czarnota* (GPN 2916); by W shore of Morskie Oko Lake [49°11'41"N/20°03'55"E] alt. 1420 m, 30 May 2004, *leg. M. Węgrzyn 1621* (KRA); by E shore of Morskie Oko Lake [49°11'57"N/20°04'27"E] alt. 1400 m, 30 May 2004, *leg. M. Węgrzyn 1541* (KRA); Gf-23 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: Wernejówka settlement, by bank of Wisłok River below Putyska Mt., alt. ca 420 m, 22 Aug. 1974, *leg. J. Nowak* (KRAM-L 33159), as *Micarea* sp.; Gf-27 – EASTERN BESKIDY MTS, GÓRY SANOCKO-TURCZAŃSKIE MTS: Góry Słonne Mts, Monasterzec village, 28 May 1990, *leg. J. Kiszka* (BDPA), as *Bacidia albicans*; Gf-69 – WESTERN BIESZCZADY MTS: Bieszczadzki National Park, valley of Terebowiec stream, 8 Aug. 1990, *leg. J. Kiszka* (KRAP), as *M. cinerea*; Gg-70 – WESTERN BIESZCZADY MTS: Bieszczadzki National Park, S slope of Halicz Mt., by hiking track, alt. 1263 m, 10 July 2003, *leg. J. Kiszka* (KRAP) together with *M. lignaria*; Gg-71 – WESTERN BIESZCZADY MTS: Bieszczadzki National Park, Sianki forest district, forest section no. 78i, 19 June 2002, *leg. P. Czarnota* (GPN 2842).

ADDITIONAL SPECIMENS EXAMINED. CZECH REPUBLIC, LUŽICKE HORY: ca 0.5 km W of Studeny village [50°50.60'N/14°27.16'E] on sandstone boulders near stream in broadleaf forest, 26 Apr. 2003, *leg. P. Czarnota* (GPN 3317). UKRAINE, EASTERN CARPATHIANS: Zakarpacka Oblast, Gorgany Mts, road from Ozirne settlement to Doboszanka Mt. in valley of Dolzyniec stream [48°26'N/24°20'E] alt. ca 1300 m, on spruce log, 23 Aug. 2001, *leg. U. Bielczyk* (KRAM-L 46342), as *M. adnata*.

*Micarea polycarpella* (Erichsen) Coppins & Palice (Figs 50 & 51)

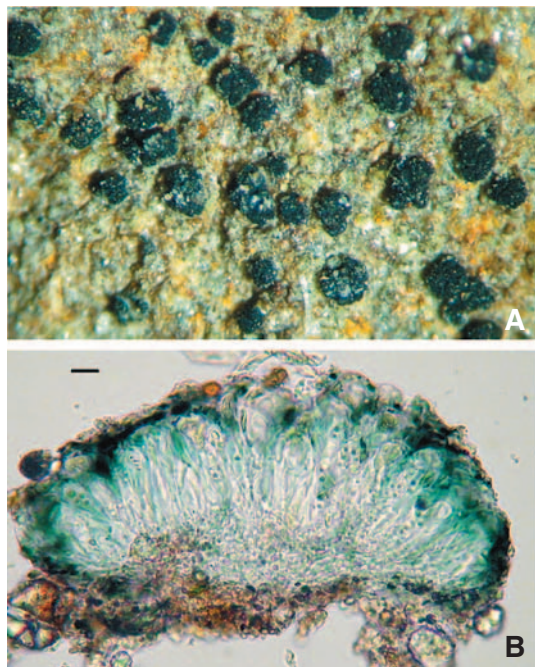
in Coppins, Palice & Soldán, Bryonora **16**: 23. 1995.

*Lecidea polycarpella* Erichsen, Verh. Bot. Vereins Prov. Brandenburg **71**: 90. 1929. TYPE: Germany (HGB – HOLOTYPE, *n.v.*; Jacobsen & Coppins 1989).

– *Lecidea segrex* Erichsen, Schriften Naturwiss. Vereins Schleswig-Holstein **20**: 345. 1934. TYPE: Germany (HGB – HOLOTYPE, *n.v.*; Jacobsen & Coppins 1989).

Thallus effuse, epilithic, forming irregular, thin, minutely warted areoles ca 0.2–0.3 mm wide, usually developed under apothecia, pale buff to greenish-buff or rarely, when pycnidia abundant, thallus thicker, composed of larger, irregular, ±flat or scurfy-granular areoles, 0.4–1.2 mm wide, greenish-grey to dull olive-grey, dark prothalline hyphae sometime visible. Photobiont not micareoid; algal cells globose 7–18 µm diam. Apothecia immarginate, first ±flat or slightly convex, later hemispherical to ±subglobose, black, matt, simple or compacted into small groups or sometimes tuberculate, 0.15–0.30 mm wide (0.40 mm when tuberculate). Hymenium 30–35(–40) µm tall, upper part bluish, greyish-blue to aeruginose, K–, epithecium not distinctly delimited, but the highest part usually darker owing to the pigmented gel-matrix adhering to paraphyses, lower part hyaline; narrow, aeruginose black coloured vertical streaks usually present. Asci cylindrical, 30–35 × 7–9 µm. Ascospores oblong-ellipsoid, ellipsoid, simple, 8–10 × 3–4.5 µm. Paraphyses rather scanty, in KOH poorly separated owing to the gel-matrix not dissolving, rarely branched and anastomosing, 1–2 µm wide, but some of them fewer in number, as scattered individuals or in small fascicles, multiseptate, thicker, 2–2.5 µm wide, slightly widening above to 3 µm, branched especially in upper part; walls coated by dark greenish pigment or hyaline but closely bound up with dark pigmented gel-matrix. Hypothecium hyaline or pale straw-coloured, 50–70 µm tall, hyphae gelatinized, cell-lumina up to 4–5 µm wide. Excipulum indistinct, reflexed as greyish outer zone, 10–15 µm wide composed of coherent (even in KOH), dark-walled hyphae, better developed in young apothecia. Pycnidia rarely present, but





**Fig. 50.** *Micarea polycarpella* (Erichsen) Coppins & Palice: A – morphology (GPN 3310); B – vertical section of apothecia (Czarnota 4523, GPN). Scale bare = 10  $\mu$ m.

sometimes numerous (as in the specimen Czarnota 4524), immersed, black, 70–150  $\mu$ m wide, ostioles widely gaping; walls dull olive to aeruginose blackish, K–, Conidia (mesoconidia) cylindrical, 4–4.8(–5)  $\times$  1.2–1.4(–1.6)  $\mu$ m.

**CHEMISTRY.** Thallus K–, C–, Pd–; material insufficient for TLC.

**NOTES.** *Micarea polycarpella* was included in the genus *Micarea* mainly on the basis of the ascus structure (*Micarea*-type) and the presence of branched and anastomosing paraphyses, as well as the hyphae forming an inconspicuous excipulum (Coppins *et al.* 1995). On the other hand, some characters, particularly the large algal cells exceeding 15  $\mu$ m diam., are uncharacteristic of *Micarea* s.str. The large photobiont cells are also present in several species belonging to the *Micarea sylvicola*-group, as well as in *M. erratica* and *M. lynceola*. All those species have relatively poor relationships with *M. prasina* (the type species for the genus) and probably at least some

of them refer to other taxonomic groupings (see *M. sylvicola*-group in Andersen 2004; Andersen & Ekman 2005). This hypothesis requires further molecular verification and stronger statistical support.

The black, small apothecia, immarginate (or poorly marginate when immature) and inconspicuous thallus, as well as a bluish or aeruginose epihymenium and hyaline hypothecium are present in several other saxicolous species belonging to different genera. For this reason, *M. polycarpella* can be mistaken for *Lecidea variegatula* Nyl., *Psilolechia clavulifera* (Nyl.) Coppins, *Micarea bauschiana* or *M. lynceola* (= *M. excipulata* Coppins); although the last species is unknown in Poland, its discovery there is possible in view of recent records in the Czech Republic (Palice 1999) and Germany (Scholz 2000). Its detailed description and taxonomical remarks are given by Coppins (1988) and by Coppins and Muhr (1997). The presence of a strongly developed, hyaline excipulum composed of paraphysis-like hyphae is the most important diagnostic feature that distinguishes it from *M. polycarpella*, which has a reflexed excipulum composed of stout, pigmented hyphae.

*Lecidea variegatula* [recently recorded in Poland several times (Czarnota 2007); to date it is listed in Polish red list of threatened lichens as extinct species (Cieśliński *et al.* 2003)] normally has larger, marginate, lecideine apothecia, more developed, minutely squamulose or areolate thallus and smaller, narrowly elliptic ascospores (see e.g. Wirth 1995), so should not be confused with *M. polycarpella* having permanently immarginate apothecia. However, some poor developed collections of *L. variegatula* have also been seen.

The form of *Micarea bauschiana* with blackish apothecia and an inconspicuous thallus can morphologically resemble *M. polycarpella*, but it completely lacks an excipulum, its paraphyses separate in K and, above all, it differs in its ecology, since it usually occupies shaded, vertical rocky faces within forest communities, while *M. polycarpella* prefers rather ruderal, insolated habitats.

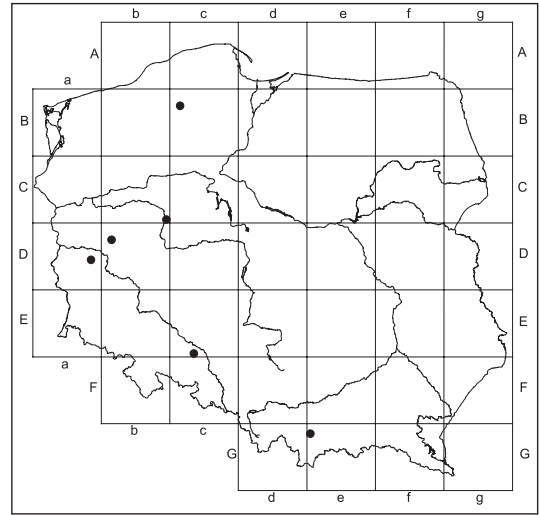
*Psilolechia clavulifera* also has a different ecology to *M. polycarpella*, since it is mostly

found on clayey soil, humus, pebbles between tree roots and directly on root-systems of fallen or underhanged trees within coniferous forests; it is occasionally an epiphyte on the base of trunks (incrusted by soil). Moreover, the apothecial section of *P. clavulifera* is opaque, in contrast to *M. polycarpella*, owing to the hymenium consisting of very dense, wide paraphyses; it also has significantly smaller dacryoid ascospores and another type of photobiont. For further taxonomic details see Coppins (1983).

**HABITAT AND DISTRIBUTION IN POLAND.** Czarnota (2004) reported *M. polycarpella* for the first time from Poland (Beskid Wyspowy Mts) suggesting that it was possibly more frequent in this country, but despite lichenological field studies in different regions of this area only two further collections (from the same locality in Pojezierze Lubuskie lakeland ) have been made. Two other specimens have been discovered during taxonomic revision of material housed in WRSL, both of which were reported by Stein (1879: 207) as *Biatora atomaria* Th. Fr.; the specimen from the vicinity of 'Falkenberg' was cited by Leśnianański (1999) as *Lecidea atomaria* Th. Fr.

*Micarea polycarpella* is an inconspicuous colonizer of various acidic rocky substrata. In western Poland it has been found on a small, sandstone pebble, a piece of flint and a postglacial siliceous conglomerate pebble laying directly on cart-roads and a sandy dune at the edge of pine forest. In the Western Beskidy Mts, a small specimen has been collected on a small sandstone pebble by a cart-road in an open, agriculture landscape. *Micarea polycarpella* also grows on volcanic rocks according to an old record from a small basalt pebble in the vicinity of Niemodlin town; unfortunately, there is a lack of detailed notes on this site, but there is some knowledge of a former basalt quarry working in the same region (Leśnianański, pers. comm.), from which it was probably collected. Accompanied species of these examined materials include *Buellia stigmatea*, *Lecanora hagenii* and *Verrucaria* sp.

*Micarea polycarpella* is regarded as a pioneer colonizer growing usually in secondary habitats



**Fig. 51.** Distribution map of *Micarea polycarpella* (Erichsen) Coppins & Palice in Poland.

on loose or dumped siliceous stones, on dusty pieces of wood laying on the ground (Jacobsen & Coppins 1989; Palice 1999), even in places strongly contaminated by heavy metals (Palice & Soldán 2004), and recently it has been found in a natural habitat in the high Ecuadorian Andes (see below).

**WORLD DISTRIBUTION.** In view of its large ecological tolerance, it is curious that *M. polycarpella* has been reported so rarely, not only in Poland but also in other European countries, with the exception of the Czech Republic (Palice 1999; Palice & Soldán 2004). A more intensive exploration of 'ruderal habitats' would no doubt increase its frequency and extend its geographical range.

**EUROPE:** Austria (Jacobsen & Coppins 1989; Coppins *et al.* 1995); Czech Republic (Coppins *et al.* 1995; Palice 1999; Vězda & Liška 1999); Germany – Schleswig-Holstein (Erichsen 1929, as *Lecidea polycarpella*; Erichsen 1934, as *Lecidea segrex*; Jacobsen & Coppins 1989, as *Lecidea polycarpella*; Coppins *et al.* 1995; Jacobsen 1992, 1997; Palice 1999); Great Britain (Coppins 2002); Sweden (Palice 1999). **SOUTH AMERICA:** Ecuador (*leg. Palice*; see below).

**EXSICCATAE SEEN.** Arnold, *Lich. Exs. No. 1239* (H-NYL *p.m.* 5410).

SPECIMENS EXAMINED. Grid square Bc-21 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, RÓWNINA CHARZYKOWSKA PLAIN: between Prądzona and Borowy Młyn villages, by shore of lake, 7 July 1968, *leg. Z. Tobolewski* ? (POZ); Cb-99 – POJEZIERZE WIELKOPOLSKO-KUJAWSKIE LAKELAND, POJEZIERZE GNIEŹNIEŃSKIE LAKELAND: Dziewicza Góra hill, 29 Sept. 1934, *leg. F. Krawiec* (POZ), as *Lecidea erratic*; Da-58 – WZNIESIENIA ZIELONOGÓRSKIE HEIGHTS, WAŁ ZIELONOGÓRSKI RAMPART: Zielona Góra town (Telegraphenberg bei Grünberg), 7 Febr. 1874, *leg. T. Hellwig* (WRSL), as *Biatora atomaria*; Db-21 – POJEZIERZE LUBUSKIE LAKELAND, BRUZDA ZBASZYŃSKA BASIN: by road between Chobienice village and Babimost town, ca 3 km E of Babimost [52°10'15"N/15°52'42"E] 7 July 2005, *leg. P. Czarnota* 4523, 4524 (GPN); Ec-93 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA NIEMODLIŃSKA PLAIN: near Niemodlin town (Schlesien, Rossdorfer Walde bei Falkenberg), ?, *leg. J. Ploesel* (WRSL), as *Biatora atomaria*; Ge-10 – WESTERN BESKIDY MTS, BESKID WYSPOWY MTS: NE slope of Luboń Wielki Mt., red hiking track, ca 0.5 km of Glisne village, 5 June 2003, *leg. P. Czarnota* (GPN 3244).

ADDITIONAL SPECIMENS EXAMINED. CZECH REPUBLIC, TŘEBOŇSKO: settlement Hajnice near Mirochov village, on small granite pebbles, 12 Apr. 2002, *leg. P. Czarnota* (GPN 3310). ECUADOR, PROV. TUNGURAHUE: Baños, waterfall Inis Maria, on shists, alt. ca 1900–1950 m, 11 Mar. 2003, *leg. Z. Palice* (PRA; GPN ex PRA).

***Micarea prasina* Fr.** (Figs 2A–E, 4H & 52)

Syst. orb.: 256–7. 1825. TYPE: Sweden, Småland, Femsjö, on lignum, *E. M. Fries* (UPS – LECTOTYPE, *n.v.*; Coppins 1989).

*Biatora prasina* Fr., *Stirp. agri femsion.*: 36. 1825., *nom. illeg.* (Art. 63). – *Biatora prasina* (Fr.) Trevisan, *Linnea* **28**: 288. 1856., *nec Tuck. & Mont. in Mont.* 1857. – *Catillaria prasina* (Fr.) Th. Fr., *Lich. Scand.* **2**: 572. 1874. [See note (i) in Coppins 1983: 174].

– *Lecidea melanobola* Nyl., *Flora* **50**: 371. 1867. – *Catillaria prasina*  $\beta$ . *byssacea* f. *melanobola* (Nyl.) Blomb. & Forss., *Enum. Pl. Scand.*: 91. 1880. – *Lecidea erysiboides* subsp. *melanobola* (Nyl.) Nyl. *in Hue*, *Rev. Bot. Courrensan* **5**: 103. 1886. – *Micarea prasina* f. *melanobola* Hedl., *Bih. Kongl. Svenska Vetensk.-Akad. Handl. III*, **18**(3): 87. 1892. – *Catillaria melanobola* (Nyl.) Vain., *Acta Soc. Fauna Fl. Fenn.* **57**(2): 465. 1934. – *Micarea melanobola* (Nyl.) Coppins, *Bull.*

*Brit. Mus. (Nat. Hist.), Bot.* **11**(2): 156. 1983. TYPE: Finland, Tavastia australis, Kuhmois [Kuhmoinen], on bark of *Picea abies*, 1866, *J. P. Norrlin* (H-NYL 21614 – LECTOTYPE!; H-NYL *p.m.* 4504 – ISOLECTOTYPE!). [See note (i) below].

– *Lecidea prasina* Nyl., *Flora* **57**: 312. 1874. – *Micarea prasina* f. *byssacea* subf. *prasina* (Nyl.) Th. Fr. *in Hedl.*, *Bih. Kongl. Svenska Vetensk.-Akad. Handl. III*, **18**(3): 77. 1892. TYPE: Fennia, Tavastia australis, Padasjoki: Nyystölä, lepän kuorella (= ad corticem *Alni*), 1872, *E. Lang* (H-NYL 21604 – LECTOTYPE!); TLC 20/4/GPN: micareic acid. [New synonym; see general note and note (ii) below].

– *Lecidea sordidescens* Nyl., *Flora* **57**: 312. 1874. – *Catillaria prasina* var. *byssacea* f. *sordidescens* (Nyl.) Blomb. & Forss., *Enum. Pl. Scand.*: 91. 1880. – *Micarea prasina* f. *byssacea* subf. *sordidescens* (Nyl.) Th. Fr. *in Hedl.*, *Bih. Kongl. Svenska Vetensk.-Akad. Handl. III*, **18**(3): 77. 1892. – *Lecidea byssacea* var. *sordidescens* (Nyl.) Vain., *Term. Füz.* **22**: 320. 1899. – *Catillaria prasina* var. *sordidescens* (Nyl.) Lettau, *Hedwigia* **52**: 136. 1912. *Micarea prasina* var. *sordidescens* (Nyl.) Brodo, *Bull. New York State Mus. Sci. Serv.* **410**: 152. 1968. TYPE: Switzerland, Zürich, Hepp, *Flecht. Eur. No.* 278 (H-NYL 21632 – ISOLECTOTYPE!; WRSL – ISOLECTOTYPE!).

– ?*Catillaria micrococca* f. *glebulosa* Erichsen, *Ann. Mycol.* **36**: 139. 1938. TYPE: Germany (HBG – HOLOTYPE, *n.v.*).

GENERAL NOTE. All taxa of *M. prasina* s.l. with their types containing micareic acid [recognized previously by Coppins (1983, 1989) as ‘*prasina*-unknown B’] have been included as synonyms of *M. prasina* s.str. The secondary substance in the type of *Lecidea prasina* Nyl. is reported here for the first time. For details on *Lecidea melanobola* Nyl. see note (i) below.

(i) The type materials of *L. melanobola* were insufficient for TLC, but a specimen from Estonia (TU–1320), recognized as *M. melanobola* (Nyl.) Coppins and agreeing with the lectotype of this species in morphology and anatomy, was analyzed and found to contain micareic acid. The specimen of *Lecidea erisiboides* subsp. *melanobola* Nyl. typified by Coppins as the lectotype of *L. melanobola* (H-NYL 21614) was earlier synonymized on the original packet by Nylander with *L. prasina*, which would suggest that he deliberated over the possibility of the names referring to the same taxon. The presence of micareic acid in *L. prasina* can support the hypothesis that both these taxa merely represent darker forms of *M. prasina*. According to Hedlund (1892),

those specimens with black fruit-bodies should also be regarded as a separate form of *M. prasina* named '*M. prasina* for. *melanobola*' (see above), a point of view shared by this author. Clearly, molecular studies of well defined gatherings will resolve this problem.

(ii) Based on morphological analyses of several 19th century specimens called *Lecidea prasiniza* (e.g. by Zwackh) or *Biatorina prasiniza* (e.g. by Arnold) one would suppose that '*prasiniza*' was distinguished from similar specimens referred to *M. prasina* s.l. by darker pigmented apothecia and a rather less developed, granular, olivaceous thallus. However, confusion is evident as for example the specimen distributed by Arnold as *Biatorina prasina* (Fr.) *a laeta* Th. Fr., Scand. 572 = *Lecidea sordidescens* Nyl., Flora 1874, p. 312, *Biatorina erysiboides* Arn. exs. 280 in Arnold, *Lich. Exs. No. 280C* (e.g. H-NYL 21621), which has 'hybrid' characteristics of a typically *M. prasina* s.str. thick, granular sorediose thallus, but with subglobose, dark, brownish-grey apothecia, was also identified by Nylander as *Lecidea prasiniza* Nyl.

Thallus effuse, granular to sorediose in appearance or warted-granular to almost continuous (if less developed) when covered in gelatinous, non-lichenized algae, white-green, bright green to olive-green or olivaceous, composed of small, very often aggregated goniocysts, surrounded by hyaline hyphae and hyaline to  $\pm$ olivaceous,  $K^{\pm}$  violet,  $C^{\pm}$  violet gel-matrix. Photobiont micareoid; algal cells 4–8  $\mu$ m. Apothecia variable in size and colour even in the same collection, numerous or very often absent, convex to  $\pm$ subglobose, simple, sometimes adnate or tuberculate, immarginate at start, pale, whitish, brownish, greyish, sometimes piebald or leaden-black to almost black, 0.2–0.4 mm diam. or to 0.8 mm when tuberculate, sessile or immersed between granules of the thallus. Hymenium 30–60  $\mu$ m tall, hyaline throughout, straw-coloured or irregularly olivaceous to dark olive-grey especially in upper part; pigment confined to gel-matrix,  $K^{\pm}$  violet,  $C^{\pm}$  violet (in darker forms  $K^+$  and  $C^+$  intensive violet). Asci clavate to cylindrical-clavate, 25–55  $\times$  8–12  $\mu$ m. Ascospores ovoid, oblong-ovoid, ellipsoid, 0–1-septate, (6–)8–12(–14)  $\times$  (2.5–)3–4(–5.5)  $\mu$ m. Paraphyses usually numerous, branched and anastomosing, hyaline, 0.7–1.2(–2)  $\mu$ m wide, only slightly increasing above. Hypothecium hyaline to pale  $\pm$ yellowish,

40–160  $\mu$ m tall. Excipulum absent. Pycnidia of two types, rare or numerous, sessile or mostly immersed in surrounding goniocysts, globose or barrel-like, whitish to olive-black with white pycnidial walls, olivaceous to olive-grey and than  $K^{\pm}$  violet,  $C^{\pm}$  violet: (1) very small, 30–60  $\mu$ m, usually immersed and mostly visible during microscopic examination of the granular thallus, more rarely distinctly sessile with gaping ostioles; microconidia filiform to narrowly fusiform, 5–8(–9)  $\times$  (0.5–)0.7–0.9  $\mu$ m; (2) bigger, 50–150 (–170)  $\mu$ m, sometimes almost pyriform with extruding white conidial mass or widely gaping ostioles; mesoconidia cylindrical, cylindrical-fusiform, often biguttulate, 4–5.5(–6)  $\times$  1–1.2(–1.5)  $\mu$ m.

CHEMISTRY. Thallus and apothecia  $C^-$ ,  $K^-$ ,  $Pd^-$ . TLC: micareic acid.

NOTES. *Micareia prasina* is morphologically very variable, forming a well-developed, thick, sorediose thallus when it occurs on soft lignum, but when growing on bark of trees or on hard wood its granular thallus is less distinctive and sometimes even inconspicuous (especially when covered by non-lichenized algae); specimens with a thick thallus often have no apothecia (in contrast to those with a less distinctive thallus, but in both cases TLC or simple colour reactions may be necessary to distinguish it since several other species closely resemble *M. prasina*, such as the bright green, sterile, sorediose thallus forms of *Biatora chrysantha* (Zahlbr.) Printzen, *B. efflorescens* (Hedl.) Erichsen, *B. epixanthoides* (Nyl.) Diederich, *Micareia viridileprosa*, *Placynthiella dasaea* (Stirt.) Tønsberg, *Vezeadaea retigera* Poelt & Döbbele and several *Bacidia* (*Bacidina*) species. Among them, however, only *M. prasina* contains micareic acid (see details about the substance in Coppins 1983: 87, as 'prasina unknown B', and Elix *et al.* 1984). *Biatora chrysantha*, *M. viridileprosa* and *P. dasaea* react  $C^+$  red owing to the presence of gyrophoric acid, *B. efflorescens* containing argopsin, resulting in a  $P^+$  ginger reaction, and the rest have no secondary substances detected by TLC.

When the thallus is inconspicuous (mostly growing on hard wood), *M. prasina* may be easily confused with *M. anterior*, *M. micrococca*

and *M. misella*, especially in those instances when *M. prasina* and *M. micrococca* are intermixed and the examination by TLC appears to be impossible (micareic and methoxymicareic acids are located in the same place in the chromatogram). The lack of the olivaceous, K<sup>+</sup> violet, C<sup>+</sup> violet pigment within epithecium or pycnidial walls can distinguish *M. anterior* from the others, but unfortunately this pigment is often invisible in pale apothecia of *M. prasina* and *M. micrococca*. Darker, epixylic forms of *M. prasina* are also very similar to *M. nowakii*, which also produces micareic acid, but develops a more or less minutely warted thallus, emergent to almost stalked, black pycnidia bearing shorter mesoconidia (as in *M. denigrata*), as well as smaller ascospores (see differences under *M. nowakii*, Table 5).

There is a lack of distinctive features to delimit *M. melanobola* at specific rank, and the high concentration of the olive-grey pigment ('Sedifolia-grey') within the epithecium and the presence of blackish or even black apothecia are considered to be within the variation of *M. prasina*. This opinion seems to be reasonable, the more so because single collections of *M. prasina* often possess pale to dark, or even almost black, apothecia. In four examined Estonian collections identified previously as *M. melanobola*, apothecia were infected by some unknown, non-lichenized fungus visible as stout, multiseptate, gold-brown hyphae in cross sections; this may be the reason for the greater production and concentration of the olive-black pigment (distinctly turning K<sup>+</sup> violet and C<sup>+</sup> violet) in the upper part of the hymenium and also in vertical streaks. Similarly, the holotype of *L. melanobola*, as well as Zwackh's specimen from Heidelberg (Zwackh, *Lich. Exs. No. 656*, distributed as *Lecidea prasiniza*; with dark, olive-black granular thallus and subglobose, blackish-grey to black apothecia), referred to *M. melanobola* sensu Coppins (1983), are also streaked with probably the same, invasive fungus as that mentioned above. Among these four Estonian collections, only one was sufficient for TLC and this, as well as the abovementioned Zwackh's collection and several others coming from Poland, all contain only micareic acid.

When *M. prasina* forms pycnidia, they are usually semi-immersed or more rarely sessile, white, whitish-grey, less frequently grey or in darker morphotypes also blackish-grey, olive-grey to almost black (as in *S. Cieśliński & Z. Tobolewski s.n.*, loc. 68, KTC). Sometimes pycnidia are well developed (Fig. 4H), ±globose with a pale mass of mesoconidia and can resemble those of *M. tomentosa*, more so as some of them can be minutely rough at the base. *Micareea tomentosa*, however, has no secondary substances detected by TLC and produces shorter mesoconidia (for further differences see Table 6).

Some collections [e.g. from Pojezierze Mrągowskie lakeland, leg. *S. Cieśliński*, 7.05.1990, stan. 675 (KTC), TLC 1/14/GPN, Pojezierze Wschodniosuwalskie lakeland, leg. *R. Kozik*, 12.09.1984 (KRAP), TLC 1/8/GPN and Pogórze Dynowskie foothills (GPN 3188), TLC 6/12/GPN] have been considered as *M. prasina* s.l. and excluded from the list of examined specimens of *M. prasina* s.str. presented here. They have a slightly different chromatogram perhaps indicating more than only micareic acid; a separate spot located in almost the same R<sub>f</sub> value of 5 class (in solvent A) and UV<sup>+</sup> vivid citrine-yellow after H<sub>2</sub>SO<sub>4</sub> and charring. However, this maybe only an artifact arising from different concentrations of micareic acid. All these collections are morphologically similar and have intermediate features between *M. prasina* s.str. and *M. micrococca*. They have numerous, white, whitish-grey, straw-grey or pale straw-brownish, mostly convex to subglobose, sometimes tuberculate apothecia, a rather inconspicuous thallus composed of olivaceous to greenish-white goniocysts, and immersed to semi-immersed, ±globose, whitish pycnidia.

HABITAT AND DISTRIBUTION IN POLAND. In Poland, *M. prasina* has been treated to date in a broad sense, namely *M. prasina* s.l., and for this reason all previous collections require chemotaxonomical revision to determine which are truly *M. prasina* s.str. It is, of course, one of the commonest members of the genus, much recorded in the past, but only records of those Polish specimens which contain micareic acid

**Table 6.** Diagnostic features for the separation of *M. hedlundii* Coppins, *M. prasina* Fr. and *M. tomentosa* Czarnota & Coppins.

| Feature / Species              | <i>M. hedlundii</i>  | <i>M. prasina</i>  | <i>M. tomentosa</i>  |
|--------------------------------|--|--|--|
| Thallus colour                 | dull olive to olive-green  | whitish-green, bright green to olive-green   | bright green   |
| Goniocysts pigment             | ± orange (usually present), K+ purple-violet   | lack or sometimes ±olive to greyish, K+ violet   | lack, K-   |
| Chemistry (TLC)                | no substances  | micareic acid  | no substances  |
| Apothecia colour               | brownish, dilute greyish-brown to brown  | variable: pale, dilute brown, dilute grey, grey-brown, piebald to almost blackish-brown or blackish-grey | pale, slightly brownish, pinkish brown or brownish-straw coloured  |
| Apothecia size                 | 0.15–0.5(–0.8) mm, usually tuberculate   | 0.2–0.4(–0.8) mm, sometimes tuberculate  | 0.15–0.3 mm, simple  |
| Ascospores (µm)                | 0–1-septate; (7–)8–10(–12) × (2.5–)3–4   | 0–1-septate; (6–)8–12(–14) × (2.5–)3–4(–5.5)   | (0–)1-septate; (6.5–)7.5–9(–9.5) × 2.2–3.5(–3.75)  |
| Pycnidia producing mesoconidia | distinct, stalked, with sometimes branched pycnidio-phores, pinkish-brown, densely tomentose | immersed between goniocysts to sessile, globose, whitish, greyish to rarely blackish                     | sessile to shortly stalked, simple, at first covered with white tomentum, later sometimes tomentose only at the base of pycnidia |
| Mesoconidia size (µm)          | 4–5.5 × 1.2–1.7  | 4–5.5(–6) × 1–1.2(–1.5)  | (3–)3.2–3.5(–4) × 1.2–1.5(–1.6)  |
| Substrata                      | mostly soft lignum of decaying stumps within natural forest                                  | decaying stumps or lignum of decorticated fallen logs, rarely bark of trees                              | usually decaying stumps, rarely bark at the base of coniferous trees ( <i>Abies alba</i> ) within natural forest                 |

are listed below. The list of examined specimens mentioned below consists almost exclusively of those analyzed by TLC.

Stein (1879: 193) was the first who reported *Biatorina prasina* Fr. from the Silesia, but he did not provide locality details, probably because it was quite common throughout the region. Unfortunately, only one gathering of *M. prasina* s.str. from Silesia, by an anonymous 19th century collector, has been found in WRSL.

In the Polish lichenological literature there are many reports giving localities of *M. prasina* (s.l.) in different regions of the country, but many of them have no available analogues in official national or private collections; therefore, those from Pomerania (Fałtynowicz & Tobolewski 1989: 486; Fałtynowicz & Miądlkowska 1990: 58; Rutkowski 1993: 33; Lipnicki 1993: 703; Miądlkowska 1997: 2; Fałtynowicz *et al.* 2000: 123; Fałtynowicz & Królak 2001: 138), some others from NE Poland (Cieśliński & To-

bolewski 1989: 88; Cieśliński & Zielińska 1994: 57; Fałtynowicz 1994: 22; Kolanko 2000: 60; Zalewska & Rutkowski 2001: 156; Kukwa & Fałtynowicz 2002: 379), Pojezierze Lubuskie and Pojezierze Wielkopolskie lakelands (Lipnicki 1991: 20), from Nizina Południowowielkopolska lowland (Kubiak 1999: 236), the Sudetes (Fabiszewski 1968: 78; Miądlkowska 1993: 35), from uplands in the middle part of the country (Halicz & Cieśliński 1967: 39; Kiszka 1987: 128, 1993: 208, 1997b: 198; Toborowicz 1998: 82), Roztocze (Bystrek & Ożóg 1974: 261), from Carpathian foothills (Kozik 1977: 233; Kiszka 1995: 64, 1996: 40) and the Carpathians (Kiszka 1967a: 42, b: 431, 1985: 226, 1997a: 293, 2004: 34; Kiszka & Piórecki 1992: 58) have not been confirmed and taxonomically revised here.

*Micarea prasina* is a forest species found mainly in more natural communities. It appears to be more frequent in the southern, mountainous part of the country, where more differentiated stands

occur and an abundance of large-sized decaying wood (stumps, fallen logs) is much greater than in the managed pine woodlands of the lowlands. Despite this, it frequently grows in larger lowland forests, but it mostly differs from mountain collections in possessing a less sorediate thallus, so it is often overlooked in the field. Moreover, in these ecological circumstances, most thalli are covered by non-lichenized algae and its collections are insufficient for TLC. Well-developed specimens are found almost always within old, natural reserves, which would indicate that it is a less ecologically tolerant species than *M. micrococca*, as previously suggested by (Coppins 1983: 176; see also under *M. micrococca*).

*Micarea prasina* mainly occurs on soft wood of decaying stumps and logs in wet or moist niches, where it dominates the substratum often only in association with lignicolous bryophytes or additionally with *Lepraria lobificans*, *Lichenomphalia umbellifera*, *Micarea hedlundii*, *M. nigella*, *Placynthiella dasaea*, *P. icmalea*, *Trapeliopsis pseudogranulosa* and *T. viridescens*. On harder wood it is mostly associated with *Absoconditella lignicola*, *Arthonia spadicea*, *Cladonia coniocraea*, *C. digitata*, *Coenogonium pineti*, *Hypogymnia physodes*, *Micarea botryoides*, *M. misella* and *Trapelia corticola*. In the lowlands, rarely, but more frequently than in mountains, *M. prasina* is also recorded from the base of trunks of *Betula pendula*, *Pinus sylvestris* and *Quercus* sp. within pine woodlands or on the bark of several deciduous trees such as *Quercus robur* (e.g. in Góry Świętokrzyskie Mts), *Quercus petraea* (e.g. in Wzniesienia Łódzkie heights) or *Sorbus torminalis* (in Bory Tucholskie Forest) in mixed and hornbeam forests, where it is associated with, for example, *Arthonia spadicea*, *Cladonia coniocraea*, *C. digitata*, *Hypogymnia physodes*, *Lecanora expallens*, *Lepraria* sp., and sporadically *Porina leptalea*.

In the mountains, *M. prasina* is one of the commonest lignicolous lichen species; Nowak (1972: 59) noting that it was one of the 'montane species having their principal centre of distribution in one or both forested montane zones'. Indeed, it is most frequently found in the coniferous, fir-spruce forest *Abieti-Piceetum* covering the lower belt of

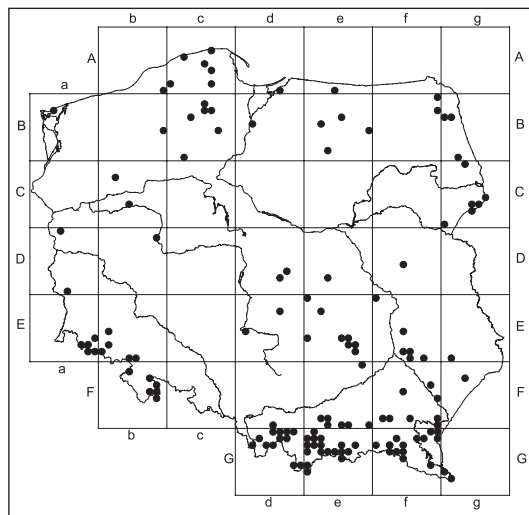


Fig. 52. Distribution map of *Micarea prasina* Fr. in Poland.

the Carpathians and in the upper mountain spruce forest *Plagiothecio-Piceetum* in the Carpathians, as well as Sudetes. The highest locality (1500 m) from which it has been recorded in Poland is in the High Tatra Mts.

**WORLD DISTRIBUTION.** Although *M. prasina* has been known since 1825, its distinction in the modern sense (based on the presence of micareic acid by TLC) is only recent, resulting from the re-introduction of *M. micrococca* (Coppins 2002). For this reason, an insufficient number of reports from Europe exist to characterize its distribution.

**EUROPE:** Austria (Steiermark – Obermayer, *Lich. Graec. No. 11, 109*); Finland (as *Lecidea prasinizia*; TLC made here); Germany (Coppins 1983, as *Catillaria micrococca* f. *glebosula*; e.g. Arnold, *Lich. Exs. No. 280C*); Great Britain (Coppins 1983, as *M. prasina* containing substance B; Coppins 2002); the Netherlands, common (Aptroot *et al.* 2004); Sweden (Coppins 1989, designation of lectotype); Switzerland (Coppins 1983, as *Lecidea sordidescens* containing 'prasina-unknown B'; Lojka, *Lichenogr. Univ. No. 31*; Scherer, *Lich. Helvet. No. 278*); Ukraine – Podilya Upland (Bielczyk *et al.* 2005). **NORTH AMERICA:** USA (Coppins 1983: 179, citing Cummings, *Dec. N. Am. Lich. I, No. 355*).

It is likely that many reports of *M. prasina* from the rest of the world include a large proportion of *M. prasina* s.str. records (however *M. micrococca* would seem to be much more common). The following reports of *M. prasina* s.l. need re-evaluation.

EUROPE: Austria (Hafellner & Türk 2001); Azores, Madeira and Canary Islands (Hafellner 1995); Belgium and Luxembourg (Diederich & Sérusiaux 2000); Cyprus (Litterski & Mayrhofer 1998); Czech Republic (Vězda & Liška 1999) Denmark (Søchting & Alstrup 2002); Estonia (Randlane & Saag 1999); Finland (Vitikainen *et al.* 1997); Germany (Scholz 2000) – e.g. Lower Saxony (Hauck 1996), Nordrhein-Westfalen (Heibel 1999), Schleswig-Holstein (Jacobsen 1992); Greece – Ikaria island (Sipman *et al.* 2005); Hungary (Verseghy 1994); Iceland (Kristinsson & Heidmarsson 2006); Ireland (Seaward 1994); Italy (Nimis & Martellos 2003); Latvia (Piterāns 2001); Lithuania (Motiejūnaitė 1999); Norway (Santesson 1993); Romania (Ciurchea 1998); Portugal (van den Boom 1999); Russia – Leningrad Region (Zavarzin *et al.* 1999), Komi Republic (Hermansson *et al.* 1998), North Osetia, NW Caucasus (Blinkova & Urbanavichus 2005); Slovakia (Pišút *et al.* 1996); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993); Switzerland (Scheidegger *et al.* 2002); Ukraine – Eastern Carpathians (Kondratyuk *et al.* 1998). NORTH AMERICA: USA – Columbia (McCune 1994), Michigan (Fryday *et al.* 2001), New York – State (Brodo 1968, as *Micarea prasina* var. *sordidescens*), North Carolina (Lendemer & Yahr 2004). ASIA: Russia – Siberia, lower Ob River (Sedelnikova & Taran 2000); Turkey (Yildiz *et al.* 2002). AUSTRALOCEANIA: Tasmania (Jarman & Kantvilas 2001 – probably different species named as *M. prasina* Fr. aggr.; form A–E). SOUTH AMERICA: Brazil (Aptroot 2002); Chile (Galloway & Quilhot 1998).

EXSICCATAE SEEN (*M. prasina* s.str.). Arnold, *Lich. Exs. No. 280* and *No. 280C* (H-NYL, H, WRSL); Hepp, *Flecht. Eur. No. 278* (WRSL); Lojka, *Lichenogr. Univ. No. 31* (H); Obermayer, *Lich. Graec. No. 11* (H), *No. 109* (H); Schaerer, *Lich. Helvet. No. 278* (WRSL); Zwackh, *Lich. Exs. No. 656* (H-NYL).

SPECIMEN EXAMINED. Grid square Ab-99 – POBRZEŻE KOSZALIŃSKIE COASTLAND, RÓWNINA SŁAWIENSKA PLAIN: SW shore of Łętowo Lake, W of Kępcice town, 17 July 1983, *leg. I. Izydorek* (Hb. Izydorek); Ac-36 – WYBRZEŻE SŁOWIŃSKIE COAST: Wierzchucińskie Błota (former peat-bog), ‘Długosz królewski w Wierzchucinie’ nature reserve, forest section no. 244 [54°47'53"N/18°02'07"E] 5 Aug. 2005, *leg. M. Kukwa 4540a* (UGDA); Ac-42 – WYBRZEŻE SŁOWIŃSKIE COAST: Słowiński National Park, Kluki forest district, forest section no. 71, 12 Sept. 1970, *leg. Z. Tobolewski* (POZ) and forest section no. 79, 30 Aug. 1968, *leg. Z. Tobolewski* (POZ), as *Catillaria* sp.; Ac-55 – WYSOCZYNA ŻARNOWIECKA PLATEAU: between Kisewo and Brzeźno Lęborskie villages near Kisewska Struga river, 25 Oct. 2001, *leg. E. Garska* (Hb. Izydorek); Ac-66 – POJEZIERZE WSCHODNIOPOMORSKIE LAKELAND, POJEZIERZE KASZUBSKIE LAKELAND: ca 3 km S of Porzecele village on Łeba River, ?, *leg. W. Faltynowicz* (UGDA-L 9259); Ac-80 – POJEZIERZE ZACHODNIOPOMORSKIE LAKELAND, WYSOCZYNA DAMNICKA PLATEAU: Leśny Dwór forest division, Skarszów forest district, forest section no. 89c, 17 June 1991, *leg. E. Szeftlińska* (Hb. Izydorek); Ac-86 – POJEZIERZE WSCHODNIOPOMORSKIE LAKELAND, POJEZIERZE KASZUBSKIE LAKELAND: ‘Kurze Grzędy’ nature reserve, forest section no. 100, 5 May 2005, *leg. M. Kukwa 3994, 3995* (UGDA), forest section no. 133b, 5 May 2005, *leg. M. Kukwa 4022* (UGDA) and forest section no. 136c, 5 May 2005, *leg. M. Kukwa 4041* (UGDA); Ad-96 – POBRZEŻE GDAŃSKIE COASTLAND, WYSOCZYNA ELBLĄSKA PLATEAU: valley of Grabianka River, Elbląg forest division, Górki forest district, forest section no. 206 [54°16'N/19°32'E] alt. 140 m, 23 Aug. 2003, *leg. R. Szymczyk* (OLS) and forest section no. 213 [54°15'40"N/19°32'20"E] alt. 140 m, 23 Aug. 2003, *leg. R. Szymczyk* (OLS); Ae-94 – NIZINA STAROPRUSKA LOWLAND, RÓWNINA SĘPOPOLSKA PLAIN: Sporwiny settlement, 6 May 1989, *leg. J. Nowak* (KRAM-L 26350); Ba-23 – POBRZEŻE SZCZECIŃSKIE COASTLAND, UZNAM AND WOLIN ISLANDS: Wolin Island, Woliński National Park: Międzyzdroje forest district, forest section no. 11f, above cliff [53°57'49"N/14°30'10"E] alt. ca 50 m, 16 May 2004, *leg. P. Czarnota 4288* (GPN) and forest section no. 12 [53°57'31"N/14°29'51"E] alt. ca 50 m, 16 May 2004, *leg. P. Czarnota 4301* (GPN), Wiśleka forest district, forest section no. 10A<sub>j</sub> [53°57'53"N/14°31'38"E] alt. ca 40 m, 16 May 2004, *leg. P. Czarnota 4300* (GPN); Bb-59 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, DOLINA GWDY VALLEY: ‘Cisy w Czarnem’ nature reserve [53°44'15"N/16°58'45"E] 13 Nov. 2004, *leg. M. Kukwa 3719* (UGDA); Bc-15 – BORY Tucholskie FOREST: Wdzy-



dzki Landscape Park, ca 0.5 km E of Wyrówno Lake, W bank of Wda river, 17 June 2003, *leg. M. Kukwa s.n.* (GPN 4791); Bc-25 – BORY TUCHOLSKIE FOREST: Lipusz forest division, Joniny forest district, forest section no. 197c, ca 0.5 km SE of Słupinko village, 12 Sept. 2002, *leg. A. Kowalewska* (UGDA) and forest section no. 199b, ca 0.5 km S of Słupinko village, 14 Sept. 2002, *leg. A. Kowalewska* (UGDA); Wdzydzki Landscape Park, ca 0.5 km SW of Szludron village, 11 Sept. 2002, *leg. A. Kowalewska* (UGDA); Bc-26 – BORY TUCHOLSKIE FOREST: peat-bog near Drzędno Lake, 29 July 1983, *leg. W. Faltynowicz* (UGDA-L 7819); Bc-33 – RÓWNINA CHARZYKOWSKA PLAIN: Zaborski Landscape Park, near Zmarłe Lake, 28 Sept. 2001, *leg. P. Czarnota* (GPN 2614); Bc-57 – BORY TUCHOLSKIE FOREST: ca 1 km N of Śliwice village near Czersk town, 24 May 1986, *leg. W. Faltynowicz* (UGDA-L 3913); Bc-92 – POJEZIERZE KRAJEŃSKIE LAKELAND: W end of Mesy settlement, ca 6 km N of Więcbork town, 31 July 2002, *leg. L. Lipnicki* (Hb. Lipnicki); Bd-42 – POJEZIERZE IŁAWSKIE LAKELAND, POJEZIERZE IŁAWSKIE LAKELAND: Kwidzyń forest division, Lisewo forest district, forest section no. 207, between Ryjewo and Małki villages, 19 Aug 1996, *leg. M. Kukwa* (UGDA-L 7804, 7806) and forest section no. 218, 28 Aug. 1996, *leg. M. Kukwa* (UGDA-L 7811); Be-35 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE OLSZTYŃSKIE LAKELAND: 2 km NW of Wilimy village, loc. 618, 17 Sept. 1989, *leg. S. Cieśliński* (KTC); Be-42 – POJEZIERZE OLSZTYŃSKIE LAKELAND: Olsztyn, Las Miejski, square OL-H-14, Sept. 2001, *leg. D. Kubiak* (OLTC) and square OL-D-16, 9 Aug. 2000, *leg. D. Kubiak* (OLTC); Be-59 – KRAINA WIELKICH JEZIOR MAZURSKICH LAKELAND: Puszcza Piska Forest, forest section no. 203, ca 4 km NE of Ukta village, loc. 276, 2 Sept. 1987, *leg. S. Cieśliński* (KTC; GPN 3661); Be-83 – POJEZIERZE OLSZTYŃSKIE LAKELAND: ca 4.5 km NE of Napiwoda village, forest section no. 291, loc. 1187, 22 Aug. 1993, *leg. S. Cieśliński* (KTC); Bf-09 – POJEZIERZE LITEWSKIE LAKELAND, POJEZIERZE WSCHODNIO-SUWAŁSKIE LAKELAND: Puszcza Augustowska Forest, Wigierski National Park, Wigry forest division, forest section no. 106A, 12 Sept. 1984, *leg. R. Kozik* (KRAP); Bf-29 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, forest section no. 14, ca 5 km N of Przewięź village, loc. 98, 15 Sept. 1986, *leg. S. Cieśliński* (KTC); Bg-30 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, border of forest sections no. 39/63, ca 4.5 km N of Przewięź village, 15 Sept. 1986, *leg. S. Cieśliński* (KRAM-L 31897); Bg-31 – RÓWNINA AUGUSTOWSKA PLAIN: Puszcza Augustowska Forest, border of forest sections no. 125/126 and 143/144, ca 2 km SW of ‘Mały Borek’ nature reserve, loc.

109, 18 Sept. 1986, *leg. S. Cieśliński* (KTC); Bg-92 – NIZINA PÓLNOCCNOPODLASKA LOWLAND, WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, ‘Budzisk’ nature reserve, forest section no. 109d, 11 June 1999, *leg. K. Czyżewska* (LOD 10971); Cb-22 – POJEZIERZE POŁUDNIOWOPOMORSKIE LAKELAND, RÓWNINA DRAWSKA PLAIN: Drawieński National Park, Radecin nature reserve [53°05'56"N/15°53'40"E] alt. ca 80 m, 18 May 2004, *leg. P. Czarnota* 4122, 4126 (GPN); Cb-64 – PRADOLINA TORUŃSKO-EBERSWALDZKA VALLEY, KOTLINA GORZOWSKA BASIN: Puszcza Notecka Forest, N of road between Mokrz and Rzecin villages, 4 Oct. 2001, *leg. K. Glanc* (GPN 2647); Cg-03 – NIZINA PÓLNOCCNOPODLASKA LOWLAND, WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, ‘Stare Biele’ nature reserve, 19 Mar. 1999, *leg. K. Kolanko* (Hb. Kolanko); Cg-55 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowiecki National Park, forest section no. 340A, 12 Aug 2002, *leg. P. Czarnota* (GPN 2943); Cg-56 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowiecki National Park, forest section no. 256, 15 Sept. 1987, *leg. K. Czyżewska* (LOD 5608) and forest section no. 374, near Dziedzinka settlement, 11 June 1996, *leg. S. Cieśliński* (KTC); Cg-64 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Hajnówka forest division, forest section no. 488C, ‘Nieznany Bór’ nature reserve, loc. 68, 1982, *leg. S. Cieśliński & Z. Tobolewski* (KTC) and forest section no. 572A, ‘Michnówka’ nature reserve, 11 Aug. 2002, *leg. P. Czarnota* (GPN 2972); Cg-65 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Białowieża forest division, forest section no. 447B, loc. 84, 1981–1984, *leg. S. Cieśliński & Z. Tobolewski* (POZ); Cg-74 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Hajnówka forest division, forest section no. 697D, ‘Starzyna’ nature reserve, loc. 138, 1983, *leg. S. Cieśliński & Z. Tobolewski* (KTC; POZ) and forest section no 634A, loc. 158, 198?, *leg. S. Cieśliński* (BSG); Cg-90 – WYSOCZYNA DROHICZYŃSKA PLATEAU: Radziwiłłówka forest district, forest section no. 105, loc. 160, 20 May 1987, *leg. S. Cieśliński & Z. Tobolewski* (KTC); Da-04 – POJEZIERZE LUBUSKIE LAKELAND, RÓWNINA TORZYMSKA PLAIN: Puszcza Rzepińska Forest, ca 4 km S of Rzepin town, Nowy Młyn forest district [52°18'03"N/14°46'37"E] alt. 60 m, 8 Apr. 2006, *leg. P. Czarnota* 4843 (GPN); Da-95 – NIZINA ŚLĄSKO-ŁUŻYCKA LOWLAND, BORY DOLNOŚLĄSKIE FOREST: E of Lutynka village, along railway, 14 Sept. 2000, *leg. L. Śliwa* 1354 (KRAM); Db-18 – POJEZIERZE WIELKOPOLSKO-KUJAWSKIE LAKELAND, POJEZIERZE POZNAŃSKIE LAKELAND: Stęszewskie Lakeland, Wielkopolski National Park, Wiry forest district, forest section no.

- 46f [52°17'54"N/16°49'36"E] 19 May 2004, *leg. P. Czarnota 3912* (GPN); Dd-67 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, WZNIESIENIA ŁÓDZKIE HEIGHTS: Wzniesienia Łódzkie Landscape Park, Janiów forest district, forest section no. 51k, 3 Nov. 2004, *leg. M. Hachulka* (LOD 12164); Dd-76 – WZNIESIENIA ŁÓDZKIE HEIGHTS: 'Las Łagiewnicki' nature reserve, forest section no. 19a, 30 July 1997, *leg. B. Kośmider* (LOD 9971); De-73 – WYSOCZYNA RAWSKA PLATEAU: Rawa Mazowiecka forest division, 'Trębaczew' nature reserve, forest section no. 90, 20 Aug. 1970, *leg. K. Czyżewska* (LOD 714); Df-54 – NIZINA POŁUDNIOWOPOLSKA LOWLAND, RÓWNINA ŁUKOWSKA PLAIN: near 'Jata' nature reserve in the vicinity of Żdźary village [51°57'11"N/22°11'53"E] 21 June 2005, *leg. P. Czarnota 4659* (GPN); Ea-69 – WESTERN SUDETES, KOTLINA JELENIÓGÓRSKA BASIN: vicinity of Jelenia Góra town (Sattler bei Hirschberg), 22 July 1845, *leg. ? (WRSL)*; Ea-77 – GÓRY IZERSKIE MTS: Dolina Izery valley, ca 1 km W of Orle settlement, in peat-bog spruce forest [50°49.11'N/15°22.63'E] alt. ca 800 m, 9 July 2003, *leg. P. Czarnota* (GPN 3550); Ea-78 – KARKONOSZE MTS: Szklarska Poręba town, Jeleniogórska street, 11 Nov. 1997, *leg. M. Ratajczak* (LOD 10781 together with *M. botryoides*) and 4 May 1999, *leg. M. Ratajczak* (LOD 10901); Karkonoski National Park, Wodospad Szklarki waterfall, 2000, *leg. M. Kossowska* (Hb. Kossowska); vicinity of Michałowice village, alt. 690 m, 2003, *leg. M. Staniaszek* (Hb. Staniaszek); Ea-88 – KARKONOSZE MTS: N slope of Śmielec Mt, valley of Niedźwiada stream, alt. 1075 m, 2003, *leg. M. Staniaszek* (Hb. Staniaszek); Ea-89 – KARKONOSZE MTS: Turek Mt., alt. 870 m, 2003, *leg. M. Staniaszek* (Hb. Staniaszek); Eb-51 – POGÓRZE ZACHODNIOSUDECKIE FOOTHILLS, POGÓRZE KACZAWSKIE FOOTHILLS: near Kamiennik stream, E of Świerzawa town [51°00'37"N/15°59'00"E] alt. ca 290 m, 22 Apr. 2005, *leg. P. Czarnota 4746* (GPN); Eb-71 – WESTERN SUDETES, RUDAWY JANOWICKIE MTS: Strużnica village, W of Czartówka Wood by forest road, alt. ca 600 m, 13 Oct. 1999, *leg. G. Leśniński* (OPUN together with *M. misella*); Trzeńsko village, 0.3 km E of Karpnicka Pass, alt. 480 m, 7 June 1999, *leg. G. Leśniński* (OPUN); Eb-80 – KARKONOSZE MTS: Karkonoski National Park: Karpacz – Wilcza Poręba town, Dolina Łomniczki valley, by hiking track, alt. 700 m, 7 July 2003, *leg. P. Czarnota* (GPN 3536, 3537) and [50°45.81'N/15°45.32'E] alt. 710 m, 7 July 2003, *leg. P. Czarnota* (GPN 3287), Dolina Łomniczki valley, by hiking track [50°45.74'N/15°45.48'E] alt. 730 m, 7 July 2003, *leg. P. Czarnota* (GPN 3478), [50°45.60'N/15°45.63'E] alt. ca 735 m, 7 July 2003, *leg. P. Czarnota* (GPN 3460) and [50°45.18'N/15°45.18'E] alt. 800 m, 7 July 2003, *leg. P. Czarnota* (GPN 3457); Sowa Dolina valley, alt. 1040 m, 2003, *leg. M. Staniaszek* (Hb. Staniaszek); Eb-94 – MIDDLE SUDETES, GÓRY KAMIENNE MTS: ca 1 km W of Grzmiąca village, by Rybnica stream [50°42'20"N/16°18'55"E] alt. ca 480 m, 21 Apr. 2005, *leg. P. Czarnota 4489* (GPN); Eb-95 – GÓRY SOWIE MTS: S slope of Wielka Sowa Mt. above Sokolec village [50°39'55"N/16°29'30"E] alt. ca 700 m, 21 Apr. 2005, *leg. P. Czarnota 4695* (GPN) and below the top of Wielka Sowa Mt. in upper-mountain peat-bog [50°40'30"N/16°29'04"E] alt. ca 950 m, 21 Apr. 2005, *leg. P. Czarnota 4687* (GPN); Ed-26 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, WYSOCZYNA BELCHATOWSKA PLATEAU: Belchatów Industrial Region, Pytowice Wood, forest section no. 199, 25 June 1982, *leg. K. Czyżewska* (LOD 8328); Ed-51 – WYŻYNA WOŹNICKO-WIELUŃSKA UPLAND, WYŻYNA WIELUŃSKA UPLAND: Załęczański Landscape Park, Węże Mt. 17 Sept. 1997, *leg. M. Kukwa* (Hb. Kukwa together with *M. misella*); Ee-00 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, RÓWNINA PIOTRKOWSKA PLAIN: 'Spała' nature reserve, forest section no. 285, 8 May 1970, *leg. K. Czyżewska* (LOD 11875 together with *M. hedlundii*); Ee-22 – WYŻYNA PRZEDBORSKA UPLAND, WZGÓRZA OPCZYŃSKIE HILLS: Opoczno forest division, Białaczów forest district, forest section no. 101a, 'Białaczów' nature reserve, 20 Apr. 2002, *leg. K. Czyżewska* (LOD 11396); Ee-60 – WZGÓRZA ŁOPUSZAŃSKIE HILLS: Włoszczowa forest division, Zabrody forest district, forest section no. 53, 19 June 1974, *leg. K. Czyżewska* (LOD 3087); Ee-65 – WYŻYNA KIELECKA UPLAND, GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, forest section no. 83, at foot of Pasma Klonowskie range, 4 July 1998, *leg. S. Cieśliński & A. Donica* (KTC) and forest section no. 84, loc. 9, 1 Apr. 1998, *leg. S. Cieśliński & A. Donica* (KTC); Pasma Klonowskie range, S of Łączna village, Klonów forest district, forest section no. 218, loc. 12, 30 July 2001, *leg. A. Donica* (KTC) and forest section no. 220, loc. 223, 30 July 2001, *leg. A. Donica* (KTC); Dolina Wilkowska valley, forest section no. 243, loc. 225, 30 July 2001, *leg. A. Donica* (KTC); Pasma Klonowskie range, vicinity of Świętokrzyski National Park, N of Bukowa Góra near Łączna village, loc. 222, 30 July 2001, *leg. A. Donica* (KTC); Ee-66 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park: Pasma Klonowskie range, forest section no. 55, near railway station, loc. 30, 6 Nov. 1998, *leg. S. Cieśliński & A. Donica* (KTC), Psary forest district, forest section no. 18, Góra Psarska Mt., loc. 54, 3 July 2000, *leg. A. Donica* (KTC), Wzorki forest district, forest section

- no. 31, loc. 47, 1 July 2000, *leg. A. Donica* (KTC), Podgórze forest district, forest section no. 42, 'Czarny Las' nature reserve, loc. 202, 16 July 2001, *leg. A. Donica* (KTC); Ee-76 – GÓRY ŚWIĘTOKRZYSKIE MTS: Łysogóry range, Świętokrzyski National Park: Dębno forest district, forest sections no. 92/93, loc. 242, 2 Aug. 2001, *leg. A. Donica* (KTC) and forest section no. 129, 2 Aug. 2001, *leg. A. Donica* (KTC), Święta Katarzyna forest district, Agata block-field, forest section no. C1, loc. 145, 25 Sept. 2000, *leg. A. Donica* (KTC together with *M. misella*), forest section no. 164, loc. 86, 5 Aug. 2000, *leg. A. Donica* (KTC) and forest section no. 195, S slope of Łysica Mt., loc. 76, 6 July 2000, *leg. A. Donica* (KTC), Jastrzębi Dół forest district, forest section no. 49, loc. 245, 2 Aug. 2001, *leg. A. Donica* (KTC), forest section no. 159, loc. 244, 2 Aug. 2001, *leg. A. Donica* (KTC) and forest sections no. 160/161, 2 Aug. 2001, *leg. A. Donica* (KTC); a meadow S of Wilków village, loc. 72, 6 July 2000, *leg. A. Donica* (KTC); Ee-77 – GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park: Łysogóry range, Jastrzębi Dół forest district, forest section no. 150, loc. 94, 6 Aug. 2000, *leg. A. Donica* (KTC); Święty Krzyż forest district, forest section no. 118, loc. 56, 4 July 2000, *leg. A. Donica* (KTC), forest sections no. 196/197, on block-field area, loc. 189, 5 July 2001, *leg. A. Donica* (KTC), forest section no. 209, loc. 180, 3 July 2001, *leg. A. Donica* (KTC) and forest section no. B1, loc. 308, 5 July 2002, *leg. A. Lubek* (KTC); Łysa Góra Mt. [50°51'39"N/21°02'44"E] alt. 580 m, 6 May 2004, *leg. P. Czarnota* 3822 (GPN); S slope of Łysa Góra Mt., forest section no. 201b [50°51'36"N/21°02'43"E] alt. ca 580 m, 6 May 2004, *leg. P. Czarnota* 3828 (GPN); Chełmowa Góra Mt., forest section no. A4, loc. 136, 27 July 2001, *leg. A. Donica* (KTC) and [50°53'16"N/21°05'42"E] alt. ca 280 m, 6 May 2004, *leg. P. Czarnota* 3824 (GPN); Dębno forest district, forest section no. 125/126, loc. 95, 6 Aug. 2000, *leg. A. Donica* (KTC); vicinity of the Świętokrzyski National Park, Pasma Bielińskie range, forest sections no. 27/28, loc. 277, 2 July 2002, *leg. A. Lubek* (KTC); Jodłowy Dwór forest district, forest section no. 119, loc. 55, 4 July 2000, *leg. A. Donica* (KTC); Ee-87 – GÓRY ŚWIĘTOKRZYSKIE MTS: Pasma Bielińskie range, Bieliny forest district, border of forest sections no. 131/132, loc. 175, 3 July 2001, *leg. A. Donica* (KTC); Ef-00 – NIZINA ŚRODKOWO-MAZOWIECKA LOWLAND, RÓWNINA KOZIENICKA PLAIN: Puszcza Koziennicka Forest, 'Zagożdżon' nature reserve, 2000, *leg. S. Cieśliński* (KTC), as *M. denigrata* and 2002, *leg. S. Cieśliński* (KTC); Ef-54 – WYŻYNA LUBELSKA UPLAND, WZNIESIENIA URZĘDOWSKIE HEIGHTS: forest between Urzędów and Dzierzkowice villages, alt. ca 200 m, 19 May 2003, *leg. P. Czarnota* 4192 (GPN); Ef-84 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, ca 1 km N of Gielnia village in peat-bog near ponds, 9 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LBL); Ef-85 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, 'Łęka' nature reserve, 8 Sept. 1999, *leg. S. Cieśliński* (LBL); near Narożniki forester's lodge, ca 0.5 km SW of Kolonia Łysaków village, 8 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LOD 12171 together with *M. viridileprosa*); border of Lasy Janowskie Landscape Park, vicinity of Majdan Łysakowski village, 8 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LBL); Ef-95 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, road between Świdry settlement and 'Jastkowice' nature reserve, 9 Sept. 1999, *leg. L. Śliwa & B. Krzewicka* (LBL together with *M. misella*); Ef-97 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, edge of meadow by Branew River near Porytowe Wzgórze region [50°37'N/22°27'E] 9 Sept. 1999, *leg. U. Bielczyk, R. Kozik, L. Lipnicki & H. Wójciak* (LBL); Eg-91 – ROZTOCZE, MIDDLE ROZTOCZE: Roztoczański National Park, Stogi forest district, forest section no. 12g [50°39'15"N/23°02'41"E] alt. ca 290 m, 28 Apr. 2004, *leg. P. Czarnota* 3920 (GPN) and forest section no. 178b [50°35'42"N/23°04'42"E] alt. ca 260 m, 28 Apr. 2004, *leg. P. Czarnota* 3890 (GPN); Fb-14 – MIDDLE SUDETES, GÓRY STOŁOWE MTS: Góry Stołowe National Park, ca 0.3 km NW of Batorówek settlement, by hiking track, alt. 675 m, 23 Apr. 2003, *leg. P. Czarnota* (GPN 3273); Fb-27 – EASTERN SUDETES, GÓRY ŻŁOTE MTS: near Różaniec Pass, by the border of PL/ČR [50°24'11"N/16°52'15"E] alt. 580 m, 19 Apr. 2005, *leg. P. Czarnota* 4414 (GPN); ca 1.5 km S of Złoty Potok town, by road to Łądek Zdrój town [50°26'20"N/16°51'18"E] alt. 450 m, 19 Apr. 2005, *leg. P. Czarnota* 4453 (GPN together with *M. misella*); Fb-38 – GÓRY ŻŁOTE MTS: near Łądek Zdrój town, towards Trolak Mt., 19 Oct. 1959, *leg. K. Glanc* (KRAM-L 26423); Fb-47 – ŚNIEŻNIK MASSIF: hiking track from Puchaczówka Pass to Czarna Góra Mt., alt. 860 m, 19 Oct. 2000, *leg. K. Szczepańska* (Hb. Szczepańska); Fb-48 – GÓRY ŻŁOTE MTS: Góry Białskie Mts, 'Nowa Morawa' nature reserve, W slope of Solec Mt., alt. ca 900 m, Aug. 2003, *leg. K. Szczepańska* (Hb. Szczepańska); Góry Białskie Mts, N slope of Jawornik Kamienny Mt., by hiking track from Bielice village to Puszcza Jaworowa Forest, alt. 800 m, 31 July 2003, *leg. K. Szczepańska* (Hb.

Szczepańska); Fd-58 – WYŻYNA KRAKOWSKO-CZĘSTOCHOWSKA UPLAND, WYŻYNA OLKUSKA UPLAND: Dolina Będkowska valley, 9 km EEN of Krzeszowice town, alt. 400 m, 26 July 1986, *leg. J. Nowak* (KRAM-L 30351), as *Micarea* sp.; Wyżyna Ojcowska Upland, Ojcowski National Park, Dolina Saspowska valley, forest section no. 30a, 15 Apr. 2004, *leg. P. Czarnota 3916* (GPN) and near Jaskinia Łokietka cave [50°12.04'N/16°49.12'E] alt. 340 m, 15 Apr. 2004, *leg. P. Czarnota 4134* (GPN); Fd-95 – BESKID MAŁY MTS: S slope of Beskid Mt., valley of Cisowy stream, alt. 600 m, 12 Apr. 1961, *leg. J. Nowak* (KRAM-L 7024, 7227); Fe-08 – NIECKA NIDZIAŃSKA BASIN, NIECKA POŁANIECKA BASIN: Oględów village near Staszów town, 4 Sept. 1990, *leg. J. Kiszka* (BDPA); Fe-82 – POGÓRZE ZACHODNIOBESKIDZKIE FOOTHILLS, POGÓRZE WIŚNICKIE FOOTHILLS: Cichawka stream, well-head, 19 May 1998, *leg. L. Śliwa 815b, 827b* (KRAM); Fe-83 – POGÓRZE WIŚNICKIE FOOTHILLS: Królówka-Skotnica village, 2 June 1998, *leg. L. Śliwa 679* (KRAM); Fe-93 – POGÓRZE WIŚNICKIE FOOTHILLS: hill by road to Rajbrot village, near Paprotna Góra Mt., 7 May 2000, *leg. L. Śliwa 1108a* (KRAM); Fe-95 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE ROŻNOWSKIE FOOTHILLS: valley of stream on N slope of Majdan Mt., alt. 400 m, 23 June 1971, *leg. R. Kozik* (KRAP); Fe-96 – POGÓRZE ROŻNOWSKIE FOOTHILLS: forested valley of stream near Siekierczyna village, alt. 460 m, 23 June 1971, *leg. R. Kozik* (KRAP together with *M. adnata*); Fe-99 – POGÓRZE CIĘŻKOWICKIE FOOTHILLS: Liwocz Mt., above Wróblowa village, alt. 400 m, 30 June 1972, *leg. R. Kozik* (KRAP); Ff-38 – KOTLINA SANDOMIERSKA BASIN, PŁASKOWYŻ TARNOGRODZKI PLATEAU: forest near Cieplice village, 24 Oct. 1984, *leg. J. Kiszka* (BDPA); Ff-44 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: ca 2 km E of Przewrotne village, near Hucisko settlement, 29 Aug. 2002, *leg. P. Czarnota* (GPN 2932); Ff-59 – PŁASKOWYŻ TARNOGRODZKI PLATEAU: Czerwona Wola forest district, 20 July 1984, *leg. J. Kiszka & J. Piórecki* (BDPA); Ff-81 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE STRYŻÓWSKIE FOOTHILLS: Strzyżów forest division, Cieszyna forest district, W slope of Chełm Mt. [49°53'22"N/21°33'09"E] alt. 470 m, 17 Apr. 2005, *leg. P. Czarnota 4760* (GPN); Ff-82 – POGÓRZE DYNOWSKIE FOOTHILLS: 'Herby' nature reserve, S of Jazowa village [49°50'34"N/21°39'58"E] alt. 440 m, 17 Apr. 2005, *leg. P. Czarnota 4666* (GPN); Ff-85 – POGÓRZE DYNOWSKIE FOOTHILLS: ca 2 km NNE of Barycz village near Kąkolówka settlement, 20 Mar. 2003, *leg. P. Czarnota* (GPN 3204); Ff-89 – POGÓRZE DYNOWSKIE FOOTHILLS: Hofubla settlement, 27 Apr. 1983, *leg. J. Kiszka* (BDPA) and

27 Sept. 1983, *leg. J. Kiszka* (BDPA), both as *Catillaria* p. for. *laeta*; Ff-99 – POGÓRZE PRZEMYSKIE FOOTHILLS: Tarnawce village, 26 Sept. 1983, *leg. J. Kiszka* (BDPA); Krasiczyn village, 26 Sept. 1983, *leg. J. Kiszka* (BDPA); Fg-23 – ROZTOCZE, EASTERN ROZTOCZE: near Narol village, 20 July 1984, *leg. J. Kiszka* (BDPA); Gd-05 – WESTERN BESKIDY MTS, BESKID MAKOWSKI MTS: Pasma Pewelskie range: Pewel Wielka village, Plutowa Polana settlement, alt. ca 650 m, 22 July 1965, *leg. J. Nowak* (KRAM-L 13607, 13627), Ślemień village, end of Czarny Dział valley, alt. ca 530 m, 5 Aug. 1965, *leg. J. Nowak* (KRAM-L 4949, 5053), valley of Wierchowacina stream, alt. 650 m, 23 Aug. 1965, *leg. J. Nowak* (KRAM-L 15282), N slope of Zwaliska Mt, alt. ca 550 m, 23 Sept. 1965, *leg. J. Nowak* (KRAM-L 13583); Gd-06 – BESKID ŻYWIECKI MTS: Pasma Jałowieckie range, Siwcówka settlement, valley of Stryżawka stream, alt. ca 600 m, 16 Aug. 1965, *leg. J. Nowak* (KRAM-L 15487); Stryżawa village, upper part of Czerna stream, alt. 580 m, 5 Sept. 1965, *leg. J. Nowak* (KRAM-L 15461); Lachowice village, Adamy settlement, alt. ca 690 m, 25 July 1965, *leg. J. Nowak* (KRAM-L 15612); Gd-07 – BESKID ŻYWIECKI MTS: Pasma Jałowieckie range, Zawoja village, valley of Kalinka stream, Chrząszcze – Topory settlement, alt. 700 m, 15 July 1965, *leg. J. Nowak* (KRAM-L 15636, 15790); Gd-08 – BESKID MAKOWSKI MTS: valley of Osielec stream, alt. ca 580 m, 5 June 1966, *leg. J. Nowak* (KRAM-L 17569); Gd-13 – BESKID ŚLĄSKI MTS: E slope of Barania Góra Mt., valley of Bystra stream, Węgierska Górka forest division, Sikorzane forest district, forest section no. 199d, alt. ca 1000 m, 10 May 2002, *leg. P. Czarnota* (GPN 2795, 2809); Gd-16 – BABIA GÓRA RANGE: N slope of Babia Góra Mt., Babiogórski National Park, forest section no. 10, by hiking track to Markowe Szczawiny shelter-house, alt. 1180 m, 9 June 2004, *leg. P. Czarnota 4106* (GPN) and forest section no. 22a [49°34'45"N/19°31'22"E] alt. 1320 m, 9 June 2004, *leg. P. Czarnota 4105* (GPN); Gd-17 – BABIA GÓRA RANGE: Polica range: valley of Rotnia stream, alt. 600 m, 23 Oct. 1965, *leg. J. Nowak* (KRAM-L 15936), Sucha Góra Mt., alt. 700 m, 23 Oct. 1965, *leg. J. Nowak* (KRAM-L 15954), Naroże Mt., alt. 1000 m, 23 Oct. 1965, *leg. J. Nowak* (KRAM-L 17203), N slope of Polica Mt, 'Klemensiewicz's' nature reserve, by hiking track, alt. ca 1250 m, 4 June 2004, *leg. P. Czarnota 3913* (GPN); Gd-22 – BESKID ŻYWIECKI MTS: Lastoczka settlement below Rachowiec Mt., alt. 710 m, 11 Aug. 1964, *leg. J. Nowak* (KRAM-L 14189, 14200, 14206); Gd-24 – BESKID ŻYWIECKI MTS: Piłsko range, Sopotnia Wielka village, valley of W Ciemnym stream, alt. 830 m, 17 June 1966, *leg. J. Nowak* (KRAM-L 17070); Gd-25

- BESKID ŻYWIECKI MTS: Piłsko range, Korbielów vil-  
lage near shelter-house, alt. 590 m, 11 Sept. 1964, *leg.*  
*J. Nowak* (KRAM-L 16625); Gd-58 – TATRA MTS, WEST  
TATRA MTS: Dolina Jarzabcza valley at edge of  
Jarzabcza Wyżnia glade, alt. 1335 m, 1 Sept. 1959, *leg.*  
*Z. Tobolewski* (POZ); Dolina Chochołowska valley near  
Ścieżka nad Regłami hiking track, alt. 1000 m, 30 Aug.  
1960, *leg.* *Z. Tobolewski* (POZ); Dolina Chochołowska  
valley, between Huciska and Jamy glades [49°15'24"N/  
19°49'20"E] alt. 1060 m, 18 June 2004, *leg.* *L. Śliwa*  
2466, 2474 (KRAM); Gd-59 – WEST TATRA MTS: S slope  
of Kominy Tylkowe Mt., by track between Iwanówka  
glade and Iwaniacka Pass, alt. 1226 m, 5 Sept. 1959,  
*leg.* *Z. Tobolewski* (POZ); Dolina Lejowa valley, Niżna  
Polana Kominiarska glade [49°15'12"N/19°50'54"E]  
alt. 1140 m, 15 June 2004, *leg.* *L. Śliwa* 2177 (KRAM);  
Gd-59 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION,  
RÓW PODTATRZAŃSKI DEPRESSION: Magura  
Witowska range, between Cicha Polana and Molkówka  
glades [49°17'05"N/19°49'33"E] alt. 950 m, 11 July  
2004, *leg.* *L. Śliwa* 2781, 2814, 2824 (KRAM); between  
Dolina Lejowa and Kościeliska valleys, above Biały  
Potok glade [49°16'40"N/19°51'18"E] alt. 930 m,  
12 July 2004, *leg.* *L. Śliwa* 2852 (KRAM); Ge-01 –  
WESTERN BESKIDY MTS, BESKID WYSPOWY MTS:  
E slope of Lubogoszcz Mt., ca 1 km W of Kasina Wielka  
village, by hiking track, alt. 680 m, 23 Sept. 2001, *leg.*  
*P. Czarnota* (GPN 2070); Ge-10 – BESKID WYSPOWY  
MTS: NE slope of Luboń Wielki Mt., by hiking track  
[49°39.20'N/19°59.74'E] alt. 950 m, 5 June 2003, *leg.*  
*P. Czarnota* (GPN 3594); Ge-10 – GORCE MTS: Gorce  
National Park, E slope of Suhora Mt., valley of Olszowy  
stream, alt. 860 m, 23 Feb. 2002, *leg.* *P. Czarnota* (GPN  
2725 together with *M. hedlundii*) and valley of Olszowy  
stream at the border of forest sections nos 75 and 134,  
by forest road, alt. ca 820 m, 29 Mar. 2004 *leg.* *P. Czarnota*  
3818 (GPN); Ge-11 – GORCE MTS: Gorce National  
Park: NW slope of Gorc Kamienicki Mt. in Dolina  
Kamienicy valley, alt. 1020 m, 8 Sept. 1959, *leg.*  
*K. Glanc* (GPN 2559 together with *M. nigella*; KRAM-L  
26421), valley of Konina stream, Podpiecie region below  
Cyrhla Hanulowa glade, alt. 740 m, 3 Feb. 1993, *leg.*  
*P. Czarnota* (GPN 279), N slope of Kudłoń Mt., Za  
Siarką region below Pyrzówka glade, alt. 980 m,  
26 Sept. 1995, *leg.* *P. Czarnota* (GPN 435), valley of  
Gorcowy Potok stream, Groń forest region, alt. 860 m,  
4 Oct. 1996, *leg.* *P. Czarnota* (GPN 1161), valley of  
Gorcowy Potok stream below Jaworzynka glade, alt.  
890 m, 2 Dec. 1997, *leg.* *P. Czarnota* (GPN 1907),  
N slope of Gorc Troszacki stream, below Adamówka  
glade, alt. 980 m, 20 Dec. 2000, *leg.* *P. Czarnota* (GPN  
2389), below Spaleniec clearing, alt. 940 m, 27 Mar.  
2002, *leg.* *P. Czarnota* (GPN 2790 together with  
*M. misella*); Ge-12 – BESKID WYSPOWY MTS: W slope  
of Modyń Mt., ca 1 km E of Zalesie village [49°37'30"N/  
20°22'40"E] alt. 850 m, 2 July 2005, *leg.* *P. Czarnota*  
4606 (GPN); Ge-20 – GORCE MTS: W slope of Turbacz  
Mt., Dolina Lepietnicy valley, alt. 1000 m, 12 Sept.  
1964, *leg.* *K. Glanc* (KRAM-L 35976); Gorce National  
Park: valley of Olszowy stream, at foot of Średnie Mt.,  
alt. 700 m, 27 Oct. 1995, *leg.* *P. Czarnota* (GPN 484),  
'Turbacz' nature reserve, valley of Olszowy stream below  
Średnie glade, alt. 780 m, 21 June 1996, *leg.* *P. Czarnota*  
(GPN 1285) and 790 m, 26 June 1996, *leg.* *P. Czarnota*  
(GPN 1126), forest section no. 66b, by Olszowy stream,  
near the border of 'Turbacz' nature reserve [49°33.82'N/  
20°05.40'E] alt. 770 m, 18 July 2003, *leg.* *P. Czarnota*  
(GPN 3513); Ge-21 – GORCE MTS: Gorce National Park:  
E slope of Mostownica Mt. in Dolina Kamienicy valley,  
alt. 1065 m, 3 Apr. 1959, *leg.* *K. Glanc* (GPN 2561  
together with *M. nigella*; KRAM-L 26420), S slope of  
Kudłoń Mt. above Stawieniec glade, alt. 1100 m, 3 Apr.  
1959, *leg.* *K. Glanc* (KRAM-L 26412), 'Turbacz' nature  
reserve, N slope of Średnie ridge, 9 Sept. 1964, *leg.*  
*K. Glanc* (KRAM-L 26425), NW slope of Turbacz Mt.  
in valley of Olszowy stream, alt. 1190 m, 27 June 1966,  
*leg.* *K. Glanc* (KRAM-L 26426), Dolina Kamienicy  
valley below Hala Turbacz alpine meadow, alt. 1170 m,  
4 Aug. 1967, *leg.* *K. Glanc* (KRAM-L 39966), valley of  
Ustępny Potok stream near forest road below Ustępne  
glade, alt. 880 m, 20 Feb. 1995, *leg.* *P. Czarnota* (GPN  
298), 'Turbacz' nature reserve, valley of Turbacz stream  
below Średnie glade, alt. 910 m, 30 May 1996, *leg.*  
*P. Czarnota* (GPN 949), valley of Kamienica stream  
below Bieniowe glade, alt. 870 m, 15 May 1997, *leg.*  
*P. Czarnota* (GPN 1693), EN slope of Przysłopok Mt.,  
valley of Z Popod Figurek stream, alt. 820 m, 15 Mar.  
1997, *leg.* *P. Czarnota* (GPN 1556); Ge-22 – GORCE  
MTS: Lubań range, valley of Rolnicki stream  
[49°29'59"N/20°21'03"E] alt. 860 m, 18 Oct. 2004, *leg.*  
*P. Czarnota* 4034 & *A. Wojnarowicz* (GPN) and valley of  
Kudowski stream, by hiking track near stream, alt.  
ca 700 m, 18 Oct. 2004, *leg.* *P. Czarnota* 4008  
& *A. Wojnarowicz* (GPN); Ge-25 – BESKID SADECKI  
MTS: Jaworzyna Krynicka range, 'Barnowiec' nature  
reserve, alt. 820 m, 25 Aug. 1966, *leg.* *M. Olech* (KRA);  
Ge-27 – MIDDLE BESKIDY MTS, BESKID NISKI MTS,  
Experimental Forest of Agriculture Academy in Kraków,  
vicinity of Krzyżówka settlement by road to Tylicz  
village [49°29'03"N/20°56'57"E], 25 Sept. 2005, *leg.*  
*P. Czarnota* 4560 (GPN); Ge-30 – OBNIŻENIE ORAW-  
SKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKO-  
NOWOTARSKA BASIN: 'Bór na Czerwonem' nature  
reserve [49°27.73'N/20°02.36'E] alt. 620 m, 4 June

- 2003, *leg. P. Czarnota 4196* (GPN), [49°27.84'N/20°02.35'E] alt. 620 m, 4 June 2003, *leg. P. Czarnota 4187* (GPN); Ge-32 – PIENINY MTS: a forest by track between Wyrobek glade and Zamkowa Góra hill in Czorsztyn village, alt. 740 m, 12 June 1956, *leg. Z. Tobolewski* (POZ); Ge-33 – PIENINY MTS: Pieniński National Park: forest section no. 7d, valley of Ociemny stream [49°25'46"N/20°25'41"E] 13 May 2004, *leg. P. Czarnota 3843* (GPN), N slope of Ociemne Mt. [49°25'47"N/20°25'38"E] alt. ca 570 m, 13 May 2004, *leg. P. Czarnota 3852* (GPN), S slope of Macelowa Mt. above Sromowce Niżne village [49°24'22"N/20°22'52"E] 13 May 2004, *leg. P. Czarnota 3853* (GPN); Ge-33 – WESTERN BESKIDY MTS, BESKID SADECKI MTS: Radziejowa range, valley of Biały stream, alt. 670 m, 6 June 1991, *leg. L. Śliwa* (KRA); Ge-34 – BESKID SADECKI MTS: Radziejowa range: valley of some tributary of Rohacz stream, alt. 630 m, 13 Sept. 1967, *leg. M. Olech* (KRA), Zaczeryk stream, alt. 450 m, 20 Feb. 1990, *leg. L. Śliwa* (KRA), Piwniczna forest division, Roztoka Wielka forest district, forest section no. 182 above 'Baniska' nature reserve [49°26'50"N/20°36'41"E] 4 Nov. 2004, *leg. P. Czarnota 4326* (GPN); Ge-35 – BESKID SADECKI MTS: Jaworzyna Krynicka range, 'Łabowiec' nature reserve, alt. 820 m, 23 Aug. 1966, *leg. M. Olech* (KRA) and alt. 920 m, 13 Oct. 2001, *leg. M. Węgrzyn* (KRA); Ge-36 – BESKID SADECKI MTS: Jaworzyna Krynicka range, 'Żebracze' nature reserve, alt. 720–800 m, 5 July 2001, *leg. P. Czarnota* (GPN 2492, 2493, 2494); Ge-45 – BESKID SADECKI MTS: Jaworzyna Krynicka range, Skałka nad Żegiestowem hill, alt. 650 m, 7 Oct. 1967, *leg. M. Olech* (KRA); Ge-50 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, RÓW PODTATRZAŃSKI DEPRESSION: near Małe Ciche village, Pańszczykowa Polana glade [49°17'30"N/20°03'35"E] alt. 925 m, 16 June 2004, *leg. L. Śliwa 2297* (KRAM) and [49°17'40"N/20°03'29"E] alt. 920 m, 24 July 2004, *leg. L. Śliwa 3328* (KRAM); Ge-50 – TATRA MTS, WEST TATRA MTS: Tatra National Park, forest section no. 209f, Dolina Strażyska valley near ground road on Strażyski Potok stream, alt. 940 m, 28 June 2002, *leg. P. Czarnota* (GPN 2828) and Dolina Kościeliska valley, Żleb Trzynastu Progów area above Wąwóz Kraków gorge, alt. 1200 m, 23 July 2002, *leg. P. Czarnota* (GPN 2904); Ge-50 – HIGH TATRA MTS: Dolina Suche Wody valley by road to Brzeziny, ca 0.9 km of shelter-house on Hala Gąsienicowa alpine meadow, alt. 1450 m, 22 Sept. 1955, *leg. Z. Tobolewski* (POZ); Ge-60 – HIGH TATRA MTS: NW slope of Żabia Czuba Mt. below Siedem Granatów ridge near the border of PL/SK, alt. 1500 m, 9 July 2002, *leg. P. Czarnota* (GPN 2893 together with *M. botryoides*; GPN 2907); Gf-13 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: S slope of Zamczysko Mt., S of Rymanów Zdrój village, alt. 435 m, 18 Aug. 1974, *leg. J. Kiszka* (KRAP); Gf-17 – EASTERN BESKIDY MTS, GÓRY SANOCKO-TURCZAŃSKIE MTS: by road near Kuźmina village [49°36'42"N/22°24'04"E] alt. ca 390 m, 16 June 2005, *leg. P. Czarnota 4531* (GPN); Gf-22 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: vicinity of Tylawa village, alt. 640 m, 12 Sept. 1974, *leg. J. Kiszka* (KRAP); Gf-08 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE PRZEMYSKIE FOOTHILLS: Cisowa Górna settlement, 21 July 1984, *leg. J. Kiszka & J. Piórecki* (BDPA); 'Krepek' nature reserve, by road between Bircza and Przemyśl town [49°42'09"N/22°31'55"E] alt. 370 m, 17 June 2005, *leg. P. Czarnota 4502* (GPN); Gf-09 – POGÓRZE PRZEMYSKIE FOOTHILLS: Brylińce village, 20 July 1984, *leg. J. Kiszka & J. Piórecki* (BDPA), as *Catillaria p. for. laeta*; Gf-16 – EASTERN BESKIDY MTS, GÓRY SANOCKO-TURCZAŃSKIE MTS: Góry Słonne Mts, near Wujskie village, by road between Przemyśl and Sanok towns, 23 July 1984, *leg. J. Kiszka & J. Piórecki* (BDPA); Gf-19 – GÓRY SANOCKO-TURCZAŃSKIE MTS: Jamna Górna settlement, 27 July 1984, *leg. J. Kiszka* (BDPA); ca 1 km N of Kwaszenina settlement by road to Arłamów village [49°33'52"N/22°38'35"E] alt. 460 m, 17 June 2005, *leg. P. Czarnota 4496* (GPN); Gf-20 – MIDDLE BESKIDY MTS, BESKID NISKI MTS: ca 2.5 km SW of 'Terepak' forest area on NE slope of Cyrła Mt. near Kremna village, alt. ca 500 m, 8 Oct. 1979, *leg. J. Nowak* (KRAM-L 33348); Rozstajne settlement, by bank of Wisłok River, alt. ca 430 m, 6 Sept. 1979, *leg. J. Nowak* (KRAM-L 33212); Gf-22 – BESKID NISKI MTS: ca 4 km SE of Dukla town, 'Rezerwat Tysiąclecia na Cergowej Górze' nature reserve above Nowa Wieś village [49°32'07"N/21°41'51"E] alt. ca 380 m, 5 Aug. 2004, *leg. P. Czarnota 4050, 4051* (GPN); by road between Dukla town and Barwinek settlement, ca 8 km S of Dukla town [49°29'26"N/21°42'12"E] alt. ca 400 m, 5 Aug. 2004, *leg. P. Czarnota 4066* (GPN); SW slope of Piotruś Mt., above Stasianie forester's lodge in valley of Jasiołka River [49°28'02"N/21°44'20"E] alt. ca 500 m, 5 Aug. 2004, *leg. P. Czarnota 4056, 4057* (GPN); Gf-24 – BESKID NISKI MTS: valley of Sanoczek stream near Tokarnia village, NW slope of Tolsta Mt., alt. ca 500 m, 24 Oct. 1974, *leg. J. Nowak* (KRAM-L 32308); Gf-32 – BESKID NISKI MTS: an anonymous stream between Dił Mt. and Oblaz hill, below 'Piotruś' Wood near Daliowa village, alt. ca 480 m, 11 Sept. 1974, *leg. J. Nowak* (KRAM-L 32735); Gf-33 – BESKID NISKI MTS: valley of Ostresz stream below Dilec Mt. near Daliowa village, alt. ca 450 m, 25 Oct. 1974, *leg. J. Nowak* (KRAM-L 32288); Gf-34 – BESKID NISKI MTS:

valley of Izwór stream near Wisłok Wielki village, alt. ca 580 m, 23 June 1974, leg. J. Nowak (KRAM-L 32817); valley of Graniczna stream near Tokarnia village, SE slope of Tołsta Mt., alt. ca 600 m, 24 Oct. 1974, leg. J. Nowak (KRAM-L 33045); valley of Wisłok stream near Wisłok Górny village below Kanasiówka Mt., alt. 625 m, 22 June 1974, leg. J. Nowak (KRAM-L 32933); Bukowica range, valley on SW slope of Skibce (Zrubanec) Mt. near Darów settlement, alt. 600 m, 16 Sept. 1974, leg. J. Nowak (KRAM-L 32736); Gf-44 – BESKID NISKI MTS: Siwakowska Dolina Mt., by border road (also hiking track), alt. ca 680 m, 21 June 1974, leg. J. Nowak (KRAM-L 32818); Gf-58 – EASTERN BESKIDY MTS, WESTERN BIESZCZADY MTS: Bieszczadzki National Park, N slope of Połonina Wetlińska range in valley of Bardo stream, 5 Sept. 2001, leg. J. Kiszka (KRAP); Gf-68 – WESTERN BIESZCZADY MTS: W slope of Kamienna Mt., alt. 700 m, 28 July 1958, leg. K. Glanc (KRAM-L 26424); Gg-60 – WESTERN BIESZCZADY MTS: S of Stuposiany village, SE of former village Pszczeliny, alt. 650 m, 29 July 1959, leg. Z. Tobołowski (POZ); Bieszczadzki National Park, valley of Zwór stream, SW of Tarnica Mt., 2 Oct. 2000, leg. J. Kiszka (KRAP); Gg-71 – WESTERN BIESZCZADY MTS: Bieszczadzki National Park: near Syhłowaty stream, 19 July 2001, leg. J. Kiszka (KRAP together with *M. nigella*), Sianki forest district, forest section no. 78i, 19 June 2002, leg. P. Czarnota (GPN 2838), Sianki former village, by road to the Przełęcz Użocka pass [49°00'N/22°53'E] alt. 825 m, 23 Aug. 2003, leg. R. Kościelniak (KRAP).

ADDITIONAL SPECIMENS EXAMINED (all specimens contain micareic acid detected by TLC). CZECH REPUBLIC, RYCHLEBSKÉ HORY: near the border of Poland, valley of Bilá Voda stream, S of Bilá Voda village, vicinity of Šafářova skála outcrop [50°24'35"N/16°53'38"E] alt. ca 500 m alt., on soft wood of decaying spruce log within shady spruce mountain forest, 23 Apr. 2004, leg. P. Czarnota 4209 (GPN). ESTONIA, VILJANDI COUNTY: Tipu forestry, forest square no. 137, on bark of *Alnus glutinosa* within spruce forest, 8 Aug. 1968, leg. A. Sõmermaa (TU-1320), as *M. melanobola*. RUSSIA, NORTH-EASTERN KAMCHATKA: Ust'-Kamchatsky district, basin of Yelovka river, right side of Yelovka River opposite the estuary of Urylychen River, alt. ca 101 m [56°55'25"N/160°59'57"E] on mossy soil within moss rich spruce (*P. ajanensis*) forest with *Betula ermanii*, *Larix kajanderi*, *Sorbus sambucifolia*, *Pinus pumila*, 29 Aug. 2003, leg. D. E. Himelbrant & E. S. Kuznetsova (LECB) and alt. ca 107 m [56°55'30"N/160°59'57"E] on bark of *Picea ajanensis*, 29 Aug. 2003, leg. D. E. Himelbrant & E. S. Kuznetsova (LECB).

*Micarea submilliaria* (Nyl.) Coppins (Fig. 53)

Graphis Scripta 6: 37. 1994.

*Lecidea submilliaria* Nyl., Flora 52: 410. 1869. – *Bilimbia submilliaria* (Nyl.) Arnold, Flora 53: 473. 1870. – *Bacidia submilliaria* (Nyl.) Zahlbr., Cat. Lich. Univ. 4: 153. 1926. TYPE: Finland, Lapponia enontekiensis, Enontekis (Enontekiö), Kilipisjärvi, pone Leutsuvaara, 1867, J. P. Norrlin 660 (H-NYL 18546 – ISOTYPE!; H – LECTOTYPE, n.v.; Coppins 1994). [Note: unfortunately the examined type material of *Lecidea submilliaria* is almost completely destroyed].

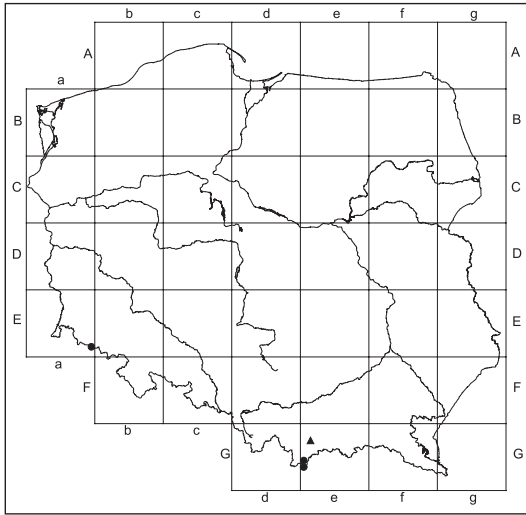
– *Lecidea granulans* Vain., Meddeland. Soc. Fauna Fl. Fenn. 10: 4. 1883. – *Toninia granulans* (Vain.) Zahlbr., Cat. Lich. Univ. 4: 288. 1926. – *Micarea granulans* (Vain.) Timdal, Opera Bot. 110: 123. 1991. TYPE: Finland, Lapponia (n.v.).

– *Bacidia subleprosula* Vězda, Preslia 33: 366. 1961. – *Bilimbia subleprosula* (Vězda) Ozenda & Clauzade, Les Lichens: 775. 1970. – *Micarea subleprosula* (Vězda) Vězda in Vězda & V. Wirth, Folia Geobot. Phytotax. 11: 101. 1976. TYPE: Czech Republic, Bohemia, Sudety, Krkonoše, Mumlava valley near Harrachov, 900 m alt., over decaying mosses on granitic rocks, 1960, A. Vězda (E – ISOTYPE!).

Thallus morphologically identical to *M. leprosula* (see under this taxon), warted or composed of convex to subglobose, fragile areoles, ash, ash-grey, in the middle part often breaking down to form sorediate patches, showing white or cream medulla, C+ red, Pd+ yellow. Photobiont micareoid; algal cells ±globose, 5–8 µm diam. Apothecia not found in Polish specimens; know only to the author from a few European collections, from which the examined material from Sweden (*L.-E. Muhr* 4380, E) has apothecia similar to those described by Coppins (1983: 183). For apothecial characters see Vězda (1961) and Coppins (1983). Pycnidia not found.

CHEMISTRY. TLC: alectorialic acid (all specimens where examined in solvent A).

NOTES. Sterile forms found in Poland are almost identical with those represented by *M. leprosula* and only on the basis of distinct Pd+ thallus reactions is possible to separate both species at first sight. Since both species can grow in similar alpine conditions, ecological distinctions are also problematic. Therefore, TLC analyses are neces-



**Fig. 53.** Distribution map of *Micarea submilliaria* (Nyl.) Coppins (●) and *Micarea synotheoides* (Nyl.) Coppins (▲) in Poland.

sary, since *M. submilliaria* contains alectorialic acid and *M. leprosula* argopsin and gyrophoric acid (for more differences see under the latter species). While the apothecia of both species are morphologically similar, and their vertical sections have almost the same pigmentation, ascospores of *M. submilliaria* are distinctly different in a size and septation (see Coppins 1983).

**HABITAT AND DISTRIBUTION IN POLAND.** In Poland, *M. submilliaria* is known only from those localities in the Sudetes and Tatras published previously by Czarnota (2004); further exploration of the other lower mountain ranges has failed to find it. Therefore, it probably has an alpine distribution in the country, growing on humus, plant debris and decaying bryophytes over thin soil and rocky crevices in dwarf-pine and alpine mountain belts at altitudes of 1250 to 2050 m. It is usually found in association with *Helocarpon crassipes*, *Micarea leprosula*, *M. lignaria* and *Protomicarea limosa*.

**WORLD DISTRIBUTION.** Coppins (1983) reported this species from only three European localities in Wales, Sweden and the Czech Sudetes where it occurred at altitudes ranging from 200 to 900 m. Today, based on more data from other

regions of the Continent and Poland, it should be accepted as a rare mountain species in Central Europe owing to its preferences to high altitudes and high precipitation, the latter climatic requirement probably the cause of its oceanic distribution in several other parts of Europe.

**EUROPE:** Austria (Hafellner & Türk 2001); Czech Republic (Vězda 1961, as *Bacidia subleprosula*; Vězda & Liška 1999, as *Micarea subleprosula*); Finland (Vitikainen *et al.* 1997); Great Britain (Coppins 1983, 2002); Norway (Santesson 1993, as *Micarea granulans*); Slovakia (Pišút *et al.* 1996, as *M. granulans*); Spain (Llimona & Hladun 2001, as *M. granulans*); Sweden (Santesson 1993, as *M. granulans*). **SOUTH AMERICA:** Ecuador (Palice, pers. comm.).

**SPECIMENS EXAMINED.** Grid square Ea-89 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park, N slope of Śnieżka Mt. in Kocioł Łomniczki corrie [50°44.38'N/15°44.03'E] alt. 1300 m, 8 July 2003, leg. P. Czarnota (GPN 3281 together with *M. leprosula*) and waterfalls of Łomniczka stream [50°44.56'N/15°43.88'E] alt. 1250 m, 7 July 2003, leg. P. Czarnota (GPN 3461); Ge-50 – TATRA MTS, HIGH TATRA MTS: Dolina Waksmundzka valley below Wołoszyńska Wyżnia Pass [49°13.74'N/20°03.13'E] alt. 2050 m, 9 Aug. 2003, leg. P. Czarnota (GPN 3655); Ge-60 – HIGH TATRA MTS: Hala za Mnichem alpine meadow below Szpiglasowa Pass, alt. 1800 m, 6 June 1971, leg. J. Nowak (KRAM-L 23048 together with *M. lignaria*); Dolina Pięciu Stawów valley below Szpiglasowa Pass, Szpiglasowa Perć region by hiking track [49°12.11'N/20°02.04'E] alt. 1790 m, 8 Aug. 2003, leg. P. Czarnota (GPN 3563); Dolina Pięciu Stawów valley, Niżnie Solnisko region near W shore of Wielki Staw Lake [49°12.61'N/20°01.91'E] alt. 1750 m, 8 Aug. 2003, leg. P. Czarnota (GPN 3582); Dolina Roztoki valley below shelter-house in Dolina Pięciu Stawów valley [49°12.92'N/20°03.15'E] alt. 1620 m, 8 Aug. 2003, leg. P. Czarnota (GPN 3624); Dolina Pięciu Stawów valley below Niżni Liptowski Kostur Mt. [49°12.23'N/20°01.85'E] alt. 1750 m, 8 Aug. 2003, leg. P. Czarnota (GPN 3616; UGDA ex GPN).

*Micarea sylvicola* (Flot.) Vězda & V. Wirth  
(Figs 4B, 54 & 55)

Folia Geobot. Phytotax. **11**: 99. 1976.

*Lecidea sylvicola* Flot., Lich. Schles. 171. 1829. TYPE: Poland, Schlesien, Flotow, Lich. Exs. No. 171A [UPS



– LECTOTYPE, *n.v.*, sel. Hertel (1975: 74); WRSL – ISOLECTOTYPE!].

– *Lecidea aggerata* Mudd, Man. Brit. Lich.: 208. 1861. TYPE: England, Yorkshire, Battersby, Mudd, *Lich. Brit. No. 175* (E – ISOTYPE!; BM – LECTOTYPE, *n.v.*; H-NYL 14016 – ISOLECTOTYPE!, other ISOLECTOTYPES: M, MANCH, *n.v.*).

– *Lecidea incincta* Nyl., Lich. Scand.: 231. 1861. TYPE: Finland (H – HOLOTYPE, *n.v.*).

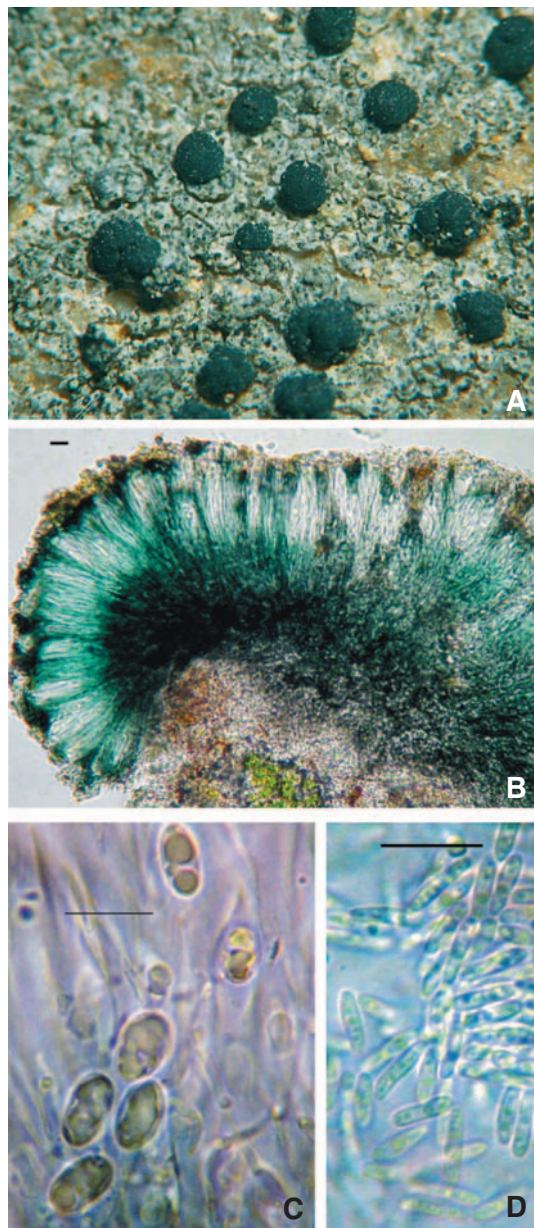
– *Biatora smaragdina* Arnold, Verh. K. K. Zool.-Bot. Ges. Wien **19**: 613. 1869. TYPE: Italy (M – HOLOTYPE, *n.v.*).

– *Lecidea hellbomii* Lahm, Flora **53**: 177. 1870. TYPE: Sweden (M – LECTOTYPE, *n.v.*).

– *Lecidea sylvicola* f. *sublivida* Vain., Meddeland. Soc. Fauna Fl. Fenn. **10**: 104. 1883. – *Lecidea sylvicola* var. *sublivida* (Vain.) Vain., Acta Soc. Fauna Fl. Fenn. **57**(2): 298. 1934. TYPE: Finland (TUR-VAINIO 25226 – HOLOTYPE, *n.v.*).

– *Lecidea hypocyanea* Vain., Acta Soc. Fauna Fl. Fenn. **57**(2): 300. 1934, non Stirt. 1879 nom. illeg. (Art. 53.1) – *Lecidea vainioi* H. Magn., Blyttia **7**: 31. 1949, *nom. nov.* TYPE: Finland [TUR-VAINIO 33172 – LECTOTYPE, *n.v.*, sel. Hertel (1975: 74)].

Thallus usually  $\pm$ thick, cracked crust forming small, flat or scurfy-granular distinct areolae, greyish-green or pale to dark olive-green, sometimes with bluish-grey tinge. Photobiont not micareoid; cells globose or ellipsoid 5–12(–15)  $\mu$ m diam. Apothecia numerous, immarginate from the start, convex-hemispherical or sometimes  $\pm$ globose, usually simple, 0.2–0.5 mm diam., but also often becoming tuberculate and than up to 1.2 mm diam., black, grey-black and sometimes with bluish tinge; white rim at the base of apothecia sometimes present, when the white protothallus more developed. Hymenium bright or intensive aeruginose-blue, K+ green intensifying. Ascospores simple, ovoid or ellipsoid-ovoid, 6–9(–10)  $\times$  (2.5–)3–4(–4.5)  $\mu$ m. Paraphyses of two types: (1) rather scanty, hyaline throughout, scarcely branched, not visible septate, thin 0.8–1.2  $\mu$ m; (2) thick, 2–2.5  $\mu$ m, multiseptate, simple or concentrated in small fascicles visible as darkish coloured vertical streaks because of walls coated by dark aeruginose pigment. Hypothecium black blue-aeruginose or olive-black,



**Fig. 54.** *Micarea sylvicola* (Flot.) Vězda & V. Wirth: A – morphology (GPN 2799); B – vertical section of apothecia (GPN 3586); C – examples of ascospores extending more than 4  $\mu$ m wide (Czarnota 4114, GPN); D – mesoconidia (Czarnota 4730, GPN). Scale bars = 10  $\mu$ m.

K+ dull blackish-green, but sometimes, especially in the centre often purple-black, K+ purple intensifying, owing to ‘Melaenida-red’ pigment.

Excipulum absent. Pycnidia usually present and numerous, immersed, black, often with gaping ostioles; walls dark aeruginose in upper part, K+ dull olive-green, lower part usually olive-brown or dilute, K-. Mesoconidia cylindrical,  $3.5\text{--}6 \times 1.2\text{--}1.5 \mu\text{m}$  diam.

CHEMISTRY. No substances detected by TLC.

NOTES. *Micarea sylvicola* is a member of the saxicolous community *Micareetum sylvicolae* James *et al.* 1977 (Coppins 1983) composed of, or associated with, other morphologically similar species from such genera as *Micarea*, *Porpidia*, *Psilolechia*, *Lecidea* and *Scoliciosporum*. In the field it is very often confused with *M. erratica* and *M. lignaria* or with black forms of *M. peliocarpa*, *M. lutulata* and *M. bauschiana*, but anatomically it resembles only *M. tuberculata* (see differences under this species). From the other above-listed taxa, *M. sylvicola* differs mainly in the clearly black-aeruginose hypothecium ( $\pm$ purple-fuscous inside) giving a K+ sordid green intensifying reaction. However, in more shaded localities slightly paler forms of the species are sometimes found and their apothecia sections can resemble more pigmented specimens of *M. bauschiana* at first sight. In these instances carefully, microscopic examination of the hyphae composing the hypothecia is needed (see Coppins 1983).

The species usually has a thick, distinctly cracked thallus, but occasionally collections are found with an inconspicuous, thin and almost continuous to scurfy thallus with numerous developed, immersed pycnidia (e.g. GPN 3627). When such specimens have no apothecia, distinguishing them from some forms of *M. erratica* is difficult since they both have non-micareoid, large-celled photobiont, similar structure and pigmentation of the pycnidia and lack of any secondary metabolites detected by TLC. *Micarea erratica* differs only in having slightly smaller mesoconidia.

Recent studies on the molecular phylogeny of the former Micareaceae (Andersen & Ekman 2005) show that *M. sylvicola* should belong to the Psoraceae together with other members of the *Micarea sylvicola*-group, but here it is still retained in *Micarea* sensu Coppins (1983).

HABITAT AND DISTRIBUTION IN POLAND. *Micarea sylvicola* was reported from Silesia at the beginning of the 19th century by the author of the species, Flotow (see below). There are many other 19th century reports from the same area (Körber 1855; Stein 1879; Eitner 1896, 1901), but, unfortunately all their collected specimens (e.g. WRSL) have disappeared; despite this, such reports would mainly be based on accurate determinations since *M. sylvicola* is still, as in the past (e.g. Stein 1879: 254 'An beschatteten Felsen und Steinen von der Hgl. bis in's HGb. zerstreut ...'), a common, saxicolous species, occurring throughout the mountainous regions of the Silesia, although recent reports appear to be relatively less numerous. Other than Fabiszewski (1968), who provides two further localities from Silesia (Śnieżnik Massif, Eastern Sudetes), the remaining records are the result of recent explorations of different Sudetic ranges, mainly by the author, reported here for the first time from numerous sites growing on different acid rocks, e.g. granite, malaphyre, sandstone, schist or gneiss, on loose stones, boulders and faces of outcrops mostly within forest communities.

The main area of its occurrence is, however, the southern, mountainous part of Poland, where it frequently grows on sandstone within different forest communities from the upland to upper mountain belt of the Flysch Carpathians. It is also found frequently on granite boulders in the High Tatra Mts, where it occurs at its highest altitude (1970 m) in Poland. Associated species on different rocky habitats in mountains include, for example, *Acarospora fuscata*, *Baeomyces rufus*, *Lecanora polytropha*, *Lepraria* spp., *Micarea bauschiana*, *M. botryoides*, *M. lignaria*, *M. lithinella*, *M. lutulata*, *M. peliocarpa*, *Pertusaria* sp., *Porpidia* spp., *Rhizocarpon* spp., *Scoliciosporum umbrinum*, *Trapelia coarctata*, *T. involuta* and *T. placodioides*.

Although *M. sylvicola* appears to have rather distinctive anatomical features, many specimens deposited in Polish herbaria under this name [= *Lecidea sylvicola* Flot.], and reported before in Polish literature are not this species. Some collections from the Beskid Śląski Mts (KRAP),

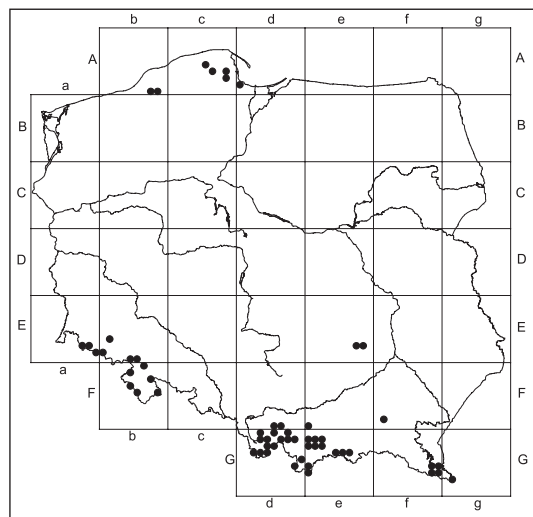


Fig. 55. Distribution map of *Micarea sylvicola* (Flot.) Vězda & V. Wirth in Poland.

previously identified as *L. sylvicola*, actually refer to *M. lutulata* (see under this species). Similarly, among several collections named *L. sylvicola* from the Wyżyna Kielecka upland (KTC), only two specimens have been confirmed (from Góry Świętokrzyskie Mts; see below) and records from the Chęciny Region (Toborowicz 1983) currently refer to *M. erratica*; furthermore, published reports of *M. sylvicola* from the Western Pomerania region need to be corrected, since of four localities known from there to date (Fałtynowicz 1992), it has only been confirmed from two of them (ATPOL grid square Ac-66 and Ad-80). Two other collections belong to *M. lutulata* and *M. myriocarpa*.

However, *M. sylvicola* has recently been found in Pomerania, not only in the eastern part but also in Pojezierze Zachodniopomorskie lakeland and Pobrzeże Kaszubskie coastland, being found on post-glacial granite boulders within different forest communities or at the edges of woodlands, mostly without accompanied lichen species or more rarely with *Lepraria* spp., *M. erratica* and *Porpidia* spp.

There are a few old records of *M. sylvicola* from the main Polish lowlands, in the Nizina Południowopodlaska lowland (Eichler 1886: 264 'vicinity of Międzyrzec town') and in the Lower Silesia (Stein 1879: 254 Żagań town 'Sagan'),

but, unfortunately, these reports are unconfirmed. Recent field studies made by the author have also been negative, but its occurrence on post-glacial granite boulders remains a possibility within those areas.

**WORLD DISTRIBUTION.** This widespread saxicolous species occurs on acid rocks (granite, basalt, different kind of sandstones and metamorphic rocks) and occasionally also on a dry, consolidated soil in almost all continents usually in woodlands, especially in mountainous regions or more rarely in lowlands on post-glacial boulders.

**EUROPE:** Austria (Hafellner & Türk 2001); Belgium (Diederich & Sérusiaux 2000); Bulgaria (Popnikolov & Zhelezova 1964, as *L. sylvicola*); Czech Republic (Vězda & Liška 1999); Denmark, rare (Søchting 1998; Søchting & Alstrup 2002); Finland (Vitikainen *et al.* 1997); Germany – Lower Saxony (Hauck 1996), Nordrhein-Westfalen (Heibel 1999), Schleswig-Holstein (Jacobsen 1992); Great Britain (Coppins 1983, 2002); Iceland (Kristinsson & Heidmarsson 2006); Ireland (Seaward 1994); Italy (Nimis & Martellos 2003); Latvia, rare (Piterāns 2001); the Netherlands, extinct (Aptroot *et al.* 2004); Norway (Santesson 1993); Russia – Leningrad Region (Zavarzin *et al.* 1999), Middle Urals (Paukov & Trapeznikova 2005), NW Caucasus, North Osetia (Blinkova & Urbanavichus 2005); Slovakia (Pišút *et al.* 1996); Slovenia (Suppan *et al.* 2000); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993); Ukraine – Eastern Carpathians and Podilsko-Middle-Pridnieper: (Kondratyuk *et al.* 1998 – Cherkasy oblast). **ASIA:** Mongolia – Khobdo (Biazrov 2005); Russia – Polar Ural (Andreev *et al.* 1996); Taiwan (Aptroot & Sparrius 2003); Turkey (Yildiz *et al.* 2002). **AUSTRALOCEANIA:** Australia – Tasmania (Jarman & Kantvilas 2001; on dry, consolidated soil in eucalypt forests). **NORTH AMERICA:** USA (Esslinger 1997) – Colorado (Weber & Wittmann 2000), Maine and Massachusetts (Greene 2005), New York State (Harris 2004). **SOUTH AMERICA:** Brazil (Aptroot 2002).

**EXSICCATAE SEEN.** Arnold, *Lich. Exs. No. 409A, B* (H-NYL, WRSL); Flotow, *Lich. Exs. No. 171A* (WRSL);

Norrl. & Nyl., *Herb. Lich. Fenn. No. 764* (KRAM); Vězda, *Lich. Rariores Exs. No. 363* (GPN); Vězda, *Lich. Sel. Exs. No. 1341* (H); Zwackh, *Lich. Exs. No. 596* (H-NYL), *No. 597* (H-NYL), *No. 780* (H-NYL), *No. 919* (H-NYL, KRAM).

SPECIMENS EXAMINED. Grid square Ab-97 – POJEZIERZE ZACHODNIOPOMORSKIE LAKELAND, WYSOCZYNA POLANOWSKA PLATEAU: Żytnik forest district, forest section no. 87, W of Krag village, 29 June 1983, *leg. I. Izydorek* (Hb. Izydorek); Ab-98 – WYSOCZYNA POLANOWSKA PLATEAU: Warcino forest division, Zielice forest district, the border of forest sections nos 262 and 279, S of Kępie village, 10 Oct. 1976, *leg. I. Izydorek* (Hb. Izydorek); Ac-55 – POBRZEŻE KOSZALIŃSKIE COASTLAND, WYSOCZYNA ŻARNOWIECKA PLATEAU: SW of Chrzanowo village, 10 Nov. 2001, *leg. E. Garska* (Hb. Izydorek); W of Salino village, Choczewo forest division, Młot forest district, forest section no. 64d, 19 Oct. 2001, *leg. E. Garska* (Hb. Izydorek); Ac-66 – POJEZIERZE WSCHODNIOPOMORSKIE LAKELAND, POJEZIERZE KASZUBSKIE LAKELAND: Porzecze village, 20 July 1985, *leg. W. Faltynowicz* (UGDA-L 3383); Łówcz Dolny village on Łeba River, 1.5 km S of Porzecze village, 19 July 1985, *leg. W. Faltynowicz* (UGDA-L 3180); Ac-68 – POJEZIERZE KASZUBSKIE LAKELAND: Trójmiejski Landscape Park, Sopieszyno forest district, forest section no. 119, 25 Nov. 1995, *leg. W. Faltynowicz* (UGDA-L 5309); Ac-78 – POJEZIERZE KASZUBSKIE LAKELAND: near Kamień village, 25 Nov. 1995, *leg. W. Faltynowicz* (Hb. Kukwa); Kamień village near S shore of Kamień Lake, 7 Aug. 2005, *P. Czarnota* (not collected); Ad-80 – POBRZEŻE GDAŃSKIE COASTLAND, POBRZEŻE KASZUBSKIE COASTLAND: Gdańsk – Oliwa town, Dolina Ewy valley, 6 July 1984, *leg. W. Faltynowicz* (UGDA-L 2604); Ea-77 – WESTERN SUDETES, GÓRY IZERSKIE MTS: Dolina Izery valley, ‘Torfowisko w Dolinie Izery’ nature reserve, by road near mouth of Kobyła stream to Izera River [50°50.14’N/15°22.16’E] alt. ca 820 m, 9 July 2003, *leg. P. Czarnota* (GPN 3502); Ea-78 – KARKONOSZE MTS: Pogórze Karkonoskie foothills, ca 1.5 km NE of Michałowice village below Piechowicka Góra Mt., by road to Jelenia Góra town [50°50.80’N/15°34.98’E] alt. 500 m, 9 July 2003, *leg. P. Czarnota* (GPN 3493); Ea-89 – KARKONOSZE MTS: Karkonoski National Park, Dolina Łomniczki valley, by hiking track [50°44.60’N/15°43.98’E] alt. 1200 m, 7 July 2003, *leg. P. Czarnota* (GPN 3451) and N slope of Śnieżka Mt. in Kocioł Łomniczki glacial corrie [50°44.38’N/15°44.03’E] alt. 1300 m, 8 July 2003, *leg. P. Czarnota* (GPN 3283); Eb-61 – GÓRY KACZAWSKIE MTS: N slope of Baraniec Mt, ca 2 km N of Radomierz village [50°56’52”N/15°53’07”E] alt. ca 550 m,

22 Apr. 2005, *leg. P. Czarnota 4473* (GPN); Eb-80 – KARKONOSZE MTS: Karkonoski National Park, Karpacz – Wilcza Poręba town, Dolina Łomniczki valley, by hiking track [50°45.81’N/15°45.32’E] alt. 710 m, 7 July 2003, *leg. P. Czarnota* (GPN 3286, 3473) and Dolina Łomniczki valley, by hiking track [50°45.01’N/15°44.84’E] alt. 820 m, 7 July 2003, *leg. P. Czarnota* (GPN 3466); Eb-94 – MIDDLE SUDETES, GÓRY KAMIENNE MTS: ca 1 km W of Grzmiąca village, by Rybnica stream [50°42’20”N/16°18’55”E] alt. ca 480 m, 21 Apr. 2005, *leg. P. Czarnota 4469* (GPN); Eb-95 – GÓRY SOWIE MTS: S slope of Wielka Sowa Mt, by stream at N edge of Sokolec village [50°39’46”N/16°28’59”E] alt. ca 620 m, 21 Apr. 2005, *leg. P. Czarnota 4404* (GPN) and above the village by forest road [50°40’01”N/16°29’43”E] alt. ca 770 m, 21 Apr. 2005, *leg. P. Czarnota 4685* (GPN); Ee-77 – WYŻYNA KIELECKA UPLAND, GÓRY ŚWIĘTOKRZYSKIE MTS: Świętokrzyski National Park, field-block below the top of Łysa Góra Mt., 4 July 1959, *leg. B. Halicz & S. Kuziel* (KTC); Ee-78 – GÓRY ŚWIĘTOKRZYSKIE MTS: Pasma Jeleniowskie range, field-block below the top of Szczytniak Mt., 1981, *leg. E. Pietrzyk* (KTC); Fb-06 – MIDDLE SUDETES, GÓRY SOWIE MTS: Srebrna Góra village, near fortress [50°34.50’N/16°38.83’E] 22 Apr. 2004, *leg. P. Czarnota 4151* (GPN); Fb-14 – GÓRY STOŁOWE MTS: Góry Stołowe National Park, Szczeliniec Wielki Mt, Wielbłąd ‘Dromader’ outcrop, alt. 625 m, 9 Dec. 1979, *leg. M. R. D. Seaward* (Hb. MRDS 103581) and ca 0.3 km NW of Batorówek settlement, by hiking track, alt. 675 m, 23 Apr. 2003, *leg. P. Czarnota* (GPN 3276); Fb-27 – EASTERN SUDETES, GÓRY ŻŁOTE MTS: near Różaniec Pass, by the border of PL/ČR [50°24’11”N/16°52’15”E] alt. 580 m, 19 Apr. 2005, *leg. P. Czarnota 4409* (GPN); Fb-34 – MIDDLE SUDETES, GÓRY BYSTRZYCKIE MTS: Mostowice village [50°17’03”N/16°28’19”E] alt. 580 m, 20 Apr. 2005, *leg. P. Czarnota 4730* (GPN); Fb-45 – GÓRY BYSTRZYCKIE MTS: by road between Poręba village and Przełęcz Spalone pass, alt. ca 610 m, 20 Apr. 2005, *leg. P. Czarnota 4399* (GPN); Fb-48 – EASTERN SUDETES, GÓRY ŻŁOTE MTS: Góry Białskie Mts, ‘Nowa Morawa’ nature reserve, W slope of Solec Mt., alt. ca 900 m, Aug. 2003, *leg. K. Szczepańska* (Hb. Szczepańska); S slope of Jawornik Kobyliczny Mt., Dukt Działcowy, by road, alt. 900 m, 1 Aug. 2003, *leg. K. Szczepańska* (Hb. Szczepańska); Fd-95 – WESTERN BESKIDY MTS, BESKID MAŁY MTS: upper part of valley of Kocierka stream, between Zakocierz settlement and Madohora Mt., alt. 700 m, 11 Apr. 1961, *leg. J. Nowak* (KRAM-L 7300); Fd-96 – BESKID MAŁY MTS: Leskowiec Mt., alt. 890 m, 10 May 1960, *leg. J. Nowak* (KRAM-L 6338) and alt. 850 m, 10 May

- 1960, *leg. J. Nowak* (KRAM-L 6339); Fe-90 – BESKID WYSPOWY MTS: Kamiennik Mt., alt. 725 m, 14 Apr. 1966, *leg. J. Nowak* (KRAM-L 5633); Ff-81 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE STRYZÓWSKIE FOOTHILLS: worked-out quarry of sandstone near Cieszyna village, alt. 380 m, 28 Aug. 1972, *leg. R. Kozik* (KRAP); Gd-03 – WESTERN BESKIDY MTS, BESKID ŚLĄSKI MTS: Hala Jaškowa Galde, alt. 780 m, 4 Aug. 1965, *leg. J. Kiszka* (KRAP; GPN 2408); Małe Skrzyczne Mt., alt. 1120 m, 1 Sept. 1964, *leg. J. Kiszka* (KRAP); N slope of Skrzyczne Mt., alt. 1150 m, 2 Sept. 1964, *leg. J. Kiszka* (KRAP); a meadow below the top of Magura Mt., alt. 1065 m, 27 June 1964, *leg. J. Kiszka* (KRAP; GPN 4214); Gd-05 – BESKID MAŁY MTS: Płona Mt., alt. 710 m, 10 Aug. 1960, *leg. J. Nowak* (KRAM-L 6340); Gd-07 – BESKID ŻYWIECKI MTS: Pasma Jałowickie range, Grzechynia village, valley of Grzechynka stream, alt. ca 590 m, 3 Sept. 1965, *leg. J. Nowak* (KRAM-L 15806), as *M. erratica*; Gd-13 – BESKID ŚLĄSKI MTS: valley of Bystra stream, alt. ca 760 m, 10 May 2002, *leg. P. Czarnota* (GPN 2799); Gd-14 – BESKID ŻYWIECKI MTS: Piłsko range, valley of Sopotnia Mała stream, alt. 700 m, 20 Sept. 1964, *leg. J. Nowak* (KRAM-L 16911); Gd-16 – BABIA GÓRA RANGE: N slope of Babia Góra Mt. above Markowe Szczawiny shelter-house, Babiogórski National Park, forest section no. 22a [49°34'45"N/19°31'22"E] alt. ca 1320 m, 6 June 2004, *leg. P. Czarnota 4114* (GPN); Gd-17 – BABIA GÓRA RANGE: Polica range, Ośka Wood near Sidzina village, alt. 740 m, 26 June 1965, *leg. J. Nowak* (KRAM-L 15851), as *M. erratica*; N slope of Polica Mt. near the border of 'Klemensiewicz's' nature reserve, by hiking track, alt. ca 1250 m, 4 June 2004, *leg. P. Czarnota 3884* (GPN); Gd-18 – BABIA GÓRA RANGE: Polica range, valley of Malinowy stream, alt. 600 m, 27 May 1965, *leg. J. Nowak* (KRAM-L 16243); Gd-24 – BESKID ŻYWIECKI MTS: Piłsko range, 'Rysianka' nature reserve, alt. 1090 m, 7 Sept. 1964, *leg. J. Nowak* (KRAM-L 16818); Gd-25 – BESKID ŻYWIECKI MTS: Piłsko range, valley of Cebula stream below Hala Mędralowa alpine meadow, alt. 1270 m, 24 June 1966, *leg. J. Nowak* (KRAM-L 17026); Gd-32 – BESKID ŻYWIECKI MTS: valley of Radecki stream, alt. 710 m, 5 Aug. 1964, *leg. J. Nowak* (KRAM-L 14101); Wielka Racza Mt., alt. 1100 m, 6 Aug. 1964, *leg. J. Nowak* (KRAM-L 14457); Gd-33 – BESKID ŻYWIECKI MTS: Wielka Racza range, valley of Przegibek stream below Będoszka Wielka Mt., alt. 800 m, 7 Aug. 1964, *leg. J. Nowak* (KRAM-L 13977); between Bór and Graniczne settlements near the source of Solanka stream, alt. ca 705 m, 24 Aug. 1985, *leg. J. Nowak* (KRAM-L 27830); Gd-34 – BESKID ŻYWIECKI MTS: Piłsko range, Ku-
- biesówka Mt., alt. 790 m, 5 Sept. 1964, *leg. J. Nowak* (KRAM-L 15308), as *M. erratica*; Gd-49 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, POGÓRZE SPISKO-GUBAŁOWSKIE FOOTHILLS: Kierpcówka settlement, alt. 1040 m, 15 Sept. 1964, *leg. J. Kiszka* (KRAP; GPN 4213); Gd-58 – TATRA MTS, WEST TATRA MTS: Dolina Jarzabcza valley, alt. ca 1170 m, 1 Sept. 1960, *leg. Z. Tobolewski* (POZ) and alt. 1380 m, 10 Oct. 1987, *leg. J. Nowak* (KRAM-L 24380), as *Micarea* sp.; Ge-10 – WESTERN BESKIDY MTS, GORCE MTS: by the bank of Raba River below Królewska Góra Mt. near Rabka – Zaryte settlement, alt. 470 m, 24 Oct. 2004, *leg. P. Czarnota* (GPN 2340); NE slope of Luboń Wielki Mt., by hiking track [49°39.40'N/19°59.84'E] alt. 850 m, 5 June 2003, *leg. P. Czarnota* (GPN 3253); Ge-11 – GORCE MTS: Gorce National Park, NE slope of Kudłoń Mt., above Adamówka glade, alt. 1150 m, 19 Aug. 1966, *leg. K. Glanc* (KRAM-L 39622); W slope of Kudłoń Mt. above Konina village, alt. 1190 m, 10 Sept. 1966, *leg. K. Glanc* (KRAM-L 39619); Ge-12 – BESKID WYSPOWY MTS: W slope of Modyń Mt., 0.5 km E of Zalesie village [49°37'44"N/20°22'38"E] alt. 760 m, 2 July 2005, *leg. P. Czarnota 4604* (GPN) and ca 1 km E of Zalesie village [49°37'30"N/20°22'40"E] alt. 850 m, 2 July 2005, *leg. P. Czarnota 4607* (GPN together with *M. peliocarpa*); Ge-20 – GORCE MTS: valley of Kowaniec Wielki stream, alt. 720 m, 26 July 1968, *leg. K. Glanc* (KRAM-L 39620); Gorce National Park, valley of Olszowy stream near the border of 'Turbacz' nature reserve, alt. 820 m, 26 June 1996, *leg. P. Czarnota* (GPN 1224, 1470) and valley of Olszowy stream, 'Turbacz' nature reserve near mouth of Łochowy stream, alt. 850 m, 9 Nov. 1994, *leg. P. Czarnota* (GPN 696); Ge-21 – GORCE MTS: Gorce National Park, Kiczora Mt., alt. 1280 m, 1 Apr. 1959, *leg. K. Glanc* (KRAM-L 29695, as *Bacidia* sp.), Dolina Forędówek valley, alt. 950 m, 1 Apr. 1959, *leg. K. Glanc* (KRAM-L 29692), as *Bacidia umbrina* var. *compacta*, Dolina Kamienicy valley, by forest road, alt. 800 m, 8 Sept. 1959, *leg. K. Glanc* (KRAM-L 48427 together with *Lecidea lithophila*), by forest road near Konina stream, alt. 780 m, 3 Oct. 1994, *leg. P. Czarnota* (GPN 1463), N slope of Jaworzyna Kamienicka Mt., Dolina Kamienicy valley below Jaworzyna glade, alt. 1060 m, 19 July 1999, *leg. P. Czarnota* (GPN 2197), Dolina Kamienicy valley below Średniak glade by forest road, alt. 1020 m, 7 May 1999, *leg. P. Czarnota* (GPN 1974), valley of Turbacz stream, 'Turbacz' nature reserve below Średnie glade, alt. 920 m, 30 May 1994, *leg. P. Czarnota* (GPN 1307), *ibid.*, Na Piaski region, alt. 960 m, 30 May 1996, *leg. P. Czarnota* (GPN 1348), valley of Olszowy stream, 'Turbacz' nature reserve below Czoło glade, alt. 1020 m,

20 Aug. 1996, *leg. P. Czarnota* (GPN 1314), Dolina Kamieniczy valley, mouth of Wspólny Potok stream, alt. 930 m, 9 June 1997, *leg. P. Czarnota* (GPN 1664), by Roztoka stream at the top of Kopieniec Mt., alt. 880 m, 25 May 2001, *leg. P. Czarnota* (GPN 2438); Ge-22 – GORCE MTS: Lubań range, near Jaworzyna Ochotnicka glade, by hiking track, alt. ca 1025 m, 24 June 2004, *leg. P. Czarnota 4003 & A. Wojnarowicz* (GPN); Ge-34 – BESKID SADECKI MTS: Radziejowa range: NE slope of Wielka Prehyba Mt., alt. 1170 m, 17 June 1965, *leg. M. Olech* (KRA), Prehyba Mt., alt. 1150 m, 19 Aug. 1960, *leg. J. Kiszka & J. Nowak* (KRAM-L 7339) and Piwniczna forest division, Roztoka Wielka forest district, forest section no. 182 above ‘Baniska’ nature reserve [49°26'54"N/20°36'37"E] alt. ca 1000 m, 4 Nov. 2004, *leg. P. Czarnota 4339* (GPN); Ge-35 – BESKID SADECKI MTS: Jaworzyna Krynicka range, Pusta Wielka Mt., alt. 1060 m, 22 Aug. 1968, *leg. M. Olech* (KRA); Ge-36 – BESKID SADECKI MTS: Jaworzyna Krynicka range, ‘Żebracze’ nature reserve, alt. 980 m, 7 Sept. 1989, *leg. L. Śliwa* (KRA), alt. 720 m, 5 July 2001, *leg. P. Czarnota* (GPN 2589), alt. 760 m, 5 July 2001, *leg. P. Czarnota* (GPN 2491); Ge-50 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, RÓW PODATRZAŃSKI DEPRESSION: near Małe Ciche village, Pańszczykowa Polana glade [49°17'40"N/20°03'29"E] alt. 920 m, 24 July 2004, *leg. L. Śliwa 3302* (KRAM) and near Małe Ciche village, Brzanówka glade [49°17'23"N/20°05'21"E] alt. 930 m, 24 July 2004, *leg. L. Śliwa 3352* (KRAM); Ge-50 – TATRA MTS, HIGH TATRA MTS: Dolina Waksmundzka valley, by Waksmundzki Potok stream [49°15.16'N/20°04.81'E] alt. 1220 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3627) and [49°14.91'N/20°04.33'E] alt. 1340 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3589); Dolina Roztoki valley, by hiking track [49°13.51'N/20°04.20'E] alt. 1250 m, 9 Aug. 2003, *leg. P. Czarnota* (GPN 3330); Ge-60 – HIGH TATRA MTS: Tatra National Park, Morskie Oko forest district, forest section no. 47c, NW slope of Żabia Czuba Mt. below Siedem Granatów ridge near the border of PL/SK, alt. 1500 m, 9 July 2002, *leg. P. Czarnota* (GPN 2889); Dolina Roztoki valley below shelter-home in Dolina Pięciu Stawów valley, by hiking track [49°12.96'N/20°03.11'E] alt. 1530 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3586); N slope of Szpiglasowy Wierch Mt., by Szpiglasowa Perć region [49°11'58"N/20°02'26"E] alt. 1970 m, 8 Oct. 2005, *leg. P. Czarnota 4569* (GPN); Dolina Rybiego Potoku valley, Żleb Żandarmerii gully [49°12'26"N/20°04'05"E] alt. 1640 m, 19 June 2004, *leg. M. Węgrzyn 2033* (KRA together with *M. marginata*); Gf-58 – EASTERN BESKIDY MTS, WESTERN BIESZCZADY MTS: Bieszczadzki National Park, N slope

of Połonina Wetlińska, by Bardo stream, 5 Sept. 2001, *leg. J. Kiszka* (KRAP); Gf-59 – WESTERN BIESZCZADY MTS: E slope of Kosowiec Mt. above Stuposiany village, alt. 700 m, 10 Aug. 1958, *leg. K. Glanc* (KRAM-L 39621); Gf-68 – WESTERN BIESZCZADY MTS: Bieszczadzki National Park, Dział Mt., N slope of the range, 8 Aug. 2001, *leg. J. Kiszka* (KRAP); Gf-69 – WESTERN BIESZCZADY MTS: Bieszczadzki National Park, valley of Rzeczyca stream, alt. 797 m, 9 July 2003, *leg. J. Kiszka* (KRAP); Gg-71 – WESTERN BIESZCZADY MTS: Bieszczadzki National Park, by Syhłowaty stream, 19 July 2001, *leg. J. Kiszka* (KRAP).

### *Micarea synotheoides* (Nyl.) Coppins

(Figs 53 & 56)

in Topham & Walker, *Lichenologist* **14**: 67. 1982.

*Lecidea synotheoides* Nyl., *Lich. Jap.*: 63. 1890. – *Catillaria synotheoides* (Nyl.) Zahlbr., *Cat. Lich. Univ.* **4**: 78. 1926. TYPE: Japan, ‘Itjigome’, on lignum, 1879, *E. Almquist* (H-NYL 19101 – LECTOTYPE!).

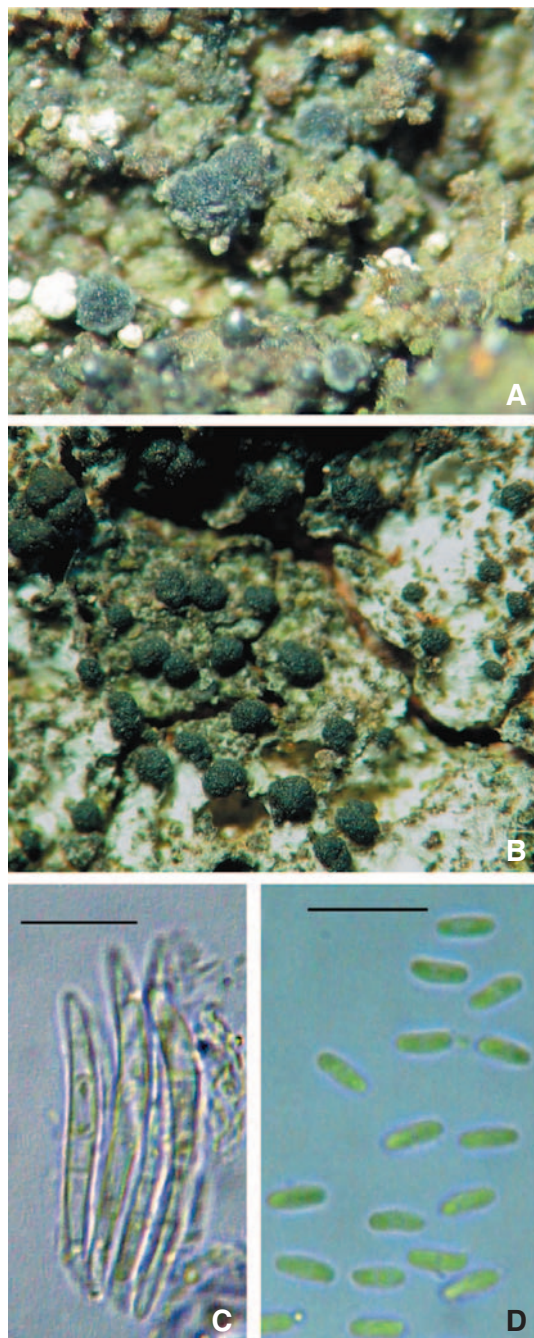
– *Lecidea longella* Nyl., *Acta Soc. Sci. Fenn.* **26**: 31. 1900. – *Catillaria longella* (Nyl.) Zahlbr., *Cat. Lich. Univ.* **4**: 56. 1926. TYPE: Japonia, Itchigome ‘Itjigome, Vega exp.’, on bark of coniferous tree, 1879, *E. Almquist* (H-NYL 19103 – LECTOTYPE!), designated here; H-NYL *p.m.* 4472 – ISOLECTOTYPE!). NOTES. Both lectotype and isolectotype of *Lecidea longella* Nyl. are morphologically and anatomically almost identical to the lectotype of *Lecidea synotheoides* Nyl. and other collections from Japan belonging to the latter taxon (H-NYL 19194!, H-NYL *p.m.* 4473!; identified earlier by Coppins). They are also very similar to the type of *Lecidea globulosella* Nyl. collected by Almquist as well during the same Vega expedition (see under *M. globulosella*). However, the analyzed isolectotype (H-NYL *p.m.* 4472) has no substances detected by TLC. In 1993 Printzen revised the specimen H-NYL 19103 and regarded it as the holotype of *L. longella*, leaving his annotation that it belongs to *Micarea*. In 1994 Coppins confirmed that previous identification and recognized it as *M. synotheoides* (Nyl.) Coppins. Later Printzen (1995: 192) published this synonym. In Nylander’s herbarium I encountered another specimen from probably the same collection. From this reason a lectotypification has been made here.

Thallus dark olivaceous, thin, composed of clustered, small granules (goniocysts) becoming continuous and cracked, ±gelatinous when wet, C–. Photobiont micareoid; algal cells 5–7 µm diam. Apothecia small, immarginate or sometimes

with slightly paler external part when immature, slightly convex to hemispherical, greyish-black to leaden, 0.15–0.25 mm diam., C–. Hymenium 35–40  $\mu\text{m}$  tall, hyaline to olive-grey in upper part, K+ violet, C+ violet; pigment confined to gel matrix. Asci clavate, 30–35  $\times$  9–12  $\mu\text{m}$ . Ascospores mostly straight or slightly curved, only occasionally  $\pm$ sigmoid, acicular, fusiform to rod-shaped, 14–20(–24)  $\times$  1.8–2.5(–3.2)  $\mu\text{m}$ , usually (0)–1–3-septate and only sporadically up to 5-septate. Paraphyses numerous, hyaline throughout, branched and sometimes anastomosed, 1–1.2  $\mu\text{m}$  wide, apices only slightly widening. Hypothecium hyaline. Excipulum indistinct, hyaline to pale olivaceous differs from the hymenium in more branched and wider (1.2–1.5  $\mu\text{m}$ ) paraphysis-like, hyaline hyphae. Pycnidia numerous, 60–120  $\mu\text{m}$  tall, usually emergent (as in *M. denigrata*) to almost  $\pm$ shortly stalked with gaping ostioles and often white mass of conidia; pycnidial walls olivaceous, K+ violet, C+ violet. Mesoconidia cylindrical, 3.5–5  $\times$  1–1.5  $\mu\text{m}$ . Microconidia not seen in the Polish specimen.

CHEMISTRY. No substances detected by TLC.

NOTES. Analyzed central European specimens from the Czech Šumava Mts, Polish Western Beskidy Mts and Ukrainian Eastern Carpathians are closely related and perhaps, belong to a separate taxon, characterized mainly by poor septation and small size of their ascospores. In all examined material from those regions the ascospores resemble those found in the type specimens (see below) as well as those of *M. globulosella* – length up to 20  $\mu\text{m}$  [13–16(–20)  $\times$  2–2.5(–3)  $\mu\text{m}$ ], mostly (0)–1–3-septate, straight or only slightly curved, rarely rod-shaped. Coppins (1983) noticed the shorter spores (14–26  $\mu\text{m}$ ) in Japanese specimens than those in *M. synotheoides* growing in the British Isles, but he considered both populations as conspecific because of the large variation in spores among British collections. Most features such as the olive,  $\pm$ gelatinous thallus when wet, no thallus and apothecial reaction C– (gyrophoric acid absent), ‘micareoid’ photobiont, a size, pigmentation and dimensions of apothecia are really similar in specimens of British and central European popula-



**Fig. 56.** *Micarea synotheoides* (Nyl.) Coppins: A – morphology of Polish specimen (Czarnota 1165, GPN); B – morphology of Scottish specimen (Czarnota 3420, GPN); C – ascospores (Czarnota 1165, GPN); D – mesoconidia (GPN 3595). Scale bars = 10  $\mu\text{m}$ .

tions. However, in contrast to the British as well as Japanese findings, well developed pycnidia bearing mesoconidia resembling those produced by *M. denigrata* are found in mountain specimens from Central Europe. They are usually emergent in thallus warts or even shortly stalked, while in Scottish specimens examined here, pycnidia are more inconspicuous and mesoconidia more cylindrical and slightly longer. It is possible that climatic and ecological conditions are responsible for these differences, such as mode of propagation, being mainly by ascospores in oceanic regions and by conidia in mountainous habitats.

Based on the structure of apothecia (e.g. numerous, strongly branched and anastomosed paraphyses, olivaceous, K<sup>+</sup> violet pigment in upper part of hymenium, size and shape of narrowly fusiform ascospores) and well-developed pycnidia, *M. synotheoides* may be included in the '*M. denigrata* group' composed of *M. denigrata*, *M. nitschkeana* and *M. globulosella*. Unfortunately, in contrast to the last species, *M. synotheoides* has no gyrophoric acid and its dull olive thallus composed of more or less clustered goniocysts and the same olivaceous pigment 'Sedifolia-grey' (Meyer & Printzen 2000; 'Pigment D' of Coppins 1983; 'Thalloidima-Green' of Ekman 1996) suggests it could be a member of *M. prasina*-group (Coppins 1983). This hypothesis is supported by its position in the phylogenetic tree of *Micarea* based on analyses of mtSSU (Andersen & Ekman 2005) or additional (ITS) DNA sequences (Andersen 2004).

In many respects, the only Polish specimen of *M. synotheoides* resembles the mountain collections with well-developed, numerous pycnidia referring to *M. globulosella*, but differs from them in a lack of gyrophoric acid (see also under *M. globulosella*). For more differences from *M. synotheoides* and other similar species see Coppins (1983: 189) and Czarnota (1997b).

**HABITAT AND DISTRIBUTION IN POLAND.** The first report from the Gorce Mts at the end of the last century (Czarnota 1997b) is still the only known site for Poland; details on its occurrence, ecology and associated species are presented by Czarnota (1997b).

**WORLD DISTRIBUTION.** *Micarea synotheoides* is a rarely reported species, restricted mainly to strongly oceanic European regions. It is also known outside Europe, from a single, old locality in Japan and from a recent record in North America.

**EUROPE:** Czech Republic (see below); Great Britain and Ireland (Coppins 1983, 2002; Seaward 1994); Madeira and Canary Islands (Coppins 1983; Hafellner 1995); Norway (Andersen & Ekman 2005); Spain (Llimona & Hladun 2001); Ukraine (see below). **NORTH AMERICA:** USA – Washington (Tønsberg & Coppins 2000). **ASIA:** Japan (Nylander 1890; Coppins 1983; Kurokawa 2003).

**SPECIMEN EXAMINED.** Grid square Ge-21 – WESTERN BESKIDY MTS, GORCE MTS: Gorce National Park, S slope of Kudłoń Mt., Dolina Kamienicy valley below Pustak glade, alt. 1060 m, 8 Oct. 1996, leg. P. Czarnota 1165, 1200 (GPN).

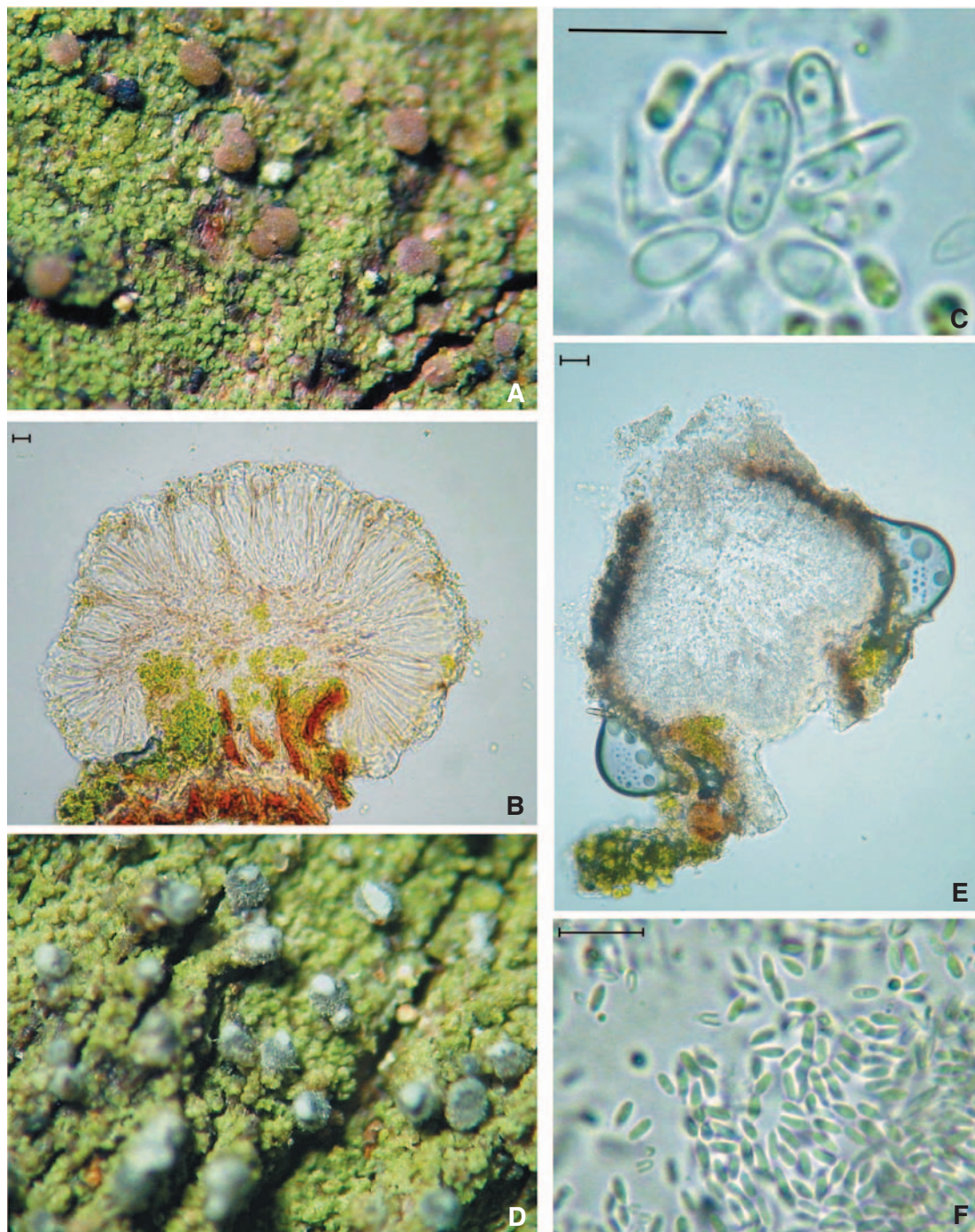
**ADDITIONAL SPECIMENS EXAMINED.** CZECH REPUBLIC, ŠUMAVA MTS: Volary, Placký Mt., NW of 'Rakouska louka' and NE of 'Trojmeci', on bark of *Picea abies* within climatic spruce forest, [48°46'30–40"N/13°50'30–45"E] alt. 1280–1320 m, 29 May 1998, leg. Z. Palice 1644 (PRA; GPN 3597 ex PRA). JAPAN, HONSU: 'Itjgome', on bark of coniferous tree, 1879, E. Almquist (H-NYL p.m. 4473). SCOTLAND, ARGYLL: Comonachan Wood, ca 0.5 km W of bank of Loch Goil [56°07.78'N/4°54.66'W] alt. 100 m, on bark of *Quercus* within ancient wood, 12 Sept. 2003, leg. P. Czarnota 3420 (GPN); Hell's Glen Wood ca 4.5 km N of Lochgiolhead village [56°12.36'N/4°54.98'W] alt. 50 m, on bark of *Quercus*, 13 Sept. 2003, leg. P. Czarnota 3412 & B. J. Coppins (GPN). UKRAINE, EASTERN CARPATHIANS: Jasiela, the Stanislava Valley, on bark of the basis of *Acer pseudoplatanus*, alt. ca 1150 m, 30 June 1997, leg. Z. Palice (PRA; GPN 3595 ex PRA).

***Micarea tomentosa* Czarnota & Coppins sp. nov.**  
(Figs 57 & 58)

*Species haec Micaraceae hedlundii Coppins similis sed thallo pallide viridi, goniocystis interne non flavo-brunneolo pigmentis, K–, apotheciis minoribus (0.15–1.3), mox simplicibus sessilibusque, dilute rufescenti-luteolis vel pallido fusciscentibus, acrosporibus brevioribus, (6.5–)7.5–9.0(–9.5) μm longis, 2.2–3.5(–3.75) μm latis, pycnidiis conspicuis, breviter stipitatis, saltem pro parte cum tomento exili albido recedit.*

**TYPE:** POLAND, MIDDLE ROZTOCZE, Roztocki National Park, Kosobudy forest divi-





**Fig. 57.** *Micarea tomentosa* Czarnota & Coppins *sp. nov.*: A – morphology, B – vertical section of apothecia, C – ascospores, D – morphology of tomentose pycnidia, E – vertical section of pycnidia, F – mesoconidia (Czarnota 3949, GPN – holotype). Scale bars = 10  $\mu$ m.

sion, Stogi forest district, forest section no. 178b [50°35'42"N/23°04'42"E] alt. ca 260 m, on bark of *Abies alba*, at the base of trunk within shady fir forest, 28 Apr. 2004, leg. P. Czarnota 3949 (GPN – HOLOTYPE).

Thallus bright green, granular, thin; granules 30–50 µm diam. composed of small goniocysts, 10–15 µm diam. and confluent with a hyaline gel-matrix, K–. Photobiont micareoid; cells ±globose, 4–7 µm diam. Apothecia pale, slightly brownish, pinkish-brown or straw-coloured, rather scanty, simple, convex to hemispherical, ±adnate, 0.15–0.3 mm. Hymenium 35–40 µm tall, hyaline, but sometimes, especially in upper part slightly straw-coloured, K–, C–. Asci 30–35 × 7–9 µm, *Micarea*-type. Ascospores oblong-ellipsoid, or oblong, (0–)1-septate, (6.5–)7.5–9(–9.5) × 2.2–3.5(–3.75) µm. Paraphyses scanty, transversely septate, 1.0–1.5(–1.7) µm wide, sparingly branched and anastomosing, more in upper part and there slightly widening to 2(–2.4) µm, hyaline; some of them confluent in yellowish gel-matrix resemble vertical streaks. Hypothecium hyaline throughout, ca 70 µm tall. Excipulum absent, but in lower part of hymenium constricted under the hypothecium the paraphyses are numerous and more branched. Pycnidia numerous when apothecia absent or rare around the place where apothecia are developed, white at first and globose, sessile, but soon becoming pale, whitish-grey or grey, shortly stalked, with often widely gaping ostioles or with white bulbs of conidia, distinctly tomentose, especially when young; older ones sometimes without tomentum, glossy in upper part or with whitish hyphae covering bases of the pycnidia; pycnidial walls at first hyaline, K– or only slightly greyish, but in mature pycnidia walls slightly brownish straw-coloured to brown, K ±violet to violet-grey, covered by hyaline tomental hyphae, ca 0.7–1 µm wide; the base of pycnidiophores more intensive yellow brown, K–. Conidia (mesoconidia) oblong cylindrical, (2.98–)3.2–3.5(–3.77) × 1.23–1.5(–1.65) µm.

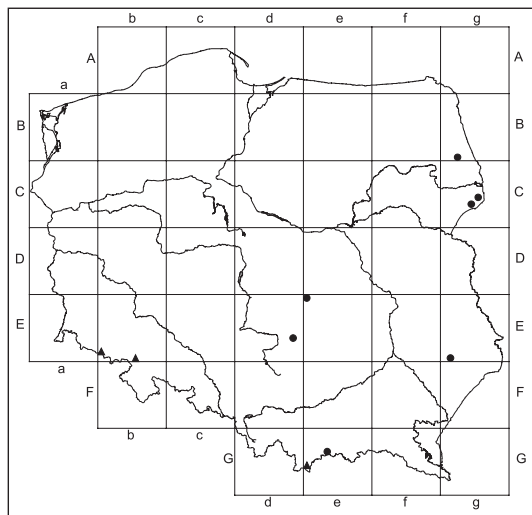
CHEMISTRY. Thallus and apothecia K–, C–, Pd–; walls of pycnidia sometimes K± slightly

greyish to violet-grey. TLC: substances not detected in four specimens analyzed.

NOTES. Because of the stalked pycnidia covered with whitish tomentum, the species can resemble *Micarea hedlundii*, which was formerly the only known *Micarea* species having tomentose pycnidia; however, *M. tomentosa* differs morphologically in having a brighter coloured thallus composed of larger granules than the goniocysts of *M. hedlundii* and by brighter, pale or slightly brownish, usually simple or adnate apothecia. The apothecia of *M. hedlundii* are often tuberculate, larger and darker, pinkish-brown or brown pigmented. In anatomy, *M. tomentosa* can be distinguished from *M. hedlundii* by the absence of the dull orange 'Intrusa-yellow' pigment (reacting K+ violet, C+ violet) within the goniocysts. The yellowish colour within the sections of apothecia of *M. tomentosa* do not change after K, but yellow-olive pigment inside pycnidial walls reacts K± violet or violet-grey. The species forms a bright green granular thallus, very similar to that of *M. prasina*, but the latter contains micareic acid, does not develop tomentose pycnidia and produces slightly longer mesoconidia and larger ascospores. For differences between *M. tomentosa* and other similar 'sorediose' species see Table 6.

Considering the morphological and anatomical similarity of all the above-mentioned species, *M. tomentosa* seems to be closely related to the *M. prasina* complex. It is possible that the 'Sedifolia-grey' pigment characteristic to this group is also present within the apothecia and goniocysts, as well as in the pycnidial walls, of *M. tomentosa*, but its concentration is persistently too low to give the diagnostic K+ violet reaction. Sometimes a slightly greyish colour results, as in some paler pycnidia of *M. misella* (see under that species).

HABITAT AND DISTRIBUTION IN POLAND. The species is known from several localities in different regions of Poland, mostly within large complexes of natural forest ecosystems, especially in protected nature reserves, possibly demonstrating its particular role as an indicator of ecological continuity for forest habitats. *Micarea tomentosa* has been recorded there on decaying



**Fig. 58.** Distribution map of *Micarea tomentosa* Czarnota & Coppins (●) and *Micarea tuberculata* (Sommerf.) R. A. Anderson (▲) in Poland.

wood (stumps and logs) as well as occasionally on bark at the base of standing fir trees (as in *locus typicus*) in shady stands. It seems to be more frequent in the Białowieża Primeval Forest where it grows on lignum of decaying stumps of different deciduous trees within ancient hornbeam forest. Only a few associated species, *Lepraria lobificans*, *Micarea nigella* and *M. prasina*, were included in the specimens examined.

**WORLD DISTRIBUTION.** *Micarea tomentosa* is known from Poland and one locality in Slovakia (Palice *et al.* 1999, as *M. cf. hedlundii*; see also below). Based on limited ecological data, it may belong to the group of lichens with subcontinental distribution. It is probably found in central and eastern forested parts of Europe, perhaps even in mountains, but it is most probably a rare species.

**ADDITIONAL SPECIMENS EXAMINED.** POLAND: Grid square Bg-92 – NIZINA PÓLNOCPODLASKA LOWLAND, WYSOCZYNA BIAŁOSTOCKA PLATEAU: Puszcza Knyszyńska Forest, Czarna Białostocka forest division, ‘Budzisk’ nature reserve, forest sections no. 109d, on wood of decaying stumps, 11 June 1999, *leg. K. Czyżewska* (LOD 10895), as *M. hedlundii* (Czyżewska *et al.* 2002) and forest section no. 124c, 12 June 1999, *leg. K. Czyżewska* (LOD 11876); Cg-55 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest,

Białowiecki National Park, near cross of forest sections no. 314 and 340, by tourist road [52°44′32″N/23°49′57″E] alt. 155 m, on wood of decaying stump within oak-linden-hornbeam forest, 11 May 2006, *leg. P. Czarnota 4784* (GPN); Cg-64 – RÓWNINA BIELSKA PLAIN: Białowieża Primeval Forest, Hajnówka forest division, forest section no. 599B [52°38′40″N/23°38′02″E] 155 m alt., on wood of decaying stump within hornbeam forest, 12 May 2006, *leg. P. Czarnota 4783* (GPN); Ed-68 – WYŻYNA PRZEDBORSKA UPLAND, NIECKA WŁOSZCZOWSKA BASIN: Siłniczka forest division, Dębowiec Wood, forest section no. 165, on wood of decaying stump, 24 Sept. 1970, *leg. K. Czyżewska* (LOD 1031), as *Catillaria prasina* f. *laeta*; Ee-00 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HILLS, RÓWNINA PIOTRKOWSKA PLAIN: ‘Spała’ nature reserve, forest section no. 285, on decaying bark of standing trunk of *Abies alba*, 4 Nov. 1993, *leg. K. Czyżewska* (LOD 11864); Ge-32 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, PIENINY MTS: Pieniński National Park, Poręba [49°25′49″N/20°20′26.8″E] on soft lignum of decaying stump within fir-spruce mountain forest, 25 May 2006, *leg. J. Kozik* (GPN 4851); Ge-33 – PIENINY MTS: Pieniński National Park, S slope of Ociemne Mt. [49°25′47″N/20°25′38″E] alt. ca 570 m, on fir log within Carpathian beech forest, 13 May 2004, *leg. P. Czarnota 3851* (GPN). SLOVAKIA, SLOVENSKÝ RAJ NATIONAL PARK: Hrabušice, Veľký Kysel gorge [48°55′50″–56°00″N/20°24′15–30″E] alt. 800–850 m, on moribund wood of a stump, 12 June 1998, *leg. Z. Palice 925* (GPN ex PRA).

***Micarea tuberculata* (Sommerf.) R. A. Anderson**  
(Figs 3E, 58 & 59)

Bryologist 77: 46. 1974.

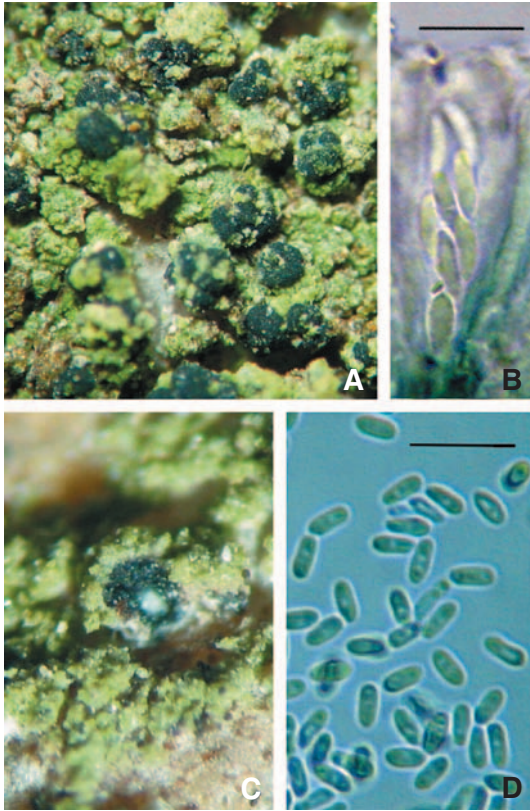
*Lecidea tuberculata* Sommerf., Suppl. Fl. Lapp.: 160. 1826. TYPE: Norway (O – LECTOTYPE, *n.v.*; UPS – ISOLECTOTYPE, *n.v.*).

– *Lecidea latens* Taylor in Mackay, Fl. Hib. 2: 259. 1836. TYPE: Ireland (BM – LECTOTYPE, *n.v.*).

– *Lecidea botrycarpa* Nyl., Flora 48: 603. 1865. TYPE: Russia, Karelia onegensis, ‘ad Onegam, Kapselka’, 1863, *T. Simming* (H-NYL 10766 – HOLOTYPE!).

– *Lecidea subinfidula* Nyl., Flora 52: 295. 1869. TYPE: Finland (H – LECTOTYPE, *n.v.*; UPS – ISOLECTOTYPE, *n.v.*).

– *Lecidea tuberculata* var. *scandinavica* Vain., Acta Soc. Fauna Fl. Fenn. 57(2): 309. 1934. TYPE: Finland, Tavastia australis, Lammi, Evo, Lapinkallio, 1866, *J. P. Norrlin* (H-NYL 10767 – LECTOTYPE!).



**Fig. 59.** *Micarea tuberculata* (Sommerf.) R. A. Anderson: A – morphology (GPN 3517); B – ascospores, C – pycnidium bearing mesoconidia, D – mesoconidia (Flakus 140, KRAM-L 48356). Scale bars = 10  $\mu\text{m}$ .

Thallus scurfy-granular or more often forming an irregularly cracked, granular crust, usually pale greenish-grey or olive-green in shaded localities. Photobiont not ‘micareoid’; cells 5–12(–15)  $\mu\text{m}$ . Apothecia black, convex-hemispherical and immarginate from the start, later becoming globose and mostly tuberculate; simple, small, 0.15–0.3 mm diam., but in clusters, up to 0.5 mm diam.; sometimes rounded by white rim of discoloured hyphae. Hymenium aeruginose or aeruginose-blue, but with usually dark aeruginose-black vertical streaks, due to the presence of dark pigmented paraphyses, K+ bluish-aeruginose intensifying; if the dark streaks numerous, then hymenium seems to be dark coloured, similar to hypothecium. Ascospores small, 0(–1)-septate, narrowly oblong-ovoid or oblong-ellipsoid, 6–8(–9)  $\times$  1.3–2.2(–2.5)  $\mu\text{m}$ .

Paraphyses of two types: (1) narrow, 1–1.5  $\mu\text{m}$  diam., only in the apical part slightly widening up to 1.8  $\mu\text{m}$ , hyaline throughout, sparingly branched and anastomosed, more numerous and branched in lower part of the hymenium; (2) thick, 2–3.5  $\mu\text{m}$  diam. with  $\pm$ globose caps up to 4.5  $\mu\text{m}$  diam., distinctly multiseptate, concentrated in small, usually numerous fascicles, walls of paraphyses incrustated by black-sordid green pigment. Hypothecium 80–120  $\mu\text{m}$  tall, aeruginose-black, K+ intensifying; hyphae stout, coated with dark green pigment. Excipulum not developed. Pycnidia sometimes present, immersed, black, 60–130  $\mu\text{m}$  wide, often with gaping ostioles and extruding white mass of conidia; pycnidial walls dark sordid green, K $\pm$  intensifying. Mesoconidia cylindrical, (3.5–)3.8–4.2  $\times$  (1.3–)1.6–1.8  $\mu\text{m}$ .

CHEMISTRY. No substances detected by TLC.

NOTES. *Micarea tuberculata* morphologically resembles *M. sylvicola* and saxicolous forms of *Psilolechia clavulifera*, with which it can be associated covering shaded vertical rocky walls (as for example in Góry Sowie Mts). However, anatomically it is almost identical with *M. sylvicola*, having the same intensive ‘Cinereorufa-green’, K+ dull green pigment in almost the whole ascomatal section. Careful examination of size and pigmentation of paraphyses as well as of ascospore dimensions is necessary to separate the species. *Micarea tuberculata* differs in having stout, dark green pigmented paraphyses causing the hymenium to appear almost entirely intensive bluish-green (due to the additional blue tinge in the gel-matrix). Its vertical streaks are also numerous and more visible, so sometimes (as for example in Arnold, *Lich. Exs. No. 1057* and *Czarnota 4403*, GPN) there is no distinct separation between hymenium and hypothecium as in *M. sylvicola*. Smaller, narrowly ellipsoid ascospores, which are never more than 2.5  $\mu\text{m}$  wide also distinguish *M. tuberculata* from the last species which has ovoid spores, up to 4(–4.5)  $\mu\text{m}$  wide. *Psilolechia clavulifera* has small ascospores, but they are usually dacryoid. Moreover, it mainly differs from *M. tuberculata* in its hyaline hypothecium. Although its epihymenium is sometimes bluish, reacting K+ green

as in *M. tuberculata*, it has never vertical streaks composed of pigmented paraphyses.

**HABITAT AND DISTRIBUTION IN POLAND.** *Micarea tuberculata* is known from only three localities in Poland, resulting from the recent exploration of the Karkonosze Mts in Western Sudetes and the High Tatra Mts, two of which have already been reported (Czarnota 2004; Flakus 2004). Moreover, it occurs on granitic rocks and on metamorphic boulders (probably gneiss) in the Góry Sowie Mts (Middle Sudetes). It has been found within spruce monoculture, as well as in open environments at the edge of a forest by a stream and in a woodless alpine belt, but prefers rather sheltered and shaded niches on vertical faces towards the base of acid rocks or in underhangs (especially Góry Sowie Mts); here it is associated with *M. lignaria*, *M. lutulata*, *M. myriocarpa*, *M. sylvicola* and *Psilolechia clavulifera*. In view of the special kind of rocky substratum occupied by *M. tuberculata*, it is likely to be more frequent on granite in the higher parts of Tatra Mts and on hypogenic or metamorphic rocks throughout the Sudetes.

**WORLD DISTRIBUTION.** *Micarea tuberculata* is probably very rare worldwide or overlooked or misidentified in the field (as for example *M. sylvicola*), but considering recent reports it appears to be widely distributed in European mountains and postglacial regions from Fennoscandia to the Pyrenees in Spain and to the Ural Mts in the east. It is probably more frequent in North America.

**EUROPE:** Austria (Hafellner & Türk 2001); Czech Republic (Vězda & Liška 1999); Finland (Vitikainen *et al.* 1997); Germany (Coppins 1983; Sholz 2000); Great Britain and Ireland (Coppins 1983, 2002; Seaward 1994); Italy (Nimis & Martellos 2003); Norway (Santesson 1993); Russia – Leningrad Region (Zavarzin *et al.* 1999), Tver region (Moutchnik & Zavarzin 2005), Middle Urals (Paukov & Trapeznikova 2005); Spain (Llimona & Hladun 2001); Sweden (Santesson 1993). **ASIA:** China – Yunnan (Aptroot *et al.* 2003). **NORTH AMERICA:** USA – Colorado (Anderson 1974).

Erroneously reported from Slovakia by Vězda (1975) as *Lich. Sel. Exs. No. 1341* ('Slovakia,

Carpates, montes Kremnické pohorie, in valle rivi supra pagum Ihráč, alt. 600 m s.m., 18 Sept. 1975, *leg. A. Vězda*) and probably later by Pišút *et al.* (1996); the revised specimen housed in H refers to *M. sylvicola* (as does the material in BM; see Coppins 1983: 188). However, *M. tuberculata* from Slovakia has been discovered in Lojka's materials housed in H-NYL (see additional specimens examined).

**EXSICCATAE SEEN.** Arnold, *Lich. Exs. No. 1057* (H-NYL, WRSL).

**SPECIMENS EXAMINED.** Grid square Eb-80 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park, Dolina Łomniczki valley, by hiking track [50°45.36'N/15°45.42'E] alt. 770 m, 7 July 2003, *leg. P. Czarnota* (GPN 3517); Eb-95 – MIDDLE SUDETES, GÓRY SOWIE MTS: S slope of Wielka Sowa Mt, by stream at N edge of Sokolec village [50°39'46"N/16°28'59"E] alt. ca 620 m, 21 Apr. 2005, *leg. P. Czarnota 4403, 4406* (GPN); Ge-50 – TATRA MTS, HIGH TATRA MTS: Dolina Gašienicowa valley below Czarny Staw Gašienicowy Lake, alt. 1600 m, 29 Aug. 2002, *leg. A. Flakus 140* (KRAM-L 48356).

**ADDITIONAL SPECIMEN EXAMINED.** SLOVAKIA: 'Supra saxa gneissacea alpis 'Dzurow' com. Liptó in Hungaria, 1879, *leg. Lojka* (H-NYL 10764), as *Lecidea tuberculata*.

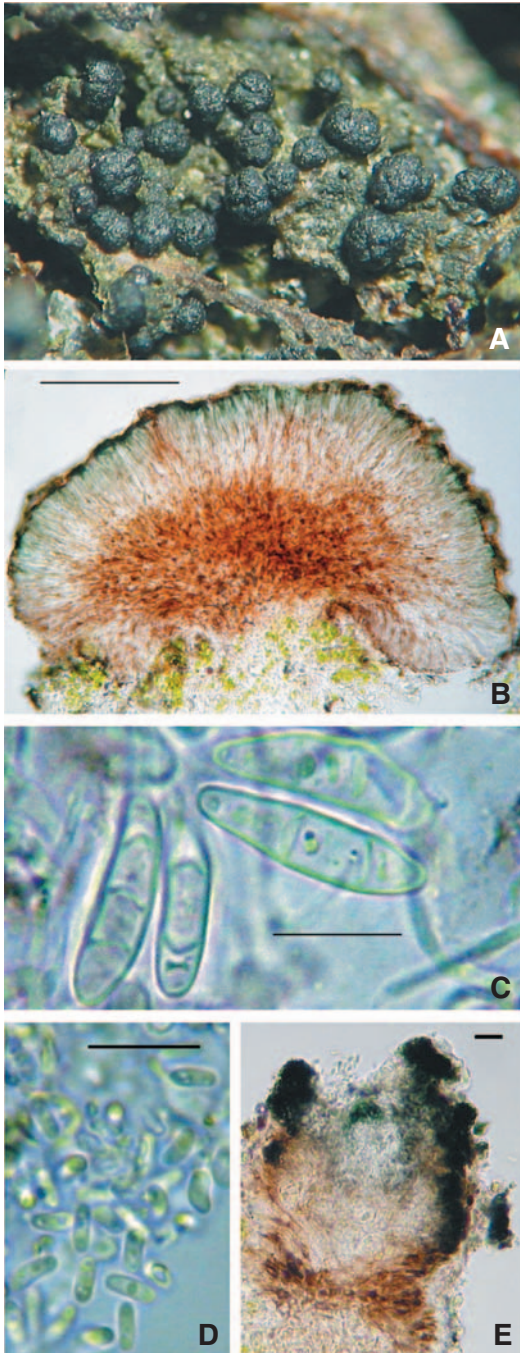
***Micarea turfosa* (A. Massal.) Du Rietz**  
(Figs 60 & 61)

Svensk Bot. Tidskr. 17: 94. 1923.

– *Biatora turfosa* A. Massal., *Ric. Lich. Crost.*: 128. 1825. TYPE: Poland?, Sudetes, 'Flotow, *Lich. Exs. No. 130*' (VER – HOLOTYPE, *n.v.*).

– *Biatora turfosa* subsp. *verrucula* Norman, K. Nor. Vidensk. Selsk. Skr. 5: 353. 1868. – *Lecidea verrucula* (Norman) Th. Fr., *Lich. Scand.* 2: 523. 1874. – *Micarea verrucula* (Norman) Hedl., Bih. Kongl. Svenska Vetensk.-Akad. Handl. III, 18(3): 84, 95. 1892. TYPE: Norway (ISOLECTOTYPES: LD, M, O, *n.v.*).

Thallus usually epibryophytic, effuse, thin, ±continuous, membranaceous and often appearing ±gelatinous when moist, rarely slightly thicker and almost warted, especially on wood, but not forming distinct granules, brown-black to dull olive-black, sometimes inconspicuous. Photobiont micareoid, algal cells 4–8 µm. Apothecia numerous, mostly



**Fig. 60.** *Micarea turfosa* (A. Massal.) Du Rietz: A – morphology, B – vertical section of apothecia (Czarnota 3617, GPN); C – ascospores (Czarnota 3284, GPN); D – mesoconidia, E – vertical section of pycnidia bearing mesoconidia (GPN 3515). Scale bars: B = 100  $\mu\text{m}$ ; C–E = 10  $\mu\text{m}$ .

simple, 0.1–0.3 mm diam. or sometimes tuberculate, immarginate from the start, convex to globose and constricted at the base, black, slightly glossy. Hymenium 30–50  $\mu\text{m}$  tall, in the middle part various coloured: hyaline, dilute olivaceous, olivaceous-brown, fuscous brown, orange-brown (brownish tinge particularly present in lower part, but sometimes almost all hymenium concoloured with hypothecium); upper part sordid green, K+ dulling. Asci clavate, 35–45  $\times$  10–12  $\mu\text{m}$ . Ascospores oblong-ellipsoid, oblong, 0–1(–3)-septate, 15–22(–25)  $\times$  (4.5)5–6.5(–7)  $\mu\text{m}$ . Paraphyses very abundant, dense, branched and anastomosing, walls in upper part olive-black to sordid green and additional surrounded by the dark olivaceous or aeruginose incrustated gel-matrix, 1.2–1.5(–2)  $\mu\text{m}$  wide, but apices often globose and widening up to 2.5(–3.5)  $\mu\text{m}$ . Hypothecium 60–140  $\mu\text{m}$  tall, fuscous brown to reddish-brown, K–. Excipulum distinct, often reflexed, composed of paraphysis-like, dense, interwoven hyphae, dark brown to olive-brown, K– or K+ dulling when olive pigment present; pigment confined to gel-matrix. Pycnidia usually present, but inconspicuous, immersed, sometimes numerous (especially when only anamorphic state present) and then mostly  $\pm$ sessile, 30–60  $\mu\text{m}$  diam.; walls greenish-black, K+ dulling. Microconidia cylindrical, 3.5–4.5  $\times$  1  $\mu\text{m}$ .

**CHEMISTRY.** No substances detected by TLC.

**NOTES.** In Polish specimens there is a great variability in the size and shape of ascospores of *M. turfosa* as observed in some European specimens by Coppins (1983). Most of them, especially those growing as epibryophytic, bear 0–1-septate, 15–22  $\times$  4.5–6  $\mu\text{m}$  spores, but others from Karkonosze Mts found on water-logged wood have mainly 2–3-septate ascospores up to 20–25  $\mu\text{m}$  long and 6–7  $\mu\text{m}$  wide.

Considering the strongly alpine character of *M. turfosa*, its black and gelatinous thallus and absence of many other *Micarea* species growing in this harsh climatic condition, makes it quite easy to identify in the field. Unfortunately, during microscopic examination some problems with its correct determination may arise owing to a few other species sometimes occurring on bryophytes in high

mountain having a similar apothecial anatomy. The dark, brown hypothecium, sordid green to olive-brown, K+ dulling hymenium and ascospores with similar septation are found also in *M. botryoides*, to which *M. turfosa* is probably closely related since both species form a separate, infrageneric group (Andersen 2004). *Micarea botryoides* differs from *M. turfosa* in having of two types of paraphyses, smaller ascospores and, above all, numerous, stalked pycnidia with mesoconidia, while this type of pycnidia is still unknown in *M. turfosa*. *Micarea botryoides* can be distinguished also by more or less visible greenish tinge of the thallus. Unfortunately, sometimes its epibryophytic thallus is indistinctive and the pycnidia are hardly stalked; in such cases, an analysis of more material (e.g. the central part of the thallus) is needed. On the other hand, lignicolous specimens of *M. turfosa* can form a thicker, almost slightly warted thallus (as in GPN 3513) resembling in structure that of *M. botryoides*. However, the thallus of *M. turfosa* is always black or black-brown coloured. Both species also differ in their ecology, since *M. botryoides* is usually saxicolous and prefers shady forest conditions, while *M. turfosa*, mostly terricolous, grows above the timber-line, in rather open localities exposed to light.

Globose, sessile apothecia on a dark olive-brown, ±gelatinous thallus is sometimes found in terricolous *M. melaena*, as for example in the specimen from large, boggy area in the Kotlina Orawska basin at the base of Tatra Mts; in this case, its thallus is too dark to see the characteristic C+ red reaction, one important feature distinguishing it from *M. turfosa*, and furthermore, most of the ascospores may be only 1-septate as in *M. turfosa*. However, the hypothecium of the latter is never purple-green pigmented and K+ dull sordid green, but permanently brown, even in K. *Micarea incrassata*, *Bilimbia lobulata* (Sommerf.) Hafellner & Coppins and *Protomicarea limosa* (Ach.) Hafellner, also found in the same alpine environment, have apothecial pigmentation and ascospore septation similar to *M. turfosa*, but they all have a differently structured ±pale thallus and occupy different niches. For further details see under *M. incrassata*.

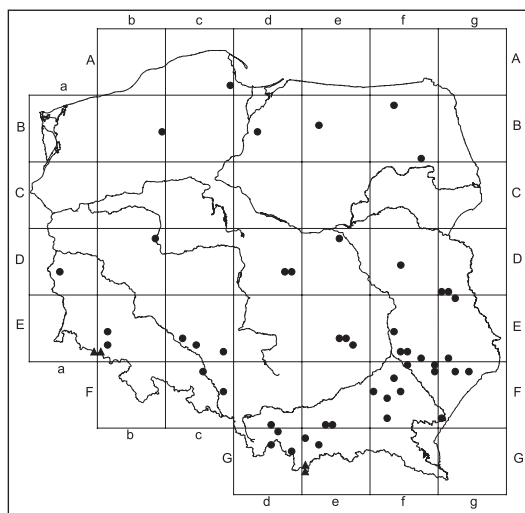


Fig. 61. Distribution map of *Micarea turfosa* (A. Massal.) Du Rietz (▲) and *Micarea viridileprosa* Coppins & van den Boom (●) in Poland.

**HABITAT AND DISTRIBUTION IN POLAND.** *Micarea turfosa* was formerly reported from the Karkonosze Mts by Körber (1855), Stein (1879) and Migula (1931) from the vicinity of Śnieżka Mt. and Śnieżne Kotły glacial corries ('Riesengebirge – Gipfel der Schneekoppe, Koppenplan an der Lomnitz und in den Schneegruben'), where it was observed on moribund peat mosses and plant debris. Although there are no reports of it from here since then, recent collections can confirm its continued presence there.

The single locality in the High Tatras is the next one in Poland from where *M. turfosa* was previously reported (Nowak 1975, as *exsiccata*); recent exploration of the mountain range shows that it is still present there as a component of the alpine lichen flora, although it has not been refound in Nowak's location in the Gašienicowa Valley.

All recent collections made at altitudes of ca 1320–1980 m confirm its alpine distribution in this part of Europe (Coppins 1983). In both the highest Polish ranges of the Sudetes and Carpathians, *M. turfosa* grows on decaying, terricolous bryophytes or turf in local, small bogs and also directly on mineral soil on old disused hiking tracks and patches, and more rarely in shaded postglacial gullies on mosses or humus over gra-

nitic rocks splashed by stream water. Sometimes it occurs on some pieces of wood, decorticated roots and branches occasionally flooded by the stagnant, ground water in *Sphagnum*-bogs. It is especially frequent in the Karkonosze Mts above 1400 m along the main ridge, but particularly in the upper mountain peat-bog 'Równia pod Śnieżką' covered by *Pinus mugo* community and *Eriophorum vaginatum*, where it is expanding over several square metres, usually without associated lichen species, but occasionally with *Cladonia* spp., *Helocarpon crassipes*, *Lepraria* sp. and *Micarea diminuta*.

There are a few other Polish mountain ranges exceeding the timber-line, but neither in Western Carpathian's Babia Góra Massif (alt. 1725 m) and Pilsko Mt. (alt. 1577 m) nor in Śnieżnik Mt. (alt. 1425 m) located in the eastern Sudetes has this species been recorded to date, although it is possible that it does occur there.

WORLD DISTRIBUTION. *Micarea turfosa* has been reported mainly from polar regions as well as from high mountains in Europe and the British Isles indicate that it is an arctic-alpine species (Coppins 1983) with a bipolar distribution. It is also found in the boreal zone of a few Baltic countries where extensive *Sphagnum*-bogs occur.

EUROPE: Austria (Hafellner & Türk 2001); Czech Republic (Vězda & Liška 1999; Bayerová *et al.* 2004); Estonia (Randlane & Saag 1999); Finland (Vitikainen *et al.* 1997); Great Britain (Coppins 1983, 2002); Hungary (Verseghy 1994); Italy (Nimis & Martellos 2003); Norway (Santesson 1993); Russia – Komi Republic (Hermansson *et al.* 1998); Slovakia (Coppins 1983; Pišút *et al.* 1996); Sweden (Santesson 1993). ASIA: Russia – Putorana Plateau (Zhurbenko 1996), Beringian Chukotka (Andreev *et al.* 1996). NORTH AMERICA: Canada – Manitoba, Quebec (Thomson 1997); Greenland (Thomson 1997); USA – Alaska (Thomson 1997). SOUTH AMERICA: Argentina (*R. Santesson 687* – E ex UPS; Acc.-nr. L 112439). ANTARCTICA: Deception Island, King George Island, South Shetlands (Aptroot & Knaap 1993; Olech 2001); South Orkney (Øvstedal & Lewis Smith 2001).

EXSICCATAE SEEN. Hertel, *Lecid. exs. No. 252* (E);

Nowak, *Lich. Pol. Merid. Exs. No. 134* (H); Vězda, *Lich. Sel. Exs. No. 1135* (H).

SPECIMENS EXAMINED. Grid square Ea-89 – WESTERN SUDETES, KARKONOSZE MTS: Karkonoski National Park: upper mountain peat-bog with *Pinus mugo* community in Równia pod Śnieżką region [50°44.36'N/15°42.49'E] alt. 1400 m, 8 July 2003, *leg. P. Czarnota* (GPN 3284, 3485, 3515), border of PL/ČR [50°44.44'N/15°43.36'E] alt. 1400 m, 8 July 2003, *leg. P. Czarnota* (GPN 3504), Kocioł Łomniczki glacial corrie, waterfalls of Łomniczka stream [50°44.57'N/15°43.74'E] alt. 1320 m, 7 July 2003, *leg. P. Czarnota* (GPN 3469), Kocioł Łomniczki glacial corrie below the road to Śnieżka Mt. [50°44.26'N/15°44.04'E] alt. ca 1400 m, 8 July 2003, *leg. P. Czarnota* (GPN 3506), sources of Łomniczka stream below Równia pod Śnieżką region [50°44.63'N/15°43.51'E] alt. ca 1400 m, 7 July 2003, *leg. P. Czarnota* (GPN 3528); Eb-80 – KARKONOSZE MTS: Karkonoski National Park, N slope of Śnieżka Mt., road below the top, alt. ca 1500 m, 8 July 2003, *leg. P. Czarnota* (GPN 3492 together with *M. diminuta*); Ge-50 – TATRA MTS, HIGH TATRA MTS: Dolina Stawów Gąsienicowych valley below Długi Staw Gąsienicowy Lake, alt. 1790 m, 26 July 1971, *leg. J. Nowak* (KRAM; H – see exsiccata), as *Lecidea (Biatora) turfosa*; Dolina Gąsienicowa valley, by shore of Dwoisty Staw Lake [49°13'56"N/20°00'19"E] alt. 1650 m, 27 Aug. 2005, *leg. M. Węgrzyn 2516* (KRA); Dolina Pańszczycy valley [49°14'21"N/20°02'11"E] alt. 1650 m, 10 June 2004, *leg. M. Węgrzyn 1852* (KRA); Dolina Roztoki valley, by Roztoka stream [49°13'11"N/20°03'35"E] alt. 1350 m, 30 July 2005, *leg. M. Węgrzyn 2423, 2439* (KRA); Ge-60 – HIGH TATRA MTS: by SW shore of Morskie Oko Lake, alt. 1450 m, 13 Sept. 1966, *leg. Z. Tobolewski* (POZ); Dolina Pięciu Stawów valley, SE shore of Czarny Staw Polski Lake [49°12.32'N/20°01.83'E] alt. 1720 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3569, 3570); Dolina Pięciu Stawów valley below Niżni Liptowski Kostur Mt. [49°12.23'N/20°01.85'E] alt. 1750 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3617); Dolina Pięciu Stawów valley, Niżni Zagon region above Wielki Staw Lake [49°12.77'N/20°02.39'E] alt. 1700 m, 8 Aug. 2003, *leg. P. Czarnota* (GPN 3623); Dolina Pięciu Stawów valley, Wyżni Zagon region [49°12'53"N/20°02'20"E] alt. 1750 m, 30 July 2005, *leg. M. Węgrzyn 2467* (KRA); N slope of Szpiglasowy Wierch Mt., below Szpiglasowa Pass [49°11'56"N/20°02'13"E] alt. 1950 m, 8 Oct. 2005, *leg. P. Czarnota 4583* (GPN); Dolina Za Mnichem valley by hiking track [49°11'45"N/20°02'44"E] alt. 1980 m, 8 Oct. 2005, *leg. P. Czarnota 4568* (GPN); Dolina Morskiego Oka valley, Kolebka Pod Chłopkiem region [49°11'20"N/20°04'10"E] alt. 1730 m, 19 June 2004, *leg. M. Węgrzyn 1984* (KRA).



ADDITIONAL SPECIMENS EXAMINED. CZECH REPUBLIC, KRKONOŠE MTS: Upska jama corrie, Limprichtova skalka rock [*ca* 50°43'45"N/15°43'E] alt. 1350–1400 m, over decaying bryophytes, 3 June 1998, *leg.* Z. Palice (PRA). NORWAY, SÖR-TRÖNDELAG: Rissa parish, *ca* 1 km NE of the parish church, on turf in hollows on a bog, 31 July 1961, *leg.* R. Santesson 14348 (POZ).

*Micarea viridileprosa* Coppins & van den Boom  
(Figs 2F & 61)

*in* van den Boom & Coppins, *Lichenologist* **33**(2): 87. 2001. TYPE: France. dept. Finistère, 10 km W of Douarnenez, Pointe du Millier, Moulin de Keriolet, on old *Castanea* bark, 21 July 1997, *leg.* P. van den Boom 24014 (E – TOPOTYPE!).

Thallus crustose, ±leprose, willow green, bright green, intensely green to whitish-green, C+ orange-red, K–, P–, composed of irregular goniocysts or sometimes minutely warted, especially at the edge of patches or when coated by non-lichenized algae, warts mostly cracked and extruding sorediose granules; goniocysts up to 20(–25) µm diam., surrounded by stout hyphae, often penetrating algal cells by visible haustoria. Photobiont micareoid; algal cells 5–8 µm diam. Apothecia usually absent or very rare (only a few found twice in Polish specimens), pale straw-coloured, waxy, convex, immarginate, but sometimes with slightly paler outer part, simple or adnate like those in *M. adnata*, usually semi-immersed between goniocysts, 0.2–0.5(–0.6) mm wide, C– [according to van den Boom and Coppins (2001) should be C+ red; see notes below]. Hymenium hyaline throughout, 35–45(–50) µm tall. Asci cylindrical-clavate to clavate, 25–35(–40) × 8–10(–12) µm. Ascospores (0–)1(–3)-septate, (6–)10–15(–17) × 2.5–4 µm, oblong, fusiform-oblong, ellipsoid, sometimes slightly curved. Paraphyses numerous, densely branched and anastomosing, hyaline, (1.2–)1.5–2(–2.5) µm wide, increasing above to 2.5–3 µm, easily separating in K. Hypothecium colourless, 100–150 µm tall, composed of stout hyphae up to 5 µm wide. Excipulum variable in size, but distinct, 15–30(–40) µm wide, colourless, of richly branched and anastomosing paraphysis-like hyphae. Pycnidia not seen.

CHEMISTRY. TLC: gyrophoric acid in thallus.

NOTES. To date, more than 70 Polish specimens of *M. viridileprosa* are known, only two of which are fertile. Owing to the sterile, sorediose thallus resembling non-lichenized algae commonly occurring in similar niches, it has probably been overlooked in the field (see also van den Boom & Coppins 2001).

The bright green sorediose thallus could refer to several other lichen species, including effuse forms of *M. prasina* growing on soft lignum in forests which has the same morphology when sterile. Furthermore, both species can be infected by non-lichenized, gelatinous algae which extrude similar, clustered sorediose granules resembling soralia. Distinguishing both species is quite easy, because only *M. viridileprosa* reacts C+ orange-red, owing to its thallus containing gyrophoric acid. Similarities and differences between *M. viridileprosa* and other lichens, including the members of the *Micarea prasina*-group (*sensu* van den Boom & Coppins 2001), *Placynthiella dasaea*, *Fellhanera viridisorediata* Aptroot, M. Brand & Spiers and *Scoliciosporum galluræ* Vězda & Poelt, are presented by van den Boom and Coppins (2001). Moreover, some difficulties could arise in the separation of sterile, epiphytic forms of *M. viridileprosa* and *Biatora chrysantha* (Zahlbr.) Printzen; both can have similar, sorediose thalli containing gyrophoric acid, but microscopic examination of the former shows that its bright green soralia are composed of thicker granules and arise from a more or less continuous crust, unlike *M. viridileprosa* which forms a leprose thallus from the beginning.

*Trapelia corticola* also has a pale green thallus reacting C+ red owing to gyrophoric acid, and sometimes when its soralia are very abundant and widespread it could be confused with *M. viridileprosa*. However, *T. corticola* can be distinguished by its larger photobiont cells, as well as its different thallus structure, since at least some of the soralia are distinctly separate, and small, ±flat thallus areoles between them are usually visible.

The small goniocysts forming the granular thallus of *M. viridileprosa*, algal cells penetrated

by haustoria, 'Sedifolia grey', K<sup>+</sup> violet pigment within pycnidial walls, as well morphology and anatomy of apothecia suggest that it is a member of the *M. prasina*-group (van den Boom & Coppins 2001). It is obvious that the gelatinous hyphae surrounding goniospores in *M. viridileprosa* and the paraphyses are distinctly thicker than in other sorediose species belonging to this group, and moreover in contrast to most of them it produces gyrophoric acid [similar to *M. pycnidiphora* Coppins & P. James and *M. levicula* (Nyl.) Coppins].

Andersen (2004) did not include *M. viridileprosa* in her molecular analyses of the genus, so its position in the phylogenetic tree of *Micarea* could not be determined. However, new sequences from a small subunit of the mitochondrial ribosomal DNA (mtSSU) have recently been obtained from four samples (Czarnota 3436, 3869, 4518, 4527) and a preliminary new phylogenetic analysis confirms afore-going van den Boom and Coppins's hypothesis (Czarnota & Guzow-Krzemińska, *in prep.*). The results show that all samples of *M. viridileprosa* assembled in the monophyletic group very closely related to *M. micrococca*. In the light of this, there is a strong probability that both species exemplify evolutionary progression. Pale forms of the latter, corresponding to the type of the basionym (*Biatora micrococca* Körb.) and examined specimens of *M. viridileprosa*, have a very similar morphology, anatomy and ecology and differ above all in secondary metabolites. This may indicate that the production of lichen substances is a result of evolution (e.g. in the process of adaptation to changing environmental conditions).

One of the features of *M. viridileprosa* provided by van den Boom and Coppins (2001) is the apothecial C<sup>+</sup> red reaction owing to the presence of gyrophoric acid. Unfortunately, in Polish specimens, generally both entire apothecia and their cross sections did not turn in C, although the sorediose thallus surrounding apothecia turned distinctly red. There is no explanation for this divergence, but the apothecia chosen for microscopic studies surely belong to *M. viridileprosa*.

HABITAT AND DISTRIBUTION IN POLAND. This recently described species from Western Europe has been reported for the first time from Kotlina Biebrzańska basin (Sparrius 2003) and soon after in different regions of Poland (Czarnota 2004). Based on those localities, one could suppose that *M. viridileprosa* occurs mainly in eastern Poland, but as listed below, recent observations show that it is probably common, being formerly overlooked or unindentified.

*Micarea viridileprosa* appears to be particularly frequent in mixed, pine-oak woodlands in the lowlands, but it has also been recorded, for example, within natural pine woodlands *Empetro nigri-Pinetum* (Libb. & Siss. 1939 n.n.) Wojt. 1964 on sandy coastal dunes on the Wybrzeże Słowińskie coastland, within the pine managed plantation on fertile soil in the Polesie region, within large forest areas in moist and boggy, old pine or pine-spruce stands of Puszcza Solska Forest and Bory Stobrawskie Forest, often mixed with *Abies alba*, *Alnus glutinosa*, *Betula pendula*, *Quercus* sp. and *Sorbus aucuparia* and within natural fir and fir-spruce stands in Roztocze upland and Góry Świętokrzyskie Mts. In most cases, *M. viridileprosa* is found on the bark of *Pinus sylvestris*, but records on other phorophytes, such as *Alnus glutinosa* (see also Sparrius 2003), *Abies alba* and *Quercus* sp., are known. It usually occurs in moist niches on bark at the base of tree trunks close to the soil in association with *Cladonia digitata*, *Micarea micrococca* (with which it is often confused), rarely with *M. denigrata* or *Placynthiella dasaea* and occasionally with *Micarea botryoides* (on the bark of *Alnus glutinosa*). More rarely it is recorded on decaying wood of coniferous trees or moribund bryophytes (e.g. *Polytrichum* sp.), covering humus and soft lignum or sandy soil in underhangs by forest roads (e.g. Czarnota 4519); associated species include *Micarea hedlundii*, *M. misella*, *M. nigella*, *M. prasina*, *Placynthiella dasaea* and *P. icmalea*, and also *Abconditella lignicola* when the wood is harder. Unfortunately, the recently reported specimen of *M. viridileprosa* on the bark of *Sorbus aucuparia* from Wigry National Park (Czarnota 2004) was mistakenly determined; more detailed examination of the photobiont shows

that the sterile collection actually refers to *Scoliciosporum sarothamni* (Vain.) Vězda or *S. galluræ* Vězda & Poelt.

In higher mountains, *M. viridileprosa* is probably a rare species considering the few records from the Western Carpathians and the single one from the Sudetes. Here it usually grows on soft wood of decaying stumps of coniferous trees, on the bark of *Fagus sylvatica*, and on moribund bryophytes and plant debris covering slopes of forest roads or in crevices between rocky boulders within different forest communities at altitudes of ca 500–1000 m.

In Western Europe it has been reported from different habitats (van den Boom & Coppins 2001), indicating its ecological tolerance. Polish records of *M. viridileprosa* in both natural and secondary forest communities as well as in an open unforested environments can confirm that it is a cosmopolitan species.

WORLD DISTRIBUTION. *Micarea viridileprosa* is a recently described species from Western Europe and for this reason is still little known in other part of Europe and elsewhere. Considering its common occurrence in pine woodlands across Poland, it is almost certainly more frequent than the records would suggest and probably stretches to a long distance beyond its current eastern distribution line.

EUROPE: Belgium, France, Germany – Niedersachsen (van den Boom & Coppins 2001); Czech Republic – České Švýcarsko (Palice *et al.* 2002); Great Britain (van den Boom & Coppins 2001; Coppins 2002); Italy (van den Boom & Coppins 2001; Nimis & Martellos 2003); the Netherlands, common (van den Boom & Coppins 2001; Aptroot *et al.* 2004); Portugal and Switzerland (van den Boom & Coppins 2001). AUSTRALOCEANIA: Australia – Tasmania, *leg. Kantvilas* (Coppins, pers. comm.).

SPECIMENS EXAMINED. Grid square Ac-89 – POBRZEŻE GDAŃSKIE COASTLAND, POBRZEŻE KASZUBSKIE COASTLAND: Trójmiejski Park Krajobrazowy, dolina Samborowo [54°23'09"N/18°32'52"E] 1 Aug. 2004, *leg. M. Kukwa 3402* (UGDA); Bb-59 – POJEZIERZE POLUDNIOWOPOMORSKIE LAKELAND, DOLINA GWDY VALLEY: 'Cisy w Czarnem' nature reserve [53°44'15"N/

16°58'45"E] 13 Nov. 2004, *leg. M. Kukwa 3716a* (UGDA); Bd-53 – POJEZIERZE IŁAWSKIE LAKELAND, POJEZIERZE IŁAWSKIE LAKELAND: SE of Szadowa village, S shore of Liwa River [53°46'18"N/19°03'31"E] 12 Apr. 2004, *leg. M. Kukwa 3071a* (UGDA); Be-42 – POJEZIERZE MAZURSKIE LAKELAND, POJEZIERZE OLSZTYŃSKIE LAKELAND: Olsztyn town, Las Miejski Wood, 21 Oct. 2000, *leg. D. Kubiak* (OLTC); Bf-13 – POJEZIERZE ELCKIE LAKELAND: Puszcza Borecka Forest (sq.79) [54°04'N/22°09'E] 8 July 1995, *leg. A. Zalewska* (OLS-L 1381 together with *M. botryoides*); Bf-97 – NIZINA PÓLNOCNOPODLASKA LOWLAND, KOTLINA BIEBRZAŃSKA BASIN: Biebrza Valley, Biebrzański National Park, near Werykle settlement, 18 Oct. 2002, *leg. K. Kolanko* (Hb. Kolanko); Da-64 – OBNIŻENIE DOLNOLUŻYCKIE DEPRESSION, KOTLINA ZASIECKA BASIN: Bory Zielonogórskie Forest, ca 1.5 km S of Proszów settlement [51°45'02"N/14°49'25"E] alt. ca 90 m, 8 July 2005, *leg. P. Czarnota 4506* (GPN); Db-18 – POJEZIERZE WIELKOPOLSKO-KUJAWSKIE LAKELAND, POJEZIERZE POZNAŃSKIE LAKELAND: Stęszewskie Lakeland, Wielkopolski National Park, Wiry forest district, forest section no. 46f [52°17'54"N/16°49'36"E] 19 May 2004, *leg. P. Czarnota 3909* (GPN); Dd-67 – WZNIESIENIA POŁUDNIOWOMAZOWIECKIE HEIGHTS, WZNIESIENIA ŁÓDZKIE HEIGHTS: Wzniesienia Łódzkie Landscape Park, 'Struga Dobieszowska' nature reserve [51°50'40"N/19°35'11"E] alt. ca 180 m, 14 July 2004, *leg. P. Czarnota 4173* (GPN); Dd-68 – WZNIESIENIA ŁÓDZKIE HEIGHTS: Wzniesienia Łódzkie Landscape Park, vicinity of Tadzín village, 13 June 2004, *leg. M. Hachulka* (LOD 11892); Tadzín forest district, forest section no. 110, ca 1 km W of Tadzín village [51°49'39"N/19°44'33"E] alt. ca 190 m, 14 July 2004, *leg. P. Czarnota 4177* (GPN); De-15 – NIZINA ŚRODKOWOMAZOWIECKA LOWLAND, KOTLINA WARSZAWSKA BASIN: Puszcza Kampinoska Forest, Kampinoski National Park, 'Sieraków' nature reserve, Liszki forest district, forest section no. 72c [52°20'27"N/20°47'42"E] alt. ca 60 m, 27 Apr. 2004, *leg. P. Czarnota 3946* (GPN), alt. ca 70 m, 27 Apr. 2004, *leg. P. Czarnota 4042* (GPN) and forest section no. 92b [52°19'34"N/20°48'41"E] alt. ca 70 m, 26 Apr. 2004, *leg. P. Czarnota 4099, 4103* (GPN); Df-54 – NIZINA POLUDNIOWOPODLASKA LOWLAND, RÓWNINA ŁUKOWSKA PLAIN: near 'Jata' nature reserve in the vicinity of Żdźary village [51°57'11"N/22°11'53"E] 21 June 2005, *leg. P. Czarnota 4661* (GPN); Dg-90 – WESTERN POLESIE, RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Lasy Parczewskie Wood, Parczew forest division, forest section no. 70, 'Torfowisko przy Jeziorze Czarnym' nature reserve [51°31'01"N/23°02'08"E] 27 Oct. 2004, *leg. P. Czarnota 4258, 4259* (GPN); Dg-91 – RÓWNINA

- ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Lasy Parczewskie Wood, ca 2 km NE of Stary Orzechów village by road between Łęczna town and Sosnowica village [51°30'14"N/23°02'53"E] alt. ca 160 m, 27 Oct. 2004, *leg. P. Czarnota 4221* (GPN); Eb-51 – POGÓRZE ZACHODNIOSUDECKIE FOOTHILLS, POGÓRZE KACZAWSKIE FOOTHILLS: near Kamiennik stream, E of Świerzawa town [51°00'37"N/15°59'00"E] alt. ca 290 m, 22 Apr. 2005, *leg. P. Czarnota 4753* (GPN); Eb-71 – WESTERN SUDETES, RUDAWY JANOWICKIE MTS: Wieściszowice village, worked-out quarry of pyrite named 'Błękitne Jeziorko', alt. ca 650 m, 9 June 2000, *leg. G. Leśniński* (OPUN); Ec-62 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA OLEŚNICKA PLAIN: Bory Namysłowskie Forest, ca 1 km N of Dobrzyń village, by road to Wojcice village [50°57'28"N/17°28'09"E] 23 Apr. 2005, *leg. P. Czarnota 4449* (GPN); Ec-74 – RÓWNINA OPOLSKA PLAIN: Bory Stobrawskie Forest, ca 2 km SE of Karłowice village [50°51'11"N/17°44'32"E] 24 Apr. 2005, *leg. P. 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Donica* (KTC), as *M. prasina*; Ee-77 – GÓRY ŚWIĘTOKRZYSKIE MTS: Lysogóry range, Świętokrzyski National Park, Święty Krzyż forest district, forest section no. 116, on field-block, 5 July 2001, *leg. A. Donica* (KTC), as *M. prasina*; Ef-53 – WYŻYNA LUBELSKA UPLAND, WZNIESIENIA URZĘDOWSKIE HEIGHTS: ca 1 km S of Mazanów village [50°59'09"N/21°54'49"E] 26 Oct. 2004, *leg. P. Czarnota 4257* (GPN) and [50°59'01"N/21°54'57"E] 26 Oct. 2004, *leg. P. Czarnota 4267* (GPN); Ef-84 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Puszcza Solska Forest, ca 0.7 km W of Łązek settlement near Zaklików village, N of Sanna River [50°46'25"N/22°00'02"E] alt. ca 170 m, 26 Oct. 2004, *leg. P. Czarnota 4071* (GPN), [50°46'21"N/21°59'51"E] alt. ca 170 m, 26 Oct. 2004, *leg. P. Czarnota 4077* (GPN) and ca 0.5 km of Łązek settlement [50°46'16"N/21°59'50"E] alt. ca 170 m, 26 Oct. 2004, *leg. P. Czarnota 4069* (GPN); Ef-85 – RÓWNINA BIŁGORAJSKA PLAIN: border of Lasy Janowskie Landscape Park, Kolonia Łysaków village, 9 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LBL); Lasy Janowskie Landscape Park, ca 2 km S of Kolonia Łysaków village, 9 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LBL); near Narożniki forester's lodge, ca 0.5 km SW of Kolonia Łysaków village, 8 Sept. 1999, *leg. K. Czyżewska, R. Kościelniak, J. Bystrek, A. Matwiejuk, D. Babulewicz* (LOD 12171); Ef-97 – RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Landscape Park, Porytowe Wzgórze, ca 2.5 km S of Flisy village [50°37.97'N/22°28.20'E] alt. ca 220 m, 10 Oct. 2003, *leg. P. Czarnota* (GPN 3438, 3434, 3432 together with *M. misella*, 3435 together with *M. nigella*); Eg-02 – WESTERN POLESIE, RÓWNINA ŁĘCZYŃSKO-WŁODAWSKA PLAIN: Poleski National Park, forest section no. 192b [51°25'37"N/23°10'51"E] 27 Apr. 2004, *leg. P. Czarnota 3869* (GPN); Eg-91 – ROZTOCZE, MIDDLE ROZTOCZE: Roztoczański National Park, Stogi forest district, forest section no. 178b [50°35'42"N/23°04'42"E] alt. ca 260 m, 28 Apr. 2004, *leg. P. Czarnota 3889, 3900* (GPN) and forest section no. 179d [50°35'36"N/23°04'36"E] alt. ca 260 m, 28 Apr. 2004, *leg. P. Czarnota 3813* (GPN); Fc-15 – NIZINA ŚLĄSKA LOWLAND, RÓWNINA NIEMODLIŃSKA PLAIN: Bory Niemodlińskie Forest, W of Gwoździce village by road between Opole and Krapkowice towns [50°30'34"N/17°54'54"E] alt. ca 130 m, 23 Apr. 2005, *leg. P. Czarnota 4455* (GPN); Fc-48 – KOTLINA RACIBORSKA BASIN: Lasy Raciborskie Forest, ca 1 km W of Goszyce village, by road between Gliwice and Kędzierzyn Koźle towns [50°16'33"N/18°22'59"E] 18 Apr. 2005, *leg. P. Czarnota 4434, 4437, 4439* (GPN); Fd-95 – WESTERN BESKIDY MTS, BESKID MAŁY MTS: Wapienica Mt., Zagórnik settlement 3.5 km EES of Andrychów town, alt. 500 m, 5 Oct. 1986, *leg. J. Nowak* (KRAM-L 30469), as *Micarea* sp.; Fe-93 – POGÓRZE ZACHODNIOBESKIDZKIE FOOTHILLS, POGÓRZE WIŚNICKIE FOOTHILLS: hill by road to Rajbrot village, near Paprotna Góra Mt., 7 May 2000, *leg. L. Śliwa 1108b* (KRAM); Fe-94 – POGÓRZE WIŚNICKIE FOOTHILLS: 'Bukowiec' nature reserve [49°49'50"N/20°35'00"E] alt. 430–460 m, 21 May 1999, *leg. L. Śliwa 1033c & B. Krzewicka* (KRA), as *M. prasina*; Ff-05 – KOTLINA SANDOMIERSKA BASIN, RÓWNINA BIŁGORAJSKA PLAIN: Lasy Janowskie Forest, 1 km SW of Żdźrzywa village, by road between Nisko and Janów Lubelski towns [50°33'14"N/22°14'03"E] alt. ca 180 m, 25 Oct. 2004, *leg. P. Czar-*

*nota* 4242 (GPN); Ff-09 – RÓWNIINA BIŁGORAJSKA PLAIN: Puszcza Solska Forest, ca 2 km N of Biłgoraj town, ‘Obary’ nature reserve [50°35’27”N/22°40’52”E] 28 Oct. 2004, *leg. P. Czarnota* 4243 (GPN); Ff-19 – RÓWNIINA BIŁGORAJSKA PLAIN: Puszcza Solska Forest, ca 0.5 km E of Smółsko Duże village, by road between Biłgoraj and Józefów towns [50°28’47”N/22°47’42”E] alt. 210 m, 28 Oct. 2004, *leg. P. Czarnota* 4261, 4269 (GPN); Ff-23 – RÓWNIINA TARNOBRESKA PLAIN: near road between Nowa Dęba town and Bojanów village [50°24.86’N/21°50.92’E] 6 Aug. 2003, *leg. P. Czarnota* (GPN 3638); Ff-40 – DOLINA DOLNEJ WISŁOKI VALLEY: Tuszynia forest division, Przaclaw forest district, forest section no. 116 near ‘Bagnó Przaclawskie’ nature reserve [50°11’16”N/21°25’08”E] alt. ca 150 m, 18 Apr. 2005, *leg. P. Czarnota* 4548 (GPN) and forest section no. 110 [50°11’29”N/21°25’18”E] alt. ca 150 m, 18 Apr. 2005, *leg. P. Czarnota* 4552 (GPN); Ff-44 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: 0.5 km W of Styków village, 14 Aug. 2005, *leg. P. Czarnota* 4527 (GPN); Ff-52 – PŁASKOWYŻ KOLBUSZOWSKI PLATEAU: ca 2 km S of Przedbórz village by road to Sędziszów Małopolski town [50°09’02”N/21°45’31”E] 18 Apr. 2005, *leg. P. Czarnota* 4533 (GPN); Ff-82 – POGÓRZE ŚRODKOWOBESKIDZKIE FOOTHILLS, POGÓRZE DYNOWSKIE FOOTHILLS: ‘Herby’ nature reserve, S of Jazowa village [49°50’34”N/21°39’58”E] alt. 440 m, 17 Apr. 2005, *leg. P. Czarnota* 4665 (GPN); Fg-12 – ROZTOCZE, MIDDLE ROZTOCZE: Puszcza Solska Forest, Józefów forest division, Kalina forest district, ‘Czartowe Pole’ nature reserve near Hamernia village [50°26’25”N/23°06’30”E] alt. ca 250 m, 28 Oct. 2004, *leg. P. Czarnota* 4228, 4229 (GPN); Fg-14 – MIDDLE ROZTOCZE, near Żytki settlement [50°23’23”N/23°29’47”E] alt. 300 m, *leg. P. Czarnota* 4704 (GPN); Fg-80 – KOTLINA SANDOMIERSKA BASIN, DOLINA DOLNEGO SANU VALLEY: vicinity of Przemyśl town, 5 Aug 2003, *leg. A. Nowakowska* (GPN 3662); Gd-06 – WESTERN BESKIDY MTS, BESKID ŻYWIECKI MTS: Pasma Jałowieckie range, Lachowice village, Adamy settlement, alt. ca 690 m, 25 July 1965, *leg. J. Nowak* (KRAM-L 15612 together with *M. prasina* s.str.); Gd-25 – BESKID ŻYWIECKI MTS: Pilsko range, Korbielów village near shelter-house, alt. 590 m, 11 Sept. 1964, *leg. J. Nowak* (KRAM-L 16625 together with *M. prasina* s.str.); Gd-38 – OBNIŻENIE ORAWSKO-PODHALAŃSKIE DEPRESSION, KOTLINA ORAWSKO-NOWOTARSKA BASIN: ‘Las Łakociowski’ forest, E of Chyżne village, 5 Aug. 1999, *leg. J. Kiszka* (KRAP), as *Micarea* sp.; Ge-10 – WESTERN BESKIDY MTS, GORCE MTS: Burchane Mt., W slope above Poręba Górna – Buchole settlement, alt. ca 650 m, 4 Oct. 2003, *leg. P. Czarnota* (GPN 3436); Ge-22 – GORCE MTS: Lubań

range, valley of Kudowski stream, by hiking track, alt. ca 700 m, 24 June 2004, *leg. P. Czarnota* 4000 & *A. Wojnarowicz* (GPN).

#### EXCLUDED TAXA

##### *Micarea assimilata* (Nyl.) Coppins

Bull. Brit. Mus. (Nat. Hist.), Bot. **11**(2): 163. 1983.

The specimen reported from the Tatra Mts by Tobolewski (1959; as *Lecidea assimilata* Nyl.) refers to *Micarea incrassata* Hedl. (Czarnota 2004) and others, reported from the same area by Olech (1983, 1985; as *Lecidea assimilata* Nyl. var. *irrubata* Th. Fr.) and by Alstrup & Olech (1992; as *M. assimilata* (Nyl.) Coppins var. *irrubata* Th. Fr.) refer to *Helocarpon crassipes* Th. Fr. Some of Nowak’s collections from Babia Góra Mt. named *Lecidea assimilata* have also been examined in KRAM, but these too belong to *H. crassipes*.

From the highest part of Sudetes, Stein (1879), followed by Migula (1931), reported *Lecidea assimilata* var. *irrubata*; the former author gave only one record made by Fritze, but on the Czech side of Karkonosze Mt. (‘am Petersteine im Gesenke’), and the latter provided no locality details. The species appears to be misunderstood since almost all specimens housed in WRSL under that name and under *L. assimilata* Nyl. var. *infusata* Th. Fr. were erroneously identified and belong to other taxa, e.g. to *Mycobilimbia berengeriana* (A. Massal.) Hafellner & V. Wirth – Peterstein, 1865, *leg. B. Stein*, as *L. a.* var. *irrubata*; to *Helocarpon crassipes* – Kesselkoppe, 09.1872, *leg. B. Stein* and Schneekoppe, ?, *leg. B. Stein*, both as *L. a.* var. *infusata*; or to *Mycobilimbia hypnorum* (Lib.) Kalb. Hafellner – Tirol, Muttentjorg?, 08. 1876, as *L. a.* var. *infusata*.

ADDITIONAL SPECIMENS EXAMINED. NORWAY, DOVRE: Togstner, 23 July 1863, *leg. Th. M. Fries* [WRSL – probably part? of the original gathering, which was the base for invalidly published taxon *Lecidea assimilata* Nyl. var. *irrubata* Th. Fr., Lich. Scand. **2**: 522. 1874 (Art. 26); see Coppins 1983: 114]. ROMANIA, OCNA SIBIULUI: ‘Bei Salzburg bei den Salzgruben auf steriler Erde’, 17 May 1877, *leg. J. Barth* (BP) and ‘Salzburg’, 17 May 1878, *leg. J. Barth* (WRSL), both

as *Catillaria salina* Stein (*nomen nudum*). SCOTLAND, EAST ROSS: ca 17 km ESE of Ullapool, Seana Braigh, summit ridge, alt. 2800 ft., on summit turf, 23 June 1984, leg. Coppins 10469 et al. (E). SWEDEN, T. LAPPMARK: Abisko N.P., NNE slope of Slättatjåkka Mt., alt. 1070 m, on humus and bryophytes over rock, 21 July 2002, leg. Z. Palice (PRA; GPN ex PRA).

***Micarea melaenida*** (Nyl.) Coppins

Bull. Brit. Mus. (Nat. Hist.), Bot. 11(2): 163. 1983.

Although Printzen (1995) and Fałtynowicz (2003) include this species in the list of Polish lichens (as *Catillaria schumannii* Körb. ex Stein and *C. melaenida* (Nyl.) Arnold respectively), it appears to have been collected outside Poland. The *locus typicus* of *C. schumannii* is probably located in the Oberlausitz region on west side of the Nysa River in a former region belonging to Silesia (see also Coppins 1983). Printzen (1995: 217), who examined other specimens of *Catillaria schumannii* (syntypes designated by him from L) than those previously typified by Coppins (1983: 154) suggested that it may refer to some species of *Psilolechia*. Those analyzed gatherings were, however, in very bad condition. Based on microscopic examination of the type specimens mentioned below there is no doubt that this taxon is a synonym of *M. melaenida*.

EXAMINED SPECIMENS. GERMANY, Reichenbach near Ernsdorf, *Schuman* [WRSL – LECTOTYPE and ISOLECTOTYPE of *Catillaria schumannii* ('*Schumannii*') Stein, Cohn, Krypt.-Fl. Schles. 2(2): 232. 1879; sel. Coppins 1983: 154]. FRANCE, 'GALLIA: Gard, Pujaut prope Avenionem, alt. 100 m, *supra solum argillaceo-sabulosum, ad marginem Querceti ilicis*', 6 Nov. 1966, C. Roux, (BP – ISOTYPE of *Catillaria schumannii* Körb. ex Stein var. *meridionalis* Cl. Roux & Vězda in Vězda, Sched. Lich. Sel. Exs. No. 537. 1967; see Coppins 1983: 154).

***Micarea ternaria*** (Nyl.) Vězda

Sched. Lich. Sel. Exs. No. 858. 1970.

This species was erroneously reported from the High Tatra Mts by Alstrup and Olech (1990) and later included in the lichen checklist of the Tatra National Park (Alstrup & Olech 1992) and

the Polish checklists (Fałtynowicz 1993, 2003). Material examined from that locality shows it to be *M. lignaria*; the authors determined it as *M. ternaria* based on 3-septate ascospores and lack of Pd thallus reaction, but further investigation showed the latter to have a distinctive ginger tinge due to the presence of argopsin. There are many cases when the thallus of *M. lignaria* does not react P+ ginger immediately, so a later examination of such material is necessary. Furthermore, 3-septate spores are often common in Polish specimens of *M. lignaria* (see under this taxon).

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ARNOLD, Lich. Exs.: 120 *M. bauschiana*; 167B (*Bilimbia lignaria*) *M. peliocarpa*; 279 *M. micrococca*; 280 *M. prasina*; 280C *M. prasina*; 332B, C *Micarea melaena*; 409A *M. sylvicola*; 409B *M. sylvicola* [in WRSL *M. lululata*]; 503C *M. nitschkeana*; 556 (*Lecidea assimilata*) *Helocarpon crassipes*; 626 *M. misella*; 1051 (*Bilimbia ternaria*) *M. peliocarpa*; 1057 *M. tuberculata*; 1121 *Helocarpon crassipes*; 1122 (*Biatorina prasiniza*) *M. micrococca*; 1173 (*Biatora meiocarpoides*) *M. lithinella*; 1233 *M. bauschiana* and *M. lululata*; 1239 (*Lecidea atomaria*) *M. polycarpella*; 1427 (*Biatorina prasiniza*) *M. micrococca*; 1471 (*Biatorina glomerella*) *M. elachista*; 1472 (*Biatorina prasiniza*) *M. micrococca*. Lich. Mon.: 243 *M. micrococca*.

CROMBIE, Lich. Brit. Exs.: 85 *M. erratica*.

FLOTOW, Lich. Exs.: 171A *M. sylvicola*.

FRIES, Lich. Suec.: 29 (*Lecidea miliaria*) *Micarea lignaria*; 212B *M. melaena*.

HEPP, Flecht. Eur.: 14 (*Biatora synothesa*) *M. denigrata*; 20 (*Biatora lignaria* '*lignaria*') *M. nitschkeana*; 21 (*Biatora cinerea*) *M. nitschkeana*; 278 *M. prasina*; 284 *M. peliocarpa*, 285 (*Biatora lignaria*  $\gamma$  *miliaria*) *M. peliocarpa*; 510 (*Lecidea saxigena* in H-NYL) *M. peliocarpa*.

HERTEL, Lecid. Exs.: 34 *M. lignaria*; 152 *M. incrasata* and *M. assimilata*; 191 *M. lignaria*; 229 *M. erratica*; 230 *M. erratica*; 231 *M. lithinella*; 251 *M. lignaria*; 252 *M. turfosa*, 273 *M. erratica*.

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LARBALESTIER, Exs. Brit.: 139 *M. micrococca*.

LEIGHTON, Lich. Brit. Exs.: 186 *M. erratica*; 388 (*Lecidea sabuletorum* var. *miliaria*) *M. botryoides*.

LOJKA, Lich. Hung.: 24 (*Lecidea sylvicola*, corrected later as *Lecidea ternaria* var. *saxigena*) *M. peliocarpa*; 305 *M. nitschkeana*. Lichenogr. Univ.: 29 (*Lecidea prasiniza*) *M. micrococca*; 30 (*Lecidea prasiniza* v. *prasinoleuca*) *M. micrococca*; 31 (*Lecidea sordidescens*) *M. prasina*.

MAGNUSSON, Lich. Sel. Scand.: 134 (*Catillaria prasina* f. *laeta*) *M. micrococca*; 340 *M. nitschkeana*.

MALME, Lich. Suec. Exs.: 23 (*M. prasina* f. *laeta*) *M. micrococca*; 24 (*M. prasina* f. *byssacea*) *M. micrococca*; 125 *M. lithinella*.

MIGULA, Crypt. Germ., Aust., Helv.: 1 (*Bilimbia miliaria*) *M. lignaria* + *M. leprosula*; 132 (*Catillaria synothea*) *M. denigrata*.

MOUGEOT & NESTLER, Stirpes Crypt. Vog.-Rehn.: 1430 *M. lignaria*.

MUDD, Lich. Brit. Exs.: 196 *M. erratica*.

NORRLIN & NYLANDER, Herb. Lich. Fenn.: 764 (*Lecidea tuberculata*) *M. sylvicola*.

NOWAK, Lich. Pol. Merid. Exs.: 134 *M. turfosa*; 139 *M. lignaria*.

OBERMAYER, Lich. Graec.: 7 & 8 *M. adnata*; 11 *M. prasina*; 109 *M. prasina*.

RABENHORST, Lich. Eur.: 626 (*Biatorina synothea* for. *denigrata*) *M. denigrata*; 648 *M. bauschiana*; 676 (*M. prasina*) *M. micrococca*; 733 *M. micrococca*.

RÄSÄNEN, Lich. Fenn.: 426 *M. globulosella*; 651 (*Catillaria prasina*) *M. micrococca*; 652 (*Catillaria sordidescens*) *M. micrococca*; 653 *M. micrococca*.

SCHAERER, Lich. Helv.: 196 (*Lecidea sabuletorum* var. *lignaria*) only part of the example labelled 'In m. Belpberg' belongs to *M. lignaria* (see also Coppins 1983: 206); 278 *M. prasina*.

SCHAERER & HEPP, Lich. Helvet. Exs.: 664 (*Biatora synothea*) *M. denigrata* (only form 1; form 2 refers to cf. *Lecania cyrtella*).

TØNSBERG, Lich. Isid. Sored. Crust. Exs.: 44 *M. leprosula*.

VĚZDA, Lich. Bohem.: 133 *M. lignaria*; Lich. rariores exs.: 363 (*M. botryoides*) *M. sylvicola*; Lich. Sel. Exs.: 90 (*Catillaria prasina*) *M. micrococca*; 565 (*Catillaria glomerella*) *M. denigrata*; 1134 *M. elachista*; 1135 *M. turfosa*; 1341 (*M. tuberculata*) *M. sylvicola*; 1430 *M. denigrata*; 1467 (*M. prasina*) *M. micrococca* [and fragment of *M. nitschkeana*].

WEBER, Lich. Exs.: 73 *M. denigrata*.

WILLEY, Lich. Boreali Amer.: 328 (*Biatora micrococca*) *M. prasina*.

ZWACKH, Lich. Exs.: 168 (*Lecidea micrococca* et immixta *L. prasiniza*) *M. micrococca*; 276 (*Bilimbia miliaria* var. *lignaria*) *M. peliocarpa*; 279A *M. bauschiana*; 416 *M. micrococca*; 590 *M. lithinella*; 591B (*Lecidea prasiniza* var. *prasinoleuca*) *M. micrococca*; 592 B (*Lecidea prasiniza*) *M. micrococca*; 592C (*Lecidea prasiniza*) *M. micrococca*; 594A, B *M. bauschiana*; 595 *M. bauschiana*; 596 (*Lecidea latens*) *M. sylvicola*; 597 (*Lecidea latens*) *M. sylvicola*; 656 (*Lecidea prasiniza*) *M. prasina*; 780 (*Lecidea trachona*) *M. sylvicola*; 919 *M. sylvicola*.

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