



## LECANORA COMPALLENS AND *L. SINUOSA*, TWO NEW OVERLOOKED CORTICOLOUS LICHEN SPECIES FROM WESTERN EUROPE

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**Abstract:** *Lecanora compallens* and *L. sinuosa*, two corticolous lichens, are described as species new to science on the basis of numerous collections. *Lecanora compallens* is a sorediate species, known only as sterile. It is probably common in Western Europe, but overlooked because it is very similar to *L. expallens*. Chemically, the new species is identical with *L. strobilina*, of which it may represent a sorediate counterpart. *Lecanora sinuosa* is a new species similar to *L. chlarotera* and so far only known from a limited area in the Netherlands and Germany, although it may be overlooked elsewhere. *Lecanora sinuosa* is very close to *L. hybocarpa*, with which it shares the *pulicaris*-type epihymenium interspersed with fine crystals but differs markedly by its thick thallus and thick and sinuous apothecium margin.

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### Introduction

In the Netherlands there exists a long tradition of mapping and monitoring epiphytic lichens (Barkman 1958; de Wit 1976; van Dobben 1993). Until the 1980s, air pollution caused by sulphur dioxide was an important reason to perform this kind of work. During the last decade, however, air pollution caused by ammonia has been a more important reason for the Dutch government to use lichens as biomonitors (van Herk 1999).

A rapid change in environmental conditions during recent decades has caused a considerable increase in most of the common epiphytic lichen species (van Herk & Aptroot 1998). Several species new to science have been found during recent lichen monitoring that were not present at the investigated sites before. Among the new species is the sorediate *Lecanora barkmaniana*§ Aptroot & van Herk (Aptroot & van Herk 1999a), a nitrophilous species favoured by ammonia pollution. Eutrophication of the bark is probably also a cause of the rapid spread of *Bacidia neosquamulosa* Aptroot & van Herk (Aptroot & van Herk 1999b) and to a lesser extent of *Protoparmelia hypotremella* Van Herk, Spier & V. Wirth (Aptroot *et al.* 1997).

This paper describes two additional corticolous *Lecanora* species. Unlike *L. barkmaniana* and *B. neosquamulosa*, the new species have probably been

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§See note added at the end of this article.

regular constituents of the epiphytic lichen flora for a much longer time. Until recently they were not recognized as separate species, probably because they are superficially very similar to other common species.

*Lecanora compallens* sp. nov. is known from numerous localities, with more than 80 collections. All collections are sterile, but the morphology and chemistry strongly suggest that it belongs to *Lecanora*. Morphologically the new species is intermediate between *L. expallens* and *L. barkmaniana*. Chemically the new species is identical with *L. strobilina* (Spreng.) Kieff., of which it may represent a sorediate counterpart.

*Lecanora sinuosa* sp. nov. was first collected in 1997 and is now known from twenty localities. Until recently it was not recognized as a separate species, probably because of its macroscopic similarity to *L. chlarotera* Nyl., with which it also shares the same chemistry. Microscopically, the new species resembles *L. hybocarpa* (Tuck.) Brodo, with which it shares the key characters separating this species from *L. chlarotera*, but it differs markedly in the thallus and apothecium margin.

## The Species

### ***Lecanora compallens* Van Herk & Aptroot sp. nov.**

*Lecanora corticola*. Thallus sterilis albogriseus, zeorinum continens, sine acidio usnifico. Sorediis granulosis glaucoviridis tectur, acidum usnicum et zeorinum continentes. Apothecia ignota. Habitus cum *Lecanora expallens* congruens.

Typus: The Netherlands, Drenthe, Drouwenerveen, on *Quercus robur* along road, 5 March 1998, C. M. van Herk 2345 & A. Aptroot 41889 (L—holotype; ABL, hb. Van Herk, hb. Spier—isotypes, TLC).

(Figs 1–2)

*Thallus* corticolous, usually 1–3 cm diam., but sometimes covering areas of up to 5 cm diam., continuous; margin whitish grey (without usnic acid), immersed and shiny, usually with low, glaucous grey warts of 0.1–0.2 mm diam., without hypothallus; medulla below soredia 0.1–0.3 mm thick, white. *Soralia* always present, starting as c. 0.1–0.3 mm punctiform openings, soon uprising (not excavate) and aggregating into irregular patches, usually covering most of the thallus except for a marginal zone of c. 1 mm. *Soredia* granular, in a dense mass, c. 15–30 µm diam., in an up to 0.4-mm thick layer, yellowish to slightly mint-green (with usnic acid), contrasting in colour with the thallus. Herbarium specimens over one year become covered with tiny colourless needles due to recrystallization of zeorin. *Apothecia* and *pycnidia* unknown.

*Chemistry*. Thallus C–, PD–, K–, UV–; soredia C–, PD–, K+yellowish to yellowish brown, UV–; usnic acid and zeorin found with TLC.

*Etymology*. From *com*, together with, and (*ex*)*pallens* referring to the common presence of *L. expallens* at the same localities.

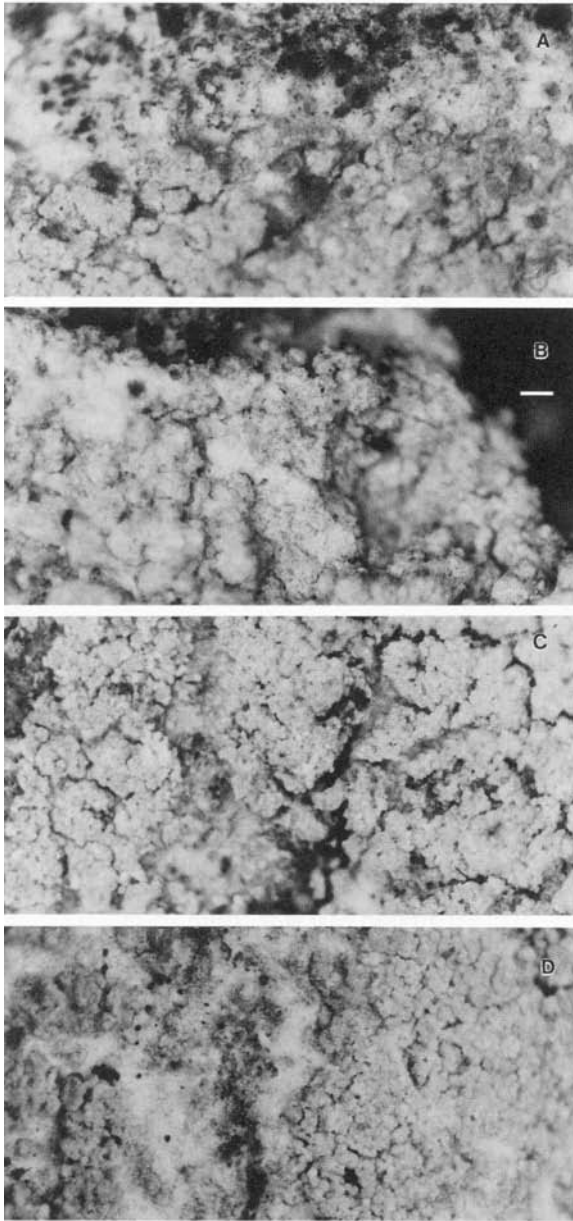


FIG. 1. *Lecanora compallens*, habitus and comparison with adjacent thalli of similar species. A, habitus with margin, isotype (Van Herk & Aptroot 41889, ABL); B, habitus with soredia, Van Herk 2179; C, adjacent thalli of *L. compallens* and *L. barkmaniana*, Van Herk 2069–9 (left: *L. barkmaniana*); D, adjacent thalli of *L. compallens* and *L. expallens*, Van Herk 0507–5 (left: *L. expallens*). Scales: A & B=0.1 mm C & D=0.4 mm.

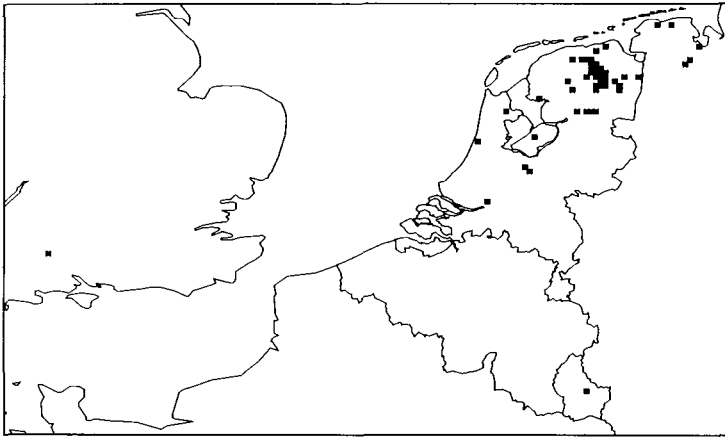


FIG. 2. Distribution of *Lecanora compallens*, based on herbarium specimens seen. A square corresponds to  $5 \times 5 \text{ km}^2$ . A few records from Mecklenburg-Vorpommern (former East-Germany) and Belgium are not on the map.

*Ecology and distribution.* Usually on the west side of exposed wayside trees, especially *Quercus robur*, but also on *Fraxinus*, *Populus*, *Salix*, *Sorbus*, *Tilia*, *Ulmus* and even *Sambucus*. On *Q. robur*, it occurs most commonly on medium-aged (50–80 years) trees mainly on the flat surfaces of the ridges. On *Salix alba*, it is also found on pollarded trees.

The species occurs on acid as well as neutral bark and has no critical ecology. It is not favoured by eutrophication, but avoids very acid bark. It is accompanied by a wide range of species, mainly crustose species of well-lit, exposed situations, for example, *Buellia griseovirens*, *L. chlarotera*, and *Pyrrhospora querneae*. At nearly all stations of the new species *L. expallens* is also present but both species intermingle at only a minority of its stations. The reason is that at exposed stations, favoured by *L. compallens*, *L. expallens* is usually restricted to the sheltered east side. Both species may meet at the north and south faces of the trees.

At 41 monitoring stations with *Q. robur* the complete species composition is available, but its occurrence is apparently not highly correlated with any other species, showing that there exists no species with a comparable ecology. In circumstances with strong competition of fruticose or foliose lichens on the west side of the trees, the species may be restricted to a narrow border zone at the north and south faces.

Records of *L. compallens* are known from the Netherlands, Germany (Weser-Ems, Mecklenburg-Vorpommern), Belgium, Great Britain (Wiltshire) and Luxembourg (Gutland). It is very common in a limited area in the northern part of the Netherlands (Fig. 2), where it sometimes covers large parts of the trunks, comparable, for example, to *Pyrrhospora querneae*. Elsewhere in the Netherlands it is less abundant, usually only scattered thalli being present, and hence it is easily overlooked. Small collections are available from Germany, Belgium, Great Britain and Luxembourg.

*Discussion.* This new species undoubtedly belongs to *Lecanora*. The chemistry has been checked repeatedly (TLC was carried out on ten collections). It was found to be usnic acid and zeorin by TLC. The identity of zeorin and usnic acid have been confirmed by co-chromatography with the chemically identical *L. strobilina* and *Cladonia diversa* Asperges. This chemistry is very common in the genus, and occurs, for instance, in *L. strobilina*, which differs by the generally thicker, yellowish (usnic-acid-containing) thallus, the lack of regular soralia and the presence of apothecia. The new species is chemically identical with *L. strobilina*, though usnic acid is present only in the soredia. It may represent its sorediate counterpart.

The new species is morphologically closest to *L. expallens*, which can be easily separated by the C+orange reaction due to the presence of thiophanic acid. It does not simply represent a chemical race of *L. expallens*, as there are also consistent morphological differences (see Fig. 1D). Isolated thalli of *L. compallens* (without competition) always have a thallus margin of c. 1 mm with low glaucous grey warts. Such a wide zone is lacking in *L. expallens* and corticate warts are also lacking. Furthermore, *L. expallens* has usually excavate soralia and a more yellowish, never mint-green, colour, and sometimes a black hypothallus is present. Both species retain their separate integrity even when they grow in close mosaic-forming contact.

Morphologically the new species is also close to the recently described *L. barkmaniana* (Aptroot & van Herk 1999a), with which it also sometimes grows (Fig. 1C). For instance, both species have microscopically identical soredia, but *L. compallens* differs by the yellowish tinge of the soredia due to usnic acid, and by a much thinner, often mostly immersed, thallus. Furthermore, *L. barkmaniana* contains atranorin, which is lacking in *L. compallens*.

*Selected specimens examined:* **Germany:** *Weser-Ems:* Oldenburgische Geest, near Westerstede, on *Quercus* at woodland edge, 1998, *U. de Bruyn* 1040 (ABL, hb. De Bruyn). *Mecklenburg-Vorpommern:* Mecklenburgische Seenplatte, Malchin, west side of lake Kummerov, on *Tilia* in old graveyard, 1998, *U. de Bruyn* s.n. (hb. De Bruyn).—**Great Britain:** *Wiltshire:* Stapleford, 1972, *A.M. Burnet* (hb. Seaward, MRDS 102050).—**Luxembourg:** *Gutland:* Larochette, on *Sorbus domestica* near farm, 1998, *P. Diederich* 13622 (hb. Diederich).—**The Netherlands:** *Drenthe:* De Punt, on *Quercus robur* near farm, 1998, *C. M. van Herk* 2056–1, (hb. Van Herk, TLC); Eelde, Yde, on old *Q. robur* in village centre, 1998, *C. M. van Herk* 2069–9 (hb. Van Herk, with *L. barkmaniana*); Gasselterboerveen, on *Q. robur* along road, 1998, *C. M. van Herk* 2179 (ABL, hb. Van Herk, with *L. expallens*, MCT); Norgervaart, on *Q. robur* along canal, 1998, *C. M. van Herk* 2024–3, 5 (hb. Van Herk, TLC); Peize, on ancient *Q. robur* in graveyard, 1998, *C. M. van Herk* 0507–5 (hb. Van Herk, with *L. expallens*); Peizerwold, on *Q. robur* along road, 1998, *C. M. van Herk* 0506–10, 1 (hb. Van Herk, TLC); Ruinerweide, on *Q. robur* along road, 1998, *C. M. van Herk* s.n. (hb. Van Herk, TLC); Roden, on *Q. robur* along road, 1998, *C. M. van Herk* 0495–1, 4, 6 (hb. Van Herk, TLC); Zeijen, on *Q. robur* along road, 1998, *C. M. van Herk* 2033–3, 5 (hb. Van Herk, TLC). *Flevoland:* Lelystad, on *Fraxinus excelsior* along road, 1998, *A. Aptroot* 43963 (ABL). *Friesland:* Gaasterland, Nijemirdum, on young *Quercus robur* near house, 1996, *C. M. van Herk* 2459–2 (hb. Van Herk, TLC). *Groningen:* Leek, between Enumatil and Midwolde, on *Ulmus* along road, 1977, *A. Aptroot* 584 (ABL, hb. Van Herk, MCT); Noordhorn, on *Populus* along road, 1998, *C. M. van Herk* s.n. (hb. Van Herk). *Noord-Holland:* Midwoud, on *Ulmus* along road, 1998, *C. M. van Herk* s.n. (hb. Van Herk); Haarlem, on *Populus* in coastal sand dunes, 1998, *C. M. van Herk* s.n. (hb. Van Herk, TLC). *Utrecht:* Leusden-Centrum, on *Q. robur* along road, 1998, *C. M. van Herk* 4017-SBO (hb. Van Herk, TLC). *Zuid-Holland:* Dordrecht, Biesbosch, Otter,

on pollarded *Salix alba* along ditch, 1998, *A. Aptroot* 42031 (ABL, MCT). **Belgium:** *Namur:* Nismes, on *Tilia* along road, 1999, *A. Aptroot* 44702 (ABL).

### ***Lecanora sinuosa* Van Herk & Aptroot sp. nov.**

*Lecanora* corticola. Thallus albogriseus, verrucosus, sinuato-rimosus. Apothecia sessilia, marginibus sinuosibus, discis pallidobrunneis. Epithymenium, cortex marginis et amphithecium typis *pulicaris* sensu Brodo (1984). Ascosporis  $13\text{--}17 \times 7.5\text{--}9 \mu\text{m}$ , pachydermatis. Atranorinum et gangaleoidinum continens.

Typus: The Netherlands, Drenthe, Hoogeveen, Nieuweroord, Verlengde Hoogeveensche Vaart, on *Quercus robur* along road near canal, 5 March 1998, *C. M. van Herk* 2232-1, 6 & *A. Aptroot* 41891 (L—holotype; ABL, hb. Van Herk—isoatypes, TLC).

(Figs 3–4)

*Thallus* corticolous, usually 1–3 cm diam., continuous, whitish grey to grey, verrucose, mostly covered with raised warts of 0.1–0.4 mm diam. and 0.1–0.3 mm high, with sinuous outlines and/or cracks, resembling and homologous to the thalline margins of the apothecia, without hypothallus. *Apothecia* sessile, numerous, disc concave to flat, pale to medium brown, 0.4–1.0 mm diam., margin raised, relatively thick, often incurved, whitish grey to grey, 0.1–0.3 mm wide and high, with sinuous outlines, resembling and homologous to the thallus warts, corticate with a gelatinous *c.* 12–18  $\mu\text{m}$  thick cortex, which is up to 25  $\mu\text{m}$  thick at base [cortex *pulicaris*-type sensu Brodo (1984)], with chlorococcoid algae (mostly just below the cortex) and copiously filled with 15–70  $\mu\text{m}$  large, hyaline, angular packets of crystals [amphithecium *pulicaris*-type sensu Brodo (1984)], PD –. *Hymenium* hyaline, medium brown (in section) in upper 6–9  $\mu\text{m}$ , 60–85  $\mu\text{m}$  high, copiously or sparsely filled with tiny, pale brownish crystals between the paraphyses [epithymenium *pulicaris*-type sensu Brodo (1984)]. *Hypothecium* hyaline, copiously filled with chlorococcoid algae and with 15–70  $\mu\text{m}$  large, hyaline, angular packets of crystals. *Ascospores* hyaline, ellipsoid to broadly ellipsoid,  $13\text{--}17 \times 7.5\text{--}9 \mu\text{m}$ , average  $15.0 \times 8.0 \mu\text{m}$  ( $n=50$ ), wall *c.* 0.7  $\mu\text{m}$  thick. *Pycnidia* unknown.

*Chemistry.* Thallus C – , PD – , K + yellow, UV – ; atranorin (constant) and gangaleoidin (in part of the collections) found with TLC.

*Etymology.* From *sinuous*, wavy, referring to the incurved apothecium margin and thallus warts with a sinuous outline.

*Ecology and Distribution.* The species has mainly been found on well-lit and exposed wayside *Q. robur* trees, but once on *Ulmus*. It occurs most commonly on medium-aged to old trees, often being found on the relatively dry east face. The species occurs on slightly acid bark and probably has a rather critical ecology. The species is not favoured by eutrophication, although it tolerates a relatively high level of eutrophication. It is accompanied by a wide range of lichens, mainly crustose species of well-lit situations, for example, *Haematomma ochroleucum*, *Lecanora horiza*, *Parmelia acetabulum*, *Pertusaria coccodes* and *Phlyctis argena* (Table 1). Stations with *L. sinuosa* are often



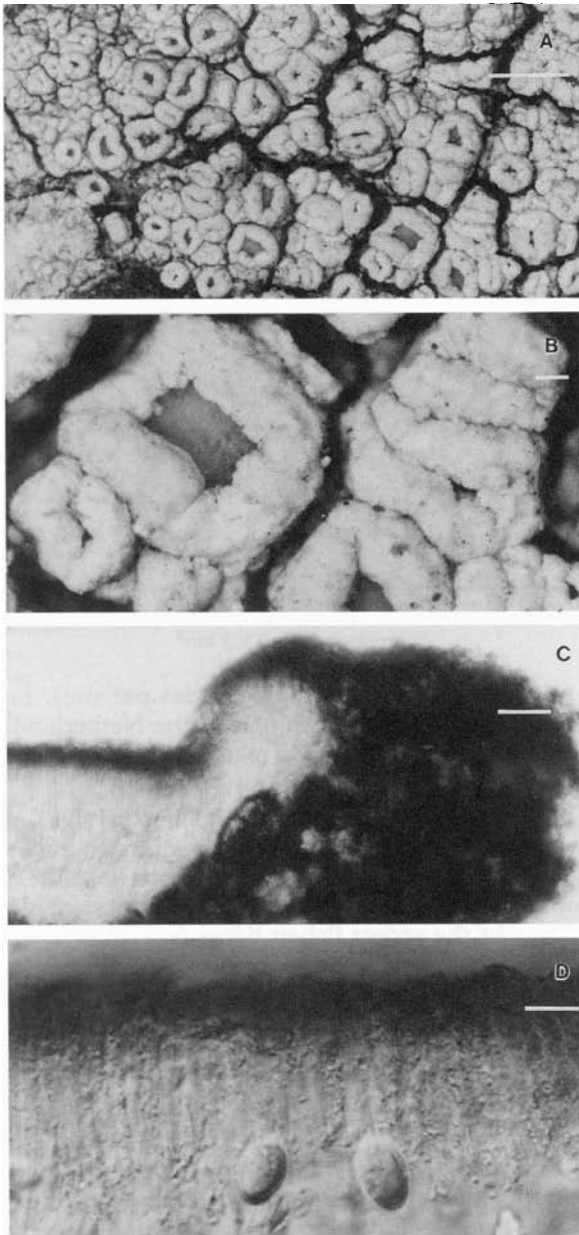


FIG. 3. *Lecanora sinuosa*, Van Herk 2080-1, 3, 4. A, habitus with margin; B, apothecia; C, section through apothecium; D, hymenium with ascospores. Scales: A=1 mm B=0.1 mm; C=40  $\mu$ m; D=10  $\mu$ m.

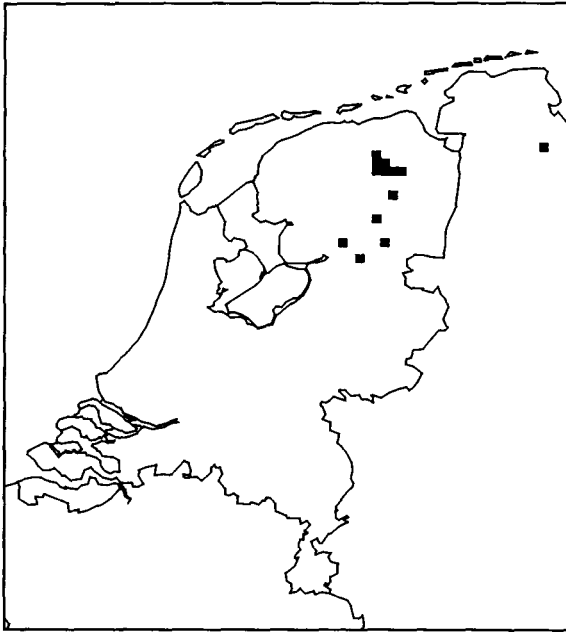


FIG. 4. World distribution of *Lecanora sinuosa*, based on herbarium specimens seen. A square corresponds to  $5 \times 5 \text{ km}^2$

extremely rich in species (average of 33.5 species per site). *Lecanora sinuosa* occurs in a limited area in the northern part of the Netherlands and adjacent Germany (Fig. 4), where it seems to be relatively rare.

*Discussion.* This new species undoubtedly belongs to the *Lecanora subfusca* group. Several regional revisions of this group exist, for example Brodo (1984) for North America, Lumbsch (1994) for Australasia and Poelt & Vězda (1981) for Europe. However, the present species is not treated in any of these revisions, nor in any of the recent lichen floras (e.g. Purvis *et al.* 1992).

In chemistry and in apothecial characters, the species superficially resembles several other corticolous *Lecanora* species, especially *L. chlarotera*, which differs by the *chlarotera*-type epihymenium and the more regular and relatively thinner apothecium margin.

Microscopically, the new species resembles *L. hybocarpa*, with which it shares the *pulicaris*-type epihymenium interspersed with fine crystals separating both species from *L. chlarotera*, but from which it differs markedly by the thallus, which is thinner in *L. hybocarpa*, and by the apothecium margin, which is more regular and relatively thinner in *L. hybocarpa*. There is also a difference in chemistry, with gangaleoidin present in addition to atranorin in two (*Aptroot* 42121 and *van Herk* 0567-1, 2) out of eight collections tested by TLC of *L. sinuosa*, but this is not significant, as the presence or absence of gangaleoidin in the *L. subfusca*-group is quite variable at species level, illustrated by Brodo (1984: Table 5), who notes that this substance is



TABLE 1. Lichen composition of 16 roadside sample plots with *Lecanora sinuosa* in the Netherlands\*

Species	Number of plots where present
<i>Anaptychia ciliaris</i>	1
<i>Bacidia arnoldiana</i> s. lat.	10
<i>Buellia griseovirens</i>	16
<i>B. punctata</i>	16
<i>Calicium viride</i>	1
<i>Candelaria concolor</i>	1
<i>Candelariella vitellina</i>	9
<i>C. xanthostigma</i>	2
<i>Cladonia fimbriata</i>	5
<i>Cliostomum griffithii</i>	5
<i>Diploicia canescens</i>	2
<i>Evernia prunastri</i>	13
<i>Fellhanera subtilis</i>	2
<i>Haematomma ochroleucum</i> var. <i>porphyrium</i>	11
<i>Hypocenomyce scalaris</i>	3
<i>Hypogymnia physodes</i>	11
<i>H. tubulosa</i>	3
<i>Lecanora barkmaniana</i>	3
<i>L. carpinea</i>	10
<i>L. chlarotera</i>	16
<i>L. compallens</i> sp. nov.	8
<i>L. comizaoides</i>	8
<i>L. dispersa</i>	3
<i>L. expallens</i>	16
<i>L. hageni</i>	2
<i>L. horiza</i>	7
<i>L. muralis</i>	3
<i>L. pulicaris</i>	8
<i>L. saligna</i>	1
<i>L. sinuosa</i> sp. nov.	16
<i>L. symmetrica</i>	1
<i>Lecidella elaeochroma</i>	14
<i>L. flavosorediata</i>	5
<i>L. scabra</i>	2
<i>Lepraria incana</i>	16
<i>Micarea denigrata</i>	1
<i>M. nitschkeana</i>	1
<i>Ochrolechia androgyna</i>	8
<i>O. turneri</i>	2
<i>Opegrapha atra</i>	2
<i>O. niveoatra</i>	2
<i>Parmelia acetabulum</i>	15
<i>P. caperata</i>	1
<i>P. elegantula</i>	1
<i>P. exasperatula</i>	4
<i>P. glabratula</i>	2
<i>P. laciniatula</i>	1
<i>P. revoluta</i>	7
<i>P. saxatilis</i>	6

Continued

TABLE 1. *Continued*

Species	Number of plots where present
<i>P. subaurifera</i>	15
<i>P. subrudecta</i>	12
<i>P. sulcata</i>	16
<i>P. tiliacea</i>	1
<i>Pertusaria albescens</i>	6
<i>P. amara</i>	5
<i>P. coccodes</i>	8
<i>P. pertusa</i>	5
<i>Phaeophyscia orbicularis</i>	2
<i>Phlyctis argena</i>	16
<i>Physcia adscendens</i>	4
<i>P. caesia</i>	7
<i>P. dubia</i>	2
<i>P. tenella</i>	16
<i>Physconia enteroxantha</i>	3
<i>P. grisea</i>	4
<i>Protoparmelia hypotremella</i>	2
<i>P. oleagina</i>	5
<i>Pseudevernia furfuracea</i>	6
<i>Pyrrhospora quernea</i>	10
<i>Ramalina farinacea</i>	16
<i>R. fastigiata</i>	16
<i>R. fraxinea</i>	4
<i>R. lacera</i>	1
<i>Schismatomma decolorans</i>	5
<i>Trapeliopsis granulosa</i>	1
<i>Xanthoria candelaria</i>	14
<i>X. parietina</i>	15
<i>X. polycarpa</i>	16

\*At each site usually ten *Quercus robur* trees were investigated. Data was collected by the first author during a mapping programme at the request of the Dutch government.

inconstant in nearly half of the species he reports it from; often somewhat correlated with geography. The identity of atranorin and gangaleoidin has been proved by co-chromatography with *L. gangaleoides* Nyl.

The new species has been compared with numerous specimens of *L. hybocarpa* from Canada, U.S.A., Portugal (all in ABL), Germany (Eifel, Büdesheim, 1998, *A. Aptroot* 42861, ABL, which is the first report of this species from Germany) and Belgium (hb. Brand), which were all in full agreement with the descriptions in Brodo (1984) and Giralt (1996), and consistently different.

Other species that are reminiscent in some respects, but which are more distant from *L. sinuosa*, are *L. subrugosa* Nyl., which has a pigmented, not granulose epipsamma (epihymenium *glabrata*-type), *L. meridionalis* H. Magn., which has nearly black apothecia (epihymenium *chlarotera*-type or *gangaleoides*-type) and *L. rugosella* Zahlbr., which has a coarsely granular epipsamma (epihymenium *chlarotera*-type).

*Selected specimens examined:* **Germany:** *Niedersachsen:* Ostfriesland, Westerstede, Wiefelstede, on *Quercus* near farm, 1998, A. Aptroot 42121 & C. M. van Herk s.n. (ABL, hb. Van Herk, with *L. chlarotera*, TLC).—**The Netherlands:** *Drenthe:* Beilen, on old *Q. robur* near farm, 1997, C. M. van Herk 0567–1, 2 (hb. Van Herk, TLC); De Groeve, on *Q. robur* in village, 1998, C. M. van Herk 2085–2 (hb. Van Herk, TLC); De Punt near Eelde, on *Q. robur* along road, 1998, C. M. van Herk 2055–1 (hb. Van Herk, TLC); Eelderwolde, on old *Q. robur* along road, 1998, C. M. van Herk 2080–1, 3, 4 (hb. Van Herk, TLC); Nijeveen, on ancient *Q. robur* in the village, 1997, C. M. van Herk 0027–6 (ABL, hb. Van Herk, with *L. chlarotera*, TLC); Peize, on roadside *Q. robur*, 1998, C. M. van Herk 0501–1, 5 (hb. Van Herk, TLC). *Groningen:* Aduard, Nieuwklap, on *Ulmus* along road, 1998, C. M. van Herk s.n. (hb. Van Herk).

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Note added in proof: *Lecanora barkmaneana* should be *Lecanora barkmaniana*. In *The Lichenologist* **31**: 3–8 (1999) *Lecanora barkmaneana* was described as new to science (Aptroot & van Herk). Unfortunately, it appears that the correct spelling, according to the International Code of Botanical Nomenclature (Art. 60.11, 60.C1), should be *Lecanora barkmaniana*. We apologise for the confusion caused, although we like to point out that the name originally proposed was *Lecanora barkmanii*, and the change to (the incorrect) *barkmaneana* was suggested by one of the anonymous referees. Although the description is valid, researchers are advised to use the correct spelling.

