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Rimeliella, a New Lichen Genus Related to *Rimelia* of the Parmeliaceae

By

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黒川 逍*：ウメノキゴケ科の新属 オオチヂレマツゲゴケ属

During the last forty years, *Parmelia* s. lat. has been extensively studied by various authors. The process of taxonomic revision resulted in the subdivision of *Parmelia* s. lat. based on the chemical, morphological, anatomical, and geographical characters. Thus a number of genera were segregated from *Parmelia* s. lat. or some others were resurrected. Even though *Parmotrema* is one of them, it seems to be still a collective genus including some natural groups to be segregated as distinct genera. In fact, *Rimelia* was recently segregated from it by Hale & Fletcher (1990). In the present paper, the new genus *Rimeliella* Kurok. is described to accomodate seven species previously classified under *Parmotrema*. They are *Rimeliella conferenda* (Hale) Kurok., *R. fumarprotocetrarica* (Marcelli et Hale) Kurok., *R. neotropica* (Kurok.) Kurok., *R. subcaperata* (Krempelh.) Kurok., *R. subsumpta* (Nyl.) Kurok., *R. subtinctoria* (Zahlbr.) Kurok., and *R. uruguensis* (Krempelh.) Kurok. The new genus is characterized by dimorphous rhizines, very wide pale brown to brown lower surface, effigurate-maculate upper surface, and often sparsely branched cilia.

Rimeliella Kurok., gen. nov.

Parmelia subgenus *Amphigymnia* section *Subflavescentes* subsection *Ornaticolae* series *Subpallidae* Hale, Contr. U. S. Nat. Herb. **36**: 314, 1965.

Thallus foliaceus, adnatus vel laxe adnatus, margine ciliatus, superne effiguratus, subtus ex toto pallidus vel raro versus centrum tantum nigrescens, dense rhizinosus, rhizinis dimorphis; sporae hyalinae, simplices.

Type species. *Parmelia subcaperata* Krempelh. [= *Rimeliella subcaperata* (Krempelh.) Kurok.]

Thallus foliose, adnate or loosely attaching; lobes plane, rotund, 5−15 mm wide, sparsely to moderately ciliate, cilia black, about 1 mm long; upper surface distinctly maculate, irregularly cracked with age, isidiate, sorediate or without isidia and soredia; medulla white; lower surface pale brown to brown, but often becoming blackish only near the center, papillate or short rhizinate to the margin, short rhizines rather dense, usually formed on whole lower surface, simple or sparsely branched, not reaching the substratum, 0.1−0.3 mm long, long rhizines coarse, formed in groups, usually anchoring the thallus on the substratum, often more than 1 mm long. Apothecia rather rare, more or less stalked, more than 1.5 cm in diameter; disc perforate; spores colorless, simple, 5−10 × 8−19 μm.

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Rimeliella was first recognized as a distinct group (series *Subpallidae* of subsection *Ornaticolae*, section *Subflavescentes*, subgenus *Amphigymnia*, genus *Parmelia*) by Hale in 1965. The series *Subpallidae* was characterized by the uniformly pale brown lower surface of the thallus, which is short rhizinate to the margin. It was classified under section *Subflavescentes*, since all species of the series are ciliate and it was included in subsection *Ornaticolae*, since the upper surface is distinctly maculate in all species of the series.

This widespread, remarkably uniform genus is distinguished from *Parmotrema* by a number of characters. The lower surface is uniformly short rhizinate to the margin of lobes as noted by Hale (1965). These short rhizines are simple in most species of *Rimeliella*, excepting *Rimeliella uruguensis*, in which they are sparsely branched and more or less intricated. They are free from the substratum and do not seem to play the rôle to anchor the thallus on the substratum. They may be considered as rhizonomorphs in the sence of Hannemann (1973). Rhizinomorphs are known in *Umbilicaria*, *Dermatocarpon*, and *Xanthomaculina* (*Omphalodium* by Hannemann). Short rhizines (rhizinomorphs) of *Rimeliella* resemble very much those of *Xanthomaculina hottentotta* (Ach.) Hale, in which both simple and sparsely branched rhizinomorphs are found. Rhizines quite different from these short rhizines (rhizonomorphs) are also found on the lower surface of the thallus of all species of *Rimeliella*. They are much thicker and longer than rhizonomorphs mentioned above and are usually formed in groups near the center of lobes. Some of these longer rhizines apparently anchor the thallus on the substratum and the longer rhizines can be considered to play the same rôle as ordinary rhizines of all species of *Parmotrema* do. However these long rhizines are formed in groups in *Rimeliella* and look quite different from ordinary rhizines of *Parmotrema*. They resemble very much umbilici of *Xanthomaculina hottentotta* rather than ordinary rhizines of *Parmotrema*., even though they do not form tightly conglutinated very thick hyphal bundles to be called umbilici. In addition, the upper surface is similarly effigurate-maculate in all species of *Rimeliella* and *Xanthomaculina hottentotta* (Hale 1985). Thus, *Rimeliella* can be considered to be more closely related to *Xanthomaculina* rather than to *Parmotrema*.

Thalli of *Rimeliella* are adnate to loosely attaching and lobes are rather wide and rotund and are ciliate. Lower surface of the thallus is rhizinate to the margin. These features suggest the close affinity between *Rimeliella* and *Rimelia*. Maculae on the upper surface are quite distinct in both genera, even though they form a net-work (reticulation) only in *Rimelia* (Hale & Fletcher 1990). In addition, atranorin and salazinic acid are common secondary products in both genera. Therefore, *Rimeliella* may be considered to be closely related to *Xanthomaculina* on the one hand and to *Rimelia* on the other hand.

In 1965 Hale gave an interesting discussion on the taxonomy of chemical strains of *Parmelia*, including *Parmelia subcaperata*, *P. subsumpta*, and *P. subtinctoria* groups (now classified under *Rimeliella*). This discussion was unfortunately based on a number of misidentifications of lichen substances. Through the present study, I have tried to clarify the secondary products of each species of *Rimeliella*.

Chemical variants observed in *Rimeliella* are summarized in the Table 1. *Rimeliella fumarprotocetrarica* and *R. uruguensis* are excluded from the table, because the former produces fumarprotocetraric acid, a rare substance in this genus, in the medulla and the latter is morphologically quite different. Close study of Table 1 shows a preponderance of species with atranorin

and norlobaridone, loxodin, and/or salazinic acid. Atranorin and salazinic acid are easily detected with the color tests and crystal tests and have been often used as important substances separating species. Norlobaridone and loxodin, which are usually associated each other in lichens, can be demonstrated with the crystal methods with some difficulty (Kurokawa 1969) and should be tested with the thin layer chromatographic (TLC) methods. In 1965, the TLC methods were not commonly used yet and Hale employed only the crystal methods. In addition, crystals yielded by norlobaridone and loxodin in GE and GAW were not well understood at that time and Hale misidentified these crystals as yielded by cryptochlorophaeic acid and/or fatty acids.

The Table 1 also shows that variants with a color reacting acid (salazinic acid) and without a color reacting acid have been often considered as different species, namely *Parmelia subtinctoria* and *P. haitiensis* for isidiate series, *P. subsumpta* and *Parmotrema conferendum* for sorediate series, and *R. subcaperata* and *R. recipienda* for series with no isidia nor soredia (abbreviated as NIS). When he described *Parmotrema neotropicum* (= *Rimeliella neotropica*), Hale (1977) considered the species to represent the chemical population with salazinic acid alone in isidiate members of the *Parmotrema recipiendum* group in the sence of Hale (1977) and to be indistinguishable morphologically from other isidiate members, *P. haitiense* (= *Rimeliella haitiensis*) and *P. subtinctorium* (= *Rimeliella subtinctoria*). Consequently, he recognized three species for isidiate members of the *P. recipiendum* group; i.e. *P. haitiense* (norlobaridone and loxodin), *P. subtinctorium* (norlobaridone, loxodin, and salazinic acid), and *P. neotropicum* (salazinic acid). Hale (1977) also noticed that *P. neotropicum* often produces traces of usnic acid. So far as I have tested, the concentration of usnic acid seems to be extremely variable and usnic acid was demonstrated in 23 (including the type) of 26 specimens tested and was not demonstrated in three specimens. Usnic acid seemed to be produced in extremely low concentrations even in three specimens. The production of norlobaridone and loxodin can be considered to show a negative correlation with the production of usnic acid in the isidiate series. Therefore, the chemical variants III and IV of the isidiate series (Table 1) can be considered to form a distinct species, *Rimeliella neotropica* (=*Parmotrema neotropicum*), even though usnic acid may be deficient or nearly deficient in some specimens. On the other hand, the chemical variants I and II belong to another species, *R. subtinctoria* (=*Parmelia subtinctoria*), considering norlobaridone and loxodin as constant components and salazinic acid as an accessory component in the species. Thus, *Parmelia haitiensis* can be simply reduced as a synonym of *Rimeliella subtinctoria*.

Table 1. Chemical variants and their names*

a sexual propagules \ chemical variants**	I	II	III	IV
isidiate	*Parmelia haitiensis*	*Parmelia subtinctoria*	*Parmotrema neotropicum*	
sorediate	*Parmotrema conferendum*	*Parmotrema reitzii*	*Parmelia subsumpta*	(unnamed)
NIS***	*Parmelia recipienda*	(unknown)	*Parmelia erubescens*	*Parmelia subcaperata*

* Original names are used.

** Chemical variant I contains atranorin, norlobaridone, and loxodin.
Chemical variant II contains atranorin, norlobaridone, loxodin, and salazinic acid.
Chemical variant III contains atranorin and salazinic acid.
Chemical variant IV contains atranorin, usnic acid, and salazinic acid.

*** NIS is an abbreviation of "no isidia and soredia".

Hale (1965) reported only atranorin and salazinic acid in *R. subsumpta* (chemical variant III in the Table 1). However, usnic acid has been demonstrated in nine of 23 specimens examined in the present study (see under *R. subsumpta*). These specimens can be considered to belong to chemical variant IV of the sorediate series (Table 1), and has not yet been named before as shown in Table 1. The chemical variation observed here is quite similar to that described above in *Rimeliella neotropica*, in which usnic acid is an accessory component. As in the isidiate series, in addition, *Parmotrema conferendum* and *P. reitzii* can be regarded as conspecific, considering salazinic acid as an accessory component. In the NIS series, considerable amounts of usnic acid is produced in some specimens of *Rimeliella subcaperata*, as pointed out by Krog & Swinscow (1981). Thus, usnic acid is considered as an accessory component also in *R. subcaperata*. It is noteworthy that chemical variant II, producing atranorin, norlobaridone, loxodin, and salazinic acid, has not been found in the NIS series.

Artificial key to the species of *Rimeliella*

1. Thallus with no asexual propagules.
   2. Short rhizines sparsely branched and more or less intricated; amphithecium ciliate ..... *R. uruguensis*
   2. Short rhizines mostly simple; amphithecium eciliate.
      3. Thallus containing norlobaridone ..... *R. recipienda*
      3. Thallus lacking norlobaridone and loxodin ..... *R. subcaperata*
1. Thallus isidiate or sorediate.
   4. Thallus isidiate.
      5. Medulla K−, P+ orange red, containing fumarprotocetraric acid ..... *R. fumarprotocetrarica*
      5. Medulla K−, P− or K+ yellow turning red, P+ intensive yellow, containing norlobaridone and/or salazinic acid.
         6. Thallus containing norlobaridone; usnic acid never produced in the cortex ..... *R. subtinctoria*
         6. Thallus lacking norlobaridone and loxodin; small amounts of usnic acid often produced in the cortex ..... *R. neotropica*
   4. Thallus sorediate.
      7. Thallus containing norlobaridone ..... *R. conferenda*
      7. Thallus lacking norlobaridone and loxodin ..... *R. subsumpta*

Rimeliella conferenda (Hale) Kurok., comb. nov.

Parmotrema conferendum Hale, Mycotaxon **5**: 433, 1977. Type collection: On rocks along stream, El Valle, Estado Mérida, Venezuela, elevation 2600 m, M. E. Hale 43291 — holotype in US (not seen).

Parmotrema reitzii Hale, Mycotaxon **5**: 439, 1977. Type collection: Lajes, Santa Catarina, Brazil, elevation 950 m, Reitz and Klein 12927 — holotype in US (not seen).

Unfortunately I did not have a chance to examine any specimen of this species. However, the descriptions given to *Parmotrema conferendum* and *P. reitzii* by Hale (1977) show these taxa indisputably belong to *Rimeliella* and can be considered to be cospecific as discussed before.

Hale (1977) assumed that *Parmotrema reitzii* might be a "hybrid" species in the *P. recipiendum* (= *Rimeliella recipienda*) group, coordinate with *P. subsumptum* (= *Rimeliella subsumpta*) and *P. conferendum* (= *Rimeliella conferenda*). If it was so, usnic acid should be produced at least some of the specimens of *P. reitzii*. However, usnic acid was reported in none of them. This may suggest that *P. reitzii* can not be considered as a "hybrid" between *P. subsumptum* and *P. conferendum*.

At present, specimens containing norlobaridone and loxodin in the medulla are known from the United States, Venezuela, Argentina (Hale 1977), and Ethiopia (Vinnem 1975) and those containing salazinic acid along with norlobaridone and loxodin from Venezuela and Brazil (Hale 1977).

Rimeliella fumarprotocetrarica (Marcelli et Hale) Kurok., comb. nov.

Parmotrema fumarprotocetraricum Marcelli et Hale, Mycotaxon **25** : 88, 1986. Type collection: On mangrove trees near bridge over Itanhaem River, Km 112 of the BR-101 highway, Itanhaem, Sãn Paulo, Brazil, M. P. Marcelli 8 — holotype in US (not seen).

Thallus corticolous, adnate to more or less loosely attaching, pale straw-yellow, 8–12 cm in diameter; lobes rotund, 7–12 mm wide, sparsely ciliate at the margin, cilia simple, 0.2–1.2 mm long; upper surface shiny, white-maculate, irregularly cracked with age, moderately isidiate, isidia cylindrical or granulate, often crowded in part; medulla white; lower surface pale brown to chestnut-brown, often blackish towards the center; rhizines dimorphous; short rhizines thin and simple,

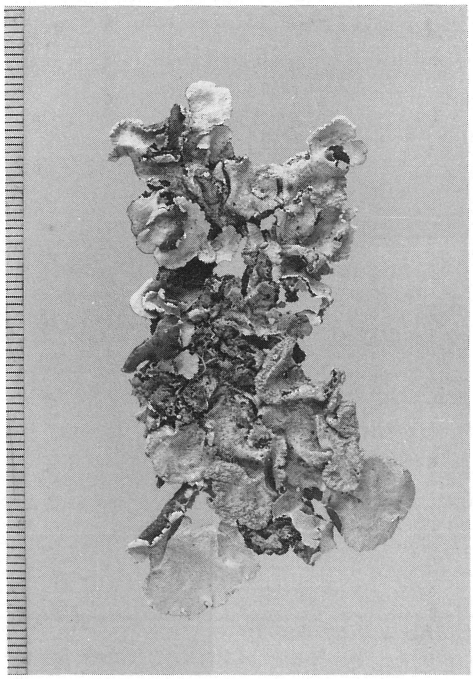

Fig. 1. *Rimeliella fumarprotocetrarica* (S. Kurokawa 8249). Scale indicates mm.

Fig. 2. Holotype of *Parmelia recipienda* (= *Rimeliella recipienda*). ×1.7.

about 0.1 mm long, long rhizines coarse, formed in groups, often more than 1 mm long. Apothecia and pycnidia not seen.

Chemical ingredients. Atranorin, usnic acid (trace), fumarprotocetraric acid, and protocetraric acid (trace).

This species is very unique in this genus, because it produces fumarprotocetraric acid in the medulla. Judging from the color of the thalli reported by Hale (1986), a trace amount of usnic acid seems to be present also in the type specimen as was demonstrated in Kurokawa 8249. However, it was probably overlooked by Hale, because of the low concentration.

The present species was reported from mangrove in São Paulo to forests at 800 m in Santa Catarina in Brazil. Now, the range also includes Parana though the distribution seems to be restricted to southern Brazil.

Specimens examined. Brazil. Parana: Jardim Paraizo, 9 km west of Curitiba, elevation about 800 m, S. Kurokawa 8249 (TNS).

Rimeliella neotropica (Kurok.) Kurok., comb. nov.

Parmotrema neotropicum Kurok. in Hale, Mycotaxon **5**: 437, 1977. Type collection: On conifers, Km 1145 on highway 290, west of San Cristóbal, Chiapas, Mexico, elevation 2120 m, M. E. Hale 20190 — holotype in US.

Thallus adnate to more or less loosely attaching, pale mineral gray to straw-yellow, 5–10 cm in diameter; lobes rotund, 7–14 mm wide, sparsely to moderately ciliate at the margin, cilia simple to sparsely branched, 0.3–1.2 mm long; upper surface shiny, distinctly white-maculate, irregularly fissured with age, isidia simple or branched, cylindrical, often ciliate apically; medulla white; lower surface more or less rugose, pale brown, blackish only in narrow zones near the center, short rhizinate to the margin, short rhizines simple, about 0.1 mm long, long rhizines coarse, often more than 1 mm long. Apothecia and pycnidia not seen.

Chemical ingredients. Atranorin, salazinic acid, and often usnic acid.

This species may be easily confused with *R. subtinctoria*, from which it is clearly distinguished by the lack of norlobaridone and loxodin. It can be considered as the isidiate counterpart species of *R. subcaperata*. It is very interesting that the amount of usnic acid is very variable in both species. Isidia are often ciliate apically in this species.

In the following list, specimens, in which usnic acid was not detected, are marked with asterisks.

Specimens examined. U. S. A. North Calorina: 4 miles south of Reidsville, Rockingham Co., M. E. Hale 16381 (US). Alabama: Little River Canyon, DeKalb Co., H.A. Siek 1018 (US). Florida: 2.3 miles s. of the Colimbia County-Georgia state line, along US 441, trunk of *Magnolia virginiana*, B. J. Moore (4250) & Culberson (DUKE); Sanford, Seminole Co., S. Rapp s. n.* (US). Mexico. Chiapas, M. E. Hale 20013, 20041, 20230, 20267, 20614, 21205 (US). Veracruz, M. E. Hale 10859 (US). Cuba. Slope of El Gato, Loma del Gato, Sierra Maestra, Oriente, Imshaug 24798 (US). Brazil. Serra Dourada, Goias, elevation about 750 m, J. A. Rizzo 751 (TNS). Serra Negra, Pernambuco, elevation 900–1000 m, S. Kurokawa (8067) & L. Xavier Fil.* (TNS). National Park of Tijuca, Rio de Janeiro, S. Kurokawa 8414* (TNS).

Rimeliella recipienda (Nyl.) Kurok., comb. nov.

Parmelia recipienda Nyl., Flora **68**: 609, 1885 — *Parmotrema recipiendum* (Nyl.) Hale, Phytologia **28**: 338, 1974. Type collection: Brazil, s. c. — holotype in H, Nyl. Herb. no. 35212.

Parmelia annae Lynge, Ark. Bot. **13** (13): 88, 1914. Type collection: Santa Anna da Chapada, Mato grosso, Brazil, Malme 2368B — lectotype in S (not seen).

Parmelia ceracea Lynge, Ark. Bot. **13** (13): 97, 1914. Type collection: Pilcomayo, Gran Chaco, Paraguay, Malme, September 7, 1893 — lectotype in S (not seen).

Thallus corticolous, adnate to more or less loosely attaching, buff to straw-yellow in herbarium, 10–15 cm in diameter; lobes rotund, 7–15 mm wide, sparsely to moderately ciliate at margin, cilia black, often branched, 0.5–1.5 mm long; upper surface shiny, effigurate-maculate, fissured with age, with no isidia and soredia; lower surface pale brown to darkening, often blackish only near the center, densely short-rhizinate to the margin, short rhizines simple, 0.2–0.5 mm long, long rhizines coarse, often more than 3 mm long. Apothecia common, often more than 1.5 cm in diameter, more or less stalked, disc perforate; spores simple, hyaline, 6–10 × 12–19 μm.

Chemical ingredients. Atranorin, norlobaridone, and loxodin.

This species resembles *R. subcaperata*, because these two species lack isidia and soredia. It is, however, easily distinguished from the latter species by negative color reactions with K and P in the medulla.

In this species, the chemical variant producing norlobaridone, loxodin, and salazinic acid together has not been found yet.

Hale (1965) reported this species from Brazil, Paraguay, and Argentina as *Parmelia subcaperata* containing cryptochlorophaeic acid. After that, Osorio (1980) reported this species from Uruguay. Consequently, the distribution range known at present includes Brazil, Paraguay, Uruguay, Peru, Argentina, and Australia.

Specimens examined. Australia. New South Wales: Pine Ridge, Liverpool Plains, J. Gregson s. n. (TNS). Brazil. Botanical Garden of Rio de Janeiro, T. Kariyone s. n. (TNS). Parana: Campo Largo, on road to Estançia Ouro Fino, west of Curitiba, elevation about 800 m, S. Kurokawa (8131, 8134, 8138, 8149) & L. Xavier Fil. (TNS). Peru. Santa Ana Valley, Potrero, 1200 m, F. L. Herrera 1109a (TNS). Argentina. Manuela Pedraza, Oran, Salta, Eyerdam & Beetle 22879 (TNS).

Rimeliella subcaperata (Krempelh.) Kurok., comb. nov.

Parmelia subcaperata Krempelh., Nat. For. Kjoeb. Vid. Medd. **1873**: 10, 1873 — *Parmotrema subcaperatum* (Krempelh.) Hale, Phytologia **28**: 339, 1974. Type collection: Lagoa Santa, Serra da Piedade, Brazil, Warming 297 — holotype in M.

Parmelia erubescens Stirt., Scot. Nat. **4**: 201, 1877–78. Type collection: Near Brisbane, Australia, Bailey s. n. — holotype in BM (not seen).

Parmelia imperforata Nyl., Acta Soc. Sci. Fenn. **26** (10): 7, 1899. Type collection: Brazil, Glaziou in 1839 — holotype in H, Nyl. Herb. no. 35425.

Thallus adnate to more or less loosely attaching, pale straw-yellow in the herbarium, 10–16 cm in diameter; lobes rotund, 5–15 mm wide, sparsely to moderately ciliate at margin, cilia black, mostly simple, 0.7–1.5 mm long; upper surface shiny, effigurate-maculate, without isidia and soredia; medulla white; lower surface pale brown to brown, often blackish only near the center, short rhizinate or papillate to the margin; short rhizines simple, to 0.3 mm long, long rhizines

coarse, formed in groups, more than 1 mm long. Apothecia common, more or less stalked, to 3 cm in diameter, disc perforate, spores simple, 6−10 × 12−19 μm; pycnidia common, immersed in the thallus, pynoconidia 10−13 μm long.

Chemical ingredients. Atranorin, salazinic acid, and sometimes usnic acid.

In 1965, Hale reduced *Parmelia recipienda* (= *Rimeliella recipienda*) as a synonym of this species. However, now *Rimeliella recipienda* is treated as a distinct species, as discussed above.

Even though usnic acid has not been detected in any specimens examined in the present study, Krog & Swinscow (1981) reported the production of considerable amounts of usnic acid in this species.

This species shows a disjunctive distribution in Brazil, Paraguay (Osorio 1970a), and Uruguay (Osorio 1970b, 1980) in South America and Australia.

Specimens examined. Australia. Victoria: on rocks at summit of Yomjangs, Wilson s. n. (MEL 6137). Flinders Island: Peak to south of Killiecrankie Bay, R. Filson 7056 (MEL 14132). Brazil. Minas Gerais: Uberlandia, L. Xavier Fil. 1062 (TNS). Rio de Janeiro: Petrópolis, elevation about 810 m, S. Kurokawa 8351, 8354 (TNS). São Paulo: Pico de Itapéva, Pindamonhangaba, D. M. Vital 734 (TNS); Piquete, A. Robert s. n. (DUKE). Parana: Jardim Paraizo, 9 km west of Curitiba, elevation about 800 m, S. Kurokawa 8258, 8259 (TNS).

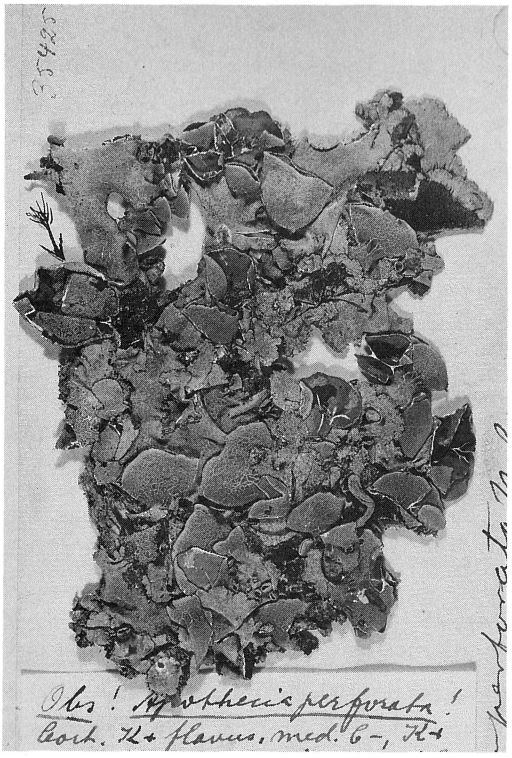

Fig. 3. Holotype of *Parmelia imperforata* (= *Rimeliella subcaperata*). ×0.9.

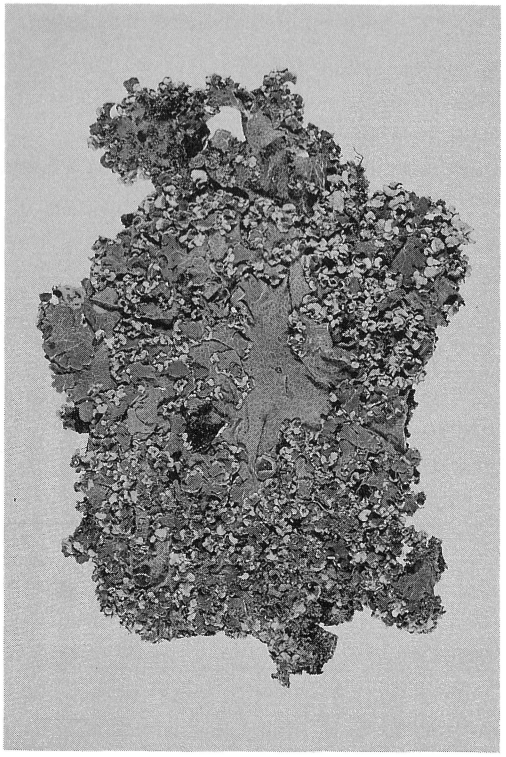

Fig. 4. Holotype of *Parmelia subsumpta* (= *Rimeliella subsumpta*). ×1.0.

Rimeliella subsumpta (Nyl.) Kurok., comb. nov.

Parmelia subsumpta Nyl., Flora **52**: 117, 1869 — *Parmotrema subsumptum* (Nyl.) Hale, Mycotaxon **5**: 434, 1977. Type collection: Minas Gerais, Brazil, Glaziou s. n. — holotype in H, Nyl. Herb. no. 35451.

Parmelia. urceolata var. *nuda* Müll. Arg., Flora **63**: 266, 1880. Type collection: Petrópolis, Brazil, Deventer 33 — holotype in G (not seen).

Parmelia hypotropa var. *imperialis* Hue, Nuov. Arch. Mus. Paris, ser. 4, **1**: 189, 1899 — *Parmelia corrugis* var. *imperialis* (Hue) Zahlbr., Cat. Lich. Univ. **6**: 236, 1929. Type collection: Brazil, S. M. Theresa Christina s. n. — holotype in P (not seen).

Thallus adnate to more or less loosely attaching, pale glaucous buff to pale straw-yellow, 7–15 cm in diameter; lobes rotund, 7–15 mm wide, sparsely to moderately ciliate at margin, cilia black, often branched, 1–2 mm long; upper surface shiny, effigurate-maculate, sorediate, soralia mainly marginal but often also laminal especially on older lobes; lower surface pale tan to darkening, sometimes blackening only near the center, short rhizinate to the margin, short rhizines simple, but rarely branched, 0.2–0.5 mm long, long rhizines coarse, often more than 2 mm long. Apothecia very rare (not seen in materials examined, but according to Vinnem (1975), the holotype has small perforate apothecia and spores 8 × 13 μm).

Chemical ingredients. Atranorin, salazinic acid, and often small amounts of usnic acid.

As in *Rimeliella neotropica*, usnic acid is often produced in the present species, having been demonstrated in nine (marked with asterisks in the following list) of 24 specimens examined. *R. sumsumpta* can be considered to be the sorediate counterpart species of *R. subcaperata*.

Hale (1965) reported this species from North America (U. S. A. and Mexico), Central America (Guatemala and Panama), South America (Venezuela, Brazil, and Argentina), and Africa (Congo, Kenya, and Union of South Africa). Vinnem (1975) reported it from Ethiopia and Krog & Swinscow (1981) added Tanzania as another locality in Africa. In South America, Osorio (1975, 1979) reported it from Uruguay. In Asia and the Pacific region, Kurokawa recorded the occurrence of the species in Nepal (Kurokawa 1966, 1989) and Papua New Guinea (Kurokawa 1979). Now the distribution range is extended to southeastern Asia, including Taiwan and Thailand, and Australia.

Specimens examined. Taiwan. Prov. Nantoh: Lisan, S. Kurokawa 879 (TNS). Thailand. Chien Mai: Maetang District, elevation about 1000 m, S. Kurokawa 1741* (TNS, MEL, C). India. Senchal, Darjeeling, H. Hara et al.* (TNS). Nepal. Nagarjun, Kathmandu, T. Nakaike 59* (TNS). Nagarjong, north-west of Kathmandu, on *Myrica* sp., H. Kanai 9* (TNS). Dakshinkal, M. Watanabe 110* (TNS). Papua New Guinea. Eastern Highland District: Obihaka Coffee Plantation, west of Goroka, elevation about 1500 m, S. Kurokawa 5918 (TNS). Australia. New South Wales: Boonoo Boonoo, J. L. Boorman (NSW L1690). U. S. A. Geogia: Vogel State Park, Union Co., M. E. Hale 7325 (US). Mexico. Puebla: 3 km west of Puebla-Veracruz state line on highway 150, M. E. Hale 19653 (US). Chiapas: south of Teopisca, M. E. Hale 20509 (US, DUKE), 20521 (US); east of Teopisca, M. E. Hale 20359* (US); El Sumidero Canyon, Tuxtla Gutiérrez, M. E. Hale 21044* (US); 50 km west of Textla Gutiérrez, M. E. Hale 19957 (US). Jarisco: San Sebastian, Arroyo de Santa Gertrudis, alt. 1500 m, Y. Mexia 1541b* (US). Costa Rica. Vicinity of Santa Maria de Dota, Provincia de San José, alt. 1500–1800 m, P. C. Stanley & J. Valerio 43405 (US). Panama. Chiriqui: Llano del Volcano, Scholander s.n.* (US). Brazil. Minas Gerais: Caldas, H. Mosén 2313 (TNS). Rio de Janeiro: Petrópolis, elevation about 810 m, S. Kurokawa 8355 (TNS). Rio Grande do Sul: São Francisco de Paula, Colinas de São

Francisco, alt. 900 m, H. S. Osorio & M. Fleig SF/5 (TNS). Argentina. San Ignacio, Omroga s. n. (US). Uruguay. Department of Canelones: Carrasco (Franklin Roosevelt National Park), S. Kurokawa 8506, 8507 (TNS).

Rimeliella subtinctoria (Zahlbr.) Kurok., comb. nov.

Parmelia subtinctoria Zahlbr. in Handel-Mazzetti, Symb. Sin. **3**: 193, 1930 — *Parmotrema subtinctorium* (Zahlbr.) Hale, Phytologia **28**: 339, 1974. Type collection: Sanyingpan, north of Yunnanfu, Yunnan, China, Handel-Mazzetti 5645 — holotype in WU.

Parmelia proboscidea var. *aspera* Müll. Arg., Flora **69**: 258, 1886. Type collection: Caracas, Venezuela, Ernst 71 — holotype in G (not seen).

Parmelia virens f. *isidiosa* Müll. Arg., Ann. Nat. Hofm. Wien **7**: 303, 1892. Type collection: Toowoomba, Queensland, Hartmann 58 — holotype in G and isotype in US.

Parmelia velutina Zahlbr., Ann. Crypt. Exot. **1**: 206, 1928. Type collection: Mt. Tjibodas, Java, van Overeen 89 — holotype in W [non *P. velutina* (Ach.) Wallr., Fl. Crypt. Germ. **3**: 552, 1831].

Parmelia protovirens Gyeln., Fedde Repert. **29**: 289, 1931. Based on *P. virens* f. *isidiosa* Müll. Arg.

Parmelia haitiensis Hale, Bryologist **62**: 20, 1959 — *Parmotrema haitiense* (Hale) Hale, Phytologia **28**: 336, 1974. Type collection: Blue Mountain, Jamaica, Orcutt 2987 — holotype in US.

Thallus adnate to more or less loosely attaching, mineral gray but soon turning straw-buff in the herbarium, 5–15 cm in diameter, lobes rotund, 7–13 mm wide, sparsely to moderately ciliate, cilia black, sometimes branched, 0.5–2 mm long; upper surface shiny, distinctly white-maculate, irregularly cracked with age, moderately to densely isidiate, isidia cylindrical, simple or branched, rarely ciliate apically; medulla white; lower surface pale to dark brown, blackish only near the center, densely short rhizinate or papillate to the margins, short rhizines simple, 0.1–0.3 mm long, long rhizines formed in groups, coarse, often more than 1 mm long. Apothecia rare, 3–5 mm in diameter, amphithecium isidiate, disc perforate (imperforate in younger stages), spores 5–8 × 8–11 μm.

Chemical ingredients. Atranorin, norlobaridone, loxodin, and salazinic acid or atranorin, norlobaridone, and loxodin.

Although type specimens of *Parmelia proboscidea* var. *aspera* and *P. haitiensis* contain atranorin, norlobaridone and loxodin and lack salazinic acid, these taxa are simply reduced as synonyms of *Rimeliella subtinctoria* as discussed before.

This species resembles *R. neotropica*, from which it is clearly distinguished by the production of norlobaridone and loxodin. It can be considered as the isidiate counterpart species of *R. recipienda*. Isidia of *R. subtinctoria* are sometimes ciliate apically as in those of *R. neotropica*. Ciliate isidia are found in specimens containing salazinic acid as well as in those lacking salazinic acid, and do not seem to have any taxonomic value. While the chemical variant lacking salazinic acid of this species is restricted to temperate and tropical zones of the New World, this species is widely distributed in temperate and tropical zones in the World.

Exsiccatae and representative specimens examined.

Atranorin, salazinic acid, norlobaridone, and loxodin are present in the following exsiccatae and specimens.

Exsiccatae. Kurokawa: Lich. Rar. Crit. Exs., no. 86 (TNS, DUKE). Vězda: Lich. Sel. Exs., no. 70

(TNS, US). Weber: Lich. Colo. Exs., no. 278 (TNS, DUKE).

Specimens. Japan. Prov. Kazusa: Ichinomiya, Y. Asahina 35 (TNS). Prov. Shinano: Yatsugatake Mts., Y. Asahina s. n. (TNS, US). Prov. Suruga: Kuno-san, Shizuoka, H. Kashiwadani 10320 (TNS). Prov. Izu: Basara Pass, Matsuzaki, S. Kurokawa 88016 (TNS). Prov. Mikawa: Iwagoya Park, Y. Asahina et al. (TNS). Prov. Ohmi: Kusatsu, H. Kashiwadani 14816 (TNS). Prov. Ise: Futami, Y. Asahina s. n. (TNS). Prov. Harima: Mikawa-mura, Shiso-gun, K. Utsumi s. n. (TNS). Prov. Tamba: Kamimutobe, M. Togashi s. n. (TNS). Prov. Inaba: Tottori, K. Yasuda s. n. (TNS). Prov. Hoki: Tomari-mura, Tohaku-gun, on *Pinus thunbergii*, Y. Ikoma 6029-a (TNS). China. Mantschuria: Lakeside of Penchihu, Y. Asahina 21 (TNS). Taiwan: Piyanan, Prov. Ilan, S. Kurokawa 744 (TNS); Lisan, Prov. Nantoh, S. Kurokawa 877, 878 (TNS); Mt. Tsutson-san, Mt. Ali, elevation 2300–2900 m, S. Kurokawa 136 (TNS); Mt. Nanfong, Kaoshiung Pref., elevation 800–1300 m, S. Kurokawa 2791, 2837 (TNS). Nepal. Gokarna, M. Watanabe 46, 52 (TNS). Indonesia. Java: Mountain Garden of Tjibodas, elevation about 1400 m, S. Kurokawa 2145, 2152 (TNS). U. S. A. Wisconsin: 3 miles north of Gotham, Richland Co., on bark of *Quercus*, W. L. Culberson 1970 (DUKE). Iowa: Fayette Co., Fink s. n. (US). Illinois: Cadiz, Hardin Co., M. E. Hale 13947 (US). West Virginia: 2 miles north of Brandywine, Pendelton Co., M. E. Hale 18543 (US). Virginia: Mile 10222, Blue Ridge Parkway, Bedford Co., M. E. Hale 19176 (US). Kentucky: near Oil Valley, Wayne Co., M. E. Hale 13360 (US). Missouri: near Radical, Stone Co., M. E. Hale 2459 (US). Kansas: Bateville, Woodson Co., M. E. Hale 4676 (US). Tennessee: Cliff Springs, Overton Co., Phillips s. n. (US). Arkansas: 8 miles south

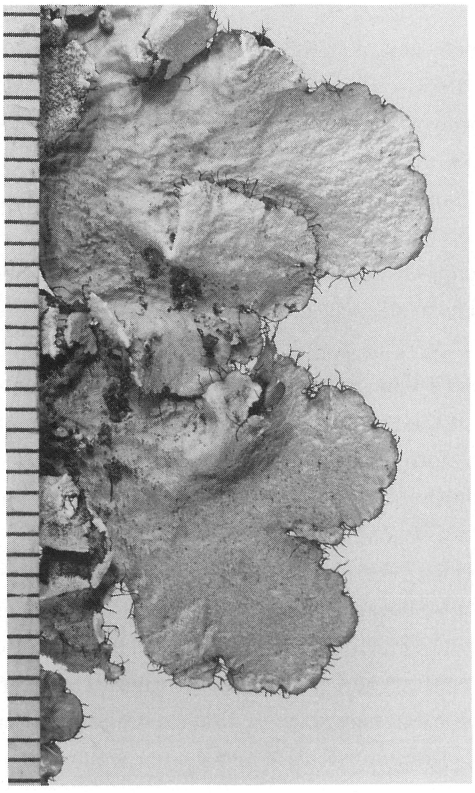

Fig. 5. Part of the thallus of *Rimeliella subtinctoria* (S. Kurokawa 1347). Scale indicates mm.

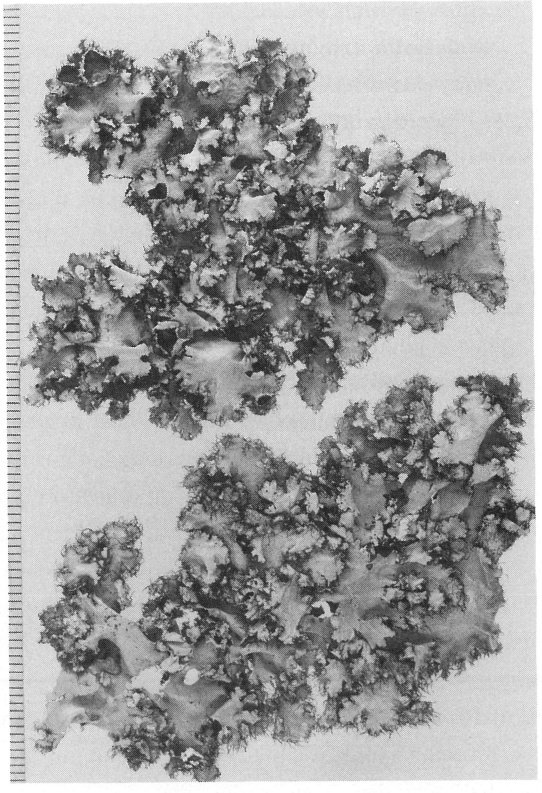

Fig. 6. *Rimeliella uruguensis* (L. Lagede Ximenez s. n). Scale indicates mm.

of Hollis, Perry Co., M. E. Hale 3095 (US). Oklahoma: Beaver Bend State Park, McCurtain Co., M. E. Hale 4929 (US). Texas: near Avinger, Cass Co., M. E. Hale 5265 (US). Arizona: Cave Creek, Chiricahua Mountains, Cochise Co., Weber & Shushan 8787 (US). Georgia: near Cleveland, White Co., M. E. Hale 7457 (US). Alabama: Pell City, St. Clair Co., M. E. Hale 7235 (US). Louisiana: near Shreveport, Caddo Parish, M. E. Hale 5620 (US). Mexico. Hidalgo: Jacala, Chase 7431 (US). Puebla: 3 km west of Puebla-Veracruz state line, on highway 150, M. E. Hale 21043 (US). Mexico: north of Acambay, Cain 27593 (US). Michoacan: 61 km northwest of Zitácuaro, M. E. Hale 20862 (US). Oaxaca: 132 km northwest of Oaxaca on highway 190, M. E. Hale 20826 (US, TNS). Union of South Africa. Transvaal: Punch Bowl Inn, north of Louis Trichardt, O. Almborn 6431 (US). Cape Province: Stormsriver, Humansdorp, O. Almborn 4128 (US).

Atranorin, norlobaridone, and loxodin are present but salazinic acid is lacking in the following specimens (representative).

U. S. A. Virginia: Brokenburg, Spotsylvania Co., M. E. Hale 15709 (US). Missouri: Aurora, Lawrence Co., M. E. Hale 2516 (US). Arkansas: Cove Lake, Logan Co., M. E. Hale 3452 (US). Texas: near Milano, Milam Co., M. E. Hale 5471 (US). Mississippi: Holly Springs, Marshall Co., M. E. Hale 7881 (US). Florida: on trunk of roadside *Carya illinoiense*, Walton Co., B. J. Moore (4862) & W. L. Culberson (DUKE). Mexico: Veracruz: northeast of Huatusco, M. E. Hale 19478 (US). Puebla: 3 km west of Puebla-Veracruz state line on highway 150, M. E. Hale 19616 (US). Chiapas: 50 km west of Tuxtla Gutiérez, M. E. Hale 19921 (US). Haiti. Summit of Montagne Noire, C. M. Wetmore 2735 (US). Jamaica. Blue Mountain, H. A. Imshaug 14789 (US).

Rimeliella uruguensis (Krempelh.) Kurok., comb. nov.

Parmelia uruguensis Krempelh., Flora **61** : 461, 1878 — *Parmotrema uruguense* (Krempelh.) Hale, Phytologia **28** : 339, 1974. Type collection: Cordova and Conception, Argentina, Lorentz & Hieronymus s. n. — holotype in M and isotype in US.

Parmelia dusenii Zahlbr., Ann. Mycol. **6** : 133, 1908. Type collection: Carmen de Patagones, Patagonia, Argentina, Dusén 158 — holotype in W.

Thallus loosely attached to twigs, 4–8 mm broad, olivaceous gray in the herbarium, lobes rotund, usually suberect, 5–15 mm wide, moderately to densely ciliate, cilia black, sometimes branched, 1–2 mm long; upper surface shiny, distinctly white-maculate, irregularly cracked with age, without isidia and soredia, occasionally with black cilia; medulla white; lower surface pale straw-brown with blackening center, short rhizinate to the margin, short rhizines often branched, more or less intricated, 0.3–1 mm long, long rhizines formed in groups near the center of lobes, coarse, often more than 1 mm long. Apothecia common, more or less stalked, to 11 mm in diameter, amphithecium ciliate, disc perforate, spores colourless, 5–7 × 9–13 μm.

Chemical ingredients. Atranorin and salazinic acid.

This species is easily confused with *R. subcaperata*, because these two species have similar thalli with no isidia and soredia, moderately to densely ciliate lobes, distinctly white-maculate upper surface, pale brown wide zone on the lower surface and dimorphous rhizines. However, *R. uruguensis* is clearly distinguished from the latter species by sparsely branched and more or less intricated short rhizines. Amphithecium of the apothecium is ciliate and the upper surface of the thallus is also occasionally ciliate in *R. uruguensis*.

Hale (1965) classified the present species under series *Ornaticolae* of subsection *Ornaticolae*.

However, this species is apparently a member of *Rimeliella*, because it has dimorphous rhizines, effigirate-maculate upper surface, lower surface papillate or short rhizinate to the margin, etc.

Hale (1965) considered this species was endemic to Argentina. However, Osorio (1970b, 1975, 1978) exclusively studied the present species in Uruguay. Consequently, the distribution range now includes Argentina and Uruguay.

Specimens examined. Uruguay. Artigas: Arrocera Conti., L. Lage de Ximenez s. n. (TNS). Colonia: Boca del Cufré, E. Alonso s. n. (TNS). Argentina. Santiago de Estero: Moreno, Highread 6.40 km west from Quimilí, A. Krapovickas & Cristóbal s. n. (TNS).

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摘　　要

日本でもよく知られているオオチヂレマツゲゴケ（*Rimeliella subtinctoria*）の仲間は，従来，ウメノキゴケ属（*Parmotrema*）の一つのシリーズとして扱われ，表面に顕著な白斑があり，裂片にシリアをつけ，裏面が広く淡褐色または褐色であることが特色とされてきた。これらの特色のほかに，仮根に２型があって，短い方の仮根には，地衣体を基物に固着する機能は認められず，Hannemann（1973）のいう rhizinomorph に相当するものと認められ，長い方の仮根は基物に固着するものがあって，ウメノキゴケ属の他の種の仮根と同じような機能をもつものと認められる。また，長い方の仮根は地衣体中央部近くで集団を作っていて，その状態はイワタケ属やカワイワタケ属の臍状体を思わせるものがある。この点では，オオチヂレマツゲゴケの仲間は，rhizinomorph と臍状体をあわせ持つアフリカ産の *Xanthomaculina hottentotta* に近縁のものと考えられる。また，短い方の仮根が裂片の先端近くまで密生している点や，網目状になることはないが，表面に顕著な白斑がある点は，マツゲゴケ属（*Rimelia*）にもよく似ている。こうした点を考慮して新属オオチヂレマツゲゴケ属（*Rimeliella*）を提唱し，必要な新組み合わせを作った。

Literature Cited

Hale, M. E., 1965. A monograph of *Parmelia* subgenus *Amphigymnia*. Contr. U. S. Nat. Herb. **36**: 193−358.

———, 1977. New species in the lichen genus *Parmotrema* Mass. Mycotaxon **5**: 432−448.

———, 1985. *Xanthomaculina*, a new lichen genus in the Parmeliaceae (Ascomycotina). Lichenologist **17**: 255−265.

———, 1986. New species in the lichen family Parmeliaceae (Ascomycotina). Mycotaxon **25**: 85−93.

——— & A. Fletcher, 1990. *Rimelia* Hale & Fletcher, a new lichen genus (Ascomycotina: Parmeliaceae). Bryologist **93**: 23−29.

Hannemann, B., 1973. Anhangsorgane der Flechten, ihre strukturen und ihre systematische Verteilung. Bibliotheca Lichenol. **1**: 1−123.

Krog, H. & T. D. V. Swinscow, 1981. *Parmelia* subgenus *Amphigymnia* (lichens) in East Africa. Bull. Brit. Mus. (Nat. Hist.), Bot. ser., **9**: 143−231.

Kurokawa, S., 1966. *Anaptychiae* and *Parmeliae*. *In* Hara, H. (comp.): The flora of eastern Himalaya 605−610.

———, 1969. On the occurrence of norlobaridone in *Parmeliae*. Journ. Hattori Bot. Lab. **32** : 205–218.
———, 1979. Enumeration of species of *Parmelia* in Papua New Guinea. *In* Kurokawa, S. (ed.): Studies on cryptogams of Papua New Guinea 125–148.
———, 1989. Species of *Anaptychia* and *Parmelia* collected in the Kathmandu area. *In* Watanabe, M. & S. B. Malla (eds.): Cryptogams of the Himalayas **1** : 155–160.
Osorio, H. S., 1970a. Lichens from Cantera, south Paraguay. Com. Bot. Mus. Hist. Nat. Montevideo **4** (50) : 1–3.
———, 1970b. Contribution to the lichen flora of Uruguay IV. Nova Hedw. **19** : 339–344.
———, 1975. Contribution to the lichen flora of Uruguay VIII. Additions and corrections. Com. Bot. Mus. Hist. Nat. Montevideo **4** (59) : 1–12.
———, 1978. Contribucion a la flora liquenica del Uruguay IX. Liquenes del Rio Uruguay al norte de Salto Grande. Rev. Fac. Human. Cien., ser. Cienc. Biol. **1** (4) : 49–56.
———, 1979. Contribution to the lichen flora of Uruguay XI. Lichens from Arazati, San José Department. Bryologist **82** : 472–473.
———, 1980. Contribution to the lichen flora of Uruguay XV. Additional records to the Rio Uruguay lichen flora. Phytologia **46** : 137–142.
Vinnem, B., 1975. *Parmelia* subgen. *Amphigymnia* in Ethiopia. Norw. Journ. Bot. **22** : 139–166.