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TWO LEPRARIOID LICHENS NEW TO SRI LANKA

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Abstract: A brief account of collections and literature pertaining to the lichens of Sri Lanka is followed by descriptions of *Lepraria atrotomentosa* Orange & Wolseley sp. nov. and the first Sri Lankan records of *Leproloma sipmanianum* Kümmerl. & Leuckert. *Lepraria atrotomentosa* is also reported from Japan.

Introduction

The lichen flora of Sri Lanka has been relatively well studied since G. H. K. Thwaites, Superintendent and later Director of the Botanic Gardens at Peradeniya, made collections during 1849–1880. Of the 196 species in his collection, currently at BM, described by LEIGHTON (1870), 43 species were new to science, including many Graphidaceae and Thelotremataceae. Subsequently, S. O. I. Almquist's collections in 1879 formed the basis of Nylander's *Lichenes Ceylonenses* (NYLANDER 1900). S. Kurokawa and M. Mineta collected mainly in montane forest in 1966 and 1968 and provided accounts of *Anaptychia* (KUROKAWA 1973) and the Parmeliaceae (KUROKAWA & MINETA, 1973). During the 1970s, M. E. Hale collected in lowland rainforest where access along logging roads allowed him to collect lichens from the canopy of giant dipterocarp trees. These collections resulted in regional accounts of *Relicina* (HALE 1980) and the Thelotremataceae (HALE 1981).

Following a botanical excursion from the University of Vienna in 1984, Brunnbauer compiled an account of the literature on lichens in Sri Lanka in 15 fascicles (BRUNNBAUER 1984–1987), including a checklist of 546 species together with synonymy. Further publications by MÖBERG (1986, 1987), AWASTHI (1991), MAKHIJA & PATWARDHAN (1992), BREUSS & BRUNNBAUER (1997) and VĚZDA *et al.* (1997) have brought the number up to 659 species.

While participating in a lichen workshop at Peradeniya University in 1999, the second author visited sites where lichen collections had been made by the third and fourth authors for extraction of secondary products (WILLIAMS *et al.* 1998). Specimens described in this paper were collected during the workshop and on subsequent occasions.

Taxonomy

The taxonomy of the persistently sterile, leprose lichens of the genera *Lepraria* Ach. and *Leproloma* Nyl. ex Cromb. has become much better known in the last 20 years, largely as a result of the use of thin-layer chromatography (TLC). The genera are morphologically simple, and TLC is often necessary for their identification to species level. Thus, *Leproloma* is distinguished from *Lepraria* by the presence of dibenzofurans related to pannaric acid. *Lepraria* is considered to be a form genus, comprising taxa of uncertain affinities. In contrast, *Leproloma* appears to be a natural taxon, despite an incorrect report of apothecia in this genus (TØNSBERG & JØRGENSEN 1997). Both genera are fairly well known in Europe, particularly as a result of work by LAUNDON (1989, 1992), TØNSBERG (1992) and LEUCKERT *et al.* (1995). *Lepraria* and *Leproloma* are often conspicuous taxa in temperate regions in microhabitats sheltered from direct rainfall, but *Lepraria* is rare in lowland tropical rainforest and appears to be restricted to montane habitats (WOLSELEY, unpublished data). Recently, however, two new species of *Lepraria* were described from montane forest in New Guinea (APTROOT *et al.* 1997).

Material and Methods

Specimens of *Lepraria* were collected in the upland area of Nuwara Eliya in Central Province on exposed, roadside, proterozoic gneiss and quartz schist. *Leproloma* was collected in Uva Province below Horton Plains on rather extensive areas of proterozoic rocks around Beragala.

Thin-layer chromatography, using solvent systems G and EA, was carried out according to the methods of WHITE & JAMES (1985). Images of the thalli were prepared using a JVC KY-F55B 3-CCD Colour Video Camera mounted on a Leica MZ8 stereomicroscope, and Neotech Image Grabber 24/PCI software.

Lepraria atrotomentosa Orange & Wolseley, sp. nov.

Thallus leprosus, pallide caesiogriseus, subtiliter granulatus, lobis parvulis infrequentibus instructus. Lobi usque ad 1.4 mm lati, c. 100 µm crassi, in pagina inferiore tomento fuscato vestiti. Granula thallina 60–200 µm diametro. Thallus acidum lecanoricum, zeorinum et atranorinum continens. Ascomata et coniomata ignota.

Typus. SRI LANKA. Central Province: Nuwara Eliya District, Ramboda, 07°03'30"N, 80°42'E, alt. 1700 m, on rocks and soil in road-cutting, 12.i.2000, V. Karunaratne, K. Bombuwala & S. Mendis [Holotype—BM; isotype—PDA].

(Fig. 1)

Thallus crustose, pale blue-grey, comprising mostly a leprose, finely granular crust, but with occasional short, fragile, poorly defined lobes up to 1.4 mm wide. *Lobes* c. 100 µm thick, with upturned margin forming an irregular rim 120–180 µm wide composed almost entirely of soredia-like granules, overlying a thin and indistinct layer of interwoven hyphae which are c. 2.5–3.5 µm wide, giving rise to ±downwardly-directed, thick-walled, dark grey to brown hyphae 3–4.5 µm wide; lower surface of lobes with dark bluish grey to dark brown tomentum, often

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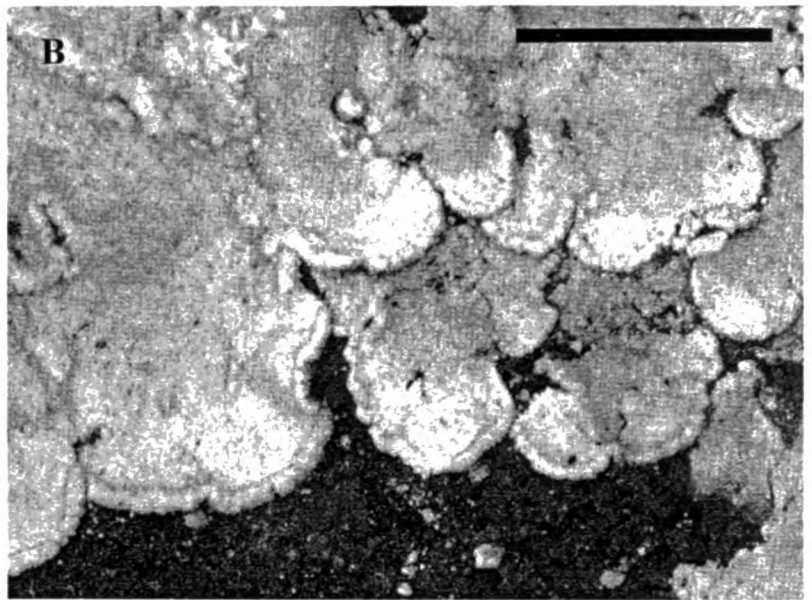
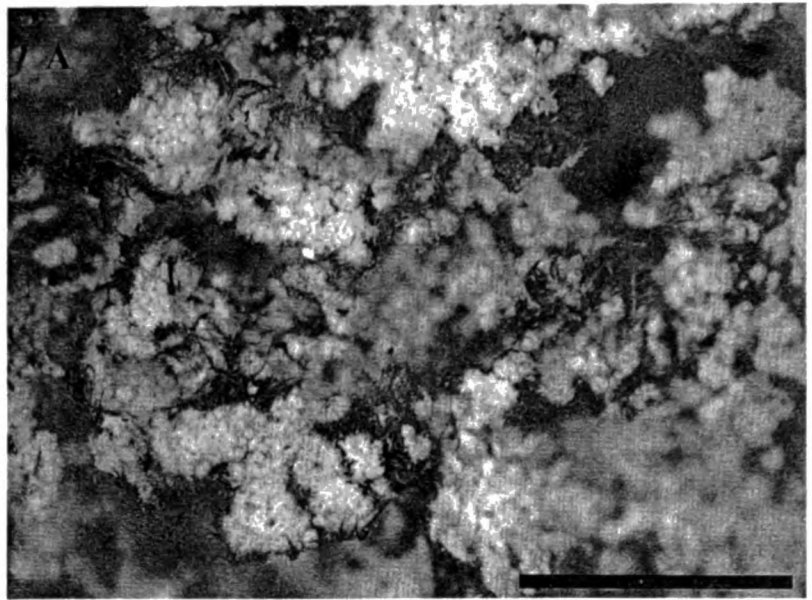


Figure 1: A, *Lepraria atrotomentosa* (holotype). Thallus with lobes and tufts of dark hyphae. Scale = 1 mm. B, *Leptoloma sipmanianum* (Bomhuwala et al., 12.i.1999, BM). Scale = 2 mm.

projecting slightly and visible from above; older parts of the thallus comprising a thin layer of living granules c. 100 µm thick, overlying dead granules matted together by dark hyphae. *Thallus granules* 60–200 µm diam., mostly without distinctly projecting hyphae, a few with hyphae projecting to c. 40 µm. *Soredia* without a distinct wall. *Photobiont* green; cells ±spherical, 6–15 µm diam., enveloped by branched hyphae with ±cylindrical cells 2–3 µm wide. *Ascomata and conidiomata* unknown.

Chemistry: Lecanoric acid, zeorin, atranorin. Acetone extract of thallus on filter paper K+ yellowish, C+ pink, PD+ yellow.

Notes: In general appearance, this species resembles a number of leprose, finely granular species including *L. incana* (L.) Ach. and *L. elobata* Tønsb. However, distinctive morphological features include the presence of weakly developed lobes and the copious production of dark hyphae from the underside of the thallus granules. When the lobes are not in close contact with the substratum, the dark hyphae form a well-developed tomentum on the underside; otherwise the hyphae ramify through the substratum. A distinct layer of dark hyphae also occurs in *L. nigrocincta* Diederich, Sérusiaux & Aptroot from New Guinea (APTROOT *et al.* 1997), but that species contains divaricatic acid. Lecanoric acid has not been previously reported in *Lepraria*.

The foregoing description applies to the Sri Lankan specimens only; however, the Japanese material has similar morphology and identical chemistry.

Ecology: The Sri Lankan specimens grow on damp and shaded, overhung rock surfaces and on soil sheltered from rain.

Additional specimens examined: —JAPAN. near Nikko, Karikomiko, alt. c. 1625 m, on mosses (mainly *Racomitrium diminutum*) over shaded acid rock, 4.ix.1983, M. R. D. Seaward (Herb. M. R. D. Seaward, NMW); 50 km SW of Hiroshima, Miyajima Island, on *Agies firma*, 9.ix.1983, M. R. D. Seaward (Herb. M. R. D. Seaward, NMW); Shōshenkyō, alt. c. 700 m, vertical granite face, 7.x.1987, M. R. D. Seaward (Herb. M. R. D. Seaward, NMW). —SRI LANKA. *Central Province:* Nuwara Eliya District, Ramboda, at side of main road to Nuwara Eliya, on partly shaded rock below forest, alt. 1500 m, 19.v.1999, P. A. Wolseley & K. Bombuwala (BM); Ramboda, 500 m from type locality, on rocks at roadside, alt. 1600 m, 4.xi.1999, V. Karunaratne, K. Bombuwala & S. Mendis RB-01 (BM, NMW).

Lepruloma sipmanianum Kümmerl. & Leuckert

In C. Leuckert & H. Kümmerling, *Nova Hedwigia* 52: 27 (1991).

Typus. SOUTH AFRICA. *Transvaal Province:* Pietersburg District, Soutpansberg Mountains, Llewellyn Farm, near Vivo, 13.i.1986, H. Sipman 19.839 [Holotype—B!].

(Fig. 2)

Thallus up to 20 mm diam. or becoming confluent with other thalli, grey-green, deep cream, ecorticate, forming a soft and fragile membrane that is appressed to the substratum. *Lobes* distinct, short, 0.1–2.6 mm wide, 120–200 µm thick, with a narrowly upturned margin which forms a distinct, raised rim 140–220 µm wide,

composed of colourless, branched and anastomosing, encrusted hyphae 1.5–2.5 μm wide; upper surface of lobes soft, \pm smooth, or with indistinct granules 20–80 μm diam.; older parts of thallus often somewhat wrinkled; surface of thallus with numerous coarse, soft granules 100–280 μm diam.; surface of granules without projecting hyphae, or with projecting hyphae to c. 40 μm long; lower surface of lobes with a sparse to dense, dark bluish grey to dark brown tomentum of grey to brown hyphae forming a hypothallus which is occasionally visible on the upturned margins of the lobes. Upper parts of lobes with clusters of algal cells loosely enveloped by hyphae, forming soredia-like masses up to 50 μm diam. *Hypothallus* comprising grey to brown hyphae that are thicker and less strongly branched than thallus hyphae, 2.5–4 μm wide, usually with thickened walls. *Photobiont* green; cells \pm spherical, 8–13 μm diam. *Ascomata* and *conidiomata* unknown. [Description applies to the Sri Lankan specimens only.]

Chemistry: Pannaric acid-6-methylester (major), oxypannaric acid-6-methylester (minor), traces of unknown substances including (?)anthraquinones. Acetone extract of thallus on filter paper K+ reddish brown, C+ yellowish, PD+ pink.

Notes: *Leproloma sipmanianum* was previously reported from South Africa, Colombia and Brazil (LEUCKERT & KÜMMERLING 1991). It is similar to *L. membranaceum* (Dickson) Vain., but the marginal lobes are neater in appearance with a less granular surface, and the upturned margin is better defined. The neat marginal lobes superficially resemble the squamules of *Normandina pulchella* (Borrer) Nyl. The hyphae comprising the thallus are slightly narrower than in *L. membranaceum* (2–3.5 μm), so that there is a greater differentiation between the thalline and hypothalline hyphae. Although the marginal lobes of *L. sipmanianum* are ecorticate, they are typically rather smooth and do not appear to be composed of granular propagules. Distinct and easily detached, soredia-like propagules are mainly confined to the mature parts of the thallus.

Leproloma sipmanianum is the only species of the genus known to contain anthraquinones (LEUCKERT & KÜMMERLING 1991), but they occur in smaller amounts than the dibenzofurans and were not definitely identified by TLC of the Sri Lanka material, although possibly detected as faint traces.

Leproloma membranaceum and *L. sipmanianum* form distinct marginal lobes, whereas the other two species, *L. diffusum* J. R. Laundon and *L. vouauxii* (Hue) J. R. Laundon lack lobes. *Leproloma sipmanianum* has a similar chemistry to *L. vouauxii*, thus forming a link between lobed and non-lobed members of the genus. All species contain dibenzofurans related to pannaric acid and are typically white to yellowish in colour, rather than the bluish grey found in some species of *Lepraria*, including *L. atrotomentosa*. However, taxa containing the dibenzofuran porphyritic acid belong in *Lepraria*.

There is a gradation in morphology within *Leproloma* from completely leprose to subsquamulose species. The thallus surface in *L. diffusum* and *L. vouauxii* is largely composed of functional propagules (soredia), whereas in *L. sipmanianum* well-defined soredia are mainly confined to the centre of the thallus.

Ecology: This species grows on exposed and well-lit, siliceous bed-rock with filamentous and other cyanobacteria and with sparse mosses.

Additional specimens examined: —SRI LANKA. *Uva Province:* Badulla District, Beragala, on rock face at Beragala junction on Badulla-Colombo road, 06°45'30"N, 80°54'30"E, alt. 1077 m, 28.v.1999, K. Bombuwala & P. Wolseley (NMW); *loc. id.*, 4.xi.1999, V. Karunaratne, K. Bombuwala & S. Mendis (PDA); *loc. id.*, 12.i.2000, K. Bombuwala, S. Mendis & S. Kathirgamanathar (BM); *loc. id.*, 3 km from the Beragala junction towards Haputale on Badulla-Colombo road, alt. 1100 m, 12.i.2000, K. Bombuwala, S. Mendis & S. Kathirgamanathar (PDA); *loc. id.*, 5 km from the Beragala junction towards Haputale on Badulla-Colombo road, alt. 1150 m, 12.i.2000, K. Bombuwala, S. Mendis & S. Kathirgamanathar (NMW). —BRAZIL. Rio de Janeiro, Rostinga südlich der Stadt, 2.xi.1952, F. Mattick 1613 (B).

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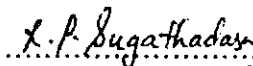
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