

# Australasian Lichenology

Number 41, July 1997

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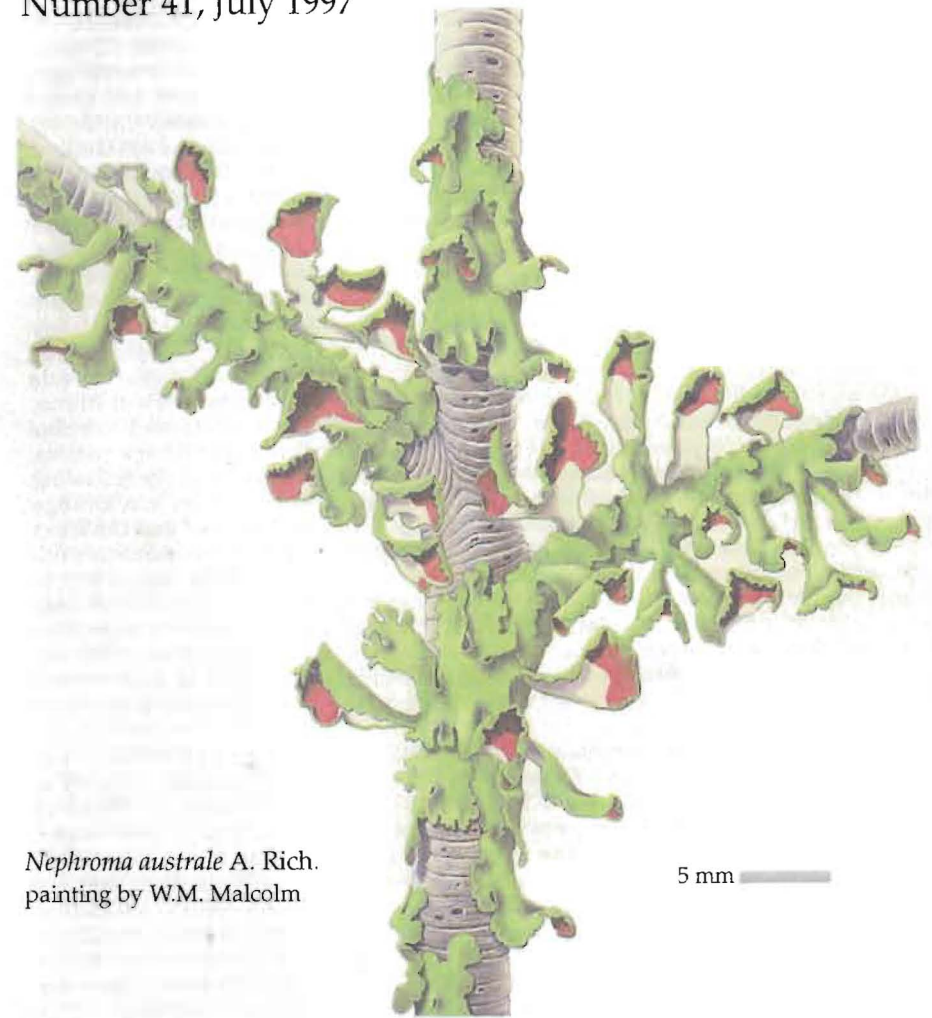
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*Nephroma australe* A. Rich.  
painting by W.M. Malcolm

5 mm

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## Austrian Botanists visit Tasmania

Helmut Mayrhofer, Martin Magnes, and Christian Scheuer  
Karl-Franzens-Universität Graz, Austria

"Austrian Botanists Visit"—This was the headline of a small note in Hobart's *The Saturday Mercury* of November 9, 1996, with the following information: "Twenty botanists from Austria will arrive in Tasmania on Tuesday for a two-week visit. The party includes teaching and research staff and post-graduate and senior undergraduate students from the Botany Department of Karl Franzens University, Graz. The Tasmanian Herbarium, part of the Tasmanian Museum and Art Gallery, is host for the visit". Indeed, on Tuesday (12.11.) late morning, 20 people from the University of Graz in Austria arrived at Hobart airport after a long but pleasant flight with the Australian National Airline QANTAS. Everybody was tired after more than 30 hours of travel via Frankfurt, Bangkok, Singapore, and Melbourne, but happy that no luggage had been lost nor bottles broken during plane-changes. The party consisted of 16, mainly senior, undergraduate students (Elisabeth Baloch, Margret Dabernig, Barbara Emmerer, Pramodchandra Harvey, Monika Heftberger, Andreas Joham, Helmut Kammerer, Harald Komposch, Harald Krenn, Markus Möslinger, Eveline Neubauer, Gerhard Prenner, Johannes Prügger, Ursula Suppan, Ulrike Trinkaus, and Alois Wilfling) plus four scientists (Paul Blanz, Martin Magnes, Helmut Mayrhofer, and Christian Scheuer). Gintaras Kantvilas of the Tasmanian Herbarium, who organized an outstanding scientific programme, picked up the 20 jet-lagged and tired people. The first afternoon and the following morning were set aside so that we could rest up and orient ourselves in a strange country where, for example, the traffic is driving on the "wrong side" and the stars in the sky are completely unfamiliar. We also bought books on Tasmanian wildlife, maps, and those unavoidable souvenirs like canvas crusher hats (a good way to mark yourself as a tourist in Tasmania at this time of year) or cuddly stuffed wombats. Coming from cool late autumn in Central Europe, we were expecting fine and moderate spring weather, but we encountered an altogether different reality during the following 12 days, which made it much easier to understand the severe conditions flora and vegetation are exposed to on a southern island in the roaring 40s.

We began the official programme on Wednesday afternoon (13.11.) with a visit to the Tasmanian Herbarium. There we had the pleasure of meeting the staff of the herbarium and the authors of *The Students' Flora of Tasmania*, Dr. Winifred M. Curtis and Dennis I. Morris, who told us that we can look forward to a second edition of this opus. We admired the three oldest specimens kept in the Tasmanian Herbarium, the extremely useful and very handy reference herbarium that we consulted more than once during the next days (we would really like to have such a thing for our regional flora in Steiermark), and finally some mycologists almost got lost, deeply immersed in the boxes of the Rodway Collection. Then we were taken on a guided tour through the Tasmanian Museum and Art Gallery, where we looked at historic buildings and the well-presented historic collection of the museum, followed by a reception given by the Director, staff, and Trustees of the Tasmanian Museum and Art Gallery. Most of the Austrians, coming from a country which has no access to the sea, have never tasted such a variety of seafood as we were offered at the buffet. Thanks to Mrs. Patricia Sabine, director of the Museum, and the staff and Trustees for this extremely warm welcome which we had never expected.

Thursday (14.11.) Typical Tasy weather (cool, with showers and very windy) accompanied us on our first field trip to forests in the Arve and Huon Valleys of the Hartz Mountains, where John Hickey (Forest Conservation and Biology Branch, Forestry Tasmania) introduced us to various examples of forest management. First of all, we were impressed by those tall trees of *Eucalyptus regnans* and *E. obliqua*, and by the tree fern *Dicksonia antarctica*—it looked familiar, but I think that most of us have seen such things before only on old-fashioned teaching posters with reconstructions of palaeophytic vegetation. The epiphytic fern *Tmesipteris obliqua* was another typical textbook zombie that came to life for us in these forests. One of the more energetic students insisted on walking through a dense stand of *Gahnia grandis* below the Zig Zag Walk, just for fun and to verify the stories about the terrestrial leeches in Tasmania. Forest management by burning, and reforestation by sowing seeds, are more or less unknown in temperate Europe, and we were stunned by a vast burnt area with gigantic eucalypt stumps, charred *Dicksonia* trunks with small green fronds already peeping out the top, and only two pioneer species of bryophytes covering the burnt ground. The botanical highlights of the riparian rainforest along the Huon river in the Tahune Forest Reserve included the rare *Lagarostrobos franklinii* (the Huon pine), *Cenarrhenes nitida* in flower, but also two fungal parasites of *Nothofagus cunninghamii*, the ascomycete *Cyttaria gunnii* with its decorative globose fruiting bodies, and the rather destructive hyphomycete *Chalara australis*. On the road close to Warratah Lookout, we came into contact with snow for the first time on this trip—we tried to study subalpine woodland with *Nothofagus cunninghamii* and *Richea pandanifolia* during a snowstorm.

Friday (15.11.) With some relief, we had fine weather on our trip to the east, passing Wielangta Forest, imposing tall wet sclerophyll forests with *Eucalyptus regnans* and *E. globulus*, with a dense understorey of various tall shrubs, e.g. the beautiful *Bedfordia salicina* in full bloom and the rare *Beyeria viscosa* (Euphorbiaceae). Around Robertsons Bridge, we explored a small relict rainforest in a gully. Although not many of the taller species of rainforest trees occur in this gully, we were shown that almost all typical rainforest epiphytes (ferns and bryophytes) are present in this tiny area. Then we visited Mayfield Beach for lunch and a look at some of the larger brown seaweeds (e.g. *Durvillea potatorum*), before entering an area covered with many square miles of dry sclerophyll forest. Now, different from the impressive maze of tangled unfamiliar species in the dark rainforest and in the understorey of the wet sclerophyll forests, the more open vegetation (and the fine weather) made it easier for all of us to appreciate the beauty and diversity of the Tasmanian flora. We admired the flowers of *Banksia marginata*, *Melaleuca pustulata*, *M. squamea*, *Stackhousia monogyna*, *Pimelea nivea*, *Burchardia umbellata*, and many others. We saw the "black boys" (*Xanthorrhoea australis*) and the delicate young twigs sprouting from dormant buds under the charred bark of the eucalypt trunks, impressive examples of adaptation to frequent fires, demonstrating the enormous ecological importance of fire in this type of vegetation. We saw many more shrubs and herbs in flower along the road, sometimes wondering why we should not stop at such occasions and why our guides (Gintaras, Fred Duncan, and Stephen Harris) kept us moving. We realized why when we reached Hardings Falls Forest Reserve with its picturesque landscape. All the plants we had seen along the road were in flower along the path down to Hardings Falls. *Veronica formosa*, *Bauera rubioides* (pink form), *Correa reflexa*, *Pelargonium australe*, and others rewarded us for our patience, including saxicolous lichens such as *Poeltiaria coromandelica* and *Rinodina thiomela*. We reached our motel at Swansea just as daylight was fading. It had been a glorious day, especially for plant photography.

Saturday (16.11.) Fine weather again and another photographers' day on our trip to the Freycinet Peninsula, where we were guided by Gintaras and Stephen Harris. First we took the Wineglass Bay Track from Coles Bay to Wineglass Bay. We studied open woodland (dominated by *Eucalyptus tenuiramis*, *E. amygdalina*, and *Allocasuarina* spp.) and its understorey on granite (including several interesting lichen species such as *Cladia retipora*, *Flavoparmelia haysonii*, *Leioderma duplicatum*, *Parmelia signifera*, *Relicina limbata*, and *Teloschistes spinosus*). Botanical highlights along the trail included *Calytrix tetragona* and *Kunzea ambigua* (Myrtaceae), *Drosera peltata* and *D. pygmaea*, the twining parasite *Cassytha pubescens* (Lauraceae), and the orchid *Dendrobium striolatum*. Towards the end of Wineglass Bay Track we started to mix up all those smallish leguminose shrubs with yellow flowers.

We continued on the Isthmus Track to Hazards Beach, walking along a transition from open woodland to coastal scrub and sedgeland. Fortunately, the coastal dune was not yet invaded by *Ammophila arenaria*, but mainly stabilized by the native grass *Spinifex sericeus* and the decorative *Carpobrotus rossii*. Besides all the interesting plants (*Callitris rhomboidea*, *Lomatia tinctoria*, *Leucopogon parviflorus*, *Thryptomene micrantha*, *Pattersonia fragilis*, *Xyris operculata*, etc.), we found numerous deposits of oyster shells half-buried in the sand along the path. We learned that these are heaps of prehistoric rubbish, left behind by Tasmanian aboriginal people a long time ago.

Sunday (17.11.) The bad weather reached even the east coast while the party was visiting coastal heath and higher shrubland near Friendly Beaches Lookout and another patch of tall open dry sclerophyll forest on dolerite on the southern border of Douglas Apsley National Park. On the way to and around Apsley Gorge Lookout, we found *Gonocarpus teucrioides* (Haloragaceae), the rare endemic *Gyrostemon thesioides*, and impressive trees of the parasitic *Exocarpus cupressiformis*. In spite of the rain, we enjoyed the view down to the Apsley river, with numerous trees of the conifer *Callitris rhomboidea* along the banks.

Before travelling back to Hobart, we switched to applied botany and visited the Freycinet Vineyard in order to taste the local grape and to buy a few bottles. On our way back to Hobart we viewed the grazed land of sheep farms from the bus. Many plants in this sort of grassland were introduced from temperate parts of the northern hemisphere, and therefore were much more familiar to us. Even some of the typical weeds of grazed land were introduced, e.g. *Ulex europaeus*, *Senecio jacobaea*, and *Rumex acetosella*. One of the more palatable native grasses, *Themeda triandra*, has become rare because of selective grazing by sheep.

We completed the day with some zoology in the Bonorong Wildlife Park near Brighton, feeding the kangaroos and wallabies, petting the koalas, not petting the Tasmanian devils, and gazing at some representatives of nocturnal Tasmanian wildlife in a darkroom (by the way, here is another of Murphy's Laws: Joey sticks its head out of the pouch only as long as the finger of the photographer does not come anywhere near the trigger).

Monday (18.11.) Morning and lunchtime at the Botanic Gardens, including a guided tour by Dr. Leonie Scriven, and a talk on public activities of the Botanic Gardens in education and environmental issues. In the afternoon we visited the Department of Plant Science of the University of Tasmania. Professor Bob Hill introduced us to "Phylogeny and History of Southern Hemisphere Floras" in his crisp and stimulating lecture, and Dr. René Vaillancourt gave us an overview of his molecular studies on the fascinating endemic *Lomatia tasmanica*, a species in which the single existing population is probably a clone that has survived and spread only vegetatively during the last 40,000 years.

Tuesday (19.11.) Start of a three-day excursion to southwest Tasmania and the Mt. Field area under the guidance of Gintaras, assisted by Lynn Cave. At Peppermint Hill Forest Reserve west of New Norfolk, we viewed the last patch of dry sclerophyll vegetation with many interesting species in flower (e.g. *Tetratheca labillardierei*, *Gonocarpus micranthus*, and the tiger orchid *Diuris sulphurea*) and lichens on bark as well as on the ground (*Candelariella xanthostigmoides*, *Hafellia dissia*, *Heterodea muelleri*, *Parmelina pseudorelicina*, *Pyrrhospora laeta*, *Rinodina asperata*, etc.) before entering the spectacular world of tall eucalypt forests, cool temperate rainforests, and buttongrass moorlands. The rest of the first day was devoted to rainforests. From Lady Binny Corner in Florentine Valley, we staggered on the dark and slippery ground under a callidendrous rainforest, with huge trees of *Eucalyptus obliqua* towering over *Nothofagus cunninghamii*, *Atherosperma moschatum*, and *Phyllocladus aspleniifolius*, with *Dicksonia antarctica* dominating the undergrowth. Everything was saturated with moisture, while the dead fronds of *Dicksonia* were covered by fructifications of microfungi, and dead and living trunks carried large polypores and foliose lichens (e.g. *Pseudocyphellaria billardierei*, *P. glabra*, *Stictia stipitata*, etc.). This must be one of the paradises on earth, especially designed and created for lichenologists and mycologists.

Along Scotts Peak Road, we stopped to experience implicate and thamnisc rainforests, at first trying to clamber through an over-dimensional thicket of densely interwoven, not-very-upright trees, e.g. *Agastachys odorata* and *Anodopetalum biglandulosum*, the famous "horizontal" (this should not be called a "forest"!); then we took the equally impressive but much more convenient "Creepy Crawly Nature Trail". After some more rainshowers, we were glad to arrive at the small motel in Maydena, and enjoyed the fine food served by a German waitress and the stories of the German host.

Wednesday (20.11.) The weather was not promising, but this day we were supposed to view extensive areas of buttongrass moorland, with several stops along Scotts Peak Road to Red Knoll Lookout, south of Lake Pedder. Frequent showers, interrupted by short sunny periods, and very cold winds—field conditions common for much of the year—made the fieldwork not very pleasant. The first example of buttongrass moorland, characterized by *Gymnoschoenus sphaerocephalus* (Cyperaceae), showed us also a great variety of other grass-like plants, e.g. *Restio hookeri* and *Empodisma minus* (Restionaceae), some smaller shrubs, e.g. *Bauera rubioides* (white form) and *Sprengelia incamata*, and lichens on the ground among the higher plants, such as *Cladia moniliformis* and *Siphula decumbens*. The vegetation around Red Knoll Lookout did not look very promising at first, but the plants were merely smaller than before—we soon found the extraordinary *Haemodorum distichophyllum*, the tiny *Sprengelia distichophylla*, and many others including *Siphula jamesii*. Then we continued through this fascinating landscape, stopping at another piece of buttongrass moorland with copses dominated by *Banksia marginata* and young eucalypt trees, and along a roadside with photogenic specimens of *Telopea truncata*, *Oxylobium ellipticum*, gigantic tussocks of *Gahnia grandis*, and still undescribed *Cladia* species.

On the way back to Maydena, we decided to walk up to the Needles in order to study the changes of vegetation patterns around the timberline. We did not mind the steep and slippery path, but we could not make it to the top of this mountain ridge, ending up in a heavy snowstorm that covered everything (students, supervisors, and plants). Once again, Austrian students impressed our local guides by continuing to take notes even under rather harsh conditions. Adding up all those drenched notes, we managed to record quite a complete list of all those interesting plants we saw along the path, e.g. *Persoonia gunnii*, *Dracophyllum milliganii*,

and *Anemone crassifolia*. We observed the transition from *Eucalyptus nitida* to *E. vernicosa*, but finally had to accept that in this strange part of Tasmania the timberline is defined with the help of buttongrass.

By the evening we were back in Maydena, enjoying the open fire in the lounge, drying our wet clothes, having some drinks, and discussing the programme of the previous and following days, after having managed to collect enough money to pay for food and accommodation (no credit cards accepted).

Thursday (21.11.) Everybody was very keen to view the alpine flora and vegetation on Mt. Field, but the forests around Maydena were already covered with snow. The road to Mt. Field was open only to vehicles with snow-chains! While waiting for further news about the condition of the road, we explored yet another thamnian rainforest (*Anodopetalum*-type) along the Lyrebird Nature Walk, dominated by *Eucalyptus delegatensis*, *E. johnstonii* (a yellow gum), *Atherosperma moschatum*, *Nothofagus cunninghamii*, and *Anodopetalum biglandulosum* covered with bryophytes and lichens (e.g. *Bunodophoron* spp., *Leifidium tenerum*, *Pseudocypbellaria* spp., *Metus conglomeratus*, *Sagenidium molle*, etc.) Eventually our driver managed to reach the parking area at Lake Dobson. The subalpine woodland along Pandani Grove Nature Walk was covered by 25 cm of fresh snow, and the *Richea pandanifolia* were wearing impressive white caps. Nevertheless, Gintaras, Lynn, and Alex Buchanan were able to show us several of the typical shrubs and trees partly hidden under the snow (e.g. *Eucalyptus coccifera* and *E. gunnii*, and the interesting conifers *Athrotaxis cupressoides*, *A. selaginoides*, and *Microstrobos niphophilus*). Lastly, Gintaras collected *Isoetes gunnii* from the icy water, before we drove back to Lake Fenton in order to view another stand of subalpine woodland with *Nothofagus gunnii*. There we were rewarded for our efforts with a little bit of sunshine that even lasted until the end of the next stop at Russels Falls. The twigs and branches of *Nothofagus cunninghamii* below the waterfall were heavily infested by fruiting bodies of *Cyttaria gunnii* at all stages of development. We reached our cosy base, the Regent Park Hotel in Hobart, in the cold evening (freezing 5°C!).

Friday (22.11.): The upper part of Mount Wellington was covered with snow, and the road to the top was closed. Instead of studying alpine plants, we decided to explore the flora and vegetation along Pinnacle Track, in order to view the transition between dry and wet sclerophyll forests with its interesting understorey, under the supervision of Gintaras and Lynn. The diversity of eucalypt species along this path is impressive, but most of us were intrigued by *Hakea lissosperma* that was in full bloom all over the slope. Again, the more open vegetation along the path and the acceptable weather enabled us to find many interesting plants that we had not seen before (e.g. *Richea dracophylla*, *Tasmania lanceolata*, and two remarkable Asteraceae, *Senecio linearifolius* and *Brachyglottis brunonis*, plus the lichen *Dibaeis arcuata* on soil). At lunchtime, when the road was open again, we drove briefly to the snow-covered summit in order to view the bay of Hobart before driving back to the city. Farewell speeches were made in the bus throughout the 45-minute ride back to the city. Then we all dispersed in Hobart, arranging and packing the specimens in the Herbarium, or buying the last gifts. In the evening, we had a joint meal in a nice restaurant, where the waitress became a bit concerned about our strange habit of everyone's clicking glasses with everybody else from our party ("They don't smash them, do they?"). No worries, it is just a way to keep thirsty souls from drinking too quickly. Then we paid a last visit to a bar, the last hours before leaving a marvellous country in the early morning, travelling back home via Melbourne and Sydney on Saturday (23.11.).

Many, many thanks to Gintaras and his team for their generous support and the perfect organization of an outstanding scientific programme covering the main vegetation types of Tasmania. In addition to the usual floristic approach, Gintaras and his colleagues taught us to understand the important factors influencing the ecology, distribution, and occurrence of the plants and vegetation types we have seen during our excursion. We have never experienced such a well-organized event before, and this is definitely due to the excellent preparation, supervision, and guidance by Gintaras. It has proved once again that herbaria do not function as lifeless collections of dried specimens stored for posterity, but as centres in the first line of scientific work and communication. Without the facilities and coordinating functions of the Tasmanian Herbarium, including the know-how of the staff, such a marvellous and stimulating (in both directions) field trip would not have been possible.

Thanks also to our students and to Paul Blantz, who have done their very best throughout the excursion and also during the preparation seminar. The "yellow book" was admired by our Tasmanian colleagues, and it is a pleasure to pass this compliment on to our students, who have contributed a lot of time and effort for the compilation of this excursion guide.

We are also indebted to the authorities of the University of Graz for their support in various ways, especially for financial contributions to the travelling costs, and to the Parks and Wildlife Service of the Department of Environment and Land Management (Hobart) for permits to collect plant material from reserved land.



The Austrian botanists' party with the team of the Tasmanian Herbarium: Lynn Cave (third row left near Christian, Helmut, and Martin), Alex Buchanan (top right, behind Paul Blantz), and Gintaras Kantvilas (front) in a snow-covered subalpine woodland near Lake Fenton (Mt. Field National Park).

Additional lichen records from New Zealand 25.

*Calenia microcarpa* Vězda

Barbara Polly

Museum of New Zealand Te Papa Tongarewa  
Box 467, Wellington, New Zealand

*Calenia microcarpa* Vězda, *Folia Geobotanica et Phytotaxonomica* **14**, 55 (1979).

The thallus is crustose, thin, and white, and measures up to 3.5 mm in diameter. Plentiful white hairs appear on all specimens collected to date in New Zealand, but the species is reported from elsewhere with few or no such hairs (Hartmann 1996, Santesson 1952). The apothecia are deeply sunken in thalline warts which leave the white pruinose disk exposed. The asci are single-spored. The ascospores are ellipsoid, slightly curved, and muriform, and measure  $42\text{--}50 \times 20\text{--}22 \mu\text{m}$ .

This is the first time that a species of *Calenia* has been found in New Zealand, although the genus is widespread in tropical America and the Pacific. *Calenia* is predominately a genus of foliicolous lichens.

SPECIMEN EXAMINED

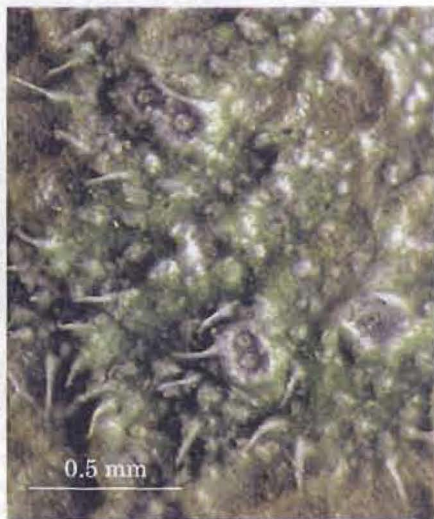
•North Island, South Auckland, Lake Okataina, western walkway, end of Miller's Road, on leaves of *Beilschmiedia tawa*. NZMS 260 U16:057330,  $38^{\circ}09'S$ ,  $176^{\circ}22'E$ , *B. Polly*, 6.x.1996 (WELT 5502), det. A. Vězda.

Acknowledgments

I wish to thank A. Vězda and R. Lücking for assistance with the identification.

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Santesson, R (1952): Follicolous lichens I, a revision of the taxonomy of the obligately foliicolous lichenized fungi. *Symbolae Botanicae Upsalienses* **12**, 1–590.  
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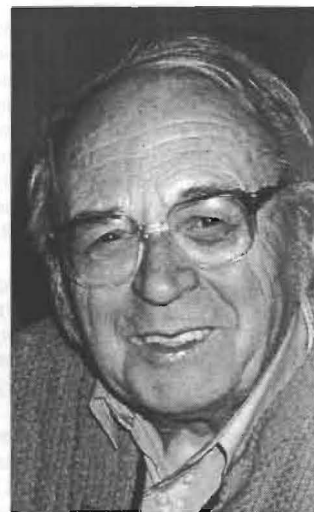
ILLUSTRATIONS: WM MALCOLM

ANNOUNCEMENT

A new society—The Society of Australian Systematic Biologists

A new society has been formed in Australia to represent and foster the interests of systematics and systematists. It encompasses the broad interests and activities of those working in the areas of taxonomy, phylogenetics, biogeography, and evolutionary biology, and covers all groups of organisms, but with specific reference to those in the Australasian region. The Society operates by e-mail only, and has *no membership fees*. To join, please send your full name, postal address, taxon group or interests, e-mail address, and phone and fax numbers to the Society's Secretary Dr David Morrison <davidm@iris.bio.uts.edu.au>. Details about the Society and its inaugural conference, to be held in Adelaide 29 September – 3 October 1997, can be found on the Society's home page <<http://www.science.uts.edu.au/sasb/>>.

PERSONALIA



PHOTOS: NANCY MALCOLM



Antonín Vězda visited New Zealand with Fausto Ceni for three weeks in April. They spent a week in the Nelson area, and then toured the South Island with Bill and Nancy Malcolm. Communication was sometimes difficult but always entertaining, an eclectic mix of English, German, and Latin.

During his distinguished career, Antonín has authored over 550 lichen names, including more than 25 genera and 320 species new to science. He is an honorary member of lichen societies in Britain and Italy, and the International Association for Lichenology in 1992 awarded him its prestigious Acharius Medal. The journal *Bibliotheca Lichenologica* in 1995 dedicated a volume to him—Band 58, *Scripta Lichenologica*, edited by Edit Farkas, Robert Lücking, and his long-time colleague Volkmar Wirth. His large personal herbarium is particularly important for foliicolous taxa, and over the years he has issued thousands of exsiccata. Fausto recently published over 100 marvellous close-up colour photographs of lichens in Nimis *et al.*'s *Licheni e Conservazione dei Monumenti* (CLUEB, Bologna).

## Aquatic pyrenolichens in New Zealand 1, distribution and habitats

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Pyrenolichens (or pyrenocarpous lichens) are lichens which produce their ascospores within flask-shaped perithecia, in contrast to the more familiar disc-shaped apothecia of discocarpous lichens. Pyrenolichens are mainly crustose, found sometimes upon bark or leaves, and more often as pale to dark stains on rocks. They are recognisable in the first instance by their ascomata, which may be small spheres upon the thallus or, if immersed, as bumps with a tiny central pore, the ostiole, through which the spores are released.

Many pyrenolichens are to be found along inland waterways, on stones as well as *in situ* rock on the beds and along the banks of streams, rivers, and lakes. Depending on the intensity and frequency of abrasion and upheaval by floods, these habitats can hold a rich lichen flora. Some discolichens occur here, but it is pyrenolichens which tend to dominate these habitats, as closely appressed rosettes or coalescing mats, often black or brownish in colour but also in various shades of green, greenish-white, or even pinkish. Some grow where they are permanently submerged, others tolerate an alternation of submersion and exposure to air, and others extend away from the water's edge to grow also on rocks in adjacent moist, shady environments.

Our preliminary studies of New Zealand aquatic pyrenolichens are revealing previously undescribed taxa, as well as new records of lichens previously known from other regions. In Part 1 of this article we summarise our findings to date on distribution and habitats. Part 2, to be published later, will provide an identification key. We hope these might stimulate others to make further collections, especially in the North Island.

Table 1 lists all freshwater aquatic pyrenolichens currently known from New Zealand, and tabulates occurrence of those species recently collected by one of us (PNJ), mainly in the southern half of the South Island. The collection sites (Fig. 1) are grouped within four somewhat arbitrary habitat types to reveal possible patterns of distribution. In the following notes, emphasis is placed on describing the general environment, substrata, conditions of moisture and inundation, and extent of disturbance (or lack of it) from flooding, sedimentation, and abrasion, as these particularly influence pyrenolichen presence and abundance.

### Lowland river and lake margins

Site A = Southland, Gore, Mataura River: 70 m altitude, greywacke rock and stones along bank of large, flood-prone, sometimes silty river, in full light.

Site B = Fiordland, Lake Te Anau: lake shore, in very high rainfall environment (c. 3000 mm annually), on stable sandstone boulders and rocks just below lowermost root zone of beech forest, and beneath shade of overhanging branches, at and just above mean lake level (202–203 m), an elevation which can be either submerged or above water level for several months at a time.

### Lowland forest streams

Shaded forest streams and damp gullies, altitudinal range 5–300 m, constant humidity.

Site C = Wellington Harbour, Somes Island: south-aspect coastal bank under shrubs, a grotto moistened by freshwater seepage, with pyrenolichens on slippery greywacke faces and on splash-moistened stone chips of small talus fan.

Site D = Otago Peninsula: steep stream, often just a dribble, within low native forest remnant, with pyrenolichens upon the 1 m-wide basalt bed, and on the crests of scattered boulders, both in the stream bed and protruding from the adjacent forest floor.

Site E = Dunedin, Leith Valley, and Site F = Bethunes Gulley, a tributary stream: permanent streams 1–4 m wide, beneath a canopy of broad-leaved trees, the stream beds with polished basalt stones and boulders to 1 m diameter, subject to periodic spates which overtop the largest boulders. Pyrenolichens grow close to normal water level on those rock faces least prone to abrasion, but become more abundant upon streamside boulders. They gradually give way to bryophyte dominance further away from the stream and on the downstream side of boulders.

Site G = Wellington, head of Akatarawa Valley, on rounded greywacke boulders beside stream in deeply shaded ferny forest gully.

Site H = north Otago, Trotters Gorge: on the more firmly embedded schist and greywacke stones within gravelly bed of gentle stream 3–5 m wide flowing beneath partial shade of *Kunzea* and *Sophora* forest in bed of a small gorge flanked by sandstone bluffs.

### Montane grassland streams

Streams in full light in tussock grassland settings, 400–900 m altitude.

Sites I and J = inland north Otago, Three O'Clock and Nenthorn Streams: gentle streams incised in small gorges in rolling grassland landscape, the streams 1–3 m wide, comprising an alternation of humic-stained pools with sills of schist bedrock. Rainfall relatively low (c. 600 mm annually); flooding infrequent and carrying only a small bedload of gravels. Pyrenocarps are especially common on rock close to waterline, extending upslope where stream-splash occurs, and also permanently submerged on the least mobile stones on shallow pool floors.

Site K = central Otago, Old Man Range: on schist stones in a steep permanent stream 0.5 m wide, typical of those which run down the tussocky flanks of inland Otago ranges.

Site L = NW Otago, Dart Valley: on schist pebbles submerged in permanent stream 0.4 m wide, only slightly incised, descending across grassy toe-slope in floor of mountain valley. This site illustrates one type of habitat where pyrenolichens are abundant, in contrast to their paucity in larger, more flood-disrupted streams and rivers in the same vicinity.

Site M = Fiordland, head of Borland Valley: gneiss flanking a steep mountain torrent near treeline, subject to seasonal snow avalanches and to almost waterfall conditions at times of heavy rain, yet with little sediment load.

## Alpine streams

Streams near crests of Otago block mountains, at 1000–1800 m altitude; 0.3–1.5 m wide, meandering through or emerging from peatland, snowbanks, or alpine herb-field. These are streams of relatively constant flow and low sediment load, with pyrenolichens common on submerged schist stones of pools, and on bedrock margins. Over winter months they will be frozen and snow-covered. Site N = Garvie Mountains (Fig. 3); Site O = Rock and Pillar Range; Site P = Remarkables Range; Site Q = Dunstan Range; Site R = Old Man Range; Site S = Pisa Range (Fig. 2).

## Distribution patterns and habitat preferences

The number of pyrenolichens recorded at collection sites ranges from 1 to 6. Table 1 indicates a tendency for species of *Anisomeridium*, *Porina*, and *Strigula* to be more characteristic of lowland sites, while *Verrucaria* spp. become more prominent at higher altitudes (Fig. 2). This pattern is not unexpected, for a comparable relationship is known to occur generally within these genera from warmer to colder latitudes.

A few species exhibit a very broad altitudinal range, notably *V. rheitrophila* (100–1800 m). Species most frequently associated with lowland shaded streams are *Anisomeridium carinthiacum*, *A. laevigatum*, *Porina guentheri*, *P. leptalea*, *Strigula johnsonii*, *S. aff. stigmatella* and *Verrucaria hydrela*. In montane streams, the most frequent species are *V. phaeoderma*, *V. margacea*, and *V. austroschisticola*, the latter two species (Fig. 3) along with *V. rheitrophila*, *V. sp.* (undescribed), and *Staurothele fissa* are those most likely to be found in alpine streams.

Our Table 1 classification of species as either facultative or obligate aquatics is preliminary and simplified. On some stream and river margins, zonation patterns are evident; for example, on the Mataura River banks, *V. fiordlandica* forms a pinkish band above a black zone, more frequently submerged, of *V. aquatilis*. Further study would reveal a gradation, by species, of tolerance to submersion. Nevertheless, it is obvious that many pyrenolichens are able to tolerate extended periods of time alternately below or above water. When not submerged, these pyrenolichens must be subject to the same wetting and drying factors—intermittent rain, mist, dew, and so on—that affect most terrestrial lichens. But for some pyrenolichens growing beside streams in open sites, the interesting situation can be observed where at a certain distance away from an actively splashing reach, the erratic deposition of splash droplets results in wetting-drying cycles ranging from every few minutes to perhaps several times per day.

In most of the collection sites, pyrenolichen cover is in the order of c. 40–80% of the available substratum. When discocarp lichens are also present, these likewise tend to have a closely crustose habit with ascomata scarcely protruding above the thallus. One example is *Hymenelia lacustris*, which seems to be a frequent associate of pyrenolichens on stream margin rocks, the *Hymenelia* typically orange in full light but pale green in shaded sites.

Aquatic pyrenolichens are most abundant in waterways that are least frequently or least violently disturbed by flood-carried sediment. The effects of sediment abrasion are sometimes apparent from a pattern of lichen preference for the least exposed faces of stream rocks, and also from the eroded or scoured appearance of thalli closely examined in hand specimens. Different stages of lichen colonisation and establishment are often obvious between one stone and another in a stream bed, some having scattered young rosettes and others a complete cover of older thalli. Examples can be found of a flattened schist stone bearing young rosettes on its upper surface and old thalli underneath, evidence of having been recently overturned on the stream bed.

In addition to the mechanical influences of upheaval and of abrasion, a third factor in semi-aquatic environments is that of silt deposition. On the one hand, silt deposition might smother pyrenolichens; on the other hand, the appropriate amount of fine silt might act to nourish lichen growth or to aid establishment of new thalli. The manner in which fine sediments become caked onto rock as floodwaters subside, or gradually and differentially settle out upon the microtopography of a stream bed, appears to be relevant to pyrenolichen distribution patterns in some waterways.

What might be the ecological roles of pyrenolichens in freshwater aquatic habitats? How are they affected by water temperature, nutrient levels, or sediment movement regimes? How do they interact with algae, bryophytes, and other organisms? To what extent might they be important as habitat or food source for aquatic invertebrates? More questions than answers; meanwhile plenty of scope for chipping away at wet rocks with cold chisel and hammer, dabbing the specimens on a trouser leg to dry them sufficiently that the immediate recognition characters become visible under a hand lens, curating and identifying collections, and making even the most basic of field observations on habitat and associations.

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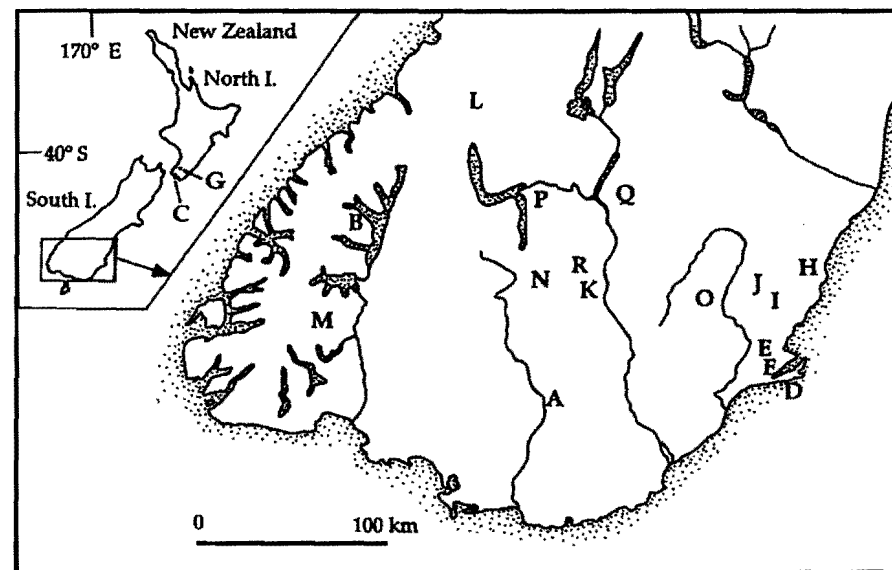


Fig. 1. Map showing aquatic pyrenolichen collection sites A–Q.

Habitat types:

LOWLAND  
river, lake

LOWLAND  
forest streams

MONTANE  
grassland streams

ALPINE  
streams

Sites:

		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
<i>Verrucaria fiordlandica</i>	o	+	+																	
<i>Verrucaria aquatilis</i>	o	+							+											
<i>Polyblastia melaspora</i>	f		+								+									
<i>Porina ahlesiana</i>	f		+																	
<i>Verrucaria praetermissa</i>	o		+																	
<i>Porina guentheri</i>	f		+																	
<i>Verrucaria hydrlea</i>	o			+	+		+		+		+									
<i>Anisomeridium laevigatum</i>	f				+	+														
<i>Porina leptalea</i>	f				+		+													
<i>Strigula johnsonii</i>	f					+	+													
<i>Strigula aff. stigmatella</i>	f					+	+													
<i>Verrucaria rheitrophila</i>	o						+		+						+	+	+	+	+	+
<i>Porina fluminea</i>	o								+											
<i>Anisomeridium carinthiacum</i>	f								+											
<i>Porina chlorotica</i>	f								+					+						
<i>Verrucaria margacea</i>	o									+		+		+	+					
<i>Verrucaria phaeoderma</i>	o										+		+	+						
<i>Verrucaria austroschisticola</i>	o											+	+		+	+				+
<i>Verrucaria sp.</i>	o														+					+
<i>Verrucaria inconstans</i>	o														+					
<i>Staurothele fissa</i>	o																			+

Additional species:

*Dermatocarpon luridum* (o): subalpine (Galloway 1985; as *D. weberi*)

*Porina aptrootii* (f): lowland (McCarthy 1993)

*Strigula australiensis* (f): lowland (McCarthy *et al.* 1996)

Table 1. Aquatic pyrenolichens in New Zealand, with records of habitats and recent collection sites. o = obligately aquatic; f = facultatively aquatic, or semi-aquatic, or otherwise in damp shady places. Collection sites A to Q (described in text) are ordered approximately from lowland to alpine habitats. Species are listed in order as they first occur along this gradient.

Fig. 3. *Verrucaria margacea* (dark thallus, large perithecia) and *V. austroschisticola* (pale thallus, small perithecia) on an alpine stream rock in the Garvie Mountains (Site N).



Fig. 2. Pyrenolichens, mainly *Verrucaria* spp., blackening submerged stones in an alpine stream, 1650 m altitude, in the Pisa Range, Otago (Site S).





## Notes on the Tasmanian records of *Melaspilea gemella* (Eschw.) Nyl.

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**Abstract:** The chief characteristics of the Tasmanian specimens determined as *Melaspilea gemella* (Eschw.) Nyl. by F.R.M. Wilson are described and compared to the type of that species from Brazil and to the European taxon *M. diplasio- spora* (Nyl.) Müll. Arg. No firm conclusions as to the correct identity of the Tasmanian taxon can be made at this stage.

### Introduction

*Melaspilea gemella* was introduced into the current checklists of Tasmanian and Australian lichens (Kantvilas 1994, Filson 1996) on the basis of two specimens from Mt Arthur, northern Tasmania, collected by F.R.M. Wilson in 1892. In the course of an investigation of species of *Melaspilea* and *Opegrapha* in Tasmania, this material was examined and compared to the type from tropical America. The results of this study are reported here.

*Melaspilea gemella* (Eschw.) Nyl. *Ann. Sci. nat. Bot.*, ser. 5, 7: 344 (1867).  
*Graphis scaphella* [var.] *gemella* Eschw. in Mart., *Fl. Bras. enum. pl.* 1: 88 (1833).  
Type: Brazil, "Brasilia provinc. Bahia", *Martius* (M! - holotypus).

This species grows on bark and is characterised by the following: mostly unbranched lirellate ascomata 0.36–0.84 mm long and 0.14–0.16 mm wide, with a slit-like disc, sometimes gaping in the middle portions of larger ascomata; exciple developed laterally only, open at the base, with the upper part composed of rows of rectangular cells, c. 4–7 × 4–4.5 µm; an I+ pale blue hymenium (after pretreatment in KOH); eight-spored asci, 48–51 × 17–21 µm; hyaline to brown, smooth-walled (at 1000×), non-halonate, 1-septate ascospores, 18–21(–23.5) × 8–9 µm.

The type specimen grows with a species of *Graphina* with hyaline, muriform spores, 35–39 × 15–17 µm, with 5 transverse septa. This graphid is well delimited from the areas of bark on which the *Melaspilea* thallus occurs, and there is no evidence that the latter is lichenicolous.

The material collected by Wilson appears to be from the bark of *Pomaderris apetala*, a common understorey tree in wet eucalypt forest in Tasmania, and consists of scattered, unbranched, black lirellae, 0.4–1.1 mm long and 0.16–0.2 mm wide. Outwardly, this material is very similar to the type of *M. gemella*, and also possesses an I+ pale blue hymenium (after pretreatment in KOH), non-amyloid asci and hyaline to brown, 1-septate ascospores. The exciple is also similar, but differs in that it is lined with upwardly directed, septate, simple or sparingly branched periphyses, c. 2–2.5 µm wide; no such structures were observed in the type of *M. gemella*. The Wilson collections differ further in having larger asci (62–73 × 22–31 µm) and larger ascospores [17–25(–28) × 9.5–12(–14) µm]. Like *M. gemella*, they too are associated with a graphid, in this case the common species *G. librata* C. Knight, as well as with *Thelotrema lepadinum* (Ach.) Ach.

Indeed, the Wilson collections are very similar to *M. diplasio- spora* (Nyl.) Müll. Arg. from Ireland and Wales (Purvis *et al.* 1992), and may well be conspecific with that species. *M. diplasio- spora* also has very similar black lirellae, 0.36–1 × 0.16–0.18(–0.2) mm, and relatively large ascospores [19.5–27(–32) × 9.5–13.5(–16) µm]. A few scattered, simple or sparingly branched paraphyses (c. 1.5 µm wide in mid-hymenium) were seen in the Wilson collections and in *M. diplasio- spora*, but were not detected in the type of *M. gemella*. However, some of the mature, brown spores in the Wilson collections develop an additional septum in the lower or in both cells, but no such secondary septa have been recorded from *M. diplasio- spora*, nor found in the specimen examined for comparison.

*M. diplasio- spora* appears to be parasitic on the thallus of *Graphis elegans*, the host sometimes being inhibited from producing its own ascomata (H. Fox, pers. comm). It is perhaps significant that both of the other two taxa studied are also at least closely associated with graphids.

### Conclusions

Our preliminary investigations of these taxa and the Wilson collections remain inconclusive. Their generic position alone is unresolved, because as currently loosely defined, *Melaspilea* is a highly heterogeneous grouping comprising taxa with a wide range of ascomatal morphologies and ascus and spore types. Certainly none of the taxa is in any close way related to the type species of the genus, *M. arthonioides* (Fée) Nyl., which has roundish arthonioid ascomata. Nor are the precise relationships at the species level assessable at this stage. More fresh material and careful observations are required to assess the biological status of the Tasmanian fungus and of *M. gemella*. The taxonomic significance of the presence or absence of paraphyses and periphyses and of ascospore size and septation in the fungi under discussion also needs to be tested. In the meantime, it remains expedient to continue to refer the Wilson collections to *M. cf. gemella* in the loosest sense.

### SPECIMEN EXAMINED

*Australia*. •Tasmania, Mt Arthur [41°17'S, 147°17'E], 1892, *Rev. F.R.M. Wilson* s.n. (MEL 515666, MEL 515635).

### ALSO STUDIED

*M. diplasio- spora*. *British Isles*. •Wales, V.C. 48, Merioneth, near Dollgellau, Pandy Woods, on *Tilia*, Sept. 1941, *R. Burn* (E).

### Acknowledgments

We thank the curators of MEL for the loan of the Wilson material, Dr D. Triebel (M) for locating the type of *M. gemella*, and Dr P. Clerc (G) for providing relevant copies of *Martius*' flora.

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**Terricolous *Aspicilia* in semi-arid eastern  
Australia: how many species are there?**

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Terricolous Australian specimens of *Aspicilia* have historically been referred to *Aspicilia calcarea* (L.) Mudd. Specimens of *Aspicilia* species have been collected extensively from calcareous soils in South Australia and NSW, particularly by Rogers (1970), and occur in three distinct forms, one on rock and two on soil. On soil, one takes on a sprawling fruticose form and the other is more crustose. On rocks, however, specimens are strictly crustose. Weber visited Australia in 1967 and suggested that the morphology of *A. calcarea* changes markedly in response to environmental factors. Although many lichen species do show great morphological variation under different environmental conditions, this wide range in morphology for terricolous *Aspicilia* growing sympatrically may represent more than just environmental modification. Weber (1967) suggested that field observations are necessary to distinguish environmental modification from genetic species variation. We would like to report on such field observations.

Before reporting on the field observations, some historical and taxonomic background is useful. Thomson (1960) proposed that the terricolous fruticose form of *Aspicilia* in North America be ascribed to a separate genus *Agrestia*. In Australia, Filson and Rogers (1979) treated the two forms on soil as one taxon in their treatment of lichens of South Australia. In general, the fruticose form on soil in North America is more erect than the Australian material.

The Russian lichenologists Elenkin and Mereschkovsky, in 1901 and 1918 respectively, discussed the taxonomic relationships of the dwarf fruticose *Aspicilia* taxa. Describing the fruticose forms, they separated them into a new genus called *Sphaerothallia* Mereschk. The Russians described material comparable to the North American material of *Agrestia cyphellata* (Thomson 1960) as *Sphaerothallia hispidia* Mereschk. This *S. hispidia* had laminal pseudocyphellae. They also described several other taxa lacking pseudocyphellae.

Today most lichenologists do not accept these dwarf fruticose *Aspicilia* as a separate genus, although many species and forms are recognized. A recent treatment by Hafellner (1991) in his studies of *Aspicilia* rejected treating these terricolous fruticose *Aspicilia* as a discrete genus.

During January 1997, we had the opportunity to visit a wide range of calcareous sites in western NSW. We found one fruticose *Aspicilia* with acute, gradually tapering lobe tips and lacking pseudocyphellae which has a close affinity with *Aspicilia reptans* (Looman) Wetmore, a common taxon known only from western North America. Another commonly observed entirely crustose form lacking lobate margins and pseudocyphellae seems to be related to *A. terrestris* Tomin, a

taxon from Asia. In the field, *A. terrestris* appears as a sterile white crust similar to infertile *Lecidea ochroleuca* Pers., although more areolate. Unlike species of *Lecidea*, the thallus turns a greyish colour when wetted due to the pruinose covering on the thallus. A third form, reported by Filson and Rogers (1979) as more erect and fruticose and containing obvious laminal pseudocyphellae, was not observed in western NSW.

Preliminary observations suggest that there are at least three taxa of *Aspicilia* on soils in western NSW. Rigorous examination of herbarium material may tell us more about the diversity of terricolous Australian *Aspicilia*, and field evaluations at the species level may reveal clear differences among them in their preference for certain soils.

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## Some lichens of Hattah-Kulkyne National Park, Victoria

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During January 1997, I spent some time at the Hattah-Kulkyne National Park and, as I had recently become interested in lichens, was keen to learn about lichens of semi-arid areas. Despite a comprehensive list of plants of Hattah-Kulkyne National Park (DCFL 1983a) which includes 18 moss species recorded by J.H. Willis, no lichens appeared on the list, and the park rangers knew nothing about them. So, armed with a hurriedly arranged collection permit, my newfound interest, and very little else, I embarked on an opportunistic collection of lichens of the area.

Hattah-Kulkyne National Park (HKNP) is in the semi-arid Mallee area of north-west Victoria, east of the Calder Highway between Ouyen and Mildura, 34°40'S and 142°20'E. It is a park of 48,000 ha, with an extensive lake system fed by the Chalka Creek, an anabranch of the Murray River, and has an average annual rainfall of 200 mm. In the past it has suffered from overgrazing, rabbit infestations, and vegetation clearing. The vegetation notes for the park (DCFL 1983b) describe four major vegetation types occurring in the park.

landscape type	vegetation	soil type
Mallee	<i>Eucalyptus gracilis</i> , <i>Eucalyptus domosa</i> <i>Heterodendrum</i> spp. <i>Dodonaea</i> spp.	light-coloured, unstable yellow sand and a more stable reddish-yellow sand to sandy loam
Riverain woodland	<i>Eucalyptus camaldulensis</i> <i>Eucalyptus largiflorens</i> <i>Acacia stenophylla</i>	heavy clays and grey sands
Open sandhills	<i>Allocasuarina</i> spp. <i>Callitris</i> spp.	reddish sand and sandy loam
Saline flats	<i>Halosarcia</i> spp. <i>Sarcocornia</i> spp. <i>Frankenia</i> spp.	clay soils and shallow soil overlying deposits of gypsum

The following lichen list has been produced with help from Simone Louwhoff (MEL) and Professor Jack Elix (ANU), and includes some lichen species collected previously from HKNP which are lodged in MEL.

### Species list

*Buellia subalbula* (Nyl.) Müll. Arg.  
*Caloplaca vitellinula* (Nyl.) H. Olivier  
*Chondropsis semiviridis* (F. Muell. ex Nyl.) Nyl.  
*Diploschistes gypsaceus* (Ach.) Zahlbr.  
*Diploschistes ocellatus* (Vill.) Norman  
*Diploschistes scruposus* (Schreb.) Norman  
*Diploschistes thunbergianus* Lumbsch & Vězda  
*Endocarpon pusillum* Hedwig  
*Endocarpon simplicatum* (Nyl.) Nyl.  
*Flavoparmelia rutidota* (Hook. f. & Taylor) Hale

*Fulgensia bracteata* (Hoffm.) Räsänen  
*Fulgensia subbracteata* (Nyl.) Poelt  
*Lecanora sphaerospora* Müll. Arg.  
*Physcia adscendens* (Fr.) H. Olivier  
*Physcia albicans* (Pers.) J.W. Thomson  
*Psora crystallifera* (Taylor) Müll. Arg.  
*Psora decipiens* (Hedw.) Hoffm.  
*Punctelia subalbicans* (Stirt.) D.J. Galloway & Elix  
*Ramalina inflata* ssp. *australis* G.N. Stevens  
*Teloschistes chrysophthalmus* (L.) Th. Fr.  
*Usnea inermis* Motyka  
*Xanthoparmelia molliuscula* (Ach.) Hale  
*Xanthoparmelia pumila* (Kurok. & Filson) Elix & J. Johnst.  
*Xanthoparmelia reptans* (Kurok.) Elix & J. Johnst.  
*Xanthoparmelia taractica* (Kremp.) Hale  
*Xanthoria parietina* (L.) Th. Fr.

### Discussion

The majority of corticolous lichens occurred on the cypress pines, *Callitris* spp., and the prickly bottlebrush, *Callistemon brachyandrus*. This *Callistemon* is classed as "rare" in the Mallee (McCann 1989), and it was the only tree on which I found *Usnea* species.

While I had difficulty with identification of the saxicolous (mainly limestone) lichens, I noticed that many of the lichens appeared similar to those that occur on limestone in Victorian coastal areas, and I would be interested to know if this is the case.

The terricolous lichens were the most prolific, and some of these too remain unidentified. *Psora decipiens*, *Psora crystallifera*, and *Xanthoparmelia* species were particularly showy on the harsh arid soils and, in one claypan, the species of *Diploschistes* spanned more than 20 cm in diameter. I was extremely interested to see how prolific the *Xanthoparmelia* was around edges of, or on spits running into, the dry salt lakes. *Chondropsis semiviridis* also occurred in this habitat, and we were lucky enough to be there when one of the few rainfalls of recent months occurred and were able to see and photograph it in its dry, rolled-up state and its wet, flat, state.

I have lodged identified specimens in the National Herbarium of Victoria, Melbourne, and have sent some specimens, with ecological notes, to the park rangers at Hattah-Kulkyne National Park. I also alerted the rangers to the excellent paper by Eldridge (1996) on the importance of terricolous lichens as indicators of ecosystem health, in the hope that this may provide some knowledge about, and engender some enthusiasm and protection for, these fascinating lichens in the park.

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## Four New Depsidones from *Pertusaria* and *Lecanora* Lichens

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**Abstract:** The new depsidones methyl pseudonorstictate (1), methyl pseudosalazinate (2), methyl psoromate (3) and methyl 2'-*O*-demethylpsoromate (4) have been detected in *Pertusaria* or *Lecanora* species.

The lichen genera *Pertusaria* and *Lecanora* have proved rich sources of lichen substances, particularly of depsides and depsidones (Archer 1993; Lumbsch 1994; Elix & Lumbsch 1996).

In a continuation of our chemotaxonomic investigations of these genera, we have recently encountered four new lichen metabolites, all of which are methyl esters of common depsidones. They include methyl pseudonorstictate (1), methyl pseudosalazinate (2), methyl psoromate (3), and methyl 2'-*O*-demethylpsoromate (4).

### Materials and Methods

Authentic (synthetic) material of the methyl esters (1) and (2) were obtained in the following manner:

**Methyl pseudonorstictate** (1) was prepared by treating a methanolic solution of norstictic acid (1 mmol) with *N,N*-dicyclohexylcarbodiimide (1.1 mmol). After filtration of the precipitated dicyclohexylurea, concentration of the solution afforded the pseudo-ester (1). *Methyl pseudonorstictate* (1) crystallized from methanol in colourless needles, m.p. 271–272° dec. (Found: mol. wt. 386.0645. C<sub>19</sub>H<sub>14</sub>O<sub>9</sub> requires mol. wt. 386.0637). <sup>1</sup>H n.m.r. (CDCl<sub>3</sub>) δ 2.32, s, 9-Me; 2.53, s, 1-Me; 3.63, s, OMe; 6.44, s, CHOMe; 6.75, s, H2; 7.87, s, 8-OH; 10.41, s, CHO; 12.10, s, 3-OH. Mass spectrum *m/z* 387 (27), 386 (M, 87), 383 (11), 355 (23), 354 (60), 342 (15), 341 (66), 330 (14), 327 (15), 326 (33), 325 (10), 299 (17), 298 (10), 271 (13), 270 (13), 255 (10), 245 (14), 242 (11), 239 (20), 236 (12), 229 (11), 217 (10), 215 (11), 211 (18), 183 (17), 181 (12), 179 (18), 177 (36), 169 (12). Standard TLC R<sub>F</sub> values: R<sub>F</sub> (A) 0.70; R<sub>F</sub> (B) 0.32; R<sub>F</sub> (C) 0.54; R<sub>F</sub> (E) 0.14. Standard HPLC: R<sub>T</sub> 22.7 min.; R<sub>I</sub> 0.29.

**Methyl pseudosalazinate** (2) was prepared by reacting salazinic acid with methanol under the conditions described above. However, this resulted in a mixture of products, which were subsequently separated by preparative layer chromatography over silica gel using 15% acetic acid-toluene as eluant. Two fast-moving bands developed. The higher R<sub>F</sub> band yielded methyl 9- $\alpha$ -methoxy-6-pseudosalazinate (5), while the second band contained methyl pseudosalazinate (2). *Methyl pseudosalazinate* (2) crystallized from ethyl acetate as colourless microcrystals, m.p. 265° dec. (Found: mol. wt. 402.0586. C<sub>19</sub>H<sub>14</sub>O<sub>10</sub> requires mol. wt. 402.0587). <sup>1</sup>H n.m.r. (CDCl<sub>2</sub>) δ 2.53, s, ArMe; 3.64, s, OMe; 4.94, s, CH<sub>2</sub>; 6.46, s, CHOMe; 6.76, s, H2; 8.10, s, 8-OH; 10.42, s, CHO; 12.11, s, 3-OH. Mass spectrum *m/z* 402 (M, 5%), 384 (14), 369 (32), 177 (10), 149 (13), 108 (69), 107 (53), 105 (12), 91 (100). TLC R<sub>F</sub> values: R<sub>F</sub> (A) 0.28; R<sub>F</sub> (B) 0.14; R<sub>F</sub> (C) 0.17; R<sub>F</sub> (E) 0.02. Standard HPLC: R<sub>T</sub> 19.31 min.; R<sub>I</sub> 0.19.

This compound was formerly reported by Asahina and Tukamoto (1934), but that report was in error since these authors actually synthesised the methyl ester (6) rather than the pseudo-ester (2).

**Methyl psoromate** (3) (Huneck & Sargent 1976; Elix *et al.* 1990) and **methyl 2'-*O*-demethylpsoromate** (4) (Keogh 1976) were synthesized as has been described previously. Methyl psoromate (3) had standard TLC R<sub>F</sub> (A) 0.70; R<sub>F</sub> (B) 0.47; R<sub>F</sub> (C) 0.65; R<sub>F</sub> (E) 0.46. Standard HPLC: R<sub>T</sub> 27.64 min.; R<sub>I</sub> 0.42. Methyl 2'-*O*-demethylpsoromate (4) had standard TLC R<sub>F</sub> values: R<sub>F</sub> (A) 0.52; R<sub>F</sub> (B) 0.44; R<sub>F</sub> (C) 0.42; R<sub>F</sub> (E) 0.15. Standard HPLC: R<sub>T</sub> 26.26 min.; R<sub>I</sub> 0.39.

**Chromatography.** Natural compounds were characterized by thin-layer chromatography (TLC) according to the methods standardized for lichen products (Culbertson 1972; Elix & Ernst-Russell 1993), and by high-performance liquid chromatography (HPLC) with retention index values (R<sub>I</sub>) calculated from benzoic acid and solorinic acid controls (Elix & Ernst Russell 1996; Feige *et al.* 1993). The HPLC was coupled to a photodiode array detector for ultraviolet spectroscopic comparisons. By this means the ultraviolet spectra observed for the various components eluting in the HPLC chromatogram were recorded and computer-matched against a library of ultraviolet spectra recorded for authentic metabolites under identical conditions. For each new substance, the correlation of ultraviolet spectra of the synthetic and natural material was greater than 99.9%.

### Discussion and Results

We have now confirmed the occurrence of the depsidones (1) – (4) in several lichen species. Although the corresponding carboxylic acids (Huneck & Yoshimura 1996) are well-known lichen metabolites, the methyl esters (1) – (4) have not hitherto been recorded as occurring in Nature. Comparisons were conducted between the synthetic esters (1) – (4) and the total acetone extracts from the various species by TLC in four independent solvent systems and HPLC coupled to a photodiode array detector for ultraviolet spectroscopic comparisons.

By this means, extracts of *Pertusaria falklandica* Imshaug were shown to contain norstictic acid (major), methyl pseudonorstictate (1) (minor), connorstictic acid (minor), salazinic acid (trace), stictic acid (trace) and atranorin (minor). Extracts of *Pertusaria* sp. (Fig. 1) were shown to contain norstictic acid (major), salazinic acid (minor), methyl pseudonorstictate (1) (minor), connorstictic acid (minor), subnorstictic acid (minor), methyl pseudosalazinate (2) (minor), and an unknown (minor).

Extracts of *Lecanora intumescens* (Rabenh.) Rabenh. (Fig. 2) were shown to contain psoromic acid (major), 2'-*O*-demethylpsoromic acid (minor), atranorin (minor), chloroatranorin (minor), methyl psoromate (3) (minor), unknown (minor), and methyl 2'-*O*-demethylpsoromate (4) (trace).

### SPECIMENS EXAMINED

#### *Pertusaria falklandica* Imshaug

*Falkland Islands.* • Fox Bay, coastal rocks at Kelp Point, H.A. Imshaug 42208A, 9 Feb. 1968 (BM).

#### *Pertusaria* sp.

*Papua New Guinea.* • Morobe Province, Hekwangi Village, 7 km NW of Memyama, H. Streimann 19405, 2 May 1982 (B, CANB, H, LAE).

#### *Lecanora intumescens* (Rabenh.) Rabenh.

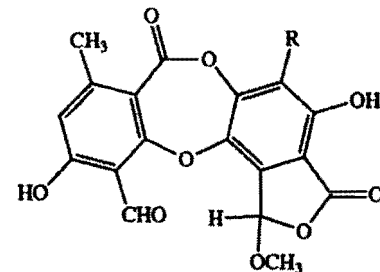
*Germany.* • Rheinland-Pfalz, Eifel Mountains, Nitztal, 400 m, G.B. Feige 8030, 9 July 1990 (ESS). *France.* • Normandie, Viren, misit Pelvet (UPS).

## Acknowledgments

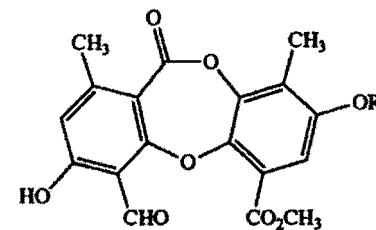
We thank the curators of the herbaria BM, CANB, ESS, and UPS for the loan of lichen specimens, and the Australian Biological Resources Study for their financial support of this work.

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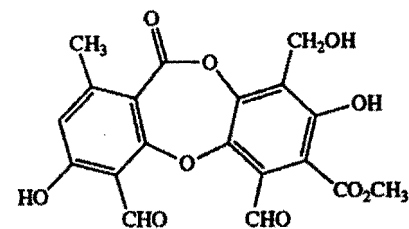
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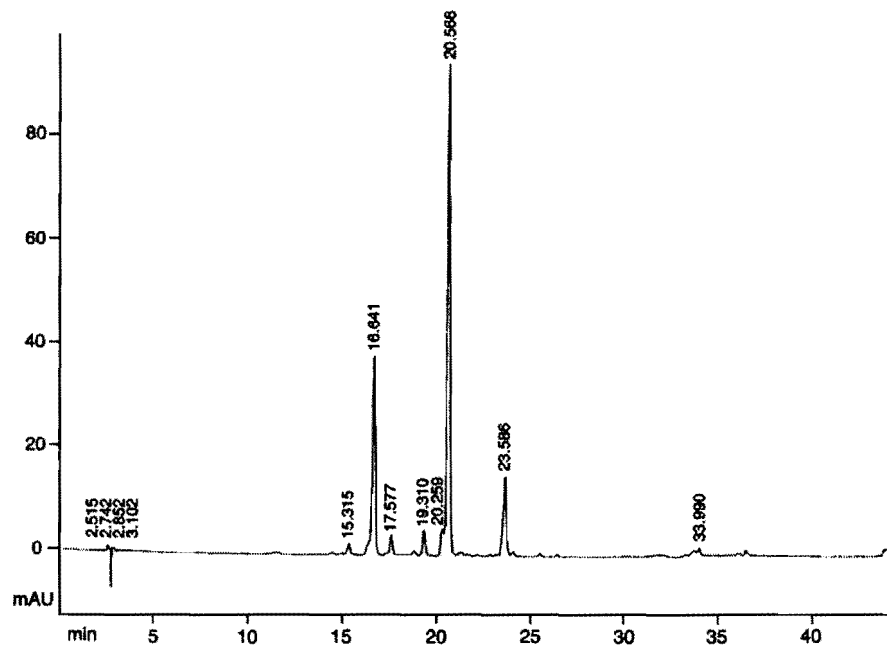
- (1), R = CH<sub>3</sub>
- (2), R = CH<sub>2</sub>OH
- (5), R = CH<sub>2</sub>OCH<sub>3</sub>



- (3), R = CH<sub>3</sub>
- (4), R = H



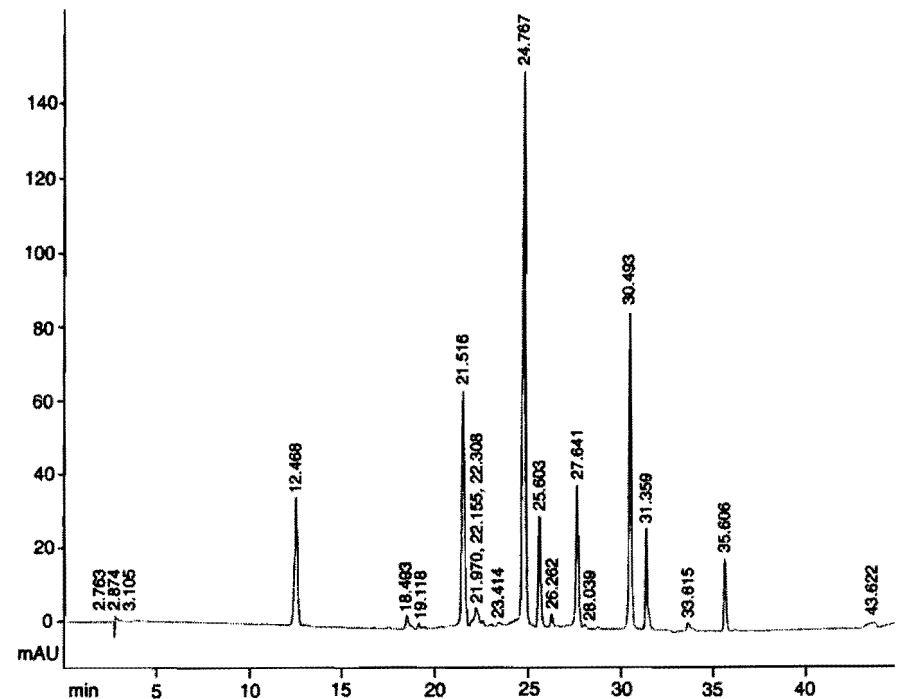
(6)



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**Figure 1.** HPLC of acetone extract of *Pertusaria* sp. (*Streimann 19405*).

R<sub>T</sub> 15.315 = connorstictic acid; R<sub>T</sub> 16.641 = salazinic acid; R<sub>T</sub> 17.577 = subnorstictic acid; R<sub>T</sub> 19.310 methyl pseudosalazinate; R<sub>T</sub> 20.259 = unknown; R<sub>T</sub> 20.566 = norstictic acid; R<sub>T</sub> 23.586 = methyl pseudonorstictate.



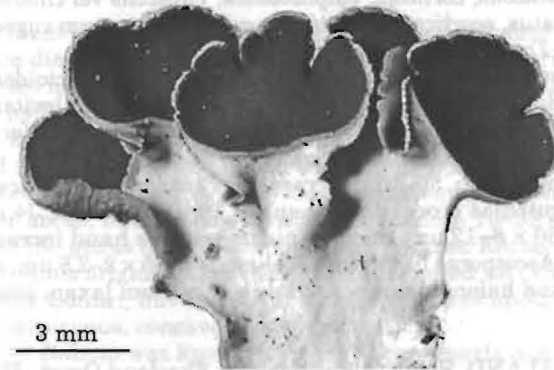
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**Figure 2.** HPLC of acetone extract of *Lecanora intumescens* (*Feige 8030*).

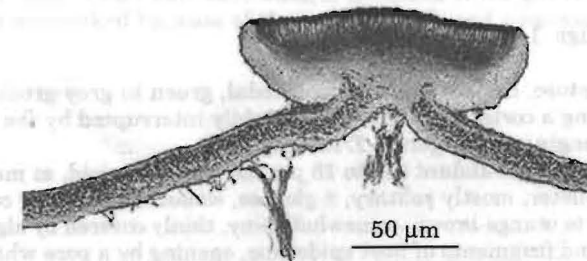
R<sub>T</sub> 21.516 = 2'-*O*-demethylpsoromic acid; R<sub>T</sub> 24.767 = psoromic acid; R<sub>T</sub> 25.603 = unknown; R<sub>T</sub> 26.262 = methyl 2'-*O*-demethylpsoromic acid; R<sub>T</sub> 27.641 = methyl psoromate; R<sub>T</sub> 30.493 = atranorin; R<sub>T</sub> 31.359 = chloroatranorin; R<sub>T</sub> 12.468, 35.606 = internal standards.

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*Nephroma australe* ventral surface



*Degelia gayana* section through apothecium

## A new polyspored *Belonia* from New Zealand

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**Abstract:** *Belonia vezdana* sp. nov. is described from New Zealand's South Island. The new species differs from all of the other known species of the genus in having polyspored asci.

***Belonia vezdana* Malcolm & Coppins sp. nov.** (Gyalectales, Fam. *incert. sed.*)

Thallus crustaceus, corticola, epiphloeodes, virescens vel cinereovirescens, haud manifeste limitatus, ecorticatus, continuus vel ob substratum rugosum interruptus. Alga ad genus *Trentepohlia* pertinens.

Apothecia vulgo copiosa (usque ad 15 per cm<sup>2</sup>), perithecioida, in maturitate 0.18–0.25 mm diametro, vulgo solitaria, ± globosa, interdum leviter basi constricta, fusca vel aurantiaco-fusca, subnitida, extus strato thalino algifero tenuiter tecta, ope inconspicuum impigmentiferum ostiolum aperiens.

Excipulum hyalinum, 30–40 µm crassum. Paraphyses simplices, <1.5 µm crassis, septatae, guttulas croceas continentes, 70–100 µm alti, J+ caeruleum. Asci cylindrici, 60–80 × 8–12 µm, membranis in apicibus haud incrassatis, polyspori (sporis 16–32). Ascospores filiformes, hyalinae, 48–55 × 2–2.5 µm, septis transversalibus 9–12, haud halonatae, multiseriatae, in spiram laxam contortae. Conidiomata non vidi.

Type: NEW ZEALAND, South Island, Nelson, Sharland Creek, Hira Forest, 60 m altitude, NZMS 260 027:382928, 41°16.4'S, 173°20.2'E, on bark of *Salix fragilis* 20 m from creekbed in abandoned pasture, *W. Malcolm 2074*, 6.ii.1997; holotype CHR489027, isotype E.

Illustrations: Figs. 1–3 (habit and anatomy).

Thallus crustose, corticolous, endophloeodal, green to grey-green, not clearly delimited, lacking a cortex, continuous or patchily interrupted by the substratum. Photobiont belonging to the genus *Trentepohlia*.

Apothecia usually abundant (up to 15 per cm<sup>2</sup>), perithecioid, at maturity 0.18–0.25 mm in diameter, mostly solitary, ± globose, sometimes slightly constricted at the base, brown to orange-brown, somewhat shiny, thinly covered by alga-containing thallus tissue and fragments of host epidermis, opening by a pore which is usually inconspicuous and unpigmented, but is darkened in some ascomata.

Excipulum 30–40 µm wide, hyaline internally, often reddish brown toward the exterior in dark ascomata. Paraphyses simple, <1.5 µm thick, septate, containing orange droplets, 70–100 µm tall, I<sub>Lugol's</sub>+ blue. Asci cylindrical, 60–80 × 8–12 µm, without apical thickening or apparatus, polysporic (16–32 per ascus). Ascospores filiform, hyaline, 48–55 × 2–2.5 µm, transversely 9–12-septate, the cells 4–6 µm long, without a perispore, multiseriate, twisted into a loose spiral. Conidiomata not seen.

**Etymology:** With great pleasure we dedicate this new species to Antonín Vězda in recognition of his outstanding service to lichenology during his long and distinguished career. It is particularly fitting that a species of *Belonia* be named for him, because that genus was among the first he worked on.

### Discussion

*Belonia vezdana* is known from only the type locality, where it was collected from the bark of twigs (12–16 mm diameter) of mature *Salix fragilis* L. (Salicaceae) growing 20 m from a creekbed in long-abandoned pasture. Associated lichens included *Graphis librata*, *Graphina subvelata*, and species of *Caloplaca*, *Bacidia*, and *Lecanora*.

We are confident that this lichen belongs in *Belonia* because it shows several traits which are diagnostic for that genus—(1) a non-black perithecioid ascoma lacking paraphyses and covered with modified excipular tissue that develops a pore-like opening at maturity, (2) simple, septate paraphyses containing orange droplets and filling the ascoma cavity rather than forming a distinct epihymenium, and (3) thin-walled asci that lack any apical thickening or apparatus and react blue in I<sub>Lugol's</sub>. However, whereas previously described members of the genus produce (4–)8 spores per ascus, this lichen consistently produces 16–32 spores per ascus. The diagnosis of the genus need not be emended, because Körber did not mention the spore-count in his original diagnosis. The multisporous asci suggest an affinity with *Pachyphiale* Lönnr., but species of that genus have apothecioid ascomata that reveal a conspicuous, concave disc at maturity.

Until recently *Belonia* was known from only Scandinavia and Europe. *Belonia pellucida* Coppins & Malcolm (*ined.*) was the first species discovered in the Southern Hemisphere, and *B. vezdana* is the second. Recently a third has been found in Tasmania (P.M. McCarthy, pers. comm.). The fact that all three of those taxa were undescribed implies that still more austral members of the genus await discovery, presumably overlooked because of their small thalli and ascomata.



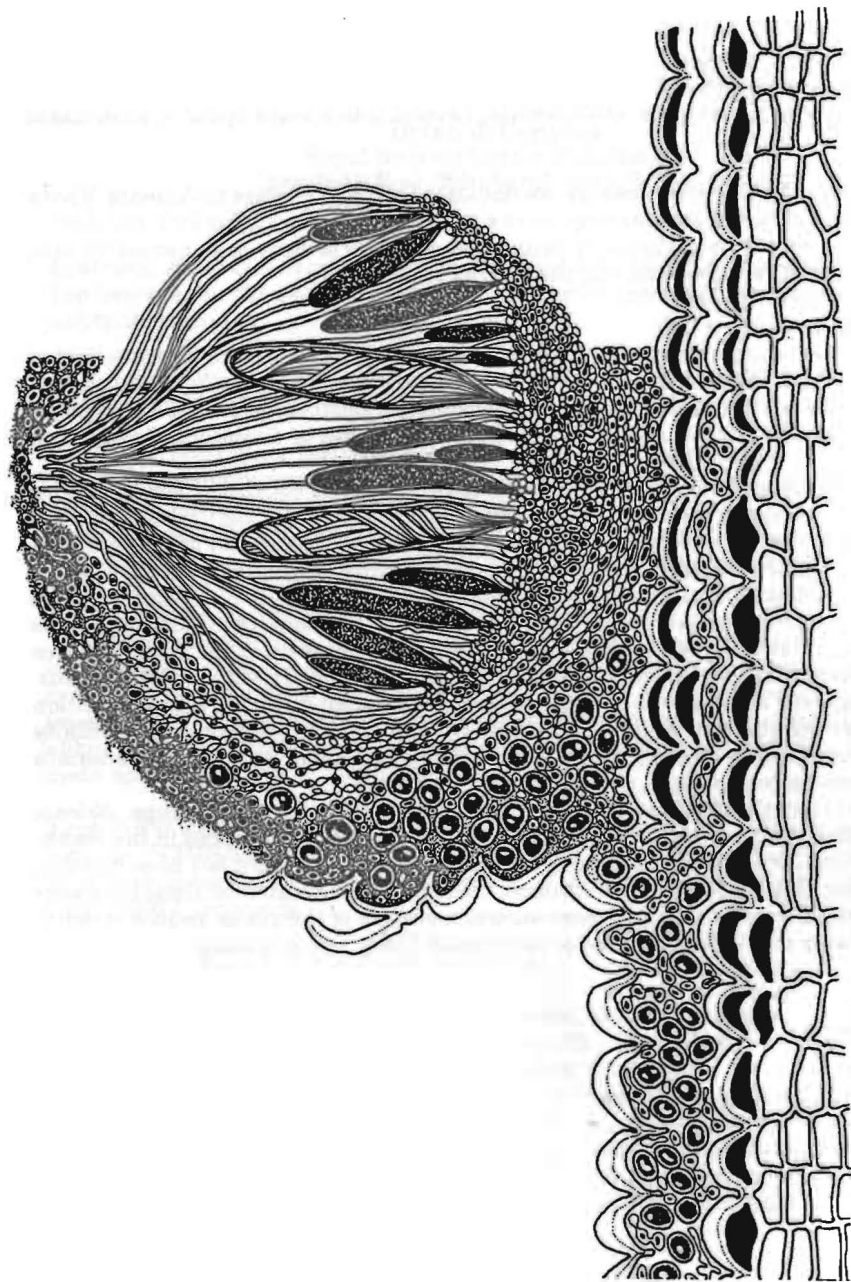


Figure 1. *Belonia vezdana*, holotype. Vertical section through perithecioid ascoma showing ruptured surface tissues of host leaf, photobiont cells, excipulum, asci, and paraphyses. Scale 50 mm = 100  $\mu$ m.

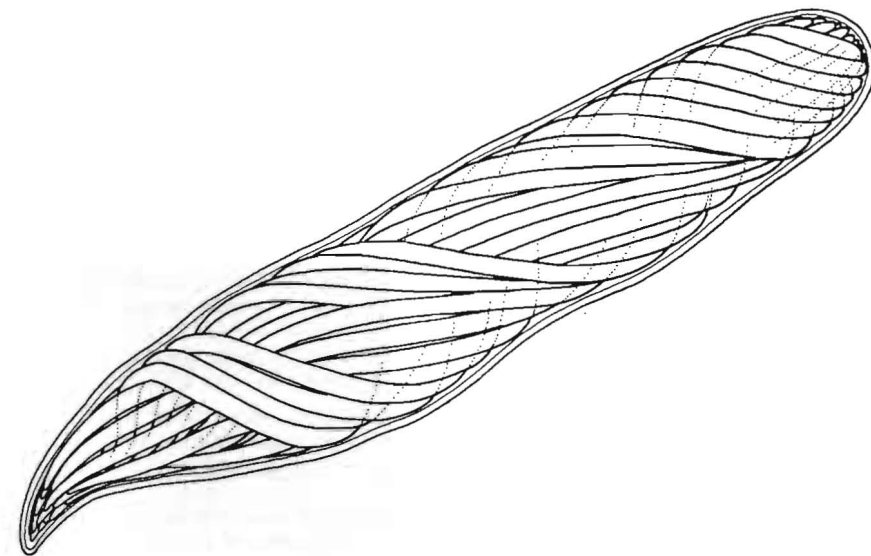


Figure 2. *Belonia vezdana*, holotype. Ascus with numerous immature ascospores. Scale 25 mm = 10  $\mu$ m.

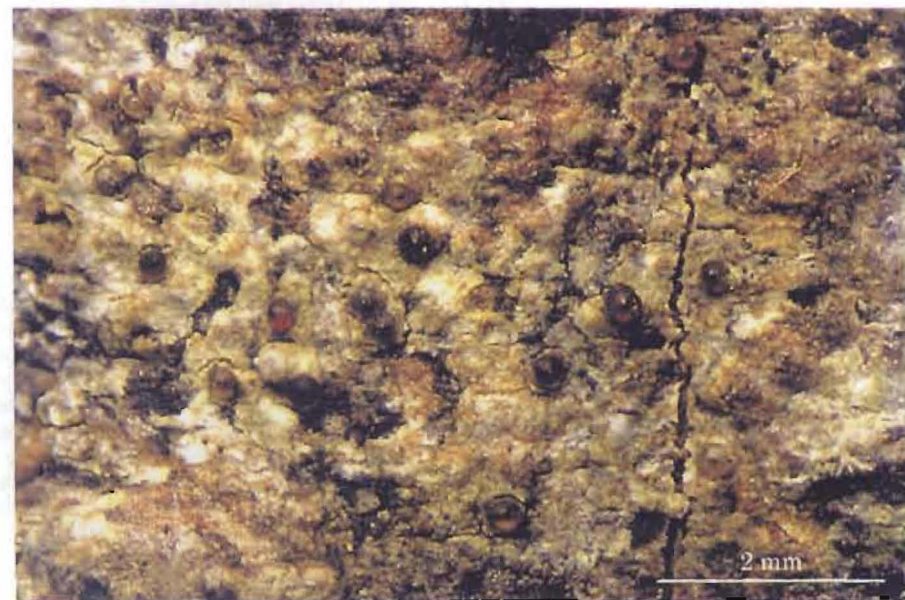


Figure 3. *Belonia vezdana*, holotype. Habit

**Three new species of microcarpic *Dimerella* from New Zealand: *D. rubrifusca*, *D. lutescens*, and *D. fuscescens***

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**Abstract:** Three new species of *Dimerella* with microcarpic apothecia from New Zealand are described and illustrated. *D. rubrifusca* is corticolous and characterized by brownish apothecial discs and short ascospores. *D. lutescens* is also corticolous and characterized by flat apothecial margins concolorous with the disc. *D. fuscescens* is foliicolous and characterized by brownish apothecia and a plectenchymatous excipulum with a thin thalline covering.

***Dimerella rubrifusca* Vězda & Malcolm sp. n. (Gyalectaceae)**

Thallus crustaceus, tenuis vel fere haud distinctus, hypophloeodes. Apothecia orbicularia, 0.15 mm in diametro, 50 µm alta, dispersa et modice sparsa, rubrifusca vel fusca, nitida, pro parte subpellucida, primum crassa marginata disco punctiformi, late adnata, demum marginibus attenuatis integris, discis apertis, concavis vel fere planis, basi constricta. Excipulum plectenchymaticum, pallide rubrifuscum. Hymenium 45–50 µm altum, hyalinum, in zona epihymeniali infuscatum. Paraphyses simplices, 0.5 µm crassis, apicibus clavatis, 1–1.5 µm crassis. Asci cylindrici, 8-sporei, ascosporae uniseriales, ellipsoideae, 6–7 × 1.8–2.2 µm. Pycnidia non visa.

Holotypus: NEW ZEALAND, South Island, Nelson, Hackett River, north side, 160 m altitude, 41°24.0'S, 173°13.5'E, NZMS 260 N28:288787, on bark of mature *Podocarpus totara* in mixed beech-podocarp lowland forest, *W. Malcolm 2709*, 25.ii.1996; holotype CHR489336, isotypes herbaria of W. Malcolm and A. Vězda.

Illustration: Fig. 1 (habit and anatomy).

Thallus crustose, thin or almost indistinct, hypophloeodal. Apothecia circular, 0.15 mm in diameter, 50 µm tall, scattered and moderately sparse, reddish brown or brown, shiny, in part nearly translucent, at first broadly adnate with thick margins and punctiform discs, eventually constricted at the base with thin, entire margins and open, concave or nearly plane discs. Excipulum plectenchymatous, pale reddish brown. Hymenium 45–50 µm high, hyaline, brownish in the epihymenial region. Paraphyses simple, 0.5 µm thick, clavate at the apex, 1–1.5 µm thick. Asci cylindrical, 8-spored, ascospores uniseriate, ellipsoid, 6–7 × 1.8–2.2 µm. Pycnidia not seen.

Species of *Dimerella* typically have yellow, orange, or rarely white apothecia. Therefore the reddish brown to brown apothecia of this new species is a reliable diagnostic character. The European species *D. tavaresii* also has reddish brown apothecia, but they are much larger (0.5 mm in diameter), as are the ascospores (12–14 µm in length).

***Dimerella lutescens* Vězda & Malcolm sp. n. (Gyalectaceae)**

Thallus crustaceus, tenuis, epiphloeodes, cinereoviridis, pro parte nitidus, prothallo nullo. Apothecia copiosa, orbicularia, basi arcte constricta, 0.2–0.25 mm lata, 60 µm alta, lutescentia vel fere alba, plana, marginibus integris, colore ab discis haud differentibus. Excipulum hyalinum, plectenchymaticum cellulis pro parte globosis. Hymenium 40–45 µm altum, hyalinum. Paraphyses simplices, 1 µm crassis, apicibus capitatis et usque 4 µm crassis. Asci clavati, 8-sporei, ascosporis 2-serialibus, ellipsoideo-fusiformes, 7–9 × 2–2.2 µm. Pycnidia non visa.

Holotypus: NEW ZEALAND, South Island, Nelson, Hackett River, north side, 160 m altitude, 41°24.0'S, 173°13.5'E, NZMS 260 N28:288787, on bark of mature *Podocarpus totara* in mixed beech-podocarp lowland forest, *W. Malcolm 2710*, 25.ii.1996; holotype CHR489337, isotypes herbaria of W. Malcolm and A. Vězda.

Illustrations: Figs. 2 (habit) and 3 (anatomy).

Thallus crustose, thin, epiphloeodal, ash-green, shiny in part, without a prothallus. Apothecia abundant, circular, strongly constricted at the base, 0.2–0.25 mm wide, 60 µm tall, yellowish or almost white, plane, with entire margins, concolorous with the disc. Excipulum hyaline, plectenchymatous, the cells spherical in part. Hymenium 40–45 µm tall, hyaline. Paraphyses 1 µm thick, with a capitate apex up to 4 µm thick. Asci clavate, 8-spored, the ascospores biseriata, ellipsoid-fusiform, 7–9 × 2–2.2 µm. Pycnidia not seen.

The following combination of traits is characteristic of this new species: microcarpic apothecia (0.2–0.25 µm diameter), white or yellowish, plane, constricted at the base, with flat margins concolorous with the disc, a low hymenium, and biseriata ascospores. The new species is taxonomically close to *D. pusilla* (Mont.) R. Sant. & Vězda from tropical America, but that species differs in having orange discs with whitish margins, and ascospores measuring 3–4 µm in length.

***Dimerella fuscescens* Vězda & Malcolm sp. n. (Gyalectaceae)**

Thallus crustaceus, foliicolus (epiphyllus hypophyllusque), continuus, maculas usque 1 cm latas formans, pallide fuscoluteus vel fere fuscus, laevigatus, 10–20 µm crassus. Apothecia copiosa, orbicularia, 0.2–0.28 mm in diametro, 0.1 mm alta, basi paulum constricta, sed late adnata, ab initio plana, pallide fusca vel testacea, marginibus paulum vel vis elevatis. Excipulum ad latera thallo algifero tenui tectum, plectenchymaticum textura paraplectenchymatica nulla, ± hyalinum. Hymenium 60–70 µm altum, hyalinum. Paraphyses simplices, 1.5 µm crassis, cellulis terminalibus clavatis vel fere subglobosis, 3–4 µm crassis. Asci 8-sporei, ascosporae uniseriales, ellipsoideae-fusiformes, 6–9 × 1.8–2 µm. Pycnosporae simplices, 2.5–3 × 1 µm.

Holotypus: NEW ZEALAND, South Island, Nelson, York Valley, 200 m altitude, 41°18.2'S, 173°16.5'E, NZMS 260 O27:330896, on leaves of *Alectryon excelsus* in disturbed lowland forest, *W. Malcolm 1275*, 11.xi.1993; holotype CHR489338, isotypes herbaria of W. Malcolm and A. Vězda.

**OTHER SPECIMEN EXAMINED:**

NEW ZEALAND, South Island, Nelson, Cable Bay Walkway, 220 m altitude, 41°10.2'S, 173°23.8'E, NZMS 260 O27:432042, on leaves of *Beilschiedia tawa* in disturbed lowland forest, *W. Malcolm 1863*, 19.xii.1993; herbaria of W. Malcolm and A. Vězda.

Illustrations: Figs. 4 (habit) and 5 (anatomy).

Thallus crustose, foliicolous (epiphyllic to hypophyllic), continuous, forming blotches up to 1 cm wide, pale brownish yellow or almost brown, smooth, glossy, 10–20 µm thick. Apothecia abundant, circular, 0.2–0.28 mm in diameter, 0.1 mm tall, somewhat constricted at the base but broadly adnate, initially plane, pale brown or brick-red, the margin somewhat or strongly raised. Excipulum 25–30 µm thick, thinly covered toward the edges with algae-containing thallus, of plectenchymatous tissue but lacking paraplectenchyma, ± hyaline. Hymenium 60–70 µm tall, hyaline. The paraphyses 1.5 µm thick, the terminal cell clavate or almost subglobose, 3–4 µm thick. Asci cylindrical, 8-spored, very thin-walled. Ascospores uniseriate, ellipsoid-fusiform, 6–9 × 1.8–2 µm. Pycnospores simple, 2.5–3 × 1 µm.

The new species' brownish apothecia and plectenchymatous excipulum with a thin thalline covering distinguish it from the other known foliicolous species of the genus.

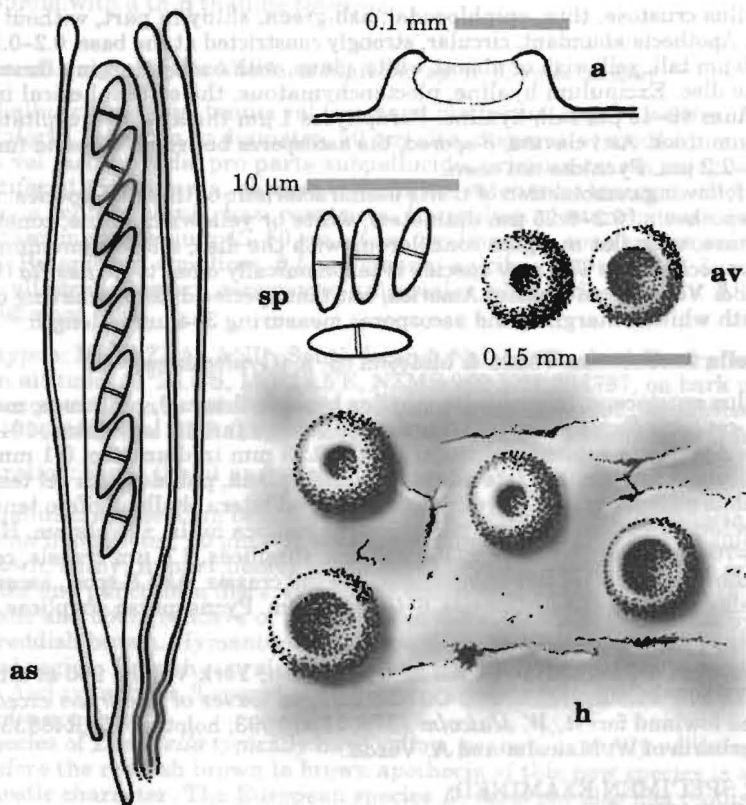


Fig. 1. *Dimerella rubrifusca* Vězda & Malcolm (Orig.). **a**, vertical section through an apothecium. **as**, asci and paraphyses. **sp**, ascospores. **av**, apothecia viewed from above, immature on the left and mature on the right. **h**, habit.

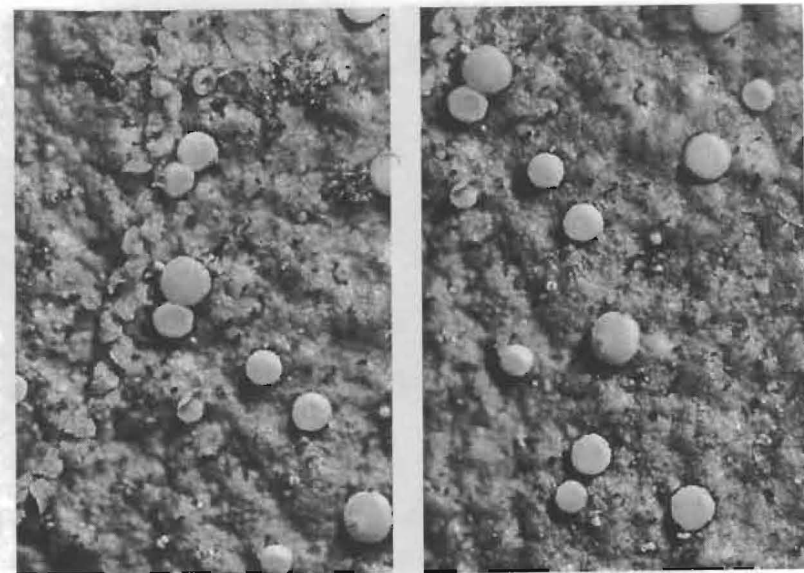


Fig. 2. *Dimerella lutescens* Vězda & Malcolm (Orig.). Habit. 1 mm

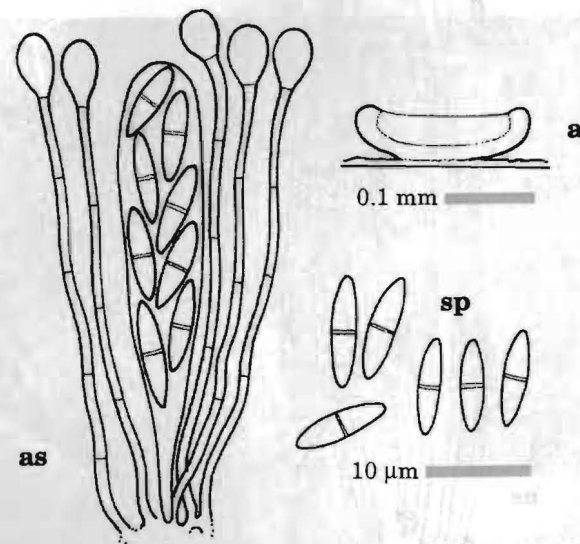


Fig. 3. *Dimerella lutescens* Vězda & Malcolm (Orig.). **a**, vertical section through an apothecium. **as**, asci and paraphyses. **sp**, ascospores.

# Australasian Lichenology

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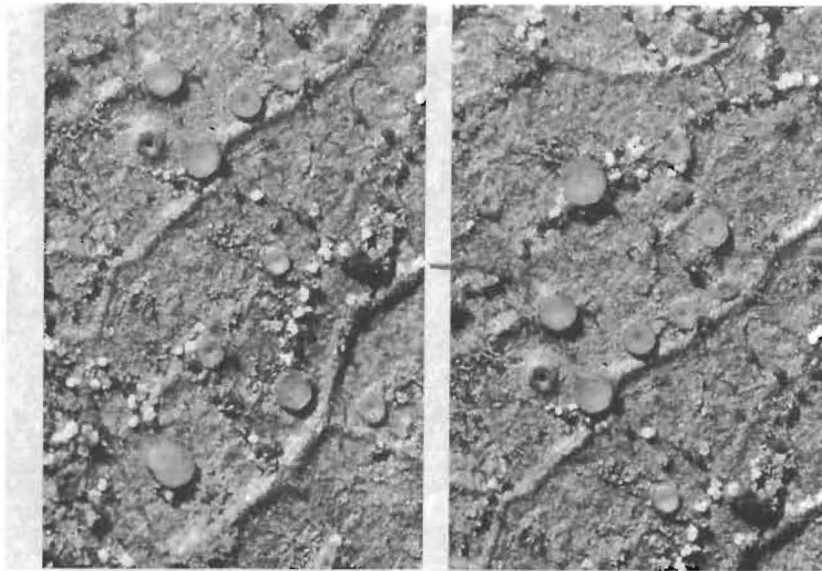


Fig. 4. *Dimerella fuscescens* Vězda & Malcolm (Orig.). Habit. 1 mm

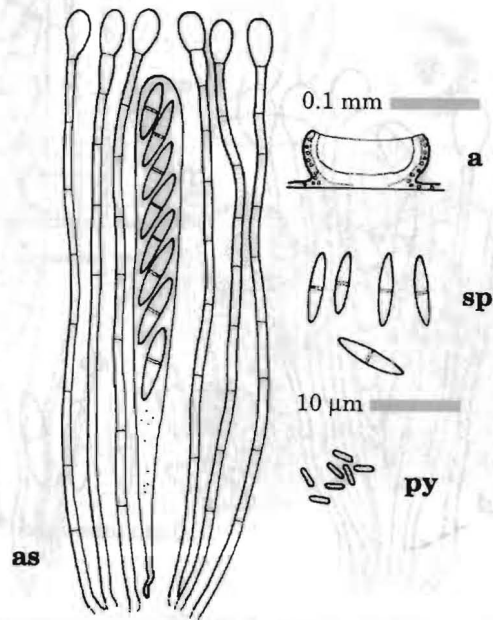
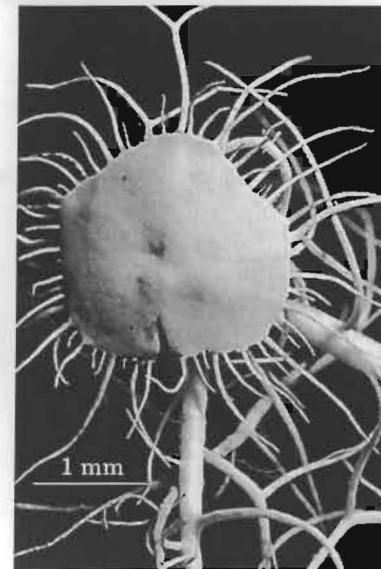
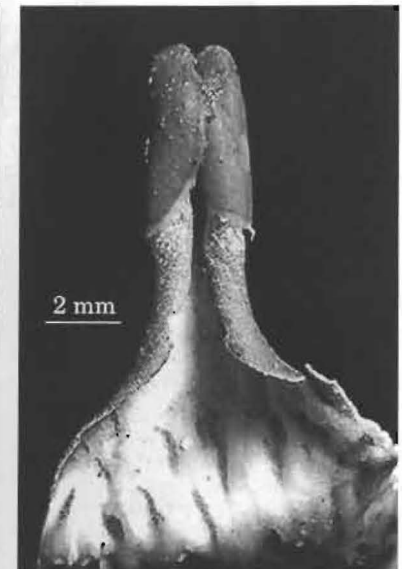


Fig. 5. *Dimerella fuscescens* Vězda & Malcolm (Orig.). a, vertical section through an apothecium. as, asci and paraphyses. sp, ascospores. py, pycnospores.



*Usnea pusilla*



*Peltigera dolichorhiza*