CORTICOLOUS MYXOMYCETES FROM VICTORIA

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Abstract

The moist chamber culture technique was used to investigate the myxomycetes (plasmodial slime moulds) associated with the microhabitat represented by the bark surface of living trees in the state of Victoria. Thirty-six species of myxomycetes in 18 genera were recorded from bark samples collected at 12 different localities throughout Victoria. Twenty-nine species are new records for Victoria, and eight (*Arcyria olivaceoglobosa*, *Collaria biasperospora*, *Echinostelium brooksii*, *Licea testudinacea*, *Macbrideola* cf. *declinata*, *M. synsporus*, *Minakatella longifila* and *Physarum auriscalpium*) are new records for Australia. One other species, a long-stalked *Comatricha* with small, reticulate spores, is new to science.

Key words: Australia, corticolous, myxomycetes, new records, Victoria.

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Introduction

The myxomycetes (plasmodial slime moulds) are a group of fungus-like organisms usually present and sometimes abundant in terrestrial ecosystems. Myxomycetes have been known from their fruiting bodies since at least the middle of the seventeenth century, but most species tend to be rather inconspicuous or sporadic in their occurrence and thus not always easy to detect in nature. Most surveys for these organisms have focused on those species characteristically associated with coarse woody debris. The myxomycetes found in this microhabitat often occur in great profusion, typically producing fruiting bodies of sufficient size to be easily detected in the field (Martin and Alexopoulos 1969, Stephenson 1988). However, there are several other microhabitats for myxomycetes in forest ecosystems. In temperate forests, one of the more important of these is the bark surface of living trees. More than 100 species of myxomycetes have been reported from tree bark and some of these appear to be restricted to this microhabitat. Prominent examples of these "corticolous" (bark-inhabiting) myxomycetes include various species of *Echinostelium*, *Licea* and *Macbrideola* (Alexopoulos 1964, Mitchell 2004).

Mitchell (1995) included 21 species of corticolous myxomycetes in his checklist of the Myxomycota of Australia. All of these were obtained from bark samples placed in moist chamber cultures where the samples came from scattered localities throughout the country. Only nine corticolous species were reported for Victoria. McHugh *et al.* (2003) increased the number of species known from the bark microhabitat in Australia to 53, with all of the additional records derived from samples collected in northern Queensland. The purpose of the study reported herein was to survey the corticolous myxomycetes associated with trees at 12 localities in Victoria. This effort represented one component of a more

extensive survey that also encompassed the other types of microhabitats (coarse woody debris, aerial litter and ground litter) in which these organisms commonly occur.

List of Localities

All of the localities from which bark samples were obtained in the context of the study reported herein are listed below. All samples were collected by the third author during late March 2004.

Locality 1: AUSTRALIA: Victoria, Kinglake National Park, Mount Everard Track (37° 33′ 19″ S, 145° 20′ 14″ E).

Locality 2: AUSTRALIA: Victoria, Kinglake National Park, Jehosaphat Gully (37° 32′ 13″ S, 145° 21′ 06″ E).

Locality 3: AUSTRALIA: Victoria, Yarra Ranges National Park, Donna Buang Rainforest Gallery (37° 42′ 37″ S, 145° 42′ 14″ E).

Locality 4: AUSTRALIA: Victoria, Lake Eildon National Park, Merlo's Lookout (37° 10′ 23″ S, 145° 50′ 51″ E).

Locality 5: AUSTRALIA: Victoria, roadside park near the town of Mansfield (37° 03′ 09″ S, 146° 05′ 41″ E).

Locality 6: AUSTRALIA: Victoria, upper slope of Mount Buller (37° 07′ 32″ S, 146° 27′ 00″ E).

Locality 7: AUSTRALIA: Victoria, Chiltern-Mt. Pilot National Park (36° 09′ 32″ S, 146° 38′ 29″ E).

Locality 8: AUSTRALIA: Victoria, Burrowa-Pine Mountain National Park (36° 04′ 29″ S, 147° 46′ 04″ E).

Locality 9: AUSTRALIA: Victoria, South East Forest National Park (37° 08′ 12″ S, 149° 21′ 34″ E).

Locality 10: AUSTRALIA: Victoria, Drummer Rainforest Walk west of Alfred National Park (37° 34′ 07″ S, 149° 16' 21″ E).

Locality 11: AUSTRALIA: Victoria, Mitchell River National Park (37° 40′ 03″ S, 149° 21′ 29″ E).

Locality 12: AUSTRALIA: Victoria, Bald Hills Wetland Reserve (38° 44′ 01″ S, 145° 56′ 20″ E).

Materials and Methods

The methods used in carrying out the present study were essentially the same as those described by Stephenson (1989) for a study of the myxomycetes associated with bark and litter microhabitats in the upland forests of the southeastern United States. Samples of the dead outer bark were collected from one or more trees at each of the localities visited in Victoria. Each sample consisted of several pieces of bark (usually about 3 to 8 pieces of 2–5 cm size from one tree or from several individuals of the same species) taken randomly from a convenient trunk height that ranged from 1.0–1.8 m. All bark samples were placed in small paper bags, sent to the first author, and used to prepare moist chamber cultures in the manner described by Stephenson and Stempen (1994). The moist chambers used consisted of disposable plastic Petri dishes (9 cm diam.) lined with filter paper. Samples were moistened with distilled water adjusted to pH 7.0 with KOH. Since substrate pH is an important factor determining the abundance and distribution of myxomycetes (e.g., Stephenson 1989, Wrigley de Basanta 2004), after approximately 24 hours excess water in each dish was poured into a clean plastic beaker, where the pH was measured using a low maintenance electrode and an Orion model 210A pH meter. Cultures were kept at room temperature (22-25°C) in diffuse daylight and examined with a stereomicroscope on a regular basis for a period of up to several months in order to detect plasmodia and/or fruiting bodies. When necessary, a small amount of water was added to each culture to maintain moist conditions.

Myxomycete plasmodia and/or fruiting bodies were noted and recorded each time the cultures were checked. When fruiting bodies of a given species developed more than once in the same culture, they were considered to represent a single collection. As such, some collections consisted of a single fruiting body, whereas others consisted of numerous fruiting bodies. As soon as fruiting bodies were judged to be fully mature (usually at least 1–2 days after they were first noticed), the portion of

the substrate upon which they occurred was removed from the moist chamber, air-dried, and then glued in a small box for permanent storage. Identifications of collections were made using the descriptions and keys provided by Martin and Alexopoulos (1969) and Mitchell (2004). In some instances, sporocarps were preserved as permanent slides in lactophenol and/or glycerol gelatin.

Results

Annotated list of species

Moist chamber cultures prepared with bark samples collected in the present study yielded 36 species of myxomycetes, including a number of new records for Australia, several new records for the Southern Hemisphere and one species new to science. In the list that follows, the myxomycetes we recorded are arranged alphabetically by genus and then species. Nomenclature follows Lado (2001) and Hernández-Crespo and Lado (2005), with the conserved names of several genera (Lado *et al.* 2005) approved recently by the Committee for Fungi (Gams 2005) of the IAPT. The abbreviation 'cf.' in the name of a taxon indicates that the specimen representing the source of the record could not be identified with certainty. This usually indicates scanty or aberrant material. Specimens listed herein are deposited in the herbarium of the University of Arkansas (UARK). Collection numbers are those of the third author.

Arcyria cinerea (Bull.) Pers.

Locality 4: *Eucalyptus* sp. (pH 5.0), SLS 21622. Locality 7: *Eucalyptus* sp. (pH 6.0), SLS 21646. Locality 11: *Tristaniopsis laurina* (pH 5.3), SLS 21684.

First reported from Australia by Cooke (1892) but not previously known from Victoria.

Arcyria olivaceoglobosa M.L. Farr, S.W. Chapm. & Mitchel

Locality 12: *Eucalyptus* sp. (pH 3.9), SLS 21694.

This apparently rare species was described originally from material collected in Colorado and British Columbia in North America (Farr 1979). Our record is the first for the Southern Hemisphere.

Arcyria pomiformis (Leers) Rostaf.

Locality 4: *Callitris* sp. (pH 5.0), SLS 21620; *Eucalyptus* sp. (3.9), SLS 21627. Locality 8: *Eucalyptus* sp. (pH 5.1), SLS 21656. Locality 11: *Callitris* sp. (pH 4.7), SLS 21686.

First reported from Australia by Mitchell (1995) but not previously known from Victoria.

Calomyxa metallica (Berk.) Nieuwl.

Locality 4: *Callitris* sp. (pH 5.0), SLS 21715.

Clastoderma debaryanum A. Blytt

Locality 7: *Eucalyptus* sp. (pH 7.5), SLS 21651. Locality 11: Unidentified tree (pH 3.8), SLS 21682.

Collaria biasperospora (Kowalski) Dhillon & Nann.-Bremek. ex Ing

Locality 8: *Eucalyptus* sp. (pH 5.1), SLS 21659.

A new record for the Southern Hemisphere.

Comatricha elegans (Racib.) G. Lister

Locality 1: *Eucalyptus obliqua* (pH 3.9), SLS 21614. Locality 7: *Eucalyptus* cf. *tricarpa* (pH 3.4), SLS 21648; *Eucalyptus* sp. (pH 3.4), SLS 21649. Locality 9: *Eucalyptus* sp. (pH 4.2), SLS 21672.

First reported from Australia by Fraser (1933) but not previously known from Victoria.

Comatricha laxa Rostaf.

Locality 4: *Eucalyptus* sp. (pH 5.0), SLS 21623. Locality 11: *Eucalyptus* sp. (pH 5.6), SLS 21681.

First reported from Australia by Fraser (1933) but not previously known from Victoria.

Comatricha pseudonigra G. Moreno, W.C. Rosing, D.W. Mitch. & S.L. Stephenson

Locality 11: Unidentified tree (pH 3.8), SLS 21683A, 21683B.

When first examined, our two collections could not be referred to any known species. The long-stalked sporocarps closely resemble those of *C. nigra* (Pers. ex J.F. Gmel.) J.Schröt, but the spores are smaller (5 µm as compared to

9-10 µm in *C. nigra*) and the spore ornamentation is different. This material was later determined to represent the new species *Comatricha pseudonigra* (Moreno *et al.* 2007).

Cribraria confusa Nann.-Bremek. & Y. Yamam.

Locality 9: *Eucalyptus* sp. (pH 3.5), SLS 21667A. Locality 10: Unidentified tree (pH 3.6), SLS 21678. Locality 11: *Pittosporum* sp. (pH 3.4), SLS 21689; unidentified tree (pH 3.8), SLS 21918.

First reported from Australia by Mitchell (1995) but not previously known from Victoria.

Cribraria microcarpa (Schrad.) Pers.

Locality 4: *Eucalyptus* sp. (pH 3.9), SLS 21628.

First reported from Australia by McHugh *et al.* (2003) but not previously known from Victoria.

Cribraria minutissima Schwein.

Locality 6: *Eucalyptus* sp. (pH 3.5), SLS 21633. Locality 7: *Eucalyptus* sp. (pH 3.4), SLS 21647. Locality 9: *Eucalyptus* sp. (pH 3.5), SLS 21667B.

First reported from Australia by Mitchell (1995) but not previously known from Victoria.

Cribraria violacea Rex

Locality 7: *Eucalyptus* sp. (pH 7.5), SLS 21652.

Diderma chondrioderma (de Bary & Rostaf.) G. Lister

Locality 10: Unidentified tree (pH 5.1), SLS 21674.

First reported from Australia by Mitchell (1995) but not previously known from Victoria.

Echinostelium apitectum K.D. Whitney (= *E. vanderpoelii* Nann.-Bremek., D.W. Mitch., T.N. Lakh. & R.K. Chopra)

Locality 4: *Eucalyptus* sp. (pH 3.9), SLS 21714. Locality 5: *Pinus radiata* (pH 4.2), SLS 21625

First reported (as *Echinostelium vanderpoelii*) from Australia by Mitchell (1995) but not previously known from Victoria.

Echinostelium brooksii K.D. Whitney

Locality 6: *Eucalyptus* sp. (pH 3.5), SLS 21644.

New record for Australia.

Echinostelium colliculosum K.D. Whitney & H.W. Keller

Locality 11: *Tristaniopsis laurina* (pH 5.3), SLS 21685.

First reported from Australia by Mitchell (1995) but not previously known from Victoria.

Echinostelium minutum de Bary

Locality 2: *Eucalyptus* sp. (pH 5.4, 6.4), SLS 21615; *Olearia argophylla* (pH 4.9), SLS 21616. Locality 4: *Leptospermum* sp. (pH 5.4), SLS 21619; *Callitris* sp. (pH 5.0), SLS 21621. Locality 8: *Eucalyptus* sp. (pH 5.1), SLS 21658. Locality 9: *Leptospermum* sp. (pH 5.4), SLS 21663; *Eucalyptus* sp. (pH 3.4), SLS 21664B. Locality 12: *Acacia* sp. (pH 5.8), SLS 21696.

Enerthenema papillatum (Pers.) Rostaf.

Locality 4: *Eucalyptus* sp. (pH 3.9), SLS 21629. Locality 10: Unidentified tree (pH 3.6), SLS 21679. Locality 11: *Pittosporum* sp. (pH 3.6), SLS 21690

First reported from Australia by Fraser (1933) but not previously known from Victoria.

Hemitrichia leiocarpa (Cooke) Lister

Locality 2: *Olearia* sp. (pH 5.7), SLS 21617.

First reported from Australia by McHugh *et al.* (2003) but not previously known from Victoria.

Licea biforis Morgan

Locality 9: *Acacia* sp. (pH 6.2), SLS 21665.

First reported from Australia by Mitchell (1995) but not previously known from Victoria.

Licea kleistobolus G.W. Martin

Locality 4: *Eucalyptus* sp. (pH 3.9), SLS 21630.

First reported from Australia by Mitchell (1995) but not previously known from Victoria.

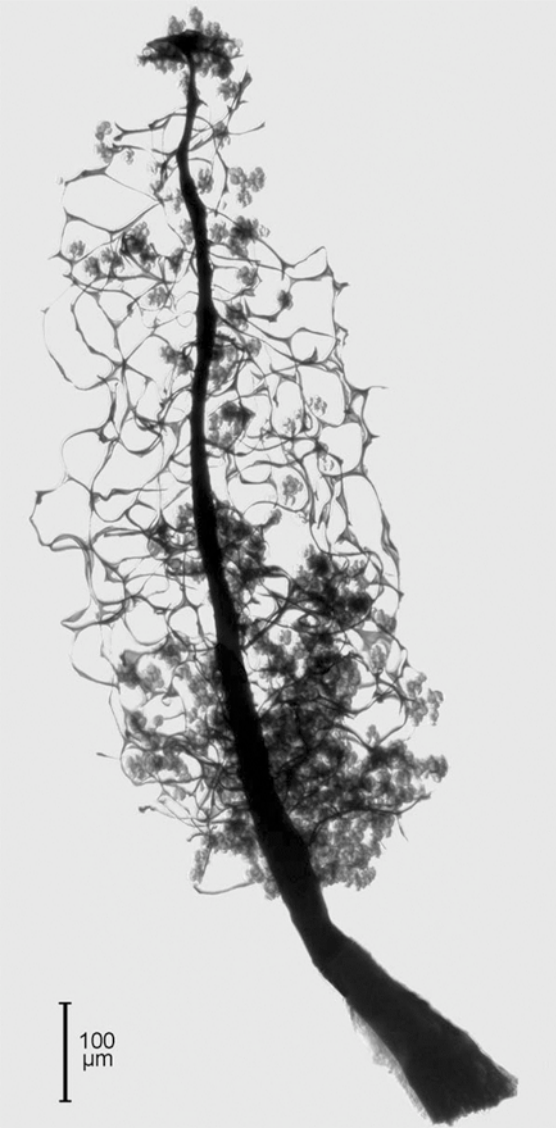

Figure 1. Sporocarp of *Macbrideola synsporus*, a species not previously known from the Southern Hemisphere.

Licea parasitica (Zukal) G.W. Martin

Locality 9: *Acacia* sp. (pH 6.2), SLS 21666.

First reported from Australia by Mitchell (1995) but not previously known from Victoria.

Licea testudinacea Nann.-Bremek.

Locality 11: *Callitris* sp. (pH 4.7), SLS 21687.

A new record for the Southern Hemisphere.

Macbrideola cornea (G. Lister & Cran) Alexop.

Locality 4: *Eucalyptus* sp. (pH 6.2), SLS 21645. Locality 7: *Eucalyptus* sp. (pH 7.5), SLS 21655B.

First reported from Australia by Mitchell (1995) but not previously known from Victoria.

Macbrideola* cf. *declinata T.E. Brooks & H.W. Keller

Locality 8: *Eucalyptus* sp. (pH 5.1), SLS 21660.

Our specimen is only provisionally referred to this species. Although the sporocarps possess a persistent peridium as is the case for *Macbrideola declinata*, the spores are slightly larger and the capillitium more extensive than described for the latter species (Eliasson *et al.* 1988). There are no previous records of this species from Australia.

Macbrideola synsporus (Alexop.) Alexop. (Fig. 1)

Locality 9: *Eucalyptus* sp. (pH 3.5), SLS 21669.

A new record for the Southern Hemisphere.

Minakatella longifila G. Lister

Locality 9: *Leptospermum* sp. (pH 5.4), SLS 21664A.

A new record for the Southern Hemisphere.

Paradiacheopsis cribrata Nann.-Bremek.

Locality 8: *Eucalyptus* sp. (pH 3.6), SLS 21662. Locality 9: *Eucalyptus* sp. (pH 3.5), SLS 21670. Locality 10: Unidentified tree (pH 5.1), SLS 21675. Locality 11: *Callitris* sp. (pH 4.7), SLS 21688.

First reported from Australia by Jordan *et al.* (2006) but not previously known from Victoria.

Paradiacheopsis fimbriata (G. Lister & Cran) Hertel ex Nann.-Bremek.

Locality 5: *Pinus radiata* (pH 4.2), SLS 21626.

First reported from Australia by Mitchell (1995) but not previously known from Victoria.

Perichaena chrysosperma (Curr.) Lister

Locality 7: *Eucalyptus* sp. (7.5), SLS 21654.

Physarum auriscalpium Cooke

Locality 7: *Eucalyptus* sp. (pH 7.5), SLS 21655.

A new record from Australia, although the species is known from New Zealand (Stephenson 2003).

Physarum bivalve Pers.

Locality 5: *Quercus* sp. (pH 5.2), SLS 21713.

First reported from Australia by Cheesman and Lister (1915) but not previously known from Victoria.

Physarum pusillum (Berk. & M.A. Curtis) G. Lister

Locality 4: *Eucalyptus* sp. (pH 5.0); SLS 21624.

Stemonitopsis hyperopta (Meyl.) Nann.-Bremek.

Locality 4: *Eucalyptus* sp. (pH 3.9), SLS 21671.

First reported from Australia by Jordan *et al.* (2006) but not previously known from Victoria.

Trichia botrytis (J.F. Gmel.) Pers.

Locality 10: Unidentified tree (pH 5.1), SLS 21676.

First reported from Australia by Cooke (1892) but not previously known from Victoria.

Discussion

As a general observation, bark from the various species of *Eucalyptus* sampled throughout Victoria did not seem particularly productive for corticolous myxomycetes, compared with the diversity we have observed in the temperate forests of Europe and eastern North America over a period of several decades. However, there were a couple of instances (one for Locality 4 and the other for Locality 7) in which samples from a particular type of *Eucalyptus* yielded at least six different species. Values of pH recorded for moist chamber cultures prepared with bark samples collected during this study ranged from 3.2 to 7.5, which is comparable to the values reported by Stephenson (1989) for similar research carried out in eastern North America. The pH of a given substrate is known to be an important factor determining the distribution of particular species of myxomycetes in nature (Stephenson & Stempen 1994) and this appears to be reflected in the data obtained in the present study. For those species obtained from more than a single moist chamber culture, the pH values of those cultures in which it appeared were usually rather similar. The only noteworthy exception was *Clastoderma debaryanum*, which was recorded from cultures with pH values of 3.8 and 7.5.

The new records obtained in the present study bring the total number of corticolous myxomycetes known from Australia to at least 61 species. Because much of Australia remains understudied for this ecological group of myxomycetes, it seems certain that future surveys will yield additional records.

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