

## MYCOLOGISTS AND BRYOPHYTES

Heino Lepp

PO Box 38, Belconnen, ACT 2616, Australia.

### Abstract

Anecdotal evidence, gained from many conversations, suggests that the existence of leafy liverworts is often overlooked by Australian fungal collectors and the examination of published papers and photographs supports this suggestion. Some fungi, commonly reported as growing with mosses, may in fact be growing with leafy liverworts and lumping everything under the term 'moss' gives misleading ecological information. It is usually easy to distinguish mosses from leafy liverworts and a simple guide, that will suffice in the majority of cases, is given.

H. Lepp (2002). Mycologists and bryophytes. *Australasian Mycologist* 21 (2): 76–78.

### Introduction

Mosses, liverworts and hornworts are collectively called bryophytes. Mosses are *leafy* (having leaves on stems). Hornworts are *thallose* (growing as flattish, green lobes), with no differentiation into leaves and stems. There are both leafy and thallose liverworts but the most widely known liverworts are probably the thallose genera *Lunularia* and *Marchantia*. However, there are far more species of leafy liverworts than thallose liverworts. Bryophytes have a haploid gametophyte stage and a diploid sporophyte stage. In a moss or leafy liverwort the gametophyte is the leaves-on-stems plant and the sporophyte consists of a spore capsule (often on a stalk, or *seta*) that grows out of the gametophyte. Jarman & Fuhrer (1995) give good colour photos of many bryophyte species and the illustrations in Catcheside (1980), Scott (1985) and Scott & Stone (1976) are well worth perusing.

### Differences between mosses and leafy liverworts

This simple table lists a few useful characteristics and it should give you the right answer close to 99% of the time. You can find out more from the references given above. *Elaters* are small, spiral structures amongst the spore mass.

	Mosses	Leafy liverworts
<b>Sporophyte</b>		
Capsule	initially green and finally brown; mature capsule almost always with a well-defined mouth, through which the spores are released; persistent	black; no mouth, the capsule splits along four dehiscence lines and opens out as four segments, to expose the spores to the air; not persistent
seta	opaque, initially green and finally red to brown; solid; persistent	hyaline; flimsy; soon collapsing
Elaters	absent	usually present
<b>Gametophyte</b>		
leaf nerve	present or absent	always absent
leaf form	simple (and possibly serrate/crenulate in part)	simple to heavily divided

If sporophytes are present, then it is almost always an easy matter to decide which you have—and you can do it with the naked eye! If there are no sporophytes look for a nerve in the leaf. There is considerable variation in the nerves of moss leaves.

- Most commonly the nerve is very narrow but in some genera the nerve is over half the width of the leaf.
- The nerve may extend the length of the leaf (and even beyond) or be very short.
- Mostly the nerve is simple but occasionally it is forked and in a few species two nerves are present.

### Leafy liverworts, *Galerina* and the Hygrophoraceae

To illustrate the contention in the first sentence of the abstract I will focus on *Galerina* and the 'Hygrophoraceae' (a useful term, even if no longer warranted as a separate family). I mention these taxa for three reasons. First, these fungi often seem to be found in 'mossy' habitats. Second, the Australian species have been well documented recently and, in the papers which mention associated bryophytes (Wood 2001, Young 1999, 2000b, 2000c, Young, Bougher & Robinson 2000, Young, Kearney & Kearney 2001, Young & Wood 1997), mostly just the word 'moss' is used. *Sphagnum* is the only moss genus that is mentioned, a few times. Third, I have often seen examples of *Galerina* and the Hygrophoraceae growing with leafy liverworts.

The general *Galerina* literature contains many well-documented cases of moss associations. For example, Smith & Singer (1964) list specific moss genera in many of the habitat notes. However, they also note four species associated with liverworts (unfortunately with no indication of whether leafy or thallose). Moreover, in many cases they use the unqualified word 'moss', leaving open the possibility that there has been some moss/leafy liverwort confusion. In Australia I have often seen *Galerina* sporocarps growing from rotten wood covered by a monoculture of the leafy liverwort genus *Lepidozia*. At other times only the leafy liverwort genus *Chiloscyphus* (or *Lophocolea*—depending on your taxonomic preference) has been around the sporocarps.

Similarly I have seen terrestrial hygrophoraceous sporocarps growing through carpets of pure *Chiloscyphus/Lophocolea*. Several photos in Fuhrer & Robinson (1992) clearly show hygrophoraceous species accompanied by leafy liverworts. The fungi, page references and likely liverwort genera are as follows:

*Hygrocybe lilaceolamellata* (p. 42) *Bazzania* is dominant around the base of the upright specimen; there is also another, very small-leaved species in the foreground (this photo is referred to by Young 2000b, where there is no mention of liverworts).

*Hygrocybe miniata* (p. 42) something akin to *Lepidozia*.

*Humidicutis rosella* (p. 43) *Bazzania* (in lower right corner, behind the hazy, foreground filmy fern).

*Hygrocybe procera* (p. 44) *Bazzania* (along the lower half of the left hand margin).

The (?) *Hygrocybe* on the cover of Young (2000a) could well be growing in a bed of *Lepidozia*. Other common genera worth becoming familiar with are *Frullania* and *Lethocolea*. You should also bear in mind that some leafy liverwort genera, such as *Cephaloziella* and *Zoopsis*, have very tiny leaves and so might initially be mistaken for filamentous algae.

### Finally, moss or leafy liverwort—does it matter? Yes!

They are different organisms with, for example, different chemistries that may well influence the fungi growing nearby. The surveys by Felix (1988) and Döbbeler (1997) list many specific associations, make some observations about liverworts, mosses and fungi—but note that more is unknown than known about fungus-bryophyte associations. Since there is still so much to learn, accurate terminology is essential. If you are not sure of what you have, follow the example of May (1997) and use the word 'bryophyte'. Ideally, you would always include a bryophyte sample, say a few square centimetres, with your fungal collection. The *Galerina* and Hygrophoraceae examples show that it does pay to be careful—but the issue goes beyond these taxa. Everyone will have seen numerous fungal genera in 'mossy' habitats. Failing to distinguish mosses from leafy liverworts is akin to being unable to tell an agaric from a polypore.

### Acknowledgements

I am greatly indebted to Judith Curnow who, over the years, has introduced me to many wonders of the liverwort world. I thank Judith and Chris Cargill for helpful discussions during the writing of this note.

### References

- Catcheside, D.G. (1980). *Mosses of South Australia*. Government Printer, South Australia.
- Döbbeler, P. (1997). Biodiversity of bryophilous ascomycetes. *Biodiversity and Conservation* **6**, 721–738.
- Felix, H. (1988). Fungi on bryophytes; a review. *Botanica Helvetica* **98**, 239–269.
- Fuhrer, B & Robinson, R. (1992) *Rainforest Fungi of Tasmania and south-east Australia*. CSIRO & Forestry Commission, Tasmania.
- Jarman, S.J. & Fuhrer, B.A. (1995). *Mosses and Liverworts of Rainforest in Tasmania and South-eastern Australia*. CSIRO & Forestry Tasmania.
- May, T.W. (1997). *Laccaria* in Grgurinovic, C.A. *Larger Fungi of South Australia*. The Botanic Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee, Adelaide.
- Scott, G.A.M. (1985). *Southern Australian Liverworts*. Australian Government Publishing Service.
- Scott, G.A.M. & Stone, I. (1976). *The Mosses of Southern Australia*. Academic Press.
- Smith, A.H. & Singer, R. (1964). *A monograph of the genus Galerina Earle*. Hafner Publishing Company, New York.
- Wood, A.E. (2001). Studies in the Genus *Galerina* (Agaricales) in Australia. *Australian Systematic Botany*, **14**, 615–676.
- Young, A.M. (1999). The *Hygrocybeae* (Fungi, Basidiomycota, Agaricales, Hygrophoraceae) of the Lane Cove Bushland, Park, New South Wales. *Austrobaileya* **5**, 535–564.
- Young, A.M. (Tony). (2000a). *Common Australian Fungi: a bushwalker's guide* (revised edition). UNSW Press.
- Young, A.M. (2000b). Additions to the Hygrophoraceae (Fungi, Agaricales) of south eastern Australia. *Muelleria*, **12**, 3–36.
- Young, A.M. (2000c). Remarks on Hygrophoraceae in or near Lamington National Park, south-east Queensland, Australia. *Australasian Mycologist* **19**, 96–100.
- Young, A.M., Kearney, R. & Kearney, E. (2001). Additions to the Hygrophoraceae of Lane Cove Bushland Park. *Australasian Mycologist* **20**, 79–86.
- Young, A.M., Bougher, N.L. & Robinson, R.M. (2000). Hygrophoraceae of Western Australia II. Further Taxa. *Australasian Mycologist* **19**, 41–48.
- Young, A.M. & Wood, A.E. (1997). Studies on the Hygrophoraceae (Fungi, Homobasidiomycetes, Agaricales) of Australia. *Australian Systematic Botany* **10**, 911–1030.