The enigmatic Myxomycetes

SARAH LLOYD
Birralee, Tasmania. Email: sarahlloyd@iprimus.com.au

Slime moulds are not usually thought of as cryptogams, but as they reproduce by spores they more or less fit the Oxford Dictionary of Plant Sciences definition 'plants that reproduce by spores or gametes rather than seeds, i.e. an alga, bryophyte or pteridophyte' (Allaby 1998). Except slime moulds are not plants.

Myxomycetes – what are they?

Acellular slime moulds, also known as myxomycetes or myxogastrids, are opportunistic ubiquitous organisms. They are most abundant in temperate forests but they also occur in tropical forests, alpine areas, heathlands, grasslands, deserts, and arctic and sub-Antarctic regions. In short, wherever there is organic material.

Myxomycetes were once included with plants when all living things were placed in just two kingdoms – plants and animals. When more kingdoms were created to encompass a vastly more complex world than was originally imagined, slime moulds were moved to the kingdom fungi. Indeed, they are often described as fungus-like organisms and, like most fungi, they make only a relatively brief appearance at their fruiting body stage. However, they do not have any structures analogous to fungal hyphae. So where to next?

Before long the pulsating feeding plasmodial stage of myxomycetes was discovered and they were moved to the animal kingdom. Then their single-celled amoeboid feeding stage was observed and they were moved again, this time to the kingdom protozoa. However, this kingdom does not encompass organisms that have an amoeboid, plasmodial and spore bearing stage. They are now considered to be Amoebozoans but whether Amoebozoa is a supergroup or a kingdom is matter of some debate. (Steven L. Stephenson personal communication.)

Life cycle

There are many variations on the following 'basic' life cycle:

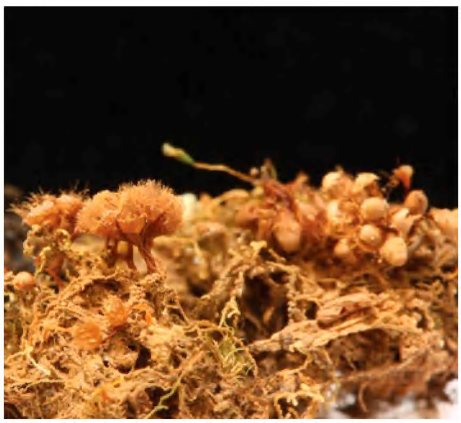
Fruiting bodies produce spores from which emerge one to four amoebae called either myxamoebae or swarm cells.(They are myxamoebae if conditions are dry and flagellated swarm cells if conditions are wet.) These single-celled organisms, whose population can reach extraordinary numbers of between 10 and 1000 and sometimes 10 000 per gram of soil, move about in the soil or wood where they feed by engulfing bacteria – their principal food at this stage. The amoebae don't grow but divide into two identical cells. Sooner or later they find a compatible amoeba and fusion of their protoplasm and nuclei takes place, eventually forming a plasmodium. The plasmodium – the second feeding stage – moves about and feeds on bacteria, fungal hyphae, fruiting bodies and spores, algae (which can remain alive and green within the plasmodium), possibly lichens and probably each other. During this stage there is synchronous nuclear division resulting in the production of numerous nuclei: small plasmodia have several hundred nuclei; larger ones have millions. From the plasmodia (of which there are several kinds) arise one to several thousand spore-bearing fruiting bodies. There are a variety of fruiting bodies types, many of which are exquisitely beautiful.

Myxomycetes take 'hidden' to new depths. If they run out of food or things get too dry, they can revert to dormant structures at both their amoeboid and plasmodial stages. One can only wonder at the longevity of dormant amoeba and plasmodium – called microcysts and sclerotium respectively – hidden within woody substrates.

Moist chamber cultures

Researchers – usually mycologists – undertake surveys of myxomycetes by collecting any fruiting bodies that happen to be in the field, as well as copious amounts of substrate: bark, leaf litter, bryophytes etc. This is placed on wetted absorbent paper in Petri dishes and kept moist at room temperature. Fruiting bodies can appear within days but the material needs to be checked with a dissection microscope over the following weeks and months. This moist chamber culture technique is extremely important in the study of myxomycetes and can augment field collections by 20–60% of species, depending on the habitat.

Didymium clavus **(0.7 mm high) on treefern frond. Photo: Sarah Lloyd.**



(left to right) ***Alwisia lloydiae*****. 4.5mm tall.** ***Trichia verrucosa*****. 3mm high.** ***Arcyria*** **sp. 1.5mm tall. Photos: Sarah Lloyd**

Research in Northern Tasmania

Since 2010 I have studied myxomycetes in the wet eucalypt forest at Black Sugarloaf, Birralee in central north Tasmania (Lloyd 2014). I have over 1100 field collections representing approximately 120 species but have not used moist chambers because I have daily access to my study site.

The best time to find myxomycetes is several days after a bout of wet weather when active plasmodia and/or immature fruiting bodies are relatively easy to see – especially those that are white, yellow, bright red or hot pink when they first appear. They slowly darken over hours or days and all but disappear in the dim light of the forest. Mature fruiting bodies, most of which are around 2 mm tall, are usually only found when actively searching with a head lamp and hand lens.

The literature suggests that slime moulds are predominantly soil dwelling organisms that appear on logs and litter, so I started by searching the huge old bryophyte-covered eucalypt logs and sodden Dogwood (*Pomaderris apetala*). Before long I checked fallen trees and branches that remained off the ground because they were suspended in vegetation; standing dead trees; the fibrous stems of dead Clematis (*Clematis aristata*); the bark of living trees; and the litter that accumulates amongst the fronds of Treeferns (*Dicksonia antarctica*). All sites, at one time or another, have proven to be rich in slime moulds.

Identification – common, rare and 'new' species

Identification of the approximately 1000 species known worldwide is based entirely on the structure of their fruiting bodies which, unlike fungi, retain their shape and colour indefinitely if properly stored. (Myxomycetes are stored by gluing substrate with attached fruiting bodies to a piece of card that fits inside a small box – matchboxes are ideal.) Species are placed in one of five orders and once familiar with their appearance it is reasonably easy to assign to family or genus with the aid of a hand lens. However, assigning species names can be difficult. This is because the fruiting bodies are sensitive to changing conditions during the relatively short time they are forming and even those arising from the same plasmodium can vary greatly in shape, colour, development of the capillitium (thread-like structures within the spore mass), amount of deposited lime, spore size and decoration and 'practically every other factor which is used in the keys' (Martin and Alexopoulos 1969). Most specimens require microscopic examination with a compound microscope, and a page of colour photographs depicting all these features is needed to enable comparison with published descriptions.

Among the many species that have appeared at Black Sugarloaf are several new records for Australia including *Elaeomyxa reticulospora*, a species otherwise known only from the type locality in Java; and at least one new species, *Alwisia lloydiae* D.V. Leontyev, S.L. Stephenson & M. Schnittler(Leontyev *et al*. 2014). Whether this indicates a particularly rich site or simply that very few people are looking can only be determined if similar studies are undertaken elsewhere.

Conservation

The study of myxomycetes – let alone their conservation – is in its infancy in Australia (which is regarded as among the least studied countries in the world). However, retaining habitats with copious quantities of living and dead plant material of all ages should maintain a diversity of myxomycetes.

References

Allaby, M. (1998). *A Dictionary of Plant Sciences*, 2nd edn. Oxford University Press, Oxford.

Leontyev, D.V., Stephenson, S.L. and Schnittler, M. (2014) A new species of *Alwisia* (Myxomycetes) from New South Wales and Tasmania *Mycologia, 106(6), 1212-1219*.

Lloyd, S.J. (2014). *Where the slime mould creeps, the fascinating world of myxomycetes.* Tympanocryptis Press, Birralee.

Martin, G.W. and Alexopoulos, C.J. (1969). *The Myxomycetes*. University of Iowa Press, Iowa.

Lloyd, Sarah. 2016. "The enigmatic myxomycetes." *Australasian Plant Conservation: journal of the Australian Network for Plant Conservation* 24(3), 8–9. https://doi.org/10.5962/p.373627.

View This Item Online: https://www.biodiversitylibrary.org/item/325111
DOI: https://doi.org/10.5962/p.373627
Permalink: https://www.biodiversitylibrary.org/partpdf/373627

Holding Institution
Australian Network for Plant Conservation

Sponsored by
Atlas of Living Australia

Copyright & Reuse
Copyright Status: In copyright. Digitized with the permission of the rights holder.
Rights Holder: Australian Network for Plant Conservation
License: http://creativecommons.org/licenses/by-nc-sa/4.0/
Rights: http://biodiversitylibrary.org/permissions

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at https://www.biodiversitylibrary.org.

This file was generated 10 December 2023 at 06:39 UTC